Comments of

COALITION FOR SAFE BUILDING MATERIALS

(California Pipe Trades Council, California Firefighters Association, Consumer Federation of California, Planning and Conservation League, Center for Environmental Health, Sierra Club of California and Communities for a Better Environment)

on the

ADDENDUM TO ADOPTED MITIGATED NEGATIVE DECLARATION
STATE CLEARINGHOUSE NO. 2000091089
FOR
CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE
USE FOR POTABLE WATER PIPING IN RESIDENTIAL BUILDINGS

VOLUME III

APPENDICES TO THE COMMENTS OF
ADAMS BROADWELL JOSEPH & CARDOZO

April 22, 2005

December 2004

Curriculum Vitae

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Current

Senior Fellow, Economic Studies, The Brookings Institution (since 7/95, Visiting Fellow 7/94 – 6/95)
Co-Director of the European Central Bank's International Wage Flexibility Project
Board of Reviewers, *Industrial Relations*
Consultant on labor economics and statistics

Previous Professional Positions

Director, National Community Development Policy Analysis Network, 1/96-10/01.
Senior Economist, President's Council of Economic Advisors 7/93 - 6/94
Professor of Economics, Department of Economics, University of California, Berkeley (6/95 - 7/95, Associate Professor 7/87 - 6/95, Assistant Prof. 7/80-6/87)
Visiting Assistant Professor of Industrial Relations, Sloan School of Management, M.I.T. (Spring 1986)

Education

Ph.D. in Economics, M.I.T., 1981
B.A. in Social Studies, Bard College, 1976

Journal Articles

"School Readiness and Genetic Differences," *The Future of Children,* forthcoming Vol. 15, #1 (Spring, 2005).

"Racial Discrimination in Labor Markets with Announced Wages," *American Economic Review,* forthcoming, with Kevin Lang and Michael Manove.

"The IQ Paradox is Still Resolved: Reply to Loehlin (2002) and Rowe and Rodgers (2002)" *Psychological Review,* (October, 2002) with James R. Flynn.

"A Foundation for Behavioral Economics," *American Economic Review, Papers and Proceedings,* (May, 2002) with Jessica Cohen.

"Heritability Estimates vs. Large Environmental Effects: The IQ Paradox Resolved," *Psychological Review* (April 2001) with James R. Flynn.

"Near Rational Wage and Price Setting and the Long Run Phillips Curve," *Brookings Papers on Economic Activity*, 2000:I, with George Akerlof and George Perry.

"Racial Test Score Differences as Evidence of Reverse Discrimination: Less than Meets the Eye," *Industrial Relations*, Vol. 38, #3 (July,1999) p331-363, with Thomas J. Kane, reprinted in Harry J. Holzer and David Neumark eds. *The Economics of Affirmative Action,* Edward Elgar: Camberley Surrey (2004).

"The Macroeconomics of Low Inflation," *Brookings Papers on Economic Activity*, 1996:I, pp. 1-76, with George Akerlof and George Perry.

"An Analysis of Unemployment in Sri Lanka," *Journal of Development Studies*, 31 (4), April 1995, pp. 620-36, with Kevin Lang.

"Labor Supply with Hours Restrictions," *International Economic Review*, Vol. XXXIV, no. 1, February 1993, pp. 169-92, with Shelly Lundberg.

"Hedonic Damage Estimates: Assuming the Can Opener." *Journal of Forensic Economics*, Vol. III, no. 3, Fall 1990, pp. 51-60, reprinted in *A Hedonic Primer for Economists and Attorneys*, John O. Ward (ed.), Lawyers & Judges Publishing Company, Tucson, 1992.

"Error Components in Grouped Data: Is it Ever Worth Weighting?" *Review of Economics and Statistics*, Vol. LXXII, no. 2, May 1990, pp. 328-333.

"Does It Matter What We Trade? Trade and Industrial Policies When Labor Markets Don't Clear," *Industrial Relations Research Association Series, Proceedings of the Forty-Second Annual Meeting*, December 28-30, 1989, Atlanta, pp. 527-535.

"Employee Crime, Monitoring, and the Efficiency Wage Hypothesis," *Journal of Labor Economics*, July 1989, with Lawrence Katz, Kevin Lang, and Lawrence Summers.

"The Changing Structure of the Female Labor Market, 1976-1984," *Industrial Relations Research Association Series, Proceedings of the Forty-First Annual Meeting*, December 26-30, 1988, New York, with Rachel Friedberg and Kevin Lang.

"Labor Market Segmentation and the Union Wage Premium," *Review of Economics and Statistics*, August 1988, with Kevin Lang.

"The Reemergence of Segmented Labor Market Theory," *American Economic Review, Papers and Proceedings*, May 1988, with Kevin Lang.

"Bargaining Unit, Union, Industry and Locational Correlates of Union Support in Certification and Decertification Elections," *Industrial Relations*, Fall 1987, with Douglas Wholey and James Robinson.

"The Impact of the Runaway Office on Union Certification Elections in Clerical Units," *Industrial Relations Research Association Series, Proceedings of the Thirty-Ninth Annual Meeting*, December 28-30, 1986, with Beatrice Frieberg.

"Crime and Punishment Again: The Economic Approach with a Psychological Twist," *Journal of Public Economics*, 1986, reprinted in Gianluca Fiorentini and Stefano Zamagni eds. *The Economics of Corruption and Illegal Markets* Edward Elgar:Cheltenham (1998)

"A Test of Dual Labor Market Theory," *American Economic Review*, September 1985, with Kevin Lang.

"Accounting for the Decline in Union Membership, 1950-1980," *Industrial and Labor Relations Review*, April 1985, with Jonathan Leonard.

"Differences Between Risk Premiums in Union and Nonunion Wages and the Case for Occupational Safety Regulation," *American Economic Review, Papers and Proceedings*, May 1984.

"The Effect of Company Campaigns on Certification Elections: Law and Reality Once Again," *Industrial and Labor Relations Review*, July 1983.

"The Productivity Crisis: Secular or Cyclical?" *Economics Letters*, #9, 1982.

"The Economic Consequences of Cognitive Dissonance," *American Economic Review*, June 1982, with George Akerlof, reprinted in George Akerlof, *An Economic Theorist's Book of Tales*, Cambridge University Press, 1984.

Books and Monographs

Urban Problems and Community Development, Brookings 1999, Co-editor with Ronald Ferguson.

Looking Before We Leap: Social Science and Welfare Reform. Brookings, 1995. Co-editor with Kent Weaver.

Labor and an Integrated Europe. Brookings, 1993. Co-editor with Lloyd Ulman and Barry Eichengreen.

The U.S. Labor Market Effects of European Economic Integration: Policy Considerations. National Commission for Employment Policy, 1993.

The Dynamics of Trade and Employment. Ballinger, 1988. Co-editor with Laura Tyson and John Zysman.

Book Chapters

"Inflation and Unemployment in the U.S. and Canada: A Common Framework," in Pierre Fortin and Craig Riddell eds. *Growth, Employment and Technology: Perspectives on Economic Policies* (forthcoming) with George Akerlof, Pierre Fortin and George Perry.

"Instinct and Choice: A Framework for Analysis" in Cynthia Garcia Coll Elaine L. Bearer, and Richard Lerner eds. *Nature and Nurture: The Complex Interplay of Genetic and Environmental Influences on Human Behavior and Development*, Erlbaum, 2004, p145-170. with Jessica Cohen.

"Have the New Human Resource Management Practices Lowered the Unemployment Rate?" in *The Roaring 90s*, A. Krueger and R. Solow editors, Russel Sage Foundation, 2002, with Jessica Cohen and Adam Posen.

"Editors' Introduction," to *Urban Problems and Community Development*, W. Dickens and R. Ferguson (eds.), Brookings, 1999.

"Rebuilding Urban Labor Markets: What Community Development Can Accomplish," in *Urban Problems and Community Development*, W. Dickens and R. Ferguson (eds.), Brookings, 1999.

"Why Has the AFDC Caseload Increased?," in *Looking Before We Leap*, W. Dickens and K. Weaver (eds.), Brookings, 1995.

"The Effects of Family Caps," in *Looking Before We Leap*, W. Dickens and K. Weaver (eds.), Brookings, 1995.

"Editors' Introduction," to *Labor and an Integrated Europe*, Ulman, Eichengreen, and Dickens (eds.), Brookings, 1993.

"The U.S. Labor Market Effects of EC92: A Labor Rents Perspective," in Ulman, Eichengreen, and Dickens, *Labor and an Integrated Europe*, Brookings, 1993.

"Labor Market Segmentation: Reconsidering the Evidence," in William Darity, ed., *Labor Economics: Problems in Analyzing Labor Markets*, Kluwer Academic, 1993, with Kevin Lang.

"Why Do Firms Monitor Workers?" in Weiss, Y., ed., *Advances in the Theory and Measurement of Unemployment*, Macmillan: London, 1990, with Lawrence Katz, Kevin Lang, and Lawrence Summers.

"Neoclassical and Sociological Perspectives on Segmented Labor Markets," in Paula England and George Farkas, eds., *Industries, Firms, and Jobs: Sociological and Economic Approaches*, Plenum Press: New York, 1988, with Kevin Lang.

"The Effect of Trade on Employment: Techniques and Evidence, " in Tyson, Dickens and Zysman, *The Dynamics of Trade and Employment*, Ballinger, 1988.

"Why It Matters What We Trade: A Case for Active Policy," in Tyson, Dickens and Zysman, *The Dynamics of Trade and Employment*, Ballinger, 1988, with Kevin Lang.

"Where Have All the Good Jobs Gone?" in Kevin Lang and Jonathan Leonard, eds., *Unemployment and the Structure of Labor Markets*, Basil-Blackwell, 1987, with Kevin Lang.

"Inter-Industry Wage Differences and Industry Characteristics," in Kevin Lang and Jonathan Leonard, eds., *Unemployment and the Structure of Labor Markets*, Basil-Blackwell, 1987, with Lawrence Katz.

"Safety Regulation and 'Irrational' Behavior," in Benjamin Gilad and Stanley Kaish, eds., *Handbook of Behavioral Economics*, JAI Press, 1986.

"Occupational Safety and Health Regulation and Irrational Behavior: A Preliminary Analysis," in John D. Worrall and David Appel, eds., *Workers' Compensation Benefits: Adequacy, Equity and Efficiency*, ILR Press, 1985.

"Occupational Safety and Health Regulation and Economic Theory," in William Darity, ed., *Labor Economics: Modern Views*, Kluwer-Nijhoff, 1984.

Published Comments, Speeches, Opinion Articles, and Reviews

"The Comparative Advantage of Faith Based Organizations in Community Development and the Implications for Public Policy: Comment on Avis Vidal's The Role of Congregations in Community Development," in E.J. Dione ed. *Sacred Places, Civic Purposes: Should Government Aid Faith-Based Charity?* Brookings, 2002.

"Great Leap Forward," *New Scientist* (April 20, 2001), with James R. Flynn.

Comment on Charles Wyplosz, "Do We Know How Low Inflation Should Be?" in *Why Price Stability? Proceedings of the First ECB Central Banking Conference*, ECB, 2001, Alicia G. Herrero, Vitor Gaspar, Lex Hoogduin, Julian Morgan, and Bernhard Winkler eds.

"Why a Little Inflation is Good," *The Milken Institute Review*, 2000 (4th quarter) p12-18, with George Akerlof and George Perry.

Comments on Lawrence F. Katz and Allan B. Krueger, "The High Pressure U.S Labor Market of the 1990s," *Brookings Papers on Economic Activity*, 1999:1.

"Information and Productivity," FEED, Summer, 1998

"Low Inflation or No Inflation?," *The Brookings Review* XIV:4 (Fall 1996), p. 46, with George Akerlof and George Perry.

"The High Cost of Zero Inflation," *Challenge* (Sept.-Oct., 1996), p. 11-17, with George Akerlof and George Perry.

"If Things Are So Good Why Do We Feel So Bad," *Durell Journal of Money and Banking*, Volume 8, No. 3, (Summer 1996) p. 13.

"A Bad Bill That Needs to be Fixed," *All Politics, CNN/Time* Counterpoint, Web Site http://allpolitics.com/issues/counterpt/9608/02/.

Comments on Jagdish Bhagwati, "Trade and Wages: A Malign Relationship?," in *Imports, Exports and the American Worker*, Brookings 1996, Susan Collins, ed.

Participant in and invited on-line dialog, "One Nation Underpaid," *FEED*, (Spring 1996), Web Site http://www.feedmag.com/96.03dialog/96.03dialog1.html, /96.03dialog2.html, and /96.03dialog3.html.

"Trade and Wages," Speech given at Institute for International Education APEC Symposium

October 22, 1994 San Francisco California, Conference Proceedings, IIE, D.C., 1995.

"Does The Bell Curve Ring True?," *The Brookings Review* XIII:3 (Summer 1995), p. 18-22, with Thomas Kane and Charles Schultze.

Comments on Peter Gottschalk and Robert Moffitt, "The Growth in Earnings Instability in the U.S. Labor Market," *Brookings Papers on Economic Activity*, 1994:2.

Comments on Gregory Saltzman, "Public Sector Bargaining Laws Really Matter: Evidence from Ohio and Illinois," in Richard Freeman and Casey Ichniowsky, eds., *When Public Sector Workers Unionize*, University of Chicago Press, 1988.

Comments on Kevin Murphy and Robert Topel, "The Evolution of Unemployment in the U.S. 1968-1985," in Stanley Fischer, ed., *NBER Macro Economics Annual*, MIT Press, 1987.

Comments on a session on part-time and temporary workers at the Winter meetings of the Industrial Relations Research Association. *Proceedings of the Thirty-Ninth Annual Meeting*, December 28-30, 1986.

Comments on a session on civilian and military job training at the Winter meetings of the Industrial Relations Research Association. *Proceedings of the Thirty-Ninth Annual Meeting*, December 28-30, 1986.

"What Do the British Want from Worker Participation? A Review," *Sloan Management Review*, Winter, 1981.

Grants

Russell Sage and Century Foundation small grant for study of the effects of changing human resource management policies on the relationship between inflation and unemployment, with Adam Posen. January 1999 – February 2001.

National Science Foundation grant to study the implications of low inflation for economic performance. September 1997- August 1999, with George Akerlof

Casey, MacArthur, and Rockefeller Foundation grant to develop the National Community Development Policy Analysis Network and publish *Urban Problems and Community Development,* January 1996 to October 2001. With Ronald Ferguson and the NCDPAN steering committee.

National Commission for Employment Policy grant to study the effects of European economic integration on the U.S. labor market, October 1991-July 1992.

Small Business Administration grant to study the effects of turnover on training costs for small businesses, July 1987-June 1988.

National Science Foundation grant of super computer time for a study of labor market structure,

August 1986-July 1987, with Kevin Lang.

National Science Foundation Applied Economics grant to study alternative explanations for Labor Market Segmentation including efficiency wage models. August 1986-July 1987, with Kevin Lang.

Faculty Development Summer Research Grant, University of California, Summer 1985.

Office of Technological Assessment grant to study Trade, Business Relocation and U.S. Labor Adjustment, October 1984-April 1985, with Laura Tyson and John Zysman.

National Science Foundation Research Grant to study dual labor markets, August 1984-July 1986, with Kevin Lang.

Testimony and Government Service

Co-director (with Erica Groshen) of a thirteen country collaborative project sponsored by the European Central Bank (along with IZA and the New York Federal Reserve) to use micro data to assess the extent of wage rigidity, and the relation of rigidity to economic outcomes, and to labor market and governmental institutions. We have held two conferences for participants, and in June of 2004 held our final conference in Frankfurt. We are now working with the country teams to develop our final report.

Presented a seminar on estimating wage rigidity using micro data at the Bank of Portugal and consulted with bank staff, November 2004.

Participated in a seminar on the implications of downward nominal wage rigidity for central bank policy held at the Bank of Norway. Consulted with Bank of Norway staff. June 2003

Participated in the first European Central Banking conference in Frankfurt. Presented a seminar at the European Central Bank on applying work on the effects of low inflation to Europe. Consulted with bank staff. November 2001.

Served as a consultant to the Montgomery County Public Schools' legal team defending against charges of reverse discrimination in acceptance of children for the county's special, gifted and talented programs. Winter and Spring of 2000.

Presented seminars on continuing work on the welfare effects of low inflation at the Bank of Canada, May 31, 1999.

Reviewed Clinton Administration plans for reforming Affirmative Action contracting rules, Spring 1996 and Summer 1997.

Presented seminar on the effects of downward nominal wage rigidity on the long run trade-off between inflation and unemployment to the governors and staff of the Federal Reserve (with George Akerlof and George Perry). October 1996.

Reviewed draft of OSHA's economic analysis of its proposed ergonomics standard for White House, February, 1995.

Participant in Panel Briefing for Congressional Staff on State of Labor Markets and Labor Policy, September 19, 1994.

Senior Economist with the President's Council of Economic Advisors July 1993-July 1994. I consulted on a wide range of labor market and macro economic issues and helped in the development of legislation for the administration's school-to-work initiative, its reemployment initiative, OHSA reform, and welfare reform. I directed the CEA's efforts to prepare for a special G7 ministers' meeting on job generation and acted as Laura Tyson's deputy at the meeting advising her and Vice President Gore on their participation. On numerous occasions I represented the CEA at deputy cabinet and cabinet level meetings. I helped convene a deputy level strategic planning initiative on labor markets and directed a sub-group to develop plans for more effective enforcement of anti-discrimination laws.

Member of advisory panel for Office of Technological Assessment, review of OSHA's selection of control technologies and assessment of their impacts and costs, 1993 to 1995.

"Efficiency Wage Theory: You Get What You Pay For," Before the Public Utility Commission of the State of California, June, 1992.

"An Evaluation of DRA's Proposed Methodology for Determining Appropriate Levels of Compensation for SoCAL Employees," Before the Public Utility Commission of the State of California, July 17, 1989.

Prepared an analysis of the causes of unemployment in Sri Lanka for the World Bank, 1990, with Kevin Lang.

"The Socio-Economic Consequences of the Construction of Luz SEGS VIII for the State of California and the Project Area," Before the California Energy Commission, March 2, 1989.

"Did the State of California Deliberately Discriminate Against Women in Setting Salaries in the 1930s and If So, Did That Discrimination Continue Past the 1937-38 Changes to the State's Methods for Determining Compensation?" Testimony in U.S. District Court, February 8-24, 1989.

"Does the NLRA Still Protect Workers' Rights to Collective Bargaining?" Before the Labor Subcommittee of the U.S. Senate Labor and Human Resources Committee, January 29, 1988.

Working Papers

"Low Birth Weight and Social Disadvantage: Tracking their relationship with children's IQ during the period of school attendance," submitted to *Intelligence* November (2004), with Naomi Breslau, James Flynn, Edward Peterson, and Victoria Lucia.

"Networks and Neighborhoods: The Consequences of Economic Segregation and Geographic Mobility," Brookings mimeo, March 1997.

"Do Labor Rents Justify Strategic Trade and Industrial Policy?" Brookings mimeo, June 1995.

"Bilateral Search as an Explanation for Labor Market Segmentation and Other Anomalies," NBER Working Paper #4461, September 1993, with Kevin Lang.

"Good Jobs: Increasing Worker Productivity With Trade and Industrial Policy," Berkeley Mimeo, 1991.

"A Goodness of Fit Test of Dual Labor Market Theory," NBER Working Paper #2350, with Kevin Lang.

"Wages, Employment and the Threat of Collective Action by Workers," NBER Working Paper #1856.

"Testing Dual Labor Market Theory: A Reconsideration of the Evidence," NBER Working Paper #1670, with Kevin Lang.

"Structural Change and the Decline of Union Density," NBER Working Paper #1882, with Jonathan Leonard.

"Are Efficiency Wages Efficient?" NBER Working Paper #1935, April 1986, with Lawrence Katz and Kevin Lang.

"Interindustry Wage Differences and Theories of Wage Determination," with Lawrence Katz, NBER Working Paper #2271, 1987.

"Consistent Estimation Using Data from More than One Sample," NBER Technical Paper #33, July 1984, with Brian Ross.

"Are Asset Demand Functions Determined by CAPM?" NBER Working Paper #1113, April 1983, with Jeffrey Frankel.

"The Productivity Enhancing Effects of R&D Expenditures: Another Look," Berkeley mimeo, March 1983, with Kathryn Marshall.

"Work and Personality: A Structural Interpretation of the Class-Values Relation," a Group for Work Democracy discussion paper, Cambridge, Massachusetts, June 1979.

"Instrumental Variables Estimation of a Two-Market Disequilibrium Model of the U.S. Economy," M.I.T. mimeo, March 1979.

Referee

American Economic Review
The Brookings Institution
Econometrica
Economic Development and Cultural Change
Economic Development Quarterly
Economic Inquiry
Economic Journal
Economica
Economics Letters
Economics of Education Review
Empirical Economics
European Economic Journal
Industrial and Labor Relations Review
International Review of Law and Economics
Journal of Applied Econometrics
Journal of Behavioral Economics
Journal of Development Economics
Journal of Economic Behavior and Organization
Journal of Human Resources
Journal of International Economics
Journal of Labor Economics
Journal of Law, Economics, and Organization
Journal of Macroeconomics
Journal of Molecular Psychiatry
Journal of Money, Credit and Banking
Journal of Political Economy
Journal of Public Economics
Journal of Public Policy Analysis and Management
Levy Institute
National Academy of Sciences
National Institute of Aging
National Science Foundation
Oxford Economic Papers
Oxford University Press
Psychological Bulletin
Psychological Review
Quarterly Journal of Economics
Regional Science and Urban Economics
Review of Economic Studies
Review of Economics and Statistics
Review of General Psychology
Review of Industrial Organization
Social Science and Humanities Research Council of Canada
Social Science Quarterly
World Bank

DECLARATION OF JULIA E. MAY IDENTIFYING CALIFORNIA MANUFACTURING OF CPVC PLASTIC PIPE, PIPE FITTINGS, OR ADHESIVES FOR DRINKING WATER APPLICATIONS, AND AIR EMISSIONS ASSOCIATED WITH THESE CALIFORNIA MANUFACTURING FACILITIES

I, Julia E. May, do declare and if called as a witness would testify as follows:

1. I am an air quality expert and hold an engineering degree from the University of Michigan (1981). I have 18 years of experience researching industrial air emissions and chemical use for non-profit community organizations.

2. I have confirmed that the following companies manufacture CPVC plastic pipe, fittings, and/or cement or adhesives certified for potable drinking water uses at their California facilities: IPS or Industrial Polychemical Services; Dura Plastics; Harvel Plastics; Spears Manufacturing; King Brothers or KBI; and T. Christy Enterprises.

3. I have confirmed that Oatey Co. manufactures CPVC cement/adhesive for drinking water uses in either California or Ohio.

4. I performed research through the Toxic Release Inventory (TRI) databases kept by the U.S. Environmental Protection Agency on EPA's Envirofacts website (http://www.epa.gov/enviro/). I found two of the above seven California manufacturers to be reported by EPA TRI database as emitting toxic chemicals. The online documents provided by US EPA which provide chemical use and emissions data for these companies are called "Form R's" and are submitted by the company to US EPA. EPA's most recent full data available online for query is 2002. Emission summaries are included in the table below.

5. The TRI database listed IPS Corporation and Oatey company as emitting thousands of pounds of Methyl Ethyl Ketone in 2002, and sending thousands more offsite for either incineration or energy recovery.

6. I searched an online database of the California Air Resources Board (CARB) http://www.arb.ca.gov/app/emsinv/facinfo/facinfo.php) and found

IPS Corp. in California listed:
http://www.arb.ca.gov/app/emsinv/facinfo/facdet.php?co_=19&ab_=SC&facid_=800367&dis_=SC&dbyr=2002&dd= The air emissions results of this search are included in the table below and the web page listing the data for this facility is attached (entitled "Facility Details"). The most recent year's data available from the California Air Resources Board website on this facility lists 21.51 tons per year (tpy) of Total Organic Gases, including 18.24 tpy of Reactive Organic Gases (ROG). Reactive organic gases are those which easily react in the atmosphere to form ground-level ozone (a primary component of smog). They are also called organic precursors, or VOCs (volatile organic compounds).

7. The San Joaquin Air Pollution Control District (SJAPCD) provided me with data on permitted air emissions for Harvel Plastics, according to permits issued by the SJAPCD. SJAPCD has four permits for Harvel Plastics for operations using PVC and CPVC materials, beginning with intake into silos of resin materials, transfer and blending systems, and scrap material grinding and pulverizing. The actual pipe forming involving heating and extruding the pipe appears to be exempt from their permitting, since no permits were present for that part of the operation.

8. I reviewed the attached document from the Bay Area Air Quality Management District (with heading "Plant number") which identifies 25 permitted air emission sources at Oatey Co. in Newark, California, and provides computed air emissions as of January 16, 2003 of 0.29 tons per year (tpy) of particulate matter (or 580 lbs/year) and 26.78 tpy (or 53,560 lbs/year) air emissions of organic precursor (which means chemicals which cause the formation of ground level ozone, or which are ozone precursors).

9. The following table provides the results of my research on the issues discussed above:

Company, address, & phone number	Manufacturing of CPVC materials for drinking water uses in California	Results of research on air emissions from these facilities
IPS Corp (Industrial Polychemical Services) Address: 17109 S MAIN ST, Carson, CA, also listed as Gardena, CA Phone (800) 421-2677, (310) 898-3352 Manufacturer of Adhesives	IPS manufactures several adhesives for drinking water uses with CPVC pipe at its plant in Gardena, California. One example is named "2714."	**CARB online database,** 2002 (most recent year available) air emissions: Reactive Organic Gases (ROG): 18.24 tons per year (tpy), Total Organic Gases: 21.51 tpy **US 2002 EPA TRI online database:** Methyl Ethyl Ketone (MEK) used onsite and released to air: Air stack releases of 6,462 lbs, plus air fugitive releases of 750 lbs. Additional MEK used onsite but ultimately transferred offsite: An additional 45,796 lbs of MEK are used onsite but ultimately sent out of state to Kansas after use for "Energy Recovery." (This company also reported use of over 38,000 lbs of MEK to EPA's TRI in the previous year, 2001)
Dura Plastic Products 533 East Third St, PO Box 2097 Beaumont, CA Phone (951) 845-3161	Dura Plastics manufactures CPVC pipe which is approved for potable uses at their Beaumont, California facility.	*I could not find this company listed in the US EPA TRI database nor the CARB database under this name, address, or zipcode.*
King Bros. Industries (KBI) 29101 The Old Road, Valencia, CA Phone (661) 257-3262	King Bros. manufactures CPVC valves & fittings for potable uses (NSF approved) at is facility in Valencia, California.	*I could not find this company listed in the US EPA TRI database nor the CARB database under this name, address, or zipcode.*

Spears Manufacturing Company 15853 Olden St, PO Box 9203 Sylmar, CA 91342, Facility in Gardena CA, (818) 364-1611	Spears manufactures pipe fittings for both PVC and CPVC at its California facility.	*I could not find this company listed in the US EPA TRI database nor the CARB database under this name, address, or zipcode.*
T. Christy Enterprises, Inc. Address 403 West Brenna Lane, Orange, CA 92667 Phone (714) 507-3300	T. Christy manufactures cement for CPVC pipe that is approved for drinking water uses at its facility in Anaheim, California.	*I could not find this company listed in the US EPA TRI database nor the CARB database under this name, address, or zipcode.*
Harvel Plastics, Inc. 7001 Schirra Ct, Bakersfield, CA 93313 Phone (610) 252-7355	Harvel Plastics manufactures CPVC pipe for potable water uses at is facility in Bakersfield, California.	**San Joaquin Air Pollution Control District permitting data received by telephone conversation April 11, 2005:** First Permit: Pneumatic blowing of raw material plastic resin into silos in receiving: Up to 6.2 lbs/day of PM10 (Particulate Matter 10 microns or less) emissions are permitted. The emission factor (used to calculate emissions) for this activity is 0.0335 lbs of PM10 emissions per ton of material received. Second Permit: Pneumatic transfer systems & blending: Up to 8 lbs/day PM10 emissions are permitted for this operation. Emission factors used range from 0.014 to 0.04 lbs PM10 emissions per ton of material throughput. Third & Fourth Permits together: Scrap grinding and pulverizing: Up to 8.2 lbs/day PM10 emissions are permitted for this operation. Emission factor used is 0.17 lbs PM10 emissions per ton of material throughput. Pipe extrusion including melting: exempt from SJAPCD air permitting

Oatey Co. 6600 Smith Ave., Newark, CA, 94560 Phone (888) 466-2839	Oatey manufactures CPVC cement for drinking water uses, (an example is Low VOC Flo Guard Gold (number 31901 for 4 oz size, but this also comes in many other sizes, with different product numbers). at its facility in Newark, California as well as in Ohio.	**BAAQMD permit Air Emission Data** (attached): Emissions computed Jan 16 2003: Particulate: 0.29 tpy Organic precursor: 26.78 tpy **US 2002 EPA TRI online database:** Methyl Ethyl Ketone (MEK) used onsite and released to air: Stack or point air releases of 7,200 lbs. Additional MEK used onsite but ultimately transferred offsite: An additional 6,600 lbs of MEK used onsite is ultimately sent to a California facility offsite for incineration (to Onyx Env Services L.L.C. 1704 W. First St., Azusa, CA, LA County)

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and that this declaration was executed on this 21st day of April 2005.

Julia E. May
Air Quality Expert

Community relations

San Francisco Bay Area Water Transit Authority
Media relations

SEIU 790 – BART Employees, San Joaquin Health Employees
Strike crisis communications

St. Anton Partners
Community relations

Coalition Against Neighborhood Nevada Casinos
Strategic communications, coalition building – Native American gaming issues

Yuba County Entertainment
Strategic communications, coalition building – Native American gaming issues

A native of Daly City, California Mark A. Capitolo has over 12 years experience in managing political and public affairs campaigns for candidates, ballot measures, labor unions, business groups and non-profit coalitions.

Prior to forming his consulting practice, he was the Director of Public Affairs for Barnes Mosher Whitehurst Lauter & Partners in Sacramento, where he directed media relations for several political campaigns and public affairs clients.

Capitolo is experienced in several policy issues including education, transportation, infrastructure, organized labor and Native American gaming.

In addition to his political background, Capitolo was a freelance journalist, with several pieces published in the *California Journal Weekly* and *Sacramento Bee/Neighbors.*

Capitolo is a former Communications Director for California State Senate Majority Leader Don Perata, and has provided communications and political consulting to Assembly Speaker Emeritus Herb Wesson.

He spent three years as a Senior Account Executive for Hopcraft Communications where he helped develop paid and earned media programs for statewide ballot measure campaigns and issue advocacy programs for non-profit coalitions.

Capitolo is a regular volunteer and supporter of the Capitol Focus Youth Political Awareness Program, which exposes thousands of young people to the political process each year.

Capitolo earned his Bachelor's degree in Government from California State University Sacramento.

Selected Clients

Rivera Lakes Joint Venture - University Park
Local government relations, marketing consulting

California Applicant Attorneys Association
Media relations, political organizing

Sacramento RiverCats
Special event marketing

California Commission on Jobs and Economic Growth
Strategic communications

Citizens Against Casinos
Strategic communications, coalition building – Native American gaming issues

California Infrastructure Coalition
Membership development, media relations

Ramco Enterprises

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in strictest confidence ... The chemical industry'ssecrets / HIGH-LEVEL CRIME / Italy develops a case formanslaughter because workers breathed *vinyl chloride*

By JIM MORRIS
Staff

VENICE, Italy - In America, the allegation would be gross negligence. The proceeding would be civil, not criminal, and only money would be at stake.

In Italy, the willful exposure of workers to cancer-causing chemicals has been given another name: manslaughter.

Thirty-one former executives of two Italian chemical companies are standing trial and may go to jail for ignoring warnings and allowing their employees to breathe horrific amounts of ***vinyl chloride*** and its relative, ethylene dichloride, inside a plant at Porto Marghera on the western shore of the Venice Lagoon.

"Cagionavano il delitto di strage," the indictment reads. "They caused the crime of massacre."

More than 150 former workers at the plant - owned first by Montedison, then Enichem - have died of cancer since 1973, and another 600 or so are thought to be suffering from work-related illnesses.

The defendants also are accused of polluting the lagoon with dioxin, a powerful carcinogen.

"People still collect shellfish from the lagoon and sell it to restaurants in Venice," said Fabrizio Fabbri, a Rome-based organizer for the environmental group Greenpeace. "The bottom sediment is like a slimy, black tar."

The trial, a criminal proceeding that also holds the possibility of civil damages, began in March and is expected to last a year. It already has had an impact.

In late May, most of the 500 or so individual plaintiffs in the case - sick workers and relatives of those who died - accepted a $36.5 million settlement offer from the two companies, a development that all but emptied the courtroom. It was an extraordinary concession on the part of Italian industry.

"Social consciousness is changing," the lead prosecutor, Felice Casson, said in an interview. "This case is contributing heavily to that."

Many of the Porto Marghera men who have died or are ailing started at the plant in the 1950s and '60s.

"These men were on the front lines of a war, only they didn't know it," said Fiamengo Bruna, whose 56-year-old husband, Ido Bettin, died of cancer 10 years ago. "It was a war without guns. They had no means of defending themselves."

Oliviero Saretta's children used to joke that he was "radioactive" when he came home from work.

"He had to wash himself and change his clothes at the plant," said Saretta's wife, Natalina Fassina. "In spite of that he still smelled of chemicals."

Saretta died of cancer, at 58, in 1987.

Nicola Palmieri, general counsel for Milan-based Montedison, said that the company's settlement with the workers and their families should not be construed as an admission of liability.

"These people have suffered," Palmieri said. "We do not believe we should drag them through extended litigation, through the very unpleasant rituals of testimony."

Federico Stella, an attorney representing Enichem's parent, Rome-based ENI, declined comment.

Fabbri views the 63 billion-lira settlement as nothing more than a shrewd public-relations move.

"They want to cut out the biggest part of the plaintiffs to reduce attention on the trial," he said.

Montedison, in particular, had good reason to want a lower profile. The company - which operated the Porto Marghera plant from 1966 to 1987 (although ENI acquired the property in 1983) - had ample evidence of ***vinyl chloride*** 's hazards.

In the early 1970s, it was one of four sponsors of animal research in Italy that demonstrated carcinogenic effects at low levels of exposure.

At the same time, documents show, Montedison and other European manufacturers formed an alliance with American companies such as Dow Chemical and Union Carbide, trading health information about ***vinyl chloride*** and at one point signing a

secrecy agreement forbidding the disclosure of research findings.

"The Americans should fear this case," Casson said. "If this (legal theory of manslaughter) should be exported, it could be very dangerous for them. All of them were involved in keeping the worker exposure limits as high as possible."

The prosecution was motivated by two main sources: Greenpeace, which has campaigned internationally against the family of chemicals known as chlorinated hydrocarbons, and Gabriele Bortolozzo, a former Montedison and Enichem worker killed in a cycling accident in 1995.

Bortolozzo had begun reading about ***vinyl chloride*** in the 1970s. By the 1980s, many of his contemporaries at the plant had died or were dying of cancer; he started collecting death certificates and talking to widows. In 1985, he was isolated by Montedison in a dusty warehouse - punishment, he believed, for his obstinacy.

Bortolozzo retired in 1990 but continued his quest. In 1994, he captivated Casson with an elaborate tale of corporate indifference. For this Bortolozzo was ridiculed by the trade unions, with which he already had a strained relationship, and others who saw him as a threat to the Porto Marghera economy.

Casson spent the next three years collecting internal documents and combing the files of some 7,000 workers. In 1997, he charged the former Montedison and Enichem executives with precipitating human and environmental disasters, disdaining studies and warnings about conditions in the plant.

The indictment issued by the ``Tribunale di Venezia" specifically mentions the Italian animal-research program in the early 1970s, as well as a plant audit conducted by the University of Padua in 1975 and 1976. The audit detailed a "grave sanitary situation."

The upshot of the pervasive management neglect became apparent last year, when Italy's National Institute of Health reported that it had found statistically significant excesses of a number of cancers - including liver, brain and lung - in a mortality study of people who had worked at the plant between 1956 and 1995.

Bortolozzo would not have been surprised at the institute's revelations; he had written of a cancer epidemic years before.

"The real mortality from (***vinyl chloride***) is different from the `official' one," he asserted in a report published by an Italian magazine, ``Medicina Democratica," in 1994. "The data on deaths from angiosarcoma (an obscure cancer of the liver tied to ***vinyl chloride*** exposure) given by public bodies and companies are not reliable. Among those dead at Montedison because of ***vinyl chloride*** , only three have been officially recognized."

He continued: "Montedison has always had a state-of-the-art medical infrastructure, but with only one purpose: maintain the physical efficiency of the workers for production reasons. The message of the company was, `Look, there's nothing bad, really.' As a matter of fact, they keep (people) working in the same place. This is

fascism."

Bortolozzo's daughter, Beatrice, and son, Gianluca, are among the few plaintiffs who refused to settle with the chemical companies.

"We would never accept their money," Beatrice said. "This factory has stolen husbands, stolen fathers. You can't put a value on the life of a person."

Two Montedison retirees in their 60s, neither of whom wished to be quoted by name, said in an interview that they blame the company for the demise of most of their friends and their own poor health.

Each has been plagued by sexual dysfunction, liver abnormalities and a numbing of the extremities, which becomes more pronounced in cold weather. Cancer is always in the back of their minds.

Although it was clear by 1974 that ***vinyl chloride*** was carcinogenic, the men said, there was no monitoring in the plant, which made both ***vinyl chloride*** monomer and polyvinyl ***chloride*** resin, until the early 1980s.

"We tried not to think about it," one said. "We had to work, and we had three choices: Leave Italy, go to the factory or do outlaw activities."

He added, however, that he would not allow his son to work for Montedison.

"I would have killed him myself before I would have let him do that."

For many years, the retirees said, ***vinyl chloride*** levels inside the plant were staggering, reaching a potentially explosive 40,000 parts per million near the reactors, where the liquid monomer was turned into resin.

There is no reason to believe that conditions were much better in U.S. plants prior to 1974, when the government imposed strict new limits on ***vinyl chloride*** .

As late as 1973, for example, an average of one employee per quarter was overcome by ***vinyl chloride*** vapor at a Conoco PVC plant in Aberdeen, Miss., according to a company document. This would indicate levels in excess of 15,000 ppm.

Both American and European manufacturers had access to data generated by an Italian oncologist, Dr. Cesare Maltoni, who in July 1971 began a series of animal experiments on ***vinyl chloride*** that lasted a decade.

The research was sponsored by Montedison and three other chemical companies, Imperial Chemical Industries of England, Solvay of Belgium and Rhone-Progil of France.

Maltoni knew by the fall of 1972 that ***vinyl chloride*** could produce tumors in rats - notably, angiosarcoma - at levels as low as 250 ppm.

There was disagreement, however, about whether this finding was conveyed to the U.S. government.

The Chemical Manufacturers Association and its British counterpart, the Chemical Industries Association, said that the information was passed on to the National Institute for Occupational Safety and Health by manufacturers at a meeting on July 17, 1973 - six months before three angiosarcoma deaths were reported by the B.F. Goodrich Chemical Co. in Louisville, Ky.

NIOSH said it wasn't told. The agency's surveillance director, William Lloyd, became so enraged at the suggestion that NIOSH had sat on the Maltoni data that he went on British television and called the industry officials "damned liars."

In fact, the American companies had agreed in 1972 not to divulge any of Maltoni's findings without the Europeans' permission.

Documents show that two of Montedison's top medical officials in the 1970s, Emilio Bartalini (a defendant in the trial) and Tiziano Garlanda, provided confidential information to members of the CMA's ***vinyl chloride*** panel before the chemical was openly acknowledged to be a carcinogen.

Dr. Theodore Torkelson, a retired Dow toxicologist who was on the panel at the time, said that the secrecy pact has been misinterpreted. Its intent, he said, was merely to prevent the premature release of data.

"They didn't want somebody going off half-cocked," Torkelson said of the Europeans.

The agreement held until Goodrich revealed the Louisville angiosarcoma deaths in January 1974. In the months afterward, many wondered why Maltoni's research hadn't been taken more seriously.

Now 68, Maltoni explored this still-sensitive subject during an interview at his laboratory, incorporated into a 15th-century castle near Bologna.

In the early years, he said, he was virtually alone in his contention that ***vinyl chloride*** should be tightly controlled in the workplace.

"The relevance of my work was not perceived," Maltoni said. "At that time, the philosophy was, `Who cares about animal data? We want human data.' They were ready to attack me."

Louisville, he said, demonstrated that "animals may be highly predictive of an effect in humans."

And yet many industries and government bodies still require after-the-fact human evidence - decades-long epidemiological studies of dead workers - before they feel compelled to act.

"This is a tragedy," Maltoni said.

Montedison's failure to respond to what was universally described as solid research by Maltoni is one of the chief issues in the Venice trial.

"They knew for sure," prosecutor Casson said of the company. "They commissioned the work."

Said Montedison counsel Palmieri: "We knew that the product had some effect on health. We don't know exactly what happened (at Porto Marghera), whether there is causation. These workers may have contracted their illnesses in the workplace. Probably not." ... 1972-74 ...international tension In 1972, Dr. Cesare Maltoni, an Italian oncologist, confirmed a strong link between exposure to ***vinyl chloride*** and angiosarcoma, a rare liver cancer, in lab animals. Before sharing the research results with the American chemical industry, the European sponsors required a formal agreement of confidentiality. ..... we pledge to hold such information strictly in confidence within our company unless and until formally notified specific consent to its release has been granted by the European sponsors. ... March 23, 1973: An Allied Signal internal memo describes Dow Chemical's concerns about Maltoni's research and the desire to present a united front in providing the information to the National Institute for Occupational Safety and Health (NIOSH). Dow Management is extremely worried about this development and one of their executives is about to contact other producers (and presumably users) so that the industry (with permission of the European group) can as a group take all the data known to NIOSH. They do not want to act unilaterally. ... In early 1974, the cancer connection became public when B.F. Goodrich reported angiosarcoma cases among workers at its PVC plant in Louisville, Ky. This led to renewed interest in the European animal research, and a public statement by Britain's Chemical Industries Association that NIOSH had been told about the research the previous year. William Lloyd, a top NIOSH official, angrily denied the claim and discussed it in a July 19 letter to A.W. Barnes, a chemical industry executive in England. As regards the controversy as to who knew what about angiosarcoma of the liver associated with VC exposures, I have personally concerned myself with tracking down the rumors which began circulating the week of January 22, 1974, that NIOSH had previous knowledge of the problem. And, after thorough review of the facts which convinced me that there was no substance to these rumors, I strongly urged our Director to publicly state that there was no support for such stories. ... In his response, Barnes conceded that angiosarcoma was not discussed at a 1973 meeting attended by NIOSH representatives, but implied that NIOSH should have been more inquisitive. With hindsight it is the greatest of pities that we didn't happen to mention the liver in the initial presentation or, not having done so, that we weren't asked which sites were affected. ... 1973 ... moral and legal issues March 26, 1973: A letter to chemical executives from the Manufacturing Chemists Association, a trade group, discusses ethical and practical aspects of informing government agencies about ***vinyl chloride*** health research. There is also the aspect of moral obligation not to withhold from the Government significant information having occupational and environmental relevance, and the desirability of industry taking the initiative rather than at some later time having to defend another course. ... May 31, 1973: A Union Carbide internal memo raises a legal concern about the March 26 MCA letter: 1. The MCA letter to company executive contacts, dated March 26, 1973, could be construed as evidence of an illegal conspiracy by industry if the information were not

made public or at least made available to the government.

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GRIM NUMBERS/ The astonishingamount of *vinyl chloride* present at a plant inEngland

By JIM MORRIS
Staff

CHESTERFIELD, England - When he worked at the Vinatex PVC plant in the early 1970s, Colin Hadfield often marveled at his good fortune.

"It was the best job I ever had, the easiest job I ever had," Hadfield said. "I kept asking, `Is there any danger?' "

Assured by management that there wasn't, Hadfield put in 4 1/2 years at the plant, a joint venture of Conoco and a now-defunct British company, Stavely Chemicals Ltd.

Only later did he realize the downside of one of the most coveted blue-collar jobs in the North Midlands. He developed acroosteolysis, which caused his fingers to whiten and go numb. He became impotent, had pounding headaches, was constantly tired.

In a sense, Hadfield is lucky. He doesn't have cancer - as far as he knows - and has made it to age 63.

Dozens of other former Vinatex workers, who inhaled ***vinyl chloride*** at levels far exceeding even the most lenient standards of the time, are dead or dying.

"These people have got away with industrial murder," said David Foster, a haggard man of 55 who suffers from a liver ailment that may be a precursor to cancer. "They've known about this bloody stuff for a long time. They fooled people into believing it was bloody harmless."

John Knight, coordinator of the North Derbyshire Trade Union Safety Committee, estimates that only about half of the 250 people who worked at Vinatex during its 15-year history are still alive.

He and several associates have begun tracking down and interviewing the surviving

Vinatex workers, and the families of those who died.

"We're going to look into a range of things: government benefits, compensation awards, litigation," Knight said. "We're also going to look into publicizing it worldwide, because workers in other areas who've dealt with ***vinyl chloride*** have all been told the same story: that the chemical is perfectly safe, that you can taste it, you can touch it, you can smell it."

Vinatex opened here in the industrial north of England in 1969. After word circulated about the generous pay and relatively soft work, the new plant was deluged with applicants.

Business was good. By 1970 Vinatex was running 40 reactors, turning ***vinyl chloride*** monomer into PVC resin.

It took only a few years for the first cases of acroosteolysis - "white-finger," the workers called it - to appear. Much later came the cases of angiosarcoma, the liver cancer caused almost exclusively by exposure to ***vinyl chloride*** .

The chemical was present in astonishing amounts at Vinatex. One measurement in 1973 showed an airborne concentration of 50,000 parts per million - 100 to 1,000 times what most manufacturers then considered to be the safe limit.

"Anytime anybody had any suspicions or qualms, they were soon dispelled by management," said Foster, who drove a tanker truck for Vinatex. "People were afraid to speak out."

Geoffrey Larkin, 61, used to climb into the reactors to clean them. The vapors were so intoxicating, he said, that "you'd feel as though you'd just came out of the pub."

Larkin has since had two heart attacks, pneumonia and an enlarged spleen, which had to be removed.

By the early 1980s, Vinatex had settled more than 35 claims for compensation by acroosteolysis victims, and by 1984 it was out of business.

The deaths and illnesses did not stop, however, and questions are being raised about Houston-based Conoco's role in the debacle.

"Conoco took over the plant soon after it opened," Knight said. "They had some chaps come over from the United States and train people in production methods."

Said Hadfield, a former plant operator: "The idea was that they were making the same stuff in America, but they came here because it was more accessible to Europe."

Although Conoco had a 50 percent interest in Vinatex for its first 10 years, "we did not have any role in the day-to-day operation of the facility," spokesman Carlton Adams said. "We did share some information with them on some of the early (***vinyl***

chloride) studies."

On June 20, 1973, D.M. Jonas of Vinatex wrote to Conoco's Research and Development Department, then in Ponca City, Okla., seeking details of two studies sponsored by a group of American manufacturers.

Conoco's Flynt Kennedy responded on Aug. 30 that the studies were still in their early stages.

"There are no hard data to support specific health and safety problems related to VCM (***vinyl chloride*** monomer) at this time," Kennedy wrote. But he added, "I would agree that Vinatex should take appropriate steps so that worker exposure to VCM vapors is at the lowest practical value."

A few months earlier, Imperial Chemical Industries, the British conglomerate that supplied ***vinyl chloride*** monomer to Vinatex, had issued a misleading position paper stating that the compound caused cancer in rats at 30,000 parts per million, and that this was "greatly in excess of the levels to which workers in the industry are normally exposed."

In his letter, Kennedy called the Imperial paper "an excellent, concise summary of the problem regarding not only past information, but also the current situation."

He did not mention that Italian animal studies - well known to both American and European manufacturers by late 1972 - had found ***vinyl chloride*** to be carcinogenic at levels as low as 250 ppm.

According to the former Vinatex workers, Conoco was an active partner in the operation. Attorneys for the workers' union, however, saw no tactical value in pursuing the American firm in court.

"They got off very, very, very lightly," Foster said.

Already weakened by his liver condition, Foster has been told by his doctors that he may develop angiosarcoma, a particularly aggressive and painful cancer.

"It's a specter hanging over all our lives," he said. "We don't know when it's going to hit us."

Last year the disease claimed 55-year-old Graham Houghton, a former Vinatex truck driver. Former operator Barry Caudwell was diagnosed in February 1993 and was dead, at 59, by the following January.

"He was in terrible pain those last 11 months, terrible," said Caudwell's wife, Joan. "He couldn't walk very far, and his lung collapsed."

Cancers other than angiosarcoma also materialized.

Andrew Giove watched his once-strapping father, Marco, who cleaned reactors at

Vinatex, wither and die from a brain tumor last year at 65.

"They just get away with it," Giove said of the chemical companies. "They shouldn't be able to. They ruined a lot of people's lives."

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in strictest confidence / The chemical industry's secrets /TOXIC SECRECY / For years, makers and users of *vinyl chloride* concealed the terrible truth: The chemical can cause cancer

By JIM MORRIS
Staff, Copyright 1998, Houston Chronicle

LAKE CHARLES, La. - Blind and comatose, Dan Ross succumbed to brain cancer on Oct. 9, 1990.

A large and unpretentious man of 46, Ross had spent 23 years at the Conoco - later Vista - chemical plant here. He had made a good living, raised a family, saved for retirement.

After his diagnosis, Ross came to believe that he had struck a terrible bargain, forfeiting perhaps 30 years of his life through his willingness to work with ***vinyl chloride*** and other cancer-causing substances.

"Just before he died, he said, `Mama, they killed me,' " recalled his wife, Elaine. "I promised him I would never let Vista or the chemical industry forget who he was."

She hasn't. Her husband's untimely death set her and a local attorney, William Baggett Jr., on a circuitous course of litigation that led to the industry's well-insulated core.

During the past eight years, Baggett has acquired thousands of previously secret documents, most having to do with ***vinyl chloride*** - used to make one of the world's most common plastics.

These documents, and others obtained in recent months by the Houston Chronicle, suggest that major chemical manufacturers closed ranks in the late 1950s to contain and counteract evidence of ***vinyl chloride*** 's toxic effects.

Letters, memoranda and minutes of meetings depict a framework of dubious science

and painstaking public relations, coordinated by the industry's main trade association.

There are two dominant themes: Avoid disclosure and deny liability.

"There was a concerted effort to hide this material," said Dr. David Rosner, a professor of public health and history at Columbia University who has reviewed many of the documents as part of a research project. "It's clear there was chicanery."

In a prepared statement, the Chemical Manufacturers Association called such charges "irresponsible." The group said that it promotes a policy of openness among its members.

"We took the problem seriously," said Dr. Theodore Torkelson, a retired Dow Chemical toxicologist who chaired the CMA's ***vinyl chloride*** panel for 11 years in the 1970s and '80s. "We did what we thought was ethical, scientifically sound and morally responsible."

The documents present another scenario: That the chemical companies, through their silence and inertia, subjected at least two generations of workers to excessive levels of a potent carcinogen that targets the liver, brain, lungs and blood-forming organs.

Although they freely shared health information among themselves, the companies were evasive with their own employees and the government. They were unwilling to disrupt the growing market for polyvinyl ***chloride*** (PVC) plastic, used in everything from pipe to garden hoses.

"Even though they may be competitive in some spheres, in others they aren't," Baggett said. "They have a mutual interest in their own employees not knowing (about health effects), in their customers not knowing, in the government not knowing."

Put in context by hundreds of interviews, the documents flesh out a story that made headlines during the first half of 1974, only to be overshadowed by Watergate and Richard Nixon's resignation.

And they accentuate the problem of occupational cancer, which, by some estimates, takes more lives (50,000) each year than AIDS, homicide or suicide, but receives far less attention.

To this day, most manufacturers acknowledge only that ***vinyl chloride*** causes angiosarcoma, an extremely rare cancer of the liver. They insist that the exposure levels necessary to produce the disease have not been seen in two decades.

As a rule, this is true. Because of government-required controls - controls the industry resisted - ***vinyl chloride*** contamination in and around chemical plants has been reduced dramatically.

Significant exposures in some places occurred well into the 1980s, however. And unusual cancers other than angiosarcoma continue to kill chemical workers and

retirees prematurely.

On April 30, Henry Tousaint, who had spent 20 years at the PPG Industries plant in Lake Charles, died of mantle-cell lymphoma at age 54.

Tousaint and other PPG workers routinely cleaned chemical storage tanks and mixed pesticides, inhaling ***vinyl chloride*** , benzene and other carcinogens in the process. Those who complained of dizziness or breathing difficulties were given cough syrup, kept in gallon jugs, Tousaint said three months before his death.

"We didn't know no better," he said. "But they did."

Officials at the company's Pittsburgh headquarters would not comment.

Baggett won large settlements for both the Tousaint and the Ross families from PPG, Conoco and Vista, none of which admitted culpability. He is building a conspiracy case against 29 other chemical companies, the CMA and the Society of the Plastics Industry, alleging that they obfuscated evidence of ***vinyl chloride*** -related deaths and diseases.

"What I hope to achieve, through Billy, is that every man who works in a chemical plant is told the truth and tested on a regular basis in the proper manner," Elaine Ross said. "I want the chemical companies to be accountable for every little detail that they don't tell these men."

Since the death of her husband - a towering, blond man she met in Alabama when she was 17 and he was 20 - Ross has oscillated between despair, rage and listlessness. She gave up sewing, baking and other diversions. She can't sleep without tranquilizers, can't bear to look at Dan's picture.

She sees older couples and is filled with resentment, thinking: "That should have been us."

By the spring of 1959, the evidence was beginning to accrue.

Manufacturers of ***vinyl chloride*** - then known only as an explosion hazard and an intoxicant - came to realize that the compound might be poisoning the people who worked with it.

Dow had been discreetly testing the sweet-smelling, gaseous substance on rats, rabbits, guinea pigs and dogs at its Biochemical Research Laboratory in Midland, Mich.

The results were troubling. Adverse liver effects had been seen in animals that had inhaled only 100 parts per million of ***vinyl chloride*** , a fraction of the concentration to which many workers were exposed.

In a letter to the B.F. Goodrich Chemical Co.'s industrial hygiene director on May 12, 1959, one of the Dow scientists, V.K. Rowe, outlined the experimental findings

and concluded that ***vinyl chloride*** could produce "rather appreciable injury" among workers routinely exposed to 500 parts per million, then the voluntary standard. Rowe ended his letter with a plea:

" . . . this opinion is not ready for dissemination yet and I would appreciate it if you would hold it in confidence . . . "

For the next 15 years, the Goodrich hygienist and many others responsible for worker health in the chemical industry did a remarkable job of honoring such requests.

Before Dow began its animal work in 1958, there had been few investigations of ***vinyl chloride*** - although acute effects had been seen in guinea pigs as early as 1930, and liver damage had been found in 15 of 45 ***vinyl chloride*** workers examined as part of a 1949 study in the Soviet Union.

The Dow researchers published their data in the American Industrial Hygiene Association Journal in 1961, recommending a ***vinyl chloride*** exposure limit of 50 ppm.

No one outside of Dow listened. Indeed, a 1963 Yale University animal study sponsored by Allied Chemical found no significant effects below 500 ppm.

"The industry goofed up," said Torkelson, who helped conduct the Dow experiments. "Probably if they had listened to our 50 ppm (recommendation), we wouldn't have had a problem."

(The Occupational Safety and Health Administration didn't come into being until 1970; consequently, there was no government agency to force companies to act.)

In the fall of 1964, Goodrich - which would be commended for revealing a cluster of angiosarcomas at one of its plants a decade later - sought help from the Kettering Laboratory at the University of Cincinnati.

A puzzling hand disability had emerged among workers who cleaned the reactors - huge, blenderlike devices in which ***vinyl chloride*** monomer is turned into PVC resin - at a Goodrich plant in Louisville, Ky.

At the time, cleaners entered the reactors without respiratory protection to chip away the residue that built up on the walls.

"Nobody felt like ***vinyl chloride*** was a problem," said Jerome Heckman, a Washington attorney who has represented the Society of the Plastics Industry for 44 years. "The workers used to climb down in those damned reactors and play around in them because they got a great high out of it."

By 1966, it had become apparent that the hand condition - acroosteolysis, characterized by numbness and swelling of the fingers - was systemic, indicative of ***vinyl chloride*** 's toxicity. And it was not confined to reactor cleaners.

The following year, an epidemiological study of ***vinyl*** workers commenced at the University of Michigan. All company data, it was emphasized, would be held "in strictest confidence."

As the Michigan researchers catalogued cases of acroosteolysis, Dr. Pier Luigi Viola, an industrial physician for the Belgian chemical firm Solvay, attempted to produce the disease in monkeys and rats exposed to ***vinyl chloride*** gas in a Rome laboratory.

Instead, he produced cancer, albeit at high concentrations. American manufacturers grasped the significance of this unexpected finding.

"Since this report appears to be so convincing," Dr. George Roush, medical director of the Ethyl Corp. in New Orleans, wrote to a colleague on June 24, 1970, "I suppose that we must consider ***vinyl chloride*** as a carcinogen . . . "

By the end of 1972, Dr. Cesare Maltoni, an Italian oncologist, had seen angiosarcoma in rats exposed to as little as 250 ppm of ***vinyl chloride*** . The news traveled quickly across the Atlantic.

An Allied Chemical memorandum called Maltoni's results "disconcerting," and a Uniroyal memo concluded, "The work in Europe indicates we have a problem which cannot be ignored."

Although the Michigan acroosteolysis registry ultimately collapsed from lack of industry cooperation, its keepers managed to convey an important message to the Manufacturing Chemists Association, the trade group that later became the CMA: Get people out of the reactors, or at least limit exposures to 50 ppm.

The recommendation, included in a confidential report to the MCA in February 1969, was not followed. As a result, workers such as William Smith were needlessly exposed to high levels of ***vinyl chloride*** .

Smith entered his first reactor at the Goodyear Tire and Rubber Co. plant in Niagara Falls, N.Y., in November 1973.

He died, at 40, of a brain tumor on Sept. 15, 1993, leaving behind a wife and young daughter. He was hospitalized for the last eight months of his life, unable to speak.

"Every day I went to the hospital, and we would write on a pad," said his wife, Holly Cummings. "It took him half an hour or 45 minutes to get one stupid sentence down. It eventually got to the point where he couldn't even nod his head."

Cummings settled a lawsuit against Goodyear, but not before company lawyers tried to blame her husband's cancer on nitrates in lunch meat. "They asked me how much bologna he ate," Cummings said.

The wall of secrecy surrounding ***vinyl chloride*** was not breached until Jan. 23, 1974, when B.F. Goodrich announced that it had found three fatal cases of angiosarcoma among workers at its PVC plant in Louisville.

Although Goodrich was praised for its candor, it and other manufacturers knew a great deal about the chemical's toxic properties long before Louisville and understood the economic consequences of bad publicity.

Indeed, Goodrich - fearful of a broad indictment of PVC - had tried to stop publication of a European researcher's paper in 1966, according to a Monsanto memo. It is unclear whether Goodrich succeeded.

Goodrich said in a prepared statement that it "has always acted responsibly in addressing potential health risks associated with direct exposure to ***vinyl chloride*** ."

(An article on acroosteolysis, authored by four Goodrich medical officials, was published in the Journal of the American Medical Association in 1967. It was inconclusive, suggesting that the disease was not serious or common, was restricted to reactor cleaners and was due in large part to "personal idiosyncrasy.")

The Louisville cancer revelation in 1974 set in motion months of frenetic activity in Washington, highlighted by contentious OSHA and congressional hearings. Labor leaders and public-health advocates spoke of a cover-up by the ***vinyl*** industry; the industry accused them of overreacting and threatening its very survival.

OSHA adopted an emergency temporary standard of 50 ppm and later proposed a permanent standard of 1 ppm. A federal ban was imposed on the use of ***vinyl chloride*** as a propellant in hair sprays, pesticides and other aerosol products; a proposed ban on PVC liquor bottles was averted when the industry found a way to limit migration of ***vinyl chloride*** into the liquor.

(Mindful of "essentially unlimited liability to the entire U.S. population," as Union Carbide put it in 1973, some manufacturers already had begun to pull out of the aerosol market. Tests had shown that it was not unusual for hair spray users of that era to be exposed to hundreds or even thousands of parts per million of ***vinyl chloride*** ; a 1972 Carbide memo pointed out that "beauty operators applying hair spray on a daily, routine basis might actually be a better population to examine than chemical plant operators.")

Despite the convincing animal data from Italy and public pressure, the chemical companies did not acquiesce. A study commissioned by the Society of the Plastics Industry concluded that the new OSHA standard would eliminate at least 1.6 million jobs - from reactor cleaners to plastics fabricators - and have a minimum economic impact of $65 billion.

The SPI challenged the standard before a three-judge federal panel and lost on Jan. 31, 1975.

"I argued that it was arbitrary and capricious to say 1 (ppm), that they pulled that number out of their ear," said Heckman, the society's attorney. "I got killed in court."

In the panel's opinion, retired Supreme Court Justice Tom Clark wrote that "the

record shows what can only be described as a course of continued procrastination on the part of the industry to protect the lives of its employees."

Despite the dire predictions, the industry did not disappear.

Using technology developed in Japan in the late 1960s, manufacturers installed reactors that greatly reduced the need for manual cleaning. New ways were found to lower the ***vinyl chloride*** content of PVC resin from hundreds of parts per million to less than 1 ppm.

"The industry really, really changed," said Bill Carroll, a vice president with Occidental Chemical in Dallas and an officer with the ***Vinyl*** Institute, a trade association. "If you look at how close it might have come to being regulated out of existence - to come from that circumstance to the point of doing what had to be done to make the product safe, I think it's a tremendous success story."

There remained, however, the matter of cancer.

By the mid-1970s, clusters of disease were beginning to spring from plants such as the Monsanto chemical complex in Indian Orchard, Mass. For ***vinyl*** workers who had started in the 1940s, '50s and possibly the early '60s, the requisite latency for cancer had passed.

In the summer of 1975, a group of Monsanto workers approached the Massachusetts Department of Labor and Industries with the death certificates of 56 former colleagues and a list of others who had died.

A department physician found additional deaths and determined that there was a cancer excess among workers who had been assigned to Building 85, where PVC resin was fabricated into ***vinyl*** swimming-pool bottoms, wallpaper backing and other items. Pancreatic cancer had killed at a rate five times the national average.

The National Institute for Occupational Safety and Health did a study, as did Monsanto. Their conclusions were strikingly different.

Monsanto found "no occupationally related health problem" at the plant. NIOSH found an excess of digestive-system cancers and said it suspected "occupational factors."

Workers, understandably, were frustrated and confused. Erik Wengstrom, who was laid off in 1973 and spent years documenting cancer cases in hopes of holding Monsanto liable, remains bitter about the experience.

"People were dying like flies," Wengstrom said.

In February 1979, the ***vinyl*** industry was presented with another potential crisis. OSHA had found a cluster of brain cancers at the Union Carbide plant in Texas City, and ***vinyl chloride*** was strongly suspected as the causative agent.

As was the case at Indian Orchard, concurrent studies yielded conflicting results. NIOSH and Union Carbide could not even agree on the number of brain cancer deaths; the former listed 23, the latter 12.

Even the Carbide number represented an excess. But the company attributed it to chance, not chemicals.

In a study published in 1982, federal investigators gave details of 25 brain cancer deaths among former employees of Dow's Texas Division in Freeport. The deaths occurred between 1951 and 1977, and most the cancers were of two strains: astrocytoma and glioblastoma.

The average age at death was 55, and eight of the victims were under 50. The conclusion - with which the company strenuously disagreed - was that there was "an increased risk of death due to brain tumor" among ex-Dow workers.

In the late 1980s and early '90s, cancer became an issue for Houston-based Vista, now known as Condea Vista. At least four workers - Dan Ross and another man at Vista's ***vinyl chloride*** monomer plant in Lake Charles, and two men at its PVC plant in Aberdeen, Miss. - had developed brain tumors, and there had been other cancers as well.

Vista management held several meetings with workers in an effort to quell fear and mistrust. These were some of the comments received during two sessions in Lake Charles in April 1991, according to a Vista memo:

"Previous explanation about cancer deaths was a snow job, bull----. Our questions were not answered. We believe these employees died because of exposure in the plant. We were told to shut up and not make trouble."

"We think our jobs are killing us. No one listens."

"If the real answer is that Vista doesn't know how much we're hurt by this exposure, then we deserve some kind of compensation for the agony of not knowing."

"EDC (ethylene dichloride, a suspected carcinogen) drips from the ceiling. When you flush the toilets in the plant and the water fills up again you're overcome with EDC fumes."

Ray Reynolds, Vista chairman of Oil, Chemical and Atomic Workers Local 4-555 and an operator at the Lake Charles plant, said in an interview that the company has been slow to respond to such concerns, despite evidence that chemical exposures have caused illness and death.

"It's all about money," said Reynolds, a gaunt man of 41 with a baffling - and, he thinks, work-related - condition of the nervous system that keeps him fatigued and in pain. "All these years, I believe, they've been killing people, but they've put a dollar figure on it."

Tom Grumbles, Vista's manager of product safety and occupational health in Houston, said that the 1991 meetings were tense but productive, part of a "fairly extensive effort to communicate with our employees.

"Obviously, personal medical issues are very emotional for people," Grumbles said. "There's little chance you're going to satisfy everyone."

Predictably, some of the cancers out of the chemical plants gave rise to workers' compensation claims and lawsuits.

Few of these actions, however, resulted in lucrative judgments or settlements; the burden of proof for occupational cancer was simply too great, and the industry was able and willing to play hardball.

After her husband, Joseph, died of angiosarcoma in January 1989, Dorothy Succi filed a claim against his employer, Gencorp Polymer Products, which operated a PVC plant in Ashtabula, Ohio.

Succi had spent 28 years at the plant (closed in 1983) as a laborer, a mechanic and an electrician. He was diagnosed with angiosarcoma - irrefutably tied to ***vinyl chloride*** exposure - in 1988, and was included in a worldwide, industry-maintained registry.

When his widow sought death benefits from the Ohio Bureau of Workers' Compensation, however, Gencorp fought her, saying "we do not believe (Succi's) condition is the result of his employment with us."

A hearing was held in Columbus in November 1989, and Dorothy Succi won. But Gencorp appealed.

In a Jan. 9, 1990, letter to Succi's attorney, Gencorp safety and workers' compensation manager Kenneth Breyley offered $37,500 to settle the case.

"I truly believe we can convince the Industrial Commission the angiosarcoma could not have been the result of Joseph's exposures to `chemicals' at the workplace," Breyley wrote.

In an interview, Succi said that she settled for $48,000 after being warned by her lawyer that the case could go on for years. "I just wanted a closing to it," she said.

Gencorp spokeswoman Rosemary Younts said that the claim was contested because Joseph Succi spent most of his career as an electrician and would have had minimal contact with ***vinyl chloride*** . A document from the angiosarcoma registry, however, indicated that Succi had high exposures during his first few years at the plant.

Lake Charles attorney Baggett maintains that the 5,000 or so workers in U.S. ***vinyl chloride*** , ethylene dichloride and PVC resin plants aren't the only ones vulnerable to cancer and other serious ailments.

An estimated 120,000 people work in PVC fabrication, turning the white powder

into flooring, siding, blood bags and other familiar products. Might they, too, be at risk?

"No one (in industry) is going to study fabricators," Baggett said. "It'll never happen. What if they found something?"

Quite by accident, a Swedish researcher did find something. Three years ago, Dr. Lennart Hardell, an associate professor of oncology and epidemiology at Orebro Medical Center, began distributing questionnaires to testicular cancer victims and a group of controls.

Hardell was searching for possible occupational causes of the disease, on the rise in Sweden and other industrialized countries. By the time he had compiled his data, only one line of work stood out: PVC fabrication.

"We hadn't expected anything on PVC," Hardell said in an interview. "We had no suspicions."

The study was published late last year. Considering the high risk he had observed for PVC exposure, Hardell called for further investigation.

The Brussels-based PVC Information Council responded swiftly and decisively, as its American counterparts had done many times before.

"We do not see a cancer threat for (PVC) workers," the council said.

Coming Monday

It's a crime

The husband of Natalina Fassina, right, and more than 150 other former employees of a ***vinyl*** plant near Venice have died of cancer since 1973. Italian prosecutors say that's a crime. Now 31 former chemical company executives are standing trial on manslaughter charges alleging they exposed plant employees to excessive amounts of ***vinyl chloride*** despite warnings of its danger.

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in strictest confidence / SECOND OPINION / In an `extremelyunusual' event, a doctor under industry contract reversed hisdamaging conclusions in a study of worker deaths involving *vinyl chloride*

By JIM MORRIS
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IN SEPTEMBER 1991, the American Journal of Industrial Medicine published what appeared to be yet another prosaic study linking ***vinyl chloride*** to cancer, another scrap of evidence in a seemingly endless inquiry.

The lead author was Dr. Otto Wong, a prominent California epidemiologist. Five years earlier, Wong and three associates had finished updating a study of worker deaths in the ***vinyl*** industry and had found significant excesses of liver and brain cancer, as well as emphysema.

Their findings were reported in the journal article and might have stirred only mild interest but for one thing:

Wong hadn't received permission from the study's sponsor, the Chemical Manufacturers Association, to publish his data - data that could be used against the industry in lawsuits, that might alarm workers and attract regulators.

The unauthorized publication provoked members of the CMA's ***vinyl chloride*** panel and touched off a months-long effort to persuade Wong to recant, documents show.

Although Wong denies that he was pressured, he changed his story on ***vinyl chloride*** , declaring that the apparent excess of brain cancer deaths among workers might well be the result of "diagnostic bias" - better reporting and diagnosis of the disease in industry than in the general population.

Letters propounding this theory from Wong and one of his co-authors - as well as Dr. Hasmukh Shah, then manager of the CMA panel - appeared in the August 1993 issue of the Journal of Industrial Medicine.

"This is extremely unusual," said Dr. Philip Landrigan, the journal's editor and chairman of the Department of Community and Preventive Medicine at Mount. Sinai Medical Center in New York. "I've never seen a retraction of epidemiological findings like this with almost no defense (by the authors)."

Reprints of the Wong and Shah letters were distributed among the chemical companies and their attorneys. They are still cited by defendants in brain cancer cases, and are used to reassure workers about the safety of ***vinyl chloride*** and polyvinyl ***chloride*** . Frequent defense witness

Although he describes himself as an independent scientist, Wong has had a long relationship with trade groups like the CMA and the American Petroleum Institute, and frequently testifies as a defense witness.

Some believe that Wong's reversal on ***vinyl chloride*** was simply another episode in a decades-long history of unreliable, industry-sponsored research.

"The ultimate lesson is that you can't trust industry and its usual contractors to do this kind of work," said Herschel Hobson, an attorney in Beaumont who represents workers and has encountered Wong in several cases. "You must have some sort of independent oversight."

In a telephone interview, Wong, president of Applied Health Sciences of San Mateo, Calif., said that he wrote the "diagnostic bias" letter because he genuinely believed it could help explain the elevated brain cancer rate among ***vinyl chloride*** workers.

He had meant to raise the issue in the initial, 17-page article, he said, but "we didn't have the space to do it." He pointed out that he had stood by his 1991 finding on emphysema, although Shah had challenged it as well.

The CMA refused to make Shah available for an interview. Members of its ***vinyl chloride*** panel - representatives of manufacturers such as Dow Chemical - also declined interview requests.

In a prepared statement, the CMA said that the panel did not pressure Wong to retreat from his 1991 position.

"Our studies are conducted with world-class experts of the highest integrity . . . (who) have their results put in the public domain," the statement said. "The purpose of this research is to enable companies to take appropriate precautions to protect the health of workers and the environment." Study`s shortcomings

Documents show, however, that the CMA's epidemiological study of ***vinyl chloride*** workers, which began in 1973 and is being updated a third time, had major shortcomings from the start.

Older, highly exposed workers were left out, as were entire plants. Younger workers with little or no exposure were included. Exposures were misclassified.

These defects were recognized and discussed by the CMA and participating companies, but were not corrected. Wong said that they were not brought to his attention.

The late Dr. Joseph Wagoner, an epidemiologist with the National Institute for Occupational Safety and Health and the Occupational Safety and Health Administration in the 1970s, was one of the first outsiders to spot what he called "latency bias" in the study.

He noted, for example, that the oldest ***vinyl*** plant in the country - Union Carbide in South Charleston, W. Va., which opened in 1938 - gave the CMA's contract researchers only records of workers who were still on the payroll or had left the company during the last six years of the 30-year study period.

"As a result," Wagoner wrote in a 1974 memo, "many of those persons with the longest latency were not included."

Lake Charles, La., attorney William Baggett Jr. put it more bluntly: "They stacked the deck."

The irony is that the researchers found an abundance of cancer despite the study's inherent weakness, said Baggett, who has represented plaintiffs in several lawsuits against ***vinyl chloride*** manufacturers.

"They underestimated how potent a carcinogen they were dealing with," he said. "An extremely young population, including many workers who had barely been exposed, still had a significant amount of disease."

Angiosarcoma - which virtually everyone agrees can be caused by ***vinyl chloride*** exposure - was not the only cancer in excess. By the mid-1970s, some company officials seemed resigned to this unpleasant reality.

"At present, the epidemiological work has amply demonstrated an association between high exposures to VCM (***vinyl chloride*** monomer) and an increase in angiosarcoma of the liver, brain and lung tumors," Dr. Mitchell Zavon with the Ethyl Corp. wrote in an interoffice memo on June 18, 1976.

The news got worse. In 1981, an Italian research team led by Dr. Cesare Maltoni published 10 years' worth of animal data, concluding that ***vinyl chloride*** is a "multipotential carcinogen, affecting a variety of organs and tissues."

In 1987, the International Agency for Research on Cancer in Lyon, France, proclaimed that there was sufficient evidence to believe the chemical causes cancer of the liver, brain and lung, as well as leukemia and lymphoma.

And yet, when ***vinyl*** workers with cancers other than angiosarcoma - or their families - seek compensation, their claims almost invariably are contested. They are confronted with experts like Otto Wong.

At Baggett's request, Dr. Richard Lemen, a former NIOSH director and now a consultant in suburban Atlanta, has done an analysis of the CMA's 25-year ***vinyl chloride*** study, which in its later incarnations included 10,173 workers.

"This is probably the longest ongoing study I've ever seen," Lemen said. "***Vinyl chloride*** is such an important product that, I think, industry hopes to show it's not that big a problem, that the post-1974 controls (imposed by OSHA) have been effective."

In fact, he said, "We don't know what's going to happen to people who entered these plants after the levels went down, because there's such a long latency period for cancer. It's going to take another 25 or 30 years to get that answer."

At about the time the epidemiological study was begun, the ***vinyl*** industry subsidized animal research at Industrial Bio-Test Laboratories in Illinois. An unfortuate choice

IBT proved to be an unfortunate choice: conditions in the cages were wretched, data were fabricated and concealed, and the labs were closed in 1978. Three former executives were convicted of defrauding the federal government and drug and pesticide manufacturers.

"When IBT went down, they took a lot of work into the toilet, including ***vinyl chloride*** ," said Hobson, the Beaumont lawyer.

By the late 1980s, the chemical companies' political and public-relations worries about ***vinyl chloride*** had ebbed. Then they were blindsided by Wong.

In a letter to the director of the ***Vinyl*** Institute on Oct. 21, 1991, Dr. Robert K. Hinderer of B.F. Goodrich reported that he had just seen a copy of Wong's article in the Journal of Industrial Medicine and "quickly realized that this was the work that was sponsored by the CMA (***vinyl chloride***) Panel.

"Unfortunately, the authors failed to send a draft to the Panel for review prior to publication," Hinderer wrote. "When I discussed this with Dr. Shah at CMA, he indicated that CMA would notify them that they have violated their contract. The next step will be for the whole Panel to consider what corrective actions are necessary and / or appropriate. Hopefully, the authors will be agreeable to add some clarifying comments in a letter to the editor."

CMA memos indicate that Shah gave the matter his full attention and spent months trying to arrange a conference call between Wong and the panel members.

Wong said that he had discussions with them about the article, but that no one accused him of violating his contract. "If that's how they feel about it, that's too bad, because I insist on my right to publish," he said.

Wong's unusual self-critique in the journal was warmly received by the ***vinyl*** industry. Within days of its publication in 1993, Houston-based Condea Vista was using it to curb lingering worry and discontent among its workers.

In early 1995, the CMA contracted with Dr. Kenneth Mundt of Amherst, Mass., to update the study a third time; Wong had bid on the project and lost.

A Vista memo prepared in support of the update emphasized that manufacturers continued to face lawsuits alleging a connection between ***vinyl chloride*** and an assortment of cancers.

"This type of research is useful in defending such litigation," Vista said.

In an interview, Mundt said that he was never told of imperfections in the basic CMA data and had no reason to suspect any. He said that he expects to complete his update by October, and would not discuss his preliminary findings.

Mundt said that he saw nothing strange in Wong's about-face on brain cancer. Mundt doesn't believe, however, that the excess among ***vinyl*** workers is attributable to diagnostic bias.

"I don't think that that's a strong explanation for this," he said. "It's a possibility."

Mundt began a separate study for Vista in 1994, reviewing cancer deaths at the company's ***vinyl chloride*** plant in Lake Charles and its PVC plants in Oklahoma City and Aberdeen, Miss.

In his final report in 1996, Mundt explained that he had tracked 1,915 men who had worked at least a month at the three plants between 1963 and 1993, and had found elevations of brain, pancreatic and - for white workers only - lung cancer. None of the elevations was so striking that it pointed to a workplace problem, Mundt said.

In a brochure prepared for its employees, Vista conceded that a number of older workers were excluded from the study. It blamed Conoco, which owned the plants until 1984, for not turning over the workers' records, although Conoco says that it only failed to supply Social Security numbers for 75 people from Oklahoma City.

According to Vista, only one fatal brain cancer case from Aberdeen - that of Jim Stark - was left out of Mundt's analysis, and its inclusion "would not have significantly changed the results."

In fact, at least three cases - those of Willie Snow, who died in 1982; Gene Mayes, who died in 1984; and Stark, who died in 1993 - were excluded. (A handwritten Vista "cancer list" dated Sept. 16, 1993, includes Stark and Mayes but not Snow.)

A fourth Aberdeen worker - 47-year-old David Thompson - is suffering from the disease.

In its brochure, organized in question-and-answer format, Vista assured its employees that Mundt had found "no `epidemic' of cancer, or of any other cause of death" at the three plants. Ambiguous information

Upon closer examination, however, some of the information in the brochure is, at the least, ambiguous:

Question: "What about the excess of pancreatic cancers?"

Answer: "Pancreatic cancer is very uncommon and is not associated with any known specific cause."

(In fact, pancreatic cancer has been associated with PVC processing; a 1993 Vista memo made note of a cluster of cases at a Union Carbide plant in New Jersey).

Question: "Did Dr. Mundt have any specific recommendations?"

Answer: "Dr. Mundt stated that smoking is a known cause of lung cancer and should be avoided."

(Some researchers believe that ***vinyl chloride*** and PVC dust also can cause lung cancer; the possible connection was reported by the International Agency for Research on Cancer in 1987.)

Given Jim Stark's 18-year tenure at the Aberdeen plant and his prominence in the community, his omission from the study seems odd. Mundt said that he learned of Stark too late to add him, but Stark's daughters are skeptical.

"They don't want to mar their statistics by including these men," said Luanne Thompson (no relation to David), an attorney in Aberdeen.

"If they acknowledge Dad, they'll have to acknowledge a lot more," said Lynette Stark, who teaches at the town's junior high school.

Jim Stark began at the plant in 1966, advancing to become manager of transportation. As such, he responded to numerous tank-car derailments that resulted in ***vinyl chloride*** releases.

In 1984 - shortly after Vista had taken over from Conoco and just days before he resigned - Stark reported, and was caught in, a huge leak from the plant itself.

Stark was given a clean bill of health after a physical in March 1993, said his wife, Eileen. Two months later he was diagnosed with a type of brain cancer known as glioblastoma multiforme, which some studies associate with ***vinyl chloride*** exposure.

That summer, his weight dropped from 155 to 82 lbs. He died, at 62, on Aug. 20.

"Dad was such a fighter, with a very strong sense of justice," Luanne Thompson said. "Watching him languish like he did - it was like they took away his dignity."

Vista officials said that Stark and other former Conoco workers will be included in an expansion of the cancer study, which Mundt hopes to finish by early next year.

Even if Vista became convinced that certain cancer deaths were work-related, "it wouldn't change our practices," said Tom Grumbles, the company's occupational health manager. "Exposures have been controlled tightly."

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Low VOC (volatile organic compounds), dimethyl-2-piperidone solvent-based, PVC and CPVC pipe and component adhesives and primers containing minimal or no tetrahydrofuran
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Patent Number	Date(YYYYMM)	Main US Class	Assignee
US 4675354	198706	524099	Sperling
US 4687798	198708	524100	King
US 5384345	199501	523218	Naton
US 5422388	199506	524104	Patel
US 5470894	199511	523218	Patel
US 5817708	199810	524104	Congelio
US 5821289	199810	524104	Congelio

Cited non-Patent References:
- DuPont Nylon Intermediates and Specialties, Material Safety Data Sheet, H-16147-2.

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Parent Case Text:

CROSS-REFERENCE TO RELATED APPLICATION

The present application is a continuation-in-part application of Ser. No. 09/255,970, filed on Jan. 5, 1999; now abandoned.

Abstract: Novel low VOC solvent-based adhesives are provided, comprising a mixture of low vapor pressure, isomeric dimethyl-2-piperidones (DMPD) blended with (1) a non-solvent diluent, specifically, acetone (a VOC-exempt compound), or with mixtures of acetone and other known ketonic solvents such as methyl ethyl ketone (MEK), diethyl ketone (DEK), methyl propyl ketone (MPK), and methyl iso-butyl ketone (MIBK), cyclohexanone, and (2) thermoplastic PVC or CPVC resins. Omission of the resin provides a novel primer for pipes. The blended mixture yields PVC or CPVC pipe adhesives and primers that: (1) result in low VOC formulas (e.g., less than 510 g/l for PVC pipe and less than 490 g/l for CPVC pipe); (2) are very economical in the industry; (3) yield strong, quick setting, durable pipe joints that meet the required standards and performance criteria (e.g., ASTM D-2564 lap shear for PVC); (4) yield stable, low viscosity solutions that, in the case of adhesives, can be readily adjusted with thixotropes (e.g., Aerosil 200) to give desirable flow characteristics and body, as well as primers for solvent welding PVC and CPVC pipe and components; and (5) can be formulated with minimal (10 wt %) or no cyclic ethers such as THF.

Summary of the Invention:

TECHNICAL FIELD

The present invention relates generally to thermoplastic pipe adhesive and primer compositions, and, more particularly, to adhesives and primers used for joining PCV (polyvinyl chloride) and CPVC (chlorinated PVC) pipe. Specifically, the PVC and CPVC pipe adhesives and primers disclosed and claimed herein are solvent-based, having an environmentally-acceptable VOC (volatile organic compounds) content.

BACKGROUND ART

Solvent-based adhesives, or cements, have been in use for joining thermoplastic pipe for over 30 years. The development of these adhesives is largely responsible for growth of the thermoplastic pipe industry. Several billion pounds of plastic pipe are produced each year in North America. Rapid-setting, solvent-based adhesives weld the pipes together in a timely manner. These rapid-setting adhesives allow for the testing and trouble-shooting of piping systems in a matter of hours while maintaining the long-term durability of the pipe itself. These characteristics, rapid set, ease of use, long-term durability along with low-cost, have made the joining of plastic pipe by solvent-based adhesives a practical and economic system.

The solvent-based adhesives work primarily by two means of action. First, the solvent portion of the formulation softens the outer surfaces of the pipe through solvation of the plastic. Subsequently, the adhesive joint "cures" (hardens) by means of the solvents evaporating to the surrounding atmosphere from the pipe. Secondly, the resin dissolved in the adhesive dries through solvent evaporation and provides continuity between the welded pipe surfaces which aid in preserving the integrity of the entire pipe system. These adhesives cure rapidly (within a matter of hours), often allowing piping systems to be tested the same day as constructed. However, perhaps the most important benefit of

these solvent-based adhesives is the maintenance of the integrity of the pipe itself. The resin is the same as the plastic pipe and/or fitting material. This provides a high degree of long-term durability for the piping system, often up to 30 to 40 years of useful life. This is essential for these systems which are built into the structures of homes and buildings, or are buried underground.

Thousands of miles of thermoplastic piping systems are constructed each day throughout the world, primarily by the means previously described. These systems are used in the transfer of potable water for drinking; residential hot and cold water systems; drain, waste, and vent (DWV) applications in home and industry; turf and agricultural sprinkler systems; jacuzzi, spa and tub connections, residential and commercial fire sprinkler systems; etc. These systems are crucial to the maintenance of safe and healthy means of transport of water and other chemicals throughout the world.

Evaporation of solvents from adhesives is a concern to an environmentally-concerned world, along with all other potential sources of air pollution. Typical solids (non-volatile) contents of plastic pipe adhesives are 10 to 20% for both PVC and CPVC. The balance of the formulation is solvent. By definition, the solvents normally used, e.g., tetrahydrofuran (THF), methyl ethyl ketone (MEK), and acetone are considered to be VOCs. That is, they are volatile compounds which contain the element carbon excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, ammonium carbonate, and exempt compounds, such as methylene chloride and 1,1,1-trichlorethane. While other solvents, such as cyclohexanone and dimethyl formamide (in the case of PVC) and cyclohexanone (in the case of CPVC), may also be used in such adhesives, the amount of such solvents are typically minor, considerably less than 15 wt % (in the case of PVC) and 10 wt % (in the case of CPVC) of the total adhesive concentration. Typical VOC values of present commercial PVC solvent adhesives range from 750 to 850 grams/liter and for CPVC solvent adhesives range from 775 to 850 g/l.

Regulations are being created throughout North America regarding allowable VOC levels in adhesive formulations. Federal, state, and local agencies are beginning to adopt strict measures to drastically reduce these levels. The South Coast Air Quality Management District (SCAQMD) in the Los Angeles area has been a leader of the establishment of rules governing VOCs, such as SCAQMD Rule 1168.

SCAQMD Rule 1168 specifies a VOC level for PVC adhesives of 510 g/l or less and for CPVC adhesives of 490 g/l or less, as determined by Method 316-A. All PVC and CPVC adhesives used after Jan. 24, 1994, are required to meet that maximum allowed level. More recently, acetone has been removed from the list of solvents and placed on the list of exempt solvents. Consequently, there is, at the present time, no legal limit to the amount of acetone that can be added to adhesive compositions.

Further, tetrahydrofuran (THF), which has been a major component of PVC and CPVC adhesive compositions (typically, 25 to 75 wt %), has been found by the National Toxicology Board to have a slight carcinogenicity in animal testing. As a result, THF is under extensive investigation, both with regard to worker health (exposure during pipe assembly) and potable water issues. Furthermore, THF is a high vapor pressure, fast-evaporating solvent that heavily contributes to the VOC level. It is highly desirable to reduce THF levels, but still maintain the adhesive-contributing properties that THF offers, i.e., fast-setting, durable pipe joints.

Also, many PVC and CPVC pipe adhesives are formulated with N-methyl pyrrolidone (NMP), a very effective solvent for PVC and CPVC resins. However, the hygroscopicity of this solvent results in milky white cured film joints, even in pigmented blue and gray formulas, and this is undesirable in many applications.

Other thermoplastic pipe adhesives are formulated with large amounts of low vapor pressure solvents blends, such as di-methyladipate (available from E. I. DuPont de Nemours as DBE-6) and NMP and/or alkyl-substituted naphthalene (U.S. Pat. No. 5,821,289, issued to C. D. Congelio et al) to reduce VOC levels, but generally these type of adhesives require longer set times before water pressure testing of the system can be made. Also, these slower setting adhesives are less effective in colder environments.

Still another method to formulate low VOC cements for thermoplastic pipe and other PVC and CPVC extruded articles is to incorporate higher amounts of resin(s). This does indeed reduces VOC levels, but is less cost effective and generally slower than cements containing lower weight percent of resin.

Thus, adhesives for joining PVC and CPVC pipes having a maximum VOC level of 510 g/l (for PVC) or 490 g/l (for CPVC) are required. Yet, such adhesive must also meet the required hydrostatic burst strength and other performance criteria set forth in ASTM F-493 and D-2846 and lap shear strength set forth in ASTM D-2564. (Test method 316A has been revised and the new acceptable VOC levels are shown above.)

DISCLOSURE OF INVENTION

In accordance with the present invention, novel low VOC solvent-based adhesives are provided, comprising a mixture of low vapor pressure isomeric dimethyl-2-piperidones (DMPD) blended with (1) a non-solvent diluent, specifically, acetone (a VOC-exempt compound), or with mixtures of acetone and other known ketonic solvents such as methyl ethyl ketone (MEK), diethyl ketone (DEK), methyl propyl ketone (MPK), and methyl iso-butyl ketone (MIBK), cyclohexanone, and (2) thermoplastic PVC or CPVC resins. Primers are also provided in accordance with the present invention by omitting the inclusion of the thermoplastic resin.

The novel adhesives described herein overcome the deficiencies described above for the prior art adhesives without compromising adhesive performance. The adhesives of the present invention comprise (for joining PVC pipes and components):

(a) about 5 to 25 wt % PVC resin and 0 to about 25 wt % acrylic resin, the total of PVC resin and acrylic resin ranging from about 10 to 35 wt %;

(b) about 5 to 80 wt % of low vapor pressure dimethyl-2-piperidone (DMPD);

(c) about 10 to 75 wt % of at least one ketone selected from the group consisting of (i) 0 to 75 wt % acetone, (i) 0 to about 75 wt % of at least one low boiling point ketone having a boiling point below 80[degree(s)], (iii) 0 to about 35 wt % of at least one medium boiling point ketone having a boiling point within a range of 80[degree(s)] to 130[degree(s)] C., (iv) 0 to about 35 wt % of at least one high boiling point ketone having a boiling point greater than 130[degree(s)] C., with the proviso that the total of the medium and high boiling point ketones is a maximum of 35 wt % of the adhesive or primer composition; and

(d) 0 to about 10 wt % tetrahydrofuran.

For joining CPVC pipes and components, the foregoing composition is modified only by replacing the resin component in (a) with about 5 to 25 wt % CPVC resin.

Inclusion of the resin component provides pipe adhesives, while omission of the resin component provides pipe primers.
DMPD, which is used in the novel adhesive of the present invention, is a true solvent for PVC and CPVC and exhibits a remarkable decrease in solution viscosity when blended with the non-solvent acetone or the other ketones (such as methyl ethyl ketone, diethyl ketone, methyl propyl ketone, cyclohexanone, methyl iso-butyl ketone, methyl amyl ketone, acetophenone, methyl iso-propyl ketone, methyl butyl ketone, methyl iso-amyl ketone, di-butyl ketone, ethyl amyl ketone, etc.), thereby allowing great latitude in formulation. Blends of DMPD can be adjusted for such parameters as set time, VOC content, cost, viscosity, flash point, solids content very readily with little effect on adhesive performance.
The adhesive in this invention may include filler, thixotropic agents, colorants, stabilizers, oligomeric and polymeric rheology additives, wetting agents and adhesion promoters.
The blended mixture yields PVC or CPVC pipe adhesives that:
(1) result in low VOC formulas (e.g., less than 510 g/l for PVC pipe and less than 490 g/l for CPVC pipe);
(2) are very economical in the industry;
(3) yield strong, quick setting, durable pipe joints that meet the required standards and performance criteria (e.g., ASTM D-2564 lap shear for PVC);
(4) yield stable, low viscosity solutions that can be readily adjusted with thixotropes (e.g., Aerosil 200) to give medium and high body adhesives, as well as low bodied adhesives and primers for solvent welding PVC and CPVC pipe and components; and
(5) can be formulated with minimal (10 wt % maximum) or no cyclic ethers such as THF.
Other objects, features, and advantages of the present invention will become apparent upon consideration of the following detailed description.
BEST MODES FOR CARRYING OUT THE INVENTION
Reference is now made in detail to a specific embodiment of the present invention, which illustrates the best mode presently contemplated by the inventors for practicing the invention. Alternative embodiments are also briefly described as applicable.
In accordance with the present invention, novel low VOC solvent-based adhesives are provided, comprising a mixture of low vapor pressure isomeric dimethyl-2-piperidones (DMPD) blended with (1) (a) a non-solvent diluent, specifically, acetone (a VOC-exempt compound), or (b) with mixtures of acetone and other known ketonic solvents such as methyl ethyl ketone (MEK), diethyl ketone (DEK), methyl propyl ketone (MPK), methyl iso-butyl ketone (MIBK), methyl amyl ketone (MAK), and cyclohexanone, or (c) with one or more of the foregoing ketonic solvents without acetone, and (2) thermoplastic PVC or CPVC resins.
The novel adhesives described herein overcome the deficiencies described above for the prior art adhesives without compromising adhesive performance. The adhesives of the present invention comprise (for joining PVC pipes and components):
(a) about 5 to 25 wt % PVC resin and 0 to about 25 wt % acrylic resin, the total of PVC resin and acrylic resin ranging from about 10 to 35 wt %;
(b) about 5 to 80 wt % of low vapor pressure dimethyl-2-piperidone (DMPD);
(c) about 10 to 75 wt % of at least one ketone selected from the group consisting of (i) 0 to 75 wt % acetone, (i) 0 to about 75 wt % of at least one low boiling point ketone having

a boiling point below 80[degree(s)] ,(iii) 0 to about 35 wt % of at least one medium boiling point ketone having a boiling point within a range of 80[degree(s)] to 130[degree(s)] C., (iv) 0 to about 35 wt % of at least one high boiling point ketone having a boiling point greater than 130[degree(s)] C., with the proviso that the total of the medium and high boiling point ketones is a maximum of 35 wt % of the adhesive or primer composition; and

(d) 0 to about 10 wt % tetrahydrofuran.

For joining CPVC pipes and components, the foregoing composition is modified only by replacing the resin component in (a) with about 5 to 25 wt % CPVC resin.

Inclusion of the resin component provides pipe adhesives, while omission of the resin component provides pipe primers.

Unless otherwise specified, the concentration of a particular component is with respect to the total adhesive or primer composition. The purity of all components is that employed in normal commercial practice in the field of PVC and CPVC adhesives and primers for joining pipes and other components together.

DMPD, which is used in the novel adhesive of the present invention, is a true solvent for PVC and CPVC and exhibits a remarkable decrease in solution viscosity when blended with the non-solvent acetone or the other ketones (such as methyl ethyl ketone, diethyl ketone, methyl propyl ketone, cyclohexanone, methyl iso-butyl ketone, methyl amyl ketone, acetophenone, methyl iso-propyl ketone, methyl butyl ketone, methyl iso-amyl ketone, di-butyl ketone, ethyl amyl ketone, etc.), thereby allowing great latitude in formulation. Blends of DMPD can be adjusted for such parameters as set time, VOC content, cost, viscosity, flash point, solids content very readily with little effect on adhesive performance. There are a number of isomers of DMPD, including 1,3-dimethyl piperidone, 1,4-dimethyl piperidone, 1,5-dimethyl piperidone, 2,3-dimethyl piperidone, 2,4-dimethyl piperidone, and 2,5-dimethyl piperidone, all of which alone or in any combination are useful in the practice of the present invention. One product that is commercially available comprises a mixture containing 64 to 71 wt % of 1,3-dimethyl piperidone and 29 to 36 wt % of 1,5-dimethyl piperidone and is available from E. I. du Pont de Nemours (Wilmington, Del.).

In general, acetone may be employed as the sole ketone in the range of about 15 to 75 wt % of the total adhesive or primer composition. Alternatively, a mixture of acetone and at least one of the other above-enumerated ketones may be employed, the total concentration falling within the same range. Finally, at least one of the enumerated ketones, other than acetone, may be used in the practice of the present invention.

In particular, the ketone component comprises about 10 to 75 wt % of the total adhesive or primer composition and is at least one ketone selected from the group consisting of (1) 0 to about 75 wt % acetone; (2) 0 to about 75 wt % of at least one low boiling ketone having a boiling point less than 80[degree(s)] C., such as methyl ethyl ketone (MEK); (3) 0 to 35 wt % of at least one medium boiling ketone having a boiling point within a range of about 80[degree(s)] to 130[degree(s)] C., such as diethyl ketone (DEK), methyl propyl ketone (MPK), methyl iso-propyl ketone (MIPK), methyl iso-butyl ketone (MIBK), and methyl n-butyl ketone (MBK); and (4) 0 to about 35 wt % of at least one high boiling ketone having a boiling point greater than 130[degree(s)] C., such as cyclohexanone, acetophenone, methyl amyl ketone, methyl iso-amyl ketone, di-iso-ketone, and ethyl amyl ketone, wherein the medium boiling ketone and the high boiling ketone have a total

maximum combined amount of 35 wt %. It will be evident to those skilled in this art that if, for example, no acetone is selected, then a suitable amount of another ketone or ketones must be added to provide at least 10 wt % ketone in the adhesive or primer composition, within the constraints listed above.

With regard to the PVC resin, its incorporation into the adhesive composition provides an adhesive for PVC pipe. In addition, acrylic resins may be included, as disclosed in U.S. Pat. No. 5,422,388, issued to Naresh D. Patel et al on Jun. 6, 1995. The acrylic resin, if employed, may comprise any combination of the known homopolymers, copolymers, and terpolymers commonly employed in adhesive compositions.

The concentration of PVC resin is in the range of about 5 to 25 wt % of the total adhesive composition.

The acrylic resin, if employed, is preferably in the range of about 2 to 25 wt %, with the concentration of the mixture of both PVC and acrylic resin ranging from about 10 to 35 wt % of the adhesive composition. (A minimum of 10 wt % resin is permitted under ASTM-2564.) A concentration of PVC beyond the maximum value of 25 wt % would not be shelf-stable. With regard to the acrylic resin, less than about 2 wt % does not result in the benefits provided to the adhesive by its presence in combination with the PVC resin, while greater than about 25 wt % is not soluble in the solvent system. Within the foregoing constraints, the total resin level in the PVC adhesive ranges from about 10 to 35 wt %, as indicated above. Less than about 10 wt % makes it difficult to achieve VOC levels (if formulated without acetone or significant levels of DMPD) less than the permitted maximum of 510 g/l, while greater than about 35 wt % is not shelf-stable.

Any of the PVC resins commonly employed in PVC adhesives may be used in the practice of the present invention. Particularly preferred are those PVC resins characterized by homopolymers as classified by inherent viscosity (I.V.) in the range of about 0.6 to 0.95. The inherent viscosity of a PVC resin is determined in accordance with ASTM D-1243. Inherent viscosity is a qualitative measure of molecular weight; that is, the higher the I.V., the higher the molecular weight. A non-limiting example of a suitable PVC resin employed in the practice of the present invention is Shintech SE-650, available from Shintech, Inc. (Freeport, Tex.).

The acrylic resins advantageously employed in the practice of the present invention are those homopolymers, copolymers, and terpolymers of methyl methacrylate. When characterized by inherent viscosity, as measured with a solution containing 0.25 g polymer in 50 ml methylene chloride at 20[degree(s)] C. using a No. 50 Cannon-Fenske Viscometer, the useful range in the practice of the present invention is 0.1 to 1.25. Alternatively, an acrylic resin having a melt flow rate as determined by ASTM D-1238 in the range of 1.6 to 24 is acceptable. Examples of acrylic resins suitably employed in the practice of the present invention include (1) the V series (VS, VM, VH) resins from Atohaas, (2) the Elvacite(R) and Lucite(R) acrylic resins, both available from ICI, and (3) Acriterm(R) HS resins from ICI.

With regard to the CPVC resin, its incorporation into the adhesive composition provides an adhesive for CPVC pipe. As indicated above, the CPVC resin is contained in the adhesive formulation in an amount ranging from about 5 to 25 wt %, preferably from about 5 to about 15 wt % of the total adhesive. If too small an amount of CPVC resin is used, it may not be possible to form an effective and durable pipe joint and VOC levels

will tend to increase, while, if the amount of CPVC resin too great, it may not all solubilize in the solvent(s) and thus tends to form an undesirable "gel" therewith.
CPVC resins useful in this invention may be prepared by chlorination of polyvinyl chloride homopolymers and copolymers starting materials by procedures known to those skilled in the art. Examples of useful polyvinyl chloride homopolymers and copolymers starting materials in this regard include those described in U.S. Pat. No. 5,384,345, which teachings are incorporated herein by reference. CPVC resins are typically supplied in powder form when obtained from commercial sources. The CPVC resins used in this invention may contain chlorine in any amount effective to impart adequate heat deflection resistance property to the adhesive composition for the intended use(s). The chlorine content of the CPVC resins used in the compositions of this invention will range from about 50 to about 80% by weight, and more specifically about 57 to about 70% by weight.
Particularly preferred are those CPVC resins characterized by an inherent viscosity (I.V.) ranging from about 0.60 to 0.95, and more preferably about 0.68 to about 0.92. A non-limiting example of a suitable CPVC resin employed in the practice of the present invention is BF Goodrich Temprite 677X670 with 67% chlorination, available from BF Goodrich (Cleveland, Ohio).
The adhesives of the present invention may include additional solids. Such additional solids that may be present include fillers, thixotropic agents, colorants, stabilizers, oligomeric and polymeric rheology additives, wetting agents, and adhesion promoters. Up to about 8 wt % of the adhesive may contain such additional additives and adjuvants. Any fillers, thixotropic agents, pigments, dyes, stabilizers oligomeric and polymeric rheology additives, wetting agents, and adhesion promoters that are commonly used in PVC and CPVC adhesives may be employed in the practice of the present invention.
Preferred fillers low specific gravity hollow spheres (glass, ceramic, or synthetic, e.g., PVC), and include solid particulate inorganic fillers such as calcium carbonate, aluminum trihydrate, calcium sulfate, and crystalline silica.
Preferred colorants include dyes and pigments, such as titanium dioxide, carbon black, aluminum Lake based-orange, and conventional red or yellow colorants.
Preferred thixotropic agents include fumed silica and precipitated silica (e.g., AEROSIL-200 available from Degussa Corporation, Cab-O-Sil MS available from Cabot Corporation, and HISIL T600) and treated bentonite clay (e.g., Bentone 27), and these may be used at low levels to obtain optimum flow properties, especially with regard to controlling spillage from the pipe upon application.
Preferred stabilizers include such additives as acid scavengers, antioxidants (e.g., hindered phenols) and tin stabilizers.
Preferred rheology additives include non-PVC or non-CPVC thermoplastic resins, such as one or more of thermoplastic PVC polymers (in the case of CPVC adhesives), acrylic polymers (in the case of CPVC adhesives), MBS polymers, ABS polymers, linear and core/shell polymers, and random and block polymers including elastomeric and rubber resins.
The blended mixture yields PVC or CPVC pipe adhesives that:
(1) result in low VOC formulas (e.g., less than 510 g/l for PVC pipe and less than 490 g/l for CPVC pipe);
(2) are very economical in the industry;

(3) yield strong, quick setting, durable pipe joints that meet the required standards and performance criteria (e.g., ASTM D-2564 lap shear for PVC);
(4) yield stable, low viscosity solutions that can be readily adjusted with thixotropes (e.g., Aerosil 200) to give desirable flow characteristics and body to adhesives, as well as primers for solvent welding PVC and CPVC pipe and components; and
(5) can be formulated with minimal (10 wt % maximum) or no (0 wt %) cyclic ethers such as THF.
A number of different, specific composition ranges are preferred. These include:
(a) about 5 to 25 wt % PVC resin;
about 5 to 50 wt % DMPD; and
about 10 to 68 wt % acetone.
(b) about 5 to 25 wt % PVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % acetone; and
up to about 10 wt % tetrahydrofuran.
(c) about 5 to 25 wt % PVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % acetone; and
up to about 50 wt % MEK, where acetone and MEK together total about 10 to 68 wt % of the adhesive.
(d) about 5 to 25 wt % PVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % acetone; and
up to about 35 wt % cyclohexanone, where acetone and cyclohexanone together total about 10 to 68 wt % of the adhesive.
(e) about 5 to 25 wt % PVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % acetone; and
up to about 35 wt % of at least one of MPK and DEK, where acetone, MPK, and DEK together total about 10 to 68 wt % of the adhesive.
(f) about 5 to 25 wt % PVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % acetone; and
up to about 35% of at least one of cyclohexanone, MPK, and DEK, where acetone, MPK, DEK, and cyclohexanone together total about 10 to 68 wt % of the adhesive.
(g) about 5 to 25 wt % PVC resin or CPVC resin;
about 5 to 50 wt % DMPD; and
about 10 to 68 wt % methyl ethyl ketone.
(h) about 5 to 25 wt % PVC resin or CPVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % methyl ethyl ketone; and
up to about 10 wt % THF.
(i) about 5 to 25 wt % PVC resin or CPVC resin;
about 5 to 50 wt % DMPD;

about 10 to 68 wt % methyl ethyl ketone; and up to about 35 wt % cyclohexanone, wherein methyl ethyl ketone and cyclohexanone together total about 10 to 68 wt % of the adhesive.
(j) about 5 to 25 wt % PVC resin or CPVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % methyl ethyl ketone; and
up to about 35 wt % of at least one of MPK and DEK, wherein methyl ethyl ketone, MPK, and DEK together total about 10 to 68 wt % of the adhesive.
(k) about 5 to 25 wt % PVC resin or CPVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % methyl ethyl ketone; and
up to about 35 wt % cyclohexanone, wherein methyl ethyl ketone, MPK, DEK, and cyclohexanone together total about 10 to 68 wt % of the adhesive.
It is noted that the PVC or CPVC resin may have a concentration as low as 5 wt %. Such a formulation is still an adhesive, but it falls below the minimum of 10 wt % required to satisfy ASTM compliance.
The formulations provided above, if the solids (PVC or CPVC resin and solid additives) are omitted, are primers, and may be used as such with both PVC and CPVC pipes. Primers may be employed as part of a two-step process, comprising applying the primer to one or both surfaces of the pipes (or other objects) being joined, followed by applying the adhesive. The primer for joining PVC pipes and components or CPVC pipes and components comprises:
(a) 15 to 85 wt % dimethyl-2-piperidone;
(b) 10 to 75 wt % of at least one ketone selected from the group consisting of (1) 0 to about 75 wt % acetone, (2) 0 to about 75 wt % of at least one low boiling ketone having a boiling point less than 80[degree(s)] C., (3) 0 to about 35 wt % of at least one medium boiling ketone having a boiling point within a range of about 80[degree(s)] to 130[degree(s)] C., and (4) 0 to about 35 wt % of at least one high boiling ketone having a boiling point greater than 130[degree(s)] C., wherein said medium boiling ketone and said high boiling ketone have a maximum amount of 35 wt %; and
(c) 0 to about 10 wt % tetrahydrofuran.
Description of the Invention:
EXAMPLES
Examples 1-6; Comparative Examples 1,2
The compositions listed in Table I below exemplify some typical preferred compositions with low VOC values. SCAQMD Rule 1168 specifies a VOC level for PVC adhesives of 510 g/l or less. In Examples 1-3, DMND and MEK adhesives result in acceptable VOC levels; in Examples 4-6, the DMPD and acetone formulas evidence much lower VOC levels as a result of acetone being an exempt compound. Comparative Examples 1 and 2 in Table II show VOC levels exceeding 500 g/l for a typical THF/resin adhesive (Comparative Example 1) and for a typical commercial cement Weld-On 711 (Comparative Example 2). The viscosity for Examples 1-6 in Table I also exemplify the low values of these DMPD base adhesives, which are commercially desirable, since they can be readily increased using thixotropic agents such as fumed silica or rheology additives such as homo-, co-, or ter-polymeric methacrylate, MBS (methyl methacrylate-

butadiene-styrene), ABS (acrylonitrile-butadiene-stryene), etc. to give desirable flow characteristics and body to the adhesives.
(table - see patent image)
(table - see patent image)
Examples 7-15
The compositions listed in Table III exemplify the wide latitude in formulation with based adhesives with respect to adhesive performance. Formulas of DMPD with acetone (Examples 7, 8, 11, 13); DMPD with acetone, MEK, and cyclohexanone (Example 9); DMPD with MEK and cyclohexanone (Example 12); and DMPD and MEK (Example 15) all satisfy the minimum lap shear values for 2, 16, and 72 hours as required in ASTM D-2564 for PVC.
(table - see patent image)
Examples 7-15 clearly demonstrate to one skilled in the art that various changes and modifications may be used to adjust set-time, viscosity, VOC levels, bond strength and formulations costs and such changes and modifications are considered to fall within the scope of the invention. Likewise, one skilled in the art easily recognizes that these DMPD formulations can be made to include other known PVC and CPVC solvents such as THF, NMP, aliphatic and aromatic ketones to further adjust desired adhesive properties. Likewise, formulation comprising various molecular weight thermoplastic PVC and CPVC with DMPD blends would be obvious to one skilled in the art as exemplified in Example 13.
Examples 16-19
Table IV below lists the solution properties of adhesives containing PVC resins having I.V. values ranging from 0.68 to 0.90.
(table - see patent image)
Table IV illustrates that DMPD readily dissolves various PVC resins (of different I.V.) to give 10 wt % solutions with low viscosities. This is meant to show that cements can be formulated with a range of PVC molecular weights (based on I.V. value). While the DMPD concentration is higher than discussed earlier, it is listed here to show that although such compositions are very slow drying, nevertheless, the compositions are still good adhesives.
ASTM F-656 requires that a solvent/solvent blend is a primer if it can dissolve 10 wt % resin.
Examples 20-23
Table V below lists the hydrostatic burst strength of adhesives containing CPVC resins. The hydrostatic burst strengths were measured in accordance with ASTM-F493.
(table - see patent image)
Table V lists some specific examples of CPVC low VOC cement formulations containing DMPD, MEK, and acetone. These formulations show the solvency of DMPD/MEK/acetone combinations and their effectiveness as CPVC cements. It would be obvious to one skilled in this art that other solvent blends of DMPD/MEK/acetone and other ketones such as DEK, cyclohexanone, etc., as well as formulas with minimal amounts of THF, lend themselves as cements for CPVC articles such as pipes, fittings, etc.
INDUSTRIAL APPLICABILITY

The adhesives and primers disclosed herein are expected to find use in joining PVC and CPVC pipes and other such articles together.
Thus, there have been disclosed PVC and CPVC adhesives and primers. It will be readily apparent to those skilled in this art that various changes and modifications of an obvious nature may be made, and all such changes and modifications are considered to fall within the scope of the present invention, as defined by the appended claims.
What is claimed is:
1. An adhesive for joining PVC pipes and components or CPVC pipes and components comprising either:
(a1) about 5 to 25 wt % PVC resin and 0 to about 25 wt % acrylic resin, the total of said PVC resin and acrylic resin ranging from 10 to 35 wt %; or
(a2) about 5 to 25 wt % CPVC resin; and
(b) 5 to 80 wt % dimethyl-2-piperidone;
(c) 10 to 75 wt % of at least one ketone selected from the group consisting of (1) 0 to about 75 wt % acetone, (2) 0 to about 75 wt % of at least one low boiling ketone having a boiling point less than 80[degree(s)] C., (3) 0 to about 35 wt % of at least one medium boiling ketone having a boiling point within a range of about 80[degree(s)] to 130[degree(s)] C., and (4) 0 to about 35 wt % of at least one high boiling ketone having a boiling point greater than 130[degree(s)] C., wherein said medium boiling ketone and said high boiling ketone have a maximum amount of 35 wt %; and
(d) 0 to about 10 wt % tetrahydrofuran. (Main Claim)
2. The adhesive of claim 1 comprising said PVC resin, wherein said PVC resin has an inherent viscosity within a range of 0.6 to 0.95.
3. The adhesive of claim 1 comprising said PVC resin, wherein said acrylic resin comprises a homopolymer, a copolymer or a terpolymer of methyl methacrylate having an inherent viscosity ranging from 0.1 to 1.25 or a melt flow index ranging from 1.6 to 24.

4. The adhesive of claim 1 comprising said CPVC resin, wherein said CPVC resin has an inherent viscosity within a range of 0.6 to 0.85 and a chlorination within a range of 50 to 80 wt %.
5. The adhesive of claim 1 further comprising a filler selected from the group consisting of hollow ceramic spheres, hollow glass spheres, hollow synthetic spheres, calcium carbonate, alumina trihydrate, calcium sulfate, and crystalline silica.
6. The adhesive of claim 1 further comprising a thixotropic agent selected the group consisting of fumed silica, precipitated silica, and treated bentonite clay.
7. The adhesive of claim 1 wherein said low boiling ketone consists essentially of methyl ethyl ketone.
8. The adhesive of claim 1 wherein said at least one medium boiling ketone is selected from the group consisting of diethyl ketone, methyl propyl ketone, methyl iso-propyl ketone, methyl iso-butyl ketone, and methyl n-butyl ketone.
9. The adhesive of claim 1 wherein said at least one high boiling ketone is selected from the group consisting of cyclohexanone, acetophenone, methyl amyl ketone, methyl iso-amyl ketone, di-iso-butyl ketone, and ethyl amyl ketone.
10. The adhesive of claim 1 comprising:
(a) about 5 to 25 wt % PVC resin;

(b) about 5 to 50 wt % dimethyl-2-piperidone; and
(c) about 10 to 68 wt % acetone.
11. The adhesive of claim 10 further comprising up to about 10 wt % tetrahydrofuran.
12. The adhesive of claim 10 further comprising up to 50 wt % methyl ethyl ketone, where acetone and methyl ethyl ketone together total about 10 to 68 wt % of said adhesive.
13. The adhesive of claim 10 further comprising up to about 35 wt % cyclohexanone, where acetone and cyclohexanone together total about 10 to 68 wt % of said adhesive.
14. The adhesive of claim 10 further comprising up to about 35 wt % of at least one of methyl propyl ketone and diethyl ketone, where acetone, methyl propyl ketone, and diethyl ketone together total about 10 to 68 wt % of said adhesive.
15. The adhesive of claim 14 further comprising up to about 35% cyclohexanone, where acetone, methyl propyl ketone, diethyl ketone, and cyclohexanone together total about 10 to 68 wt % of said adhesive.
16. The adhesive of claim 1 comprising:
(a) about 5 to 25 wt % PVC resin or CPVC resin;
(b) about 5 to 50 wt % dimethyl-2-piperidone; and
(c) about 10 to 68 wt % methyl ethyl ketone.
17. The adhesive of claim 16 further comprising up to about 10 wt % tetrahydrofuran.
18. The adhesive of claim 16 further comprising up to about 35 wt % cyclohexanone, wherein methyl ethyl ketone and cyclohexanone together total about 10 to 68 wt % of said adhesive.
19. The adhesive of claim 16 further comprising up to about 35 wt % of at least one of methyl propyl ketone and diethyl ketone, wherein methyl ethyl ketone, methyl propyl ketone, and diethyl ketone together total about 10 to 68 wt % of said adhesive.
20. The adhesive of claim 19 further comprising up to about 35 wt % cyclohexanone, wherein methyl ethyl ketone, methyl propyl ketone, diethyl ketone, and cyclohexanone together total about 10 to 68 wt % of said adhesive.
21. A primer for joining PVC pipes and components or CPVC pipes and components comprising:
(a) 15 to 85 wt % dimethyl-2-piperidone;
(b) 10 to 75 wt % of at least one ketone selected from the group consisting of (1) 0 to about 75 wt % acetone, (2) 0 to about 75 wt % of at least one low boiling ketone having a boiling point less than 80[degree(s)] C., (3) 0 to about 35 wt % of at least one medium boiling ketone having a boiling point within a range of about 80[degree(s)] to 130[degree(s)] C., and (4) 0 to about 35 wt % of at least one high boiling ketone having a boiling point greater than 130[degree(s)] C., wherein said medium boiling ketone and said high boiling ketone have a maximum amount of 35 wt %; and
(c) 0 to about 10 wt % tetrahydrofuran.
22. The primer of claim 21 wherein said at least one low boiling ketone consists essentially of methyl ethyl ketone.
23. The primer of claim 21 wherein said at least one medium boiling ketone is selected from the group consisting of diethyl ketone, methyl propyl ketone, methyl iso-propyl ketone, methyl butyl ketone, and methyl iso-butyl ketone.

24. The primer of claim 21 wherein said at least one high boiling ketone is selected from the group consisting of cyclohexanone, acetophenone, methyl amyl ketone, methyl iso-amyl ketone, di-iso-butyl ketone, and ethyl amyl ketone.

25. A method for reducing VOC emissions in adhesives for joining PVC pipes and components or CPVC pipes and components, said method comprising mixing together either (a) about 5 to 25 wt % PVC resin and 0 to about 25 wt % acrylic resin, the total of said PVC resin and acrylic resin ranging from 10 to 35 wt %, or (b) about 5 to 25 wt % CPVC resin; plus 5 to 80 wt % dimethyl-2-piperidone; 10 to 75 wt % of at least one ketone selected from the group consisting of (1) 0 to 75 wt % acetone, (2) 0 to 75 wt % of at least one low boiling ketone having a boiling point less than 80[degree(s)] C., (3) 0 to 35 wt % of at least one medium boiling ketone having a boiling point within a range of about 80[degree(s)] to 130[degree(s)] C., and (4) 0 to 35 wt % of at least one high boiling ketone having a boiling point greater than 130[degree(s)] C., wherein said medium boiling ketone and said high boiling ketone have a maximum amount of 35 wt %; and 0 to about 10 wt % tetrahydrofuran.

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SOLVA-GARD® NITRILE GLOVES

Chemical Performance Data

This guide provides an indication of Solva-Gard nitrile glove performance upon exposure to specific chemicals. The breakthrough time indicated is the elapsed time between initial contact of the liquid chemical with the outside surface of the glove and the time at which the chemical can be detected at the inside surface of the glove with analytical equipment. The permeation rate is measured in milligrams per square meter per second. The indication of degradation resistance is determined by significant change(s) in one or more of a glove's physical properties such as swelling, texture, etc. This data was collected in a laboratory using glove materials meeting the product specifications for Solva-Gard style SG-133 (unlined) nitrile gloves. Glove thickness plays an important role in resistance to permeation and degradation. In addition, no laboratory environment can duplicate the conditions of actual use so the purchaser and user are cautioned to test all products in the appropriate application.

Key to Ratings:
E = Excellent, fluid has no effect
G = Good, fluid has minor effect
F = Fair, fluid has moderate effect
P = Poor, fluid has severe effect
ND = None detected
ID = Insufficient data

Physical characteristics of Solva-Gard Nitrile Gloves:
EXCELLENT abrasion resistance
EXCELLENT cut resistance
EXCELLENT puncture/snag resistance
EXCELLENT flexibility
GOOD heat resistance
EXCELLENT tensile strength

Chemical Name	CAS Number	Degradation Rating	Breakthrough Time	Permeation Rate
1,1, Dichloroethane	75-34-3	P	ID	ID
1,1,1 Trichloroethane (Methyl Chloroform)	71-55-6	P	41 min	76.4
1,1,1,2-Tetrachloroethane	630-20-6	ID	ID	ID
1,1,2,-Trichloroethane	79-00-5	P	ID	ID
1,1,2,2-Tetrachloroethane	79-34-5	ID	ID	ID
1,1-Dichloroethylene	75-35-4	ID	ID	ID
1,1-Difluoroethylene	75-38-7	ID	ID	ID
1,2-Dichloroethane (Ethylene Dichloride)	107-06-2	P	8 min	311
1,2-Dichloropropane	78-87-5	ID	ID	ID
1,2-Epoxy-3-Chloropropane	106-89-8	ID	ID	ID
1,2-Epoxybutane	106-88-7	ID	ID	ID
1,2-Epoxypropane	75-56-9	ID	ID	ID
1,3-Butadiene	106-99-0	ID	ID	ID
1,3-Diaminopropane	109-76-2	ID	ID	ID
1,3-Dichloropropene	542-75-6	ID	ID	ID
1,3-Dimethyl butylamine	108-09-8	ID	ID	ID
1,3-Propylene Oxide	503-30-0	ID	ID	ID
1,4-Diethylene Dioxide (1,4-Dioxane)	123-91-1	P	28 min	77.1
1,4-Dioxane (Diethylene Oxide)	123-91-1	P	28 min	77.1
1,6-Hexadiamine		ID	ID	ID
1-Bromo-2-Propanol (70%)	19686-73-8	ID	ID	ID
1-Chloro-2-Propanol	127-00-4	ID	ID	ID

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Chemical Name	CAS Number	Degradation Rating	Breakthrough Time	Permeation Rate
1-Methyl-4-tert-butylbenzene (p-t Butyltoluene)	27138-21-2	P	ID	ID
1-Nitropropane	108-03-2	ID	16 min	29.5
1-Pentanol	71-41-0	ID	ID	ID
2,3-Dichloro-1-Propene	78-88-6	ID	ID	ID
2-Bromoethanol (95%)	540-51-2	ID	ID	ID
2-Butanone Peroxide (50%)	1338-23-4	ID	ID	ID
2-Chloro-2-Nitropropane	594-71-8	ID	ID	ID
2-Chloroethanol	107-07-3	ID	ID	ID
2-Ethoxyethanol (2-Ethylhexyl Alcohol)	110-80-5	ID	ID	ID
2-Nitropropane	79-46-9	P	ID	ID
2-Phenyl-APB-144		ID	ID	ID
2-Propanone (Acetone)	67-64-1	P	5 min	172
3-Bromo-1-Propanol (95%)	627-18-9	ID	ID	ID
3-Chloro-1-Propanol	627-30-5	ID	ID	ID
3-Chloro-2-Methylpropene (90%)	563-47-3	ID	ID	ID
3-Chloroprene (Allyl Chloride)	107-05-1	ID	ID	ID
3-Methylaminopropylamine	6291-84-5	ID	ID	ID
4-Methoxy-4-Methyl-2-Pentanone	107-70-0	ID	ID	ID
4-Vinyl-1-Cyclohexene	100-40-3	ID	ID	ID
9-Aminoacridine HC1	134-50-9	ID	ID	ID
Acetaldehyde (Ethanal)	75-07-0	P	4 min	161
Acetic Acid, Glacial	64-19-7	F	38 min	1.9
Acetic Aldehyde (Acetaldehyde)	75-07-0	P	4 min	161
Acetic Anhydride (Acetic Oxide)	108-24-7	ID	ID	ID
Acetic Ester (Ethyl Acetate)	141-78-6	P	8 min	145
Acetic Ether (Ethyl Acetate)	141-78-6	P	8 min	145
Acetone (Dimethyl Ketone)	67-64-1	P	5 min	172
Acetonitrile (Methyl Cyanide)	75-05-8	ID	ID	ID
Acetyl Chloride	75-36-5	ID	ID	ID
Acrolein (82%)	107-02-8	ID	ID	ID
Acrylic Acid	79-10-7	F	ID	ID
Acrylonitrile	107-13-1	P	3 min	176
Allylamine	107-11-9	ID	ID	ID
Ammonia (gas)	7664-41-7	ID	ID	ID
Ammonium Fluoride (40%)	12125-01-8	G	>8 hrs	ND
Ammonium Hydroxide (29%)	1336-21-6	E	2.1 hrs	0.05
Aniline (Aminobenzene)	62-53-3	F	1.1 hrs	45.0
Aniline Oil	62-53-3	F	1.1 hrs	45
Aqua Regia		ID	ID	ID
b-Ionone	14901-07-6	ID	ID	ID
Battery Acid (25%) (Sulfuric Acid)	7664-93-9	P	ID	ID
Benzaldehyde	100-52-7	P	ID	ID
Benzene	71-43-2	P	ID	ID
Benzonitrile	100-47-0	ID	ID	ID
Benzoyl Chloride	98-88-4	P	ID	ID
Bis(2-methoxyethyl) Ether	111-96-6	ID	ID	ID
Boric Acid	10043-35-3	ID	ID	ID
Bromoacetonitrile	590-17-0	ID	ID	ID

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Chemical Name	CAS Number	Degradation Rating	Breakthrough Time	Permeation Rate
Bromobenzene	108-86-1	P	13 min	9.1
Bromodichloromethane	75-27-4	ID	ID	ID
Bromoform	72-25-2	ID	ID	ID
Butyl Acetate	123-86-4	F	29 min	54.4
Butyl Cellosolve	111-76-2	ID	ID	ID
Butyraldehyde	123-72-8	P	ID	ID
Carbon Bisulfide (Carbon Disulfide)	75-15-0	P	13 min	51
Carbon Tetrachloride (Tetrachloromethane)	56-23-5	G	3.4 hrs	5
Caustic Soda (50%) (Sodium Hydroxide)	1310-73-2	E	>6 hrs	ND
Cellosolve	110-80-5	P	ID	ID
Cellosolve Acetate	111-15-9	ID	ID	ID
Chloral	75-87-6	ID	ID	ID
Chlorine	7782-50-5	ID	ID	ID
Chloroacetic Acid	79-11-8	ID	ID	ID
Chloroacetonitrile	107-14-2	ID	ID	ID
Chlorobenzene	108-90-7	P	ID	ID
Chlorodibromomethane	124-48-1	ID	ID	ID
Chloroethene (Vinyl Chloride)	75-01-4	ID	5.7 hrs	0.14
Chloroethylene (Vinyl Chloride)	75-01-4	ID	5.7 hrs	0.14
Chloroform (Methenyl Trichloride)	67-66-3	P	4 min	352
Chloronaphthalene	90-13-1	P	2.9 hrs	>1.32
Chloroprene (2-Chlorobutadiene-1,3)	126-99-8	ID	ID	ID
Chlorotrimethylsilane	75-77-4	ID	ID	ID
cis,trans-1,2-Dichloroethylene	540-59-0	ID	ID	ID
cis-Dichloroethylene	156-59-2	ID	ID	ID
Crotonaldehyde (83%)	4170-30-3	ID	ID	ID
Cyclohexane (Hexahydorbenzene)	110-82-7	P	ID	ID
Cyclohexanol (Hexahydrophenol)	108-93-0	E	>16 hrs	ND
Cyclohexanone (Ketohexamethylene)	108-94-1	P	ID	ID
Cyclohexylamine	108-91-8	ID	ID	ID
d-Limonene	5989-27-5	ID	ID	ID
Di(2-ethylhexyl)phthalate (dioctyl phthalate)	117-81-7	ID	>8 hrs	ND
Di-n-Amylamine	2050-92-2	ID	ID	ID
Di-n-Butylamine	111-92-2	ID	ID	ID
Diallylamine	124-02-7	ID	ID	ID
Dibasic Ester	53-60-5	ID	ID	ID
Dibutylphthalate	1719-53-5	E	>16 hrs	ND
Dichloroacetylchloride	79-36-7	ID	ID	ID
Dichloromethane (Methylene Chloride)	75-09-2	P	4 min	766
Diethanolamine	111-42-2	ID	ID	ID
Diethyl Ether (Ethyl Ether)	60-29-7	P	14 min	21.8
Diethyl Oxide (Ethyl Ether)	60-29-7	P	14 min	21.8
Diethylamine	109-89-7	F	ID	ID
Diethylaminoethanol	100-37-8	E	>8 hrs	ND
Diethylene Ether (1,4-Dioxane)	123-91-1	P	28 min	77.1
Diethylene Oxide (1,4-Dioxane)	123-91-1	P	28 min	77.1
Diethylenetriamine	111-40-1	P	ID	ID
Diglycidyl Ether of Bisphenol A (DGEBA)	391-46-9	ID	ID	ID

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Chemical Name	CAS Number	Degradation Rating	Breakthrough Time	Permeation Rate
Diisobutyl Ketone (80%)	108-83-8	F	3 hrs	48.9
Diisobutylamine	110-96-3	ID	ID	ID
Diisopropylamine	108-18-9	ID	ID	ID
Dimethyl Acetamide	127-19-5	ID	ID	ID
Dimethyl Formamide (DMF)	68-12-2	F	13 min	>15
Dimethyl Sulfoxide	67-68-5	F	40 min	5.2
Dimethylamine	124-40-3	ID	ID	ID
Dimethylaminopropylamine	109-55-7	ID	ID	ID
Dimethylethanolamine	108-01-0	ID	ID	ID
Dimethylketone (Acetone)	67-64-1	P	5 min	172
Dimethylvinylchloride	513-37-1	ID	ID	ID
Dioctyl Phthalate	117-81-7	E	>8 hrs	ND
Dioxyethylene Ether (1,4-Dioxane)	123-91-1	P	28 min	77.1
Divinyl Benzene (Vinylstyrene)	1321-74-0	P	ID	ID
Epibromohydrin	3132-64-7	ID	ID	ID
Epichlorohydrin	106-89-8	P	ID	ID
EREM Solvent		ID	ID	ID
Ethanal (Acethaldehyde)	75-07-0	P	4 min	161
Ethanol (Ethyl Alcohol)	64-17-5	ID	ID	ID
Ether		P	14 min	21.8
Ethyl Acetate (Acetic Ester)	141-78-6	P	8 min	145
Ethyl Acrylate	140-88-5	ID	ID	ID
Ethyl Alcohol (Ethanol)	64-17-5	ID	ID	ID
Ethyl Aldehyde (Acetaldehyde)	75-07-0	P	4 min	161
Ethyl Ether (Ethyl Oxide)	60-29-7	P	14 min	21.8
Ethyl-n-Butylamine	13360-63-9	ID	ID	ID
Ethylamine (70% in water) (Aminoethane)	75-04-7	F	1.1 hrs	30.1
Ethylbromide	74-96-4	ID	ID	ID
Ethylene Dibromide	106-93-4	P	ID	ID
Ethylene Dichloride (1,2-Dichloroethane)	107-06-2	P	8 min	311
Ethylene Glycol Monoethyl Ether	110-80-5	ID	ID	ID
Ethylene Glycol Monoethyl Ether Acetate	111-15-9	ID	ID	ID
Ethylene Oxide	75-21-8	ID	ID	ID
Ethylenediamine	107-15-3	ID	ID	ID
Ethylmethacrylate	97-63-2	ID	ID	ID
Formaldehyde (37% in water) (Formic Aldehyde)	50-00-0	E	>21 hrs	ND
Freon TF	76-13-1	ID	>6 hrs	ND
Freon TMC		ID	ID	ID
Furan	110-00-9	P	ID	ID
Furfural (Furfuraldehyde)	98-01-1	P	28 min	265
Glutaraldehyde (25%)	111-30-8	P	ID	ID
Glutaraldehyde (7%)	111-30-8	P	4 min	0.44
Glycol Ether (Dowanol)		ID	ID	ID
Halothane	151-67-7	ID	ID	ID
Hexachlorocyclopentadiene	77-47-4	ID	ID	ID
Hexahydrobenzene (Cyclohexane)	110-82-7	P	ID	ID
Hexahydrophenol (Cyclohexanol)	108-93-0	E	>16 hrs	ND
Hexamethyldisilazane	999-97-3	ID	ID	ID

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Chemical Name	CAS Number	Degradation Rating	Breakthrough Time	Permeation Rate
Hexamethylene (Cyclohexane)	110-82-7	P	ID	ID
Hexanaphthene (Cyclohexane)	110-82-7	P	ID	ID
Hydrazine (70% in water)	302-01-2	E	>8 hrs	ND
Hydrazine Hydrate	10217-52-4	ID	ID	ID
Hydrochloric Acid (37%)	7647-01-0	G	>6 hrs	ND
Hydrofluoric Acid (48%)	7664-39-3	F	1 hr	0.49
Hydrogen Chloride (gas)	7647-01-0	ID	ID	ID
Hydrogen Peroxide (30%)	7722-84-1	ID	ID	ID
Iminobispropylamine	56-18-8	ID	ID	ID
Iodomethane (Methyl Iodide)	74-88-4	ID	ID	ID
Isoamylnitrile	110-46-3	ID	ID	ID
Isobutyl Acrylate	106-63-8	ID	ID	ID
Isobutyl Alcohol	78-83-1	G	>8 hrs	ND
Isobutyl Nitrite	542-56-3	ID	ID	ID
Isobutylamine	78-81-9	ID	ID	ID
Isobutyraldehyde	78-84-2	P	ID	ID
Isoprene	78-95-5	ID	ID	ID
Isopropyl Alcohol	67-63-0	E	>6 hrs	ND
Isopropylmethacrylate	4655-34-9	ID	ID	ID
Ketohexamethylene (Cyclohexanone)	108-94-1	P	ID	ID
m-Xylene	108-38-3	ID	ID	ID
Methacrylic Acid	79-41-4	P	1.7 hrs	23
Methacrylonitrile	126-98-7	P	7 min	560
Methanol	67-56-1	ID	32 min	11.8
Methenyl Trichloride (Chloroform)	67-66-3	P	4 min	352.0
Methyl Alcohol	67-56-1	ID	32 min	11.8
Methyl Cellosolve	109-86-4	F	55 min	13.2
Methyl Chloride	74-87-3	ID	ID	ID
Methyl Chloroform	71-55-6	P	41 min	76.4
Methyl Cyanide (Acetonitrile)	107-13-1	ID	ID	ID
Methyl Ethyl Ketone	78-93-3	P	ID	ID
Methyl Eugenol	93-15-2	ID	ID	ID
Methyl Iodide	74-88-4	ID	ID	ID
Methyl Isocyanate	624-83-9	P	ID	ID
Methylacetate	79-20-9	ID	ID	ID
Methylacrylate	96-33-3	ID	ID	ID
Methylamine (40% in water) (Aminomethane)	74-89-5	E	>8 hrs	ND
Methylbenzene (Toluene)	108-88-3	P	11 min	68.1
Methylene Chloride (Dichloromethane)	75-09-2	P	4 min	766
Methylmethacrylate	80-62-6	ID	ID	ID
Monoethanolamine	141-43-5	ID	ID	ID
Monoisopropaxidamine (95%)		ID	ID	ID
Monoisopropylamine	78-96-6	ID	ID	ID
Morpholine	110-91-8	P	48 min	206
n,n,n,n-Tetramethylenediamine	110-18-9	ID	ID	ID
n-Butylamine	109-73-9	ID	ID	ID
n-Butylchloride	109-69-3	ID	ID	ID
n-Hexane	110-54-3	E	ID	ID

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Chemical Name	CAS Number	Degradation Rating	Breakthrough Time	Permeation Rate
n-Methyl-2-Pyrrolidone	872-50-4	ID	ID	ID
n-Methylethanolamine	109-83-1	ID	ID	ID
n-Pentane (Alpha-n-Amylene)	109-66-0	E	ID	ID
n-Propyl Acetate	109-60-4	P	17 min	72.5
n-Propylmethacrylate	2210-28-8	ID	ID	ID
Nicotine	54-11-5	ID	ID	ID
Nitric Acid (17.5%) (Aqua Fortis)	7697-37-2	P	ID	ID
Nitric Acid (40%)	7697-37-2	F	>6 hrs	ND
Nitrobenzene	98-95-3	F	33 min	1.7
Nitroethane	79-24-3	ID	ID	ID
Nitromethane	75-52-5	ID	ID	ID
O-Xylene	95-47-6	ID	ID	ID
Octanoic Acid	127-07-2	ID	ID	ID
Oleic Acid	112-80-1	ID	ID	ID
Ortho Toluidine	95-53-4	ID	ID	ID
Oxalic Acid	144-62-7	G	ID	ID
Oxide Etch		ID	ID	ID
p-Dioxane (1,4-Dioxane)	123-91-1	ID	ID	ID
p-t Butyltoluene (1-Methyl-4-tert-Butylbenzene)	98-51-1	P	ID	ID
p-Xylene	106-42-3	ID	ID	ID
PCB (Aroclor 1254 50%) enyl)	11097-69-1	F	32 min	ID
Pentachlorophenol (1% in kerosene)	87-86-5	E	>13 hrs	ND
Peracetic Acid (40% in water)	79-21-0	ID	ID	ID
Perchloric Acid (70%)	7601-90-3	P	>8 hrs	ND
Perchloroethylene (Tetrachloroethylene)	127-18-4	F	1.3 hrs	5.5
Perchloromethane (Carbon Tetrachloride)	56-23-5	F	3.4 hrs	5.0
Phenol (85% in water)	108-95-2	P	39 min	>1500
Phenylamine (Aniline)	62-53-3	F	1.1 hrs	45
Phosphoric Acid (85%)	7664-38-2	G	>8 hrs	ND
Pimelic Ketone (Cyclohexanone)	108-94-1	P	ID	ID
Potassium Hydroxide (50%)	1310-58-3	E	>6 hrs	ND
Propionaldehyde	123-38-6	ID	ID	ID
Propionitrile	107-12-0	ID	ID	ID
Propyl Acetate	109-60-4	P	17 min	72.5
Propyl Alcohol	71-23-8	G	4.4 hrs	1.1
Propylene Dichloride	78-87-5	ID	ID	ID
Propylenediamine	78-90-0	F	ID	ID
Pyridine	110-86-1	P	ID	ID
Red Fuming Nitric Acid (RFNA)	52583-42-3	P	ID	ID
sec-Butylamine	13952-84-6	ID	ID	ID
Slope Etch		ID	ID	ID
Sodium Hydroxide 50% (Caustic Soda)	1310-73-2	E	>6 hrs	ND
Stoddard Solvent	8052-41-3	E	>6 hrs	ND
Styrene	100-42-5	P	ID	ID
Sulfuric Acid (25%) (Hydrogen Sulfate)	7664-93-9	P	ID	ID
Sulfuric Acid (50%)	7664-93-9	E	>6 hrs	ND
Sulfuric Ether (Ethyl Ether)	60-29-7	P	14 min	21.8
t-Butylamine	75-64-9	ID	ID	ID

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Chemical Name	CAS Number	Degradation Rating	Breakthrough Time	Permeation Rate
tert-Butyl Alcohol	75-65-0	ID	ID	ID
tert-Butyl Methyl Ether	1634-04-4	ID	ID	ID
Tetrachloroethylene	127-18-4	F	1.3 hrs	5.5
Tetrachloromethane (Carbon Tetrachloride)	56-23-5	F	3.4 hrs	5.0
Tetraethylenepentamine	112-57-2	F	ID	ID
Tetrafluoroethylene	116-14-3	ID	ID	ID
Tetrahydrofuran (THF)	109-99-9	P	4 min	167
Thioglycolic Acid	68-11-1	ID	ID	ID
Thiophene	110-02-1	P	ID	ID
Toluene (Methylbenzene)	108-88-3	P	11 min	68.1
Toluene Diisocyanate (TDI)	26471-62-5	G	3.7 hrs	1.8
trans-1,2-Dichloroethylene	156-60-5	ID	ID	ID
tri-n-propylamine	102-69-2	ID	ID	ID
Triallyamine	102-70-5	ID	ID	ID
Trichloroacetaldehyde		ID	ID	ID
Trichloroacetonitrile	545-06-2	ID	ID	ID
Trichloroethylene (TRI)	79-01-6	P	8 min	283
Trichloromethane (Chloroform)	67-66-3	P	4 min	352.0
Triethanolamine	102-71-6	ID	ID	ID
Triethylamine	121-44-8	E	>8 hrs	ND
Triethylenetetramine	112-24-3	ID	ID	ID
Tritolyl Phosphate	1330-78-5	ID	ID	ID
Valeronitrile	110-59-8	ID	ID	ID
Vinegar Naphtha (Ethyl Acetate)	141-78-6	P	8 min	145
Vinyl Acetate	108-05-4	ID	ID	ID
Vinyl Chloride (Chloroethene)	75-01-4	G	5.7 hrs	0.14
Vinylidene Fluoride	75-38-7	ID	ID	ID
Vinylstyrene (Divinyl Benzene)	1321-74-0	P	ID	ID
Witch Hazel	68916-39-2	ID	ID	ID
Xylene (mixed)	1330-20-7	F	21 min	18.5

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Hand Protection and Glove Selection

Including Glove Selection for Some Specific Chemicals
Tom Shelley, Cornell EH&S
Revised September, 1999

Introduction

Glove selection is difficult for many lab staff. Different references seem to give conflicting information and the many available styles and types of glove materials add another layer of confusion. The process of glove selection can also be very time consuming. Consequently, many chemical users select a glove that may not be appropriate for the chemicals in use.

Due to the publicity surrounding the death of a prominent Dartmouth researcher, **Federal OSHA** has placed a strong emphasis on hand protection in the workplace, especially in academic and R&D labs. In 1994 OSHA made substantial changes to the PPE Standard, 29 CFR 1910.138 - Hand Protection. The revised requirements are as follows:

Hazard assessment and equipment selection
Employee training
Record keeping requirements
Guidelines for selecting PPE, and
Hazard assessment certification

Cornell EH&S Occupational Health and Safety Section has developed a revised written *Personal Protective Equipment Program* reflecting the changes in the OSHA standard.

Supervisors are responsible for the selection, availability and use of gloves and other personal protective equipment in the workplace. Geneva EH&S can assist supervisors with the requirements of the revised OSHA standard. Please contact us at X 2350 for additional information.

The various glove manufacturers use different formulations for their polymers. A glove from one firm may not have the same chemical resistance as a glove that appears to be an identical glove made by another firm. Therefore, it is prudent to check the **glove selection charts** provided by the glove manufacturer for the gloves you use to determine their suitability for use with any particular chemical.

However, glove selection based on the manufacturers' glove selection charts is often impossible, as only a limited range of chemicals have been tested for use with a specific manufacturer's glove. Many research grade chemicals are used in such small quantities that the various glove manufacturers will probably never test them. If a chemical is not listed on a glove selection chart it is advisable to have a specialist in **personal protective equipment (PPE)** make the glove selection for you. In this case the PPE specialist would attempt to match the known characteristics of the chemical to be used with the known characteristics of the polymers commonly used to make gloves to select a glove that would be appropriate. This glove selection document includes a compilation of gloves recommended by EH&S for specific chemicals.

In some cases it may be required to hire a **testing laboratory** specializing in PPE to physically test a variety of gloves with the chemical to be used to scientifically select an appropriate glove. We have contacted a local testing firm that is capable of testing gloves for chemical resistance for a modest fee. If you have an especially hazardous chemical for which glove selection is difficult, we can make arrangements to have various gloves tested with the chemical in question.

The glove selection for the materials listed below is offered for anyone using these chemicals at Cornell. If a particular manufacturer's glove charts vary from the glove selections below, *follow the manufacturer's glove charts* for the model of glove recommended or contact EH&S at X 2350 for a second opinion on glove selection for the chemical in use. The **Cornell Distribution Center** carries an assortment of 4 mil and 8 mil disposable nitrile gloves. They also carry or can order for you a wide variety of other types of gloves.

Latex gloves, especially thin, disposable exam gloves, are widely used in labs, shops and many other work environments. Our concern is two-fold: latex gloves offer little protection from commonly used chemicals and many people, up to 20% of the population by some estimates, have developed the allergen to latex products.

The use of latex gloves is *only* appropriate for:

most biological materials
nonhazardous chemicals
very dilute, aqueous solutions of hazardous chemicals*
clean work area requirements
medical or veterinary applications

*Less than 1% for most hazardous chemicals or less than 0.1% if a known or suspect human carcinogen is in use in aqueous solution.

Latex gloves offer no protection against many common lab and shop chemicals. They will severely degrade, often in a matter of seconds or minutes, when used with some materials.

Staff required to wear latex gloves should receive training on the potential health effects related to latex. Hypoallergenic, non-powdered gloves should be used when possible. If a good substitute glove material is available, use gloves made of a material other than latex. A general-purpose substitute for latex products is lightweight nitrile gloves.

Many of the recommendations below are for "**incidental contact**." This means that, as with many chemical procedures, no or very little actual contact with a chemical in use is anticipated. The gloves specified are basically there to prevent chemical contact with the skin when something goes wrong--a spill or splash to the hand, over spray from a dispensing device, etc. As soon as practical after the chemical makes contact with the gloved hand the gloves are removed and replaced. Often a glove specified for incidental contact is not suitable for **extended contact**, when the gloved hands may come into substantial contact with or actually may become covered with or immersed in the chemical in use. Generally speaking, a more substantial glove is required for extended contact than for incidental contact, although there are exceptions.

The practice of **double gloving** is recommended for many materials listed below. Two pairs of gloves are worn, one over the other. This affords a double layer of protection. If the outer glove starts to degrade or tears open, the inner glove continues to offer protection until the gloves are removed and replaced. The best practice is to check the outer glove frequently, watching for signs of degradation (change of color, change of texture, etc.). With the first sign of degradation remove the outer glove and reglove.

There are **different approaches to double gloving**. The most common practice is to wear a thin disposable glove (4 mil nitrile) under a heavier glove (8 mil nitrile). The outer glove is the primary protective barrier while the under glove retains dexterity and acts a vapor barrier in the event of mechanical failure or the permeation of the chemical in use through the outer glove. Alternately, you can wear the heavier (and usually more expensive and durable) nitrile glove as the under glove and wear thinner disposable nitrile gloves over those, changing the thinner outer gloves frequently. It is sometimes desirable to double glove with two sets of gloves made from different materials. Here, in the event of the failure of one material, the second, different material will act as a protective barrier until the gloves can be removed. The technique of using gloves of different materials is often advisable when a mixture of hazardous materials is in use. One type of material gives protection against one component or class of chemicals in the mixture and the second glove material gives protection against other components of the mixture. The requirements for double gloving and the materials of the gloves selected are specific to the chemical(s) in use.

For those materials that are rated **"supertoxic"**, which are easily absorbed through the skin, the glove material generally recommended is **Norfoil** (Silver Shield by North Hand Protection, 4H by Safety4, or New Barrier™ brand by Ansell Edmont). Norfoil is a thin, five-layer laminate with each layer made of a different polymer. They are chemically resistant to a wide range of materials that readily attack other glove materials. (Note that one of the common lab chemicals for which they are not recommended is chloroform.) Norfoil gloves look odd, like they were stamped out of a common garbage bag. They tend to be somewhat bulky but dexterity is regained by using a heavier weight (8 mil) disposable nitrile glove over the Norfoil glove. These gloves and others are also available at the Cornell Distribution Center and from lab safety supply houses.

Definitions for terms used in glove selection charts, the materials of which gloves are made and those used to describe different characteristics of gloves are listed towards the end of this document.

References used in preparation of this document are listed at the end.

If there is a chemical for which you have a question concerning glove selection that is not on the following list, please use the ***Glove Selection Request Form*** to be found at the end of this document.

Glove Selection for Some Specific Chemicals in Use at Cornell University

For quick glove selection see the table on pages 11.16-18.

Acetic acid (glacial or concentrated solutions): nitrile gloves (incidental contact); neoprene or butyl rubber gloves are recommended if contact with acetic acid above 10% is probable for an extended period of time.

Acetic anhydride: double glove with heavier weight (8 mil) nitrile gloves (incidental contact). Acetic anhydride is very corrosive to human tissues (skin, eyes, mucus membranes) and a poison by inhalation. For handling larger quantities of pure material *only* heavier weight (.28-.33 mm) butyl rubber or neoprene gloves are recommended.

Acetone: heavier weight (8 mil) natural rubber (incidental contact); for extended contact with acetone the *only* recommended glove type is butyl rubber.

If you are cleaning parts with acetone, or have any other use of acetone where there is more than incidental contact, you *must* use butyl rubber gloves. Natural rubber gloves have about a 10 minute breakthrough time and are for incidental contact only. Nitrile gloves have a less than four minute breakthrough time and are *not recommended* for any use of acetone.

Acetonitrile: nitrile gloves or double glove with nitrile gloves (incidental contact)

For transfer of acetonitrile or for large scale use, *only* heavier weight butyl rubber or poplyvinyl acetate gloves are recommended. Acetonitrile permeates though disposable latex exam gloves in a matter of seconds and latex gloves should *never* be used to handle this material.

Acrylamide: nitrile gloves or double glove with nitrile gloves (incidental contact); butyl rubber gloves are recommended for extended contact (such as repackaging pure acrylamide into smaller containers)

Acrylamide is readily absorbed through unbroken skin. Acrylamide is a carcinogen, mutagen, teratogen and a potent neurotoxin with *no known antidote*, so adequate hand protection is essential when using this chemical. Note that once acrylamide solutions are polymerized the resulting gels are no longer hazardous and, assuming that they are not contaminated with other hazardous materials, they may be disposed of in the ordinary trash.

Note: See Heavy Metal Salts for proper disposal of gloves and other dry waste contaminated with acrylamide.

***bis*- Acrylamide:** nitrile gloves

Bis- Acrylamide (N,N'-dihydroxy-ethylene-*bis*- acrylamide) does not share the more extreme toxic characteristics of acrylamide. However, its toxicological properties have not been fully investigated and it should be treated as a hazardous material.

Ammonium hydroxide: nitrile gloves; for extended contact heavier weight neoprene or butyl rubber gloves are superior to nitrile gloves

Benzotriazole, 1,2,3-: nitrile gloves

Carbon disulfide: double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves; *remove outer glove at once if exposed to carbon disulfide*

Most nitrile gloves have a breakthrough time of only 8 to 20 minutes and thus offer little protection when exposed to carbon disulfide. For operations involving the use of larger amounts of carbon disulfide,

when transferring carbon disulfide from one container to another or for other potentially extended contact, the *only* gloves recommended are viton and polyvinyl acetate (PVA).

Carbon tetrachloride: double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves; *remove outer glove at once if exposed to carbon tetrachloride*

Most nitrile gloves have a breakthrough time of only a few minutes and thus offer little protection when exposed to carbon tetrachloride. For operations involving the use of larger amounts of carbon tetrachloride, when transferring carbon tetrachloride from one container to another or for other potentially extended contact, the *only* gloves recommended are viton. Viton gloves are expensive, but they are the standard glove to use with carbon tetrachloride.

Carbon tetrachloride is a poison, carcinogen, mutagen and teratogen. It is readily absorbed through unbroken skin. Alcohol and acetone are known to enhance the toxicity of carbon tetrachloride. The dose required to cause poisoning in humans varies significantly, with the ingestion of as little as 2 ml. having caused death. Carbon tetrachloride is also a substantial ozone depleting chemical and its use has been banned commercially. If you can find a substitute for carbon tetrachloride, it is strongly recommended that you use an alternative material.

Catechol: nitrile gloves

Chloroform: double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves; *remove outer glove at once if exposed to chloroform*

Thin (3-4 mil) Nitrile gloves have a 4 minute breakthrough time and thus offer little protection when exposed to chloroform. For operations involving the use of larger amounts of chloroform, such as transferring chloroform from one container to another or for large-scale extractions, etc., the *only* gloves recommended are viton or polyvinyl acetate (PVA). Viton gloves are expensive, but they are the standard glove to use with chloroform.

Cobalt Chloride: See Heavy Metal Salts.

Copper (Cupric) Sulfate: nitrile gloves

3,3'-Diaminobenzidine (DAB): nitrile gloves (incidental contact); double glove with nitrile gloves when handling the pure material or concentrated stock solutions

Note: See Heavy Metal Salts for proper disposal of gloves and other dry waste contaminated with DBA.

Diazomethane in Ether (a derivatizing reagent): double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves; *remove outer glove at once if exposed to diazomethane in ether.*

For possible extended contact, such as when transferring diazomethane in ether or when making reagent solutions containing this material, the *only* recommended glove would be a Norfoil glove, due to the extreme hazards associated with this material. Diazomethane is an extreme poison, a cancer suspect

agent, extremely flammable, easily detonated and has an autoignition temperature of 100° C. (an ordinary light bulb would cause a sufficient quantity of the vapor in air to autodetonate). This is easily one of the most dangerous materials in use in labs at Cornell. If there is any way you can substitute another material for diazomethane in ether it is strongly recommended that you do so.

Dichloromethane: See Methylene Chloride.

Diethyl pyrocarbonate: nitrile gloves (incidental contact); double glove with nitrile gloves when handling the pure material or concentrated stock solutions

Dimethyl sulfoxide (DMSO): heavier weight natural rubber gloves (15-18 mil; *not* 4 mil latex exam gloves) (incidental contact); butyl rubber gloves are recommended for extended contact; if you are allergic to natural latex products you may double glove with heavier weight (8 mil) disposable nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves; *remove outer glove at once if exposed to DMSO.*

Nitrile gloves are *not* recommended for use with DMSO if extended contact with the hands is expected. Some brands of nitrile gloves have degradation times of five minutes when used with DMSO. DMSO freely penetrates the skin and may carry dissolved chemicals with it into the body, so hand protection is especially important if you are working with any hazardous materials dissolved in DMSO.

1,4-Dioxane (dioxane): double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves; *remove outer glove at once if exposed to dioxane*

Most nitrile gloves have a breakthrough time of only a few minutes and thus offer little protection when exposed to dioxane. For operations involving the use of larger amounts of dioxane, when transferring dioxane from one container to another or for other potentially extended contact, the *only* gloves recommended are butyl rubber gloves. Dioxane is one of the few commonly used lab chemicals that readily degrades viton gloves.

Dioxane is only moderately toxic, but it is a listed carcinogen, mutagen and teratogen. It is readily absorbed through unbroken skin so hand protection is especially important when working with this material.

Dithiothreitol (Cleland's Reagent): nitrile gloves

Ethanol: nitrile gloves

Ethidium bromide (EtBr): nitrile gloves (incidental contact); double glove with nitrile gloves when handling the pure material or concentrated stock solutions

Note: See Heavy Metal Salts for proper disposal of gloves and other dry waste contaminated with EtBr

Ethyl Ether (diethyl ether, ether)**:** double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves; *remove outer glove at once if exposed to ether*

Ether is one of those chemicals that attacks almost all known commonly used glove materials. It permeates through viton, butyl rubber, neoprene, nitrile and natural rubber in a matter of minutes. The ***only*** recommended glove material for extended contact is polyvinyl acetate (PVA), such as the PVA™ brand made by Ansell Edmont.

Formaldehyde: nitrile gloves

Formamide: nitrile gloves (incidental contact); butyl rubber gloves are the *only* gloves recommended for direct contact with the pure material.

Formamide is often used in the pure form. If you use pure formamide in a procedure where there is probable contact with the skin, it is *strongly recommended* that you wear butyl rubber gloves.

Formic acid: double glove with heavier weight (8 mil) nitrile gloves (incidental contact)

Formic acid is very corrosive to human tissues (skin, eyes, mucus membranes). For handling larger quantities of pure material *only* heavier weight (.28-.33 mm) butyl rubber or neoprene gloves are recommended.

Gallic acid: nitrile gloves

Heavy Metal Salts (especially those that are easily soluble in water): nitrile gloves or double glove in some cases*

For most *inorganic* (ionic) salts of heavy metals the human skin is usually an effective barrier against absorption of the heavy metal ions. If there are cracks in the skin, areas of inflammation, insect bites, cuts or other breaches of the integrity of the skin, heavy metal ions may be passed directly through the skin. The salts of many heavy metals are toxic or highly toxic and rated as poisons: **arsenic, bismuth, cadmium, chromium, cobalt, lead, mercury, nickel, osmium, silver and uranium**. Some of these materials are also listed as corrosives (chromium trioxide), inhalation hazards (osmium tetroxide), known or suspect carcinogens and mutagens (lead and lead salts, mercury and its salts, etc.) or radioactive (uranium). Disposable nitrile gloves are generally acceptable for the use of the pure salts and stock (concentrated) or dilute solutions for the common salts of the above metals (acetates, chlorides, sulfates, nitrates, anhydrides, oxides, hydroxides, etc.) *where only incidental contact* will be made with these materials or their solutions.

Several heavy metal salts are more easily absorbed by the skin than others. **Osmium tetroxide** is readily absorbed by the skin and is very toxic. **Lead acetate** is absorbed 1-1/2 times more easily than other lead salts. **Mercuric chloride** can be absorbed fairly easily, especially if there are cracks, cuts or other breaks in the skin. It is also very toxic. It is recommended to *double glove* with nitrile gloves when using these materials, especially when handing the pure compounds or their strong solutions.

It is important that used gloves, and other dry materials, contaminated with heavy metals are ***not*** disposed of in the ordinary trash. Place all heavy metal contaminated gloves in a separate waste stream (container). The College of Veterinary Medicine maintains a Medical Waste Program. Gloves (and other dry waste items) contaminated with trace amounts of heavy metals may be sent to the Vet College

for disposal. EH&S can furnish the guidelines provided by the Vet College or you may contact Dr. Larry Thompson at X 8-3-3966 or Denver Metzler at X 8-3-3288 for information on this program. It is important that the materials being disposed of are clearly identified on the Medical Waste Tracking Tag you will be required to complete as part of the disposal process, such as "Trace contaminated with lead acetate." (Note that this method of disposal is also acceptable for trace contaminated gloves and other dry waste generated from the use of carcinogens, mutagens and other materials that can not be disposed of in the ordinary trash.) Uncontaminated or decontaminated gloves may be disposed of as ordinary trash.

Heptane: double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves

For extended contact, as when using heptane for large scale extractions, refilling secondary containers or as a cleaning fluid, a heavier weight nitrile (35 mils or thicker), viton or PVA gloves are recommended. Note that the permeation time for heptane through 4 mil nitrile gloves is about 8 minutes and through latex exam gloves is even less time; subsequently, these gloves are *not recommended* for use with heptane.

Hexamethylenediamine (1,6-diaminohexane): heavier weight (8 mil) nitrile gloves (incidental contact); use a heavier weight neoprene glove when handling the pure material or concentrated stock solutions (extended contact)

Hexane: double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves

For extended contact, as when using hexane for large scale extractions, refilling secondary containers or as a cleaning fluid, a heavier weight nitrile (35 mils or thicker), viton or PVA gloves are recommended. Note that the permeation time for hexane through 4 mil nitrile gloves is about 12 minutes and through latex exam gloves is only about 5-6 minutes; subsequently, these gloves are *not recommended* for use with hexane.

Hydrochloric Acid (concentrated and strong solutions): nitrile gloves (incidental contact)

A heavier weight neoprene or butyl rubber glove would be superior for long-term use with more concentrated solutions, such as cleaning glassware that has been soaking in an HCl bath or other larger-scale use of HCl.

Hydrofluoric acid (HF): double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves

Note that additional protective equipment must always be worn when using larger quantities of HF. Nitrile or rubber sleeves, rubber aprons, face shields and splash goggles (*not* safety glasses) should also be worn. All users of HF must maintain an HF first aid kit in their lab. HF users are advised to contact EH&S for an "HF Users Information Packet."

Isopropanol: nitrile gloves

Lead Acetate: See Heavy Metal Salts.

Laser dyes: nitrile gloves
Mecuric Chloride: See Heavy Metal Salts.

Mercury: nitrile gloves

Methanol (methyl alcohol): nitrile gloves

Methanol should never be allowed to make contact with the skin, as it is fairly easily absorbed by the skin. Methanol is a poison.

Methylene Chloride: double glove with heavier weight (8 mil) nitrile gloves (incidental contact)

Methylene chloride will permeate through thin (3-4 mil) nitrile gloves in four minutes or less. If you are double gloved, as recommended, and you splash or spill methylene chloride on your gloves, stop what you are doing and change the outer glove *immediately.* If you allow methylene chloride to remain on the outer nitrile glove for more than two to four minutes you must discard both sets of gloves and re-double glove. Methylene chloride permeates disposable latex exam gloves in a matter of seconds and latex gloves should *never* be used to handle this material.

For use of methylene chloride where contact with the glove is anticipated, such as stripping paint or gluing plastics, *only* polyvinyl acetate (PVA) or viton gloves are recommended. These gloves come in .28-.33 mm thickness. PVA offers the best protection.
Methyl sulfonic acid, ethyl ester (EMS) (ethyl methanesulfonate): nitrile gloves (incidental contact); double glove with nitrile gloves when handling the pure material or concentrated stock solutions

Note: See Heavy Metal Salts for proper disposal of gloves and other dry waste contaminated with EMS.
Monoethanolamine: nitrile gloves

Nickel chloride: See Heavy Metal Salts.

N-Methylethanolamine: : double glove with heavier weight (8 mil) nitrile gloves (incidental contact); *remove outer glove at once if exposed to N-methylethanolamine*

Viton, neoprene or butyl rubber gloves are recommended for extensive use of N-methyl-ethanolamine such as working with the pure material or making solutions.

Organophosphorous compounds: double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves

Osmium Tetroxide: See Heavy Metal Salts.

Paraformaldehyde: nitrile gloves

Petroleum ether: nitrile gloves (incidental contact); or heavy weight nitrile or viton for extended contact

Phenol: double glove with heavier weight (8 mil) nitrile gloves (incidental contact); neoprene or butyl rubber gloves are recommended for extensive use of phenol such as working with the pure material or making solutions.

Nitrile gloves have a 30-minute breakthrough time with phenol. If working with double gloved nitrile gloves, change the outer glove frequently if exposed to this material.

Phenol-chloroform mixtures: double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves; *remove outer glove at once if exposed to mixture.*

Viton gloves are recommended for work with phenol-chloroform mixtures when probable exposure to the mixtures exists, such as when making up the mixtures. See the entries for phenol and chloroform.

Phenylmethylsulfonyl fluoride (PMSF): nitrile gloves (incidental contact); double glove with nitrile gloves when handling the pure material or concentrated stock solutions.

Phenylmethylsulfonyl fluoride is corrosive (causes burns) on contact with the skin, eyes and mucus membranes. It is also a highly toxic cholinesterase inhibitor and central nervous system poison. Avoid all contact.

Note: See Heavy Metal Salts for proper disposal of gloves and other dry waste contaminated with PMSF.

Polychlorinated biphenyls (PCBs): For weighing out of pure or concentrated materials, wear an 8 mil or heavier nitrile glove over a neoprene glove. For dilute solutions in corn oil (1 p.p.m. or less) neoprene gloves (20 mil) are recommended.

Note: See Heavy Metal Salts for proper disposal of gloves and other dry waste contaminated with PCBs.
Polyoxyethylenesorbitan monolaurate (Tween 20): nitrile gloves

Psoralen: nitrile gloves (incidental contact); double glove with nitrile gloves when handling the pure material or concentrated stock solutions

Psoralen is corrosive (causes burns) on contact with the skin, eyes and mucus membranes. It is anticipated to be a carcinogen, it is a mutagen and a strong photosensitizer. Avoid all contact.

Note: See Heavy Metal Salts for proper disposal of gloves and other dry waste contaminated with psorale

Pump oil: butyl rubber gloves

If you are changing pump oil or servicing pumps where contact with the oil may occur, the *only* recommended glove type is butyl rubber.

Silane based silanization or drivatization compounds: double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves; *remove outer glove at once if signs of degradation occur.*

Silver nitrate: See Heavy Metal Salts.

Sodium dodecyl sulfate (SDS): nitrile gloves

Sodium azide: nitrile gloves or double glove with nitrile gloves (incidental contact)

Sulfuric acid: heavier weight (8 mil) nitrile gloves (incidental contact); heavier weight (20 mil or greater) neoprene or butyl rubbber gloves (extended contact)

Tetrahydrofuran (THF): double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves; *remove outer glove at once if THF contacts glove*

For extended contact, such as when using THF for larger scale reactions, refilling secondary containers or as a cleaning fluid, *only* Norfoil gloves are recommended. Polyvinyl acetate (PVA) gives some limited protection (up to 1-1/2 hours for some gloves) but are inferior to the Norfoil gloves. Note that the permeation time for THF through 4 mil nitrile gloves and latex exam gloves is almost instantaneous; subsequently, these gloves are *not recommended* for use with THF.

3,3',5,5'-Tetramethylbenzidine (TMB): nitrile gloves (incidental contact); double glove with nitrile gloves when handling the pure material or concentrated stock solutions Note: See Heavy Metal Salts for proper disposal of gloves and other dry waste contaminated with TMB.
N, N, N', N'-Tetramethylethylenediamine (TEMED): nitrile gloves (incidental contact); double glove with nitrile gloves when handling the pure material or concentrated stock solutions.

TEMED is corrosive (causes burns) on contact with the skin, eyes and mucus membranes.
Toluene: double glove with heavier weight (8 mil) nitrile gloves (incidental contact) or use 15 mil or heavier nitrile gloves; *remove outer glove at once if exposed to toluen.*

For extended contact, such as when using toluene for larger scale reactions, refilling secondary containers or as a cleaning fluid, *only* viton or polyvinyl acetate (PVA) gloves are recommended. Note that the permeation time for toluene through 4 mil nitrile gloves is less than 4 minutes and through latex exam gloves is less than that; subsequently, these gloves are *not recommended* for use with toluene.

Trichloromethyl chloroformate (diphosgene): This chemical, usually supplied in sealed glass ampules, is *very* air/moisture reactive, a corrosive and it is considered to be highly toxic by all routes of exposure. It must be used in a vented glove box or environmental chamber under dry nitrogen or argon. Glove boxes are usually fitted with substantial butyl rubber gloves, however, one manufacturer recommends that "heavy" gloves be worn over the glove box gloves. I would recommend using 8 mil or heavier nitrile gloves over the butyl rubber glove box gloves. *Please contact EH&S if you have any questions concerning the special procedures required for the use of this chemical.*

Triton-X100: nitrile gloves

Xylene: nitrile gloves (incidental contact)

For use of xylene where contact with the glove is anticipated, such as pouring of new or used xylene into containers or other operations, polyvinyl acetate (PVA) or viton gloves are recommended.

Definitions

Breakthrough is the time elapsed between the initial contact with a chemical and its detection inside a glove. Breakthrough time is directly proportional to glove material thickness for most materials.

Butyl rubber is a synthetic rubber (butylene and isoprene copolymer) that provides the highest permeation resistance to gases and water vapor of any protective material used to make gloves. Butyl rubber is an excellent choice for protection against esters and ketones, especially for extended contact with acetone.

Degradation is a change in one or more of the physical properties of a glove due to chemical contact. Some of these changes, such as discoloring, swelling, shrinkage or stiffness, may be visually detected but others are invisible. Degradation almost always results in a loss of performance of a glove and is an indicator of how long a glove will last. Degradation is usually detected by a change in weight of a glove and degradation ratings are often based on % change in weight over time.

Double gloving (see introduction, above) is the use of two layers of gloves to provide improved hand protection when using certain hazardous chemicals. This affords a double layer of protection. If the outer glove starts to degrade or tears open, the inner glove continues to offer protection until the gloves are removed and replaced.
Gauge or thickness of gloves is generally measured in mils. Higher gauge (thicker) gloves generally offer more protection. Generally speaking, doubling the thickness halves the permeation rate.

Finish refers to the surface texture of a glove material. Most laboratory gloves have a smooth finish. Textured surfaces are added to glove materials to provide a better grip on objects being handled.

Flock lining is a natural or synthetic shredded fiber that covers the inside of a glove to provide comfort by absorbing perspiration and providing ease in putting on and removing the glove.

Hypalon is a synthetic polymer that offers superior resistance to oxidizing agents and ozone. It is frequently used for glove box gloves.

Lower detection limit (LDL) is the minimum level detected with analytical test equipment, measured in parts per million (ppm) detected at breakthrough time.

Mil is the standard unit for measuring the gauge or thickness of glove materials. A mil is one-thousandth of an inch or 0.001". A millimeter is 39.37 mils; a mil is .00254 mm.

Natural rubber (or latex), produced from the sap of certain species of tropical trees, is used to make gloves that are suitable for the handling of biological materials, human blood and other body fluids, electronics assembly, food service and other applications where the *work* needs to be kept clean. Latex gloves are generally not suitable for use with most laboratory chemicals (see introduction, above). Latex products are also a health concern because of their protein component, to which many people are allergic. Natural rubber is often blended with other polymers to achieve various characteristics of those materials.

Neoprene is a synthetic rubber that is especially resistant to oils and petroleum products. It is also good for corrosives, alcohols, and many solvents. Neoprene is probably the best substitute material for the replacement of latex gloves for janitorial services, shop workers,
mechanics and other trades.

Nitrile, also referred to as NBR or acrylonitrile-butadiene, offers superior chemical resistance as well as puncture and abrasion resistance. 4 and 8 mil nitrile gloves are most often specified for general lab use for handling a wide variety of chemicals.

Norfoil (see introduction, above) is a lightweight, flexible laminate of several layers of polymers which offers superior resistance to permeation by a wide range of hazardous materials which often quickly degrade other glove materials. They are often used as an underglove with a tighter fitting glove of another material as an overglove to restore dexterity. Brand names of Norfoil gloves are Silver Shield by North Hand Protection, 4H by Safety4, and New Barrier™ brand by Ansell Edmont.
Overglove is a glove worn over another glove (underglove) when double gloving to provide multiple layers of resistance to hazardous chemicals. The overglove protects the underglove from chemical degradation and permeation. It is changed out when it begins to be chemically attacked to protect the underglove.
Penetration is the nonchemical transport of a chemical through a glove, usually by pinholes or microscopic tears or cracks resulting from degradation.

Permeation is the process by which a chemical passes through a glove's protective film. Permeation occurs at the molecular level and often leaves the appearance of the glove unchanged. The *rate of permeation* of a chemical through a glove is one of the determining factors in the effectiveness of a glove for use with a particular chemical. Generally speaking, the permeation rate is inversely proportional to thickness (gauge), although the length of time of exposure and temperature can be important factors for some glove materials. Permeation is an indicator of how long gloves are safe to wear.

Permeation rate at steady state is the maximum rate at which a chemical passes through a glove material, usually expressed in milligrams per square meter per second (mg./m.^{2}/sec.).

Permeation breakthrough is the time in minutes it takes for a chemical to permeate through a glove. Generally speaking, doubling the thickness of a glove quadruples breakthrough time.

Polyvinyl alcohol, or PVA, gloves give superior service for handling solvents, such as chloroform, that attack most other glove materials. PVA is water soluble and may not be used with *any* water-based materials.

Powdered gloves have an interior coating of cornstarch or other absorbent material. Powdered gloves are usually easier to take on and off and are often more comfortable for the wearer, but the powder may contribute to allergic responses in some individuals.

Supported means that the polymer of the glove is a coating over a fabric liner. This two- component glove style offers more durable hand protection. Very few gloves for laboratory use are supported.

Underglove is a glove worn under another glove (overglove) when double gloving to provide multiple layers of resistance to hazardous chemicals.

Unsupported means that a glove is made only of a pure polymer or mix of polymers. Unsupported gloves tend to offer greater dexterity and tactile sensitivity but less protection from physical damage.

Vinyl or polyvinyl chloride (PVC) gloves are economical substitutes for latex gloves for food service or assembly work but they are not resistant to many common laboratory chemicals and are not recommended for general laboratory work.

Viton is a very chemically resistant fluoroelastomer synthetic rubber. It protects against PCBs, benzene, aniline and most chlorinated and aromatic solvents. For some chemicals, such as chloroform, it is the only resistant material commonly available. Viton gloves are expensive, but they have a very long lifespan.

References Used

Ansell Edmont, *Chemical Resistance Guide,* 1990. For gloves made by this firm.

Best, *Guide to Chemical-Resistant Best Gloves,* 1997. For gloves made by this firm.

Cole-Parmer, '97-'98 *Catalog,* pp.1366-1372. This is a very generic, but useful, materials compatibility chart.

Fisher Safety, Sept., 1996, *Safety Products Reference Manual,* p. 223, 225 and 227. These charts are specific to gloves sold by Fisher. There is also a good overview of glove selection on pp. 220-222 of this catalog.

Lab Safety Supply, Aug., 1997 *General Catalog,* pp.99. This chart is specific to gloves sold by Lab Safety Supply.

Material Safety Data Sheets, from both manufacturers' and MDL-OHS data base at EH&S.
Merk Index, 10th Edition, 1983.

National Toxicology Program (NTP) chemical information sheets (available at EH&S). These information sheets are very well written and give information on specific gloves selected by NTP.

NIOSH, *Registry of Toxic Effects of Chemical Substances,* 1981-2.

Pioneer Industrial Products, *Chemical Resistance Guide,* no date. For gloves made by this firm.

Safety 4 A/S, *4H Chemical Protection Guide,* Sept. 1995. A chart for 4H brand gloves.

VWR Scientific Products, '97-'98 *Catalog,* p. 788-9. This chart is applicable only to Best gloves sold by VWR.

Electronic Resources

For those of you with Windows-based computers, Best has an electronic version of their glove selection chart available on their Web site at:

http://www.bestglove.com

You can download the software and install it on your PC. It does not have a Mac version.

---------- Cut Here ----------

Glove Selection Request Form

Name of chemical(s) _____
Please give the full name. Abbreviations may be difficult to find in the literature.

How is this chemical(s) being used? _____

How much is being used during a procedure? _____

Do you anticipate that the chemical may/will be in contact with the gloves? _____

Explain if possible. _____

Your name _____

Building _____ Room No. _____ Dept. _____

E-mail address _____ Phone No. _____

---------- Cut Here ----------

Copy and paste this form into an e-mail addressed to tjs1@cornell.edu. Please give your e-mail a subject, such as "Glove Selection Request."

Cornell University Chemical Hygiene Plan

Glove Selection Guide

Chemical	Incidental Contact	Extended Contact
Acetic Acid	nitrile	neoprene, butyl rubber
Acetic Anhydride	nitrile (8 mil), double glove	butyl rubber, neoprene
Acetone	natural rubber (latex) (8 mil)	butyl rubber
Acetonitrile	nitrile	butyl rubber, polyvinyl acetate (PVA)
Acrylamide	nitrile	butyl rubber
bis-Acrylamide	nitrile	
Ammonium Hydroxide	nitrile	neoprene, butyl rubber
Arsenic Salts	nitrile	
Benzotriazole, 1,2,3-	nitrile	
Bismuth Salts	nitrile	
Cadmium Salts	nitrile	
Carbon Disulfide	nitrile (8 mil), double glove	viton, polyvinyl acetate (PVA)
Carbon Tetrachloride	nitrile (8 mil), double glove	viton
Catechol	nitrile	
Chloroform	nitrile (8 mil), double glove	viton, polyvinyl acetate (PVA)
Chromium Salts	nitrile	
Cobalt Chloride	nitrile	
Cobalt Salts	nitrile	
Copper (Cupric) Sulfate	nitrile	
3,3'-Diaminobenzidine (DAB)	nitrile	nitrile, double glove
Diazomethane in Ether	nitrile (8 mil), double glove	Norfoil
Dichloromethane	nitrile (8 mil), double glove	polyvinyl acetate (PVA) or viton
Diethyl Pyrocarbonate	nitrile	nitrile, double glove
Dimethyl Sulfoxide (DMSO)	[1]natural rubber (latex)(15-18 mil)	butyl rubber
1,4-Dioxane	nitrile (8 mil), double glove	butyl rubber
Dithiothreitol	nitrile	
Ethanol	nitrile	
Ethidium Bromide (EtBr)	nitrile	nitrile, double glove
Ethyl Ether	nitrile (8 mil), double glove	polyvinyl acetate (PVA)
Formaldehyde	nitrile	
Formamide	nitrile	butyl rubber
Formic Acid	nitrile (8 mil), double glove	butyl rubber, neoprene (30 mils)
Gallic Acid	nitrile	
Heptane	nitrile (8 mil), double glove	nitrile (35 mil or thicker), viton, PVA

Hexamethylenediamine (1,6-Diaminohexane)	nitrile (8mil)	neoprene
Hexane	nitrile (8 mil), double glove	nitrile (35 mil or thicker), viton, PVA
Hydrochloric Acid	nitrile	neoprene, butyl rubber
Hydrofluoric Acid (HF)	nitrile (8 mil), double glove	
Isopropanol	nitrile	
Laser Dyes	nitrile	
Lead Acetate	nitrile, double glove	
Lead Salts	nitrile	
Mercuric Chloride	nitrile, double glove	
Mercury	nitrile	
Mercury Salts	nitrile	
Methanol	nitrile	
Methylene Chloride	nitrile (8 mil), double glove	polyvinyl acetate, viton
Methyl Sulfonic Acid, Ethyl Ester (EMS) (Ethyl Methanesulfonate)	nitrile	nitrile, double glove
Monoethanolamine	nitrile	
Nickel Chloride	nitrile	
Nickel Salts	nitrile	
N-Methylethanolamine	nitrile (8 mil), double glove	viton, neoprene, butyl rubber
Organophosphorous compounds	nitrile (8 mil), double glove	
Osmium Salts	nitrile	
Osmium Tetroxide	nitrile, double glove	
Paraformaldehyde	nitrile	
Phenol	nitrile (8 mil), double glove	neoprene, butyl rubber
Phenol-Chloroform mixtures	nitrile (8 mil), double glove	viton
Phenylmethylsulfonyl Fluoride (PMSF)	nitrile	nitrile, double glove
Polychlorinated Biphenyls (PCB's)	nitrile (8 mil) glove over a neoprene glove	neoprene (20 mil)
Polyoxyethylenesorbitan Monolaurate (Tween 20)	nitrile	
Psoralen	nitrile	nitrile, double glove
Pump Oil	butyl rubber	
Silane based silanization or derivatization compounds	nitrile (8 mil), double glove	
Silver Nitrate	nitrile	
Silver Salts	nitrile	
Sodium Dodecyl Sulfate (SDS)	nitrile	
Sodium Azide	nitrile	
Sulfuric Acid	nitrile (8 mil)	neoprene, butyl rubber (20 mil or greater)

Tetrahydrofuran (THF)	nitrile (8 mil), double glove	Norfoil
3,3',5,5'-Tetramethyl-Benzidine (TMB)	nitrile	nitrile, double glove
N,N,N',N'-Tetramethyl-ethylenediamine (TEMED)	nitrile	nitrile, double glove
Toluene	nitrile (8 mil), double glove	viton, polyvinyl acetate (PVA)
Trichloromethyl Chloroformate (diphosgene)	nitrile (8 mil) over butyl rubber glove box gloves	Material must be used in a glove box.
Triton-X 100	nitrile (8 mil), double glove	
Uranium Salts	nitrile	
Xylene	nitrile	polyvinyl acetate (PVA), viton

[1] If you are allergic to natural rubber products, you may double glove with 8 mil nitrile gloves.

Created 10/22/99 Tom Shelley

BAAQMD CEQA GUIDELINES
Assessing the Air Quality Impacts of Projects and Plans

Prepared by the Planning and Research Division of the
Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109

December, 1999

This document is intended to serve as a guide for those who prepare or evaluate air quality impact analyses for projects and plans in the San Francisco Bay Area. The GUIDELINES include information on legal requirements, BAAQMD rules, plans and procedures, methods of analyzing air quality impacts, thresholds of significance, mitigation measures, and background air quality information. Copies and updates are available from the BAAQMD Public Information Office at (415) 749-4900. Questions on content may be addressed to the BAAQMD's Planning and Transportation Section at (415) 749-4995.

Ellen Garvey - Air Pollution Control Officer
Peter Hess - Deputy Air Pollution Control Officer
Thomas Perardi - Director, Planning & Research Division
Jean Roggenkamp - Manager, Planning and Transportation Section

project or plan can be identified in the Initial Study (i.e., none of the significance thresholds are exceeded), the District recommends the Lead Agency either prepare a Negative Declaration or include in an EIR a statement indicating the reasons why potential air quality impacts were determined not to be significant.

Sources of air pollutant emissions complying with all applicable District regulations generally will not be considered to have a significant air quality impact.[2] Stationary sources that are exempt from District permit requirements because they fall below emission thresholds for permitting will not be considered to have a significant air quality impact (unless it is demonstrated that they may have a significant cumulative impact). The Lead Agency can and should make exception to this determination if special circumstances suggest that the emissions from the permitted or exempt source may cause a significant air quality impact. For example, if a permitted or exempt source may emit objectionable odors, then odor impacts on nearby receptors should be considered a potentially significant air quality impact.

2.3 Thresholds of Significance

This section describes the District's recommended thresholds of significance to be used by a Lead Agency when preparing an Initial Study. If, during the preparation of the Initial Study, the Lead Agency finds that any of the following thresholds may be exceeded, then an EIR should be prepared in order to more accurately evaluate project impacts and identify mitigation measures. These thresholds also may be used when preparing an EIR. If the more detailed analysis in an EIR indicates that any of these thresholds would be exceeded, the document should identify the impact as a significant air quality impact and propose mitigation measures. Chapter 3 explains how to calculate emissions to determine whether the thresholds have been exceeded. The following thresholds address impacts associated with: 1) project construction, 2) project operations, and 3) plans.

Threshold of Significance for Construction Impacts

Construction-related emissions are generally short-term in duration, but may still cause adverse air quality impacts. Fine particulate matter (PM_{10}) is the pollutant of greatest concern with respect to construction activities.[3] PM_{10} emissions can result from a variety of construction activities, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle and equipment exhaust. Construction-related emissions can cause substantial increases in localized concentrations of PM_{10}. Particulate emissions from construction activities can lead to adverse health effects as well as nuisance concerns such as reduced visibility and soiling of exposed surfaces.

Construction emissions of PM_{10} can vary greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, weather conditions and other factors. Despite this variability in emissions, experience has shown that there are a number of

[2]CEQA Guidelines, Section 15064(i).

[3] Construction equipment emits carbon monoxide and ozone precursors. However, these emissions are included in the emission inventory that is the basis for regional air quality plans, and are not expected to impede attainment or maintenance of ozone and carbon monoxide standards in the Bay Area.

Thresholds of Significance for Impacts From Project Operations

For many types of land use development, such as office parks, shopping centers, residential subdivisions and other "indirect sources", motor vehicles traveling to and from the projects represent the primary source of air pollutant emissions associated with project operations. Significance thresholds discussed below address the impacts of these indirect source emissions on local and regional air quality. Thresholds are also provided for other potential impacts related to project operations, such as odors and toxic air contaminants.

(Lead Agencies may refer to Section 2.4, Project Screening, for guidance on determining whether significance thresholds for project operations may be exceeded, and thus whether more detailed air quality analysis may be needed.)

1. **Local Carbon Monoxide Concentrations.** Localized carbon monoxide concentrations should be estimated for projects in which: 1) vehicle emissions of CO would exceed 550 lb./day, 2) project traffic would impact intersections or roadway links operating at Level of Service (LOS) D, E or F or would cause LOS to decline to D, E or F, or 3) project traffic would increase traffic volumes on nearby roadways by 10% or more.[4] A project contributing to CO concentrations exceeding the State Ambient Air Quality Standard of 9 parts per million (ppm) averaged over 8 hours and 20 ppm for 1 hour would be considered to have a significant impact.

2. **Total Emissions.** Total emissions from project operations should be compared to the thresholds provided in Table 3.[5] Total operational emissions evaluated under this threshold should include all emissions from motor vehicle use associated with the project. A project that generates criteria air pollutant emissions in excess of the annual *or* daily thresholds in Table 3 would be considered to have a significant air quality impact.

TABLE 3
THRESHOLDS OF SIGNIFICANCE
FOR PROJECT OPERATIONS

Pollutant	ton/yr	lb/day	kgm/day
ROG	15	80	36
NO_X	15	80	36
PM_{10}	15	80	36

3. **Odors.** While offensive odors rarely cause any physical harm, they still can be very unpleasant, leading to considerable distress among the public and often generating citizen complaints to local governments and the District. Any project with the potential to frequently expose members of the public to objectionable odors would be deemed to have a significant

[4] Unless the increase in traffic volume is less than 100 vehicles per hour.

[5] The thresholds for ROG and NOx are equivalent to the District offset requirement threshold (15 tons per year) for stationary sources (Regulation 2-2-302). The threshold for PM_{10} is based on the District's definition of a major modification to a major facility (Regulation 2-2-221).

The District recommends, at a minimum, that the Lead Agency, in consultation with the administering agency of the RMPP, find that any project resulting in receptors being within the Emergency Response Planning Guidelines (ERPG) exposure level 2 for a facility has a significant air quality impact. ERPG exposure level 2 is defined as "the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action".[7]

6. **Cumulative Impacts.** Any proposed project that would individually have a significant air quality impact (see Thresholds of Significance for Impacts from Project Operations, above) would also be considered to have a significant cumulative air quality impact.

For any project that does not individually have significant operational air quality impacts, the determination of significant cumulative impact should be based on an evaluation of the consistency of the project with the local general plan *and* of the general plan with the regional air quality plan. (The appropriate regional air quality plan for the Bay Area is the most recently adopted Clean Air Plan.) See Thresholds of Significance for Plan Impacts, below, for guidance on evaluating the consistency of a local general plan with the Clean Air Plan. Figure 2 provides a flow chart depicting the process for evaluating cumulative impacts.

Projects in Jurisdictions with Local Plans Consistent with the Clean Air Plan

If a project is proposed in a city or county with a general plan that is consistent with the Clean Air Plan (see below) *and* the project is consistent with that general plan (i.e., it does not require a general plan amendment), then the project will not have a significant cumulative impact (provided, of course, the project does not individually have any significant impacts). No further analysis regarding cumulative impacts is necessary.

In a jurisdiction with a general plan consistent with the Clean Air Plan, a project may be proposed that is not consistent with that general plan because it requires a general plan amendment (GPA). In such instances, the cumulative impact analysis should consider the difference(s) between the project and the original (pre-GPA) land use designation for the site with respect to motor vehicle use and potential land use conflicts. A project would not have a significant cumulative impact if: VMT from the project would not be greater than the VMT that would be anticipated under the original land use designation, and 2) the project would not result in sensitive receptors being in close proximity to sources of objectionable odors, toxics or accidental releases of hazardous materials.

[7] State of California Guidance for the Preparation of a Risk Management and Prevention Program, California Office of Emergency Services, November 1989, pg. D-2.

CEQA air quality handbook

Prepared by:

South
Coast
Air
Quality
Management
District

April, 1993

South Coast
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MESSAGE FROM THE CHAIRMAN

April, 1993

The federal Clean Air Act, the California Clean Air Act, and the 1991 AQMP revision have set forth an attainment program for this region to achieve the federal and state ambient air quality standards. Success in achieving our goal lies in the cooperative efforts of all levels of government as well as public support. Together, we have made the last three years the cleanest on record. But we have a long way to go to regain healthful air in this region. Our efforts will be challenged along the way by increases in population growth, the need to obtain emission reductions from more and smaller sources, and the need for technological breakthroughs.

However, there are actions that local government planners and project proponents can take to be proactive members of the clean air team. One of those actions involves the California Environmental Quality Act (CEQA) process. Only local governments have the ability to assess and mitigate the air quality impacts of land development or redevelopment. This fifth edition of the District's CEQA Air Quality Handbook is intended to assist you in carrying out this objective.

Without this extra effort by local government, new development could account for 43% of reactive organic compounds and oxides of nitrogen generated by mobile sources in the year 2010. It is critical that we reduce these pollutants, as they are precursors to the smoggy haze we see so frequently in our region.

If past experience is any indication of our potential to solve this problem, then I am confident that our continued partnership will succeed and the residents of this region will breathe healthful air by the year 2010.

Henry W. Wedaa

Henry W. Wedaa, Chairman
SCAQMD

DETERMINING THE AIR QUALITY SIGNIFICANCE OF A PROJECT

CHAPTER 6

Section 15002(g) of the state CEQA Guidelines defines a significant effect on the environment as "a substantial adverse change in the physical condition which exists in the area affected by the proposed project." Further, the project is considered to be of statewide, regional, or area-wide significance if it, for example, interferes with attaining the federal or state air quality standards (CEQA Guidelines Section 15206(b)(2)). To determine the significance of a project, CEQA requires the preparation of an Initial Study by the project proponent or lead agency. The Initial Study will evaluate the impact of the proposed project upon the environment, including air quality. From an air quality perspective, the impact of the project is determined by examining the types and levels of emissions generated by the project and its impact on factors that affect air quality. As such, projects should be evaluated in terms of air pollution thresholds established by the District. The thresholds of significance differ for the SCAB and the Coachella Valley. The scope of the evaluation and the extent of the required CEQA review will depend upon the estimated extent of the impact as determined by the lead agency in the Initial Study.

6.1 Preparing the Initial Study

To assist local planners and project proponents in answering the questions in the Initial Study, and thereby determining the air quality significance of a project, the key air quality issues to consider in each Initial Study category are summarized in Table 6-1.

Beyond the obvious primary impact of specific emissions arising from the operation and construction of a project, there is the potential for secondary effects. Secondary effects include such things as: impacts on the earth, water, population, transportation/circulation, energy/utilities, human health, and public services, that affect air quality indirectly. Among these secondary effects are, for example, high CO emissions from degradation in roadway level of service and NOx from power plants producing energy. All of those emissions contribute to air pollution, and need to be included in the project's emissions calculations. CEQA requires that in evaluating the significance of the environmental effect of a project, the lead agency shall consider both primary or direct and secondary or indirect consequences (CEQA Guidelines Section 15064 (d)). The impact of a project needs to be evaluated in terms of emisssion thresholds and other indicators of potential air quality impacts.

6.2 SCAB Air Pollution Thresholds for Operations

As seen above, new and modified projects will affect regional air quality both directly and indirectly. To determine the extent of a proposed project's environmental impact and the significance of such impact the project should be compared to established levels of significance. The District has established two types of air pollution thresholds to assist lead agencies in determining whether or not the operation phase of a project is significant. These can be found in the following sections under: 1) emission thresholds; and 2) additional indicators. If the lead agency finds that the operational phase of a project has the potential to exceed either of the air pollution thresholds, the project should be considered significant.

- **Emission Significance Thresholds (Primary Effects)**

The District has established these thresholds, in part, based on Section 182 (e) of the federal Clean Air Act which identifies ten tons a year of volatile organic gases as the significance level for stationary sources of emissions in extreme non-attainment areas for ozone. The South Coast Air Basin is the only extreme non-attainment area in the United States. This emission threshold has been converted to a pounds per day threshold for the operational phase of a project. The District staff also evaluated the thresholds established by other air quality management agencies in California and has taken into account the effect the thresholds would have on local governments' work load.

While Section 15064 (b) of CEQA Guidelines states that an ironclad definition of a significant effect is not possible because the significance of an activity may vary with the setting, the District believes that the setting as referred to in CEQA can be defined in this case. Under California state law (Health and Safety Code Section 40402), the South Coast Air Basin is defined as a distinct geographic area with a critical air pollution problem for which ambient air quality standards have been promulgated to protect public health. As such, the District believes that significance thresholds can be established based on scientific and factual data that is contained in the federal and state Clean Air Acts. Therefore, the District recommends that these thresholds be used by lead agencies in making a determination of significance. However, the final determination of whether or not a project is significant is within the purview of the lead agency pursuant to Section 15064 (b) of the CEQA Guidelines.

Both direct and indirect emissions should be included when determining whether the project exceeds these thresholds. The following significance thresholds for air quality have been established by the District for project operations:

55 pounds per day of ROC

55 pounds per day of NOx

550 pounds per day of CO

150 pounds per day of PM10

150 pounds per day of SOx

Ca. state 1-hour or 8-hour CO standard

Projects in the South Coast Air Basin (SCAB) with daily operation-related emissions that exceed any of the above emission thresholds should be considered to be significant.

Planners and project proponents may determine if a project is likely to be significant by screening the project using Table 6-2. The land uses listed therein are based on the mobile source emissions from projects that have the potential to exceed the emission thresholds. Table 6-2 does not cover all proposed projects or situations. If site-specific information is available, the MAAQI model or emission calculation procedures discussed in Chapter 9 of this Handbook can be used to estimate emissions totals to determine significance. Any emission reductions resulting from existing rules and ordinances should be calculated as the project's non-mitigated emissions and discussed in the project description.

In addition, level of service can be used as a screening method for determining when vehicle trips will impact a roadway, thus violating the state 1-hour or 8-hour standard, and creating a CO hotspot. Refer to Section 9.4.

- **Additional Indicators of Potential Air Quality Impacts (Secondary Effects)**

Additional indicators should be used as screening criteria indicating the need for further analysis with respect to air quality. Whenever possible, the project should be evaluated in a quantitative analysis; otherwise a qualitative analysis is appropriate. The additional indicators are as follows:

- Project could interfere with the attainment of the federal or state ambient air quality standards by either violating or contributing to an existing or projected air quality violation (refer to Chapter 12 and Appendix G, Significant Effects, State CEQA Guidelines);
- Project could result in population increases within the regional statistical area which would be in excess of that projected in the AQMP and in other than planned locations for the project's build-out year (refer to Chapter 12);
- Project could generate vehicle trips that cause a CO hot spot (refer to Section 9.4);

- Project will have the potential to create or be subjected to an objectionable odor over 10 dilution to thresholds (D/T) (refer to Chapter 5) that could impact sensitive receptors;

- Project will have hazardous materials on site (Table 10-4 and 10-5) and could result in an accidental release of air toxic emissions or acutely hazardous materials posing a threat to public health and safety (refer to Chapter 10);

- Project could emit an air toxic contaminant regulated by District rules or that is on a federal or state air toxic list (refer to Appendix 10);

- Projects could involve burning of hazardous, medical, or municipal waste as waste-to-energy facilities (refer to Chapters 10 and 13);

- Projects could be occupied by sensitive receptors within a quarter mile of an existing facility that emits air toxics identified in District Rule 1401 (New Source Review of carcinogenic air contaminants) or near CO hot spots (refer to Chapters 5 and 10);

- Project could emit carcinogenic or toxic air contaminants that individually or cumulatively exceed the maximum individual cancer risk of 10 in 1 million.

If the project has significant air quality impacts, an EIR should be prepared. If the impact of the project can be reduced below significant by the application of mitigation measures, then a Mitigated Negative Declaration (MND) can be prepared. The MND or EIR should quantify the level of emissions using the standards in this Handbook, and identify mitigation measures to lessen the project's impact to the greatest extent possible. The District recommends that all projects apply feasible mitigation measures to reduce individually and cumulatively significant air quality impacts to less than significant. Refer to Chapter 11 for an identification of mitigation measures, and the potential for emission reductions.

6.3 SEDAB (Under District Jurisdiction) Air Pollution Thresholds for Operations

The Coachella Valley and Antelope Valley, which are under the jurisdiction of the District, are in the SEDAB which has a distinctly different air pollution problem than the SCAB. The SEDAB is not classified as an extreme non-attainment area for ozone and therefore, the District has not changed the significance thresholds for the Coachella Valley and Antelope Valley from the 1987 version of this Handbook. In determining whether or not a project exceeds these thresholds, the project emissions should be calculated in the same manner as that for the SCAB (e.g. utilizing the highest daily emissions). These thresholds are as follows:

75 pounds per day of ROC

100 pounds per day of NOx

550 pounds per day of CO

150 pounds per day of PM10

150 pounds per day of SOx

Ca. state 1-hour and 8-hour CO standard

Projects in the Coachella Valley and Antelope Valley portion of the SEDAB with peak operation-related emissions that exceed any of the above emission thresholds should be considered significant.

As with the significance thresholds defined for the SCAB, planners and project proponents may determine if a project is significant by screening the project using Table 6-2 or the alternatives mentioned in Section 6.2. Level of service can also be used for determining a likely violation of the state 1-hour or 8-hour CO standard for the Coachella Valley and Antelope Valley.

The additional indicators of potential air quality impacts identified in Section 6.2 should also be used in determining if a project is significant in the Coachella Valley and Antelope Valley.

6.4 Construction Emission Thresholds for SCAB and Coachella Valley

Both the SCAB and SEDAB (that portion under the jurisdiction of the District) exceed the federal and state PM10 standards. The problem in these areas results from fugitive dust distributed during construction, from transport of disturbed dust on roadways by vehicles and wind. However, since a project's impact is limited to the construction phase, and level of mitigation, the procedure for determining significance is different than that for a project's operational impacts. When estimating a project's construction-related emissions, the emissions can be averaged over a 3-month period to include only actual working days.

The following significance thresholds for air quality have been established by the District on a quarterly basis:

2.5 tons per quarter of ROC

2.5 tons per quarter of NO_x

24.75 tons per quarter of CO

6.75 tons per quarter of PM10

6.75 tons per quarter of SO_x

However, if emissions on an individual day exceed 75 lbs a day for ROC, or 100 lbs a day for NOx, or 550 lbs a day for CO, or 150 lbs a day for PM10 and SO_x, the project should be considered significant.

Projects in the SCAB or SEDAB with construction-related emissions in a quarterly period that exceed any of the emission thresholds should be considered to be significant.

Table 6-3 provides a screening table for determining when a project's construction emissions could exceed the threshold of significance.

6.5 Selecting the Appropriate Document

Upon completion of the Initial Study, the lead agency in consultation with responsible agencies determines the most appropriate type of environmental documentation, (i.e., a Negative Declaration (ND), a Mitigated Negative Declaration (MND), or an Environmental Impact Report (EIR)). Specific criteria for determining the appropriate environmental document with respect to air quality are described below. Table 6-4 provides a quick reference for planners to determine the appropriate environmental documents for particular types of land use projects.

- **Negative Declarations**

A Negative Declaration (ND) is prepared if the Initial Study identifies no significant environmental impacts from the project. Before the release of the ND for the project, the lead agency must determine that there is no substantial evidence that the project without mitigation may have a

CEQA Project Analysis Levels

The SJVAPCD recommends a three-tiered approach to analysis based on project size to allow quick screening of most projects for significant impacts.

- Small Project Analysis Level
- Cursory Analysis Level
- Full Analysis Level
- Recommended Thresholds of Significant Impact

Small Project Analysis Level (SPAL)

The Small Project Analysis Level (SPAL) is the screening level. Projects under this level require no further analysis in order to make a finding of less than significant air quality impacts.

- Verify project size or trip volume is less than pre-calculated amounts in GAMAQI Table 5-2 or 5-3
- Verify that project is not a source or near a source of hazardous air pollutants or odors
- If demolition or renovation of existing buildings, contact the District for asbestos requirements.
- Mitigate cumulative impacts with measures appropriate for the site.

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Cursory Analysis Level (CAL)

The CAL is used to determine if significance thresholds have been exceeded on projects not meeting the SPAL criteria.

- Estimate mobile and area source emissions using URBEMIS 7G
- Screen for CO impact/use CO Protocol or CALINE4 dispersion model if needed.
- If source of hazardous air pollutants or odors or is near such a source, contact

the SJVUAPCD.

- If demolition or renovation of existing buildings, contact the District for asbestos requirements.
- Identify feasible mitigation measures and quantify benefit using URBEMIS 7G
- If impacts are identified as significant and cannot be mitigated to less than significant prepare an EIR with full analysis.

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Full Analysis Level (FAL)

The Full Analysis Level (FAL) is the level of analysis usually required for an EIR. It requires all the elements of the previous two levels and an air quality report that fully describes the air quality impacts to the public.

- Estimate mobile and area source emissions with URBEMIS 7G. For general plans and large specific/community plans use DTIM2 if transportation demand model available, otherwise use MVEI7G (BURDEN7G).
- Screen project for CO impacts, use CO Protocol or CALINE 4 if needed.
- If source of hazardous air pollutants or odors, or is near such a source, contact the SJVUAPCD.
- If SJVUAPCD identifies as potentially significant source of hazardous air pollutants, a health risk assessment will be required.
- Prepare an air quality report containing:
    - existing air quality conditions;
    - analysis of project air quality impacts;
    - mitigation measures; and
    - results of modeling as technical appendices.

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Recommended Thresholds of Significant Impact

- Ozone Precursor Emissions

  Reactive Organic Gases (ROG) 10 tons/year

  Oxides of Nitrogen (NOx) 10 tons/year

- PM-10 Emissions

  Complying with SJVAPCD Regulation VIII reduces to less than significant. Large or high intensity construction projects near sensitive receptors may require mitigation beyond Regulation VIII. (See GAMAQI Table 6-3.)

- CO Emissions

  Project causes or contributes to an exceedance of state or federal ambient CO standards. Determined by screening or modeling.

- Hazardous Air Pollutant Emissions

  Based on potential to increase cancer risk for the person with maximum exposure potential by 10 in one million. Non-cancer Hazard Index > 1. Determined by screening or modeling.

- Odor Impacts

  Based on distance of odor source from people and complaint record for facility or similar facility. More than one confirmed complaint per year averaged over a three-year period, or three unconfirmed complaints per year averaged over a three-year period. (See GAMAQI Table 4-2)

- Construction Emissions

  Same thresholds as above, but apply only during construction period. Ozone precursors calculated on an annual basis.

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SACRAMENTO METROPOLITAN
AIR QUALITY
MANAGEMENT DISTRICT

Norm Covell
AIR POLLUTION CONTROL OFFICER

April 12, 2002

To: Lead and Responsible Agencies, Consultants and Interested Persons

From: Norm Covell, Air Pollution Control Officer

Subject: **California Environmental Quality Act (CEQA)**
Revised Significance Criteria for Air Quality

On March 28, 2002 the Board of Directors of the Sacramento Metropolitan Air Quality Management District (SMAQMD) approved the following revised significance criteria/thresholds for pollutants emitted into the air.

Mass Emission Thresholds

Project Type	Ozone Precursor Emissions (Pounds/Day)	
	ROG	NOx
Short-Term Effects (Construction)	None	85
Long-Term Effects (Operation)	65	65

Emission Concentration Thresholds

California Ambient Air Quality Standards (CAAQS) *(see reverse).*
The CAAQS significance criteria are applied to all phases of a project in addition to the above mass emission thresholds.

Substantial Contribution Threshold

A project is considered to contribute substantially to an existing or projected violation of a CAAQS if it emits pollutants at a level equal to or greater than five (5) percent of the CAAQS.

The revised criteria/thresholds became effective on March 28, 2002. To allow a reasonable transition to the revised criteria/thresholds, agencies may apply either the previous or revised criteria/thresholds for CEQA determinations made prior to May 17, 2002.

Please contact Matt Jones, 916-874-4835, or Greg Tholen, 916-874-4832, if you have any questions regarding this notice.

Sincerely,

Norm Covell
Air Pollution Control Officer

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GUIDE FOR ASSESSING AND MITIGATING AIR QUALITY IMPACTS

Prepared by
the Mobile Source/CEQA Section
of the Planning Division
of the San Joaquin Valley Air Pollution Control District
1990 E. Gettysburg Avenue
Fresno, CA 93726

January 10, 2002 revision
Adopted August 20, 1998

This document is an advisory document, that provides Lead Agencies, consultants, and project applicants with uniform procedures for addressing air quality in environmental documents. Copies and updates are available from the SJVAPCD Planning Division at (559) 230-5800. Questions on content should be addressed to either the Mobile Source/ CEQA Section at (559) 230-5800 or the SJVAPCD CEQA representative at the regional office that covers the county in which the project is located.

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GUIDE FOR ASSESSING AND MITIGATING AIR QUALITY IMPACTS

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SECTION 4 – THRESHOLDS OF SIGNIFICANCE

4.1 INTRODUCTION

This section provides SJVAPCD recommended thresholds for determining whether projects have significant adverse air quality impacts as defined by CEQA. Projects demonstrated to have significant adverse impacts are required to mitigate impacts to levels considered less than significant or to prepare an EIR. The thresholds are advisory, but may be adopted administratively or formally by a governing body as recommended by the Governor's Office of Planning and Research (OPR) document *Thresholds of Significance: Criteria for Determining Environmental Significance*. The following gives the basis for the thresholds for all different types of air quality impacts.

4.2 BASIS FOR THRESHOLDS OF SIGNIFICANCE

The SJVAPCD used the OPR definitions of significant environmental effect as a basis to establish air quality Thresholds of Significance for the San Joaquin Valley. Section 15382 of the CEQA Guidelines defines "significant effect on the environment" as "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including ... air."

The Air Quality Section of Appendix G of the CEQA Guidelines (Environmental Checklist Form) contains a list of effects that may be deemed potentially significant. These are:

a) Conflict with or obstruct implementation of the applicable air quality plan;

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation;

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project is non-attainment under applicable federal or state ambient air quality standards (including releasing emissions which exceed quantitative thresholds for ozone precursors);

d) Expose sensitive receptors to substantial pollutant concentrations; or

e) Create objectionable odors affecting a substantial number of people.

For some types of impacts, the criteria listed above are straight forward, but in other cases, they require interpretation. A violation of air quality standards can be predicted for pollutants that can be modeled for atmospheric concentration. This is the case for carbon monoxide for which violations can be predicted using a dispersion model. Ozone, however, is the product of a photochemical reaction that may occur many miles away from the

source of emissions. Although atmospheric ozone models exist, they are only sensitive enough to register changes caused by the largest projects. What is more important for determining ozone impacts is a project's contribution to existing violations of the ozone standard in the SJV. By comparing a project's ozone precursor emissions with emission levels considered important under state law, this impact can be evaluated. One such level is the stationary source emissions offset threshold required by the CCAA. Additionally, the most common measure of significance for toxic air contaminants is an increase in cancer risk based on exposure levels for the nearest sensitive receptor, while odor impacts can be judged significant based on the number of complaints expected for each type of odor producing process. These criteria are described in greater detail below.

While CEQA Guidelines[26] state that an ironclad definition of a significant effect is not possible because the significance of an effect may vary with the setting, the SJVAPCD has determined that the setting, as referred to in CEQA, can be defined for air quality. Under California state law[27], the SJVAB is defined as a distinct geographic area with a critical air pollution problem for which ambient air quality standards have been promulgated to protect public health. As such, the SJVAPCD resolves that significance thresholds established herein are based on scientific and factual data. Therefore, the SJVAPCD recommends that these thresholds be used by Lead Agencies in making a determination of significance. However, it is still recognized that the final determination of whether or not a project has a significant effect is ultimately within the purview of the Lead Agency pursuant to CEQA Guidelines[28].

Basis for Ozone Precursor Thresholds. The entire SJVAB often violates state and federal ozone ambient air quality standards. Therefore, emissions related to an individual project, if substantial, will contribute to the existing violations of the ozone standards. The SJVAPCD defines "substantial contribution" for ozone precursor emissions in terms of CCAA requirements[29]. The SJVAPCD's New and Modified Stationary Source Review Rule - Offset Requirements for nitrogen oxides (NOx) and volatile organic compounds (VOCs) (in this document, equivalent to reactive organic gases [ROG])[30] reflects the CCAA requirements. Rule 2201 sets emissions thresholds above which stationary pollution sources must offset all emissions down to the thresholds. The offset thresholds vary depending on the severity of the pollution problem in each air basin and the type of pollutant. Areas categorized as severe ozone nonattainment areas such as the SJVAB have lower thresholds than areas categorized as having only a moderate ozone problem. The SJVAPCD staff also researched and evaluated many significance thresholds established by other air quality management agencies in California and found that most agencies use the same approach. Although it may be argued that any increase in pollutant emissions in an area with a severe pollution problem may be significant, a reasonable threshold is still

[26] CCR §15064(b)
[27] California Health and Safety Codes (CH&SC) §41100
[28] CCR §15064 (c)
[29] CH&SC §40920
[30] SJVAPCD Rule 2201, §4.2.3

needed to avoid unnecessarily burdening every project with a requirement to prepare an EIR, which is clearly not intended by CEQA nor desired by the SJVAPCD.

CEQA requires that in evaluating the significance of a project's potential air quality impacts, the Lead Agency shall consider both primary (direct) and secondary (indirect) consequences[31]. Primary impacts include emissions from project construction and emissions from motor vehicles traveling to and from the facility once it is operational. An example of a secondary impact would be the emissions associated with growth that may be facilitated by the expansion of a wastewater treatment plant.

Basis for PM-10 Thresholds. The entire SJVAB is a serious nonattainment area for PM-10 and any addition to the current PM-10 problem could be considered significant. However, the SJVAPCD has established regulations governing various activities that contribute to the overall PM-10 problem. The SJVAPCD has adopted a set of PM-10 Fugitive Dust Rules collectively called Regulation VIII. Several components of Regulation VIII specifically address fugitive dust generated by construction related activities. Therefore, the SJVAPCD has determined that any determination of significance with respect to construction emissions should be based on a consideration of the control measures to be implemented. From the perspective of the SJVAPCD, compliance with Regulation VIII for all sites and implementation of all other control measures indicated in Tables 6-2 and 6-3 (as appropriate, depending on the size and location of the project site) will constitute sufficient mitigation to reduce PM-10 impacts to a level considered less-than-significant.

4.3 THRESHOLDS OF SIGNIFICANCE

This section describes and establishes the SJVAPCD's Thresholds of Significance. These thresholds are recommended for use by Lead Agencies when preparing Initial Studies. If, during the preparation of the Initial Study, the Lead Agency finds that any of the following thresholds may be exceeded and cannot be mitigated, then a determination of significant air quality impact must be made and an EIR is required.

The SJVAPCD identifies thresholds that separate a project's short-term emissions from its long-term emissions. The short-term emissions are mainly related to the construction phase of a project and are recognized to be short in duration. The long-term emissions are mainly related to the activities that will occur indefinitely as a result of project operations. In addition, CEQA[32] states that another condition that could establish a project as having a significant effect on the environment is effects that are considered "cumulatively considerable." Thresholds for project construction impacts, project operations, and cumulative impacts are discussed below.

[31] CCR §15064 (d)
[32] PRC §21083(b)

4.3.1 Threshold of Significance for Project Construction Impacts

Pollutants of Concern. A project's construction phase produces many types of emissions, but PM-10 is the pollutant of greatest concern.[33] PM-10 emissions can result from a variety of construction activities, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle exhaust. Construction-related emissions can cause substantial increases in localized concentrations of PM-10, as well as affecting PM-10 compliance with ambient air quality standards on a regional basis. Particulate emissions from construction activities can lead to adverse health effects as well as nuisance concerns such as reduced visibility and soiling of exposed surfaces. Asbestos can also be of concern during demolition activity associated with construction. The use of diesel powered construction equipment produces ozone precursor emissions and combustion related particulate emissions. Large construction projects lasting many months may exceed the District's annual threshold for NOx emissions and could expose area residents to diesel particulate. Contact the SJVAPCD for analysis recommendations for large construction projects.

Qualitative Approach. The SJVAPCD's approach to CEQA analyses of construction PM-10 impacts is to require implementation of effective and comprehensive control measures rather than to require detailed quantification of emissions (although a Lead Agency may elect to do so - see Section 5 of this document for guidance). PM-10 emitted during construction can vary greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, weather conditions, and other factors, making quantification difficult. Despite this variability in emissions, experience has shown that there are a number of feasible control measures that can be reasonably implemented to significantly reduce PM-10 emissions from construction. The SJVAPCD has determined that compliance with Regulation VIII for all sites and implementation of all other control measures indicated in Tables 6-2 and 6-3 (as appropriate, depending on the size and location of the project site) will constitute sufficient mitigation to reduce PM-10 impacts to a level considered less-than-significant.

Common Measures. All control measures listed in Table 6-2 (Regulation VIII Control Measures) are required for all construction sites by regulation. Table 6-3 lists additional measures that may be required due to sheer project size or proximity of the project to sensitive receptors. If all appropriate "enhanced control measures" in Table 6-3 will not be implemented for these very large or sensitive projects, then construction impacts would be considered significant (unless the Lead Agency provides a satisfactory detailed explanation as to why a specific measure is unnecessary). Table 6-3 also lists additional control measures (Optional Measures) that may be implemented if further emission reductions are deemed necessary by the Lead Agency.

[33] The SJVAPCD recognizes that construction equipment also emits carbon monoxide and ozone precursor emissions. However, the SJVAPCD has determined that these emissions may cause a significant air quality impact only in the cases of very large or very intense construction projects. The SJVAPCD will advise Lead Agencies on quantification procedures and significance on a case by case basis.

Demolition Asbestos Impacts. Project construction sometimes requires the demolition of existing buildings at the project site. Buildings often include materials containing asbestos. Airborne asbestos fibers pose a serious health threat if adequate control techniques are not carried out when the material is disturbed. The demolition, renovation, or removal of asbestos-containing materials is subject to the limitations of the National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations as listed in the Code of Federal Regulations[34] requiring notification and inspection. Most demolitions and many renovations are subject to an asbestos inspection prior to start of activity. The SJVAPCD's Compliance Division in the appropriate region should be consulted prior to commencing any demolition or renovation of any building to determine inspection and compliance requirements. Strict compliance with existing asbestos regulations will normally prevent asbestos from being considered a significant adverse impact.

4.3.2 Thresholds of Significance for Impacts from Project Operations

The term "project operations" refers to the full range of activities that can or may generate pollutant emissions when the development is functioning in its intended use. For projects such as office parks, shopping centers, residential subdivisions, and other indirect sources, motor vehicles traveling to and from the projects represent the primary source of air pollutant emissions. For industrial projects and some commercial projects, equipment operation and manufacturing processes can be of greatest concern from an emissions standpoint. Significance thresholds discussed below address the impacts of these emission sources on local and regional air quality. Thresholds are also provided for other potential impacts related to project operations, such as odors and toxic air contaminants.

(Lead Agencies may refer to Section 5, for guidance on calculating emissions and determining whether significance thresholds for project operations may be exceeded, and thus whether more detailed air quality analysis may be needed.)

Ozone Precursor Emissions Threshold. Ozone precursor emissions from project operations should be compared to the thresholds provided in Table 4-1. Projects that emit ozone precursor air pollutants in excess of the levels in Table 4-1 will be considered to have a significant air quality impact.

Both direct and indirect emissions should be included when determining whether the project exceeds these thresholds. The following total emissions thresholds for air quality have been established by the SJVAPCD for project operations. Projects in the SJVAB with operation-related emissions that exceed these emission thresholds will be considered to have significant air quality impacts.

[34] 40CFR Part 61, Subpart M

Table 4-1
Ozone Precursor Emissions Thresholds
For Project Operations

Pollutant	Tons/yr.
ROG	10
NOx	10

Local Carbon Monoxide Concentrations Threshold. Estimated CO concentrations, as determined by an appropriate model, exceeding the California Ambient Air Quality Standard (CAAQS) of 9 parts per million (ppm) averaged over 8 hours and 20 ppm for 1 hour will be considered a significant impact.

Odor Impacts Threshold. While offensive odors rarely cause any physical harm, they can be very unpleasant, leading to considerable distress among the public and often generating citizen complaints to local governments and the SJVAPCD. Any project with the potential to frequently expose members of the public to objectionable odors will be deemed to have a significant impact. Odor impacts on residential areas and other sensitive receptors, such as hospitals, day-care centers, schools, etc., warrant the closest scrutiny, but consideration should also be given to other land uses where people may congregate, such as recreational facilities, worksites, and commercial areas. Analysis of potential odor impacts should be conducted for the following two situations:

- **Generators** – projects that would potentially generate odorous emissions proposed to locate near existing sensitive receptors or other land uses where people may congregate, *and*

- **Receivers** – residential or other sensitive receptor projects or other projects built for the intent of attracting people locating near existing odor sources.

The SJVAPCD has determined some common types of facilities that have been known to produce odors in the SJV. These are presented in Table 4-2 along with a reasonable distance from the source where the degree of odors could possibly be significant.

A Lead Agency should use Table 4-2 to determine whether the proposed project, either as a generator or a receiver, would result in sensitive receptors being within the distances indicated in Table 4-2. In addition, recognizing that this list of facilities is not meant to be all-inclusive, the Lead Agency should evaluate facilities not included in the table or projects separated by greater distances than indicated in Table 4-2 if warranted by local conditions or special circumstances. If the proposed project would result in sensitive receptors being located closer than the screening level distances indicated in Table 4-2, a more detailed analysis, as described in Section 5, should be conducted.

Table 4-2
Project Screening Trigger Levels
For Potential Odor Sources

Type of Facility	Distance
Wastewater Treatment Facilities	2 miles
Sanitary Landfill	1 mile
Transfer Station	1 mile
Composting Facility	1 mile
Petroleum Refinery	2 miles
Asphalt Batch Plant	1 mile
Chemical Manufacturing	1 mile
Fiberglass Manufacturing	1 mile
Painting/Coating Operations (e.g. auto body shops)	1 mile
Food Processing Facility	1 mile
Feed Lot/Dairy	1 mile
Rendering Plant	1 mile

Because offensive odors rarely cause any physical harm and no requirements for their control are included in state or federal air quality regulations, the SJVAPCD has no rules or standards related to odor emissions, other than its nuisance rule[35]. Any actions related to odors are based on citizen complaints to local governments and the SJVAPCD. Lead Agencies can make a determination of significance based on a review of District complaint records as described in Section 5. For a project locating near an existing source of odors, the impact is potentially significant when the project site is at least as close as any other site that has already experienced significant odor problems related to the odor source. Significant odor problems are defined as:

- more than one confirmed complaint per year averaged over a three year period, or
- three unconfirmed complaints per year averaged over a three-year period.

For projects locating near a source of odors where there is currently no nearby development *and* for odor sources locating near existing receptors, the determination of significance should be based on the distance and frequency at which odor complaints from the public have occurred in the vicinity of a similar facility.

If a proposed project is determined to be a potentially significant odor source, mitigation measures should be required. For some projects, operational changes, add-on controls, or process changes, such as carbon absorption, incineration, or relocation of stacks/vents can reduce odorous emissions. In many cases, however, the most effective mitigation strategy

[35] Rule 4102 of the SJVAPCD's Rules and Regulations and the California Health and Safety Codes Section 41700.

is to provide a sufficient distance, or buffer zone, between the source and the receptor(s). Recent experience has shown that locating upwind from an odor source does not necessarily eliminate potential problems. Even places with reliable prevailing winds experience days with light and variable winds and days with winds opposite prevailing winds related to the passage of storms. Residents in these upwind areas while exposed less frequently may be more sensitive to the odors.

Hazardous Air Pollutants (HAPs). Any project with the potential to expose sensitive receptors (including residential areas) or the general public to substantial levels of toxic air contaminants would be deemed to have a potentially significant impact. This applies to receptors locating near existing sources of toxic air contaminants, as well as sources of toxic air contaminants locating near existing receptors.

Particular attention should be placed on either the location of a facility that has the potential to emit hazardous air pollutants near an existing school or the location of a new school site near facilities that have the potential to emit HAPs. Both scenarios have specific regulations that govern agency actions, as discussed in Section 3.

Proposed development projects that have the potential to expose the public to toxic air contaminants in excess of the following thresholds in Table 4-3 would be considered to have a significant air quality impact. These thresholds are based on the SJVAPCD's Risk Management Policy.

Table 4-3
Thresholds of Significance for Toxic Air Contaminants

- Probability of contracting cancer for the Maximally Exposed Individual (MEI) exceeds 10 in one million.
- Ground-level concentrations of non-carcinogenic toxic air contaminants would result in a Hazard Index greater than 1 for the MEI.

There are currently more than 900 substances classified as hazardous air pollutants by the ARB and USEPA. All projects requiring air quality permits from the SJVAPCD are evaluated for HAP emissions. Examples of projects requiring permits are provided in Figure 1-2. All such projects should be referred to the SJVAPCD as part of the CEQA review process.

Accidental Releases/Acutely Hazardous Air Emissions. The determination of significance for potential impacts from accidental releases of acutely hazardous air pollutants should be made in consultation with the local administering agency of the Risk Management Prevention Program. The county health department, Office of Emergency Services, or local fire department is usually the administering agency.

Cumulative Impacts. Any proposed project that would individually have a significant air quality impact (see Section 4.3.2 – Thresholds of Significance for Impacts from Project Operations) would also be considered to have a significant cumulative air quality impact. Impacts of local pollutants (CO, HAPs) are cumulatively significant when modeling shows that the combined emissions from the project and other existing and planned projects will exceed air quality standards. See also Section 5.9.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Final Subsequent Environmental Assessment for:

Proposed Amended Rule 1168 – Adhesive and Sealant Applications

December 22, 2004

SCAQMD No. 041104JKK

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PREFACE

This document constitutes the Final Subsequent Environmental Assessment (EA) for Proposed Rule 1168 – Adhesive and Sealant Applications. A Draft SEA was released for a 45-day public review and comment period from October 13, 2004, to November 30, 2004. One comment letter was received from the public and is included for completeness in Appendix C. During the review and comment period for the Draft SEA, PAR 1168 was modified to delay the VOC content limit requirement of 250 grams of VOC per liter for two years from January 1, 2005, to January 1, 2007. This delay was estimated to forego 414 pounds of VOC per day. This modification was determined to be significant and require recirculation pursuant to CEQA Guidelines §15088.5. Therefore, the Draft SEA was modified and released as a Revised Draft SEA. The Revised Draft SEA included a clear statement that the Governing Board may choose all or part of any of the alternatives even if the alternative or portion of the alternative may generate environmental impacts that are significantly worse than those proposed in the project, as long as the impact is evaluated as part of the alternative analysis. The Revised Draft SEA was released for a 45-day public review and comment period from November 5, 2004, to December 21, 2004. No comment letters were received from the public on the Revised Draft SEA.

After to the release of the revised draft subsequent EA, PAR 1168 was modified to delay the implementation of the 550 gram per liter final VOC content limit requirement for PVC and CPVC primer and the 325 gram per liter final VOC content limit requirement for ABS Welding from January 1, 2005, to July 1, 2005. The delay will allow manufactures to obtain National Sanitation Foundation (NSF) commercial approval. By delaying the new VOC content limit requirements for PVC/CPVC, 0.51 ton (1,024 pounds) per day of VOC emission reductions would be foregone between January 1, 2005 and July 1, 2005. The 0.52 ton (1,024 pounds) per day of VOC emission reductions foregone between January 1, 2005 and July 1, 2005 are greater than the SCAQMD significance threshold of 55 pounds of VOC per day; therefore, the delay is a significant change.

The delay of the PVC and CPVC primer and ABS welding VOC content limit requirements from January 1, 2005, to July 1, 2005 is considered to be within the scope of the analysis of the environmental impacts resulting from implementing Alternative C. The Revised Draft SEA clearly presented Alternative C and the adverse environmental impacts from choosing Alternative C. Therefore, it was not necessary to recirculate Revised Draft SEA, in this situation, since the adverse environmental impacts of Alternative C were fully disclosed to the public in the Revised Draft SEA.

The Revised Draft EA contained the November 4, 2004 version of PAR 1168. Modifications have been made to the proposed Draft EA in accordance with changes to the Staff Report and Proposed Rule for clarity and continuity.

Aside from the modifications to delay PVC and CPVC primer and ABS welding compliance date discussed in the previous paragraph, no modifications alter any conclusions reached in the Draft EA, nor provide new information of substantial importance relative to environmental impacts in the draft document. For this reason and the fact that modifiying the compliance date for PVC and CPVC primers and ABS welding adhesives was addressed as part of the analysis of Alternative C, recirculation of the Draft EA pursuant to California Environmental Quality Act (CEQA) Guidelines §15088.5 is not required.

To facilitate identifying modifications to the document, modifications to the document are included as underlined text and text removed from the document is indicated by ~~strikethrough~~.

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CHAPTER 1

EXECUTIVE SUMMARY

Introduction
California Environmental Quality Act
CEQA Documentation for Rule 1168 – Adhesive and Sealant Applications
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Executive Summary

INTRODUCTION

The California Legislature created the South Coast Air Quality Management District (SCAQMD) in 1977[1] as the agency responsible for developing and enforcing air pollution control rules and regulations in the South Coast Air Basin and portions of the Salton Sea Air Basin and Mojave Desert Air Basin. By statute, the SCAQMD is required to adopt an air quality management plan (AQMP) demonstrating compliance with all federal and state ambient air quality standards for the district[2]. Furthermore, the SCAQMD must adopt rules and regulations that carry out the AQMP[3]. The 2003 AQMP concluded that major reductions in emissions of volatile organic compounds (VOCs) and oxides of nitrogen (NOx) are necessary to attain the air quality standards for ozone and particulate matter (PM10).

With stationary and mobile sources being the major producers of VOC emissions, which contribute to ozone formation, reducing the quantity of VOC emissions within the jurisdiction of the SCAQMD has been an on-going priority and effort by the SCAQMD. Because materials used in adhesive and sealant operations are considered by SCAQMD as one potential source where VOC emission reductions can be achieved, in April 1989, Rule 1168 – Adhesive and Sealant Applications, was adopted. Since its adoption, Rule 1168 has been amended twelve times, with the most recent amendments occurring in 2003.

Under the current version of Rule 1168, emissions are controlled by limiting the VOC content, measured in grams per liter, of the adhesives and sealants used and applied within the SCAQMD's jurisdiction. Rule 1168 also prohibits the use of certain toxic chemicals in adhesives and sealants.

A draft Subsequent Environmental Assessment (SEA) for the proposed project was released for a 45-day public review period on October 13, 2004. During the 45-day public review period, it was determined that the final VOC limit for the top and trim adhesive category could not be met by the existing January 1, 2005 effective date. PAR 1168 was modified to delay the VOC content requirement for top and trim adhesives for two years, effective January 1, 2007. This modification ~~would make~~ made an existing significant adverse impact substantially worse; therefore, requiring recirculation of the 2004 Draft SEA as a Revised Draft SEA. ~~The following describes the amendments proposed to the Rule evaluated by the 2004 Draft SEA and a revised evaluation that includes a two-year extension for the final VOC content limit for top and trim adhesives~~:

After the release of the Revised Draft SEA, PAR 1168 was modified to delay the implementation of a proposed VOC content limit requirements of 550 grams per liter for PVC/CPVC and 325 grams per liter for ABS welding from January 1, 2005 to July 1, 2005. By delaying the new VOC content limit requirements for PVC/CPVC, 0.51 ton (1,024 pounds) per day of VOC emission reductions would be foregone between January 1, 2005 and July 1, 2005.

[1] The Lewis-Presley Air Quality Management Act, 1976 Cal. Stats., ch 324 (codified at Health & Safety Code, §§40400-40540).
[2] Health & Safety Code, §40460 (a).
[3] Health & Safety Code, §40440 (a).

The delay of the PVC and CPVC primer and ABS welding VOC content limit requirements from January 1, 2005, to July 1, 2005 is considered to be within the scope of the analysis of the environmental impacts resulting from implementing Alternative C. The Revised Draft SEA clearly presented Alternative C and the adverse environmental impacts from choosing Alternative C. The Revised Draft SEA also clearly states that the Governing Board can choose all or part of any of the alternative even if the alternative or portion of the alternative may generate environmental impacts that are significantly worse than those proposed in the project as long as these impacts were disclosed in the CEQA document circulated for public review. Therefore, since the modifications to PAR 1168 made subsequent to the release of the Revised Draft EA are considered to be within the scope of the analysise of the project alternatives, the Governing Board may adopt this modification or any other alternative or portion of an alternative that may generate environmental impacts that are significantly worst than those proposed in the project.

One comment letter was received on the Draft SEA. In the comment letter, the Southern California Association of Governments (SCAG) states that it has determined that PAR 1168 is not regionally significant per SCAG's Intergovernmental Review (IGR) Criteria and CEQA Guidelines. This letter and a response is included in Appendix C for completeness. No comment letters were received on the Revised Draft SEA.

~~Draft Subsequent Environmental Assessment~~ Proposed Project

The following summarizes the main components of PAR 1168~~On October 13, 2004, a Draft SEA was released that proposed to amend Rule 1168 with the following~~:

- Delay the January 1, 2005 Final VOC limit of 250 grams of VOC per liter compliance date for two years from January 1, 2005, to January 1, 2007. Consequently, the interim VOC limit of 540 grams of VOC per liter for top and trim adhesives would be extended until January 1, 2007.
- Rescind the January 1, 2005, prohibition of methylene chloride used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications. The proposed amended rule would allow the use of solvent welding formulations containing methylene chloride used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications provided the concentration of methylene chloride does not exceed 60 percent by weight and the purchase of all methylene chloride welding products for hard sheet plastic does not exceed 20 gallons per calendar year at a single facility.
- Rescind the January 1, 2005, 285 grams per liter VOC content limit requirement for solvent cements used to weld polyvinyl chloride (PVC) plastic pipes and fittings, and instead keep the PVC welding VOC content limit requirement at the interim 510 grams per liter.
- Rescind the January 1, 2005, 270 grams per liter VOC content limit requirement for solvent cements used to weld chlorinated polyvinyl chloride (CPVC) plastic pipes and fittings, and instead keep the CPVC welding VOC content limit requirement at the interim 490 grams per liter.
- Rescind the January 1, 2005 VOC content limit requirement of 250 grams per liter, and extend the interim VOC content limit requirement for adhesive primers for plastic of 650 grams per liter from the January 1, 2005 effective date to July 1, 2005. On July, 1, 2005,

reduce the VOC content limit requirement for these primers from 650 grams per liter to 550 grams per liter. ~~Replace the January 1, 2005 VOC content limit requirement for PVC/CPVC primers of 250 grams per liter with a VOC content limit requirement of 550 grams per liter. This new 550 gram per liter VOC content limit is lower that the existing PVC/CPVC primers VOC content limit of 600 grams per liter.~~

- Lower the acrylonitrile-butadiene-styrene (ABS) welding VOC content limit requirement to 325 grams per liter which is currently at 400 grams per liter on July 1, 2005.

~~Based on the volume of affected adhesives currently used, the amount of VOC emission reductions permanently foregone presented in the 2004 Draft SEA was 0.61 ton (1,220 pounds) per day. These reductions permanently foregone exceed the SCAQMD's daily VOC significance threshold of 55 pounds per day.~~

~~**Revision to the Draft Subsequent Environmental Assessment**~~

~~Subsequent to the release of the 2004 Draft SEA, top and trim adhesive manufacturers presented evidence that the 250 grams of VOC per liter top and trim adhesives do not meet performance standards required by the industry. Therefore, PAR 1168 was modified to delay the Final VOC limit of 250 grams of VOC per liter compliance date for two years from January 1, 2005, to January 1, 2007. Consequently, the interim VOC limit of 540 grams of VOC per liter for top and trim adhesives would be extended until January 1, 2007.~~

~~The 2003 Final SEA estimated that 0.21 ton per day (414 pounds per day) of VOC emissions reductions were delayed by replacing the Final VOC limit of 250 gram of VOC per liter with the interim VOC limit of 540 grams of VOC per liter. Therefore, extending the interim VOC limits until January 1, 2007 would delay an additional 0.21 ton per day (414 pounds per day) of VOC emissions reductions until January 1, 2007.~~

~~The additional 0.21 ton per day (414 pounds per day) of VOC emissions reductions delayed is considered to be substantial increase in the severity of an existing significant adverse air quality impact because it exceeds the SCAQMD's daily VOC significance threshold of 55 pounds per day. Therefore, the revision to delay the top and trim adhesive final VOC limit until January 1, 2007 is determined to be a significant change requiring recirculation, because it is a substantial increase in the severity of an environmental impact (CEQA Guidelines §15088.5(a)(2).~~

Emissions Reductions Delayed and Foregone

~~The amount of VOC emission reductions permanently foregone from the 2004 Draft SEA and the revised VOC emission reductions delayed from extending the interim VOC limit for top and trim until January 1, 2007 would be 1,640 pounds (0.82 ton) per day, which would exceed the SCAQMD's daily VOC significance threshold of 55 pounds per day. After January 1, 2007, the final VOC content limit for top and trip adhesive would become effective and the amount of VOC emission reductions permanently foregone would be 0.61 ton (1,220 pounds) per day.~~

Based on the volume of affected adhesives currently used, the amount of VOC emission reductions foregone on January 1, 2005 would be 1.05 ton (2,096 pounds) per day on January 1, 2005. On July 1, 2005, the amount of VOC emission reductions foregone would be 0.81 ton (2,096 pounds) per day, when the new VOC content limit requirements for PVC/CPVC primers and ABS welding become effective. On January 1, 2007, the VOC emission reductions foregone would be 0.61 ton (1,206 pounds) per day, when the Final VOC content limit requirement for top and trim adhesives becomes effective. These reductions foregone exceed the SCAQMD's daily VOC significance threshold of 55 pounds per day.

~~Pursuant to the California Environmental Quality Act (CEQA) (California Public Resources Code §§21000 et seq.), this Revised Draft Final SEA was prepared because the currently proposed project is considered to be a modification of the amendments to Rule 1168 approved by the Governing Board on June 7, 2002 and October 3, 2003, respectively. A Draft SEA is was appropriate because the project is a modification of a previously adopted project. A Revised Draft SEA is was appropriate to evaluate modifications to the previously proposed project, which is expected to generate additional adverse environmental impacts from extending the interim VOC limits for top and trim adhesives until January 1, 2007, since the proposed changes are considered a significant change requiring recirculation.~~'

CALIFORNIA ENVIRONMENTAL QUALITY ACT

The proposed amendments to Rule 1168 are a "project" as defined by CEQA (California Public Resources Code §21080.5). SCAQMD is the lead agency for the proposed project and has prepared appropriate an environmental analysis pursuant to its certified regulatory program (SCAQMD Rule 110). California Public Resources Code §21080.5 allows public agencies with regulatory programs to prepare a plan or other written document in lieu of an environmental impact report once the Secretary of the Resources Agency has certified the regulatory program. The SCAQMD's regulatory program was certified by the Secretary of the Resources Agency on March 1, 1989, and is codified as SCAQMD Rule 110.

CEQA requires that the potential adverse environmental impacts of proposed projects be evaluated and that feasible methods to reduce or avoid significant adverse environmental impacts of these projects be identified. To fulfill the purpose and intent of CEQA, the SCAQMD has prepared a ~~Revised Draft~~ Final SEA to address the potential environmental impacts associated with the currently proposed amendments to Rule 1168. The preparation of a Draft SEA ~~is~~ was necessary because the proposed project is a modification to previously approved projects, the June 2002 and October 2003 amendments to Rule 1168, for which a 2002 Final EA and 2003 Final SEA were prepared and certified by the Governing Board on June 7, 2002 and October 3, 2004, respectively.

Further, in accordance with CEQA Guidelines §15162 a Draft SEA was prepared because the modifications to the previously approved project consist of substantial changes which will require major revisions to the previously certified 2002 Final EA and 2003 Final SEA due to a substantial increase in the severity of previously identified significant effects.

Subsequent to the release of the 2004 Draft SEA, PAR 1168 was revised to include a provision to delay the January 1, 2005 VOC content limit requirement for top and trim adhesives for two years until January 1, 2007. The revision would delay an additional 414 pounds of VOC emission reductions per day, which exceeds the VOC significance threshold of 55 pounds of VOC per day. This modification and associated air quality impacts constitutes substantial new information requiring recirculation of the 2004 Draft SEA as a Revised Draft SEA pursuant to CEQA Guidelines §15088.5(a)(2). ~~This~~ The Revised Draft SEA ~~is~~ was intended to: (a) provide the lead agency, responsible agencies, decision makers and the general public with detailed information on the environmental effects of the proposed project; and, (b) to be used as a tool by decision makers to facilitate decision making on the proposed project.

After the release of the Revised Draft SEA, PAR 1168 was modified to delay the implementation of a proposed VOC content limit requirements of 550 grams per liter for PVC/CPVC and 400 grams per liter from January 1, 2005 to July 1, 2005. By delaying the proposed VOC content limit requirements for PVC/CPVC, 0.51 ton (1,024 pounds) per day of VOC emission reductions would be foregone between January 1, 2005 and July 1, 2005. These VOC emissions are considered foregone, because the existing Rule 1168 VOC content limit requirement of 250 grams per liter for PVC/CPVC primers was expected to become effective on January 1, 2005. In addition, 0.11 ton (220 pounds) per day of VOC emissions reductions would begin on July 1, 2005, instead of on January 1, 2005, as proposed in the Revised Draft SEA. The 0.11 ton (220 pounds) per day of VOC emissions reductions are not considered foregone, because the proposed VOC content limit is not a current requirement, as it had not previously been presented to, or adopted by the Governing.

While the emissions reductions foregone from the delay of PVC and CPVC primer and ABS welding VOC content limit requirements from January 1, 2005, to July 1, 2005 is a modification to the previously proposed project, this modification is considered to be within the scope of the analysis of the environmental impacts resulting from implementing Alternative C. The Revised Draft SEA clearly presented Alternative C and the adverse environmental impacts from choosing Alternative C. The Revised Draft SEA also clearly states that the Governing Board can choose all or part of any of the alternative even if the alternative or portion of the alternative may generate environmental impacts that are significantly worst than those proposed in the project as long as these impacts were disclosed in the CEQA document circulated for public review. Therefore, the Governing Board may adopt this modification or any other alternative or portion of an alternative that may generate environmental impacts that are significantly worst than those proposed in the project.

CEQA DOCUMENTATION FOR RULE 1168 – ADHESIVE AND SEALANT APPLICATIONS

This ~~Revised Draft~~ Final SEA is a comprehensive environmental document that analyzes the environmental impacts from the currently proposed amendments to Rule 1168. SCAQMD rules, as ongoing regulatory programs, have the potential to be revised over time due to a variety of factors (e.g., regulatory decisions by other agencies, new data, and lack of

progress in advancing the effectiveness of control technologies to comply with requirements in technology forcing rules, etc.). The other documents which comprise the CEQA record for the currently proposed amendments to Rule 1168, include the 2004 Revised Draft Subsequent Environmental Assessment (October 2004), the 2003 Final Subsequent Environmental Assessment for Proposed Amended Rule 1168 (September 2003), the 2002 Final Environmental Assessment for Proposed Amended Rule 1168 (May 2002), and the Notice of Preparation/Initial Study (December 2001). The following is a summary of the contents of these documents.

Revised Draft Subsequent Environmental Assessment (SEA) for the Proposed Amendments to Rule 1168, November 4, 2004 (SCAQMD No. 0041404JKK): A Revised Draft SEA was prepared to address VOC emission reductions foregone from postponing the final VOC content limit for top and trim adhesives until January 1, 2007. In addition, the Revised Draft SEA clearly states that the Governing Board can choose all or part of any of the alternative even if the alternative or portion of the alternative may generate environmental impacts that are significantly worst than those proposed in the project as long as these impacts were disclosed in the document circulated for public review.. The Revised Draft SEA was released for a 45-day public review period from November 5, 2004 to December 21, 2004.

Draft Subsequent Environmental Assessment (SEA) for the Proposed Amendments to Rule 1168, October 13, 2004 (SCAQMD No. 0041012JKK): A Draft SEA for the proposed amendments to Rule 1168 was released for a 45-day public review period from October 13, 2004, to November 30, 2004. The analysis showed that there were potential adverse environmental effects that may result from implementing the proposed amendments. The Draft SEA identified "air quality" as the only area that may be adversely affected by the proposed project. One comment letter was received on the Draft SEA. After circulation of the Draft SEA, it was determined that the top and trim adhesives would not be able to meet the January 1, 2005 VOC content limits. Therefore, ~~this~~ a Revised Draft SEA was prepared, which includes VOC emission reductions delayed from postponing the final VOC content limit for top and trim adhesives until January 1, 2007, and recirculated for public review.

Final Subsequent Environmental Assessment (SEA) for the Proposed Amendments to Rule 1168, September 2003 (SCAQMD No. 080703BAR): A Draft EA for the proposed amendments to Rule 1168 was released for a 45-day public review period from August 8, 2003, to September 23, 2003. The analysis showed that there were potential adverse environmental effects that may result from implementing the proposed amendments. The Draft EA identified "air quality" as the only area that may be adversely affected by the proposed project. After circulation of the Draft SEA, a Final SEA was prepared and certified by the SCAQMD Governing Board on October 3, 2003.

Final Environmental Assessment (EA) for the Proposed Amendments to Rule 1168, May 2002 (SCAQMD No. 121101BAR): A Draft EA for the proposed amendments to Rule 1168 was released for a 45-day public review period from March 5, 2002, to April 19, 2002. The analysis showed that there were potential adverse environmental effects that may result from implementing the proposed amendments. The Draft EA identified "air quality"

as the only area that may be adversely affected by the proposed project. After circulation of the Draft EA, a Final EA was prepared and certified by the SCAQMD Governing Board on June 7, 2002.

Notice of Preparation/Initial Study (NOP/IS) of an Environmental Assessment (EA) for the Proposed Amendments to Rule 1168, December 2001 (SCAQMD No. 121101BAR): The NOP/IS of an EA for the proposed amendments to Rule 1168 was released for a 30-day public review period from December 11, 2001, to January 9, 2002. The NOP was released with an Initial Study, which contained a brief project description and the environmental checklist, as required by CEQA Guidelines. The environmental checklist contained a preliminary analysis of potential adverse environmental effects that may result from implementing the proposed amendments. The NOP/IS identified "air quality" as the only area that may be adversely affected by the proposed project.

Other CEQA Documents for Rule 1168

Several previous environmental analyses have been prepared to analyze past amendments to Rule 1168 and are summarized in the following paragraphs. The following summaries of previous CEQA documents are included for informational purposes only. The current SEA focuses on the currently proposed amendments to Rule 1168 and does not rely on these previously prepared EAs. These documents can still be obtained by contacting the SCAQMD's Public Information Center at (909) 396-2039 or the following e-mail address: ceqa_admin@aqmd.gov.

Final Environmental Impact Report (EIR) for Proposed Rule 1168 – Adhesive Applications, March 1989 (SCH No. 88092110 for Rule 1168, Adopted April 1989): Proposed Rule 1168 was considered a "technology forcing" rule that established interim and final VOC content limits for a variety of adhesive products. The EIR was circulated for a 30-day public review and comment period. The EIR analyzed potential adverse impacts from the proposed project in the following environmental areas: air quality, water quality, energy, risk of upset, public health, indirect environmental effects from economic impacts, solid waste impacts, public service impacts, and transportation. Air quality impacts (indirect emissions from add on air pollution control equipment), energy impacts, and solid waste impacts were concluded to be significant as a result of implementing the proposed project.

Final Environmental Impact Report (EIR) for Proposed Rule 1168 – Adhesive Applications, March 1989 (SCH No. 88092110 for Rule 1168, Amended March 1990): The proposed amendments extended the final compliance for one year for several categories of adhesive products. The SCAQMD concluded that impacts from the proposed project were essentially identical to those identified for Rule 1168 when it was originally adopted. Therefore, the previously prepared Final EIR served as the CEQA document for the proposed project. The previously prepared Final EIR was recertified on March 2, 1990.

Notice of Exemption (NOE) From CEQA for Proposed Amended Rule 1168 – Control of VOC Emissions From Adhesive Applications, June 1991 (for Rule 1168, Amended July 1991): The proposed amendments exempted aerosol spray can adhesives from the transfer efficiency requirements in the rule. The SCAQMD concluded that the proposed

amendments had no significant affect on air quality or emission limitations. Therefore, pursuant to the categorical exemption in CEQA Guidelines §15308 (Class 8 – Actions by Regulatory Agency for Protection of the Environment), a Notice of Exemption was prepared for the proposed project.

Final Staff Report for Proposed Rule 1168 – Solvent Cleaning Operations, Consisting of the Rule Development Assessment, the Environmental Assessment (EA), and the Socioeconomic Impact Assessment, July 1991 (SCAQMD No. 910626MG for Rule 1168, Amended August 1991): The Draft Staff Report, which included the Draft EA, was made available for a 30-day public review and comment period beginning June 26, 1991 and ending July 26, 1991. Though the Draft Staff Report was primarily focused on the adoption of Proposed Rule 1171, the solvent cleaning requirements for the use, storage and disposal of VOC-containing materials in Rule 1168 were also proposed to be superceded by the new requirements in Rule 1171. As a result, the document concluded that the most prevalent type of environmental impacts from adopting Proposed Rule 1171 and amending Rule 1168 were secondary cross-media impacts such as solid waste and disposal of aqueous wastes. However, the potential impacts were reduced to insignificance by requiring implementation of mitigation measures. No other impacts were identified.

Final Staff Report for Proposed Amended Rule 1168 – Adhesive Applications, Consisting of the Rule Development Assessment, the Supplemental Environmental Assessment (EA), and Socioeconomic Impact Assessment November 1992 (SCAQMD No. 921021MG for Rule 1168, Amended December 1992): The Draft Staff Report, which included the Draft Supplemental EA, was made available for a 30-day public review and comment period beginning October 22, 1992, and ending November 22, 1992. The proposed amendments to Rule 1168 delayed implementation of some interim and final VOC content requirement reductions for specified adhesive products. The amount of VOC emission reductions delayed as a result of implementing the proposed amendments exceeded the applicable SCAQMD VOC significance threshold. As a result, the document concluded that the proposed project would generate significant adverse air quality impacts. No other significant adverse impacts were identified.

Notice of Exemption (NOE) From CEQA for Proposed Amended Rule 1168 – Control of VOC Emissions From Adhesive Applications, November 1993 (for Rule 1168, Amended December 1993): The proposed amendments clarified the definition in the previous amendments regarding subfloor roofing adhesives. The SCAQMD concluded that the proposed amendments were administrative in nature and had no significant affect on air quality or emission limitations. Therefore, pursuant to the general rule exemption §15061(b)(3) of the CEQA Guidelines, a Notice of Exemption was prepared for the proposed project.

Final Supplemental Environmental Assessment (EA) for Proposed Amended Rule 1168 – Control of VOC Emissions From Adhesive Applications, 1997 (SCAQMD No. 961215JN for Rule 1168, Amended April 1997): The Draft Supplemental EA was made available for a 45-day review period starting December 16, 1996, and ending January 31, 1997. The proposed amendments extended final compliance dates and exemptions for

certain categories of adhesives. Air quality impacts were considered to be significant because the proposed amendments delayed previously anticipated future emission reductions from certain adhesive applications. No other significant adverse impacts from implementing the proposed project were identified.

Final Supplemental Environmental Assessment (EA) for Proposed Amended Rule 1168 – Adhesive Applications, January 16, 1998 (SCAQMD No. 981202JDN for Rule 1168, Amended February 1998): The Draft Supplemental EA was released for a 45-day review period (December 2, 1997 to January 15, 1998). The proposed amendments to Rule 1168 addressed both the EPA's comments on Rule 1168 and the SCAQMD Governing Board's direction to evaluate Rule 1168 exemptions (j)(12) through (j)(17) (scheduled to sunset on January 1, 1998). It was concluded in the Supplemental EA that, if exemption (j)(17) is used to the fullest degree, the amended rule would result in a loss of future VOC emission reductions in an amount that exceeds the SCAQMD VOC significance threshold. Therefore, potential project-specific air quality impacts of proposed amended Rule 1168 were considered significant. No other significant adverse environmental impacts were identified.

Final Environmental Assessment (EA) for Proposed Amended Rule 1168 – Adhesive and Sealant Applications, August 2000 (SCAQMD No. 2507001168JDN for Rule 1168, Amended September 2000): The amendments to Rule 1168 implemented AQMP control measure CTS-02E to obtain additional VOC emission reductions from specified categories of adhesives. The amendments were expected to reduce VOC emissions from applicable sources by approximately five tons per day. No significant adverse environmental impacts were identified for the proposed project. The Draft EA was released for a 30-day public review and comment period.

INTENDED USES OF THIS DOCUMENT

In general, a CEQA document is an informational document that informs a public agency's decision-makers and the public generally of potentially significant adverse environmental effects of a project, identifies possible ways to avoid or minimize the significant effects, and describes reasonable alternatives to the project (CEQA Guidelines §15121). A public agency's decision-makers must consider the information in a CEQA document prior to making a decision on the project. Accordingly, this ~~Revised Draft~~ Final SEA is intended to: (a) provide the SCAQMD Governing Board and the public with information on the environmental effects of the proposed project; and, (b) be used as a tool by the SCAQMD Governing Board to facilitate decision making on the proposed project.

Additionally, CEQA Guidelines §15124(d)(1) requires a public agency to identify the following specific types of intended uses of a CEQA document:

1. A list of the agencies that are expected to use the SEA in their decision-making;
2. A list of permits and other approvals required to implement the project; and
3. A list of related environmental review and consultation requirements required by federal, state, or local laws, regulations, or policies.

To the extent that local public agencies, such as cities, county planning commissions, et cetera, are responsible for making land use and planning decisions related to projects that

must comply with the proposed amendments to Rule 1168, they could possibly rely on this SEA during their decision-making process. Similarly, other single purpose public agencies approving projects at facilities complying with the proposed amendments to Rule 1168 may rely on this SEA.

EXECUTIVE SUMMARY

CEQA Guidelines §15123 requires a CEQA document to include a brief summary of the proposed actions and their consequences. In addition, areas of controversy including issues raised by the public must also be included in the executive summary. This Revised Draft SEA consists of the following chapters: Chapter 1 – Executive Summary; Chapter 2 – Project Description; Chapter 3 – Existing Setting, Chapter 4 – Potential Environmental Impacts and Mitigation Measures; Chapter 5 – Project Alternatives; Chapter 6 - Other CEQA Topics and various appendices. The following subsections briefly summarize the contents of each chapter.

Summary of Chapter 1 – Executive Summary

Chapter 1 includes a discussion of the legislative authority that allows the SCAQMD to amend and adopt air pollution control rules, identifies general CEQA requirements and the intended uses of this CEQA document, and summarizes the remaining five chapters that comprise this ~~Revised Draft~~ Final SEA.

Summary of Chapter 2 - Project Description

The following summarizes the main components of PAR 1168:

- Extend the 540 grams per liter interim VOC content limit for top and trim adhesives to January 1, 2007. The effective date for the final VOC content limit of 250 grams per liter for top and trim adhesives under the current rule is January 1, 2005. Therefore, the effective date for the final VOC content limit of 250 grams per liter for top and trim adhesives would be delayed until January 1, 2007.
- Rescind the January 1, 2005, prohibition of methylene chloride used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications. The proposed rule would allow the use of solvent welding formulations containing methylene chloride used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications provided the concentration of methylene chloride does not exceed 60 percent by weight and the purchase of all methylene chloride welding products for hard sheet plastic does not exceed 20 gallons per calendar year at a single facility.
- Rescind the January 1, 2005, 285 grams per liter VOC content limit requirement for solvent cements used to weld polyvinyl chloride (PVC) plastic pipes and fittings, and instead keep the PVC weld solvent VOC content limit requirement at the interim 510 grams per liter.
- Rescind the January 1, 2005, 270 grams per liter VOC content limit requirement for solvent cements used to weld chlorinated polyvinyl chloride (CPVC) plastic pipes and fittings, and instead keep the CPVC weld solvent VOC content limit requirement at the interim 490 grams per liter.
- Rescind the January 1, 2005 VOC content limit requirement for PVC/CPVC primers of 250 grams per liter, and extend the interim VOC content limit requirement for PVC/CPVC primers of 650 grams per liter from the January 1, 2005 effective date to

July 1, 2005. On July 1, 2005, reduce the VOC content limit requirement for PVC/CPVC primers from 650 grams per liter to 550 grams per liter. ~~Replace the January 1, 2005, VOC content limit requirement for PVC/CPVC primers of 250 grams per liter with a VOC content limit requirement of 550 grams per liter. This new 550 gram per liter VOC content limit is lower that the existing PVC/CPVC primers VOC content limit of 600 grams per liter.~~

- Lower the acrylonitrile-butadiene-styrene (ABS) welding VOC content limit requirement to 325 grams per liter which is currently at 400 grams per liter on July 1, 2005.

Summary of Chapter 3 - Existing Setting

Pursuant to the CEQA Guidelines §15125, Chapter 3 – Existing Setting, includes descriptions of those environmental areas that could be adversely affected by PAR 1168 as identified in the NOP/IS, Final EA prepared for the 2002 amendments, and Final SEA prepared of the 2003 amendments, upon which this ~~Revised Draft~~ Final SEA is based, where the only the environmental topic of "air quality" was identified and analyzed as having the potential to be adversely affected. The following subsection briefly highlights the existing setting for air quality, which, again, was the only environmental area identified that could potentially be adversely affected by implementing PAR 1168.

Air Quality

Air quality in the area of the SCAQMD's jurisdiction has shown substantial improvement over the last two decades. Nevertheless, some federal and state air quality standards are still exceeded frequently and by a wide margin. Of the National Ambient Air Quality Standards (NAAQS) established for six criteria pollutants (ozone, lead, sulfur dioxide, nitrogen dioxide, carbon monoxide and PM10), the area within the SCAQMD's jurisdiction is only in attainment with sulfur dioxide, nitrogen dioxide and lead standards. Chapter 3 provides a brief description of the existing air quality setting for each criteria pollutant, as well as the human health effects resulting from exposure to each criteria pollutant.

Summary of Chapter 4 - Environmental Impacts

CEQA Guidelines §§15126(a) and 15126.2 require that a CEQA document, "shall identify and focus on the significant environmental effects of the proposed project. Direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects."

The following subsection briefly summarizes the analysis of potential adverse environmental impacts from the adoption and implementation of PAR 1168.

Air Quality

The 2003 Final SEA included an extension for complying with the 250 gram per liter VOC content limit for top and trim adhesives as proposed in the existing Rule 1168 until January 1, 2005. Originally in the 2004 Draft SEA, staff expected that facilities would be able to meet these limits so no change is proposed for these limits. During the 45-day public review period, staff found that top and trim adhesives that comply with the final VOC content limit of 250 grams per liter do not satisfy industry performance requirements. Therefore, the

proposed project was revised to delay the effective date of the 250 gram per liter final VOC content limit for top and trim adhesives from January 1, 2005, to January 1, 2007. The delay would allow top and trim adhesives manufactures time to develop a VOC compliant adhesive that would satisfy industry performance requirements.

The 2002 FEA provided manufacturers additional time to develop compliant products for PVC and CPVC welding; and a provision to eliminate methylene chloride use in solvent welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrication by January 1, 2005.

It was also determined that products formulated with the January 1, 2005 VOC content limits for PVC and CPVC welding and primers, and methylene chloride replacement in hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrication produced inferior performance and could not satisfy industry standards. Therefore, the PAR 1168 would rescind the VOC and methylene chloride limits for the previously mentioned categories. No measures available to mitigate the significant adverse air quality impacts were found. The results of rescinding the above requirements are VOC and methylene chloride emissions reductions foregone.

Staff also proposed~~s~~ in the Revised Draft SEA to establish VOC content limits for ABS welding from 650 grams per liter to 550 grams per liter and for PVC/CPVC primers from 400 grams per liter to 325 grams per liter effective January 1, 2007. The final version of PAR 1168, delays the implementation of the new VOC content limit requirements from January 1, 2005, to July 1, 2005. The direct consequence of this modification would rescind the January 1, 2005 VOC content limit requirement of 250 grams per liter for PVC/CPVC primers, and retain the existing interim VOC content limit requirement of 650 grams per liter until July 1, 2005.

In addition, it was determined that eliminating methylene chloride from acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications could not meet performance and industry standards. PAR 1168 would replace the prohibition of methylene chloride from the previously mentioned formulations with a concentration limit of 60 percent methylene chloride and a single facility limit of 20 gallons per year of methylene chloride containing products used to solvent weld acrylic, polycarbonate, and polyethylene terephalate glycol plastics. Formulations with 60 percent methylene chloride have been developed to meet performance and industry standards.

Owners/operators of affected facilities would not be required to install control equipment or other structures that could generate construction emissions. Therefore, no construction and construction air quality impacts are anticipated for implementing PAR 1168.

The overall result of delaying/rescinding the above mentioned VOC content requirements would be 1.05 tons (2,096 pounds) per day of VOC emission reductions foregone after January 1, 2005. ~~and~~ After implementing the additional proposed limits for PVC/CPVC primers and ABS welding, the VOC emission reductions foregone would be ~~0.82~~ 0.81 ton (~~1,640~~ 1,620 pounds) per day ~~of VOC emission reductions forgone~~ ~~until~~ from July 1, 2005

to January 1, 2007. After January 1, 2007, when the top and trim final VOC content limit would become effective, 0.60 ton (~~1,220~~ 1,206 pounds) of VOC reductions per day would be foregone. After January 1, 2005, the project would generate a maximum carcinogenic risk of three in a million for residential receptors and two in a million for worker receptors, and noncarcinogenic health indices (acute and chronic) below 1.0 from allowing continued methylene chloride use in hard plastic sheet welding.

The VOC emission reductions foregone would exceed the SCAQMD's VOC significance threshold of 55 pounds per day. Allowing limited use of methylene chloride is expected to result in a carcinogenic risk that would be less than the significant criterion of ten in one million. The noncarcinogenic acute and chronic risks would be less than the hazard indices significance criterion of 1.0. Therefore, it is concluded that PAR 1168 has the potential to generate significant adverse air quality impacts from VOC emission reductions foregone during operation.

Cumulative air quality impacts from the proposed amendments and all other AQMP control measures considered together are not expected to be significant because implementation of all AQMP control measures is expected to result in net emission reductions and overall air quality improvement. Indeed, the 2003 AQMP indicated that, based on future anticipated overall reduction in VOC emissions, the district would achieve all federal ambient air quality standards by the year 2010 (SCAQMD, 2003), except for the new eight-hour ozone standard.

Potential Environmental Impacts Found Not To Be Significant

The Initial Study prepared for the 2002 amendments to Rule 1168 (released December 11, 2001) ~~is being~~ was relied upon for the preparation of this ~~Revised Draft~~ Final SEA and includes an environmental checklist of approximately 17 environmental topics to be evaluated for potential adverse impacts from the 2002 amendments. Review of the project at that time showed that the NOP/IS stage identified two topics, air quality and hazards, for further review in the 2002 Draft EA. It was later concluded in the 2002 Final EA that only air quality could be significantly adversely affected by amending Rule 1168. Where the NOP/IS and 2002 Final EA concluded that the project would have no significant direct or indirect adverse effects on the remaining environmental topics, no comments were received on the NOP/IS, 2002 Draft EA, or at the public meetings that changed this conclusion. A Draft SEA for the October 2003 amendments which relied upon the previous NOP/IS and 2002 Final EA was released for a 45-day public review and comment period from August 8, 2003 to September 23, 2003. No comments were received from the public on the 2003 Draft SEA or at public meetings. A 2004 Draft SEA was released for a 45-day public review period on October 13, 2004, which contained the current proposed project without the two year delay the final VOC content limit for top and trim adhesives. During the public review period, the proposed project was revised to delay the final VOC content limit for top and trim adhesives; therefore, the 2004 Draft SEA was revised and recirculated for public review pursuant to CEQA Guidelines §15088.5(a)(2) as a Revised Draft SEA. Further, the conclusions reached in the NOP/IS, 2002 Final EA, 2003 Final SEA, and 2004 Draft Revised SEA regarding environmental topics not expected to be adversely effected are not expected to be altered further by the proposed changes to PAR 1168. Thus, the screening

analysis conclusion that the following environmental areas would not be significantly adversely affected by the 2002 amendments continues to apply to the currently proposed project for PAR 1168:

- aesthetics
- agriculture resources
- biological resources
- cultural resources
- energy
- geology/soils
- hydrology and water quality
- land use and planning
- mineral resources
- noise
- population and housing
- public services
- recreation
- solid/hazardous waste
- transportation/traffic

Consistency

The Southern California Association of Governments (SCAG) and the SCAQMD have developed, with input from representatives of local government, the industry community, public health agencies, the EPA - Region IX and the California Air Resources Board (CARB), guidance on how to assess consistency within the existing general development planning process in the district. Pursuant to the development and adoption of its Regional Comprehensive Plan Guide (RCPG), SCAG has developed an Intergovernmental Review Procedures Handbook (June 1, 1995). The SCAQMD also adopted criteria for assessing consistency with regional plans and the AQMP in its CEQA Air Quality Handbook.

Summary Chapter 5 - Alternatives

Three feasible alternatives to the proposed amendments are summarized in Table 1-1: Alternative A (No Project); Alternative B (Further Delay Compliance Date); and Alternative C (Rescind January 1, 2005 Limits). A comparison of the potential air quality impacts from each of the project alternatives with PAR 1168 is given in Table 1-2. No other significant adverse impacts were identified for PAR 1168 or any of the project alternatives. The proposed project is considered to provide the best balance between emission reductions delayed, health risk, and adhesive performance and, therefore, is preferred over the project alternatives. However, although the proposed project provides the best balance between emission reductions delayed, health risk, and adhesive performance, the Governing Board may choose to adopt any of the alternatives in whole or in part in place of the proposed project.

PAR 1168 as modified consists of a mixture of the project proposed in the Revised Draft SEA and Alternative C. Like the project proposed in the Revised Draft SEA, PAR 1168 would forego 0.81 ton (2,096 pounds) per day between July 1, 2005 and January 1, 2007, when the new VOC content limit requirements for PVC/CPVC primers and ABS welding

become effective. In addition, PAR 1168 would forego 0.60 ton (1,206 pounds) of VOC emission reductions per day after July 1, 2007, when the final VOC content limit requirement for top and trim adhesives becomes effective. However, like Alternative C, between January 1, 2005 and July 1, 2005, PAR 1168 would forgo 1.05 ton (2,096 pounds) of VOC emission reductions per day.

The environmental impacts from the project proposed in the Revised Draft SEA and Alternative C were fully analyzed and disclosed in the Revised Draft SEA. The Revised Draft SEA clearly stated that Governing Board may choose to adopt any of the alternatives in whole or in part in place of the proposed project; therefore, the Governing Board may adopt this modification or any other alternative or portion of an alternative that may generate environmental impacts that are significantly worse than those proposed in the project as long as impacts were disclosed in the document circulated for public review.

Summary Chapter 6 - Other CEQA Topics

CEQA requires CEQA documents to address the potential for impacts from the project that cannot be avoided, irreversible environmental changes, and growth-inducing impacts. Consistent with the Final 2003 AQMP Program EIR, additional analysis of the proposed project confirms that it would not result in irreversible environmental changes or the irretrievable commitment of resources, foster economic or population growth or the construction of additional housing, or be inconsistent with regional plans.

Areas of Controversy

CEQA Guidelines §15123(b)(2) requires a public agency to identify areas of controversy, including issues raised by other agencies and the public. SCAQMD has not been made aware of any areas of controversy, nor has it received any comments during public review and comment periods for the 2003 Final SEA, 2002 Final EA or NOP/IS identifying any areas of controversy. The scheduled comment period for the rescinded 2004 Draft SEA ~~does not~~ ended until November 30, 2004. ~~As a result, SCAQMD has not received any comments on this document identifying any areas of controversy.~~ One comment letter was received on the Draft SEA and is included in Appendix C. No areas of controversy were identified in the comment letter.

The Revised Draft SEA was circulated for a public review and comment period from November 5, 2004 to December 21, 2004. No comment letters were received. Since no areas of controversy were identified by SCAQMD or the public during the review and comment periods for both the Draft SEA and Revise Draft SEA, it is concluded that PAR 1168 does not contain any areas of controversy as defined by CEQA.

Table 1-1
Project Alternatives

Rule Component	VOC Content Limits (Compliance Dates)			
	PAR 1168	**ALTERNATIVE A** (No Project)	**ALTERNATIVE B** (Further Delay Compliance Dates)	**ALTERNATIVE C** (Rescind January 1, 2005 Limits)
Top & Trim Adhesives	• Interim Limit: 540 g/l (In Effect) • Final Limit: 250 g/l (by 01/01/07)	• Interim Limit: 540 g/l (In Effect) • Final Limit: 250 g/l (by 01/01/05)	• Interim Limit: 540 g/l (In Effect) • Final Limit: 250 g/l (by 01/01/07)	• Interim Limit: 540 g/l (In Effect) • Rescind 01/01/05 250 g/l Final Limit
PVC Welding	• Interim Limit: 510 g/l (In Effect) • Rescind 01/01/05 285 g/l Final Limit	• Interim Limit: 510 g/l (In Effect) • Final Limit: 285 g/l (by 01/01/05)	• Interim Limit: 510 g/l (In Effect) • Final Limit: 285 g/l (by 01/01/07)	• Interim Limit: 510 g/l (In Effect) • Rescind 01/01/05 285 g/l Final Limit
CPVC Welding	• Interim Limit: 490 g/l (In Effect) • Rescind 01/01/05 270 g/l Final Limit	• Interim Limit: 490 g/l (In Effect) • Final Limit: 270 g/l (by 01/01/05)	• Interim Limit: 490 g/l (In Effect) • Final Limit: 270 g/l (by 01/01/07)	• Interim Limit: 490 g/l (In Effect) • Rescind 01/01/05 270 g/l Final Limit
PVC and CPVC Primer	• Interim Limit: 650 g/l (In Effect) • Rescind 01/01/05 250 g/l Final Limit, and • Add Final Limit 550 g/l (by ~~01~~ 07/01/05)	• Interim Limit: 650 g/ (In Effect) • Final Limit: 250 g/l (by 01/01/05)	• Interim Limit: 650 g/ (In Effect) • Final Limit: 250 g/l (by 01/01/07)	• Interim Limit: 650 g/l ((In Effect) • Rescind 01/01/05 250 g/l Final Limit
ABS Welding	• 400 g/ (In Effect) • Add Final Limit 325 g/l (by ~~01~~ 07/01/05)	• 400 g/l (In Effect)	• 400 g/l (In Effect)	• 400 g/l (In Effect)
Solvent Welding Hard Acrylic, Polycarbonate, PETG	• No Methylene Chloride Requirement* (In Effect) • Add Methylene Chloride Conc. Limit of 60% by Weight (by 01/01/05) • Add 20 gal/day Limit per Facility on Methylene Chloride Welding Solvent (by 01/01/05)	• No Methylene Chloride Requirement* (In Effect) • Elimination of Methylene Chloride (by 01/01/05)	• No Methylene Chloride Requirement* (In Effect) • Elimination of Methylene Chloride (by 01/01/07)	• No Methylene Chloride Requirement* (In Effect) • Rescind Elimination of Methylene Chloride (by 01/01/05)

*May be restricted by other SCAQMD rules (e.g., Rules 212, 1401)

Table 1-2
Comparison of Adverse Air Quality Impacts of the Alternatives
Loss of Anticipated VOC Emission Reductions

Category	PAR 1168	ALTERNATIVE A (No Project)	ALTERNATIVE B (Further Delay Compliance Dates)	ALTERNATIVE C (Rescind January 1, 2005 Limits)
Top & Trim Adhesives	Temporary loss in VOC emission reductions of 414 pounds per day continues until 01/01/07	No emission reductions foregone	Temporary loss in VOC emission reductions of 414 pounds per day continues until 01/01/07	Permanent loss in VOC emission reductions of 414 pounds per day
PVC Welding	Permanent loss in VOC emission reductions of ~~504~~ 500* pounds per day	No emission reductions foregone	Temporary loss in VOC emission reductions of ~~504~~ 502* pounds per day continues until 01/01/07	Permanent loss in VOC emission reductions of ~~504~~ 502* pounds per day
CPVC Welding	Permanent loss in VOC emission reductions of ~~158~~ 156* pounds per day	No emission reductions foregone	Temporary loss in VOC emission reductions of ~~158~~ 156* pounds per day continues until 01/01/07	Permanent loss in VOC emission reductions of ~~158~~ 156* pounds per day
PVC and CPVC Primer	Temporary loss in VOC emission reductions of 1,024 pounds per day continues until 07/01/05. Permanent loss in VOC emission reductions of ~~773~~ 768* pounds per day after 07/01/05	No emission reductions foregone	Temporary loss in VOC emission reductions of ~~1,030~~ 1,024* pounds per day continues until 01/01/07	Permanent loss in VOC emission reductions of ~~1,030~~ 1,024* pounds per day
ABS Welding	Additional Emissions reductions of 220 pounds per day	No change	No change	No change
Solvent Welding Hard Acrylic, Polycarbonate, PETG	Carcinogenic risk of three in a million. Acute and chronic hazard indices less than 1.0.	Elimination of carcinogenic and noncarcinogenic risk from methylene chloride	Acute and chronic hazard indices less than 1.0.until 01/01/07	Carcinogenic risk of four in a million. Acute and chronic hazard indices less than 1.0.
VOC Air Quality Impacts Significant?	Yes	No	Yes Less Than PAR 1168	Yes Greater Than PAR 1168
Methylene Chloride Risk Impacts Significant?	No	No	No	No

* Changed to be consistent with Table 4-4. Difference is a result of rounding. Ton values presented in Table 4-4 are rounded to three significant figures based on the original estimates in the October 1992 Staff Report for PAR 1168. Values in Table 1-2 were not rounded previously.

CHAPTER 2

PROJECT DESCRIPTION

Project Location
Background
Project Objective
Project Description
Technology Review

PROJECT LOCATION

The SCAQMD has jurisdiction over an area of 10,473 square miles (referred to hereafter as the district), consisting of the four-county South Coast Air Basin and the Riverside County portions of the Salton Sea Air Basin (SSAB) and the Mojave Desert Air Basin (MDAB). The Basin, which is a subarea of the SCAQMD's jurisdiction, is bounded by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto Mountains to the north and east. The 6,745 square-mile Basin includes all of Orange County and the nondesert portions of Los Angeles, Riverside, and San Bernardino counties. The Riverside County portion of the SSAB and MDAB is bounded by the San Jacinto Mountains in the west and spans eastward up to the Palo Verde Valley. The federal nonattainment area (known as the Coachella Valley Planning Area) is a subregion of both Riverside County and the SSAB and is bounded by the San Jacinto Mountains to the west and the eastern boundary of the Coachella Valley to the east (Figure 2-1).

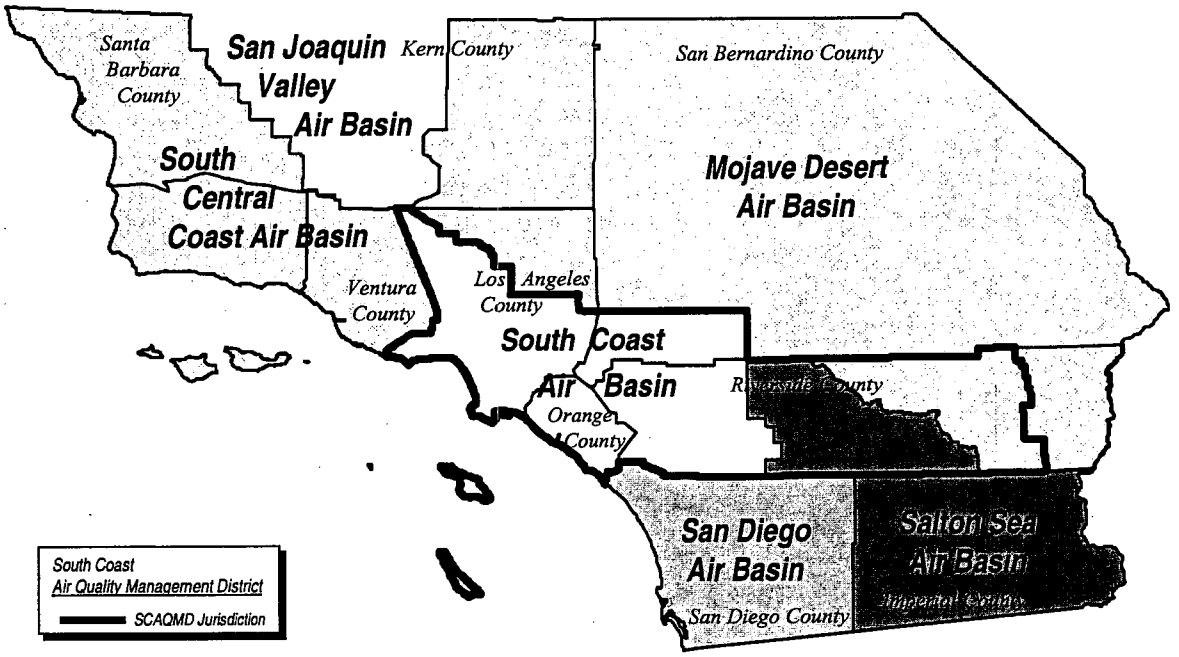

Figure 2-1
South Coast Air Quality Management District

BACKGROUND

Rule 1168 – Adhesive and Sealant Applications, controls VOC emissions from the use of adhesives and sealants used by industrial and commercial sources. Industrial sources use a wide variety of adhesives and sealants primarily for structural, thermal, or electrical applications to bond metals, plastics and composites of plastics, glass, ceramics, rubber, and paper to themselves or to each other. Companies in the district that use adhesives and sealants are engaged in a variety of activities including the assembly of corrugated boxes, motor vehicle parts and accessories, motor homes, metal and wood office furniture, pen and mechanical pencil parts, tire retreading and repairs, hardwood veneers, plastic foam products, wood office furniture and shelving, wood kitchen cabinets, fabricated metal parts and products, household furniture, electronic components and accessories, industrial machinery, and fabricated textile products. The commercial sector of the adhesives market is largely architecturally based. Application examples include: indoor and outdoor carpeting, carpet pad, wood flooring, ceramic tile, dry wall, paneling, subfloor, rubber floor, cove base, vinyl composition tile (VCT) and asphalt tile, single-ply roof membrane adhesives, and most of the plastic pipe welding and priming applications.

Three of the components of the Rule 1168 amendments that were adopted in 2002 included the following: allow the inclusion of additional time for manufacturers to develop compliant products for top and trim adhesive, PVC and CPVC welding and primers; and a provision that prohibits methylene chloride use in solvent welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrication on or after January 1, 2005.

Automotive and marine top and trim adhesives are typical used for recovering door panels, seats, dashboards, convertible tops, and floor covering, as well as the installation of sunroofs and vinyl tops. The June 2002 amendments created a special category for top and trim adhesives and set an interim VOC limit of 540 grams per liter until January 1, 2004. By this date, the VOC limit would reduce to 250 grams per liter. Pursuant to the Governing Board resolution, staff performed a technology assessment in 2003 to determine the feasibility of the 250 grams of VOC per liter limit for top and trim applications. Based on this evaluation, staff recommended, and the Governing Board agreed to delay implementation of the January 1, 2004 limits to January 1, 2005. The primary arguments for supporting a delay of emission reductions were difficulties in application of waterborne top and trim adhesives (precise tack time, low initial strength, and lesser heat resistance), coupled with the experimental nature of acetone-containing adhesives meeting the 250 grams of VOC per liter limit. Both types of adhesives, as well as hot melt glues, were being used at larger automotive conversion shops but there were performance and application concerns with water and acetone-based adhesives. Acetone based replacement adhesives are still experimental in nature and to date have not shown the necessary high heat and stain resistant characteristics that are needed for the performance demands of this industry.

In addition, previous amendments to Rule 1168 in December 1992, April 1997, and October 2003 postponed the final emission limits for adhesives and primers used to weld plastic pipes and pipe-fittings together and allow more time for development of low-VOC formulations. Despite those numerous extensions, efforts to develop compliant low-VOC adhesive technology has had limited success due to difficulties in substituting exempt

compounds for VOC solvents in PVC and CPVC welding formulations, obtaining other regulatory agency and product approval requirements, such as those of the National Sanitation Foundation (NSF), as well as conformity with specified strength requirements of applicable American Society of Testing and Materials (ASTM) standards.

Also, as part of the June 7, 2003 amendment, the Governing Board approved a ban on the sale of adhesives and sealants containing toxic chemicals such as methylene chloride, perchloroethylene, ethylene dichloride, chloroform and trichloroethylene; completely phasing-out the use of these solvents by January 1, 2005, considering one-year sell-through provisions. The ban was justified by the availability of alternative compliant adhesives and sealants. One exception to the availability of non-methylene chloride containing adhesives is solvent welding of hard acrylic, polycarbonate and polyethylene terephalate glycol plastic fabrications. As a result, an additional year (and subsequent one-year sell-through provision) was provided to allow for the continued development of acceptable replacements for methylene chloride formulations.

On October 13, 2004 a draft subsequent environmental assessment (SEA) was completed and circulated for a 45-day public review period ending November 30, 2004. At that time, it was believed that top and trim adhesives could meet the January 1, 2005, 250 grams of VOC per liter limit. Therefore, no changes to top and trim portions of Rule 1168 were proposed. It was also determined that products formulated with the January 1, 2005 VOC content limits for PVC, CPVC welding or methylene chloride replacement in hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrication produced inferior performance and could not meet industry standards and; therefore, are proposed to be rescinded. No measures available to mitigate the significant adverse air quality impacts were found.

During the 45-day public review period of the 2004 Draft SEA, the top and trim industry reported that the adhesives that met the January 1, 2005 final VOC limit (250 grams of VOC per liter of adhesive) were not meeting industry open time, repositionability, heat resistance, and stain resistance standards. Based on these findings, SCAQMD staff recommended delaying the 250 grams of VOC per liter of top and trim adhesive standard for two years (January 1, 2007). No other changes were made to PR 1168 at that time.

Therefore, the project was revised to retain the interim 540 gram per liter of VOC content limit for top and trim adhesives until January 1, 2007, at which time the final 250 gram per liter VOC limit would become effective. The remaining elements of PAR 1168 remained the same at that time. The January 1, 2005 VOC content limit for PVC/CPVC primers of 250 grams per liter would be replaced with a VOC content limit of 550 grams per liter. New VOC content limits are proposed for ABS welding. In addition, concentration and facility use limits are proposed to limit health risk associated with the use of methylene chloride solvent welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications.

After the release of the Revised Draft SEA, PAR 1168 was modified to delay the new VOC content limit requirements of 550 grams per liter for PVC/CPVC and 325 grams per liter

from January 1, 2005 to July 1, 2005. The remaining elements of PAR 1168 remain the same.

PROJECT OBJECTIVE

The primary project objectives include the following:

- The primary project goal of allowing facilities to use the lowest VOC and methylene chloride content limits that can meet industry performance requirements.
- Delay the future final VOC content limit requirements for top and trim adhesives for two years (January 1, 2007) to allow adhesive manufactures to develop a compliant adhesive that can satisfy industry performance requirements.
- Rescind the future VOC content limit requirements for PVC and CPVC welding, and the elimination of methylene chloride from welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications.
- Revise the VOC content limits for PVC and CPVC primers. Establish new lower VOC content limit requirements for ABS welding.
- Allow the use of methylene chloride in solvent welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications after January 1, 2005, but limit carcinogenic and noncarcinogenic risk by establishing restrictions on methylene chloride concentrations and annual facility usage of solvent welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications.

PROJECT DESCRIPTION

The following is a summary of the proposed changes to PAR 1168.

- Extend the 540 grams per liter interim VOC limit for top and trim adhesives to January 1, 2007. The effective date for the final VOC limit of 250 grams per liter for top and trim adhesives under the current rule is January 1, 2005. Therefore, the effective date for the final VOC limit of 250 grams per liter for top and trim adhesives would be delayed until January 1, 2007.
- Rescind the January 1, 2005, prohibition of methylene chloride used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications. The proposed rule would allow the use of solvent welding formulations containing methylene chloride used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications provided the concentration of methylene chloride does not exceed 60 percent by weight and the purchase of all methylene chloride welding products for hard sheet plastic does not exceed 20 gallons per calendar year at a single facility.
- Rescind the January 1, 2005, 285 grams per liter VOC content limit requirement for solvent cements used to weld polyvinyl chloride (PVC) plastic pipes and fittings, and instead keep the PVC welding VOC content limit requirement at the interim 510 grams per liter.
- Rescind the January 1, 2005, 270 grams per liter VOC content limit requirement for solvent cements used to weld chlorinated polyvinyl chloride (CPVC) plastic pipes and fittings, and instead keep the CPVC welding VOC content limit requirement at the interim 490 grams per liter.
- Rescind the January 1, 2005 VOC content limit requirement for PVC/CPVC primers of 250 grams per liter, and extend the interim VOC content limit requirement for

PVC/CPVC primers of 650 grams per liter from the January 1, 2005 effective date to July 1, 2005. On July, 1, 2005, reduce the VOC content limit requirement for PVC/CPVC primers from 650 grams per liter to 550 grams per liter. ~~Replace the January 1, 2005, VOC content limit requirement for PVC/CPVC primers of 250 grams per liter with a VOC content limit requirement of 550 grams per liter. This new 550 gram per liter VOC content limit is lower that the existing PVC/CPVC primers VOC content limit of 600 grams per liter.~~

- Lower the acrylonitrile-butadiene-styrene (ABS) welding VOC content limit requirement to 325 grams per liter which is currently at 400 grams per liter effective July 1, 2005.

A copy of PAR 1168 can be found in Appendix A.

TECHNOLOGY REVIEW

Top and Trim Adhesives

In the October 3, 2003 amendment to Rule 1168, staff recommended delaying the 250 grams of VOC per liter future compliance date by an additional year. This recommendation was primarily due to the experimental nature of acetone-based contact adhesives use in the automotive top and trim market, as well as comments by industry representatives regarding the difficulties with using waterborne adhesives. Since June 2004, operators of one large automotive converter have now transitioned into a new acetone-based adhesive (designed initially for the aerospace industry) whose performance and workability meets their satisfaction and complies with the future VOC limit of this specialty application. It was primarily because of this finding that staff recommends retaining the January 1, 2005 limit of 250 grams of VOC per liter, less water and less exempt compounds at the public workshop held on June 29, 2004. Based on correspondence with a large operator, the staff assessment of this formulation was that small shops could also use this adhesive for their operations. As of October 26, 2004, staff has confirmed that use of this acrylonitrile rubber-based cement has been discontinued due to unacceptable heat resistance in the field and a staining problem with light colored vinyl top material. The higher-VOC adhesive (540 grams per liter) is easier to use and is demonstrated to work; however, staff also believes that waterborne products available in the marketplace are viable as well and will work for certain applications where porous-to-porous or porous-to-nonporous substrates are bonded in areas of the vehicle that are not subject to direct heat insolation. Due to the lack of a single multipurpose top and trim adhesive, staff is further recommending delaying implementation of the 250 grams of VOC per liter standard for an additional two years.

Currently Compliant High-VOC Adhesives

The top and trim industry uses adhesives to attach various natural and synthetic materials to a variety of differing substrates including hard plastics and plastic foams, synthetic rubber, metal, and wood. Normally, these operations result in aftermarket trim including upholstery, carpeting, wood veneer, and dash covering, vinyl tops, convertible tops, headliners, door panels, seat covering, and sunroofs.

Several products are on the market and contain 490 to 540 grams of VOC per liter, less exempt compounds. They are multipurpose spray-grade contact adhesives that work for a

variety of automotive and marine applications. They contain some exempt compounds, such as acetone (25 to 35 percent by weight), and have solids contents on the order of 22 to 25 percent by volume. The applied VOC emissions resulting from their use are approximately 340 to 385 grams per liter of material used (2.8 to 3.2 pounds per gallon), and are the mainstay for small business operators today.

Waterborne Adhesives

Waterborne contact adhesives are available and are in use at a few top and trim facilities. These materials are formulated with the same neoprene rubber base, in water, with rosin acids and very little VOC (up to 80 grams per liter, less water), or as dispersions of acrylic resin and synthetic rubber in water with no VOC. These materials are much more expensive and require the use of gravity feed spray equipment, if the container can be placed above the article to be sprayed. If not, an HVLP gun with an activator pump will be needed. These products work well on foam and fabrics to foam, wood, supported vinyl, cardboard and other porous substrates. Some products may not perform well on direct spray overhead applications due to low initial green strength; however, some technical data sheets claim instant bond strength after application. Most waterborne top and trim adhesives have little or no tack and release capability, which may affect applications where materials need to be repositioned as in curvature bonding. Bonding to rubber, metal or plastic is also difficult. Some are prone to fabric staining through bleed-through; users should consult manufacturers' specification data to determine substrate compatibility.

Since the dry time of waterborne contact adhesives is longer, open time can be reduced by the addition of a salt activator. The waterborne adhesives have greater solids content (50 to 60 percent by volume). It is generally true that when applying a waterborne adhesive, one of the two adjoining substrates must be porous to allow the water to evaporate. 3M, Simalfa, and Casa Adhesive Systems manufacture a host of compliant waterborne adhesives that are being used in Original Equipment Manufacturer (OEM) facilities. The following company is using two of them today:

Known Conversion

✓ **El Kapitan Vans**

El Kapitan Vans is a van conversion facility located in Westminster, CA. Stock vans are customized to fit individual requirements. El Kapitan uses both an activated waterborne polychloroprene and a single component latex adhesive to install various trim materials to metal, synthetic foam rubbers, and wood. Examples of this are the application of dense foam rubber padding to metal flooring and wheel wells and carpeting to the rubber padding, headliner material to molded plastic foam shells and various wood surfaces to foam backed vinyl or leather trim. In each case, at least one of the surfaces is porous.

The conversion to waterborne adhesives has not been simple as the adhesive is very aggressive and cannot be repositioned without reapplying additional adhesive. Precision placement of trim materials is necessary around contours. Cold day applications (increased tack time) are overcome with additional activator. The polychloroprene adhesive works best when applied in a mist rather than higher or more complete coverage. This adhesive has been in use for nearly 3 years. The latex adhesive has been in use for a little less than a year, as they find it to work better that the activated product

on their carpet applications. Incidental problem areas are addressed by hand-held aerosol spray adhesive. Hand-held aerosol adhesives are exempt from Rule 1168, but subject to the California Air Resources Board's Consumer Products Regulation.

Acetone-Based Adhesives

Acetone-based contact adhesives are still experimental in nature and stain light colored materials. Neoprene rubber-based cements, which display the necessary heat resistance are not yet viable in the workplace at or below 250 grams of VOC per liter. Attempts to formulate low-VOC acetone-based adhesives with satisfactory performance have yet to be fruitful, in all operations and for all colors of materials. To date, adhesive manufacturers have developed at least four products but have not achieved full marketability in the top and trim industry.

Sovereign Industrial Adhesives has tested several adhesives at a new vehicle convertible top converter in Ventura County4. Some of the formulations are zero VOC acetone-based. 3M also has one product formulated with acetone that is near zero VOC, which had shown promise, yet was found to be unsuitable by the end user. In addition, a canister adhesive (Westech HSC13) is available that is touted by the manufacturer to be excellent for automotive headliners, the VOC content is less than 80 grams per liter. ITW TACC had formulated a high-solids adhesive with acetone, but made the business decision to stop production at this time. Unfortunately, the technical viability of these products is not yet proven, and manufacturers need more time for research, development, and performance testing of products with low-VOC content, but with high volumes of exempt compound.

Known Partial Conversion

✓ **Krystal Koach**

Krystal Koach is a large limousine manufacturer that also manufactures a line of tour buses. Operators of this facility use a variety of hot melt, waterborne, pressure sensitive tapes and acetone-based adhesives for a variety of applications. The most difficult applications are headliner and vinyl top installations. Krystal Koach bonds a zero VOC closed cell foam tape to the roof and follows that with the application of near zero VOC acetone-based contact adhesive to bond supported vinyl fabric to the closed cell foam to form a vinyl top. This adhesive is an acrylonitrile butadiene rubber (NBR), which has inherently high heat resistance of 212°F. The product is described to be repositionable, have good tack time and very high strength when dry. However, due to staining of light colored vinyl top materials and insufficient long term heat resistance, Krystal Koach no longer uses this product. Krystal Koach continues to use activated waterborne neoprene cement and hot melt adhesives in applications where high heat resistance (220°F) is not a factor.

Hot Melts

Sprayable hot melts are typically used for light-duty applications such as application of leather seating and door panel trim and carpeting to metal, vinyl, fiberglass and other plastics. The adhesives are very cost effective compared to standard high-VOC contact adhesives. The material comes in 1¾-inch and 2-inch slugs that melt inside an

[4]Variance Progress Report to the Ventura County Air Pollution Control District, Robbins Auto Top, 5-27-03

accompanying spray tool. Materials display high heat resistance and are available with long and short tack times. Krystal Koach is using a pressure sensitive hot melt technology, but not for areas of the vehicle that are subject to the highest temperature swings.

PVC and CPVC Welding

These products provide the mechanism for bonding same substrate materials such as plastic plumbing and electrical parts and plastic sheeting together by direct fusing to form a leak-tight continuous joint. Both plastic types typically require the use of a primer to soften the joint areas prior to the application of the cement. The finished plastic piping systems deliver drinking and irrigation water, discharge and vent sewage, transport liquid chemicals, and act as a conduit for electric and telephone wiring. Building and Uniform Plumbing codes mandate that International Association of Plumbing and Mechanical Officials (IAPMO) specifications be met. American Society for Testing and Materials (ASTM) and Nation Sanitation Foundation (NSF) requirements set the basis for IAPMO approval.

Since these products are exposed to drinking water, ASTM standards allow the use of a few organic compounds. Allowable compounds include the following: tetrahydrofuran, methyl ethyl ketone, cyclohexanone, and acetone. Acetone is an exempt compound and reduces the VOC content of adhesive formulations; however, there are certain solubility limits that restrict the total volume of acetone that can be added to a specific formulation, which in turn limits the benefit of VOC content reduction once the volume of acetone is subtracted out. High quantities of acetone cause surface crazing, a phenomenon that is not conducive to proper welding. Plastic pipe and pipefittings must be dissolved with a primer to soften the joint before application of the cement. Acetone is the only approved exempt compound under NSF ruling and it does not dissolve PVC or CPVC. Furthermore, in order for the joint to have durability, 20 to 25 percent of the reactive diluent must remain in the assembly to provide proper wetting. To date, newer formulations containing more acetone result in applications that do not meet ASTM requirements. This also applies to the primer. Solvent cement manufacturers have unsuccessfully spent approximately 11 years trying to formulate low-VOC cements and primers that meet applicable standards.

During the promulgation of the June 7, 2002 amendments, staff was hopeful that an adhesive technology (specifically epoxy) could replace solvent welding. Laboratory tests on such products show high bond strengths (lap shears) after 16 hours. However, there is no apparent penetration and softening of the PVC by the adhesive and this may interfere with long-term performance. Hydrostatic pressure burst testing also shows failure after two hours, indicative of failure under higher pressures. The requirement under ASTM 2564 standards is withstanding a pressure of 400 psig. In addition, epoxies showed the potential for constricted flow paths due to the configuration of the designed taper of pipefittings and the relative high viscosity of the epoxy adhesive. Two-component mixes are also more challenging to work with compared to one component solvent cements offered today. To date, staff cannot identify lower-VOC adhesives that can be used to adequately bond PVC and CPVC pipes and pipefittings, that meet Rule 1168 technological forcing limits, and only slight reductions are available in primers.

Water-based formulations have also been tried and were found to lead to excessive dry times and low bond strength; water has a high surface tension while the surface tension of rigid

plastic is low. Therefore, the ability of waterborne products to adequately wet the surface and provide the mechanism for welding is considered to be inadequate at this time.

Staff has determined that the current limits of 510 grams of VOC per liter for PVC welding and 490 grams of VOC per liter for CPVC welding represent reasonably available control technology limits.

~~However, reformulation of adhesives used in ABS welding will partially offset the emission reductions foregone from VOC content reductions not realized by PVC and CPVC welding systems including primers. Specifically, reformulated ABS welding products are now 325 grams per liter, reduced from 400 grams per liter. New VOC regulation for PVC/CPVC primers can be set at 550 grams per liter from 650 grams per liter, but not retained at 250 grams of VOC per liter. New PVC/CPVC primer and ABS cements at 550 and 325 grams of VOC per liter, respectively, will be available from the two largest manufacturers of these products for both industrial and architectural applications by January 1, 2005.~~ Previously, information was provide to staff that PVC/CPVC primer and ABS cements at 550 and 325 grams of VOC per liter, respectively, would be available from the two largest manufacturers of these products for both industrial and architectural applications by the first of the year. Based on this information, staff proposed a compliance date of January 1, 2005, for the lower VOC primers and ABS cements. However, in mid November 2004, one of the manufacturers requested an additional six months to complete the certification process for its primer under the NSF standards and make it available in the marketplace. In order to ease the transition into the marketplace for both lower-VOC primer and ABS cement, staff now recommends establishing a compliance date of July 1, 2005, for the lower VOC limits for PVC/CPVC primer and ABS cement. A one-year sell-through and use of cements and primers meeting the existing limits will also help cover the transition period.

Other Plastic Welding – Methylene Chloride

Acrylic, polycarbonate, and polyethylene terephalate glycol plastic (PETG) sheeting is used to build various plastic items. Among these are card deck shoes, food bins, aquariums, trophies and display cases of all kinds. Typical assemblies are cut from sheet acrylic, polycarbonate into specified geometries, dry fitted and welded in place with a syringe applicator. The solution, which contains large percentages of methylene chloride, wicks under the adjoining surfaces, fusing them together. The process from welding to packaging takes 15 to 20 minutes. Exempt compounds, such as acetone, do not provide the degree of solvation that methylene chloride does and results in weak bonds. However, manufacturers have replaced some of the total mix with methyl acetate (an exempt compound) resulting in lower concentrations of methylene chloride. The formulations now contain roughly 40 to 60 percent by weight of methylene chloride, depending on the viscosity of the applied cement (light, medium or heavily bodied cements).

As part of the July 7, 2002 amendments to Rule 1168, staff recognized that phasing out the use of methylene chloride based solvent cements for hard plastic may be difficult to achieve by reformulation. Efforts by manufacturers of these adhesives over the last two years have resulted in reducing the maximum methylene chloride content to 60 percent by weight, down from 91 percent in the original formulation. The inferior performance of substitute products compared to methylene chloride makes a complete phase out of methylene chloride

in this specific application infeasible. However, the maximum annual use of such solvent welding products for each end user is quite small because a syringe full of solvent welding material can weld many parts. To limit health risk associated with the use of these products, staff proposes to limit the methylene chloride content of these adhesives to 60 percent by weight and proposes to restrict the sales to and use by any single facility to 20 gallons per year of methylene chloride containing products used for solvent welding of acrylic, polycarbonate and PETG plastics. This estimates the current maximum annual usage of larger fabricators. Emissions from existing sources at this level are well within current health-based standards using a "worst-case" scenario for an impacted receptor.

CHAPTER 3

EXISTING SETTING

Introduction
Air Quality
Affected Sources

INTRODUCTION

In order to determine the significance of the impacts associated with a proposed project, it is necessary to evaluate the project's impacts against the backdrop of the environment as it exists at the time the NOP/IS is published. The CEQA Guidelines defines "environment" as "the physical conditions that exist within the area which will be affected by a proposed project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historical or aesthetic significance" (CEQA Guidelines §15360; see also Public Resources Code §21060.5). Furthermore, a CEQA document must include a description of the physical environment in the vicinity of the project, as it exists at the time the notice of preparation is published, from both a local and regional perspective (CEQA Guidelines §15125). Therefore, the "environment" or "existing setting" against which a project's impacts are compared consists of the immediate, contemporaneous physical conditions at and around the project site (Remy, et al; 1996).

The following sections summarize the existing setting for air quality which is the only environmental area that may be adversely affected by proposed amended Rule 1168. An overview of air quality in the district is given below. A more complete discussion of current and projected future air quality in the district, with and without additional control measures can be found in the 2003 Final Program EIR for the 2003 AQMP (Chapters 3 and 4). The Final Program EIR for the 2003 AQMP contains more comprehensive information on existing and projected environmental settings for all environmental areas discussed in this chapter. Copies of the above-referenced documents are available from the SCAQMD's Public Information Center by calling (909) 396-2039.

AIR QUALITY

Criteria Pollutants

It is the responsibility of the SCAQMD to ensure that state and federal ambient air quality standards are achieved and maintained in its geographical jurisdiction. Health-based air quality standards have been established by California and the federal government for the following criteria air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), particulate matter less than 10 microns (PM10), particulate matter less than 2.5 microns (PM2.5), and lead. These standards were established to protect sensitive receptors with a margin of safety from adverse health impacts due to exposure to air pollution. The California standards are more stringent than the federal standards and in the case of PM10 and SO2, far more stringent. California has also established standards for sulfates, visibility reducing particles, hydrogen sulfide, and vinyl chloride. The state ambient air quality standards and NAAQS for each of these pollutants and their effects on health are summarized in Table 3-1.

The SCAQMD monitors levels of various criteria pollutants at 32 monitoring stations. The 2002 air quality data from SCAQMD's monitoring stations are presented in Table 3-2.

Table 3-1
State and Federal Ambient Air Quality Standards

AIR POLLUTANT	STATE STANDARD	FEDERAL PRIMARY STANDARD	MOST RELEVANT EFFECTS
	CONCENTRATION, AVERAGING TIME		
Carbon Monoxide (CO)	20 ppm, 1-hour average > 9 ppm, 8-hour average >	35 ppm, 1-hour average > 9.5 ppm, 8-hour average <=	(a) Aggravation of angina pectoris and other aspects of coronary heart disease; (b) Decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (c) Impairment of central nervous system functions; and, (d) Possible increased risk to fetuses.
Ozone (O_3)	0.09 ppm, 1-hour average >	0.12 ppm, 1-hour average > 0.08 ppm, 8-hour average >	(a) Short-term exposures: 1) Pulmonary function decrements and localized lung edema in humans and animals; and, 2) Risk to public health implied by alterations in pulmonary morphology and host defense in animals; (b) Long-term exposures: Risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans; (c) Vegetation damage; and, (d) Property damage.
Nitrogen Dioxide (NO_2)	0.25 ppm, 1-hour average >	0.0534 ppm, AAM >	(a) Potential to aggravate chronic respiratory disease and respiratory symptoms in sensitive groups; (b) Risk to public health implied by pulmonary and extra-pulmonary biochemical and cellular changes and pulmonary structural changes; and, (c) Contribution to atmospheric discoloration.

KEY:

ppm = parts per million parts of air, by volume	AAM = Annual Arithmetic Mean
$\mu g/m^3$ = micrograms per cubic meter	AGM = Annual Geometric Mean

Table 3-1 (concluded)
State and Federal Ambient Air Quality Standards

AIR POLLUTANT	STATE STANDARD	FEDERAL PRIMARY STANDARD	MOST RELEVANT EFFECTS
	CONCENTRATION, AVERAGING TIME		
Sulfur Dioxide (SO_2)	0.25 ppm, 1-hour average > 0.04 ppm, 24-hour average >	0.03 ppm, AAM > 0.14 ppm, 24-hour average >	(a) Bronchoconstriction accompanied by symptoms which may include wheezing, shortness of breath and chest tightness, during exercise or physical activity in persons with asthma.
Suspended Particulate Matter (PM10)	20 $\mu g/m^3$, AAM > 50 $\mu g/m^3$, 24-hour average >	50 $\mu g/m^3$, AAM > 150 $\mu g/m^3$, 24-hour average >	(a) Excess deaths from short-term exposures and exacerbation of symptoms in sensitive patients with respiratory disease; and (b) Excess seasonal declines in pulmonary function, especially in children.
Suspended Particulate Matter (PM2.5)	12 $\mu g/m^3$, AAM >	15 $\mu g/m^3$, AAM > 65 $\mu g/m^3$, 24-hour average >	(a) Increased hospital admissions and emergency room visits for heart and lung disease; (b) Increased respiratory symptoms and disease; and (c) Decreased lung functions and premature death.
Lead	1.5 $\mu g/m^3$, 30-day average >=	1.5 $\mu g/m^3$, calendar quarterly average >	(a) Increased body burden; and (b) Impairment of blood formation and nerve conduction.
Sulfates (SOx)	25 $\mu g/m^3$, 24-hour average >=		(a) Decrease in ventilatory function; (b) Aggravation of asthmatic symptoms; (c) Aggravation of cardio-pulmonary disease; (d) Vegetation damage; (e) Degradation of visibility; and, (f) Property damage.
Visibility-Reducing Particles	In sufficient amount to give an extinction coefficient >0.23 inverse kilometers (visual range to less than 10 miles) with relative humidity less than 70 percent, 8-hour average (10am – 6pm PST)		Nephelometry and AISI Tape Sampler; instrumental measurement on days when relative humidity is less than 70 percent.
Hydrogen Sulfide	0.03 ppm, 1-hour average >=		Odor annoyance.
Vinyl Chloride	0.010 ppm, 24-hour average >=		Known carcinogen.

KEY:

ppm = parts per million parts of air, by volume	AAM = Annual Arithmetic Mean
$\mu g/m^3$ = micrograms per cubic meter	AGM = Annual Geometric Mean

Table 3-2
2003 Air Quality Data – South Coast Air Quality Management District

CARBON MONOXIDE (CO)						
					No. Days Standard Exceeded[a]	
Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Max. Conc. (ppm, 1-hour)	Max. Conc. (ppm, 8-hour)	Federal ≥ 9.5 ppm, 8-hour	State > 9.0 ppm, 8-hour
LOS ANGELES COUNTY (Co)						
1	Central Los Angeles	365	6	4.6	0	0
2	Northwest Coast Los Angeles Co	365	5	2.7	0	0
3	Southwest Coast Los Angeles Co	361	7	5.0	0	0
4	South Coast Los Angeles Co	363	6	4.7	0	0
6	West San Fernando Valley	365	6	4.1	0	0
7	East San Fernando Valley	349	5*	4.7*	0*	0*
8	West San Fernando Valley	365	5	3.8	0	0
9	East San Gabriel Valley 1	365	5	2.6	0	0
9	East San Gabriel Valley 2	357	3	2.1	0	0
10	Pomona/Walnut Valley	365	6	4.4	0	0
11	South San Gabriel Valley	365	5	4.0	0	0
12	South Central Los Angeles Co	362	12	7.3	0	0
13	Santa Clarita Valley	363	3	1.7	0	0
ORANGE COUNTY						
16	North Orange County	365	8	4.1	0	0
17	Central Orange County	365	6	3.9	0	0
18	North Coastal Orange County	365	7	5.8	0	0
19	Saddleback Valley	362	3	1.8	0	0
RIVERSIDE COUNTY						
22	Norco/Corona	--	--	--	--	--
23	Metropolitan Riverside County 1	365	5	3.7	0	0
23	Metropolitan Riverside County 2	360	5	3.4	0	0
24	Perris Valley	--	--	--	--	--
25	Lake Elsinore	345	4*	1.3*	0*	0*
29	Banning Airport	--	--	--	--	--
30	Coachella Valley 1**	339	3*	1.3*	0*	0*
30	Coachella Valley 2**	--	--	--	--	--
SAN BERNARDINO COUNTY						
32	NW San Bernardino Valley	363	4	2.9	0	0
33	SW San Bernardino Valley	--	--	--	--	--
34	Central San Bernardino Valley 1	--	--	--	--	--
34	Central San Bernardino Valley 2	365	5	4.6	0	0
35	East San Bernardino Valley	--	--	--	--	--
37	Central San Bernardino Mountains	--	--	--	--	--
38	East San Bernardino Mountains	--	--	--	--	--
DISTRICT MAXIMUM			12	7.3	0	0
SOUTH COAST AIR BASIN			12	7.3	0	0

KEY:

ppm = parts per million parts of air, by volume	* Less than 12 full months of data. May not be representative.
-- = Pollutant not monitored	** Salton Sea Air Basin

[a] The federal 1-hour standard (1-hour average CO > 35 ppm) and state 1-hour standard (1-hour average CO > 20 ppm) were not exceeded.

Table 3-2 (Continued)
2003 Air Quality Data – South Coast Air Quality Management District

OZONE (O_3)									
							No. Days Standard Exceeded		
							Federal		State
Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Max. Conc. (ppm, 1-hour)	Max. Conc. (ppm, 8-hour)	Fourth Highest Conc. (ppm, 8-hour)	Health Advisory ≥ 0.15 ppm, 1-hour	> 0.12 ppm, 1-hour	> 0.08 ppm, 8-hour	> 0.09 ppm, 1-hour
LOS ANGELES (LA) COUNTY (Co)									
1	Central LA	365	0.152	0.088	0.083	1	1	2	11
2	NW Coast LA Co	365	0.134	0.105	0.083	0	1	1	11
3	SW Coast LA Co	365	0.110	0.078	0.073	0	0	0	2
4	South Coast LA Co	365	0.099	0.071	0.063	0	0	0	1
6	W San Fernando Valley	365	0.179	0.129	0.119	1	14	49	68
7	E San Fernando Valley	341	0.134*	0.108*	0.097*	0*	4*	20*	37*
8	W San Fernando Valley	365	0.152	0.108	0.103	1	7	28	44
9	E San Gabriel Valley 1	365	0.150	0.124	0.107	1	11	21	40
9	E San Gabriel Valley 2	365	0.162	0.134	0.123	7	22	41	61
10	Pomona/Walnut Valley	365	0.161	0.123	0.109	3	13	24	39
11	S San Gabriel Valley	364	0.128	0.097	0.084	0	1	2	18
12	South Central LA Co	361	0.081	0.063	0.059	0	0	0	0
13	Santa Clarita Valley	363	0.194	0.152	0.137	15	35	69	89
ORANGE (OR) COUNTY (Co)									
16	North OR Co	365	0.165	0.087	0.082	1	1	2	7
17	Central OR Co	365	0.136	0.087	0.082	0	2	1	11
18	North Coastal OR Co	364	0.107	0.088	0.080	0	0	1	4
19	Saddleback Valley	362	0.153	0.105	0.097	1	4	8	16
RIVERSIDE (RV) COUNTY (Co)									
22	Norco/Corona	--	--	--	--	--	--	--	--
23	Metropolitan RV Co 1	365	0.169	0.140	0.123	4	18	62	56
23	Metropolitan RV Co 2	--	--	--	--	--	--	--	--
24	Perris Valley	357	0.155	0.121	0.119	1	7	47	59
25	Lake Elsinore	345	0.154*	0.137*	0.113*	2*	7*	35*	52
29	Banning Airport	365	0.166	0.146	0.127	3	27	63	64
30	Coachella Valley 1**	359	0.141	0.111	0.108	0	4	44	49
30	Coachella Valley 2**	365	0.123	0.105	0.102	0	0	19	24
SAN BERNARDINO (SB) COUNTY									
32	Northwest SB Valley	365	0.155	0.134	0.116	2	15	35	48
33	Southwest SB Valley	--	--	--	--	--	--	--	--
34	Central SB Valley 1	351	0.176	0.148	0.134	7	26	48	65
34	Central SB Valley 2	358	0.160	0.137	0.123	4	19	45	59
35	East SB Valley	365	0.174	0.153	0.138	12	38	72	91
37	Central SB Mountains	341	0.163*	0.142*	0.130*	6*	34*	74*	84*
38	East SB Mountains	--	--	--	--	--	--	--	--
DISTRICT MAXIMUM			0.194	0.153	0.138	15	38	74	91
SOUTH COAST AIR BASIN			0.194	0.153	0.138	36	68	119	133

KEY:

ppm = parts per million parts of air, by volume	* Less than 12 full months of data. May not be representative.
-- = Pollutant not monitored	** Salton Sea Air Basin

Table 3-2 (Continued)
2003 Air Quality Data – South Coast Air Quality Management District

NITROGEN DIOXIDE (NO_2)				
Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Max. Conc. (ppm, 1-hour[b])	Annual Average[b] AAM Conc. (ppm)
LOS ANGELES COUNTY				
1	Central Los Angeles	361	0.16	0.0338
2	Northwest Coast Los Angeles County	352	0.12	0.0231
3	Southwest Coast Los Angeles County	363	0.12	0.0238
4	South Coast Los Angeles County	341	0.14*	0.0288*
6	West San Fernando Valley	364	0.13*	0.0260*
7	East San Fernando Valley	344	0.14*	0.0356*
8	West San Fernando Valley	356	0.14	0.0322
9	East San Gabriel Valley 1	347	0.12*	0.0296*
9	East San Gabriel Valley 2	361	0.12	0.0271
10	Pomona/Walnut Valley	365	0.12	0.0352
11	South San Gabriel Valley	360	0.14	0.0353
12	South Central Los Angeles County	356	0.13	0.0312
13	Santa Clarita Valley	363	0.12	0.0221
ORANGE COUNTY				
16	North Orange County	361	0.16	0.0284
17	Central Orange County	362	0.13	0.0240
18	North Coastal Orange County	362	0.11	0.0199
19	Saddleback Valley	--	--	--
RIVERSIDE COUNTY				
22	Norco/Corona	--	--	--
23	Metropolitan Riverside County 1	360	0.09	0.0217
23	Metropolitan Riverside County 2	--	--	--
24	Perris Valley	--	--	--
25	Lake Elsinore	328	0.08*	0.0182*
29	Banning Airport	346	0.09*	0.0193*
30	Coachella Valley 1**	347	0.06*	0.0173*
30	Coachella Valley 2**	--	--	--
SAN BERNARDINO COUNTY				
32	Northwest San Bernardino Valley	363	0.11	0.0349
33	Southwest San Bernardino Valley	--	--	--
34	Central San Bernardino Valley 1	355	0.12	0.0307
34	Central San Bernardino Valley 2	362	0.10	0.0270
35	East San Bernardino Valley	--	--	--
37	Central San Bernardino Mountains	--	--	--
38	East San Bernardino Mountains	--	--	--
DISTRICT MAXIMUM			0.16	0.0356
SOUTH COAST AIR BASIN			0.16	0.0356

KEY:

ppm = parts per million parts of air, by volume	* Less than 12 full months of data. May not be representative.
AAM = Annual Arithmetic Mean	** Salton Sea Air Basin
-- = Pollutant not monitored	

[b] The state standard (1-hour average NO_2 > 0.25 ppm) and the federal standard (AAM NO_2 > 0.0534 ppm) were not exceeded.

Table 3-2 (Continued)
2003 Air Quality Data – South Coast Air Quality Management District

SULFUR DIOXIDE (SO_2)				
Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Maximum Concentration[c] (ppm, 1-hour)	Maximum Concentration[c] (ppm, 24-hour)
LOS ANGELES COUNTY				
1	Central Los Angeles	349	0.05*	0.006*
2	Northwest Coast Los Angeles County	--	--	--
3	Southwest Coast Los Angeles County	365	0.03	0.006
4	South Coast Los Angeles County	361	0.03	0.008
6	West San Fernando Valley	--	--	--
7	East San Fernando Valley	338	0.01*	0.005*
8	West San Fernando Valley	--	--	--
9	East San Gabriel Valley 1	--	--	--
9	East San Gabriel Valley 2	--	--	--
10	Pomona/Walnut Valley	--	--	--
11	South San Gabriel Valley	--	--	--
12	South Central Los Angeles County	--	--	--
13	Santa Clarita Valley	--	--	--
ORANGE COUNTY				
16	North Orange County	--	--	--
17	Central Orange County	--	--	--
18	North Coastal Orange County	354	0.02	0.012
19	Saddleback Valley	--	--	--
RIVERSIDE COUNTY				
22	Norco/Corona	--	--	--
23	Metropolitan Riverside County 1	363	0.02	0.012
23	Metropolitan Riverside County 2	--	--	--
24	Perris Valley	--	--	--
25	Lake Elsinore	--	--	--
29	Banning Airport	--	--	--
30	Coachella Valley 1**	--	--	--
30	Coachella Valley 2**	--	--	--
SAN BERNARDINO COUNTY				
32	Northwest San Bernardino Valley	--	--	--
33	Southwest San Bernardino Valley	--	--	--
34	Central San Bernardino Valley 1	361	0.01	0.004
34	Central San Bernardino Valley 2	--	--	--
35	East San Bernardino Valley	--	--	--
37	Central San Bernardino Mountains	--	--	--
38	East San Bernardino Mountains			
DISTRICT MAXIMUM			0.05	0.012
SOUTH COAST AIR BASIN			0.05	0.012

KEY:

ppm = parts per million parts of air, by volume	* Less than 12 full months of data. May not be representative.
AAM = Annual Arithmetic Mean	** Salton Sea Air Basin
-- = Pollutant not monitored	

[c] The state standards (1-hour average SO_2 > 0.25 ppm and 24-hour average SO_2 > 0.04 ppm) and the federal standards (AAM SO_2 > 0.03 ppm, 24-hour average SO_2 > 0.14 ppm, and 3-hour average SO_2 > 0.50 ppm) were not exceeded.

Table 3-2 (Continued)
2003 Air Quality Data – South Coast Air Quality Management District

SUSPENDED PARTICULATE MATTER PM10 [d]						
				No. (%) Samples Exceeding Standard		
Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Max. Conc. ($\mu g/m^3$, 24-hour)	Federal > 150 $\mu g/m^3$, 24-hour	State > 50 $\mu g/m^3$, 24-hour	Annual Average[e] AAM Conc. ($\mu g/m^3$)
LOS ANGELES COUNTY (Co)						
1	Central Los Angeles	61	81	0	6(9.8)	34.6
2	NW Coast Los Angeles County	--	--	--	--	--
3	SW Coast Los Angeles County	61	58	0	3(4.9)	29.7
4	South Coast Los Angeles County	61	63	0	4(6.6)	32.8
6	West San Fernando Valley	--	--	--	--	--
7	East San Fernando Valley	50	81*	0*	7(14.0)*	38.1*
8	West San Fernando Valley	--	--	--	--	--
9	East San Gabriel Valley 1	60	119	0	21(35.0)	44.4
9	East San Gabriel Valley 2	--	--	--	--	--
10	Pomona/Walnut Valley	--	--	--	--	--
11	South San Gabriel Valley	--	--	--	--	--
12	South Central Los Angeles County	--	--	--	--	--
13	Santa Clarita Valley	61	72	0	10(16.4)	31.8
ORANGE COUNTY						
16	North Orange County	--	--	--	--	--
17	Central Orange County	61	96	0	6(9.8)	32.7
18	North Coastal Orange County	--	--	--	--	--
19	Saddleback Valley	57	64	0	2(3.5)	26.7
RIVERSIDE COUNTY						
22	Norco/Corona	58	116	0	15(25.9)	40.5
23	Metropolitan Riverside County 1	109	164	2(1.8)	62(56.9)	56.9
23	Metropolitan Riverside County 2	--	--	--	--	--
24	Perris Valley	58	142	0	19(32.8)	43.9
25	Lake Elsinore	--	--	--	--	--
29	Banning Airport	60	79	0	9(15.0)	29.0
30	Coachella Valley 1**	60	108	0	4(6.7)	27.1
30	Coachella Valley 2**	112	124+	0+	47(42.0)+	50.2+
SAN BERNARDINO COUNTY						
32	NW San Bernardino Valley	--	--	--	--	--
33	SW San Bernardino Valley	62	149	0	18(29.0)	42.9
34	Central San Bernardino Valley 1	50	101*	0*	27(54.0)*	47.2*
34	Central San Bernardino Valley 2	59	98	0	23(39.0)	44.9
35	East San Bernardino Valley	58	92	0	15(25.9)	37.0
37	Central San Bernardino Mountains	50	47*	0*	0*	25.6*
38	East San Bernardino Mountains	--	--	--	--	--
DISTRICT MAXIMUM			164	2	62	56.9
SOUTH COAST AIR BASIN			164	2	69	56.9

KEY:

$\mu g/m^3$ = micrograms per cubic meter	-- = Pollutant not monitored
AAM = Annual Arithmetic Mean	** Salton Sea Air Basin

d PM10 samples were collected every six days at all sites except for Station Numbers 4144 and 4157 where samples were collected every three days.

e The federal standard is AAM PM10 > 50 $\mu g/m^3$ and the state standard is AAM PM10 > 20 $\mu g/m^3$ (replaced the annual geometric mean AGM PM10 > 30 $\mu g/m^3$ effective July 5, 2003).

+ The data for five samples collected on high-wind days (178 $\mu g/m^3$ on 01/06/03, 132 $\mu g/m^3$ on 02/02/03, 227 $\mu g/m^3$ on 05/15/03, 148 $\mu g/m^3$ on 06/20/03, and 309 $\mu g/m^3$ on 06/23/03 were excluded in accordance with EPA's Natural Events Policy.

Table 3-2 (Continued)
2003 Air Quality Data – South Coast Air Quality Management District

SUSPENDED PARTICULATE MATTER PM2.5[f]					
				No. (%) Samples Exceeding Standard	Annual Averages[g]
Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Max. Conc. ($\mu g/m^3$, 24-hour)	Federal > 65 $\mu g/m^3$, 24-hour	AAM Conc. ($\mu g/m^3$)
LOS ANGELES COUNTY					
1	Central Los Angeles	330	83.7	5(1.5)	21.3
2	Northwest Coast Los Angeles County	--	--	--	--
3	Southwest Coast Los Angeles County	--	--	--	--
4	South Coast Los Angeles County	324	115.2	3(0.9)	18.0
6	West San Fernando Valley	115	47.5	0	16.4
7	East San Fernando Valley	92	120.6	1(1.1)	20.9
8	West San Fernando Valley	110	89.0	1(0.9)	18.6
9	East San Gabriel Valley 1	314	121.2	3(1.0)	19.2
9	East San Gabriel Valley 2	--	--	--	--
10	Pomona/Walnut Valley	--	--	--	--
11	South San Gabriel Valley	111	90.3	1(0.9)	20.6
12	South Central Los Angeles County	117	54.8	0	20.2
13	Santa Clarita Valley	--	--	--	--
ORANGE COUNTY					
16	North Orange County	--	--	--	--
17	Central Orange County	340	115.5	3(0.9)	17.3
18	North Coastal Orange County	--	--	--	--
19	Saddleback Valley	109	50.6	0	13.1
RIVERSIDE COUNTY					
22	Norco/Corona	--	--	--	--
23	Metropolitan Riverside County 1	350	104.3	8(2.3)	24.9
23	Metropolitan Riverside County 2	116	73.3	1(0.9)	22.6
24	Perris Valley	--	--	--	--
25	Lake Elsinore	--	--	--	--
29	Banning Airport	--	--	--	--
30	Coachella Valley 1**	112	21.2	0	9.0
30	Coachella Valley 2**	118	26.8	0	11.4
SAN BERNARDINO COUNTY					
32	Northwest San Bernardino Valley	--	--	--	--
33	Southwest San Bernardino Valley	118	88.9	3(2.5)	23.8
34	Central San Bernardino Valley1	111	98.1	1(0.9)	21.8
34	Central San Bernardino Valley2	119	73.9	1(0.8)	22.2
35	East San Bernardino Valley	--	--	--	--
37	Central San Bernardino Mountains	--	--	--	--
38	East San Bernardino Mountains	55	35.0	0	10.5
DISTRICT MAXIMUM			121.2	8	24.9
SOUTH COAST AIR BASIN			121.2	14	24.9

KEY:

$\mu g/m^3$ = micrograms per cubic meter	-- = Pollutant not monitored
AAM = Annual Arithmetic Mean	** Salton Sea Air Basin

f PM2.5 samples were collected every three days at all sites except for Station Numbers 060, 072, 087, 3176, and 4144 where samples were taken every day, and Station Number 5818 where samples were taken every six days.

g The federal standard is AAM PM2.5 > 15 $\mu g/m^3$ and the state standard is AAM PM2.5 > 12 $\mu g/m^3$ (new standard, established July 5, 2003).

Table 3-2 (Continued)
2003 Air Quality Data – South Coast Air Quality Management District

TOTAL SUSPENDED PARTICULATES TSP [h]				
Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Max. Conc. ($\mu g/m^3$, 24-hour)	Annual Average AAM Conc. ($\mu g/m^3$)
LOS ANGELES COUNTY (Co)				
1	Central Los Angeles	61	157	73.5
2	Northwest Coast Los Angeles Co	59	114	49.4
3	Southwest Coast Los Angeles Co	61	122	56.7
4	South Coast Los Angeles Co	64	159	63.9
6	West San Fernando Valley	--	--	--
7	East San Fernando Valley	--	--	--
8	West San Fernando Valley	59	111	54.3
9	East San Gabriel Valley 1	55	176	83.9
9	East San Gabriel Valley 2	--	--	--
10	Pomona/Walnut Valley	--	--	--
11	South San Gabriel Valley	60	160	75.4
12	South Central Los Angeles Co	60	449	105.2
13	Santa Clarita Valley	--	--	--
ORANGE COUNTY				
16	North Orange County	--	--	--
17	Central Orange County	--	--	--
18	North Coastal Orange County	--	--	--
19	Saddleback Valley	--	--	--
RIVERSIDE COUNTY				
22	Norco/Corona	--	--	--
23	Metropolitan Riverside County 1	58	283	105.6
23	Metropolitan Riverside County 2	60	225	85.0
24	Perris Valley	--	--	--
25	Lake Elsinore	--	--	--
29	Banning Airport	--	--	--
30	Coachella Valley 1**	--	--	--
30	Coachella Valley 2**	--	--	--
SAN BERNARDINO COUNTY				
32	NW San Bernardino Valley	60	269	69.6
33	SW San Bernardino Valley	--	--	--
34	Central San Bernardino Valley 1	59	335	119.8
34	Central San Bernardino Valley 2	60	242	97.8
35	East San Bernardino Valley	--	--	--
37	Central San Bernardino Mountains	--	--	--
38	East San Bernardino Mountains	--	--	--
DISTRICT MAXIMUM			449	119.8
SOUTH COAST AIR BASIN			449	119.8

KEY:

$\mu g/m^3$ = micrograms per cubic meter	-- = Pollutant not monitored
AAM = Annual Arithmetic Mean	** Salton Sea Air Basin

h Total suspended particulates, lead, and sulfates were determined from samples collected every six days by the high volume sampler method, on glass fiber filter media.

Table 3-2 (Concluded)
2003 Air Quality Data – South Coast Air Quality Management District

		LEAD [i]		SULFATES (SOx) [i]	
Source Receptor Area No.	Location of Air Monitoring Station	Max. Monthly Average Conc.[j] ($\mu g/m^3$)	Max. Quarterly Average Conc.[j] ($\mu g/m^3$)	Max. Conc. ($\mu g/m^3$, 24-hour)	No. (%) Samples Exceeding State Standard ≥ 25 $\mu g/m^3$, 24-hour
LOS ANGELES COUNTY (Co)					
1	Central Los Angeles	0.15	0.15	14.6	0
2	Northwest Coast Los Angeles Co	--	--	14.3	0
3	Southwest Coast Los Angeles Co	0.17	0.10	16.4	0
4	South Coast Los Angeles Co	--	0.05	17.8	0
6	West San Fernando Valley	--	--	--	--
7	East San Fernando Valley	--	--	--	--
8	West San Fernando Valley	--	--	12.7	0
9	East San Gabriel Valley 1	--	--	11.7	0
9	East San Gabriel Valley 2	--	--	--	--
10	Pomona/Walnut Valley	--	--	--	--
11	South San Gabriel Valley	0.05	0.04	14.4	0
12	South Central Los Angeles Co	0.04	0.04	14.9	0
13	Santa Clarita Valley	--	--	--	--
ORANGE COUNTY					
16	North Orange County	--	--	--	--
17	Central Orange County	--	--	--	--
18	North Coastal Orange County	--	--	--	--
19	Saddleback Valley	--	--	--	--
RIVERSIDE COUNTY					
22	Norco/Corona	--	--	--	--
23	Metropolitan Riverside County 1	0.02	0.02	10.1	0
23	Metropolitan Riverside County 2	0.02	0.01	10.0	0
24	Perris Valley	--	--	--	--
25	Lake Elsinore	--	--	--	--
29	Banning Airport	--	--	--	--
30	Coachella Valley 1**	--	--	--	--
30	Coachella Valley 2**	--	--	--	--
SAN BERNARDINO COUNTY					
32	NW San Bernardino Valley	0.02	0.02	11.8	0
33	SW San Bernardino Valley	--	--	--	--
34	Central San Bernardino Valley 1	--	--	11.9	0
34	Central San Bernardino Valley 2	0.14	0.08	12.1	0
35	East San Bernardino Valley	--	--	--	--
37	Central San Bernardino Mountains	--	--	--	--
38	East San Bernardino Mountains	--	--	--	--
DISTRICT MAXIMUM		0.17	0.15	17.8	0
SOUTH COAST AIR BASIN		0.17	0.15	17.8	0

KEY:

$\mu g/m^3$ = micrograms per cubic meter	** Salton Sea Air Basin
-- = Pollutant not monitored	

i Total suspended particulates, lead, and sulfate were determined from samples collected every six days by the high volume sampler method, on glass fiber filter media.

j The federal standard (quarterly average lead > 1.5 $\mu g/m^3$) and the state standard (monthly average lead ≥ 1.5 $\mu g/m^3$) were not exceeded. In 2003, special monitoring immediately downwind of stationary sources of lead was carried out at four locations. The maximum monthly average lead concentration measured 0.35 $\mu g/m^3$ and the maximum quarterly average lead concentration measured 0.29 $\mu g/m^3$, both recorded in Central Los Angeles.

Carbon Monoxide

CO is a colorless, odorless gas formed by the incomplete combustion of fuels. CO competes with oxygen, often replacing it in the blood, thus reducing the blood's ability to transport oxygen to vital organs in the body. The ambient air quality standard for carbon monoxide is intended to protect persons whose medical condition already compromises their circulatory systems' ability to deliver oxygen. These medical conditions include certain heart ailments, chronic lung diseases, and anemia. Persons with these conditions have reduced exercise capacity even when exposed to relatively low levels of CO. Fetuses are at risk because their blood has an even greater affinity to bind with CO. Smokers are also at risk from ambient CO levels because smoking increases the background level of CO in their blood.

CO was monitored at 23 locations in the district in 2002. The federal and state eight-hour CO standards were exceeded at one location. The highest eight-hour average CO concentration of the year (10.1 ppm) was 106 percent of the federal standard. Source/Receptor Area No. 12, South Central Los Angeles County (Station No. 084), was the only location to report one day exceedances of both the federal and state CO standards in 2002.

Ozone

Unlike primary criteria pollutants that are emitted directly from an emissions source, ozone is a secondary pollutant. It is formed in the atmosphere through a photochemical reaction of VOC, NOx, oxygen, and other hydrocarbon materials with sunlight.

Ozone is a deep lung irritant, causing the passages to become inflamed and swollen. Exposure to ozone produces alterations in respiration, the most characteristic of which is shallow, rapid breathing and a decrease in pulmonary performance. Ozone reduces the respiratory system's ability to fight infection and to remove foreign particles. People who suffer from respiratory diseases such as asthma, emphysema, and chronic bronchitis are more sensitive to ozone's effects. In severe cases, ozone is capable of causing death from pulmonary edema. Early studies suggested that long-term exposure to ozone results in adverse effects on morphology and function of the lung and acceleration of lung-tumor formation and aging. Ozone exposure also increases the sensitivity of the lung to bronchoconstrictive agents such as histamine, acetylcholine, and allergens.

The national ozone ambient air quality standard is exceeded far more frequently in the SCAQMD's jurisdiction than almost every other area in the United States[5]. In the past few years, ozone air quality has been the cleanest on record in terms of maximum concentration and number of days exceeding the standards and episode levels. Ozone levels were monitored at 28 locations in 2002. Maximum one-hour average and eight-hour average ozone concentrations in 2002 (0.169 ppm and 0.145 ppm) were 141 percent and 181 percent of the federal one-hour and eight-hour standards, respectively. Ozone concentrations exceeded the one-hour state standard at all, but four of the monitored locations in 2002.

In 1997, the EPA promulgated a new NAAQS for ozone. Soon thereafter, a court decision ordered that the EPA could not enforce the new standard until adequate justification for the

[5] It should be noted that in 1999 and 2000 Houston, Texas exceeded the federal ozone standards on more occasions than the district and reported the highest ozone concentrations in the nation.

new standard was provided. The EPA appealed the decision to the Supreme Court. On February 27, 2001, the Supreme Court upheld EPA's authority and methods to establish clean air standards. The Supreme Court, however, ordered EPA to revise its implementation plan for the new ozone standard. Meanwhile, CARB and local air districts continue to collect technical information in order to prepare for an eventual SIP to reduce unhealthful levels of ozone in areas violating the new federal standard. California has previously developed a SIP for the current ozone standard, which has been approved by EPA for the South Coast Air Basin.

Nitrogen Dioxide

NO2 is a brownish gas that is formed in the atmosphere through a rapid reaction of the colorless gas nitric oxide (NO) with atmospheric oxygen. NO and NO2 are collectively referred to as NOx. NO2 can cause health effects in sensitive population groups such as children and people with chronic lung diseases. It can cause respiratory irritation and constriction of the airways, making breathing more difficult. Asthmatics are especially sensitive to these effects. People with asthma and chronic bronchitis may also experience headaches, wheezing and chest tightness at high ambient levels of NO2. NO2 is suspected to reduce resistance to infection, especially in young children.

By 1991, exceedances of the federal standard were limited to one location in Los Angeles County. The Basin was the only area in the United States classified as nonattainment for the federal NO2 standard under the 1990 Clean Air Act Amendments (CAA). No location in the area of SCAQMD's jurisdiction has exceeded the federal standard since 1992 and the South Coast Air Basin was designated attainment for the national standard in 1998. In 2002, 23 stations monitored NO2 levels in the district and the maximum annual arithmetic mean (AAM) was 0.0402 ppm which represents 75 percent of the federal standard (the federal standard is an AAM of NO2 greater than 0.0534 ppm.). The more stringent one-hour state standard (0.25 ppm) was exceeded for one day in Source/Receptor Area No. 7, East San Fernando Valley (Station No. 069) in year 2002. Despite declining NOx emissions over the last decade, further NOx emissions reductions are necessary to ensure no further exceedances of the NO2 standard and because NOx emissions are PM10 and ozone precursors.

Sulfur Dioxide

SO2 is a colorless, pungent gas formed primarily by the combustion of sulfur-containing fossil fuels. Health effects include acute respiratory symptoms and difficulty in breathing for children. In 2002, seven locations monitored SO2 levels and neither the state nor the federal standards were exceeded. Though SO2 concentrations have been reduced to levels well below state and federal standards, further reductions in emissions of SO2 are needed because it is a precursor for sulfates, PM10, and PM2.5.

Particulate Matter (PM10)

PM10 is defined as suspended particulate matter measuring 10 microns or less in diameter and includes a complex mixture of man-made and natural substances including sulfates, nitrates, metals, elemental carbon, sea salt, soil, organics and other materials. PM10 may have adverse health impacts because these microscopic particles are able to penetrate deeply into the respiratory system. In some cases, the particulates themselves may cause actual damage to the alveoli of the lungs or they may contain adsorbed substances that are

injurious. Children can experience a decline in lung function and an increase in respiratory symptoms from PM10 exposure. People with influenza, chronic respiratory disease and cardiovascular disease can be at risk of aggravated illness from exposure to fine particles. Increases in death rates have been statistically linked to corresponding increases in PM10 levels.

In 2003, PM10 was monitored at 19 locations in the district. There were two exceedances of the federal 24-hour standard (150 μg/m3), while the state 24-hour standard (50 μg/m3) was exceeded at all 19 monitored locations. The federal standard (AAM greater than 50 μg/m3) was exceeded in two locations.

Particulate Matter (PM2.5)

In 1997, the USEPA promulgated a new national ambient air quality standard for PM2.5, particulate matter 2.5 microns or less in diameter. The PM2.5 standard is a subset of PM10 such that it complements existing national and state ambient air quality standards that target the full range of inhalable PM10. In addition to the health effects for PM10, additional effects from exposure to PM2.5 may result in increased hospital admissions and emergency room visits for heart and lung disease, increased respiratory symptoms and disease, decreased lung functions, and premature death.

The SCAQMD began regular monitoring of PM2.5 in 1999. In 2003, concentrations of PM2.5 were monitored at 18 locations throughout the district. The federal 24-hour standard (65 $\mu g/m^3$) was exceeded at 12 locations. The federal standard (AAM greater than 15 $\mu g/m^3$) was exceeded in 14 locations, and the state standard (AAM greater than 12 $\mu g/m^3$) was exceeded in 15 locations.

Lead

Lead concentrations once exceeded the state and national ambient air quality standards by a wide margin, but have not exceeded state or federal standards at any regular monitoring station since 1982. Though special monitoring sites immediately downwind of lead sources recorded very localized violations of the state standard in 1994, no violations were recorded at these stations since that time.

Sulfates

Sulfates or SOx are a group of chemical compounds containing the sulfate group, which is a sulfur atom with four oxygen atoms attached. Though not exceeded in 1993, 1996, 1997, and 1998, the 24-hour state sulfate standard (25 $\mu g/m^3$) was exceeded at three locations in 1994 and one location in 1995, 1999, 2000 and 2001. There are no federal air quality standards for sulfate.

Visibility Reducing Particles

Since deterioration of visibility is one of the most obvious manifestations of air pollution and plays a major role in the public's perception of air quality, the state of California has adopted a standard for visibility or visual range. Until 1989, the standard was based on visibility estimates made by human observers. The standard was changed to require measurement of visual range using instruments that measure light scattering and absorption by suspended particles.

Volatile Organic Compounds

It should be noted that there are no state or national ambient air quality standards for VOCs because they are not classified as criteria pollutants. VOCs are regulated, however, because limiting VOC emissions reduces the rate of photochemical reactions that contribute to the formation of ozone. They are also transformed into organic aerosols in the atmosphere, contributing to higher PM10 and lower visibility levels.

Although health-based standards have not been established for VOCs, health effects can occur from exposures to high concentrations of VOCs because of interference with oxygen uptake. In general, ambient VOC concentrations in the atmosphere are suspected to cause coughing, sneezing, headaches, weakness, laryngitis, and bronchitis, even at low concentrations. Some hydrocarbon components classified as VOC emissions are thought or known to be hazardous. Benzene, for example, one hydrocarbon component of VOC emissions, is known to be a human carcinogen.

Non-Criteria Pollutant Emissions

Although the SCAQMD's primary mandate is attaining both the state ambient air quality standards and the NAAQS for criteria pollutants within the district, SCAQMD also has a general responsibility pursuant to the Health and Safety Code §41700 to control emissions of air contaminants and prevent endangerment to public health. As a result, over the last few years the SCAQMD has regulated pollutants other than criteria pollutants such as TACs, greenhouse gases and stratospheric ozone depleting compounds. The SCAQMD has developed a number of rules to control non-criteria pollutants from both new and existing sources. These rules originated through state directives, CAA requirements, or the SCAQMD rulemaking process.

In addition to promulgating non-criteria pollutant rules, the SCAQMD has been evaluating AQMP control measures as well as existing rules to determine whether or not they would affect, either positively or negatively, emissions of non-criteria pollutants. For example, rules in which VOC components of coating materials are replaced by a non-photochemically reactive chlorinated substance would reduce the impacts resulting from ozone formation, but could increase emissions of toxic compounds or other substances that may have adverse impacts on human health.

Tables 3-3, 3-4, 3-5 and 3-6 lists some key ingredients that are used in various PVC and CPVC primers, ABS welding solvents, sheet plastic welding solvents, and top and trim adhesives; and whether those ingredients are regulated under Rule 1401 - New Source Review of Toxic Air Contaminants. It is important to note that this table does not represent all of the ingredients used to manufacture PVC and CPVC primers, ABS welding cements and sheet plastic welding solvents. Of the ingredients listed in Tables 3-3, 3-4, 3-5 and 3-6 one ingredient, methylene, is regulated for carcinogenic risk, chronic (long-term non-cancer) risk and acute (short-term non-cancer) risk, one ingredient, methyl ethyl ketone, is regulated for its acute risk.

Table 3-3
Typical Ingredients Found in PVC and CPVC Primer

Ingredients	CAS #	Weight (percent)	Rule 1401 Regulated Health Impacts	Significance Threshold (at 25 meters)
Methyl Ethyl Ketone	78-93-3	15-20%	Acute Non-Cancer	6.50 lb/hr
Tetrahydrofuran	109-99-9	20-30%	Not Listed	Not Listed
Cyclohexanone	108-94-1	30-40%	Not Listed	Not Listed
Acetone	67-64-1	5-15%	Not Listed	Not Listed

Table 3-4
Typical Ingredients Found in ABS Cements

Ingredients	CAS #	Weight (percent)	Rule 1401 Regulated Health Impacts	Significance Threshold (at 25 meters)
Methyl Ethyl Ketone	78-93-3	25-65%	Acute Non-Cancer	Not Listed
Acetone	67-64-1	5-15%	Not Listed	Not Listed

Table 3-5
Typical Ingredients Found in Sheet Plastic Welding

Ingredients	CAS #	Weight (percent)	Rule 1401 Regulated Health Impacts	Significance Threshold (at 25 meters)
Methylene Chloride	75-09-02	40-65%	Carcinogen Chronic Non-Cancer; Acute Non-Cancer	33.06 lb/yr 7 lb/hr
Methyl Acetate	79-20-9	10-50%	Not Listed	Not Listed

Table 3-6
Typical Ingredients Found in Top and Trim Adhesives

Ingredients	CAS #	Weight (percent)	Rule 1401 Regulated Health Impacts	Significance Threshold (at 25 meters)
Acetone	67-64-1	< 75	Not Listed	Not Listed
Cyclohexane	110-82-7	5	Not Listed	Not Listed
Cyclohexanone	108-94-1	3 – 7	Not Listed	Not Listed
Dimethyl Ether	115-10-6	10	Not Listed	Not Listed
Hexane	110-54-3	< 20	Chronic Non-Cancer	231,000 lbs/yr
Light Aliphatic Naphtha	64742-89-8	< 25	Not Listed	Not Listed
Methyl Acetate	79-20-9	7 - 13	Not Listed	Not Listed
Propane	74-98-6	< 20	Not Listed	Not Listed
Toluene	108-88-3	< 10	Chronic Non-Cancer; Acute Non-Cancer	9,920 lbs/yr 18.5 lbs/hr
Zinc Oxide	1314-13-2	< 1.5	Not Listed*	Not Listed*

* This compound is not classified in Rule 1401 as carcinogenic, but it has a chronic risk value proposed by OEHHA that has not yet been finalized.

The following sections summarize the existing setting for the two major categories of non-criteria pollutants: compounds that contribute to ozone depletion and global warming, and TACs.

Ozone Depletion and Global Warming

The SCAQMD adopted a "Policy on Global Warming and Stratospheric Ozone Depletion" on April 6, 1990. The policy commits the SCAQMD to consider global impacts in rulemaking and in drafting revisions to the AQMP.

In March 1992, the SCAQMD Governing Board reaffirmed this policy and adopted amendments to the policy to include the following directives:

- phase out the use and corresponding emissions of chlorofluorocarbons (CFCs), methyl chloroform (1,1,1-trichloroethane or TCA), carbon tetrachloride, and halons by December 1995;
- phase out the large quantity use and corresponding emissions of hydrochlorofluorocarbons (HCFCs) by the year 2000;
- develop recycling regulations for HCFCs;
- develop an emissions inventory and control strategy for methyl bromide; and
- support the adoption of a California greenhouse gas emission reduction goal.

In support of these polices, the SCAQMD Governing Board has adopted several rules to reduce ozone depleting compounds. Several other rules concurrently reduce global warming gases and criteria pollutants.

On March 17, 2000, the SCAQMD Governing Board approved "An Air Toxics Control Plan for the Next Ten Years." The Air Toxics Control Plan identifies potential strategies to reduce toxic levels in the Basin over the ten years following adoption. To the extent the strategies are implemented by the relative agencies, the plan will improve public health by reducing health risks associated with both mobile and stationary sources. Exposure to toxic air contaminants can increase the risk of contracting cancer or result in other deleterious health effects which target such systems as cardiovascular, reproductive, hematological, or nervous. The health effects may be through short-term, high-level or "acute" exposure or long-term, low-level or "chronic" exposure.

Toxic Air Contaminants

Historically, the SCAQMD has regulated criteria air pollutants using either a technology-based or an emissions limit approach. The technology-based approach defines specific control technologies that may be installed to reduce pollutant emissions. The emission limit approach establishes an emission limit, and allows industry to use any emission control equipment, as long as the emission requirements are met. The regulation of toxic air contaminants (TACs) requires a similar regulatory approach as explained in the following subsections.

Control of TACs Under the TAC Identification and Control Program

California's TAC identification and control program, adopted in 1983 as Assembly Bill (AB) 1807, is a two-step program in which substances are identified as TACs, and airborne toxic control measures (ATCMs) are adopted to control emissions from specific sources. CARB has adopted a regulation designating all 188 federal hazardous air pollutants (HAPs) as TACs.

ATCMs are developed by CARB and implemented by the SCAQMD and other air districts through the adoption of regulations of equal or greater stringency. Generally, the ATCMs reduce emissions to achieve exposure levels below a determined health threshold. If no such threshold levels are determined, emissions are reduced to the lowest level achievable through the best available control technology unless it is determined that an alternative level of emission reduction is adequate to protect public health.

Under California state law, a federal National Emission Standard for Hazardous Air Pollutants (NESHAP) automatically becomes a state ATCM, unless CARB has already adopted an ATCM for the source category. Once a NESHAP becomes an ATCM, CARB and the air pollution control or air quality management district have certain responsibilities related to adoption or implementation and enforcement of the NESHAP/ATCM.

Control of TACs Under the Air Toxics "Hot Spots" Act

The Air Toxics Hot Spots Information and Assessment Act of 1987 (AB2588) establishes a state-wide program to inventory and assess the risks from facilities that emit TACs and to notify the public about significant health risks associated with the emissions. Facilities are phased into the AB2588 program based on their emissions of criteria pollutants or their occurrence on lists of toxic emitters compiled by the SCAQMD. Phase I consists of facilities that emit over 25 tons per year of any criteria pollutant and facilities present on the SCAQMD's toxics list. Phase I facilities entered the program by reporting their air TAC emissions for calendar year 1989. Phase II consists of facilities that emit between 10 and 25 tons per year of any criteria pollutant, and submitted air toxic inventory reports for calendar

year 1990 emissions. Phase III consists of certain designated types of facilities which emit less than 10 tons per year of any criteria pollutant, and submitted inventory reports for calendar year 1991 emissions. Inventory reports are required to be updated every four years under the state law.

In October 1992, the SCAQMD Governing Board first adopted public notification procedures specifically for Phase I and II facilities by amending Rule 212 - Standards For Approving Permits and Issuing Public Notice. These procedures require AB2588 facilities to provide public notice when exceeding the following risk levels:

- Maximum Individual Cancer Risk: greater than 10 in 1 million (10×10^{-6})
- Total Hazard Index: greater than 1.0 for TACs except lead, or > 0.5 for lead

Public notice is to be provided by letters mailed to all addresses and all parents of children attending school in the impacted area. In addition, facilities must hold a public meeting and provide copies of the facility risk assessment in all school libraries and a public library in the impacted area.

The SCAQMD continues to complete its review of the health risk assessments submitted to date and may require revision and resubmission as appropriate before final approval. Notification will be required from facilities with a significant risk under the AB2588 program based on their initial approved health risk assessments and will continue on an ongoing basis as additional and subsequent health risk assessments are reviewed and approved.

Control of TACs With Risk Reduction Audits and Plans

Senate Bill (SB) 1731, enacted in 1992 and codified at Health and Safety Code §44390 et seq., amended AB2588 to include a requirement for facilities with significant risks to prepare and implement a risk reduction plan which will reduce the risk below a defined significant risk level within specified time limits. SCAQMD Rule 1402 - Control of Toxic Air Contaminants From Existing Sources, was adopted on April 8, 1994, to implement the requirements of SB1731.

In addition to the TAC rules adopted by SCAQMD under authority of AB1807 and SB1731, the SCAQMD has adopted source-specific TAC rules, based on the specific level of TACs emitted and the needs of the area. These rules are similar to the state's ATCMs because they are source-specific and only address emissions and risk from specific compounds and operations.

Cancer Risks from Toxic Air Contaminants

New and modified sources of toxic air contaminants in the SCAQMD are subject to Rule 212 and Rule 1401. Rule 212 requires notification of the SCAQMD's intent to grant a permit to construct a significant project, defined as a new or modified permit unit located within 1000 feet of a school (a state law requirement under AB3205), a new or modified permit unit posing an maximum individual cancer risk of one in one million (1×10^{-6}) or greater, or a new or modified facility with criteria pollutant emissions exceeding specified daily maximums. Distribution of notice is required to all addresses within a 1/4-mile radius, or other area deemed appropriate by the SCAQMD. Rule 1401 currently controls emissions of carcinogenic and non-carcinogenic (health effects other than cancer) air contaminants

from new, modified and relocated sources by specifying limits on cancer risk and hazard index (explained further below), respectively.

Health Effects

One of the primary health risks of concern due to exposure to TACs is the risk of contracting cancer. The carcinogenic potential of TACs is a particular public health concern because it is currently believed by many scientists that there is no "safe" level of exposure to carcinogens. Any exposure to a carcinogen poses some risk of causing cancer. It is currently estimated that about one in four deaths in the United States is attributable to cancer. About two percent of cancer deaths in the United States may be attributable to environmental pollution (Doll and Peto 1981). The proportion of cancer deaths attributable to air pollution has not been estimated using epidemiological methods.

Non-Cancer Health Risks from Toxic Air Contaminants

Unlike carcinogens, for most noncarcinogens it is believed that there is a threshold level of exposure to the compound below which it will not pose a health risk. The California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment develops Reference Exposure Levels (RELs) for TACs which are health-conservative estimates of the levels of exposure at or below which health effects are not expected. The non-cancer health risk due to exposure to a TAC is assessed by comparing the estimated level of exposure to the REL. The comparison is expressed as the ratio of the estimated exposure level to the REL, called the hazard index (HI).

AFFECTED SOURCES

The types of facilities affected by the proposed amendments are installers of automotive and marine top and trim, plumbers and city/county public works municipalities, and several businesses related to fabricating display cases, signage, trophies and aquariums (to name a few) out of sheet plastic.

Nearly all affected industries are area sources in nature, that is, operations that do not require written permits pursuant to Rule 219, because of low spray volumes, or hand applications of solvent cements and solvent welding solutions. Table 3-7 presents an estimate of the number of affected facilities. Table 3-8 presents an estimate of the existing emissions inventory.

Table 3-7
Numbers of Known Industries

Industry Type	Numbers of Operators
Automotive Top and Trim	752
Marine Top and Trim	40
Plumbers	8,000+
Plastic Fabricators	270

Table 3-8
Estimated Existing Emissions Inventory

Industry Type	VOC Emissions (ton/day)	Methylene Chloride Emissions (ton/day)
Top and Trim[1]	0.25	
Plumbers[2]	2.18	
Plastic Fabricators[3]		0.058
Total	**2.43**	**0.058**

1) SCAQMD, Final Subsequent Environmental Assessment, Proposed Rule 1168 – Adhesive and Sealant Application, SCAQMD No. 08070BAR, Table 4-2, September 24, 2003.
2) Appendix B, Table B-1
3) Presentation titled SCAQMD Rule 1168, Methylene Chloride Use in Solvent Cements by manufacturer delivered to SCAQMD on March 23, 2004.

CHAPTER 4

ENVIRONMENTAL IMPACTS

Introduction
Potential Environmental Impacts and Mitigation Measures
Potential Environmental Impacts Found Not to be Significant
Consistency

INTRODUCTION

The CEQA Guidelines require environmental documents to identify significant environmental effects that may result from a proposed project [CEQA Guidelines §15126.2(a)]. Direct and indirect significant effects of a project on the environment should be identified and described, with consideration given to both short- and long-term impacts. The discussion of environmental impacts may include, but is not limited to, the resources involved; physical changes; alterations of ecological systems; health and safety problems caused by physical changes; and other aspects of the resource base, including water, scenic quality, and public services. If significant adverse environmental impacts are identified, the CEQA Guidelines require a discussion of measures that could either avoid or substantially reduce any adverse environmental impacts to the greatest extent feasible [CEQA Guidelines §15126.4].

The CEQA Guidelines indicate that the degree of specificity required in a CEQA document depends on the type of project being proposed [CEQA Guidelines §15146]. The detail of the environmental analysis for certain types of projects cannot be as great as for others. For example, the environmental document for projects, such as the adoption or amendment of a comprehensive zoning ordinance or a local general plan, should focus on the secondary effects that can be expected to follow from the adoption or amendment, but the analysis need not be as detailed as the analysis of the specific construction projects that might follow. As a result, this ~~Revised Draft~~ Final SEA analyzes impacts on a regional level and impacts on the level of individual industries or individual facilities where feasible.

The categories of environmental impacts to be studied in a CEQA document are established by CEQA [Public Resources Code, §21000 et seq.], and the CEQA Guidelines, as promulgated by the State of California Secretary of Resources. Under the CEQA Guidelines, there are approximately 17 environmental categories in which potential adverse impacts from a project are evaluated. Projects are evaluated against the environmental categories in an Environmental Checklist and those environmental categories that may be adversely affected by the project are further analyzed in the appropriate CEQA document.

POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Pursuant to CEQA, an NOP/IS and Final EA were prepared for the 2002 amendments to Rule 1168, and these documents are the basis for the preparation of this ~~Revised Draft~~ Final SEA to the current proposed amendments to Rule 1168. Of the 17 potential environmental impact categories previously analyzed, only one (air quality) was concluded to have potentially significant adverse impacts resulting from implementing the 2002 amendments. Further, the current proposed amendments to Rule 1168 are directly related to the analysis for the 2002 amendments because the currently proposed project constitutes a modification of the previously adopted project. Thus, air quality is again expected to be potentially significantly adversely affected by the proposed project.

Therefore, the environmental impact area of air quality is the focus of the subsequent detailed evaluation in this chapter. The environmental impact analysis for air quality incorporates a "worst-case" approach. This entails the premise that whenever the analysis requires that assumptions be made, those assumptions that result in the greatest adverse impacts are typically

chosen. This method ensures that all potential effects of the proposed project are documented for the decision-makers and the public.

Accordingly, the following analyses use a conservative "worst-case" approach for analyzing the potentially significant adverse environmental impacts associated with the implementation of the proposed project.

Air Quality

Under the existing rule, emissions are controlled by limiting the VOC content of the adhesives and sealants used and applied for various types of activities. Rule 1168 also prohibits the use of certain toxic chemicals in adhesives and sealants. The proposal contains the following amendments to Rule 1168:

- Extend the 540 grams per liter interim VOC content limit for top and trim adhesives to January 1, 2007. The effective date for the final VOC content limit of 250 grams per liter for top and trim adhesives under the current rule is January 1, 2005. Therefore, the effective date for the final VOC content limit of 250 grams per liter for top and trim adhesives would be delayed until January 1, 2007.
- Rescind the January 1, 2005, prohibition of methylene chloride used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications. The proposed rule would allow the use of solvent welding formulations containing methylene chloride used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications provided the concentration of methylene chloride does not exceed 60 percent by weight and the purchase of all methylene chloride welding products for hard sheet plastic does not exceed 20 gallons per calendar year at a single facility.
- Rescind the January 1, 2005, 285 grams per liter VOC content limit requirement for solvent cements used to weld polyvinyl chloride (PVC) plastic pipes and fittings, and instead keep the PVC welding VOC content limit requirement at the interim 510 grams per liter.
- Rescind the January 1, 2005, 270 grams per liter VOC content limit requirement for solvent cements used to weld chlorinated polyvinyl chloride (CPVC) plastic pipes and fittings, and instead keep the CPVC welding VOC content limit requirement at the interim 490 grams per liter.
- Rescind the January 1, 2005 VOC content limit requirement for PVC/CPVC primers of 250 grams per liter, and extend the interim VOC content limit requirement for PVC/CPVC primers of 650 grams per liter from the January 1, 2005 effective date to July 1, 2005. On July, 1, 2005, reduce the VOC content limit requirement for PVC/CPVC primers from 650 grams per liter to 550 grams per liter. ~~Replace the January 1, 2005, the VOC content limit requirement for PVC/CPVC primers of 250 grams per liter with a VOC content limit requirement of 550 grams per liter. This new 550 gram per liter VOC content limit is lower that the existing PVC/CPVC primers VOC content limit of 600 grams per liter.~~
- Lower the acrylonitrile-butadiene-styrene (ABS) welding VOC content limit requirement to 325 grams per liter which is currently at 400 grams per liter effective July 1, 2005.

As shown in the following discussion, the proposed amendments to delay, replace and rescind previously described ~~the final~~ VOC content limit requirements ~~for top and trim adhesives for two years, rescind the future VOC content limits of PVC and PCPVC cements, and replace the 250 gram per liter VOC content limit for PVC/CPVC primers with a 550 gram per liter VOC~~

~~content limit is~~ are expected to eliminate VOC emission reductions originally anticipated in the 2002 amendments to Rule 1168. An additional VOC content limit reduction for ABS welding is included in PAR 1168. However, even with the additional VOC reductions for ABS welding, based on the volume of PVC/CPVC cement and primer sold and presumably used, the VOC emission reductions foregone are anticipated to exceed the SCAQMD's daily significance threshold and, thus, the proposed project is expected to have significant adverse air quality impacts. The following discussion also demonstrates that the proposed methylene chloride concentration limit of 60 percent by weight and the proposed facility limit of 20 gallons per year would prevent significant adverse air quality impacts from adhesive formulated with methylene chloride.

Significance Criteria

The project will be considered to have significant adverse air quality impacts if any one of the thresholds in Table 4-1 are equaled or exceeded.

Construction Emissions

PROJECT-SPECIFIC IMPACT: The implementation of the proposed amended rule will not trigger any construction activity. No add-on control equipment or additional employees will be required from the implementation of the proposed amendments. Additionally, no add-on control equipment will be used to reduce VOC or methylene chloride emissions at affected facilities. The primary effects of the proposed amendments are to allow the continued use of existing adhesive products that comply with the existing VOC content limit requirements of 540 grams per liter for top and trim adhesives, 510 grams per liter for PVC welding and 490 grams per liter for CPVC welding, which would rescind the future January 1, 2005 VOC content limit requirements of 285 grams per liter for PVC welding and 270 grams per liter for CPVC welding. The final VOC content limit of 250 grams per liter for top and trim adhesive would be delayed until January 1, 2007, during which time the interim VOC limit of 540 would remain in place. ~~New~~ A new VOC content limit~~s~~ requirement of 325 grams per liter (currently 400 grams per liter) for ABS cements effective July 1, 2005 would be established by PAR 1168.~~, and the~~ PAR 1168 would rescind the January 1, 2005 VOC content limit requirement of 250 grams per liter for PVC/CPVC primers. After January 1, 2005, the 650 grams per liter interim VOC content limit requirement for PVC/CPVC primers would remain in effect until July 1, 2007 when it would be replaced with a 550 grams per liter VOC content limit requirement.~~ (currently 650 grams per liter) for PVC/CPVC primers would replace the 250 gram per liter VOC content limit~~. Replacing the prohibition of methylene chloride in solvent welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrication with concentration and facility limits would also not require additional construction.

Therefore, no construction and construction air quality impacts are anticipated for implementing PAR 1168.

Table 4-1
SCAQMD Air Quality Significance Thresholds

Mass Daily Thresholds		
Pollutant	**Construction**	**Operation**
NOx	100 lbs/day	55 lbs/day
VOC	75 lbs/day	55 lbs/day
PM10	150 lbs/day	150 lbs/day
SOx	150 lbs/day	150 lbs/day
CO	550 lbs/day	550 lbs/day
Lead	3 lbs/day	3 lbs/day
TAC, AHM, and Odor Thresholds		
Toxic Air Contaminants (TACs)	Maximum Incremental Cancer Risk (MICR) $\geq$ 10 in 1 million Hazard Index (HI) $\geq$ 1.0 (project increment) Hazard Index (HI) $\geq$ 3.0 (facility-wide)	
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402	
Ambient Air Quality Thresholds for Criteria Pollutants		
NO_2 1-hour average Annual average	20 $\mu g/m^3$ (= 1.0 pphm) 1 $\mu g/m^3$ (= 0.05 pphm	
PM10 24-hour average Annual Geometric Mean	2.5 µg/m3 1.0 µg/m3	
Sulfate 24-hour average	1.0 µg/m3	
CO 1-hour average 8-hour average	1.1 mg/m^3 (= 1.0 ppm) 0.50 mg/m^3 (= 0.45 ppm)	

AHM = Acutely Hazardous Material; TAC = toxic air contaminant; mg/m^3 = milligram per cubic meter; $\mu g/m^3$ = microgram per cubic meter; pphm = parts per hundred million; ppm = parts per million

PROJECT-SPECIFIC MITIGATION: No mitigation required.

Operational Emissions

PROJECT-SPECIFIC IMPACT:

VOC Emissions

Implementation of PAR 1168 is expected to result in VOC emission reductions foregone. Retaining the current VOC content limits for top and trim, PVC and CPVC welding; coupled with the reduction in VOC content for ABS welding and adhesive primers for ~~plastic~~ PVC and CPVC, would forego the 2002 FEA VOC emission reductions. Tables 4-2, 4-3 and 4-4 below summarize the inventory and the emissions foregone, resulting from these proposed amendments. VOC emission limits, emissions inventory, emissions reductions, and emissions foregone for PVC, CPVC, and ABS welding; and PVC and CPVC primer are presented in Table 4-2. Proposed changes to these categories would become permanent if the proposed project is adopted. Top and trim inventory, VOC emission inventory and VOC emission reductions delayed are presented in Table 4-3. This delay in VOC emission reductions is temporary and would end on January 1, 2007. A summary VOC emission reduction foregone for all affected adhesives are presented in Table 4-4. The first column presents the VOC emission reductions foregone in tons per day if final VOC content limits for all affected adhesive categories are rescinded. The second column presents the VOC emission reductions foregone in tons per day that would occur ~~after~~ between January 1, 2005 and July 1, 2005, if the project were approved. The third column presents the VOC emission foregone between July 1, 2005 and January 1, 2007, if the project were approved. The last column presents the VOC emission reductions forgone in tons per day that would occur after January 1, 2007, if the project were approved. The remaining columns present the same information in pounds per day.

Table 4-2
VOC Emissions Limits, Emissions Inventory, and Emissions Foregone

	VOC Limits			VOC Emissions Inventory			Emissions Foregone	
Plastic Welding Type	**Current VOC Content Limits** (gram/liter)	**1/1/2005 FEA VOC Content Limits** (gram/liter)	**Proposed VOC Content Limits** (gram/liter)	**Current Emission Inventory** (ton/day)	**Future Emissions Inventory Based on 1/1/2005 FEA VOC Content Limits**[a] (ton/day)	**Future Emission Inventory Based on 1/1/2005 Proposed VOC Content Limits**[b] (ton/day)	**Emissions Foregone Based on Rescinding FEA VOC Content Limits**[c] (ton/day)	**Emissions Foregone Based on Proposed VOC Content Limits**[d] (ton/day)
PVC	510	285	510	0.569	0.569	0.318	-0.251	-0.251
CPVC	490	270	490	0.174	0.174	0.096	-0.078	-0.078
ABS	400	400	325	0.588	0.478	0.588	0.000	0.110
PVC/CPVC Primer	650	250	550	0.832	0.704	0.320	-0.512	-0.384
Totals				**2.163**	**1.925**	**1.322**	**-0.840**	**-0.600**

[a] Future emission inventory based on 1/1/2005 FEA VOC content limits, ton/day = Current emissions inventory x ((Proposed VOC content limits)/(Current VOC content limits))

[b] Future emission inventory based on 1/1/2005 Proposed VOC content limits, ton/day = Current emissions inventory x ((1/1/2005 FEA VOC content limits)/(Current VOC content limits))

[c] Emissions foregone based rescinding FEA VOC limits (tons/day) = Future emission inventory based on 1/1/2005 proposed limits (ton/day) - Current emission inventory (ton/day)

[d] Emissions foregone based proposed VOC limits (tons/day) = Future emission inventory based on 1/1/2005 proposed limits (ton/day) - Future emissions inventory based on 1/1/2005 FEA VOC limits (ton/day)

Table 4-3
Estimated Top and Trim Adhesives Inventory and VOC Emission Reductions Delayed

Adhesive Type Based on Range of VOC Content	**VOC Content of Material** less water/exempt compounds		**VOC Content of Material, As Applied** less water/exempt compounds		**Adhesive Coverage**	**Estimated Annual Adhesive Inventory Based on Coverage**[a]	**Estimated VOC Emissions**[b]	
	grams /liter	lb/gal	grams /liter	lb/gal	sq. ft./gal	gal/yr	lb/day	ton/day
Interim VOC Limit Adhesive (Current limit post-June 2002)	540	4.50	340	2.83	309	65,194	506	0.253
Final VOC Limit Adhesive (To be in effect January 1, 2007)	250	2.08	125	1.04	625	32,232	92	0.046
Total Estimated VOC Emission Reductions Delayed[c]							**414**	**0.299**

[a] To calculate the estimated annual adhesives usage based on adhesive coverage data, multiply the 'interim VOC adhesive' inventory by a ratio of the interim VOC adhesive coverage to the coverage for the material in question. For example, the calculation of the estimated annual adhesive usage for a compliant adhesive is as follows: 65,194 gal/yr x (309 sq. ft./gal / 625 sq. ft./gal) = 32,232 gal/yr of compliant adhesive

[b] To calculate the 'estimated VOC emissions', multiply the 'VOC content of material, as applied' by the 'estimated annual adhesive inventory based on coverage' and adjust for days and tons, as applicable. For example, for the 'interim VOC limit' adhesive category, the calculation of estimated VOC emissions is as follows: 1.04 lb VOC/gal x 65,194 gal/yr x 1 yr/365 days = 506 lb VOC/day x (1 ton/2000 lb) = 0.253 tons VOC / day

[c] To calculate the 'total estimated VOC emission reductions delayed', subtract the estimated VOC emissions for final VOC limit adhesives from the estimated VOC emissions for interim VOC limit adhesives as follows: 506 lb VOC/day - 92 lb VOC/day = 414 lb VOC/day of emissions reductions delayed

~~Table 4-4~~
~~Summary of Daily VOC Emissions Foregone~~

	~~Emissions Foregone in Tons per Day~~			~~Emissions Foregone in Pounds per Day~~		
~~Plastic Welding Type~~	~~Emissions Foregone Based on Rescinding FEA VOC Content Limits (ton/day)~~	~~Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2005 (ton/day)~~	~~Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2007 (ton/day)~~	~~Emissions Foregone Based on Rescinding FEA VOC Content Limits (lb/day)~~	~~Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2005 (lb/day)~~	~~Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2007 (lb/day)~~
~~Top and Trim Adhesives~~	~~-0.21~~	~~-0.21~~	~~0~~	~~-420~~	~~-420~~	~~0~~
~~PVC Welding~~	~~-0.25~~	~~-0.25~~	~~-0.25~~	~~-500~~	~~-500~~	~~-500~~
~~CPVC Welding~~	~~-0.08~~	~~-0.08~~	~~-0.08~~	~~-160~~	~~-160~~	~~-160~~
~~ABS Welding~~	~~0~~	~~0.11~~	~~0.11~~	~~0~~	~~220~~	~~220~~
~~PVC and CPVC Primer~~	~~-0.52~~	~~-0.39~~	~~-0.39~~	~~-1,040~~	~~-780~~	~~-780~~
~~**Totals**~~	~~**-1.06**~~	~~**-0.82**~~	~~**-0.61**~~	~~**-2,120**~~	~~**-1,640**~~	~~**-1,220**~~
~~**Significance Threshold**~~	~~**0.028**~~	~~**0.028**~~	~~**0.028**~~	~~**55**~~	~~**55**~~	~~**55**~~
~~**Significant**~~	~~**Yes**~~	~~**Yes**~~	~~**Yes**~~	~~**Yes**~~	~~**Yes**~~	~~**Yes**~~

Table 4-4
Summary of Daily VOC Emissions Foregone

Plastic Welding Type	Emissions Foregone in Tons per Day[a]				Emissions Foregone in Pounds per Day[b]			
	Emissions Foregone Based on Rescinding FEA VOC Content Limits (ton/day)	Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2005 (ton/day)	Emissions Foregone Based on Proposed VOC Content Limits after July 1, 2005 (ton/day)	Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2007 (ton/day)	Emissions Foregone Based on Rescinding FEA VOC Content Limits (lb/day)	Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2005 (lb/day)	Emissions Foregone Based on Proposed VOC Content Limits after July 1, 2005 (lb/day)	Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2007 (lb/day)
Top and Trim Adhesives	-0.207	-0.207	-0.207	0	-414	-414	-414	0
PVC Welding	-0.251	-0.251	-0.251	-0.251	-502	-502	-502	-502
CPVC Welding	-0.078	-0.078	-0.078	-0.078	-156	-156	-156	-156
ABS Welding	0.000	0.000	0.110	0.110	0	0	220	220
PVC and CPVC Primer	-0.512	-0.512	-0.384	-0.384	-1,024	-1,024	-768	-768
Totals	**-1.048**	**-1.048**	**-0.810**	**-0.603**	**-2,096**	**-2,096**	**-1,620**	**-1,206**
Significance Threshold	-	-	-	-	55	55	55	55
Significant	-	-	-	-	**Yes**	**Yes**	**Yes**	**Yes**

a) Emissions foregone in tons per day were estimated in Tables 4-2 and 4-3.
b) Emissions foregone in tons per day were calculated by multiplying emissions foregone in tons per day by 2,000 pounds per ton.

The adhesive inventories, emissions inventories and emission reductions were obtained through research performed during earlier revisions of Rule 1168, based on information supplied by the manufacturers. It is assumed that one can of higher VOC content cement provides coverage for roughly the same number of pipe joints and fittings as low VOC adhesives. However, it is assumed that the top and trim adhesives vary in coverage based on the VOC content. The emission reductions that will not be achieved due to technical infeasibility based on rescinding the VOC content limits for top and trim, and PVC and CPVC welding and primer would be ~~1.06~~ 1.05 tons of VOC per day (~~2,120~~ 2,096 pounds of VOC per day) between January 1, 2005 and ~~January~~ July 1, ~~2007~~2005. With the additional VOC content limits for PVC and CPVC primers and ABS weld solvents proposed by the project, the quantity of VOC reductions foregone would be ~~0.82~~ 0.81 ton of VOC per day (~~1,640~~ 1,620pounds of VOC per day) between ~~January~~ July 1, 2005 and January 1, 2007. ~~Therefore, even with the additional VOC content limits, the proposed project would exceed the SCAQMD VOC significance threshold of 55 pounds per day.~~

After January 1, 2007, the final VOC content limit for top and trim adhesives would become effective. As presented in Table 4-2, 414 pounds of VOC emissions reductions would occur. Therefore, after January 1, 2007, the amount of VOC reductions foregone would become 0.61 ton (~~1,220~~ 1,206 pounds per day)~~,~~. ~~which~~ The VOC emission reductions foregone for all three stages of VOC content limit effective dates would also exceed the SCAQMD VOC significance threshold of 55 pounds per day.

~~Because the amendments result in significant air quality impacts, the modifications proposed in PAR 1168 to the original project (i.e., the 2002 amendments to Rule 1168) are considered to be new information that would result in making the existing significant adverse air quality impacts substantially worse. As a result, in accordance with CEQA Guidelines §15162, this Revised Draft SEA was prepared.~~ A Draft SEA was released on October 13, 2004, that included rescinding the PVC and CPVC welding VOC content limits, revised the PVC/CPVC primer VOC content limits on January 1, 2005, established a new VOC content limit for ABS welding, and replaced the elimination of methylene chloride in hard plastic sheeting cements with a methylene chloride weight and single facility use limit. After the release of the Draft SEA, PAR 1168 was modified to include a two-year delay in the final VOC content limit of 250 grams per liter for top and trim adhesives from January 1, 2005, to January 1, 2007. The delay in the effective date of the final VOC content limit for top and trim adhesives, resulted in increasing the total emissions foregone from 0.85 ton (1,700 pounds) per day to 1.05 ton (2,069 pounds) per day between January 1, 2005, and January 1, 2007. The increase in emissions foregone exceeds the SCAQMD significance threshold of 55 pounds of VOC per day. The Draft SEA included an alternative (Alternative B) that presented and analyzed adverse impacts similar to those proposed by delaying the top and trim adhesives. However, the Draft SEA did not clearly state that the Governing Board may chose any alternative analyzed in the Draft SEA. The adverse air quality impacts from Alternative B were analyzed to be significantly worse than the proposed project at the time. The Draft SEA was updated and recirculated as a Revised Draft SEA in accordance with CEQA Guidelines §15088.5, because the modification considered to be new information that would result in making the existing significant adverse air quality impacts substantially worse, and the Draft SEA did not clearly explain that the Governing Board could choose an alternative or part of an alternative that was less environmentally desirable than the

proposed project. To address this ambiguity, the Revised Draft SEA included language that clearly states that the Governing Board can choose all or part of any of the alternative even if the alternative or portion of the alternative may generate environmental impacts that are significantly worse than those proposed in the project as long as these impacts were disclosed in the CEQA document circulated for public review.

After the release of the Revised Draft Subsequent Environmental Assessment (SEA) for PAR 1168, PAR 1168 was modified to delay the PVC and CPVC primer and ABS welding VOC content limit requirements from January 1, 2005, to July 1, 2005. The delay of the PVC and CPVC primer and ABS welding VOC content limit requirements from January 1, 2005, to July 1, 2005 is considered to be within the scope of the analysis of the environmental impacts resulting from implementing Alternative C. Alternative C would result in 1,024 pounds per day of VOC emissions foregone from PVC and CPVC primer VOC emissions foregone. These VOC emissions are considered foregone, because the existing Rule 1168 VOC content limit requirement of 250 grams per liter for PVC/CPVC primers becomes effective on January 1, 2005. In addition, 0.11 ton (220 pounds) per day of VOC emissions reductions would begin on July 1, 2005 instead of January 1, 2005 as proposed in the Revised Draft SEA. The 0.11 ton (220 pounds) per day of VOC emissions reductions are not considered foregone, because the VOC content limit requirement was apart of the draft proposed project, which had not been presented to and approved by the Governing Board for adoption.

After January 1, 2007, VOC content limit requirements for top and trim adhesives would become effective and the VOC emission reductions foregone would become 0.61 ton (1,206 pounds) per day. These 0.61 ton (1,206 pounds) per day of VOC emissions foregone after January 1, 2007 are the same amount as those expected after January 1, 2007 in the Revised Draft SEA.

While the emissions reductions foregone from the delay of PVC and CPVC primer and ABS welding VOC content limit requirements from January 1, 2005, to July 1, 2005 are a modification to the previously proposed project, these modification are considered to be within the scope of the analysis of the environmental impacts resulting from implementing Alternative C. Alternative C proposed rescinding existing top and trim adhesive, and PVC and CPVC welding and primer VOC content limit requirements effective January 1, 2005. Alternative C does not include the new VOC content limit requirements for PVC and CPVC primers and ABS welding. Alternative C also proposes to rescind the restriction of methylene chloride in cement used for welding of hard sheet plastic. The proposed delay in implementing the new PVC and CPVC primer VOC content limit requirement of 550 grams per liter from January 1, 2005, to July 1, 2005 would only delay implementation for six months, a more environmentally beneficial proposal than keeping the existing interim VOC content limit requirement of 650 grams per liter proposed in Alternative C remained in effect. The Revised Draft SEA clearly presented Alternative C and the adverse environmental impacts from choosing Alternative C. The Revised Draft SEA also clearly states that the Governing Board can choose all or part of any of the alternative even if the alternative or portion of the alternative may generate environmental impacts that are significantly worse than those proposed in the project as long as these impacts were disclosed in the CEQA document circulated for public review. Therefore, the Governing Board may adopt this modification or any other alternative or portion of an

alternative that may generate environmental impacts that are significantly worst than those proposed in the project.

Methylene Chloride Emissions

The existing rule allows the use of methylene chloride in solvent welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications until January 1, 2005. In the FEA, the SCAQMD did not quantify the use of methylene chloride in compounds subject to Rule 1168, nor took any credit for reducing methylene chloride use.

In the July 7, 2002 amendment package, staff recognized that phasing out the use of methylene chloride based solvent cements for hard plastic may be difficult to achieve. There is one primary manufacturer of methylene chloride-based solvent welding products for use in the SCAQMD. The company sales of methylene chloride cements to the acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrication industries is 0.058 tons per day of methylene chloride. A solvent substitution with the exempt compound methyl acetate has replaced another toxic compound trichloroethylene. Trichloroethylene is scheduled for phase-out on January 1, 2005, and unlike methylene chloride, does not have one-year sell-through privileges. The largest manufacturer of solvent welding products has reduced methylene chloride content in its lowest viscosity product by 34 percent, and by 23 percent on its heavier bodied cement. The company has performed tests on its products with reduced methylene chloride and has determined that these reductions are the maximum available reductions they can formulate without compromising the strength of the welded joint, while still maintaining reasonable production dry time.

Efforts by manufacturers of light bodied adhesives over the last two years have resulted in formulations with maximum methylene chloride content of 60 percent by weight. The inferior performance of substitute products compared to methylene chloride makes a complete phase out of methylene chloride in this specific application infeasible. However, the maximum annual use of such solvent welding products for each end user is quite small because a syringe full of solvent welding material can weld many parts.

When considering an exemption from the prohibition of sales of adhesives and sealants containing methylene chloride, as it relates to acrylic, polycarbonate and polyethylene terephalate glycol welding, staff concludes that a limited exemption is appropriate as it protects human health to the maximum extent possible. Since the application of these materials is classified as an area source problem, they are exempt from written permits under Rule 219.

The proposed project would limit the methylene chloride content of these adhesives to a maximum of 60 percent by weight and also proposes to restrict the sales to and use by any one facility to 20 gallons of methylene chloride containing products use for solvent welding of acrylic, polycarbonate and polyethylene terephalate glycol plastics per year, which is estimated to be the current maximum annual usage of the larger fabricators.

Emissions from existing sources using the single facility maximum of 20 gallons per year and methylene chloride concentrations of 60 percent by weight are well within current or proposed health-based standards using a worst case scenario for an adversely impacted receptor.

The individual risks and health indices were established based on the Risk Assessment Procedures for Rules 1401 and 212, as published by the SCAQMD. The procedure may be extended to Rule 1402 evaluations, which sets the basis for AB2588 compliance. The attached table in Appendix B shows the various health risks associated with methylene chloride, as it is used by the plastic fabrication industries at a maximum of 20 gallons per year of 60 percent by weight of methylene chloride solvent welding formulations. The calculations show the maximum cancer risk would occur in West Los Angeles with a value of approximately three in a million residents and two in a million workers. The health indices for acute and chronic exposures (short and long term health exposure indices) at this level are below the 1.0. The significance threshold for carcinogenic risk is 10 in a million and the significance thresholds of 1.0 for both acute and chronic indices. Therefore, the proposed project is not significant for carcinogenic and noncarcinogenic risk.

PROJECT-SPECIFIC MITIGATION: Rule 1168 is being amended because compliant adhesive products for top and trim, PVC welding, CPVC welding, PVC and CPVC primers, and welding products for hard plastics such as acrylic, polycarbonate, and polyethylene terephalate glycol without methylene chloride are currently not available or fully feasible. Consequently, there are no measures available to mitigate the air quality impacts from the proposed project.

REMAINING AIR QUALITY IMPACTS: The air quality analysis concluded that significant adverse air quality impacts could be created by the proposed amendments because the 1.06 tons per day of emission reductions foregone between January 1, 2005 and July 1, 2005; the 0.82 ton (1,640 pounds) per day of emission reductions foregone between ~~January~~ July 1, 2005 and January 1, 2007; and the 0.61 ton (1,220 pounds) per day of emission reductions foregone after January 1, 2007, would exceed the SCAQMD's VOC significance thresholds of 55 pounds per day. As a result, a Statement of Findings and a Statement of Overriding Considerations ~~will be~~ has been prepared for the Governing Board's consideration and approval prior to the public hearings for the proposed amendments.

CUMULATIVE AIR QUALITY IMPACTS: In general, the preceding analysis concluded that air quality impacts from any construction activities would not be significant from implementing the proposed project. The proposed amendments would permanently forego emissions reductions originally anticipated for Rule 1168 in an amount that exceeds the SCAQMD's daily VOC significance threshold. It should be noted, however, that the air quality analysis is a conservative, "worst-case" analysis and the actual impacts may not be as great as estimated here.

The SIP settlement agreement (the Agreement) between the National Resources Defense Council, Coalition for Clean Air, and Communities for a Better Environment and the South Coast Air Quality Management District requires that when the limits under Rule 1168 are relaxed, the Board must find that it is infeasible to implement the measure by 2003. On June 7, 2002, the board authorized a delay of the implementation of technology forcing limits for top and trim adhesives, PVC welding, CPVC welding, associated primers and for other plastic cement welding to January 1, 2005. The emissions delayed were 1.06 tons (2,120 pounds) per day. Furthermore, if a limit is found to be technologically infeasible the SCAQMD may make

up the shortfall through alternative measures within two years after implementation of the 1998 rule. In this case that shortfall has been more than compensated by the September 15, 2000 amendments to Rule 1168, which achieved year 2010 reductions of 8.0 tons per day of VOC. These reductions are well in excess of the required 1.3 tons of VOC reductions required from VOC reduction measures of the Agreement. Therefore, the VOC emissions forgone by this amendment to Rule 1168 of the 1.05 tons per day of emission reductions foregone between January 1, 2005 and July 1, 2005; the ~~0.82~~ 0.81 ton (~~1,640~~ 1,620 pounds) per day between ~~January~~ July 1, 2005 and January 1, 2007; and the 0.61 tons (~~1,220~~ 1,206 pounds) per day of emission reductions foregone after January 1, 2007 do not negatively affect the Agreement.

Further, air quality modeling performed for the 2003 AQMP demonstrated that all state ambient air quality standards except for ozone and PM10 are also expected to be attained by 2010. Therefore, the cumulative adverse air quality impacts from the proposed amendments to Rule 1168 as compared to the total future reduction in the VOC inventory overall as demonstrated the 2003 AQMP are not anticipated to be significant. This determination is consistent with the conclusion in the 2003 AQMP EIR that the overall cumulative air quality impacts from implementing all AQMP control measures are not expected to be significant (SCAQMD, 2003) because of the reduction in the overall VOC emissions inventory.

POTENTIAL ENVIRONMENTAL IMPACTS FOUND NOT TO BE SIGNIFICANT

The proposed project has been evaluated and it was determined that the changes proposed to the compliance date for affected adhesives only affects air quality. While all the environmental topics required to be analyzed under CEQA were reviewed to determine if the proposed amendments would create significant impacts, the screening analysis concluded that the following environmental areas would not be significantly adversely affected by PAR 1168: aesthetics, agriculture resources, biological resources, cultural resources, energy, geology/soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, solid/hazardous waste and transportation/traffic. These topics were not analyzed in further detail in this environmental assessment, however, a brief discussion of each is provided below.

In general, by rescinding the January 1, 2005 PVC and CPVC cement and primer VOC content limits, delaying the final VOC limit for top and trim adhesive, ~~replacing the January 1, 2005 PVC/CPVC primer VOC content limit of 250 grams per liter with a limit of 550 grams per liter,~~ and replacing the prohibition of methylene chloride in solvent welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrication after January 1, 2005 with concentration and single facility use limits on methylene chloride, these amendments would forego future emission reductions expected that were expected after January 1, 2005. However, these amendments would effectively keep emissions at slightly below existing levels, since the VOC content limits and methylene chloride prohibition have not gone into effect. In addition, the proposed projected would instituting a new ~~reduce the~~ VOC content limit requirements for PVC/CPVC primer ABS cements ~~from 400 to 325 grams per liter~~. Therefore, the proposed project would in practice still lower existing VOC and methylene chloride emissions, although not as much as previously projected in the 2002 FEA, this proposed project has been determined to have little effect on environmental areas other than air quality.

Aesthetics

The proposed changes are not expected to result in substantial adverse effects on any scenic vistas, substantially degrade the existing visual character or quality of any site and its surroundings, or create new sources of substantial light or glare which would adversely affect day or nighttime views of an area. No major changes to existing facilities or stockpiling of additional materials or products outside of existing facilities are expected to result.

Agriculture Resources

The proposed project would not result in any new construction of buildings or other structures that would convert farmland to non-agricultural use or conflict with zoning for agricultural use or a Williamson Act contract. There are no provisions in the proposed amended rule that would affect land use plans, policies, or regulations. Land use and other planning considerations are determined by local governments and no land use or planning requirements will be altered by the proposed project.

Biological Resources

IV. a) - f): The affected cements and primers are typically used at existing commercial facilities and, therefore, would have no direct or indirect impacts that could adversely affect plant or animal species or the habitats on which they rely in the SCAQMD's jurisdiction. A conclusion of the 2003 AQMP EIR was that population growth in the region would have greater adverse effects on plant species and wildlife dispersal or migration corridors in the basin than SCAQMD regulatory activities, (e.g., air quality control measures or regulations). The current and expected future land use development to accommodate population growth is primarily due to economic considerations or local government planning decisions.

There are no provisions in the proposed amended rule that would affect land use plans, policies, or regulations. Land use and other planning considerations are determined by local governments and no land use or planning requirements will be altered by the proposed project. The proposed amendments to Rule 1168 would not affect in any way habitat conservation or natural community conservation plans, agricultural resources or operations, and would not create divisions in any existing communities.

Cultural Resources

There are existing laws in place that are designed to protect and mitigate potential impacts to cultural resources. The application of adhesives and sealants, in the vast majority of situations, would occur after construction has already occurred. Consequently, application of adhesives and sealants has little or no potential to disturb cultural resources. Instead, disturbance of cultural resources would most likely occur during site preparation and would be addressed at that time. Therefore, PAR1168 has no potential to cause a substantial adverse change a historical or archaeological resource, directly or indirectly destroy a unique paleontological resource or site or unique geologic feature, or disturb any human remains, including those interred outside a formal cemeteries. The proposed amendments to Rule 1168 are, therefore, not anticipated to result in any activities or promote any programs that could have a significant adverse impact on cultural resources in the district.

Energy

Because add-on control equipment is not expected to be used to comply with the provisions of PAR 1168, no additional electricity or natural gas use is expected to be required. The adhesives and sealants affected by the proposed amendments would continue to be applied in generally the same ways they are currently applied. Additionally, PAR 1168 will not substantially increase the number of businesses or amount of equipment in the district since the affected categories of solvent cements or primers are used at existing commercial facilities. An increase in energy consumption from non-renewable resources (e.g., diesel and gasoline) above current levels is not expected because the amount of adhesives and sealants shipped to suppliers and users is not anticipated to change. Further, the continued use of the affected products would not be expected to conflict with adopted energy conservation plans, result in the need for new or substantially altered power or natural gas utility systems, or be out of compliance with existing energy standards.

Geology and Soils

The proposed amendments affect existing commercial facilities that use specific types of adhesives and sealants, and, therefore, will not generate significant new adverse effects on geophysical formations in the district. Additionally, since no add-on control equipment will be used to reduce VOC emissions from the affected adhesive categories, PAR 1168 is not expected to result in additional exposure of people to potential impacts involving seismicity, landslides, mudslides or erosion as no new development is anticipated. The proposed project would not result in significant disruption or overcovering of soil, or changes in topography or surface relief features. The proposal would not result in the erosion of beach sand, or a change in existing siltation rates.

Hazards and Hazardous Materials

It is unlikely that the affected adhesives would be formulated with a non-VOC that is also a HAP because the existing version of Rule 1168 currently precludes the use of specific HAPs (e.g., chloroform, ethylene dichloride, perchloroethylene, and trichloroethylene) in adhesives and sealants, other than the proposed continued methylene chloride use in limited concentration and amounts. The possibility of a product becoming subject to Rule 1401 and Rule 1402 if it is reformulated with a HAP that is not otherwise already prohibited from use by PAR 1168, makes it unlikely that PAR 1168 will cause reformulated affected adhesives to be more toxic than what is currently commercially available for use.

As stated in the Technology Review portion in Section 2, with the exception of top and trim adhesives that meet the final VOC content limit of 250 grams of VOC per liter, adhesives for the other affected categories are available that already meet the project proposed VOC and methylene chloride limits. Components in the existing adhesive categories are presented in Tables 3-3 through 3-6. Top and trim adhesives would need to be reformulated to meet the proposed final VOC content limit of 250 grams per liter by January 1, 2007. It is also possible that some manufactures would need to reformulate some adhesives to meet the project proposed PVC/CPVC primers and ABS welding requirements. To meet the proposed VOC content limits, some PVC and CPVC primers and ABS welding cements manufacturers may need to reformulate with exempt compounds such as acetone. This solvent has potential flammability impacts, but is relatively low in toxicity. The methylene chloride content requirements may also

require reformulation of solvent welders for hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications. It is expected that any reformulation of the top and trim adhesives, PVC and CPVC primers and ABS welding cements and solvent welding for hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications would use the same components that are currently used in existing adhesives as presented in Tables 3-3 to 3-6.

Methyl acetate and acetone are assumed to be the solvents that would be chosen as a replacement for VOCs in top and trim adhesives. Acetone and methyl acetate comprise 82 to 88 percent of top and trim adhesives (Table 3-6). Since the existing amount of acetone and methyl acetate is high, replacing remaining VOCs with additional acetone and methyl acetate would not greatly alter the adverse hazards impact of the top and trim adhesives.

Methyl acetate is assumed to be the solvent that would be chosen as a replacement for methyl ethyl ketone in solvent welding formulations, and small quantities of acetone may replace some of the tetrahydrofuran and cyclohexanone in PVC and CPVC primers and ABS welding solvents. The storage or use of acetone in top and trim adhesives, PVC and CPVC primers and ABS welding cements at sites subject to Rule 1168 would not be expected to result in significant adverse hazard impacts. As shown in Table 4-5, the flammability classifications by the NFPA are the same for acetone, methyl acetate, methyl ethyl ketone, tetrahydrofuran, cyclohexane, hexane and toluene. Cyclohexanone, dimethyl ether and methylene chloride have less flammable ratings. Cyclohexanone is the only conventional solvent that has higher flash point than acetone, and all have similar lower explosive limits.

In addition, the Agency for Toxic Substances and Disease Registry and the EPA prepare and maintain a priority list of hazardous substances that are determined to pose the most significant potential threat to human health (2001 CERCLA[6] Priority List of Hazardous Substances)[7]. These substances are ranked in order of highest priority (i.e., greatest potential threat to human health), according to a combination of their known or suspected toxicity and potential for human exposure. Acetone, despite its flammability potential, is ranked at the lowest priority of 181 when compared to the following other materials that are already prohibited by the current version of Rule 1168: chloroform (rank 11), trichloroethylene (rank 15), perchloroethylene (rank 32), methylene chloride (rank 78), and ethylene dichloride (rank 82).

Further, potential impacts of formulating products with acetone, however, were previously analyzed in Subsequent Environmental Impact Report for PAR 1113 (SCAQMD No. 960626DWS, November, 1996). The conclusions that potential hazard impacts from using this exempt compound would not be significant in that document continue to be valid for the proposed project. Therefore, no new routine transport, use, emission and disposal of hazardous materials will result from the proposed amendments.

[6] The Comprehensive Environmental Response, Compensation, and Liability Act, §104(i).
[7] Agency for Toxic Substances and Disease Registry (ATSDR) and the EPA, 2001. 2001 CERCLA Priority List of Hazardous Substances.

Table 4-5
Chemical Characteristics of Solvents

Conventional Solvents								
Chemical Compound	**M.W.** [a]	**Boiling Point (@760 mmHg, °C)**	**Evap. Rate (@25 °C)**	**Flash point (°C)**	**LEL/UEL** [b] **(% by Vol.)**	**Auto-ignition Temp (°C)**	**Vapor Press (mmHg @ 20 °C)**	**Flammability Classification** [c] **(NFPA)** [d]
Methyl Ethyl Ketone	72.1	79.5	4.78	-7	1.4/11.4	505	90.6	3
Tetrahydrofuran	72.1	65	6.3	-14.4	2/11.8	321	162.2	3
Methylene chloride	84.9	40	14.5	None	13/23	556	435	1
Cyclohexanone	98.2	155.4	0.29	44	1.1/9.4	420	4.33	2
Cyclohexane	84.18	807	5.5	-18	1.3/8.4	260	97.6	3
Dimethyl Ether	46.07	-25	>1	-41	3.4/26.7	350	4450	2
Hexane	86.18	68.7	9	-9	1.1-7.5	225	150	3
Toluene	92.13	110.7	2.24	-95	1.1-7.1	480	3.8	3
Replacement Solvents								
Chemical Compound	**M.W.** [a]	**Boiling Point (@760 mmHg, °C)**	**Evap. Rate (@25 °C)**	**Flash point (°C)**	**LEL/UEL** [b] **(% by Vol.)**	**Auto-ignition Temp (°C)**	**Vapor Press (mmHg @ 20 °C)**	**Flammability Classification** [c] **(NFPA)** [d]
Acetone	58.1	56	7.7	0	2.5/12.8	465	180	3
Methyl Acetate	74.1	-98	5.3	-13	3.1./16	455	216.2	3

Sources: ARB Consumer Product Solvents Database; NIOSH, Online NIOSH Pocket Guide to Chemical Hazards; International Programme on Chemical Safety, International Chemical Safety Cards

[a] Molecular weight

[b] Lower explosive limit/upper explosive limit

[c] Flammability Rating: 0 = Not Combustible; 1 = Combustible if heated; 2 = Caution: Combustible liquid flash point of 100°F to 200°F; 3 = Warning: Flammable liquid flash point below 100°F; 4 = Danger: Flammable gas or extremely flammable liquid

[d] NFPA = National Fire Protection Association

The Uniform Fire Code and Uniform Building Code set standards intended to minimize risks from flammable or otherwise hazardous materials. Local jurisdictions are required to adopt the uniform codes or comparable regulations. Local fire agencies require permits for the use or storage of hazardous materials and permit modifications for proposed increases in their use. Permit conditions depend on the type and quantity of the hazardous materials at the facility. Permit conditions may include, but are not limited to, specifications for sprinkler systems, electrical systems, ventilation, and containment. The fire departments make annual business inspections to ensure compliance with permit conditions and other appropriate regulations.

Further, all hazardous materials are expected to be used in compliance with established OSHA or Cal/OSHA regulations and procedures, including providing adequate ventilation, using recommended personal protective equipment and clothing, posting appropriate signs and warnings, and providing adequate worker health and safety training. When taken together, the above regulations provide comprehensive measures to reduce hazards of explosive or otherwise hazardous materials. Compliance with these and other federal, state and local regulations and

proper operation and maintenance of equipment should ensure the potential for explosions or accidental releases of hazardous materials is not significant.

It is anticipated that the current regulatory requirements regarding flammable and otherwise hazardous materials will not need to be amended as a result of the proposed project since, in part; acetone and methyl acetate are already widely used. Based on the preceding information, it is also expected that implementing PAR 1168 is not expected to increase or create any new hazardous emissions which would adversely affect existing/proposed schools.
Elimination of methylene chloride concentrations in welding solvents for hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications would have eliminated the highest toxic component in the welding solvent. Staff believed that rescinding the elimination of methylene chloride in welding solvents for hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications could potentially increase carcinogenic and/or noncarcinogenic risk to significant levels when compared to zero risk from the elimination of methylene chloride. Therefore, staff proposes to limit the concentration of methylene chloride to 60 percent in welding solvents for hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications and to limit the use of welding solvents for hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications with methylene chloride to 20 gallons per facility per year.

Based on Table 3-5 methyl acetate would be the replacement solvent for methylene chloride in sheet plastic welding. Methyl acetate has a higher flash point and flammability rating. By eliminating the prohibition against methylene chloride less methyl acetate would be used, and therefore, the solvents used for sheet plastic welding would be less flammable.

Twenty gallons per year of welding solvents for hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications is below the 10,000 gallon storage threshold for California Accidental Release Prevention (CalARP) Program/EPA Risk Management Program (RMP). It is not believed that facilities would store much more than the twenty gallons usage restriction. Even if a facility stored twice the usage limit on site, the forty gallons is still much less than the CalARP/RMP threshold for reporting. Facilities that are not required to report under the CalARP program are not required to complete an off-site consequence analysis; therefore, any accidental release is not expected to adversely impact any receptors off-site. Therefore, the rescinding of the methylene chloride and establishment of methylene chloride concentration and facility limits for welding solvents with methylene chloride for hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications would not cause a significant increase in hazard materials.

It is expected that facilities that handle more than 55 gallons of hazardous material have listed welding solvents for hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications in their business plans/business emergency plan filed with the local fire department or designated Certified Unified Program Agency (CUPA). Business emergency plans are required for facilities that handle more than 55 gallons of hazardous materials. Since PAR 1168 is expected only to affect existing facilities no new reporting or change to business emergency plans are expected.

Affected products are currently used in controlled environments in limited quantities at commercial facilities so operating practices would not change and no new fire hazards to wildland areas are expected. Further, if there was an accidental condition, the impact would not be expected create a significant hazard to the public, possible nearby public airports or private airstrips or hazardous materials sites compiled pursuant to Government Code §65962.5. Similarly, the proposed amendments would not interfere with airport land use plans, adopted emergency response plans or emergency evacuation plans for the same reasons.

Hydrology and Water Quality

No add-on control equipment is required as a result of the proposed amendments. The effect of the proposed amendments would effectively allow existing use of the affected top and trim adhesives, and cements and primers. Also, it is unlikely that changes proposed in PAR 1168 will cause ABS cements and PVC/CPVC primers to be formulated with a non-VOC that contains HAPs because the current version of Rule 1168 currently precludes the use of specific HAPs (e.g., chloroform, ethylene dichloride, perchloroethylene, and trichloroethylene) in adhesives and sealants, and the proposed rule would limit use of methylene chloride. The possibility of a product becoming subject to Rule 1401 and Rule 1402 if it is reformulated with a HAP that is not otherwise already prohibited from use by PAR 1168, makes it unlikely that PAR 1168 will cause reformulated affected adhesives to be more toxic than what is currently commercially available for use.

The anticipated increase in the use of waterborne adhesives is analogous to the use of waterborne architectural coatings and inks used in graphic art operations since these waterborne products might become part of the wastewater stream only due to clean up activities. The EA prepared for amendments to Rule 1113 determined that the increased use of waterborne architectural coatings would not cause a significant adverse water quality impact. The increased use of water may have the potential to adversely affect both water demand and water quality. These impacts, however, were previously analyzed in a Subsequent Environmental Impact Report for PAR 1113 (SCAQMD No. 960626DWS, November, 1996). Therefore, the conclusions relative to water quality impacts from aqueous-based architectural coatings are applicable to affected adhesives and sealants, and, therefore, would not be significant.

Because the proposed amendments would allow continued use of existing affect top and trim adhesives, cements and primers, additional groundwater supplies would be not depleted, existing drainage patterns and systems would not be altered, and water quality would not be degraded.

The proposed project affects top and trim adhesives, adhesive and sealant operations at existing commercial facilities and, therefore, would not result in placing housing within a 100-year flood hazard area, expose people to new flooding, seiche, tsunami or mudflow conditions.

The proposed project would continue the existing operations for affected adhesives, and, therefore, will not require or result new wastewater or water drainage facilities, reduce water supplies or alter the wastewater provider's existing commitments. It is expected that affected facilities would continue to comply with any applicable requirements of the appropriate

Regional Water Quality Control Board. In conclusion, no new hydrology impacts will result from the proposed amendments.

Land Use and Planning

There are no provisions of the proposed project that would affect land use plans, policies, or regulations because the proposed amendments maintain the existing VOC content limits for PVC and CPVC cements, delay the top and trim adhesives final VOC content limit, replace PVC and CPVC primer future final VOC content limits with a new higher VOC content limit, and lower VOC content limits for ABS cements, which are used in existing commercial facilities. The proposal would allow continued but limited methylene chloride use. Land use and other planning considerations are determined by local governments and no land use or planning requirements will be altered by the proposed project. The proposed project would not affect in any way habitat conservation or natural community conservation plans, agricultural resources or operations, and would not create divisions in any existing communities. No new development or alterations to existing land designations will occur as a result of the implementation of the proposed amendments. It is not anticipated that continued use of certain adhesive and sealant products at existing commercial facilities would require additional land to continue operations or require rezoning. Therefore, no significant adverse impacts affecting existing or future land uses are expected.

Mineral Resources

There are no provisions of the proposed project that would result in the loss of availability of a known mineral resource of value to the region and the residents of the state, or of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan. The proposed amendments would allow continued use of affected adhesives, cements and primers products.

Noise

PAR 1168 would allow continued manufacture and use of existing adhesive and sealant products and continued use of those products by owners/operators of existing commercial facilities. Therefore, no changes in noise levels at affected commercial facilities or in residential areas are anticipated. Users of adhesives and sealants are typically located in existing industrial or commercial areas where noise levels are already relatively high. It is assumed that affected facilities in these areas are subject to and in compliance with existing community noise ordinances and applicable OSHA or Cal/OSHA workplace noise reduction requirements. In addition to noise generated by current operations, noise sources in each area may include nearby freeways, truck traffic to adjacent businesses, and operational noise from adjacent businesses.

Implementing PAR 1168 is not expected to result in significant noise impacts in residential areas. As with industrial or commercial areas, it is assumed that these areas are subject to local community noise standards. Owners/operators of commercial facilities that use adhesives and sealants that are located in residential areas are expected to comply with local community noise standards.

Population and Housing

PAR 1168 allows continued use of existing adhesive and sealant products and, therefore, is not expected to affect in any way population growth or the supply and/or availability of houses. Human population in the SCAQMD's jurisdiction is anticipated to grow regardless of implementing the proposed project. The proposal would not result in the creation of any industry that would induce or inhibit population growth or distribution. Because the proposed project has no effect on population growth or distribution, the proposed rule would not directly or indirectly induce the construction of single- or multiple-family housing units. Accordingly, no significant adverse impacts on human population or housing are expected.

Because the proposed project will not change existing operations at commercial facilities that use the specified adhesive and sealant products, existing housing and associated populations will not be displaced. As a result, there is no anticipated need for construction of replacement housing.

Public Services

The proposed amendments would continue current operations for affected adhesives and sealants used at existing commercial facilities. As a result, PAR 1168 is not expected to increase the need or demand for additional public services such as fire departments, police departments, schools, parks, government, etc, above current levels. Further, the proposal would not result in the need for new or physically altered government facilities in order to maintain acceptable service ratios, response times or other performance objectives.

Recreation

As discussed under "Land Use" above, there are no provisions to the proposed project that would affect land use plans, policies, or regulations. Land use and other planning considerations are determined by local governments; no land use or planning requirements will be altered by the proposal. The proposed project would not increase the use of existing neighborhood and regional parks or other recreational facilities or include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.

Solid/Hazardous Waste

It is assumed that existing operations are disposing solid/hazardous waste appropriately and in amounts approved by the appropriate regulatory agencies. Because PAR 1168 would allow continued manufacture and use of affected adhesive products, the proposed project would not substantially increase the amount of solid/hazardous waste in the Basin, but would only affect the composition of the hazardous materials in the waste, since the proposed rescinded limits have not gone into effect. However, the new methylene chloride and VOC content limits established would reduce the actual concentration of hazardous substances in the waste. Since add-on control equipment is not expected to be used to comply with the proposed amendments, no additional increase on the demand for waste disposal utilities is expected.

Based on the above, the proposed amended rule is not expected to significantly increase the volume of solid or hazardous wastes, require additional waste disposal capacity, or generate waste that does not meet applicable local, state, or federal regulations.

Transportation/Traffic

The proposed amendments will not substantially increase the amount of businesses or equipment in the district. The main effect of the proposed amendments will be a continuation of existing commercial operations that use adhesive and sealant products affected by the proposed amendments. There are no provisions in the proposed amendments that would increase existing traffic load, worker commute trips, raw material or finished product transport trips, adversely affect parking, or conflict with adopted policies associated with alternative transportation. The level of service standard, traffic levels or existing emergency accesses are expected to change because the proposed project is maintaining the existing setting.

CONSISTENCY

The Southern California Association of Governments (SCAG) and the SCAQMD have developed, with input from representatives of local government, the industry community, public health agencies, the EPA - Region IX and the CARB, guidance on how to assess consistency within the existing general development planning process in the Basin. Pursuant to the development and adoption of its Regional Comprehensive Plan Guide (RCPG), SCAG has developed an Intergovernmental Review Procedures Handbook (June 1, 1995). The SCAQMD also adopted criteria for assessing consistency with regional plans and the AQMP in its CEQA Air Quality Handbook. The following sections address the consistency between PAR 1168 and relevant regional plans pursuant to the SCAG Handbook and SCAQMD Handbook.

Consistency with Regional Comprehensive Plan and Guide (RCPG) Policies

The RCPG provides the primary reference for SCAG's project review activity. The RCPG serves as a regional framework for decision making for the growth and change that is anticipated during the next 20 years and beyond. The Growth Management Chapter (GMC) of the RCPG contains population, housing, and jobs forecasts, which are adopted by SCAG's Regional Council and that reflect local plans and policies, shall be used by SCAG in all phases of implementation and review. It states that the overall goals for the region are to (1) re-invigorate the region's economy, (2) avoid social and economic inequities and the geographical isolation of communities, and (3) maintain the region's quality of life. PAR 1168 does not hinder achieving RCPG policies as explained in the following sections.

Consistency with Growth Management Chapter (GMC) to Improve the Regional Standard of Living

The Growth Management goals are to develop urban forms that enable individuals to spend less income on housing cost, that minimize public and private development costs, and that enable firms to be more competitive, strengthen the regional strategic goal to stimulate the regional economy. Proposed amended Rule 1168 in relation to the GMC would not interfere with the achievement of such goals, nor would it interfere with any powers exercised by local land use agencies. PAR 1168 will not interfere with efforts to minimize red tape and expedite the permitting process to maintain economic vitality and competitiveness. PAR 1168 would contribute in a minor way to maintaining economic vitality by allowing affected industries to continue using currently available adhesives until such time as compliant products are available.

Consistency with Growth Management Chapter (GMC) to Provide Social, Political and Cultural Equity

The Growth Management goals to develop urban forms that avoid economic and social polarization promotes the regional strategic goals of minimizing social and geographic disparities and of reaching equity among all segments of society. Consistent with the Growth Management goals, local jurisdictions, employers and service agencies should provide adequate training and retraining of workers, and prepare the labor force to meet the challenges of the regional economy. Growth Management goals also includes encouraging employment development in job-poor localities through support of labor force retraining programs and other economic development measures. Local jurisdictions and other service providers are responsible to develop sustainable communities and provide, equally to all members of society, accessible and effective services such as: public education, housing, health care, social services, recreational facilities, law enforcement, and fire protection. Implementing PAR 1168 has no effect on and, therefore, is not expected to interfere with the goals of providing social, political and cultural equity.

Consistency with Growth Management Chapter (GMC) to Improve the Regional Quality of Life

The Growth Management goals also include attaining mobility and clean air goals and developing urban forms that enhance quality of life, accommodate a diversity of life styles, preserve open space and natural resources, are aesthetically pleasing, preserve the character of communities, and enhance the regional strategic goal of maintaining the regional quality of life. The RCPG encourages planned development in locations least likely to cause environmental impacts, as well as supports the protection of vital resources such as wetlands, groundwater recharge areas, woodlands, production lands, and land containing unique and endangered plants and animals. While encouraging the implementation of measures aimed at the preservation and protection of recorded and unrecorded cultural resources and archaeological sites, the plan discourages development in areas with steep slopes, high fire, flood and seismic hazards, unless complying with special design requirements. Finally, the plan encourages mitigation measures that reduce noise in certain locations, measures aimed at preservation of biological and ecological resources, measures that would reduce exposure to seismic hazards, minimize earthquake damage, and develop emergency response and recovery plans. Although proposed amended Rule 1168 will result in a temporary delay in originally anticipated VOC emission reductions, the cumulative effects of implementing AQMP control measures it promotes improving air quality in the region. Therefore, in relation to the GMC, PAR 1168 is not expected to interfere with attaining these goals.

Consistency with Regional Mobility Element (RMP) and Congestion Management Plan (CMP)

PAR Rule 1168 is consistent with the RMP and CMP since no significant adverse impact to transportation/circulation will result from the delay of VOC emission reductions within the district. Because affected facilities will not increase their handling capacities, there will not be an increase in material transport trips associated with the implementation of PAR 1168. Therefore, PAR 1168 is not expected to significantly adversely affect circulation patterns or congestion management. SCAQMD received a letter[8] from SCAG dated October 25, 2004 that

[8] Letter from Mr. Jeffery M Smith, AICP, Senior Regional Planner at SCAG to Mr. James Koizumi of SCAQMD on the subject of SCAG Clearinghouse No. I20040694 Proposed Amended Rule 1168, October 25, 2004.

states that the version of PAR 1168 (August 30, 2004) circulated with the 2004 Draft SEA is not regionally significant per SCAG Intergovernmental Review (IGR) criteria and CEQA Guidelines §15206.

CHAPTER 5

ALTERNATIVES

Introduction
Alternatives Rejected as Infeasible
Description of Alternatives
Comparison of Alternatives
Conclusion

INTRODUCTION

This ~~Revised Draft~~ Final SEA provides a discussion of alternatives to the proposed project as required by CEQA Guidelines. Alternatives include measures for attaining objectives of the proposed project and provide a means for evaluating the comparative merits of each alternative. A "No Project" alternative must also be evaluated. The range of alternatives must be sufficient to permit a reasoned choice, but need not include every conceivable project alternative. CEQA Guidelines §15126.6(c) specifically notes that the range of alternatives required in a CEQA document is governed by a 'rule of reason' and only necessitates that the CEQA document set forth those alternatives necessary to permit a reasoned choice. The key issue is whether the selection and discussion of alternatives fosters informed decision making and meaningful public participation. A CEQA document need not consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative.

SCAQMD Rule 110 (the rule which implements the SCAQMD's certified regulatory program) does not impose any greater requirements for a discussion of project alternatives in an environmental assessment than is required for an EIR under CEQA.

A 2004 Draft SEA was circulated for public review from October 13, 2004 to November 30, 2004. Because of substantive modification to PAR 1168, the 2004 Draft SEA has been subsequently revised and recirculated as a Revised Draft SEA. ~~This~~ The Revised Draft SEA contained~~s~~ the same alternatives as those proposed in the 2004 Draft SEA; however, the analysis ~~has been~~ was revised to compare the alternatives to the revised proposed project. The proposed project was revised with a two-year delay of the effective date for the top and trim adhesive final VOC content limit of 250 grams of VOC per liter of adhesive.

The proposed project ~~in the 2004 Draft SEA~~ project~~ed~~ ~~0.61 ton (1,220 pounds) of VOC emission reductions per day after January 1, 2005. The revision to the project would delay an additional 0.21 ton (414 pounds) of VOC emission reductions per day over the two year delay. Therefore, the revised project would forego 0.82 ton (1,640 pounds) of VOC emission reductions per day until January 1, 2007; then forego 0.61 ton (1,220 pounds) of VOC emission reductions per day after January 1, 2007.~~ 1.06 tons per day of emission reductions foregone between January 1, 2005 and July 1, 2005; the 0.82 ton (1,640 pounds) per day of emission reductions foregone between July 1, 2005 and January 1, 2007; and the 0.61 ton (1,220 pounds) per day of emission reductions foregone after January 1, 2007

ALTERNATIVES REJECTED AS INFEASIBLE

A CEQA document should identify any alternatives that were considered by the lead agency, but were rejected as infeasible during the scoping process and explain the reasons underlying the lead agency's determination [CEQA Guidelines §15126.6(c)]. These alternatives and the rationale for rejecting them as infeasible are discussed in the following subsections. No project alternatives were identified and rejected as infeasible.

DESCRIPTION OF ALTERNATIVES

The following proposed alternatives were developed by modifying specific components of the proposed amendments. The rationale for selecting and modifying specific components of the proposed amendments to generate feasible alternatives for the analysis is based on

CEQA's requirement to present "realistic" alternatives; that is, alternatives that can actually be implemented. The Governing Board may choose to adopt any portion or all of any alternative presented below. The Governing Board is able to adopt any portion or all of any of the following alternatives because the impacts of each alternative are fully disclosed to the public and the public has the opportunity to comment on the alternatives and impacts generated by each alternative.

The following four alternatives were developed by identifying and modifying major components of PAR 1168. Specifically, the primary components of the proposed alternatives that have been modified are the interim and final compliance dates and VOC content limit requirements. The alternatives, summarized in Table 5-1 and described in the following subsections, include the following: Alternative A (No Project); Alternative B (Further Delay Compliance Date); and Alternative C (Rescind January 1, 2005 Limits). Unless otherwise specifically noted, all other components of the project alternatives are identical to the components of PAR 1168. The following subsections provide a brief description of each alternative.

Alternative A - No Project Alternative

Alternative A, the No Project Alternative, would mean not amending Rule 1168 and, therefore, maintaining the existing Rule 1168 requirements. The final VOC content requirements of 250 grams per liter for top and trim adhesives, 285 grams per liter for PVC welding, 270 grams per liter for CPVC welding, 250 grams per liter for PVC/CPVC primers, and the elimination of methylene chloride welding solvents for hard acrylic, polycarbonate and polyethylene terephalate glycol plastics by using compliant reformulated products rather than installing control equipment would become effective on January 1, 2005. Users of these affected solvents and adhesives would be limited to only the compliant adhesives or any others that become available. Use of solvents and adhesives that would exceed the above VOC content limits would be prohibited. Because Alternative A would continue to prohibit reformation of adhesives with methylene chloride, it is considered to be the least toxic alternative.

If compliant adhesives are not available, owners/operators would have to discontinue using PVC, CPVC weld solvents and primers or discontinue business.

It is expected that Alternative A would continue to produce a net air quality benefit regarding VOC and methylene chloride reductions for the following reasons. It is anticipated that this alternative would continue the goal of the previous amendments to Rule 1168 and reduce VOC emissions by approximately ~~1,700~~ 2,096[9] pounds per day, either through eliminating the use of noncompliant adhesives or users finding alternative compliant formulations.

[9] Correct number was presented in Table 4-4 of the Revised Draft SEA.

Table 5-1
Project Alternatives

Rule Component	VOC Content Limits (Compliance Dates)			
	PAR 1168	**ALTERNATIVE A** (No Project)	**ALTERNATIVE B** (Further Delay Compliance Dates)	**ALTERNATIVE C** (Rescind January 1, 2005 Limits)
Top & Trim Adhesives	• Interim Limit: 540 g/l (In Effect) • Final Limit: 250 g/l (by 01/01/07)	• Interim Limit: 540 g/l (In Effect) • Final Limit: 250 g/l (by 01/01/05)	• Interim Limit: 540 g/l (In Effect) • Final Limit: 250 g/l (by 01/01/07)	• Interim Limit: 540 g/l (In Effect) • Rescind 01/01/05 250 g/l Final Limit
PVC Welding	• Interim Limit: 510 g/l (In Effect) • Rescind 01/01/05 285 g/l Final Limit	• Interim Limit: 510 g/l (In Effect) • Final Limit: 285 g/l (by 01/01/05)	• Interim Limit: 510 g/l (In Effect) • Final Limit: 285 g/l (by 01/01/07)	• Interim Limit: 510 g/l (In Effect) • Rescind 01/01/05 285 g/l Final Limit
CPVC Welding	• Interim Limit: 490 g/l (In Effect) • Rescind 01/01/05 270 g/l Final Limit	• Interim Limit: 490 g/l (In Effect) • Final Limit: 270 g/l (by 01/01/05)	• Interim Limit: 490 g/l (In Effect) • Final Limit: 270 g/l (by 01/01/07)	• Interim Limit: 490 g/l (In Effect) • Rescind 01/01/05 270 g/l Final Limit
PVC and CPVC Primer	• Interim Limit: 650 g/l (In Effect) • Rescind 01/01/05 250 g/l Final Limit, and • Add Final Limit 550 g/l (by 01/01/~~05~~07)	• Interim Limit: 650 g/ (In Effect) • Final Limit: 250 g/l (by 01/01/05)	• Interim Limit: 650 g/ (In Effect) • Final Limit: 250 g/l (by 01/01/07)	• Interim Limit: 650 g/l ((In Effect) • Rescind 01/01/05 250 g/l Final Limit
ABS Welding	• 400 g/ (In Effect) • Add Final Limit 325 g/l (by 01/01/~~05~~07)	• 400 g/l (In Effect)	• 400 g/l (In Effect)	• 400 g/l (In Effect)
Solvent Welding Hard Acrylic, Polycarbonate, PETG	• No Methylene Chloride Requirement* (In Effect) • Add Methylene Chloride Conc. Limit of 60% by Weight (by 01/01/05) • Add 20 gal/day Limit per Facility on Methylene Chloride Welding Solvent (by 01/01/05)	• No Methylene Chloride Requirement* (In Effect) • Elimination of Methylene Chloride (by 01/01/05)	• No Methylene Chloride Requirement* (In Effect) • Elimination of Methylene Chloride (by 01/01/07)	• No Methylene Chloride Requirement* (In Effect) • Rescind Elimination of Methylene Chloride (by 01/01/05)

*May be restricted by other SCAQMD rules (e.g., Rules 212, 1401)

Alternative B - Further Delay Final Compliance Date

Alternative B would allow affected facilities to continue existing operations and comply with the interim VOC content limits of 540 grams per liter for top and trim, 510 grams per liter for PVC welding, 490 grams per liter for CPVC welding, 600 grams per liter for PVC/CPVC primers, 400 grams per liter for ABS welding and the continued use of methylene chloride weld solvents for hard acrylic, polycarbonate and polyethylene terephalate glycol two additional year, that is until January 1, 2007. Once the final compliance date becomes effective, it would be expected that owners/operators will comply with the final VOC content limits of 250 grams per liter for top and trim, 285 grams per liter for PVC welding, 270 grams per liter for CPVC welding, 250 grams per liter for PVC/CPVC primers, and the elimination of methylene chloride weld solvents for hard acrylic, polycarbonate and polyethylene terephalate glycol plastics by using compliant reformulated products rather than installing control equipment.

Alternative C – Rescind January 1, 2005 Limits

Alternative C would permanently rescind top and trim adhesives; PVC welding, CPVC welding, PVC and CPVC primer, and methylene chloride restrictions in welding formulations used to bond hard acrylic, polycarbonate and polyethylene terephalate glycol plastic fabrications from future VOC compliance limits of 250 grams per liter for top and trim, 285 grams per liter for PVC welding, 270 grams per liter for CPVC welding, 250 grams per liter for PVC/CPVC primers, and the elimination of methylene chloride weld solvents for hard acrylic, polycarbonate and polyethylene terephalate glycol plastics instead of having an interim or final VOC content limits and corresponding compliance dates for these products.

COMPARISON OF THE ALTERNATIVES

The Environmental Checklist (see Chapter 2 of the Initial Study in Appendix B) identified only air quality as an environmental area that could be significantly adversely affected by the proposed project. Further evaluation of potential air quality impacts in Chapter 4 of this ~~Revised Draft~~ Final SEA confirmed that significant adverse project-specific air quality impacts would occur as a result of implementing PAR 1168. Because of the narrow focus of the proposed project, no feasible mitigation measures were identified.

The following section briefly compares the relative potential adverse air quality impacts that may be generated by each project alternative. Potential adverse impacts for the environmental topics are quantified where sufficient data are available. A comparison of the air quality impacts for each project alternative is provided in Table 5-2. No other environmental topics besides air quality were identified that could be adversely affected by implementing any project alternative.

Table 5-2
Comparison of Adverse Air Quality Impacts of the Alternatives
Loss of Anticipated VOC Emission Reductions

Category	PAR 1168	ALTERNATIVE A (No Project)	ALTERNATIVE B (Further Delay Compliance Dates)	ALTERNATIVE C (Rescind January 1, 2005 Limits)
Top & Trim Adhesives	Temporary loss in VOC emission reductions of 414 pounds per day continues until 01/01/07	No emission reductions foregone	Temporary loss in VOC emission reductions of 414 pounds per day continues until 01/01/07	Permanent loss in VOC emission reductions of 414 pounds per day
PVC Welding	Permanent loss in VOC emission reductions of ~~504~~ 500* pounds per day	No emission reductions foregone	Temporary loss in VOC emission reductions of ~~504~~ 502* pounds per day continues until 01/01/07	Permanent loss in VOC emission reductions of ~~504~~ 502* pounds per day
CPVC Welding	Permanent loss in VOC emission reductions of ~~158*~~ 160 pounds per day	No emission reductions foregone	Temporary loss in VOC emission reductions of ~~158~~ 156* pounds per day continues until 01/01/07	Permanent loss in VOC emission reductions of ~~158~~ 156* pounds per day
PVC and CPVC Primer	Temporary loss in VOC emission reductions of 1,024 pounds per day continues until 07/01/05. Permanent loss in VOC emission reductions of ~~773~~ 768* pounds per day after 07/01/05	No emission reductions foregone	Temporary loss in VOC emission reductions of ~~1,030~~ 1,024* pounds per day continues until 01/01/07	Permanent loss in VOC emission reductions of ~~1,030~~ 1,024* pounds per day
ABS Welding	Additional Emissions reductions of 220 pounds per day	No change	No change	No change
Solvent Welding Hard Acrylic, Polycarbonate, PETG	Carcinogenic risk of three in a million. Acute and chronic hazard indices less than 1.0.	Elimination of carcinogenic and noncarcinogenic risk from methylene chloride	Acute and chronic hazard indices less than 1.0.until 01/01/07	Carcinogenic risk of four in a million. Acute and chronic hazard indices less than 1.0.
VOC Air Quality Impacts Significant?	Yes	No	Yes Less Than PAR 1168	Yes Greater Than PAR 1168
Methylene Chloride Risk Impacts Significant?	No	No	No	No

* Changed to be consistent with Table 4-4. Difference is a result of rounding. Ton values presented in Table 4-4 are rounded to three significant figures based on the original estimates in the October 1992 Staff Report for PAR 1168. Values in Table 1-2 were not rounded previously

Alternative A - No Project Alternative
Like PAR 1168, Alternative A does not anticipate that owners/operators of affected facilities would have to install control equipment that could generate significant adverse air quality impacts due to construction emissions. Instead, unlike to PAR 1168, there would be no emission reductions foregone with Alternative A because owners/operators of affected facilities would continue existing operations using compliant adhesives if available. If compliant adhesives are not available, owners/operators would have to discontinue using PVC, CPVC welding cements and primers, and hard sheet plastic welding solvents with methylene chloride or discontinue business.

It is expected that Alternative A would continue to produce a net air quality benefit regarding VOC and methylene chloride reductions since the final 2002 FEA limit requirements would take affect. It is anticipated that this alternative would continue the goal of the previous amendments to Rule 1168 by reducing VOC emissions by approximately ~~1,700~~ 2,096[10] pounds per day, either through eliminating the use of noncompliant adhesives or users finding alternative compliant formulations. In addition, methylene chloride use in weld solvents for hard sheet plastic would be prohibited.

Alternative A Conclusion
Since Alternative A is the only alternative without any emission reductions foregone, this alternative is the least toxic and environmentally superior alternative. This alternative is not consistent with project objectives since as stated in the Technology Review of Section 2 of this document, there are no adhesives that can meet the VOC content limit requirements for PVC and CPVC welding solvents required to meet IAPMO, ASTM and NSF standards, and prevent the use of products needed to weld hard plastics such as acrylic, polycarbonate and polyethylene terephalate plastic sheeting.

Alternative B - Further Delay Compliance Date
Similar to PAR 1168, it is not expected that Alternative B will require installation of air pollution control equipment. As a result, it is not anticipated that owners/operators of affected facilities would have to install control equipment that could generate construction emissions. Instead, affected facilities are anticipated to continue existing operations and comply with the interim VOC content limits of 540 grams per liter for top and trim, 510 grams per liter for PVC welding, 490 grams per liter for CPVC welding, 600 grams per liter for PVC/CPVC primers, 400 grams per liter for ABS welding and the continued use of methylene chloride weld solvents for hard acrylic, polycarbonate and polyethylene terephalate glycol two additional years, that is until January 1, 2007. Once the final compliance date becomes effective, it would be expected that owners/operators will comply with the final VOC content limits of 250 grams per liter for top and trim, 285 grams per liter for PVC welding, 270 grams per liter for CPVC welding, 250 grams per liter for PVC/CPVC primers, and the elimination of methylene chloride weld solvents for hard acrylic, polycarbonate and polyethylene terephalate glycol plastics by using compliant reformulated products rather than installing control equipment.

[10] Correct number was presented in Table 4-4 of the Revised Draft SEA.

Alternative B would extend the final compliance date for top and trim adhesives, PVC and CPVC welding, PVC and CPVC primers, and the elimination of methylene chloride welding solvents for hard acrylic, polycarbonate and polyethylene terephalate glycol plastics from the expiration date of January 1, 2005, as proposed in PAR 1168, to January 1, 2007. This means that originally anticipated VOC and methylene chloride emission reductions for these adhesive categories would be delayed two additional years, to January 1, 2007. Total VOC emission reductions delayed would be approximately 1.05 tons (~~1,700~~ 2,096 pounds)[11] per day. Therefore, it is expected that Alternative B would generate significant adverse VOC air quality impacts during operation.

It is estimated that the carcinogenic risk associated with delaying the compliance date for the elimination of methylene chloride from welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications would be four in a million over seventy years. Acute and chronic noncarcinogenic hazard indices are below 1.0. The significance criterion for carcinogenic risk is ten in a million over seventy years. The significance criteria for noncarcinogenic risk are hazard indices above 1.0. Therefore, carcinogenic risk from methylene chloride would be below 10 in one million over seventy years, and exposure to methylene chloride from this alternative would only continue for two additional years until it would be prohibited on January 1, 2007, no significant methylene chloride carcinogenic risk is expected. Because acute and chronic hazard indices are below 1.0, the project is not expected to generate significant noncarcinogenic risk.

Alternative B Conclusion

This alternative is not consistent with project objectives since no compliant products are available to field test; therefore, it is unlikely compliant products could be found and tested within the near future. Therefore, further delaying the final compliance dates would not result in providing industry with compliant products.

This alternative would generate the same VOC emissions as rescinding the affective adhesive limits for two years (Alternative B). Alternative A is superior to Alternative B because it does not forgo any emission reductions. The proposed project is superior in daily adverse VOC and methylene chloride impacts since, Alternative B includes emission reductions forgone from top and trim adhesives and does not include new VOC content limits for PVC and CPVC primers, ABS weld solvent, and methylene chloride concentration and facility limits for bonding of hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications. However, the emissions forgone under Alternative B would occur for two years, if compliant adhesives could be found by January 1, 2007. If compliant adhesives are not found by January 1, 2007, this alternative would not meet the project objective of allowing facilities to use the lowest VOC and methylene chloride content limits that can meet industry performance requirements.

Alternative C – Rescind January 1, 2005 Limits

Similar to PAR 1168, it is not expected that Alternative C will require installation of air pollution control equipment. As a result, no construction-related air quality impacts are expected to occur if this alternative is implemented. Instead, affected facilities for top and

[11] Correct number was presented in Table 4-4 of the Revised Draft SEA.

trim applications are anticipated to continue existing operations using the current adhesives or previously prohibited high-VOC adhesives (which would be permanently excluded from further compliance requirements) rather than installing control equipment.

Alternative C would rescind the January 1, 2005 VOC content limits for PVC and CPVC weld solvents and primers. It is estimated that 0.85 tons (1,700 pounds) per day of VOC emission reduction would be foregone by the elimination of the January 1, 2005 VOC content limits for PVC and CPVC weld solvents and primers (Table 4-2). In addition, Alternative C would permanently exempt top and trim adhesives from VOC compliance limits altogether. This means that originally anticipated 0.2 tons (414 pounds) per day VOC emission reductions from the 2003 Final SEA for this adhesives category would be permanently foregone. Therefore, altogether Alternative C would permanently forgo approximately one ton (~~2,100~~ 2,096 pounds) of VOC emission reductions, which is greater than the VOC emission reductions foregone proposed by PAR 1168.

It is estimated that the carcinogenic risk associated with rescinding the elimination of methylene chloride from welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications would be four in a million over seventy years. Acute and chronic noncarcinogenic hazard indices would be below 1.0. The significance criterion for carcinogenic risk is ten in a million over seventy years of exposure. The significance criteria for noncarcinogenic risk are hazard indices above 1.0. Therefore, carcinogenic risk from methylene chloride is below 10 in one million, so no significant methylene chloride carcinogenic risk is expected. Because acute and chronic hazard indices are below 1.0, Alternative C is not expected to generate significant noncarcinogenic risk.

Alternative C Conclusion

Alternative C would completely rescind the VOC content limits now established in the existing rule for top and trim adhesives, PVC and CPVC welding, PVC and CPVC primers. Alternative C would also rescind the prohibition of methylene chloride used in weld solvents for hard acrylic, polycarbonate and polyethylene terephalate glycol plastics. Like the proposed project this alternative would forgo emission reductions for top and trim adhesives, PVC and CPVC welding, PVC and CPVC primers, and methylene chloride emission reductions from hard sheet plastic weld solvents. Alternative C would not include new VOC content limits for PVC and CPVC primers, ABS welding cements, and concentration and facility limits for methylene chloride used to weld hard plastics. Alternative A is superior to Alternative C because it does not forego any emission reductions. Unlike Alternative B which would limit the emissions foregone for two years, Alternative C would permanently forego emission reductions from these adhesives. Therefore, this alternative would be the most toxic and least environmentally superior alternative.

CONCLUSION

SCAQMD's policy document Environmental Justice Program Enhancements for FY 2002-03, Enhancement II-1 recommends that all SCAQMD CEQA assessments include a feasible project alternative with the lowest air toxics emissions. In other words, for any major equipment or process type under the scope of the proposed project that creates a significant environmental impact, at least one alternative, where feasible, shall be considered from a "least harmful" perspective with regard to hazardous air emissions. Because the 2002

amendments to Rule 1168 included a prohibition that eliminated the use of specific HAPs (e.g., chloroform, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene) from adhesive and sealant applications, the lowest air toxics alternative is Alternative A, the No Project Alternative.

CEQA Guidelines §15126.6(e)(2) states in part that if the environmentally superior alternative is the "No Project" alternative, the CEQA document shall also identify an environmentally superior alternative among the other alternatives. Alternative A is the environmentally superior alternative as it provides the least air quality impact because of its potential for continuing to achieve the anticipated VOC emission reductions resulting from compliance with the current version of Rule 1168. Since Alternative A, the no project alternative is the environmentally superior alternative, other than the proposed project Alternative B would be the next environmentally superior alternative. However, as presented above Alternative B would only remain the next environmentally superior alternative as long as the delayed VOC and methylene chloride limits could be met by January 1, 2007. Since no viable compliant adhesives were found, it is unlikely that facilities could comply with the VOC limit restrictions and methylene chloride prohibited by January 1, 2007. In addition the potential increase of risk from methylene chloride would be higher in Alternative B than in the proposed project which would add concentration and facility limits.

The proposed project is preferred over Alternative A and Alternative B because it achieves the primary project goal of allowing facilities to use the lowest VOC and methylene chloride content limits that can meet industry performance requirements. Imposing the current final VOC content limit requirements as proposed for Alternative A for top and trim adhesive, PVC welding, CPVC welding, PVC and CPVC primers, and prohibiting the use of methylene chloride in hard sheet plastic weld solvents could possibly eliminate these products from the market, leaving end-users with no suitable replacement alternatives. Because no compliant adhesives and sealants that achieve performance and industrial standards have been identified, Alternative B would only delay the implementation date of existing final VOC content limit requirements and methylene chloride prohibition requirement.

The proposed project is considered to provide the best balance between delayed emission reductions, health risk, and allowing additional time to formulate and manufacture compliant adhesive products for the affected adhesive categories with the desired performance characteristics and, therefore, is preferred over Alternatives A, B, and C. However, while the proposed project provides the best balance between emission reductions delayed, health risk, and adhesive performance, the Governing Board may choose to adopt any of the alternatives in whole or in part in place of the proposed project, based on other considerations in addition to environmental concerns such a compliance costs, effects on future employment (jobs lost, for example), etc.

PAR 1168 delays the new VOC content limit requirements for PVC/CPVC primers and ABS welding from the January 1, 2005 date proposed in the Revised Draft SEA to July 1, 2005. Because of this delay the 250 gram per liter VOC content limit requirement for PVC/CPVC primers would be rescinded, and the 650 gram per liter VOC content limit

requirement would be extended to July 1, 2005. On July 1, 2005 the new 550 gram per liter VOC content limit requirement would become effective. In addition, PAR 1168 would delay the new ABS welding VOC content limit requirement of 325 grams per liter from January 1, 2005 to July 1, 2005. These modifications are within the scope of the analysis of the environmental impacts resulting form implementing Alternative C.

Alternative C proposes to permanently rescind the existing January 1, 2005 effective VOC content limit requirements. Alternative C would forego 1.05 ton (2,096 pounds) of VOC emission reductions. Alternative C does not include the new VOC content limit requirements for PVC/CPVC primers and ABS welding. PAR 1168 would only delay the PVC/CPVC primers and ABS welding VOC content limit requirements from January 1, 2005 to July 1, 2005

PAR 1168 as modified would generate the following emissions foregone: On January 1, 2005, 1.05 ton (2,096 pounds) of VOC emission reductions per day would be foregone. On July 1, 2005, the amount of VOC emission reductions foregone would be 0.81 ton (2,096 pounds) per day, when the new VOC content limit requirements for PVC/CPVC primers and ABS welding become effective. On January 1, 2007, the VOC emission reductions foregone would be 0.61 ton (1,206 pounds) per day, when the final VOC content limit requirement for top and trim adhesives becomes effective.

Therefore, PAR 1168 as modified consists of a mixture of project proposed in the Revised Draft SEA and Alternative C. Like the project proposed in the Revised Draft SEA, PAR 1168 would forego 0.81 ton (2,096 pounds) per day between July 1, 2005 and January 1, 2007, when the new VOC content limit requirements for PVC/CPVC primers and ABS welding become effective. In addition, PAR 1168 would forego 0.61 ton (1,206 pounds) of VOC emission reductions per day after July 1, 2007, when the final VOC content limit requirement for top and trim adhesives becomes effective. However, like Alternative C, between January 1, 2005 and July 1, 2005, PAR 1168 would forgo 1.05 ton (2,096 pounds) of VOC emission reductions per day.

CHAPTER 6

OTHER CEQA TOPICS

Relationship Between Short-Term Uses and Long-Term Productivity
Significant Irreversible Environmental Changes
Potential Growth-Inducing Impacts

SIGNIFICANT ENVRIONMENTAL EFFECTS WHICH CANNOT BE AVOIDED IF THE PROPOSED PROJECT IS IMPLEMENTED

Rule 1168 is being amended primarily because PVC and CPVC welding cements and primers and non-methylene chloride welding solvents for hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrication do not meet industry standards for bond strength and other performance standards. To date, the results of the technology assessment for these adhesives show that industry is experiencing difficulties with the workability and performance of the low-VOC products. Consequently, there are no measures available to mitigate significant adverse air quality impacts from the proposed project. If the amendments to PAR 1168 are adopted as proposed, the expected to result in VOC emission reductions foregone would total approximately 1.05 ton (2,096 pounds) of VOC per day between January 1, 2005 and July 1, 2005, ~~0.82~~ 0.81 ton (2,096 pounds) of VOC per day between ~~January~~ July 1, 2005 and January 1, 2007, then approximately 0.61 tons (~~1,220~~ 1,206 pounds) of VOC per day after January 1, 2007. The VOC emission reductions foregone would exceed the SCAQMD's VOC significance threshold of 55 pounds per day. Therefore, PAR 1168, if implemented, has the potential to generate unavoidable significant adverse air quality impacts.

SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

CEQA Guidelines §§15126(c) and 15126.2(c) require an environmental analysis to consider "any significant irreversible environmental changes which would be involved if the proposed action should be implemented." In the NOP/IS and Final EA for the 2002 amendments to Rule 1168, documents upon which PAR 1168 is based, air quality was the only environmental area identified as potentially adversely affected by the proposed project.

The proposed changes to PAR 1168 would generate 1.05 tons (2,096 pounds) of VOC emissions foregone per day between January 1, 2005 to July 1, 2005, ~~0.82~~ 0.81 ton (2,096 pounds) of VOC emissions foregone per day between ~~January~~ July 1, 2005 and January 1, 2007, then approximately 0.61 tons (~~1,220~~ 1,206 pounds) per day of VOC emission reductions foregone after January 1, 2007; and reduce methylene chloride use to acceptable carcinogenic and noncarcinogenic risk. As stated earlier emissions reductions foregone would not increase existing emissions, but prevent future emissions reductions. The new VOC content limits would reduce the emissions forgone, and therefore after January 1, 2005 would reduce existing emissions by ~~480~~ 476 pounds (~~2,120~~ 2,096 – ~~1,640~~ 1,620) of VOC per day. The proposed limits of methylene chloride concentration and single facility usage would keep existing acceptable carcinogenic and noncarcinogenic risk to below significance. As a result, PAR 1168 would provide human health benefits by reducing population exposures to existing VOC emissions and methylene chloride concentrations, but not in the same quantities as proposed in the 2002 FEA.

As can be seen by the information presented in this ~~Revised Draft~~ Final SEA, the proposed project would not result in irreversible environmental changes or irretrievable commitment of resources.

POTENTIAL GROWTH-INDUCING IMPACTS

CEQA Guidelines §§15126(d) and 15126.2(d) require an environmental analysis to consider the "growth-inducing impact of the proposed action." Implementing PAR 1168 will not, by

itself, have any direct or indirect growth-inducing impacts on businesses in the SCAQMD's jurisdiction because it is not expected to foster economic or population growth or the construction of additional housing and primarily affects existing adhesive formulation companies.

APPENDIX A

PROPOSED AMENDED RULE 1168

In order to save space and avoid repetition, please refer to the final version of the proposed amended Rule 1168 located elsewhere in the rule package.

Version "PAR 1168" (November 4, 2004) of the proposed amended rule was circulated with the Revised Draft Subsequent Environmental Assessment that was released on December 5, 2004 for a 45-day public review and comment period ending December 21, 2004.

Original hard copies of the Revised Draft SEA, which include the version "PAR 1168" (November 4, 2004) of the proposed amended rule, can be obtained through the SCAQMD Public Information Center at the Diamond Bar headquarters or by calling (909) 396-2039.

APPENDIX B

ASSUMPTIONS AND CALCULATIONS

VOC Emissions and Emission Reduction Assumptions and Calculations

The VOC emissions and reductions in Table 4-2 of the 2002 FEA lists the baseline emissions and reductions as estimated from actual data collected in 1998; however, the 2002 FEA baseline was actually based on the October 1992 Staff Report for Proposed Amended Rule 1168 ~~1993 emissions inventory used in the April 11, 1997 Final Staff Report for Proposed Amended Rule 1168 – Control of Volatile Organic Compound Emissions from Adhesive Applications~~, which was also reported in the April 11, 1997 Final Staff Report for Proposed Amended Rule 1168 – Control of Volatile Organic Compound Emissions from Adhesive Applications and associated Final Supplemental Environmental Assessment (SEA) dated March 1997. The 2002 FEA baseline inventory was developed by applying a two percent per year growth factor, a 75 percent solids content factor and various VOC content limits established between 1993 and 1998. The solids factor was included because at that time staff assumed that solvent usage would increase with an increase of solids when sprayed. VOC emissions and reductions foregone from the January 1, 2005 VOC content limits presented in the FEA were assumed to be the same as those presented in the April 11, 1997 Final SEA, which were estimated for January 1, 2003, since the emission reductions foregone represents the difference between the emissions before and after the VOC content limit requirements.

The VOC emissions and emissions reductions utilized in the 2004 Draft SEA were taken from the Preliminary Draft Staff Report for Proposed Amended Rule 1168 – Adhesive and Sealant Applications dated June 2004. The VOC emissions and reductions presented in the 2004 Preliminary Draft Staff Report were developed from the same 1993 emissions inventory used in the FEA, but solids contact factor was removed, because staff realized that hand applications of cement do not necessarily reflect an increase in solvent usage as assumed in spray applications. However, the emissions reductions foregone are determined by the difference between the emissions based on the proposed VOC content limits and emissions based on existing VOC content limits, which remains the same with or without the solids content factor; therefore, the amount of emission reductions are the same regardless of whether the solids content factor is used. Additionally, the VOC emissions and emission reductions presented in the 2004 Preliminary Draft Staff Report were also projected to January 1, 2005.

~~The 2004 Draft SEA VOC emissions reductions foregone from rescinding the VOC content limits for PVC and CPVC welding and primers were estimated to be 0.85 tons (1,700 pounds) per day. The VOC emissions reductions foregone with the proposed VOC content limits for PVC and CPVC primers and ABS welding were estimated to be 0.61 tons (1,220 pounds)of VOC per day. Table A-1 presents the VOC emissions and emissions reductions presented in the 2004 Preliminary Draft Staff Report.~~

~~After the 2004 Draft SEA was released, staff found that the January 1, 2005 implementation of the final 250 grams VOC content per liter standard for top and trim adhesives is not feasible, because of difficulties with open time, reposition ability, and high temperature and stain resistance. Therefore, staff proposes to delay the final VOC content standard for top and trim adhesives from January 1, 2005, to January 1, 2007. Therefore, the 2004 Draft SEA was rescinded and this a Revised Draft SEA was prepared. The 2003 Final SEA estimated that 0.21 ton (414 pounds) of VOC emission reductions per day were delayed by postponing the 250 grams VOC content per liter standard for top and trim adhesives to January 1, 2005. The delay in the final VOC content standard for top and trim adhesives from January 1, 2005, to January 1, 2007 continue the delay of that 0.21 ton (414 pounds) of VOC emission reductions per day until~~

~~January 1, 2007. After January 1, 2007, the final VOC content standard would become effective and the 0.21 ton (414 pounds) of VOC emission reductions would occur. The emission reductions delayed are presented in Table 4-2.~~

Table A-1 presents the VOC emissions and emissions reductions presented in the 2004 Staff Report. The emission reductions delayed from top and trim adhesives from the 2003 Final SEA are presented in Table 4-2.

~~Therefore,~~ ~~b~~Between January 1, 2005 and July 1, 2007, the 1.05 tons (2,096 pounds) of VOC emission reductions foregone are as sum of the of the 0.60 ton (1,206 pounds) of VOC per day emission reductions foregone from the top and trim adhesive, and PVC and CPVC welding and primers. Between ~~January~~ July 1, 2005, to January 1, 2007, the proposed 0.82 ton (1,640 pounds) of VOC per day of total emission reductions forgone is the sum of the ~~0.61~~ 0.60 ton (~~1,220~~ 1,206 pounds) of VOC per day emission reductions foregone from the PVC and CPVC welding ~~and primers~~ minus the emission reductions gained by new PVC and CPVC primers and ABS welding VOC content limits; and the 0.21 ton (414 pounds) of VOC emission reductions per day of emission reductions delayed by extending the interim VOC content limit for top and trim adhesives. After January 1, 2007 when the final VOC content limit for top and trim becomes effective, the total emission reductions foregone would be ~~0.61~~ 0.60 ton (~~1,220~~ 1,206 pounds) of VOC per day. VOC emission reductions foregone exceed the VOC significance threshold of 55 tons per day. Therefore, the project is significant for VOC emissions during operation. A summary of the emissions foregone is presented in Table B-3.

Methylene Chloride Risk Assessment Assumptions and Calculations

The revision to the top and trim adhesive VOC content limit effective date does not affect the methylene chloride analyses that were developed for the previously prepared 2004 Draft SEA. Methylene chloride risk from rescinding the prohibition of methylene chloride in welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications and establishing concentration restrictions of 60 percent by weight and limiting the purchase of all methylene chloride welding products to 20 gallons per calendar year at a single facility were estimated and presented in the 2004 Preliminary Draft Staff Report. The risk was determined by estimating amount of methylene chloride emissions a facility would emit if it used 20 gallons of hard plastic sheet welding projects with 60 percent methylene chloride by weight.

Emissions, lb/year = usage, gal/year x density, lb/gal x methylene chloride weight fraction
Emissions, lb/year = 20 gal/year x 11 lb/gal x 0.60
Emissions, lb/year = 132 lb/yr of methylene chloride
Emissions, tons/year = (132 lb/yr)/(2,000 lb/ton) = 0.7 ton/yr

A Tier II risk assessment based on the SCAQMD Risk Assessment Procedures for Rules 1401 and 222, version 2.0 and Attachment K for facilities emitting 0.7 ton per year of methylene chloride for each source receptor area in the Basin. The maximum carcinogenic risk was estimated to be three in a million for residential receptors (Table B-4) in the West Los Angeles source receptor area. The noncarcinogenic hazard indices were estimated to be less than 1.0 (Table B-4). The significance threshold for carcinogenic risk is ten in a million. The significance threshold for noncarcinogenic risk is a hazard index greater than 1.0. Therefore, the proposed project is not significant for risk from methylene chloride.

Based on the 2004 Preliminary Draft Staff Report the maximum methylene chloride content in the existing welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications is 91 percent. Staff assumed that a maximum of 20 gallons per year are currently used at any single facility per year. Based on this the maximum carcinogenic risk from methylene chloride emitted from any single facility is four in a million (Table B-5) and the noncarcinogenic acute and hazard indices are below 1.0 (Table B-6).

TABLE B-1
Estimated VOC Emissions Inventories and Emissions Foregone

	VOC content limits				VOC Emissions Inventory				Emissions Foregone	
Plastic Welding Type	**1/1/1993 VOC content limits (gram/liter)**	**Current VOC content limits (gram/liter)**	**1/1/2005 FEA VOC content limits (gram/liter)**	**Proposed VOC content limits (gram/liter)**	**1/1/1993 Emission Inventory (ton/day)**	**Current Emission Inventory (ton/day)**	**Future Emissions Inventory Based on 1/1/2005 FEA VOC content limits (ton/day)**	**Future Emission Inventory Based on 1/1/2005 Proposed Limits (ton/day)**	**Emissions Foregone Based on Rescinding FEA VOC content limits (ton/day)**	**Emissions Foregone Based on Proposed VOC content limits (ton/day)**
PVC	850	510	285	510	0.569	0.569	0.318	-0.251	-0.251	0.569
CPVC	850	490	270	490	0.174	0.174	0.096	-0.078	-0.078	0.174
ABS	850	400	400	325	0.588	0.478	0.588	0.000	0.110	0.588
Primer	650	650	250	550	0.832	0.704	0.320	-0.512	-0.384	0.832
Totals					2.163	1.925	1.322	-0.840	-0.600	2.163

~~1/1/1993 Emissions Inventory - Table 2, SCAQMD, Final Staff Report for Proposed Amended Rule 1168 - Control of Volatile Organic Compound Emissions from Adhesive Applications, April 11, 1997.~~

SCAQMD, Staff Report for Proposed Amended Rule 1168, SCAQMD No: 921021MG, Attachment 1 VOC Emission Inventory For Affected Industries, October 1992.

Current emission inventory, ton/day = 1/1/1993 Emissions Inventory x (Current VOC content limits/1/1/93 VOC content limits) x $((100\% + 2\%)/100\%)^{\text{no of years}}$

Future emission inventory based on 1/1/2005 FEA VOC content limits, ton/day = Current emissions inventory x ((Proposed VOC content limits)/(Current VOC content limits))
Future emission inventory based on 1/1/2005 Proposed VOC content limits, ton/day = Current emissions inventory x ((1/1/2005 FEA VOC content limits)/(Current VOC content limits))

Emissions foregone based rescinding FEA VOC limits (tons/day) = Future Emission Inventory Based on 1/1/2005 Proposed Limits (ton/day) - Current Emission Inventory (ton/day)
Emissions foregone based proposed VOC limits (tons/day) = Future Emission Inventory Based on 1/1/2005 Proposed Limits (ton/day) - Future Emissions Inventory Based on 1/1/2005 FEA VOC Limits (ton/day)

Table B-2
Estimated Top and Trim Adhesives Inventory and VOC Emission Reductions Delayed

Adhesive Type Based on Range of VOC Content	VOC Content of Material less water/exempt compounds		VOC Content of Material, As Applied less water/exempt compounds		Adhesive Coverage	Estimated Annual Adhesive Inventory Based on Coverage [a]	Estimated VOC Emissions [b]	
	grams /liter	lb/gal	grams /liter	lb/gal	sq. ft./gal	gal/yr	lb/day	ton/day
Original VOC Limit (Pre-June 2002)	616	5.14	616	5.14	237	85,000	1,196	0.598
Interim VOC Limit (Current limit post-June 2002)	540	4.50	340	2.83	309	65,194	506	0.253
Final VOC Limit (To be in effect January 1, 2007)	250	2.08	125	1.04	625	32,232	92	0.046
Total Estimated VOC Emission Reductions Delayed [c]							**414**	**0.21**

[a] To calculate the estimated annual adhesives usage based on adhesive coverage data, multiply the 'Original VOC Limit' adhesive inventory by a ratio of the high VOC adhesive coverage to the coverage for the material in question. For example, the calculation of the estimated annual adhesive usage for a compliant adhesive is as follows:
85,000 gal/yr x (237 sq. ft./gal / 625 sq. ft./gal) = 65,194 gal/yr of compliant adhesive

[b] To calculate the 'Estimated VOC Emissions', multiply the 'VOC Content of Material, As Applied' by the 'Estimated Annual Adhesive Inventory Based on Coverage' and adjust for days and tons, as applicable. For example, for the 'Original VOC Limit' adhesive category, the calculation of estimated VOC emissions is as follows:
5.14 lb VOC/gal x 85,000 gal/yr x 1 yr/365 days = 1,196 lb VOC/day x (1 ton/2000 lb) = 0.598 tons VOC / day

[c] To calculate the 'Total Estimated VOC Emission Reductions Delayed', subtract the estimated VOC emissions for Final VOC Limit adhesives from the estimated VOC emissions for Interim VOC adhesives as follows: 506 lb VOC/day - 92 lb VOC/day = 414 lb VOC/day of emissions reductions delayed

~~Table B-3~~
~~Summary of Daily VOC Emissions Foregone~~

~~Plastic Welding Type~~	~~Emissions Foregone in Tons per Day~~			~~Emissions Foregone in Pounds per Day~~		
	~~Emissions Foregone Based on Rescinding FEA VOC Content Limits (ton/day)~~	~~Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2005 (ton/day)~~	~~Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2007 (ton/day)~~	~~Emissions Foregone Based on Rescinding FEA VOC Content Limits (lb/day)~~	~~Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2005 (lb/day)~~	~~Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2007 (lb/day)~~
~~Top and Trim Adhesives~~	~~-0.21~~	~~-0.21~~	~~0~~	~~-420~~	~~-420~~	~~0~~
~~PVC Welding~~	~~-0.25~~	~~-0.25~~	~~-0.25~~	~~-500~~	~~-500~~	~~-500~~
~~CPVC Welding~~	~~-0.08~~	~~-0.08~~	~~-0.08~~	~~-160~~	~~-160~~	~~-160~~
~~ABS Welding~~	~~0~~	~~0.11~~	~~0.11~~	~~0~~	~~220~~	~~220~~
~~PVC and CPVC Primer~~	~~-0.52~~	~~-0.39~~	~~-0.39~~	~~-1,040~~	~~-780~~	~~-780~~
~~**Totals**~~	~~**-1.06**~~	~~**-0.82**~~	~~**-0.61**~~	~~**-2,120**~~	~~**-1,640**~~	~~**-1,220**~~
~~**Significance Threshold**~~	~~**0.028**~~	~~**0.028**~~	~~**0.028**~~	~~**55**~~	~~**55**~~	~~**55**~~
~~**Significant**~~	~~**Yes**~~	~~**Yes**~~	~~**Yes**~~	~~**Yes**~~	~~**Yes**~~	~~**Yes**~~

Table B-3
Summary of Daily VOC Emissions Foregone

Plastic Welding Type	Emissions Foregone in Tons per Day[a]				Emissions Foregone in Pounds per Day[b]			
	Emissions Foregone Based on Rescinding FEA VOC Content Limits (ton/day)	Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2005 (ton/day)	Emissions Foregone Based on Proposed VOC Content Limits after July 1, 2005 (ton/day)	Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2007 (ton/day)	Emissions Foregone Based on Rescinding FEA VOC Content Limits (lb/day)	Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2005 (lb/day)	Emissions Foregone Based on Proposed VOC Content Limits after July 1, 2005 (lb/day)	Emissions Foregone Based on Proposed VOC Content Limits after January 1, 2007 (lb/day)
Top and Trim Adhesives	-0.207	-0.207	-0.207	0	-414	-414	-414	0
PVC Welding	-0.251	-0.251	-0.251	-0.251	-502	-502	-502	-502
CPVC Welding	-0.078	-0.078	-0.078	-0.078	-156	-156	-156	-156
ABS Welding	0.000	0.000	0.110	0.110	0	0	220	220
PVC and CPVC Primer	-0.512	-0.512	-0.384	-0.384	-1,024	-1,024	-768	-768
Totals	**-1.048**	**-1.048**	**-0.810**	**-0.603**	**-2,096**	**-2,096**	**-1,620**	**-1,206**
Significance Threshold	-	-	-	-	55	55	55	55
Significant	-	-	-	-	**Yes**	**Yes**	**Yes**	**Yes**

a) Emissions foregone in tons per day were estimated in Tables 4-2 and 4-3.
b) Emissions foregone in tons per day were calculated by multiplying emissions foregone in tons per day by 2,000 pounds per ton.

TABLE B-4
Carcinogenic Risk from Methylene Chloride Welding of Acrylic, Polycarbonate and Polyethylene Terephalate Glycol Plastic Fabrications with Proposed Concentration and Facility Limits

Air Monitoring Station	Q (ton/yr)	X/Q at 25 ft ($\mu g/m^3$)/ (ton/yr)	MET	U $(\mu g/m^3)^{-1}$	MP Worst Case	LEA Resi-dential	LEA Worker	MICR Resi-dental at 25ft	MICR Worker at 25 ft
Anaheim	0.07	41.45	0.86	1.00E-06	1	1	0.66	2.35E-06	1.55E-06
Azusa	0.07	41.45	0.80	1.00E-06	1	1	0.66	2.19E-06	1.44E-06
Banning	0.07	41.45	0.54	1.00E-06	1	1	0.66	1.48E-06	9.75E-07
Burbank	0.07	41.45	0.60	1.00E-06	1	1	0.66	1.64E-06	1.08E-06
Canoga Park	0.07	41.45	0.68	1.00E-06	1	1	0.66	1.86E-06	1.23E-06
Compton	0.07	41.45	0.63	1.00E-06	1	1	0.66	1.72E-06	1.14E-06
Costa Mesa	0.07	41.45	0.71	1.00E-06	1	1	0.66	1.94E-06	1.28E-06
Downtown L.A.	0.07	41.45	0.51	1.00E-06	1	1	0.66	1.40E-06	9.21E-07
El Toro	0.07	41.45	0.68	1.00E-06	1	1	0.66	1.86E-06	1.23E-06
Fontana	0.07	41.45	0.80	1.00E-06	1	1	0.66	2.19E-06	1.44E-06
Indio	0.07	41.45	0.72	1.00E-06	1	1	0.66	1.97E-06	1.30E-06
King Harbor	0.07	41.45	0.63	1.00E-06	1	1	0.66	1.72E-06	1.14E-06
La Canada	0.07	41.45	0.81	1.00E-06	1	1	0.66	2.22E-06	1.46E-06
Lancaster	0.07	41.45	0.49	1.00E-06	1	1	0.66	1.34E-06	8.85E-07
Lennox	0.07	41.45	0.66	1.00E-06	1	1	0.66	1.81E-06	1.19E-06
Long Beach	0.07	41.45	0.58	1.00E-06	1	1	0.66	1.59E-06	1.05E-06
Los Alamitos	0.07	41.45	0.64	1.00E-06	1	1	0.66	1.75E-06	1.16E-06
Lynwood	0.07	41.45	0.63	1.00E-06	1	1	0.66	1.72E-06	1.14E-06
Malibu	0.07	41.45	0.88	1.00E-06	1	1	0.66	2.41E-06	1.59E-06
Newhall	0.07	41.45	0.53	1.00E-06	1	1	0.66	1.45E-06	9.57E-07
Norco	0.07	41.45	0.75	1.00E-06	1	1	0.66	2.05E-06	1.35E-06
Palm Springs	0.07	41.45	0.60	1.00E-06	1	1	0.66	1.64E-06	1.08E-06
Pasadena	0.07	41.45	0.75	1.00E-06	1	1	0.66	2.05E-06	1.35E-06
Pico Rivera	0.07	41.45	0.70	1.00E-06	1	1	0.66	1.91E-06	1.26E-06
Pomona	0.07	41.45	0.91	1.00E-06	1	1	0.66	2.49E-06	1.64E-06
Redlands	0.07	41.45	0.90	1.00E-06	1	1	0.66	2.46E-06	1.63E-06
Reseda	0.07	41.45	0.71	1.00E-06	1	1	0.66	1.94E-06	1.28E-06
Riverside	0.07	41.45	0.82	1.00E-06	1	1	0.66	2.24E-06	1.48E-06
Santa Ana Cyn	0.07	41.45	0.92	1.00E-06	1	1	0.66	2.52E-06	1.66E-06
Upland	0.07	41.45	0.62	1.00E-06	1	1	0.66	1.70E-06	1.12E-06
Vernon	0.07	41.45	0.55	1.00E-06	1	1	0.66	1.50E-06	9.93E-07
Walnut	0.07	41.45	0.63	1.00E-06	1	1	0.66	1.72E-06	1.14E-06
West L.A.	0.07	41.45	1.00	1.00E-06	1	1	0.66	2.74E-06	1.81E-06
Whittier	0.07	41.45	0.66	1.00E-06	1	1	0.66	1.81E-06	1.19E-06
Maximum								2.74E-06	1.81E-06

Maximum Individual Cancer Risk (MICR)

Maximum emission rate (Q)

Dispersion factor (X/Q) - Table 4A, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Meterological correction factor (MET) - Table 4B, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Unit Risk Factor (U) - Table 8A, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Multi-pathway factor (MP) - Table 8, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Lifetime exposure adjustment factor (LEA) - Table 9, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

MICR = Q, ton/yr x (X/Q) x MET x U x MP x LEA

TABLE B-5
Noncarcinogenic Risk from Methylene Chloride Welding of Acrylic, Polycarbonate and Polyethylene Terephalate Glycol Plastic Fabrications with Proposed Concentration and Facility Limits

Air Monitoring Station	Q (ton/yr)	Q_{hr} (lb/hr)	X/Q at 25 ft ($\mu g/m^3$)/ (ton/yr)	X/Q_{hr} at 25 ft ($\mu g/m^3$)/ (lb/hr)	MET	MP (Worst Case)	Chronic REL	Acute REL	HIA	HIC
Anaheim	0.07	6.00	41.45	1,532	0.86	1	400	14,000	0.66	0.0059
Azusa	0.07	6.00	41.45	1,532	0.80	1	400	14,000	0.66	0.0055
Banning	0.07	6.00	41.45	1,532	0.54	1	400	14,000	0.66	0.0037
Burbank	0.07	6.00	41.45	1,532	0.60	1	400	14,000	0.66	0.0041
Canoga Park	0.07	6.00	41.45	1,532	0.68	1	400	14,000	0.66	0.0047
Compton	0.07	6.00	41.45	1,532	0.63	1	400	14,000	0.66	0.0043
Costa Mesa	0.07	6.00	41.45	1,532	0.71	1	400	14,000	0.66	0.0049
Downtown L.A.	0.07	6.00	41.45	1,532	0.51	1	400	14,000	0.66	0.0035
El Toro	0.07	6.00	41.45	1,532	0.68	1	400	14,000	0.66	0.0047
Fontana	0.07	6.00	41.45	1,532	0.80	1	400	14,000	0.66	0.0055
Indio	0.07	6.00	41.45	1,532	0.72	1	400	14,000	0.66	0.0049
King Harbor	0.07	6.00	41.45	1,532	0.63	1	400	14,000	0.66	0.0043
La Canada	0.07	6.00	41.45	1,532	0.81	1	400	14,000	0.66	0.0055
Lancaster	0.07	6.00	41.45	1,532	0.49	1	400	14,000	0.66	0.0034
Lennox	0.07	6.00	41.45	1,532	0.66	1	400	14,000	0.66	0.0045
Long Beach	0.07	6.00	41.45	1,532	0.58	1	400	14,000	0.66	0.0040
Los Alamitos	0.07	6.00	41.45	1,532	0.64	1	400	14,000	0.66	0.0044
Lynwood	0.07	6.00	41.45	1,532	0.63	1	400	14,000	0.66	0.0043
Malibu	0.07	6.00	41.45	1,532	0.88	1	400	14,000	0.66	0.0060
Newhall	0.07	6.00	41.45	1,532	0.53	1	400	14,000	0.66	0.0036
Norco	0.07	6.00	41.45	1,532	0.75	1	400	14,000	0.66	0.0051
Palm Springs	0.07	6.00	41.45	1,532	0.60	1	400	14,000	0.66	0.0041
Pasadena	0.07	6.00	41.45	1,532	0.75	1	400	14,000	0.66	0.0051
Pico Rivera	0.07	6.00	41.45	1,532	0.70	1	400	14,000	0.66	0.0048
Pomona	0.07	6.00	41.45	1,532	0.91	1	400	14,000	0.66	0.0062
Redlands	0.07	6.00	41.45	1,532	0.90	1	400	14,000	0.66	0.0062
Reseda	0.07	6.00	41.45	1,532	0.71	1	400	14,000	0.66	0.0049
Riverside	0.07	6.00	41.45	1,532	0.82	1	400	14,000	0.66	0.0056
Santa Ana Cyn	0.07	6.00	41.45	1,532	0.92	1	400	14,000	0.66	0.0063
Upland	0.07	6.00	41.45	1,532	0.62	1	400	14,000	0.66	0.0042
Vernon	0.07	6.00	41.45	1,532	0.55	1	400	14,000	0.66	0.0038
Walnut	0.07	6.00	41.45	1,532	0.63	1	400	14,000	0.66	0.0043
West L.A.	0.07	6.00	41.45	1,532	1.00	1	400	14,000	0.66	0.0068
Whittier	0.07	6.00	41.45	1,532	0.66	1	400	14,000	0.66	0.0045

Maximum emission rate (Q) in tons per year

Maximum emission rate (Q_{hr}) in pounds per hour

Dispersion factor (X/Q) - Table 4A, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Dispersion factor $(X/Q)_{hr}$ - Table 7, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.1

Meterological correction factor (MET) - Table 4B, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Multi-pathway factor (MP) - Table 8, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Reference exposure level - Table 8A, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Acute hazard index (HIA)

Chronic hazard index (HIC)

Total HIA$_{target\ organ}$ = {Σ[Qhr x (X/Q)$_{hr}$]/Acute REL}$_{target\ organ}$

Total HIC$_{target\ organ}$ = { Σ[Qyr x (X/Q) x MET x MP]/Chronic REL}$_{target\ organ}$

TABLE B-6
Existing Carcinogenic Risk from Methylene Chloride Welding of Acrylic, Polycarbonate and Polyethylene Terephalate Glycol Plastic Fabrications

Air Monitoring Station	Q (ton/yr)	X/Q at 25 ft (μg/m^3)/ (ton/yr)	MET	U (μg/m^3)$^{-1}$	MP Worst Case	LEA Resi-dential	LEA Worker	MICR Resi-dental at 25ft	MICR Worker at 25 ft
Anaheim	0.10	41.45	0.86	1.00E-06	1	1	0.66	3.56E-06	2.35E-06
Azusa	0.10	41.45	0.80	1.00E-06	1	1	0.66	3.32E-06	2.19E-06
Banning	0.10	41.45	0.54	1.00E-06	1	1	0.66	2.24E-06	1.48E-06
Burbank	0.10	41.45	0.60	1.00E-06	1	1	0.66	2.49E-06	1.64E-06
Canoga Park	0.10	41.45	0.68	1.00E-06	1	1	0.66	2.82E-06	1.86E-06
Compton	0.10	41.45	0.63	1.00E-06	1	1	0.66	2.61E-06	1.72E-06
Costa Mesa	0.10	41.45	0.71	1.00E-06	1	1	0.66	2.94E-06	1.94E-06
Downtown L.A.	0.10	41.45	0.51	1.00E-06	1	1	0.66	2.11E-06	1.40E-06
El Toro	0.10	41.45	0.68	1.00E-06	1	1	0.66	2.82E-06	1.86E-06
Fontana	0.10	41.45	0.80	1.00E-06	1	1	0.66	3.32E-06	2.19E-06
Indio	0.10	41.45	0.72	1.00E-06	1	1	0.66	2.98E-06	1.97E-06
King Harbor	0.10	41.45	0.63	1.00E-06	1	1	0.66	2.61E-06	1.72E-06
La Canada	0.10	41.45	0.81	1.00E-06	1	1	0.66	3.36E-06	2.22E-06
Lancaster	0.10	41.45	0.49	1.00E-06	1	1	0.66	2.03E-06	1.34E-06
Lennox	0.10	41.45	0.66	1.00E-06	1	1	0.66	2.74E-06	1.81E-06
Long Beach	0.10	41.45	0.58	1.00E-06	1	1	0.66	2.40E-06	1.59E-06
Los Alamitos	0.10	41.45	0.64	1.00E-06	1	1	0.66	2.65E-06	1.75E-06
Lynwood	0.10	41.45	0.63	1.00E-06	1	1	0.66	2.61E-06	1.72E-06
Malibu	0.10	41.45	0.88	1.00E-06	1	1	0.66	3.65E-06	2.41E-06
Newhall	0.10	41.45	0.53	1.00E-06	1	1	0.66	2.20E-06	1.45E-06
Norco	0.10	41.45	0.75	1.00E-06	1	1	0.66	3.11E-06	2.05E-06
Palm Springs	0.10	41.45	0.60	1.00E-06	1	1	0.66	2.49E-06	1.64E-06
Pasadena	0.10	41.45	0.75	1.00E-06	1	1	0.66	3.11E-06	2.05E-06
Pico Rivera	0.10	41.45	0.70	1.00E-06	1	1	0.66	2.90E-06	1.91E-06
Pomona	0.10	41.45	0.91	1.00E-06	1	1	0.66	3.77E-06	2.49E-06
Redlands	0.10	41.45	0.90	1.00E-06	1	1	0.66	3.73E-06	2.46E-06
Reseda	0.10	41.45	0.71	1.00E-06	1	1	0.66	2.94E-06	1.94E-06
Riverside	0.10	41.45	0.82	1.00E-06	1	1	0.66	3.40E-06	2.24E-06
Santa Ana Cyn	0.10	41.45	0.92	1.00E-06	1	1	0.66	3.81E-06	2.52E-06
Upland	0.10	41.45	0.62	1.00E-06	1	1	0.66	2.57E-06	1.70E-06
Vernon	0.10	41.45	0.55	1.00E-06	1	1	0.66	2.28E-06	1.50E-06
Walnut	0.10	41.45	0.63	1.00E-06	1	1	0.66	2.61E-06	1.72E-06
West L.A.	0.10	41.45	1.00	1.00E-06	1	1	0.66	4.15E-06	2.74E-06
Whittier	0.10	41.45	0.66	1.00E-06	1	1	0.66	2.74E-06	1.81E-06
Total								4.15E-06	2.74E-06

Maximum Individual Cancer Risk (MICR)

Maximum emission rate (Q)

Dispersion factor (X/Q) - Table 4A, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Meteorological correction factor (MET) - Table 4B, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Unit Risk Factor (U) - Table 8A, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Multi-pathway factor (MP) - Table 8, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Lifetime exposure adjustment factor (LEA) - Table 9, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

MICR = Q, ton/yr x (X/Q) x MET x U x MP x LEA

TABLE B-7
Existing NonCarcinogenic Risk from Methylene Chloride Welding of Acrylic, Polycarbonate and Polyethylene Terephalate Glycol Plastic Fabrications

Air Monitoring Station	Q (ton/yr)	Q_{hr} (lb/hr)	X/Q at 25 ft ($\mu g/m^3$)/ (ton/yr)	X/Q_{hr} at 25 ft ($\mu g/m^3$)/ (lb/hr)	MET	MP (Worst Case)	Chronic REL	Acute REL	HIA	HIC
Anaheim	0.10	6.00	41.45	1,532	0.86	1	400	14,000	0.66	0.0089
Azusa	0.10	6.00	41.45	1,532	0.80	1	400	14,000	0.66	0.0083
Banning	0.10	6.00	41.45	1,532	0.54	1	400	14,000	0.66	0.0056
Burbank	0.10	6.00	41.45	1,532	0.60	1	400	14,000	0.66	0.0062
Canoga Park	0.10	6.00	41.45	1,532	0.68	1	400	14,000	0.66	0.0070
Compton	0.10	6.00	41.45	1,532	0.63	1	400	14,000	0.66	0.0065
Costa Mesa	0.10	6.00	41.45	1,532	0.71	1	400	14,000	0.66	0.0074
Downtown L.A.	0.10	6.00	41.45	1,532	0.51	1	400	14,000	0.66	0.0053
El Toro	0.10	6.00	41.45	1,532	0.68	1	400	14,000	0.66	0.0070
Fontana	0.10	6.00	41.45	1,532	0.80	1	400	14,000	0.66	0.0083
Indio	0.10	6.00	41.45	1,532	0.72	1	400	14,000	0.66	0.0075
King Harbor	0.10	6.00	41.45	1,532	0.63	1	400	14,000	0.66	0.0065
La Canada	0.10	6.00	41.45	1,532	0.81	1	400	14,000	0.66	0.0084
Lancaster	0.10	6.00	41.45	1,532	0.49	1	400	14,000	0.66	0.0051
Lennox	0.10	6.00	41.45	1,532	0.66	1	400	14,000	0.66	0.0068
Long Beach	0.10	6.00	41.45	1,532	0.58	1	400	14,000	0.66	0.0060
Los Alamitos	0.10	6.00	41.45	1,532	0.64	1	400	14,000	0.66	0.0066
Lynwood	0.10	6.00	41.45	1,532	0.63	1	400	14,000	0.66	0.0065
Malibu	0.10	6.00	41.45	1,532	0.88	1	400	14,000	0.66	0.0091
Newhall	0.10	6.00	41.45	1,532	0.53	1	400	14,000	0.66	0.0055
Norco	0.10	6.00	41.45	1,532	0.75	1	400	14,000	0.66	0.0078
Palm Springs	0.10	6.00	41.45	1,532	0.60	1	400	14,000	0.66	0.0062
Pasadena	0.10	6.00	41.45	1,532	0.75	1	400	14,000	0.66	0.0078
Pico Rivera	0.10	6.00	41.45	1,532	0.70	1	400	14,000	0.66	0.0073
Pomona	0.10	6.00	41.45	1,532	0.91	1	400	14,000	0.66	0.0094
Redlands	0.10	6.00	41.45	1,532	0.90	1	400	14,000	0.66	0.0093
Reseda	0.10	6.00	41.45	1,532	0.71	1	400	14,000	0.66	0.0074
Riverside	0.10	6.00	41.45	1,532	0.82	1	400	14,000	0.66	0.0085
Santa Ana Cyn	0.10	6.00	41.45	1,532	0.92	1	400	14,000	0.66	0.0095
Upland	0.10	6.00	41.45	1,532	0.62	1	400	14,000	0.66	0.0064
Vernon	0.10	6.00	41.45	1,532	0.55	1	400	14,000	0.66	0.0057
Walnut	0.10	6.00	41.45	1,532	0.63	1	400	14,000	0.66	0.0065
West L.A.	0.10	6.00	41.45	1,532	1.00	1	400	14,000	0.66	0.0104
Whittier	0.10	6.00	41.45	1,532	0.66	1	400	14,000	0.66	0.0068

Maximum emission rate (Q) in tons per year

Maximum emission rate (Q_{hr}) in pounds per hour

Dispersion factor (X/Q) - Table 4A, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Dispersion factor $(X/Q)_{hr}$ - Table 7, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.1

Meteorological correction factor (MET) - Table 4B, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Multi-pathway factor (MP) - Table 8, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Reference exposure level - Table 8A, SCAQMD Risk Assessment Procedures for Rules 1401 & 212, Version 6.0

Acute hazard index (HIA)

Chronic hazard index (HIC)

Total $HIA_{target\ organ} = \{ \Sigma[Qhr \times (X/Q)_{hr}]/Acute\ REL\}_{target\ organ}$

Total $HIC_{target\ organ} = \{ \Sigma[Qyr \times (X/Q) \times MET \times MP]/Chronic\ REL\}_{target\ organ}$

APPENDIX C

COMMENT LETTER ON THE DRAFT SUBSEQUENT ENVIRONMENTAL ASSESSMENT AND RESPONSE TO THE COMMENT LETTER

SOUTHERN CALIFORNIA

ASSOCIATION of GOVERNMENTS

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Orange County Transportation Authority: Charles Smith, Orange County

Riverside County Transportation Commission: Robin Lowe, Hemet

Ventura County Transportation Commission: Bill Davis, Simi Valley

Printed on Recycled Paper 559-9/07/04

October 25, 2004

Mr. James Koizumi
SCAQMD
21865 E. Copley Drive
Diamond Bar, CA 91765-4182

RE: SCAG Clearinghouse No. I20040694 Proposed Amended Rule 1168

Dear Mr. Koizumi:

Thank you for submitting the **Proposed Amended Rule 1168** for review and comment. As areawide clearinghouse for regionally significant projects, SCAG reviews the consistency of local plans, projects and programs with regional plans. This activity is based on SCAG's responsibilities as a regional planning organization pursuant to state and federal laws and regulations. Guidance provided by these reviews is intended to assist local agencies and project sponsors to take actions that contribute to the attainment of regional goals and policies.

We have reviewed the **Proposed Amended Rule 1168**, and have determined that the proposed Project is not regionally significant per SCAG Intergovernmental Review (IGR) Criteria and California Environmental Quality Act (CEQA) Guidelines (Section 15206). Therefore, the proposed Project does not warrant comments at this time. Should there be a change in the scope of the proposed Project, we would appreciate the opportunity to review and comment at that time.

A description of the proposed Project was published in SCAG's **October 1-15, 2004** Intergovernmental Review Clearinghouse Report for public for review and comment.

The project title and SCAG Clearinghouse number should be used in all correspondence with SCAG concerning this Project. Correspondence should be sent to the attention of the Clearinghouse Coordinator. If you have any questions, please contact me at (213) 236-1867. Thank you.

Sincerely,

JEFFREY M. SMITH, AICP
Senior Regional Planner
Intergovernmental Review

Responses to Comment Letter
Southern California Association of Governments
October 25, 2004

Response
SCAQMD agrees with the SCAG that PAR 1168 is not regionally significant.

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4182
(909) 396-2000 • http://www.aqmd.gov

SUBJECT: **NOTICE OF COMPLETION OF A DRAFT SUBSEQUENT ENVIRONMENTAL ASSESSMENT**

PROJECT TITLE: **PROPOSED AMENDMENTS TO RULE 1171 – SOLVENT CLEANING OPERATIONS**

In accordance with the California Environmental Quality Act (CEQA), the South Coast Air Quality Management District (SCAQMD), as the Lead Agency, prepared this Draft Subsequent Environmental Assessment (SEA) which assesses potential environmental impacts that may result from implementing the proposed project identified above pursuant to its certified regulatory program (SCAQMD Rule 110).

This letter, the Notice of Completion (NOC) and the attached Draft SEA are not SCAQMD applications or forms requiring a response from you. Their purpose is simply to provide information to you on the above project. If the proposed project has no bearing on you or your organization, no action on your part is necessary. The project's description, location, and potential environmental impacts are described in the NOC.

Comments focusing on your area of expertise, your agency's area of jurisdiction, or issues relative to the environmental analysis should be addressed to Mr. Michael Krause (c/o CEQA) at the address shown above, or sent by FAX to (909) 396-3324 or by e-mail to mkrause@aqmd.gov. Comments must be received no later than 5:00 PM on March 25, 2005. Please include the name and phone number of the contact person for your agency. Questions relative to the rule amendments should be directed to Mr. Rizaldy Calungcagin at (909) 396-2315.

The Public Hearing for the proposed amendments is scheduled for May 6, 2005. (Note: This public meeting date is subject to change).

Date: February 9, 2005 **Signature:** Steve Smith

Steve Smith, Ph.D.
Program Supervisor
Planning, Rules, and Area Sources

Reference: California Code of Regulations, Title 14, Sections 15082(a), 15103, and 15375

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
21865 Copley Drive, Diamond Bar, CA 91765-4182

NOTICE OF COMPLETION OF A DRAFT SUBSEQUENT ENVIRONMENTAL ASSESSMENT

Project Title:
Draft Subsequent Environmental Assessment (SEA): Proposed Amended Rule 1171 – Solvent Cleaning Operations

Project Location:
South Coast Air Quality Management District (SCAQMD) area of jurisdiction consisting of the four-county South Coast Air Basin (Orange County and the non-desert portions of Los Angeles, Riverside and San Bernardino counties), and the Riverside County portions of the Salton Sea Air Basin and the Mojave Desert Air Basin

Description of Nature, Purpose, and Beneficiaries of Project:
Proposed amended Rule (PAR) 1171 – Solvent Cleaning Operations, will implement the recommendations in the technology assessments for those cleaning applications where studies have been completed. Because the technology assessment for the cleaning of screen printing, lithographic/letterpress, and ultraviolet or electron beam ink application equipment is still on-going and not expected to be completed until the end of November 2005, SCAQMD staff is proposing a one-year delay in the implementation of low-VOC limits originally scheduled for July 1, 2005 for these cleaning applications. An interim VOC limit is being proposed for these cleaning applications to take advantage of existing products in the market, which have lower VOC content limits than the current rule limit. Other amendments include: eliminating the exemption for cleaning of solar cells, laser hardware, scientific instruments, and high-precision optics; extending the exemption for the cleaning of stereolithography equipment and models and UV lamps used for curing UV inks or coatings; modifying the rule language to include the most current test methods for determining the efficiency of an emission control system; and eliminating the general prohibition exemption for methylene chloride and perchloroethylene.

Lead Agency:
South Coast Air Quality Management District

Division:
Planning, Rule Development and Area Sources

Draft SEA and all supporting documentation are available at:
SCAQMD Headquarters
21865 Copley Drive
Diamond Bar, CA 91765

or by calling:
(909) 396-2039

or by accessing the SCAQMD's website at:
http://www.aqmd.gov/ceqa/aqmd.html

The Public Notice of Completion is provided through the following:

☑ Los Angeles Times (February 9, 2005) ☑ AQMD Website ☑ AQMD Mailing List

Draft SEA Review Period:
February 9, 2005 – March 25, 2005

Scheduled Public Meeting Dates:
SCAQMD Governing Board Hearing: May 6, 2005, 9:00 a.m.; SCAQMD Headquarters

The proposed project will have a regional and areawide significance, therefore, a CEQA scoping meeting is required (pursuant to Public Resources Code §21083.9(a)(2)) and was held on January 27, 2005 for the proposed project.

CEQA Contact Person:	Phone Number:	Fax Number:	Email:
Mr. Michael Krause	(909) 396-2706	(909) 396-3324	<mkrause@aqmd.gov>

Direct Questions on Proposed Amendments to:	Phone Number:	Fax Number:	Email:
Mr. Rizaldy Calungcagin	(909) 396-2315	(909) 396-3324	<rcalungcagin@aqmd.gov>

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft Subsequent Environmental Assessment for:

Proposed Amended Rule 1171 – Solvent Cleaning Operations

SCAQMD No. 050209MK

February 9, 2005

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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

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INTRODUCTION

CEQA requires environmental documents to identify significant environmental effects that may result from a proposed project [CEQA Guidelines §15126.2 (a)]. Direct and indirect significant effects of a project on the environment should be identified and described, with consideration given to both short- and long-term impacts. The discussion of environmental impacts may include, but is not limited, to, the resources involved; physical changes; alterations of ecological systems; health and safety problems caused by physical changes; and other aspects of the resource base, including water, scenic quality, and public services. If significant adverse environmental impacts are identified, the CEQA Guidelines require a discussion of measures that could either avoid or substantially reduce any adverse environmental impacts to the greatest extent feasible (CEQA Guidelines §15126.4(c)].

The CEQA Guidelines state that the degree of specificity required in a CEQA document depends on the type of project being proposed (CEQA Guidelines §15146). The detail of the environmental analysis for certain types of projects cannot be as great as for others. For example, the environmental document for projects, such as the adoption or amendment of a comprehensive zoning ordinance or a local general plan, should focus on the secondary effects that can be expected to follow from the adoption or amendment, but the analysis need not be as detailed as the analysis of the specific construction projects that might follow. As a result, this Draft SEA analyzes impacts on a regional level and impacts on the level of individual industries or individual facilities where feasible.

The categories of environmental impacts recommended for evaluation in a CEQA document are established by CEQA (Public Resources Code, §21000 et seq.) and the CEQA Guidelines as promulgated by the State of California Secretary of Resources. Under the CEQA Guidelines, there are 17 environmental categories in which potential adverse impacts from a project are evaluated. Projects are evaluated against the environmental categories in an environmental checklist and those environmental categories that may be adversely affected by the project are further analyzed in the appropriate CEQA document.

POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A Notice of Preparation and an Initial Study (NOP/IS), including an environmental checklist, were prepared for the 1999 amendments to Rule 1171 when the VOC content limit for the affected solvent cleaning categories were originally adopted to be lowered. The proposed amendments represent a modification of the Rule 1171 amendments adopted in 1999 that delay the final compliance date for specified cleaning solvents and no new requirements are proposed. that would trigger the need to solicit guidance from responsible and/or trustee parties. SCAQMD's review of the proposed project shows that the project would have a significant adverse effect on the environment. The following sections include the analyses of the potential adverse environmental impacts of implementing the proposed amendments.

Only one environmental impact area, air quality, was identified as a potentially significant adverse effect of implementing the proposed project. The environmental impact analysis incorporates a "worst-case" approach. This entails the premise that whenever the analysis requires that assumptions be made, those assumptions that result in the greatest adverse impacts are typically chosen. This method ensures that all potential effects of the proposed project are documented for the decision-makers and the public.

Accordingly, the following analyses use a conservative or "worst-case" approach for analyzing the potentially significant adverse environmental impacts associated with the implementation of the proposed project.

Air Quality

Significance Criteria

The project will be considered to have significant adverse air quality impacts if any one of the thresholds in Table 4-1 are equaled or exceeded.

TABLE 4-1

SCAQMD Air Quality Significance Thresholds

Mass Daily Thresholds		
Pollutant	**Construction**	**Operational**
NO_x	100 lbs/day	55 lbs/day
VOC	75 lbs/day	55 lbs/day
PM10	150 lbs/day	150 lbs/day
SOx	150 lbs/day	150 lbs/day
CO	550 lbs/day	550 lbs/day
Lead	3 lbs/day	3 lbs/day
Toxic Air Contaminants (TACs) and Odor Thresholds		
TACs (including carcinogens and non-carcinogens)	Maximum Incremental Cancer Risk ≥ 10 in 1 million Hazard Index ≥ 1.0 (project increment) Hazard Index ≥ 3.0 (facility-wide)	
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402	
Ambient Air Quality for Criteria Pollutants [a]		
NO2 1-hour average annual average	In attainment; significant if project causes or contributes to an exceedance of any standard: 0.25 ppm (state) 0.053 ppm (federal)	

TABLE 4-1 (CONCLUDED)

SCAQMD Air Quality Significance Thresholds

Ambient Air Quality for Criteria Pollutants [a]	
PM10 24-hour average annual geometric average annual arithmetic mean	10.4 $\mu g/m^3$ (recommended for construction) [b] 2.5 $\mu g/m^3$ (operation) 1.0 $\mu g/m^3$ 20 $\mu g/m^3$
Sulfate 24-hour average	1 $\mu g/m^3$
CO 1-hour average 8-hour average	In attainment; significant if project causes or contributes to an exceedance of any standard: 20 ppm (state) 9.0 ppm (state/federal)

[a] Ambient air quality thresholds for criteria pollutants based on SCAQMD Rule 1303, Table A-2 unless otherwise stated.

[b] Ambient air quality threshold based on SCAQMD Rule 403.

ppm = parts per million; $\mu g/m^3$ = microgram per cubic meter; lbs/day = pounds per day;
$\geq$ greater than or equal to

Construction Emissions

PROJECT-SPECIFIC IMPACT: The Final EA prepared for the 1999 amendments to Rule 1171 did not require construction because the affected operators were simply using different cleaning solvents. Since the final VOC content limit does not change in this PAR 1171, implementing the proposed project will also not trigger any construction activity. Cleaning solvents that already comply with the proposed interim VOC content limit are currently available and are expected to be used until the final VOC content limit becomes effective in 2006. As a result, it is not anticipated that PAR 1171 will require process or equipment alteration at affected facilities. Therefore, no add-on control equipment or additional employees will be required from the implementation of the proposed amendments. Thus, no construction emissions or adverse air quality impacts from construction are expected as a result of implementing the proposed project.

Operational Emissions

PROJECT-SPECIFIC IMPACT: Three potential air quality issues arise relative to the implementing PAR 1171. Due to the proposed amendments, the following has potential to occur: 1) a delay of originally anticipated VOC emission reductions due to an extension in complying with the final VOC content limit for certain solvent cleaning categories and a extension of the sunset date for two existing exemptions; 2) permanent forgone emission reductions from establishing three new limited exemptions for certain applications that would not have otherwise occurred under the current Rule 1171 requirements; or 3) the creation of adverse localized effects such as increased exposure to toxics. There will be a new air

quality benefit from the proposed project as the current exemption from the rule requirements for the cleaning of solar cells, laser hardware, scientific instruments and high precision optics will be lifted as of the date of adoption.

Delay in VOC Emission Reductions and Forgone Emission Reductions

Emission reductions from PAR 1171 and the delay of emission reductions result from the proposed amendments to the requirements for certain solvent cleaning applications. Emission reductions are achieved on July 1, 2005, from solvent cleaning activities implementing final VOC content limits (e.g., electrical apparatus components/electronic components, coatings/adhesives application equipment, specialty flexographic printing). Also on July 1, 2005, certain solvent cleaning applications (e.g., lithographic/letterpress ink application equipment, screen printing ink application equipment, UV/EB ink application equipment) will be required to comply with an interim VOC content limit which will result in emission reductions compared to the existing emissions from these categories. PAR 1171 would allow these latter solvent cleaning categories an additional year to comply with the final VOC content limits providing all originally anticipated emission reductions by July 1, 2006. Table 4-2 outlines the emission reductions achieved from implementing PAR 1171 on July 1, 2005 and on July 1, 2006.

To calculate interim and final emission reductions shown in Table 4-2, the following equations were used:

INTERIM EMISSION REDUCTION EQUATION

Interim 2005 Emission Reduction *(tons per day)* =

2004 VOC emissions x [1 – (interim limit / current limit)]

Example of Interim Emission Reduction *(using lithographic roller wash, step 1):*

0.27 tons/day x [1 – (500 g/l / 600 g/l)] = 0.05 tons/day

FINAL EMISSION REDUCTION EQUATION

Final 2006 Emission Reduction *(tons per day)* =

(2004 VOC emissions – interim emission reduction) x [1 – (final limit / interim limit)]

Example of Final Emission Reduction *(using lithographic roller wash, step 1):*

(0.27 tons/day - 0.05 tons/day) x [1 – (100 g/l / 500 g/l)] = 0.18 tons/day

As depicted in both Tables 4-2 and 4-3, extending the final compliance date for certain solvent cleaning applications will cause a delay in emission reductions of 2.52 tons per day, or 5,040 pounds of VOC per day. In addition, the proposed project will establish three new limited exemptions and extend two existing exemptions, listed in Table 4-3 which will further add to a delay in emission reductions projected in the 1999 amendments to Rule 1171 as well as generate new foregone emission reductions.

TABLE 4-2

Rule 1171 VOC Emissions Reductions (tons per day) from Affected Solvent Cleaning Categories

Solvent Cleaning Category	2004 VOC Emission (tons per day)	Current VOC Content Limit (grams per liter)	2005 VOC Content Limit (grams per liter)	2005 Emission Reduction (tons per day)	2006 VOC Content Limit (grams per liter)	Delayed 2006 Emission Reductions (tons per day)
WILL DELAY FINAL COMPLIANCE DATE AND COMPLY WITH INTERIM LIMIT						
Litho/Letterpress: Roller Wash–Step 1	0.27	600	500	**0.05**	100	**0.18**
Litho/Letterpress: Roller Wash-Step 2/Blanket Wash & On-Press Components	3.37	800	500	**1.26**	100	**1.69**
Screen Printing Ink App.	1.06	750	500	**0.35**	100	**0.57**
UV/EB Ink Application	0.16	800	500	**0.06**	100	**0.08**
WILL MAINTAIN FINAL COMPLIANCE DATE						
Product Cleaning & Surface Preparation: Electrical/ Electronic Apparatus & Components	0.51	500	100	**0.41**	n/a	n/a
Repair & Maintenance: Electrical/ Electronic Apparatus & Components	0.10	900	100	**0.09**	n/a	n/a
Coating/Adhesive Application Equipment (excluding Architectural Coating Equipment)	3.10	550	25	**2.96**	n/a	n/a
Architectural Coating Equipment	8.78	550	25	**7.59**	n/a	n/a
Specialty Flexography Printing	0.11	600	100	**0.09**	n/a	n/a
			Emission Reductions (tons per day)	**12.86**		**2.52**

As shown in Table 4-3, these emissions total approximately three tons per day of delayed VOC emission reductions from extending the final compliance date and exemption dates, and 0.021 tons per day (or 42 pounds per day) of permanently foregone VOC emission reductions.

A VOC emission reduction delay of approximately three tons per day (6,050 pounds per day) exceeds the SCAQMD's CEQA significance operational threshold for VOCs of 55 pounds per day, thus, the proposed project will have a significant adverse air quality impact on the environment. Table 4-3 outlines the specific foregone and delayed emission reductions and expected final compliance dates. Not listed in Table 4-3 is the air quality benefit from removing the exemption for the cleaning of solar cells, laser hardware, scientific instruments and high-precision optics. It is expected that the overall VOC emissions reduced from eliminating the exemption is approximately two pounds per day.

TABLE 4-3

Delay of Emission Reductions and Expected Final Compliance Dates from PAR 1171

Solvent Cleaning Category	July 1, 2006 Emission Reductions (tons per day)	June 30, 2006 Emission Reductions (tons per day)	December 31, 2008 Emission Reductions (tons per day)	Forgone Emission Reductions (tons per day)
EXTENDED FINAL COMPLIANCE DATE				
Litho/Letterpress: Roller Wash–Step 1	0.18	--	--	--
Litho/Letterpress: Roller Wash-Step 2/Blanket Wash & On-Press Components	1.69	--	--	--
Screen Printing Ink App.	0.57	--	--	--
UV/EB Ink Application	0.08	--	--	--
LIMITED EXEMPTIONS (WITH SUNSET DATES)				
UV Lamps	--	0.005	--	--
Metering rollers, dampening rollers, printing plates (at 800 grams per liter)	--	0.5	--	--
Photocurable resins from stereolithography equipment and models	--	--	0.00025	--
PERMANENT LIMITED EXEMPTIONS				
Adhesive application equipment used for thin metal laminating operations (at 950 grams per liter)	--	--	--	0.0015
Electronic or electrical cable (at 400 grams per liter)	--	--	--	0.0195
TOTAL FOREGONE AND DELAYED EMISSION REDUCTIONS (tons per day)	2.52	0.505	0.00025	0.021

Potential Toxic Impacts – From Maintaining Compliance Dates

The Final EA prepared for the 1999 amendments evaluated exposure to TACs resulting from reformulating conventional cleaning solvents with replacement cleaning solvents to comply with the final VOC content limits currently in Rule 1171. That analysis concluded that replacement cleaning solvents are generally less toxic than conventional cleaning solvents. As a result, human health impacts from reformulating cleaning solvents with replacement solvent would not be significant. Since the main effect of PAR 1171 is to delay the final compliance date for specified cleaning solvents and no additional requirements regarding the VOC content limits of these cleaning solvents are being proposed, the conclusion from the Final EA for the 1999 amendments to Rule 1171 that human health impact from formulating cleaning solvents with replacements solvents will not create significant adverse impacts continues to apply.

The final EA for PAR 1171 in 1999 concluded there is no substantive evidence that shows the use of those solvents identified as possible replacements would result in significant adverse toxic air contaminant impacts. The replacement solvents are for the most part common chemicals used in a wide variety of industrial and even consumer applications. Their widespread use is assumed to be indicative of the ability to use these compounds in a safe manner. Current cleaning formulations contain materials that are as toxic, or more toxic, than formulations expected to be used to comply with the proposed amendments. Thus, the possible increased use of toxics in reformulated cleaners will generally be balanced by a concurrent decrease in the use of toxic materials in currently used cleaners, and toxic air contaminant impacts would not be expected to change significantly from existing conditions. According to the latest studies conducted for the technological assessment, the new compliant cleaners are being formulated with water-based solutions, soy-based (composed of methyl esters), acetone, methyl acetate, and isopropyl alcohol (IPA) blends with acetone and water.

Potential Toxic Impacts – From Requiring Interim Compliance Dates

Proposed interim VOC content limits can be complied with existing products and will, therefore, not require a change in the process or equipment at the affected facilities. Generally, the interim formulations will use similar alternative solvents as currently being tested to comply with the final compliance VOC content limits. Since the new interim limits do not require as low a VOC content limit, the formulations do not require as much of an alternative solvent to comply with the rule. As noted in Chapter 2, the solvent cleaners that will comply with the interim VOC content limits are being formulated with such chemicals as propylene glycol monomethyl ethers, di-propylene glycol monomethyl ethers (DPM), methyl esters (soy-based), acetone, 3-ethoxypropanoic acid which is an ethyl ester, and possibly IPA blends. According to the State of California, Department of Health Services, Hazard Evaluation System & Information Services (HESIS), esters used in soy cleaners, based on available data and their structure, were likely to have low toxicity. With regards to

the remaining solvent alternatives, the following toxicity information is known.

Propylene Glycol Monomethyl Ethers

Propylene glycol monomethyl ether (PGME) is a colorless liquid whch has critical liver effects in rats and the hazard index target is the alimentary system (liver). Propylene glycol is used as a solvent for cellulose, acrylics, dyes inks and stains. Thus, the primary use of PGME is in lacquers and paints. Toxicity of propylene glycol ether is lower than ethylene glycol ether, and thus, it can be regarded as relatively innocuous or low toxic. It can be used as or for chemical intermediate, brake liquid, detergent, frost resistant solvent as well as solvent for high grade paint. Use of PGME is anticipated to increase due to its low systemic toxicity.

No reports or studies of human toxicity following chronic exposure to PGME were located in the literature. Slight eye irritation was reported by two of six human volunteers exposed to 100 ppm PGME for 2 hours. These subjects were exposed for a total of three and a half hours during which no decrement in visual acuity, coordinatoion, neurological responses or reaction time measured.

Ethylene glycol momomethyl ethers (EGME), a structurally related compound to PGME, exerts considerable toxicity on the blood, thymus, testes, and developing fetus. The toxicity of EGME has been linked to its primary metabolite, methoxyacetic acid. Recent comparative toxicity and metabolism studies, however, indicate that the relatively low systemic toxicity exerted by PGME is due to its different metabolites.

Acetone

Acetone is a manufactured chemical that is also found naturally in the environment. It occurs naturally in plants, trees, volcanic gases, forest fires, and as a product of the breakdown of body fat. It is present in vehicle exhaust, tobacco smoke, and landfill sites. Acetone is used to make plastic, fibers, drugs, and other chemicals. It is also used to dissolve other substances. Industrial processes contribute more acetone to the environment than natural processes.

Acetone is absorbed into the bloodstream and carried to all the organs in the body. If it is a small amount, the liver breaks it down to chemicals that are not harmful and uses these chemicals to make energy for normal body functions. Breathing moderate-to-high levels of acetone for short periods of time, however, can cause nose, throat, lung, and eye irritation; headaches; light-headedness; confusion; increased pulse rate; effects on blood; nausea; vomiting; unconsciousness and possibly coma; and shortening of the menstrual cycle in women. Swallowing very high levels of acetone can result in unconsciousness and damage to the skin in the mouth. Skin contact can result in irritation and damage to your skin.

South Coast Air Quality Management District

21865 Copley Drive, Diamond Bar, CA 91765-4182
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SUBJECT: **NOTICE OF COMPLETION OF A DRAFT ENVIRONMENTAL ASSESSMENT**

PROJECT TITLE: **PROPOSED AMENDMENTS TO RULE 1162 – POLYESTER RESIN OPERATIONS**

In accordance with the California Environmental Quality Act (CEQA), the South Coast Air Quality Management District (SCAQMD) is the Lead Agency and has prepared a *Draft Subsequent Environmental Assessment* (*SEA*) to analyze environmental impacts from the project identified above pursuant to its certified regulatory program (SCAQMD Rule 110). The Draft SEA includes a project description and analysis of potential adverse environmental impacts that could be generated from the proposed project. The purpose of this letter and the attached Notice of Completion (NOC) and Draft SEA is to allow public agencies and the public the opportunity to obtain, review and comment on the environmental analysis.

This letter, the attached NOC, and the *Draft SEA* are not SCAQMD applications or forms requiring a response from you. Their purpose is simply to provide information to you on the above project. If the proposed project has no bearing on you or your organization, no action on your part is necessary.

Comments focusing on issues relative to the environmental analysis for the proposed project will be accepted during a 45-day public review and comment period beginning March 17, 2005, and ending 5 p.m. on May 3, 2005. **Please send any comments to Mr. James Koizumi (c/o Office of Planning, Rule Development, and Area Sources) at the address shown above**. Comments can also be sent via facsimile to (909) 396-3324 or e-mail at jkoizumi@aqmd.gov. Mr. Koizumi can be reached by calling (909) 396-3234. Please include the name and phone number of the contact person for your agency. Questions regarding the proposed amendments should be directed to Dr. Helmy Sultan at (909) 396-2362.

The Public Hearing for the proposed project is scheduled for June 3, 2005. (Note: Public meeting dates are subject to change.)

Date: March 16, 2005

Signature: Steve Smith

Title: Steve Smith, Ph.D.
Program Supervisor

Telephone: (909) 396-3054

Reference: California Code of Regulations, Title 14, §§15082(a), 15103, and 15375

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
21865 Copley Drive, Diamond Bar, CA 91765-4182

NOTICE OF COMPLETION OF A DRAFT SUBSEQUENT ENVIRONMETNAL ASSESSMENT

Project Title:
Notice of Completion of a *Draft Subsequent Environmental Assessment* (SEA) for Proposed Amended Rule (PAR) 1162 - Polyester Resin Operations

Project Location:
PAR 1162 applies to the South Coast Air Basin, which includes all of Orange County, and the non-desert portions of Los Angeles, Riverside and San Bernardino counties and the Riverside County portions of the Salton Sea Air Basin and the Mojave Desert Air Basin.

Description of Nature, Purpose, and Beneficiaries of Project:
The proposed project would affect composite fabricators that apply gel coats to an open molding surface. The existing rule requires that gel coat operators apply gel coats with nonatomizing techniques by July 1, 2005. Field testing of nonatomizing gel coat application techniques has determined that the styrene emission limits are infeasible. Styrene is considered both a volatile organic compound (VOC) and toxic air contaminate. Because this is a modification to the previously approved project, a draft subsequent Environmental Assessment is proposed. The project would permanently forego approximately 853 pounds of styrene emission reductions per day, which exceeds the SCAQMD VOC significance threshold of 55 pound per day. In addition, acute and chronic noncarcinogenic risk associated with styrene emissions would exceed the SCAQMD's hazard indices significance thresholds. This *Draft (SEA)* analyzes potential adverse environmental impacts from rescinding the implementation of the nonatomizing gel coat application technique requirement and associated Unified Emission Factors for Open Molding of Composites. The only environmental topic where significant adverse impacts were identified was air quality.

Lead Agency:	**Division:**
South Coast Air Quality Management District	Planning, Rule Development and Area Sources- CEQA

The Draft SEA and all supporting documentation are available and may be examined at:	**or by calling:**	**The Draft SEA may be examined by accessing the SCAQMD's website at:**
SCAQMD Headquarters 21865 Copley Drive Diamond Bar, CA 91765	(909) 396-2039	http://www.aqmd.gov/ceqa/aqmd.html

The Public Notice of Completion of a Draft SEA is provided through the following:

☒ Los Angeles Times (March 17, 2005) ☒ SCAQMD Website ☒ SCAQMD Mailing List

Draft SEA Review Period:
March 17, 2005 to May 3, 2005

Scheduled Public Meeting Dates
Public Hearing: June 3, 2005

[Please note that meeting dates are subject to change. Refer to the SCAQMD website Calendar of Events for current schedule - www.SCAQMD.gov.]

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Mr. James Koizumi	(909) 396-3234	jkoizumi@SCAQMD.gov
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Dr. Helmy Sultan	(909) 396-2362	hsultan@SCAQMD.gov

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft Subsequent Environmental Assessment for:

Proposed Amended Rule 1162 – Polyester Resin Operations

SCAQMD No. 050316JK

March 16, 2005

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CHAPTER 1

EXECUTIVE SUMMARY

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INTRODUCTION

The California Legislature created the South Coast Air Quality Management District (SCAQMD) in 1977[1] as the agency responsible for developing and enforcing air pollution control rules and regulations in the South Coast Air Basin (Basin) and portions of the Salton Sea Air Basin and Mojave Desert Air Basin (collectively known as the "district"). By statute, the SCAQMD is required to adopt an air quality management plan (AQMP) demonstrating compliance with all federal and state ambient air quality standards for the district[2]. Furthermore, the SCAQMD must adopt rules and regulations that carry out the AQMP[3]. The *1997 AQMP* as amended in 1999 and the *2003 AQMP* concluded that major reductions in emissions of volatile organic compounds (VOCs) and oxides of nitrogen (NO_x) are necessary to attain the air quality standards for ozone (the key ingredient of smog) and particulate matter (PM10). Ozone, a criteria pollutant, is formed when VOCs react with NO_x in the atmosphere and has been shown to adversely affect human health. VOC emissions also contribute to the formation of PM10.

Because VOC emissions, which contribute to ozone and PM10 formation, reducing the quantity of VOCs in the district has been an on-going priority and effort by the SCAQMD. Because materials used by the polyester resins industry have been considered by SCAQMD as one source where VOC emission reductions can be achieved, in March 1987, Rule 1162 – Polyester Resin Operations, was adopted. Rule 1162 was developed to reduce VOC emissions from all polyester resin operations that involve the fabrication, rework, repair, or touch-up of products used for commercial, military or industrial markets. Polyester resin operations use composite materials that include resins, gel coats, solvents, coatings and adhesives, including reinforcement materials such as fiberglass and fillers. The types of items produced in a polyester resin operation vary, including, but not limited to: boats; tubs; pools; shower enclosures; spas; bathroom fixtures; jigs; tools; molds; building panels; air pollution control equipment; sewage treatment equipment; storage tanks; transportation parts; automotive; aircraft and aerospace components; and other industrial and consumer products. The affected industries include manufacturers of the above-listed items. Currently, there are 81 facilities that are subject to the requirements of Rule 1162.

Rule 1162 has been amended several times, with the most recent amendments occurring in July 9, 2004 to delay part of the implementation of the second phase of the two-phase Control Measures CTS-08 – Further Emission Reductions from Industrial Coating and Solvent Operations, and CTS-09 – Further Emission Reductions from Large Solvent and Coating Sources from the 1997 AQMP.

The air quality objective of both control measures was to further reduce VOCs associated with the use of resins, coatings, solvents, and other VOC-containing materials used in polyester resin operations. Many of the materials used in polyester resin operations are considered toxic air contaminants (TACs); therefore, those TACs associated with the polyester resin operations that are VOCs would be reduced by implemnenting the VOC control measures. Reducing emissions from these sources would help achieve and maintain,

[1] The Lewis-Presley Air Quality Management Act, 1976 Cal. Stats., ch 324 (codified at *Health & Safety Code, §§40400-40540*).
[2] *Health & Safety Code, §40460 (a).*
[3] *Health & Safety Code, §40440 (a).*

with a margin of safety, state and federal ambient air quality standards within SCAQMD's jurisdiction.

November 2001 amendments to Rule 1162 required operators of affected facilities to comply with the latest application techniques, material requirements, and process requirements in order to reduce VOC/ TAC emissions from polyester resin operations. The proposed compliance dates varied between 2002 and 2003, depending on the method of compliance. Rule 1162 also contained updates to the applicability statement, test methods and procedures, new definitions, and other minor changes to improve clarity and promote consistency throughout. It was estimated that the November 2001 amendments to Rule 1162 would remove approximately 5,800 pounds per day of VOC/TAC emissions from the air by July 1, 2003 (approximately 1,380 pounds per day of VOC/TAC emission reductions from gel coat application).

The November 2001 amendments added the definition for the nonatomizing spray application technique to Rule 1162 (b)(19) as recommended by the American Composite Manufacturers Association (ACMA). It was defined as "any application technique in which resin or gel coat flows from the applicator in a steady and observable coherent flow, without droplets, for a minimum distance of three (3) inches from the applicator orifices." However, during the implementation of the Rule 1162 nonatomizing application requirement, composite fabricators encountered difficulties in achieving the required three inches of coherent flow in gel coat operations. SCAQMD staff verified the composite fabricators' difficulties in achieving three inches of coherent flow at the outlet of the spraying guns during a technical assessment study of Rule 1162. Staff recommended additional field testing to develop an appropriate definition of the nonatomizing application techniques for gel coats that would be used as a compliance tool for both composite fabricators and the SCAQMD compliance staff.

Staff began working with industry to develop an appropriate definition. This task was more difficult than anticipated, so Rule 1162 was amended on July 11, 2003, and July 9, 2004 to further delay the implementation of the nonatomizing application techniques from July 1, 2003 to July 1, 2004, then from July 1, 2004, to July 1, 2005, to allow for further field testing of the nonatomizing application techniques. During the July 11, 2003 amendments, staff revised the calculation of emission reductions anticipated from implementation of nonatomizing application techniques based on the latest version of the Unified Emission Factors for Open Molding of Composites available at that time. The revised VOC/TAC emission reductions were estimated to be 853 pounds of VOC/TAC per day. The July 9, 2004 amendments redefined nonatomizing spray application technique of gel coat as "use of application equipment to apply gel coat where test results and parameters document that the use of this application equipment results in VOC emissions that are no greater than the VOC emissions specified in Attachment A - Unified Emission Factors For Open Molding of Composites table of this rule."

Subsequent to July 9, 2004, SCAQMD staff has conducted field tests to verify the conditions under which the UEF provided by the ACMA could be achieved. When nonatomizing gel coat application techniques were tested under the same conditions that the

UEF were developed (i.e., low pressure and low flow), the products did not meet the performance specifications required to maintain product integrity. When tested at operating conditions under which performance standard may be met nonatomizing gel coat application techniques could not achieve the UEF provided by the ACMA. Thus, the nonatomizing spray technology did not develop as anticipated and the rule requirements cannot be met. Thus the UEF emission limits are expected to be infeasible. Based on these results, staff proposes to rescind the nonatomizing gel coat application technique requirement from Rule 1162. Staff has not identified any other feasible control technology that could achieve VOC emission reductions equivalent to those that were originally expected from nonatomizing gel coat application techniques. Since nonatomizing gel coat application techniques were expected to generate 853 pounds per day of VOC emission reductions beyond conventional techniques; these emission reductions are considered to be foregone. These emission reductions foregone would exceed the SCAQMD's operational VOC significance threshold of 55 pounds per day and, therefore are significant. In addition, based on a "worst-case" analysis of a facility with the largest gel coat usage, noncarcinogenic risk reductions foregone would also be significant.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

The proposed amendments to Rule 1162 are a "project" as defined by CEQA (California Public Resources Code §21080.5). SCAQMD is the lead agency for the proposed project and has prepared appropriate an environmental analysis pursuant to its certified regulatory program (SCAQMD Rule 110). California Public Resources Code §21080.5 allows public agencies with regulatory programs to prepare a plan or other written document in lieu of an environmental impact report once the Secretary of the Resources Agency has certified the regulatory program. The SCAQMD's regulatory program was certified by the Secretary of the Resources Agency on March 1, 1989, and is codified as SCAQMD Rule 110.

CEQA requires that the potential adverse environmental impacts of proposed projects be evaluated and that feasible methods to reduce or avoid significant adverse environmental impacts of these projects be identified. To fulfill the purpose and intent of CEQA, the SCAQMD has prepared a Draft SEA to address the potential environmental impacts associated with the currently proposed amendments to Rule 1162. The preparation of a Draft SEA is necessary because the proposed project is a modification to a previously approved project, 2001 amendments to Rule 1162, for which the 2001 Final EA was prepared or relied upon and certified by the Governing Board on November 9, 2001.

Further, in accordance with CEQA Guidelines §15162 (a)(1), this Draft SEA was prepared because the proposed project creates new significant adverse environmental impacts.

CEQA DOCUMENTATION FOR PROPOSED RULE 1162

Rule 1162 was adopted at the public hearing on March 6, 1987. The Staff Report described the proposal to regulate emissions from polyester resin operations. At the time, VOC emissions from this industry were governed by Rule 442, which applies in general to the control of VOCs. Rule 1162 regulates styrene monomer resin materials, VOCs from cleanup solvent, and established recordkeeping requirements.

This *Draft SEA* is a comprehensive environmental document that analyzes potential adverse environmental impacts from implementing PAR 1162. SCAQMD rules, as ongoing regulatory programs, have the potential to be revised over time due to a variety of factors (e.g., regulatory decisions by other agencies, new data, and lack of progress in advancing the effectiveness of control technologies to comply with requirements in technology forcing rules, etc.).

Other CEQA Documents for Rule 1162

Several previous environmental analyses have been prepared to analyze past amendments to Rule 1162 and are listed below. The following summaries of previous CEQA documents are included for information only. These documents can be obtained by contacting the SCAQMD's Public Information Center at (909) 396-2039. Some documents are also available online at www.aqmd.gov/ceqa/aqmd.html.

Reliance on a Previously Proposed CEQA Document, July 9, 2004:
This project relied upon the July 25, 2003 Final EA for Rule 1162, which extended the effective date for nonatomizing gel coat application techniques from July 1, 2004 to July 1, 2004. A Notice to Rely on a Previously Certified Environmental Assessment for a Currently Proposed Project was circulated for 45-days. No letters were received. The Final EA and Statement of Finding and Overriding Considerations were certified on July 9, 2004.

Final Environmental Assessment for Proposed Amended Rule 1162, July 25, 2003:
The *Final EA* for the proposed amendments to Rule 1162 was completed and available to the public prior to the public hearing for proposed amended Rule 1162 on July 11, 2003. No comment letters were received from the public on the *Draft EA*. The *Draft EA* was released for a 45-day public review and comment period from May 6, 2003 to June 19, 2003. The *Draft EA* and associated *Initial Study* analyzed adverse environmental impacts from proposed amendments and "air quality" was identified as the only environmental topic that would be adversely affected by the proposed rule. The July 11, 2003 amendment delayed the compliance date for nonatomizing gel coat application techniques from July 1, 2003 to July 1, 2004 to allow additional time for field testing to develop a more effective definition for nonatomizing spray application techniques. Emission reductions from nonatomizing application techniques in the Final EA were revised with the latest version of the Unified Emission Factors for Open Molding of Composites (July 23, 2001) available at that time. The revised VOC emission reductions were estimated to be 853 pounds of VOC per day, which exceeds the VOC significance threshold of 55 pounds per day. No mitigation was identified so no mitigation monitoring plan was required or prepared. Because the project was deemed significant for air quality a Statement of Finding and Overriding Considerations was prepared and adopted.

***Final Environmental Assessment for Proposed Amended Rule 1162*, October 24, 2001:**
The *Final EA* for the proposed amendments to Rule 1162 was completed and available to the public prior to the public hearing for proposed amended Rule 1162 on November 9, 2001. The *Final EA* contained one comment letter received from the public on the *Draft EA* and responses to that comment letter. The *Draft EA* was released for a 30-day public review and comment period from September 18, 2001 to October 17, 2001. The

Draft EA analyzed adverse environmental impacts from the proposed amendments. The amendments required affected facilities to comply with the latest application techniques, material requirements, and process requirements in order to reduce VOC and TAC emissions from polyester resin operations. The proposed compliance dates varied between 2002 and 2003, depending on the method of compliance. Amendments included: broadened applicability; new definitions; changes in styrene monomer content in resin materials; replacement of atomizing application techniques with nonatomizing application techniques for open mold surface operations; process requirements for closed molding systems, pultrusion operations, touch-up and repair activities, storage specifications and solvent cleaning; control systems with a control efficiency of 90 percent; recordkeeping requirements; reorganization and update of test methods and procedures; and the addition of an alterative compliance option. Staff predicted that the amendments would reduce VOC emission by 3.4 tons per day; therefore, no significant impacts were expected.

***Final Environmental Assessment for Proposed Amended Rules 219 - Equipment Not Requiring a Written Permit Pursuant to Regulation II, 481 - Spray Coating Operations, 1107 - Coating of Metal Parts and Products; 1141 - Control of Volatile Organic Compound Emissions from Resin Manufacturing; 1141.1 - Coatings and Ink Manufacturing, 1141.2 - Surfactant Manufacturing and 1162 - Polyester Resin Operations*, November 9, 2000:** The *Final EA* for the proposed amendments to Rules 219 - Equipment Not Requiring a Written Permit Pursuant to Regulation II, 481 - Spray Coating Operations, 1107 - Coating of Metal Parts and Products; 1141 - Control of Volatile Organic Compound Emissions from Resin Manufacturing; 1141.1 - Coatings and Ink Manufacturing, 1141.2 - Surfactant Manufacturing and 1162 - Polyester Resin Operations was completed and available to the public prior to the public hearing for the proposed amended rules on November 17, 2000. No comment letters were received from the public. The *Draft EA* was released for a 30-day public review and comment period from October 10, 2000, to November 8, 2000. Rule 219 was amended to use monthly limits for permit exemptions. Rules 481, 1107, 1141, 1141.1, 1141.2, and 1162 were amended in order to allow more owners/operators to take advantage of monthly recordkeeping. Optional monthly recordkeeping was added to the rules where there was only daily recordkeeping. The monthly limits were based on multiplying the daily limit times 22, rather than 30, because most businesses operate on a five-day week. Multiplying the daily limits by 30 could have allowed five-day operations to increase their emissions. Staff concluded that amendments only affected recordkeeping requirements for Rule 1162; therefore, did not impact emissions.

***Final Supplemental Environmental Assessment for Proposed Amended Rule 1162*, April 1, 1994 (SCAQMD No. 931218SG):** The *Final Supplemental EA* (*SEA*) completed for the amendments to the rule was available to the public prior to the public hearing on May 13, 1992. The *Draft SEA* was released for a 45-day public review and comment period from December 22, 1993, to February 9, 1994. Three comment letters were received from other agencies; however, no new or additional information was received that required reassessment or modification of the *Draft SEA*. The rule amendments changed monomer content requirements for resins and added monomer content requirements for gel coats. Solvent cleaning and recordkeeping requirements were removed to prevent redundancy with

Rules 1171 and 109. EPA recordkeeping requirements were added. Definitions and rule language were added to clarify and enhance rule implementation and enforceability. Requirements were added for pultrusion operations. Technology was not available for producing corrosion-resistant and high strength materials with monomer contents of 30 percent. Therefore, the amendments increased the monomer requirement for corrosion-resistant and high strength materials from 30 to 48 percent. Staff estimated that this increase in monomer content would result in 20 to 60 pounds per day of VOC emissions permanently foregone. Because the emissions foregone could exceed the regional operational significant impact thresholds, the amendments were anticipated to generate potential significant impacts.

***Final Environmental Assessment* for Proposed Amended Rule 1162, June 30, 1992:** The *Final EA* completed for the amendments to the rule was available to the public prior to the public hearing on July 10, 1992. At the time, Rule 1162 contained an exemption for corrosion-resistant and high strength materials until July 1, 1992 to allow for continuing development of a compliant product. The proposed amendments delayed the exemption for corrosion-resistant and high strength materials until July 1, 1994. Staff estimated that the delayed reductions would be 0.7 ton per day. These emission estimates exceeded the 75 pounds per day threshold of significance defined in the *SCAQMD Air Quality Handbook for Preparing Environmental Impact Reports* (April 1987); therefore, the amendments were considered significant under CEQA. A statement of overriding considerations was prepared. Additionally, the amendments corrected *SIP* deficiencies by clarifying the VOC definition and the exempt compounds definition, and added applicable test method numbers. The *Final EA* contained a summary of the environmental analysis and responses to comments received on the May 28, 1992 *Draft EA*. The *Draft EA* contained a complete description of the proposed amendments and discussions of the following: environmental setting; alternatives to the proposed amendments; the relationship between short-term uses and long-term productivity; the potential irreversible environmental changes; growth inducing impacts; cumulative impacts from the proposed amendments and other AQMP control measures; and effects not found to be significant. The core of the *Draft EA* was the discussion of potential environmental impacts and mitigation measures. The analysis of potential environmental impacts included the following topics: air quality, water quality, noise, risk of upset, transportation/circulation, public services, energy, solid waste, human health, and economics.

Notices of Exemption for Other Rule 1162 Amendments

Rule 1162 has been amended a number of times since January 1987, as summarized in the following bullet points. Each amendment described below was exempt from CEQA, so a Notice of Exemption (NOE) was prepared.

- ***Notice of Exemption for Proposed Amended Rule 1162*, July 1992:** Amendments were proposed to allow time for corrosion-resistant technology to develop to meet the rule requirements. An *NOE* which extended the rule requirements for corrosion resistant material application from the original date of July 1, 1992, until July 1, 1994, was approved in a public hearing on August 2, 1991.

- ***Notice of Exemption for Proposed Amended Rule 1162*, December 1990:** The proposed amendments were administrative changes to improve the clarity, consistency and enforceability of the rule. A *NOE* was prepared to correct inconsistencies and deficiencies in a number of SCAQMD source specific volatile organic compound control rules. The amendments were adopted at a public hearing on December 7, 1990.

- ***Notice of Exemption for Proposed Amended Rule 1162*, July 1990:** At the time, corrosion-resistant materials could not attain the monomer requirements of Rule 1162. This *NOE* was prepared to allow corrosion-resistant materials to meet the monomer requirements. The *NOE* was approved extending the rule requirements for corrosion resistant material application from the original date of July 1, 1990 until July 1, 1992 at the public hearing on August 3, 1990.

INTENDED USES OF THIS DOCUMENT

In general, a CEQA document is an informational document that informs a public agency's decision-makers and the public generally of potentially significant adverse environmental effects of a project, identifies possible ways to avoid or minimize the significant effects, and describes reasonable alternatives to the project (*CEQA Guidelines §15121*). A public agency's decision-makers must consider the information in a CEQA document prior to making a decision on the project. Accordingly, this *Draft SEA* is intended to: (a) provide the SCAQMD Governing Board and the public with information on the environmental effects of the proposed project; and, (b) be used as a tool by the SCAQMD Governing Board to facilitate decision making on the proposed project.

Additionally, CEQA Guidelines §15124(d)(1) requires a public agency to identify the following specific types of intended uses of a CEQA document:

1. A list of the agencies that are expected to use the *EA* in their decision-making;
2. A list of permits and other approvals required to implement the project; and
3. A list of related environmental review and consultation requirements required by federal, state, or local laws, regulations, or policies.

To the extent that local public agencies, such as cities, county planning commissions, etcetera, are responsible for making land use and planning decisions related to projects that must comply with the requirements in PAR 1162, they could possibly rely on this *SEA* during their decision-making process. Similarly, other single purpose public agencies approving projects at facilities complying with PAR 1162 may rely on this *SEA*.

AREAS OF CONTROVERSY

CEQA Guidelines §15124(d)(2) requires a public agency to identify areas of controversy, including issues raised by agencies and the public. The Composites Fabricators Association (CFA) developed the Unified Emission Factors (UEFs), which were used to estimate the emission reductions in the November 2001 FEIR. The UEF were also used to develop the emissions reductions estimated in the *2001* and *2003 Final EAs* and have been utilized in the National Emission Standard for Hazardous Air Pollutants (NESHAP) for Reinforced Plastic Composites Production (40CFR63 Subpart WWWW). CFA developed the UEF emission

factors, but has not yet provided feedback on the results of the SCAQMD nonatomizing spray application technique field tests.

EXECUTIVE SUMMARY

CEQA Guidelines §15123 requires a CEQA document to include a brief summary of the proposed actions and their consequences. In addition, areas of controversy including issues raised by the public must also be included in the executive summary. This *Draft SEA* consists of the following chapters: Chapter 1 – Executive Summary; Chapter 2 – Project Description; Chapter 3 – Existing Setting; Chapter 4 – Potential Environmental Impacts and Mitigation Measures; Chapter 5 – Project Alternatives; Chapter 6 - Other CEQA Topics; and various appendices. The following subsections briefly summarize the contents of each chapter.

Summary of Chapter 1 – Executive Summary

Chapter 1 includes a discussion of the legislative authority that allows the SCAQMD to amend and adopt air pollution control rules, identifies general CEQA requirements and the intended uses of this CEQA document, and summarizes the remaining five chapters that comprise this *Draft SEA*.

Summary of Chapter 2 - Project Description

The objective of PAR 1162 is to rescind the nonatomizing application technique requirement. Field testing of nonatomizing application techniques that attain industry performance standards demonstrated that the UEF estimated 853 pounds of VOC/TAC emissions reductions previously expected from nonatomizing application techniques would not occur. Staff has not identified any control technology that could achieve emission reductions equivalent to the originally expected 853 pounds of VOC/TAC per day. Therefore, these emissions are considered foregone.

Summary of Chapter 3 - Existing Setting

Pursuant to the *CEQA Guidelines §15125*, Chapter 3 – Existing Setting, includes descriptions of those environmental areas that could be adversely affected by PAR 1162. The following briefly highlights the existing setting for air quality, which was the only environmental area identified that could potentially be adversely affected by implementing PAR 1162. The foregone VOCs would add to ozone and PM10 formation.

Air quality in the area of the SCAQMD's jurisdiction has shown substantial improvement over the last two decades. Nevertheless, some federal and state air quality standards are still exceeded frequently and by a wide margin. Of the National Ambient Air Quality Standards (NAAQS) established for six criteria pollutants (ozone, lead, sulfur dioxide, nitrogen dioxide, carbon monoxide and PM10), the area within the SCAQMD's jurisdiction is only designated in attainment for the sulfur dioxide, nitrogen dioxide and lead standards. Chapter 3 provides a brief description of the existing air quality setting for each criteria pollutant, as well as the human health effects resulting from exposure to each criteria pollutant.

Summary of Chapter 4 - Environmental Impacts

CEQA Guidelines §15126(a) requires that a CEQA document, "shall identify and focus on the significant environmental effects of the proposed project. Direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects." The following subsection briefly summarizes the analysis of potential adverse environmental impacts from the adoption and implementation of PAR 1162.

Air Quality

Evaluation of PAR 1162 resulted in identifying significant adverse air quality impacts. No other environmental areas were identified that could be significantly adversely affected by the proposed project. Under the existing Rule 1162, VOCs were the only ozone precursors associated with gel coats. In paints, VOCs are used as a transport mechanism to apply pigments to the desired surface. Exposed solvents evaporate into the atmosphere. VOC emission inventories from paints and solvents are developed by assuming all VOCs within the paint and solvents evaporate. Monomers are VOCs that partially combine with themselves, or other similar compounds by a cross linking reaction to become part of the cured composite product. A portion of the monomer evaporates into the atmosphere, but the objective is to have most of the monomer cross-link and become the product. Federal, state and local emissions inventories of resins and gel coats have been developed based on monomer content of the compound and monomer emission factors. The monomers and solvents used within gel coats, in addition to being VOCs, are also considered toxic air contaminates.

The existing rule requires operators to apply gel coats with nonatomizing techniques by July 1, 2005. In adopting this provision, it was estimated that the use of nonatomizing gel coat application techniques would result in 853 pounds per day of VOC emission reductions. However, the emissions limit has been found to be infeasible. The proposed amendments to Rule 1162 would rescind the nonatomizing gel coat application technique requirement for open molds. With the rescinding of this provision, 853 pounds per day of VOC emission reductions would be considered foregone. These VOC emission reductions foregone exceed the regional operational VOC air quality significance threshold of 55 pounds per day. Therefore, air quality impacts are considered significant (Table 1-1).

However, since the July 1, 2005, effective date for nonatomizing gel coat application techniques has not passed, these emissions foregone are expected emissions reductions that have not been realized. In practice, the proposed modification to Rule 1162 (i.e., rescinding the nonatomizing gel coat application technique) would allow existing operations to continue at existing facilities; therefore, while the anticipated emission reductions would be considered foregone, the actual emissions are not expected to increase above existing levels.

TACs associated with composite materials include styrene, methyl methacrylate (MMA), methylene chloride, toluene, xylene, n-hexane, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), and 1,1,1-trichloroethane (also known as methyl chloroform, but commonly abbreviated as TCA). Methylene chloride is the only compound in the list above, recognized as carcinogenic by either federal or state regulations or agencies, the remaining compounds are noncarcinogenic TACs. Styrene is considered both an acute and chronic

noncarcinogenic compound under AB2588 and Rule 1401. Significant noncarcinogenic acute and chronic risks were estimated from styrene emission reductions foregone at a PAR 1162 facility with high styrene emissions.

Because significant adverse air quality impacts were identified for the proposed project, a Statement of Findings and a Statement of Overriding Considerations will be prepared for the Governing Board's consideration and approval prior to the public hearing for the proposed amendments.

Table 1-1
Air Quality Impacts from Proposed Project

Air Quality Topic	Proposed Project	Mitigation Measures
VOC Emissions	Significant - VOC reductions foregone are greater than 55 pounds per day	No feasible mitigation was identified
TAC (Styrene)	Significant - noncarcinogenic acute and chronic risk associated with styrene emission reductions foregone	No feasible mitigation was identified

Potential Environmental Impacts Found Not To Be Significant
The *2003 Final EA* and associated *NOP/IS* for the existing Rule 1162 includes an environmental checklist of approximately 17 environmental topics to be evaluated for potential adverse impacts from a proposed project. Air quality was the only environmental topic found to be significant in the *Final EA*. No comments were received on the *2003 Final EA* or the associated *NOP/IS* refuting these conclusions. The analysis concluded that the following environmental areas would not be significantly adversely affected by the existing Rule 1162:

- aesthetics
- agriculture resources
- biological resources
- cultural resources
- energy
- geology/soils
- hydrology and water quality
- land use and planning
- mineral resources
- noise
- population and housing
- public services
- recreation
- solid/hazardous waste

- transportation/traffic

The *2003 Final EA* and associated *NOP/IS* for the existing Rule 1162 investigated the impacts associated with delaying the nonatomizing gel coat application technique requirement for a year. Nonatomizing gel coat application techniques did not demonstrate emission reductions; therefore, environmental impacts would be the same, but would extend indefinitely instead of over one year.

Consistency

The Southern California Association of Governments (SCAG) and the SCAQMD have developed, with input from representatives of local government, the industry community, public health agencies, the EPA – Region IX and the California Air Resources Board (CARB), guidance on how to assess consistency within the existing general development planning process in the district. Pursuant to the development and adoption of its *Regional Comprehensive Plan and Guide* (*RCPG*), SCAG has developed an *Intergovernmental Review Procedures Handbook* (June 1, 1995). The SCAQMD also adopted criteria for assessing consistency with regional plans and the *AQMP* in its *Handbook.*

Summary Chapter 5 – Alternatives

State CEQA *Guidelines §15126.6(c)* require that because EIRs must identify ways to mitigate or avoid significant effects, discussion of alternatives must focus on alternatives which are capable of avoiding or substantially lessening any significant effects. *CEQA Guidelines* specifically note that the range of alternatives required in a CEQA document is governed by a 'rule of reason' and only necessitates that the CEQA document set forth those alternatives necessary to permit a reasoned choice. The key issue is whether the selection and discussion of alternatives fosters informed decision making and meaningful public participation. A CEQA document need not consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative.

In accordance with SCAQMD's policy document Environmental Justice Program Enhancements for FY 2002-03, Enhancement II-1 recommends that all SCAQMD CEQA assessments include a feasible project alternative with the lowest air toxics emissions. The "least harmful" alternative with regard to hazardous air pollutants was the alternative which replaces styrene and MMA monomers with the non-toxic, non-VOC vinyl toluene. However, commercial use of vinyl toluene is not expected by July 1, 2005.

Two feasible alternatives, in addition to the proposed project are summarized in Table 1-2: Alternative A (No Project) and Alternative B (Two Year Delay in Compliance Date).

Table 1-2
Project Alternatives

Component	PAR 1162 (Project)	Alternative A (No Project)	Alternative B (Two Year Delay in Compliance Date)
Nonatomized gel coat application techniques.	Rescind required.	No change. Requirement became effective July 1, 2005.	Postpone requirement until July 1, 2007.

- Alternative A or 'no project' means that PAR 1162 would not be adopted. Field tests demonstrated that nonatomizing gel coat application techniques, which attain industry performance standards, did not achieve the emission reductions estimated by using the UEF. Since the available control technology cannot achieve the emission reductions estimated by using the UEF, this alternative would maintain a standard that cannot be feasibly met.

- Alternative B would further delay the compliance date for nonatomizing gel coat application techniques until July 1, 2007. The existing rule, proposed project and Alternative B would forego 853 pounds per day of VOC reductions. Alternative B would provide a benefit to air quality only if a viable nonatomizing gel coat application techniques or other control could be found before the July 1, 2007 compliance date. Alternative B would be significant for VOC, and acute and chronic noncarcinogenic health risk until a viable alternative could be found.

A comparison of the potential air quality impacts from each of the project alternatives with PAR 1162 is given in Table 1-3. No other significant adverse impacts were identified for PAR 1162 or any of the project alternatives. The proposed project is the most realistic alternative since Alternative A would require implementation of techniques that have not demonstrated environmental benefits, and Alternative B speculates on technology which has not be identified or tested. Therefore, the proposed project is preferred over the project alternatives, and would be the environmentally superior project.

Summary Chapter 6 - Other CEQA Topics

CEQA requires CEQA documents to address the potential for irreversible environmental changes, growth-inducing impacts. Since PAR 1162 would allow existing operations to continue at existing facilities, that is no change in activities in existing operations, the analyses of the proposed project confirms that it would not result in irreversible environmental changes; or the irretrievable commitment of resources; or foster economic or population growth; or the construction of additional housing; or be inconsistent with regional plans.

Table 1-3
Comparison of Adverse Air Quality Impacts of the Alternatives

Air Quality Topic	PAR 1162	Alternative A (No Project)	Alternative B (Two Year Delay in Compliance Date)
Criteria Pollutant (VOC)	Significant 853 pounds per day of VOC emission reductions foregone as of 07/01/05	Significant 853 pounds per day of VOC emission reductions foregone as of 07/01/05	Significant 853 pounds per day of VOC emission reductions (until January 1, 2007) Greater than PAR 1162
Toxic Air Contaminant (Styrene)	Significant Noncarcinogenic acute & chronic health effects from foregone styrene emissions	Significant Noncarcinogenic acute & chronic health effects from foregone styrene emissions	Significant Noncarcinogenic acute & chronic health effects from foregone styrene emissions (until January 1, 2007)

CHAPTER 2

PROJECT DESCRIPTION

Project Location
Background
Existing Rule 1162
Rationale for Amendment
Project Objective
Project Description

PROJECT LOCATION

The SCAQMD has jurisdiction over an area of 10,473 square miles (referred to hereafter as the district), consisting of the four-county South Coast Air Basin (Basin) and the Riverside County portions of the Salton Sea Air Basin (SSAB) and the Mojave Desert Air Basin (MDAB). The Basin, which is a subarea of the SCAQMD's jurisdiction, is bounded by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto Mountains to the north and east. The 6,745 square-mile Basin includes all of Orange County and the nondesert portions of Los Angeles, Riverside, and San Bernardino counties. The Riverside County portion of the SSAB and MDAB is bounded by the San Jacinto Mountains in the west and spans eastward up to the Palo Verde Valley. The federal nonattainment area (known as the Coachella Valley Planning Area) is a subregion of both Riverside County and the SSAB and is bounded by the San Jacinto Mountains to the west and the eastern boundary of the Coachella Valley to the east (Figure 2-1).

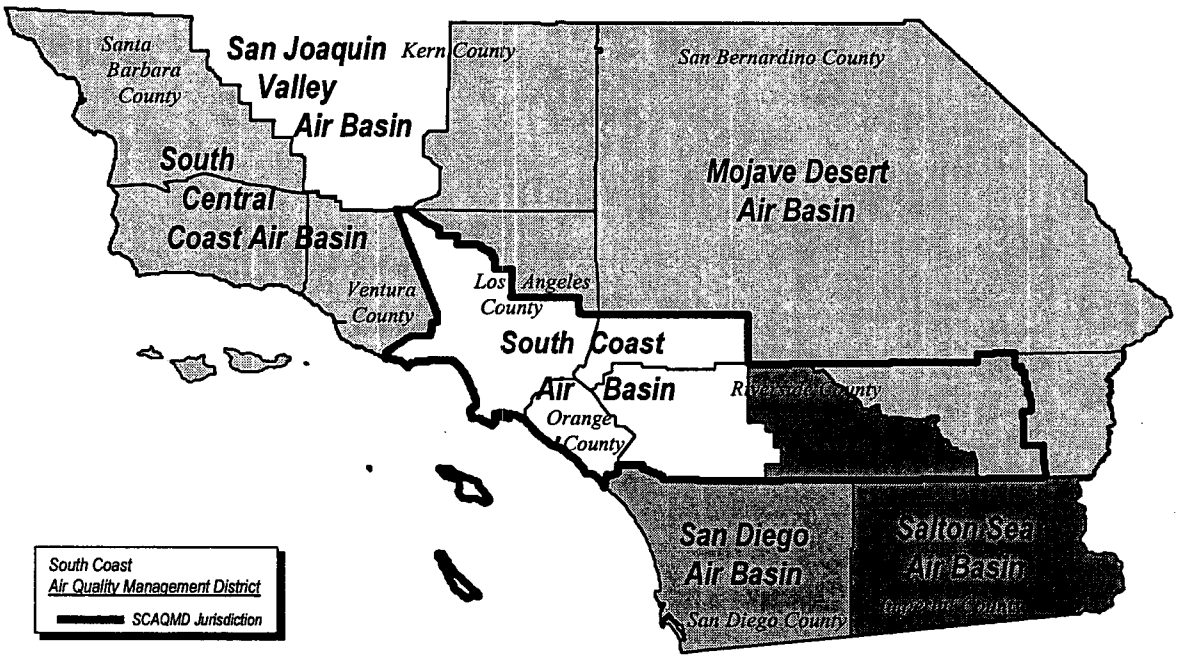

Figure 2-1
South Coast Air Quality Management District

BACKGROUND

All polyester resin operations, also referred to as the fiber reinforced plastic industry, are regulated by Rule 1162. Rule 1162 applies to polyester resin operations in the fabrication of composite or fiberglass products including bathtub, shower and vanity installations; hulls for recreational and commercial watercraft; bodies for recreational vehicles; building panels and appliances; sporting equipment; power tools; automotive, aerospace and aircraft components; and structural components for chemical process equipment and storage tanks.

Overview of Current Regulatory Requirements

There are three levels of regulatory control requirements that apply to VOCs and TACs from the polyester resin industry, including the requirements contained in Rule 1162: 1) local (i.e., SCAQMD); 2) state (i.e., California Air Resources Board or CARB); and 3) federal requirements (i.e., Environmental Protection Agency or EPA). The SCAQMD's local efforts to specifically regulate sources of VOCs and TACs from this industry have been based partly on implementing measures already adopted by EPA and CARB. The following is an overview of the SCAQMD rules that have been adopted to implement federal, state, or SCAQMD VOC and TAC reduction programs and the federal and state air toxic legislation and TAC programs.

SCAQMD Requirements

Polyester resin facilities that are subject to Rule 1162, may also be subject to three other related local rules for reducing VOC emissions from operational activities: Rule 1162 – Further Control of VOC Emissions from High-Emitting Spray Booth Facilities, Rule 1171 – Solvent Cleaning Operations, and Rule 1122 – Solvent Degreasers. Rule 1132 requires VOC reductions from any spray booth facility, except facilities in the petroleum industry; that conducts spray coating or laminating operations that produce more than 20 tons per year of VOC emissions in any emission inventory year from 1999 to present. The requirements of Rule 1171 apply to any facilities including polyester resin facilities, where the following activities occur: the cleaning by hand of application equipment (i.e., spray guns), parts, products, tools, machinery, equipment, and general working areas with VOC-containing solvent and the storage and disposal of the VOC-containing materials. Rule 1122 regulates the use of VOC-based solvents in batch-loaded cold cleaners, open-top vapor degreasers, all types of conveyorized degreasers, and air-tight and airless cleaning systems for the purpose of removing contaminants from parts, products, tools, machinery, and equipment.

There are several materials used in the polyester resin industry that contain VOCs that are also TACs. For example, resin materials and gel coats may contain any of the following: styrene, MMA, methylene chloride, toluene, xylene, n-hexane, MEK, MIBK, and TCA. In addition, the clean up solvents can contain MEK, methanol, acetone, dibasic ester (DBE), diacetone alcohol (DAA), n-methyl pyrolidone (NUT), and propylene carbonate (dioxolanone). There are two other local rules that regulate TAC emissions and which may apply to polyester resin facilities: Rule 1401 – New Source Review of Toxic Air Contaminants, and Rule 1402 – Control of Toxic Air Contaminants from Existing Sources. Rule 1401 applies to new and modified facilities, while Rule 1402 applies to facility-wide risk at existing facilities. Since the majority of polyester resin facilities are located within

SCAQMD's jurisdiction as existing sources, the requirements in Rule 1402 are the main drivers for reducing overall toxic emissions from this industry.

Some of the TACs used in polyester resin operations are considered carcinogenic (cancer-causing) and may have other non-cancer health effects. In light of these considerations, Rule 1162 includes requirements to control VOC by limiting monomer content. To the extent that VOCs in the polyester resin industry are TACs, such as monomers, Rule 1162 secondarily controls TACs by controlling VOCs. Therefore, reductions of VOC emissions would reduce associated carcinogenic and noncarcinogenic health risks from this particular industry.

State Requirements

The Air Toxics "Hot Spots" Information and Assessment Act was enacted in September 1987 by the California State Assembly as Assembly Bill 2588 (hereafter referred to as the AB2588 program). Under this act, certain stationary sources are required to report the types and quantities of specified toxic substances, including any styrene, MMA, methylene chloride, toluene, xylene, n-hexane, MEK, MIBK, TCA, and methanol, they release into the air. Emissions of interest are those that result from the routine operation of a facility or that are predictable, including but not limited to continuous and intermittent releases and process upsets or leaks. The goals of AB2588 are to collect emission data, to identify facilities having localized impacts, to ascertain health risks, and to notify nearby residents of significant risks. All 81 of the polyester resin facilities subject to Rule 1162 are currently in the AB2588 program

Federal Requirements

The federal Clean Air Act (CAA) establishes requirements to regulate emissions of air pollutants to protect human health and the environment. In addition to regulating criteria pollutants, the CAA requires the EPA to regulate TACs that have been found to adversely affect human health. Federal regulations in the CAA include the New Source Performance Standards (NSPS) under §111 and the National Emissions Standards for Hazardous Air Pollutants (NESHAPs) under §112. The EPA periodically promulgates NSPS standards in the Code of Federal Regulations (CFR), Chapter 40, Part 60 (40 CFR Part 60) and NESHAPs in 40 CFR Parts 61 and 63. The SCAQMD has been delegated authority by EPA to implement and enforce both NSPS and NESHAP requirements. The requirements in 40 CFR Parts 60 and 61 were adopted by reference in SCAQMD Regulations IX and X respectively. EPA has promulgated a NESHAP specifically for Boat Manufacturing[4], which sets standards that address organic and inorganic TAC emissions at new and existing boat manufacturing facilities. The NESHAP for Reinforced Plastic Composites Production[5] was published on April 21, 2003, for non-boat reinforced plastic composite manufacturing. Existing sources are required to incorporate pollution-prevention techniques in their production processes. These techniques include: using raw materials containing low amounts of air toxics; non-atomized resin application; and covering open resin baths and

[4] On August 22, 2001, EPA promulgated the Boat Manufacturing NESHAP in Title 40 of Code of Federal Regulations (CFR), Chapter I, Subchapter C, Part 63, Subpart VVVV (40 CFR 63, Subpart VVVV).

[5] On April 21, 2003, EPA promulgated the Reinforced Plastic Composites Production NESHAP in Title 40 of Code of Federal Regulations (CFR), Chapter I, Subchapter C, Part 63, Subpart WWWW (40 CFR 63, Subpart WWWW).

tanks. New facilities that emit less than 100 tons per year of air toxics must also meet these requirements. New facilities that emit greater than tons per year of air toxics are required to reduce open molding, centrifugal casting, continuous lamination/casting, pultrusion, SMC/BMC manufacturing, and mixing by 95 percent. Existing gel coat sources are required to meet existing standards that utilize the verified emission factors for gel coats. Existing sources must comply by April 21, 2006. New sources were required to comply by April 21, 2003 or at start-up.

For the cleaning of polyester resin components or machinery with solvents in a degreasing unit, there is an applicable NESHAP for Halogenated Solvent Cleaning[6]. The specific solvents identified in this NESHAP were incorporated into the Rule 1122.

The VOCs and TACs used in the polyester resin industry are also addressed in other federal legislation including but not limited to:

- Occupational Safety and Health Act (OSHA);
- Toxic Substances Control Act (TSCA);
- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA);
- Title III of the Superfund Amendments and Reauthorization Act (SARA); and,
- Resource Conservation and Recovery Act (RCRA).

EXISTING RULE 1162

Because VOC emissions contribute to ozone and PM10 formation, reducing the quantity of VOCs in the district has been an on-going priority and effort by the SCAQMD. Materials used by the polyester resins industry have been considered by SCAQMD as one potential source where VOC emission reductions can be achieved, in March 1987, Rule 1162 – Polyester Resin Operations, was adopted. Rule 1162 was developed to reduce VOC emissions from all polyester resin operations that involve the fabrication, rework, repair, or touch-up of products used for commercial, military or industrial markets.

The November 2001 amendments to Rule 1162 required operators of affected facilities to comply with the latest application techniques, material requirements, and process requirements in order to reduce VOC and TAC emissions from polyester resin operations. The November 2001 amendments set forth work practice standards, limit VOC and TAC emissions by specifying monomer contents in polyester resin materials and implement past AQMP control measures. The proposed compliance dates varied between 2002 and 2003, depending on the method of compliance. The November 2001 amendments to Rule 1162 also contained updates to the applicability statement, test methods and procedures, new definitions, and other minor changes to improve clarity and promote consistency throughout. The November 2001 amendments to Rule 1162 are currently only partially implemented. The November 2001 amendments included requirements for resin and gel coat operations. Additional emission reduction requirements for gel coats in an open molding source included monomer reduction and the use of nonatomizing application techniques, originally proposed to be effective July 1, 2003. The gel coat monomer and resin requirements have

[6] EPA promulgated the National Emission Standards for Halogenated Solvent Cleaning in Title 40 of Code of Federal Regulations (CFR), Chapter I, Subchapter C, Part 63, Subpart T (40 CFR 63, Subpart T).

been implemented. It was estimated that the November 2001 amendments to Rule 1162 would remove approximately 5,800 pounds per day of VOC and TAC emissions from the air by July 1, 2003.

The nonatomizing application techniques for gel coats was delayed an additional year on July 11, 2003, and July 9, 2004, moving the compliance date for nonatomizing application techniques to July 1, 2004, then to July 1, 2005. During the July 11, 2003 amendments the emission reductions from gel coats were revised with more recent UEFs. Based on this administrative change, the emission reductions from nonatomizing gel coat application techniques were revised to reflect the most current recommend emission factors, the downward to 853 pounds of VOC per day. In addition, the definition of nonatomizing spray application technique of gel coat was revised.

RATIONALE FOR AMENDMENT

Subsequent to the July 9, 2004, field tests demonstrated that nonatomizing gel coat application techniques that attain industry performance standards are not able to achieve the originally anticipated UEF estimated VOC reductions of 853 pounds per day. The implication of the field test is that atomizing and nonatomizing gel coat application techniques are environmentally equivalent. Based on these field tests, staff proposes to rescind the nonatomizing spray application technique requirement from Rule 1162.

PROJECT OBJECTIVE

The objective of proposed amended Rule (PAR) 1162 is to rescind the nonatomizing application requirement.

PROJECT DESCRIPTION

Rule 1162 applies to any person using polyester resin materials during the manufacturing and assembly of the following items, including but not limited to: boats; tubs; pools; shower enclosures; spas; bathroom fixtures; jigs; tools; molds; building panels; air pollution control equipment; sewage treatment equipment; storage tanks; transportation parts; automotive; aircraft; and aerospace components; and other industrial and consumer products. The proposed amendment applies only to operators at facilities that apply gel coat to open surface molding. The following summarizes the change to the proposed amended rule. A copy of PAR 1162 is included in Appendix B.

Applicability

No changes proposed to this subdivision of the rule.

Definitions of Terms

The definition of "nonatomizing spray application technique of gel coat" would be removed. A definition for high-volume, low-pressure spray was added for clarity.

Requirements

Subdivision (c) of the current version of Rule 1162 contains specific requirements for materials applied to molds. Rule 1162 (c)(1)(B) requires gel coats applied to an open

molding surface to use one of the "nonatomizing application techniques" specified in subparagraph (c)(1)(A)(i) through (c)(1)(A)(vi). Rule 1162 (c)(1)(B) requirements for gel coat "nonatomizing application techniques" would be removed from the rule.

Other changes were included for consistency. The words gel coat was removed from (c)(1)(A). Gel coat was added to subparagraph (c)(4), which allows the use of a hand-held spray gun with has a container to be used for touch-up and repair.

Control Equipment

No changes are currently proposed for this subdivision.

Recordkeeping Requirements

No changes are currently proposed for this subdivision.

Test Methods and Procedures

No changes are currently proposed for this subdivision.

Alternative Compliance Option

No changes are currently proposed for this subdivision.

CHAPTER 3

EXISTING SETTING

Introduction
Polyester Resin Industry
Air Quality

INTRODUCTION

In order to determine the significance of the impacts associated with a proposed project, it is necessary to evaluate the project's impacts against the backdrop of the environment as it exists at the time the NOP is published or if NOP is published, at the time the environmental analysis is commenced. The *CEQA Guidelines* define "environment" as "the physical conditions that exist within the area which will be affected by a proposed project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historical or aesthetic significance" (*CEQA Guidelines* §15360; see also *Public Resources Code §21060.5*). Furthermore, a CEQA document must include a description of the physical environment in the vicinity of the project, as it exists at the time the notice of preparation is published, from both a local and regional perspective (*CEQA Guidelines* §15125). Therefore, the "environment" or "existing setting" against which a project's impacts are compared consists of the immediate, contemporaneous physical conditions at and around the project site[7].

The following sections summarize the existing setting for air quality, which is the only environmental area that may be adversely affected by implementing PAR 1162. An overview of air quality in the district is given below. A more complete discussion of current and projected future air quality in the district, with and without additional control measures can be found in the *2003 Final Environmental Impact Report (EIR) for the 2003 AQMP* (Chapter 3 and 4) and in the *Final 2003 AQMP* and associated appendices. The *2003 AQMP Final EIR* contains more comprehensive information on existing and projected environmental settings for the environmental area discussed in this chapter. Copies of the above-referenced documents are available from the SCAQMD's Public Information Center by calling (909) 396-2039.

POLYESTER RESIN INDUSTRY

Polyester resin operations use composite materials that include resins, gel coats, solvents, coatings and adhesives, including reinforcement materials such as fiberglass and fillers. The types of items produced in a polyester resin operation vary, including, but not limited to, boats, tubs, pools, shower enclosures, spas, bathroom fixtures, jigs, tools, molds, building panels, air pollution control equipment, sewage treatment equipment, storage tanks, transportation parts, automotive, aircraft, and aerospace components, and other industrial and consumer products. The affected industries include manufacturers of the above-listed items. Currently, there are 81 facilities that are subject to the requirements of Rule 1162.

Composite materials, also known as fiber reinforced plastics, are created from combining fiber reinforcement materials with polyester resin materials. Fiber reinforcement materials are formed by pultrusion. Pultrusion is a process where continuous roving strands are moved through a strand-tensioning device into a resin bath for impregnation and then passed through a heated die for curing, such as for making fiber reinforcement materials like fiberglass and other fibrous materials used to reinforce plastic.

[7] Remy, et al; 1996

Molding is a technique of forming a product comprised of composite materials, such as plastics, into various shapes. Typically, the process for creating a molded product involves the following key phases:

1. Mixing the various materials in specific proportions according to a recipe appropriate for the type of product being fabricated. The materials are gel coats, polyester resins, fiberglass or other fiber substrate, solvents, catalyst(s), inhibitors and other chemical additives.
2. Applying the composite material onto a mold, using either manual or mechanical application techniques.
3. Composite material finishing which involves joining, machining and coating the final product.

There are two main types of molding techniques, closed molding systems and open molding systems. Closed molding systems are different from open molding systems in that they utilize a confining or enclosed mold cavity and rely on pressure and/or heat to set the materials that are applied to the mold. An open molding system is the most widely used method for applying the various polyester resin materials onto an open mold.

Composite materials can be applied to either type of mold manually or mechanically by using a "hand lay-up" or "spray-up" technique respectively. When applying materials using the hand lay-up method, a mold is prepared by first applying a mold release agent (which is often an alcohol- or wax-based paste) to its surface and it is allowed to set for a period of time (usually overnight). Next, a layer of gel coat is applied on top of the mold release agent. After the gel coat has cured, a layer of chopped fiberglass strands is manually applied. Then a mixture of polyester resin and catalyst (to quicken the final curing process of the resin) is applied to the fiberglass layer by using hand rollers, brushes, or squeegees. Additional rolling may be required to remove any air bubbles remaining after the initial application process.

For the spray-up method, the same mold release agent preparation method used for the hand lay-up method is followed. Next, fiberglass, polyester resin, and catalyst are applied simultaneously to the mold surface with a "chopper gun." There are two methods for spraying the polyester resin mixed with a catalyst and the fiberglass onto a mold, the internal mix and the external mix. For an internal mix, the polyester resin and the catalyst are mixed inside the gun and then sprayed with the fiberglass onto the mold. An external mix is when all three components remain separate from each other as they enter the gun, and instead they are mixed outside the gun as they exit the nozzle.

Status of the Materials Used in Polyester Resin Operations

Among the materials currently used in practice are composite materials that include resins, gel coats, solvents, coatings and adhesives, including reinforcement materials such as fiberglass and fillers. With the exception of the fiberglass and fillers, the composite materials contain monomers that emit VOCs as TACs, such as styrene, MMA, methylene

chloride, toluene, xylene, n-hexane, MEK, MIBK, and 1,1,1-trichloroethane[8]. Reducing VOC emissions by limiting the monomer content of polyester resin materials as applied, especially during the open molding processes, is the main focus of Rule 1162. To the extent that VOCs regulated by Rule 1162 are also TACs, Rule 1162 also produces a secondary benefit of reducing TAC emissions.

A variety of materials, namely resins, gel coats, fiber reinforcement materials, fillers, clean up solvents, inhibitors, catalysts, curing agents, and additives are necessary for manufacturing or fabricating products made of composite materials. The following discussion addresses the current technology status of these materials used by the fiber reinforced plastics industry for polyester resin operations. Analysis regarding the effect the proposed rule amendment will have on VOC emissions is discussed in Chapter 4.

Resin Materials

There is a large variety of resin materials manufactured for the purpose of composite manufacturing. Polyester resins are the primary resin materials manufactured and used by this industry. The polyester resin category includes several sub-categories that vary by chemical formulations such as phthalic resins, halogenated/clorendic resins, bisphenol-A resins, furan resins, and vinyl ester resins. The usage of a particular polyester resin depends on the mechanical properties of the material and the needs or specifications of the product being manufactured.

Of the resin materials manufactured and used for composite manufacturing, styrene is the monomer that is found most often in polyester resin. There are many specialty resins and gel coats that also contain MMA, another widely used monomer. Nationally, 17,000 tons per year of styrene is emitted and approximately 75 percent is attributed to the use of styrene-based polyester resin materials during several phases of the open molding process. The key sources of styrene and other monomer emissions occur when the resin is first applied to the mold, later when the air bubbles are rolled out, and during the curing stage of the final product.

Another category of material, polyurethanes, is slowly becoming the emerging technology in this industry because of the low- or zero-VOC and TAC contents. However, when compared to polyester resins, the use of polyurethanes is less common throughout the industry. Polyurethanes are currently being used to manufacture automotive parts (i.e., campers, inner door panels and seat backs), analytical and laboratory instrumentation; snow and water skis and boards and to fabricate diagnostic equipment.

Gel Coats

A gel coat is a clear or pigmented layer of coating that is applied to the surface of a polyester resin. Its purpose is to cosmetically enhance the appearance of the product being made while improving the product's ability to resist degradation due to exposure to weather, light, heat, et cetera. All gel coats have application- and use-based performance specifications or

[8] EPA has classified styrene, MMA, methylene chloride, toluene, xylene, n-hexane, MEK, MIBK, and TCA as possibly carcinogenic to humans; however, only methylene chloride has a unit risk factor. A screening risk analysis is completed in Chapter 4 based on risk values established by CARB/OEHHA.

requirements based on the physical properties of the specific material. The application-based specifications consider the spraying properties, resistance to sagging, porosity and resin-tearing potential of the gel coats. The use-based performance specifications consider the ability of a particular gel to resist cracking and other damage due to exposure to weather and water.

Fiber Reinforcement Materials

Fiber reinforcement materials are made of multiple filaments or fibers comprised of glass, carbon, boron, metal, or amid polymers and are used to reinforce the strength of plastic. The most common type of fiber reinforcement material is fiberglass. Regardless of what the fibers are made of, the fibers can remain as continuous or discontinuous filaments or they can be woven into continuous multi-filament yarns that consist of strands with several hundred filaments, each of which is five to 20 micrometers in diameter. The yarns can then be woven into mats or cloth. An example of how fiberglass mats are used in hand lay-up applications, the mats are arranged over a mold and sprayed with a matrix forming resin, such as an epoxy, to assure a good adhesion to the glass fibers.

Fillers

Fillers are finely divided materials or short fibers, made of materials such as silica, carbon black, talc, mica, and calcium carbonate that are used to enhance or reinforce the mechanical properties of plastics. Adding fillers will stretch the amount of resin material or gel coat that would otherwise be needed to fabricate a particular product and will displace the quantity of monomer that would otherwise be emitted if 100 percent of a resin material or gel coat (i.e., no added fillers) was used.

Clean-up Solvents

There are several solvents that are either VOCs or non-VOCs, used for cleaning-up polyester resin operations, though their use is subject to the requirements of Rule 1171. For example, solvents such as methanol and MEK (both contain VOCs), and acetone (a non-VOC[9]) are currently used in large quantities to clean equipment and tools. However, previously adopted amendments to Rule 1171 lowered the VOC content limit for cleaning materials used in polyester resin operations to 25 grams per liter, which subsequently encouraged an industry-wide transition from VOC-based cleaning materials to aqueous and other low-VOC cleaning materials. In response to the October 8, 1999 changes to Rule 1171, many manufacturers have begun to replace some clean-up solvents with products that are less volatile or less flammable. For example, products such as aqueous cleaners, dibasic ester (DBE), diacetone alcohol (DAA), n-methyl pyrolidone (NUT), and propylene carbonate (dioxolanone) are being used for cleaning polyester resin operations.

The type of cleaner chosen (i.e., solvent- or aqueous-based cleaners) depends on the item being cleaned and the cleaning method. For example, the effectiveness of aqueous cleaners relies on mechanical action (such as brushing) to clean resin from contaminated applicators while acetone and other solvent-based cleaners with high boiling points clean by dissolving the resin. Aqueous cleaners are effective for certain applications because the mechanical action causes droplets of resin to separate from the device being cleaned, wets the resin

[9] Acetone is considered a "Group I Exempt Compound" in accordance with SCAQMD Rule 102 – Definitions.

droplets with the cleaner, and subsequently causes the droplets to settle to the bottom of the cleaning tank. Solvent-based cleaners are effective because the item being cleaned can be soaked and eventually the resin will be dissolved and suspended within the solvent.

Inhibitors, Catalysts and Curing Agents

The nature of resin materials and gel coats is such that they are designed to chemically cure or cross-link the monomers shortly after they are applied to a mold. In order to prevent the premature curing of these materials when they are manufactured and stored for future use, inhibitors are added. Inhibitors are chemical additives that specifically control the spontaneous cross-linking reaction of monomers that exist in the resin materials and gel coats. Inhibitors are added to keep the resin materials and gel coats in a stable, liquid state for a minimum amount of time and at a given ambient temperature (e.g., three months at 73 ^{o}F).

The process of curing resin materials and gel coats employs curing agents or hardeners and catalysts to develop the desirable curing properties. Curing agents include anhydrides, aldehyde and amine compounds and are often used for curing a product at room temperature or at elevated temperatures as appropriate. Catalysts, also referred to as accelerators, are substances that are added in specific quantities to resin materials or gel coats to make them cure or achieve cross-linked bonds more rapidly. Also, most fabricators rely on catalysts to overcome the presence of inhibitors in the materials. Methyl ethyl ketone peroxide (MEKP) and benzoyl peroxide (BPO) are the most common catalysts used in polyester resin operations. BPO has been reported to have a beneficial effect because it is effective in reducing gel drying time and lowering the peak temperature during the curing process.

Additives

Chemical additives are introduced into resin materials and gel coats to obtain certain desirable product characteristics such as the ability to resist heat and aging, electrical properties, optical clarity, permeability, flame retardant, and ease of application. There are four classes of additives, which represent about 90 percent of all additives used in plastics. They are fillers (as previously discussed), plasticizers, colorants and stabilizers. Plasticizers are used to change the flammability, odor, biodegradability, and the glass transition temperature (T_g) of a polymer in a resin material or gel coat.

For most consumer applications, plastics are manufactured in a variety of colors. When compared to metals and ceramics, which depend on surface coatings for color, plastics have an advantage in that they can become a particular color throughout its molded form, simply because of the addition of a colorant to the resin material or gel coat. Popular pigments for colorants include titanium dioxide and zinc oxide (white), carbon (black), and various other inorganic oxides such as iron and chromium oxides. Organic compounds can also be used to add color either as pigments (insoluble) or as dyes (soluble).

In order for a plastic to have a long and useful life in any application, it is desirable for properties of that plastic to change as little as possible over time. To counter the effects of aging, small quantities of stabilizers are added. The type of stabilizer used depends on the

application. For example, some stabilizers are designed specifically to reduce degradation by sunlight, ozone, and biological agents.

Field Testing of Nonatomizing Gel Coat Application Techniques

Staff, in cooperation with American Composite Manufacturers Association (ACMA), spray equipment manufacturers, gel coat manufacturers, and major composite fabricators developed the SCAQMD Gel Coat Testing Program. The testing program objective was to develop a more appropriate and enforceable definition for the nonatomizing spray application technique of gel coats. It included VOC emission and surface quality measurements (porosity, gloss, orange peel and water resistance tests) of gel coat sprayed materials. Volatile Organic Compound (VOC) emissions were measured by SCAQMD staff. Surface quality analyses were conducted by California Polytechnic State University, San Luis Obispo. The four (4) major spray equipment manufacturers participated in the testing program, which was conducted from August through October 2004.

The Gel Coat Testing Program verified that the gel coat pressure at the tip of the spray gun is an appropriate method to define the nonatomizing spray application technique. However, the testing data also demonstrated that there were no significant differences in both the VOC emission and the surface quality measurements of the nonatomizing application and the conventional air-assisted airless application of gel coats.

Current Rule 1162 Emission Inventories

The following assumptions were used to develop the gel coat reformulation inventory:

- The emissions inventory of gel coats is based on the 1998-99 emissions inventory of composite operations in the AQMD. That inventory reflects a usage of 2,206 tons per year of gel coats. No change in gel coat usage is expected from this rule amendment.
- The emissions inventory of gel coats includes clear and pigmented gel coats. Clear gel coats include marble clear gel coats and other clear gel coats. Pigmented gel coats include white and off-white gel coats and non- white gel coats.
- The emissions inventory of gel coats is based on compliance with the July 1, 2003, monomer content requirements for gel coats as follows: marble clear gel coats (40 percent), other clear gel coats (44 percent), white and off-white gel coats (30 percent), and nonwhite gel coats (37 percent). It also based on the atomized application of gel coats.
- Clear and pigmented gel coats represent 15 percent and 85 percent, respectively, of the total gel coats usage in composite operations in the AQMD during 1998-99.
- White/off-white, and non-white represent 85 percent and 15 percent, respectively, of the total pigmented gel coats usage in composite operations in the AQMD during 1998-99.
- Marble clear gel coats and other clear gel coats represent 35 percent, and 65 percent, respectively, of the total clear gel coats usage in the AQMD during 1998-99.
- The emissions reduction of the nonatomizing application for marble clear gel coats, other clear gel coats, white and off-white pigmented gel coats, and non-white pigmented gel coats are calculated using the 2001 UEF (see Attachment).
- The nonatomizing emissions reduction of gel coats is calculated using the gel coat emissions inventory and the emissions reduction efficiency for the nonatomizing application of gel coats.

Table 3-1 presents emission estimates for gel coats without nonatomizing applications.

Table 3-1
VOC Emissions Inventory of Gel Coats without Nonatomizing Applications

Specific Type of Gel Coat, & Sub-Category	Allowed Monomer Percentage in Existing Rule after July 1, 2003 (%)	Unified Emission Factor [a] (in pounds of styrene per tons of gel coat)	Units Adjustment Factor (1 ton = 2000 pounds)	Estimated Annual Total Gel Coat Usage [b] (in tons per year)	Percentage of Estimated Annual Total Gel Coat Usage per Type & Sub-Category	Projected VOC Emissions From Gel Coats (in tons per year)
Clear, for marble resins	40	(439	÷ 2000)	x 2206	x 0.15 x 0.35	= 25.4
Clear, for other resins	44	(522	÷ 2000)	x 2206	x 0.15 x 0.65	= 56.1
Pigmented, White and Off White	30	(267	÷ 2000)	x 2206	x 0.85 x 0.85	= 212.8
Pigmented, Non-White	37	(377	÷ 2000)	x 2206	x 0.85 x 0.15	= 53.0
					TOTAL	**347**

a) Unified Emission Factors for Open Molding of Composites, July 23, 2001 (see Appendix C)
b) SCAQMD, Table 2-8, Final EA for PAR 1162, SCAQMD No. 010918BAR, Oct. 24, 2001.

AIR QUALITY

Criteria Pollutants

It is the responsibility of the SCAQMD to ensure that state and federal ambient air quality standards are achieved and maintained in its geographical jurisdiction. Health-based air quality standards have been established by California and the federal government for the following criteria air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), particulate matter less than 10 microns (PM10), particulate matter less than 2.5 microns (PM2.5), and lead. These standards were established to protect sensitive receptors with a margin of safety from adverse health impacts due to exposure to air pollution. The California standards are more stringent than the federal standards. California has also established standards for sulfates, visibility reducing particles, hydrogen sulfide, and vinyl chloride. The state and national ambient air quality standards for each of these pollutants and their effects on health are summarized in Table 3-2. The SCAQMD monitors levels of various criteria pollutants at 32 monitoring stations. The 2003 air quality data from SCAQMD's monitoring stations are presented in Table 3-3.

Table 3-2
Federal and State Ambient Air Quality Standards

	STATE STANDARD	FEDERAL PRIMARY STANDARD	MOST RELEVANT EFFECTS
AIR POLLUTANT	CONCENTRATION/ AVERAGING TIME	CONCENTRATION/ AVERAGING TIME	
Ozone	0.09 ppm, 1-hr. avg. >	0.12 ppm, 1-hr avg.>	(a) Short-term exposures: (1) Pulmonary function decrements and localized lung edema in humans and animals (2) Risk to public health implied by alterations in pulmonary morphology and host defense in animals; (b) Long-term exposures: Risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans; (c) Vegetation damage; (d) Property damage
Carbon Monoxide	9.0 ppm, 8-hr avg. > 20 ppm, 1-hr avg. >	9 ppm, 8-hr avg.> 35 ppm, 1-hr avg.>	(a) Aggravation of angina pectoris and other aspects of coronary heart disease; (b) Decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (c) Impairment of central nervous system functions; (d) Possible increased risk to fetuses
Nitrogen Dioxide	0.25 ppm, 1-hr avg. >	0.053 ppm, ann. avg.>	(a) Potential to aggravate chronic respiratory disease and respiratory symptoms in sensitive groups; (b) Risk to public health implied by pulmonary and extra-pulmonary biochemical and cellular changes and pulmonary structural changes; (c) Contribution to atmospheric discoloration
Sulfur Dioxide	0.04 ppm, 24-hr avg.> 0.25 ppm, 1-hr. avg. >	0.03 ppm, ann. avg.> 0.14 ppm, 24-hr avg.>	(a) Bronchoconstriction accompanied by symptoms which may include wheezing, shortness of breath and chest tightness, during exercise or physical activity in persons with asthma
Suspended Particulate Matter (PM10)	30 $\mu g/m^3$, ann. geometric mean > 50 $\mu g/m^3$, 24-hr average>	50 $\mu g/m^3$, annual arithmetic mean > 150 $\mu g/m^3$, 24-hr avg.>	(a) Excess deaths from short-term exposures and exacerbation of symptoms in sensitive patients with respiratory disease; (b) Excess seasonal declines in pulmonary function, especially in children
Suspended Particulate Matter (PM2.5)		15 $\mu g/m^3$, annual arithmetic mean> 150 $\mu g/m^3$, 24-hour average>	Decreased lung function from exposures and exacerbation of symptoms in sensitive patients with respiratory disease; elderly; children.
Sulfates	25 $\mu g/m^3$, 24-hr avg. >=		(a) Decrease in ventilatory function; (b) Aggravation of asthmatic symptoms; (c) Aggravation of cardio-pulmonary disease; (d) Vegetation damage; (e) Degradation of visibility; (f) Property damage
Lead	1.5 $\mu g/m^3$, 30-day avg. >=	1.5 $\mu g/m^3$, calendar quarter>	(a) Increased body burden; (b) Impairment of blood formation and nerve conduction
Visibility-Reducing Particles	In sufficient amount to give an extinction coefficient >0.23 inverse kilometers (visual range to less than 10 miles) with relative humidity less than 70%, 8-hour average (10am – 6pm PST)		Nephelometry and AISI Tape Sampler; instrumental measurement on days when relative humidity is less than 70 percent

Table 3-3
2003 Air Quality Data – South Coast Air Quality Management District

Carbon Monoxide						
					No. Days Standard Exceeded[a)]	
					Federal	State
Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Max. Conc. In ppm 1-hour	Max. Conc. In ppm 8-hour	≤9.5 ppm 8-hr.	>9.0 ppm 8-hr.
LOS ANGELES COUNTY						
1	Central LA	362	6	4.57	0	0
2	Northwest Coast LA Co	361	4	3.00	0	0
3	Southwest Coast LA Co	365	7	5.14	0	0
4	South Coast LA Co	361	6	4.71	0	0
6	West San Fernando Valley	365	7	6.00	0	0
7	East San Fernando Valley	364	6	4.88	0	0
8	West San Fernando Valley	355	7	5.00	0	0
9	East San Gabriel Valley1	361	3	2.88	0	0
9	East San Gabriel Valley2	357	3	2.50	0	0
10	Pomona/Walnut Valley	365	5	3.43	0	0
11	South San Gabriel Valley	365	6	4.00	0	0
12	South Central LA Co	365	12	7.71	0	0
13	Santa Clarita Valley	361	6	3.14	0	0
ORANGE COUNTY						
16	North Orange Co	363	11	4.71	0	0
17	Central Orange Co	274*	8*	4.71*	0*	0*
18	North Coastal Orange Co	363	6	4.57	0	0
19	Saddleback Valley	365	3	2.38	0	0
RIVERSIDE COUNTY						
22	Norco/Corona	--	--	--	--	--
23	Metropolitan Riv Co1	356	5	3.43	0	0
23	Metropolitan Riv Co2	329*	6*	4.50*	0*	0*
24	Perris Valley	--	--	--	--	--
25	Lake Elsinore	355	2	2.00	0	0
29	Banning Airport	--	--	--	--	--
30	Coachella Valley1**	357	2	1.50	0	0
30	Coachella Valley2**	--	--	--	--	--
SAN BERNARDINO COUNTY						
32	NW San Bernardino Valley	364	3	1.75	0	0
33	SW San Bernardino Valley	--	--	--	--	--
34	Central San Bern Valley1	--	--	--	--	--
34	Central San Bern Valley2	365	4	3.25	0	0
35	East San Bernardino Valley	--	--	--	--	--
37	Central San Bern Mountains	--	--	--	--	--
38	East San Bern Mountains	--	--	--	--	--
	DISTRICT MAXIMUM		12	7.71	0	0

PPM – Parts Per Million parts of air, by volume
AAM = Annual Arithmetic Mean
-- - Pollutant not monitored.
– The federal 1-hour standard (1-hour average CO> 35 ppm) and state 1-hour standard (1-hour average CO> 20 ppm) were not exceeded.
*Less than 12 full months of data. May not be representative.
a) **Salton Sea Air Basin.

Table 3-3 (Continued)

Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Max. Conc. In ppm 1-hour	Max. Conc. In ppm 8-hour	Health Advisory ≥ 0.15 ppm 1-hour	No. Days Standard Exceeded[a)] Federal > 0.12 ppm 1-hour	Federal > 0.08 ppm 8-hour	State >9.0 ppm 8-hr.
			Ozone					
LOS ANGELES COUNTY								
1	Central LA	361	0.116	0.099	0	0	1	8
2	Northwest Coast LA Co	365	0.099	0.080	0	0	0	1
3	Southwest Coast LA Co	360	0.098	0.080	0	0	0	1
4	South Coast LA Co	360	0.091	0.070	0	0	0	0
6	West San Fernando V	365	0.140	1.117	0	2	7	25
7	East San Fernando V	356	0.129	1.104	0	2	5	15
8	West San Fernando V	361	0.160	0.120	1	1	9	28
9	East San Gabriel V1	365	0.189	1.131	2	9	18	36
9	East San Gabriel V2	362	0.190	0.135	5	13	31	61
10	Pomona/Walnut Valley	363	0.144	0.108	0	1	3	12
11	South San Gabriel V	365	0.132	0.100	0	1	2	7
12	South Central LA Co	365	0.077	0.061	0	0	0	0
13	Santa Clarita Valley	356	0.184	0.129	2	9	27	49
ORANGE COUNTY								
16	North Orange Co	360	0.114	0.090	0	0	2	4
17	Central Orange Co	274*	0.107*	0.071*	0*	0*	0*	2*
18	N Coastal Orange Co	365	0.098	0.073	0	0	0	1
19	Saddleback Valley	365	0.125	0.098	0	1	2	10
RIVERSIDE COUNTY								
22	Norco/Corona	--	--	--	--	--	--	--
23	Metropolitan Riv Co1	365	0.143	0.120	0	7	34	41
23	Metropolitan Riv Co2	--	--	--	--	--	--	--
24	Perris Valley	361	0.152	0.136	5	19	58	73
25	Lake Elsinore	348	0.151	0.120	1	12	46	61
29	Banning Airport	365	0.149	0.129	2	16	49	63
30	Coachella Valley1**	358	0.137	0.114	0	6	42	53
30	Coachella Valley2**	365	0.114	0.099	0	0	17	21
SAN BERNARDINO COUNTY								
32	NW San Bernardino V	365	0.174	0.138	6	14	33	53
33	SW San Bernardino V	--	--	--	--	--	--	--
34	Central San Bern V1	365	0.165	0.136	6	13	31	44
34	Central San Bern V2	365	0.184	0.144	5	18	39	55
35	East San Bernardino V	327*	0.167*	0.144*	7*	21*	52*	68*
37	Central San Bern Moun	365	0.171	0.139	12	26	74	88
38	East San Bern Moun	--	--	--	--	--	--	--
DISTRICT MAXIMUM			0.190	0.144	12	26	74	88

PPM – Parts Per Million parts of air, by volume
AAM = Annual Arithmetic Mean
-- - Pollutant not monitored.
*Less than 12 full months of data. May not be representative.
b) – The federal 1-hour standard (1-hour average CO> 35 ppm) and state 1-hour standard (1-hour average CO> 20 ppm) were not exceeded.

Table 3-3 (Continued)

Nitrogen Dioxide					
Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Max. Conc. In ppm 1-hour[b)]	Max. Conc. In ppm 24-hour	Average Compared To Federal Standard[c)] AAM in ppm
LOS ANGELES COUNTY					
1	Central LA	365	0.14	0.078	0.0378
2	Northwest Coast LA Co	365	0.11	0.080	0.0251
3	Southwest Coast LA Co	362	0.11	0.080	0.0250
4	South Coast LA Co	364	0.13	0.070	0.0308
6	West San Fernando Valley	359	0.09	0.060	0.0266
7	East San Fernando Valley	347	0.25	0.091	0.0419
8	West San Fernando Valley	365	0.15	0.086	0.0345
9	East San Gabriel Valley1	365	0.12	0.094	0.0331
9	East San Gabriel Valley2	365	0.12	0.067	0.0274
10	Pomona/Walnut Valley	365	0.13	0.095	0.0371
11	South San Gabriel Valley	363	0.14	0.076	0.0352
12	South Central LA Co	363	0.15	0.072	0.0369
13	Santa Clarita Valley	351	0.10	0.048	0.0239
ORANGE COUNTY					
16	North Orange Co	363	0.13	0.069	0.0275
17	Central Orange Co	274*	0.12*	0.069*	0.0293*
18	North Coastal Orange Co	365	0.08	0.063	0.0182
19	Saddleback Valley	--	--	--	--
RIVERSIDE COUNTY					
22	Norco/Corona	--	--	--	--
23	Metropolitan Riv Co1	362	0.15	0.064	0.0247
23	Metropolitan Riv Co2	--	--	--	--
24	Perris Valley	--	--	--	--
25	Lake Elsinore	352	0.19	0.102	0.0185
29	Banning Airport	343	0.24	0.057	0.0211
30	Coachella Valley1**	345	0.08	0.043	0.0175
30	Coachella Valley2**	--	--	--	--
SAN BERNARDINO COUNTY					
32	NW San Bernardino Valley	347	0.13	0.085	0.0384
33	SW San Bernardino Valley	--	--	--	--
34	Central San Bern Valley1	365	0.13	0.084	0.0358
34	Central San Bern Valley2	329*	0.11*	0.066*	0.0303*
35	East San Bernardino Valley	--	--	--	--
37	Central San Bern Mountains	--	--	--	--
38	East San Bern Mountains	--	--	--	--
	DISTRICT MAXIMUM		0.25	0.102	0.0419

PPM – Parts Per Million parts of air, by volume
AAM = Annual Arithmetic Mean
-- - Pollutant not monitored.
*Less than 12 full months of data. May not be representative.
**Salton Sea Air Basin.
b) – The state standard is 1-hour average > 0.25 ppm. No location exceeded state standard.
c) – The federal standard is annual arithmetic mean NO2 greater than 0.0534 ppm. No location exceeded this standard

Table 3-3 (Continued)

Sulfur Dioxide				
Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Max. Conc. In ppm 1-hour[d)]	Max. Conc. In ppm 24-hour
LOS ANGELES COUNTY				
1	Central LA	365	0.08	0.010
2	Northwest Coast LA Co	--	--	--
3	Southwest Coast LA Co	365	0.09	0.012
4	South Coast LA Co	364	0.05	0.012
6	West San Fernando Valley	--	--	--
7	East San Fernando Valley	345	0.01	0.004
8	West San Fernando Valley	--	--	--
9	East San Gabriel Valley1	--	--	--
9	East San Gabriel Valley2	--	--	--
10	Pomona/Walnut Valley	--	--	--
11	South San Gabriel Valley	--	--	--
12	South Central LA Co	--	--	--
13	Santa Clarita Valley	--	--	--
ORANGE COUNTY				
16	North Orange Co	--	--	--
17	Central Orange Co	--	--	--
18	North Coastal Orange Co	343	0.01	0.007
19	Saddleback Valley	--	--	--
RIVERSIDE COUNTY				
22	Norco/Corona	--	--	--
23	Metropolitan Riv Co1	365	0.02	0.011
23	Metropolitan Riv Co2	--	--	--
24	Perris Valley	--	--	--
25	Lake Elsinore	--	--	--
29	Banning Airport	--	--	--
30	Coachella Valley1**	--	--	--
30	Coachella Valley2**	--	--	--
SAN BERNARDINO COUNTY				
32	NW San Bernardino Valley	--	--	--
33	SW San Bernardino Valley	--	--	--
34	Central San Bern Valley1	330*	0.01*	0.010*
34	Central San Bern Valley2	--	--	--
35	East San Bernardino Valley	--	--	--
37	Central San Bern Mountains	--	--	--
38	East San Bern Mountains	--	--	--
	DISTRICT MAXIMUM		0.09	0.012

PPM – Parts Per Million parts of air, by volume
AAM = Annual Arithmetic Mean
-- - Pollutant not monitored.
*Less than 12 full months of data. May not be representative.
**Salton Sea Air Basin.
d) – The state standards are 1-hour average >0.25 ppm and 24-hour average > 0.045 ppm. No location exceeded state standards. The federal standards are annual arithmetic mean SO_2 > 0.03 ppm, 3-hour average > 0.50 ppm, and 24-hour average > 0.14 ppm. SO_2 concentrations were well below the federal standards.

Table 3-3 (Continued)

Suspended Particulates PM10[e)]							
			No. (%) Samples Exceeding Standard			Annual Averages[h)]	
Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Max Conc. in µg/m³ 24-hour	Federal > 150 µg/m³ 24-hour	State > 50 µg/m³ 24-hour	AAM Conc. µg/m³	AGM Conc. µg/m³
LOS ANGELES COUNTY							
1	Central LA	61	97	0	20(33)	44.2	40.3
2	Northwest Coast LA Co	--	--	--	--	--	--
3	Southwest Coast LA Co	58	75	0	8(14)	37.1	34.4
4	South Coast LA Co	59	91	0	10(17)	37.4	34.8
6	West San Fernando V	--	--	--	--	--	--
7	East San Fernando V	61	86	0	14(23)	40.9	36.9
8	West San Fernando V	--	--	--	--	--	--
9	East San Gabriel V1	58	106	0	22(38)	45.3	39.9
9	East San Gabriel V2	--	--	--	--	--	--
10	Pomona/Walnut Valley	--	--	--	--	--	--
11	South San Gabriel V	--	--	--	--	--	--
12	South Central LA Co	--	--	--	--	--	--
13	Santa Clarita Valley	61	62	0	4(7)	32.0	28.5
ORANGE COUNTY							
16	North Orange Co	--	--	--	--	--	--
17	Central Orange Co	46*	93*	0*	9(20)*	36.0*	33.7*
18	N Coastal Orange Co	--	--	--	--	--	--
19	Saddleback Valley	57	60	0	3(5)	26.4	24.0
RIVERSIDE COUNTY							
22	Norco/Corona	54	109	0	18(33)	44.8	39.3
23	Metropolitan Riv Co1	117	136	0	78(67)	63.1	54.3
23	Metropolitan Riv Co2	--	--	--	--	--	--
24	Perris Valley	60	86	0	16(27)	40.8	36.0
25	Lake Elsinore	--	--	--	--	--	--
29	Banning Airport	54	219	1(1.9)	7(13)	35.1	26.7
30	Coachella Valley1**	49*	53 [k)]	0[k)]	1(2)[k)]	26.7[k)]	23.9[k)]
30	Coachella Valley2**	112[k)]	149[k)]	0[k)]	50(45)[k)]	50.2[k)]	44.3[k)]
SAN BERNARDINO COUNTY							
32	NW San Bernardino V	--	--	--	--	--	--
33	SW San Bernardino V	64	166	1(1.6)	27(42)	52.4	46.2
34	Central San Bern V1	60	106	0	34(57)	50.5	43.8
34	Central San Bern V2	60	106	0	31(52)	52.0	45.2
35	East San Bernardino V	49*	102*	0*	22(45)*	46.6*	39.6*
37	Central San Bern Moun	--	--	--	--	--	--
38	East San Bern Moun	--	--	--	--	--	--
DISTRICT MAXIMUM			219	1	78	63.1	54.3

PPM – Parts Per Million parts of air, by volume
AAM = Annual Arithmetic Mean
-- - Pollutant not monitored.
*Less than 12 full months of data. May not be representative.
e) – PM10 samples were collected every 6 days (every 3 days at Station Numbers 4144 and 4157) using the size-selective inlet high volume sampler with quartz filter media.
f) – PM2.5 samples were collected every 3 days at all sites except for the following sites: Station Numbers 060, 072, 087, 3176, and 4144 where samples were taken every day, and Station Number 5818 where samples were taken every 6 days.
g) – Total suspended particulates, lead, and sulfate were determined from samples collected every 6 days by the high volume sampler method, on glass fiber filter media.
h) – Federal PM10 standard is AAM > 50 µg/m³; and state standard is AGM > 30 µg/m³

Table 3-3 (Continued)

Suspended Particulates PM2.5 [f]					
Source Receptor Area No.	Location of Air Monitoring Station	No. Days of Data	Max. Conc. in $\mu g/m^3$ 24-hour	No. (%) Samples Exceeding Standard Federal > 65 $\mu g/m3$ 24-hour	Annual Averages[i] AAM Conc. $\mu g/m^3$
LOS ANGELES COUNTY					
1	Central LA	334	73.4	4(1.2)	22.9
2	Northwest Coast LA Co	--	--	--	--
3	Southwest Coast LA Co	--	--	--	--
4	South Coast LA Co	317	72.9	1(0.3)	21.4
6	West San Fernando Valley	109	71.1	1(0.9)	18.5
7	East San Fernando Valley	117	94.7	4(3.4)	24.9
8	West San Fernando Valley	110	78.1	1(0.9)	20.9
9	East San Gabriel Valley1	308	79.7	4(1.3)	21.8
9	East San Gabriel Valley2	--	--	--	--
10	Pomona/Walnut Valley	--	--	--	--
11	South San Gabriel Valley	95	77.3	3(3.2)	26.1
12	South Central LA Co	116	73.1	3(2.6)	24.5
13	Santa Clarita Valley	--	--	--	--
ORANGE COUNTY					
16	North Orange Co	--	--	--	--
17	Central Orange Co	252*	70.8*	1(0.4)*	22.4*
18	North Coastal Orange Co	--	--	--	--
19	Saddleback Valley	102	53.4	0	15.8
RIVERSIDE COUNTY					
22	Norco/Corona	--	--	--	--
23	Metropolitan Riv Co1	325	98.0	19(5.8)	31.1
23	Metropolitan Riv Co2	106	74.9	5(4.7)	28.3
24	Perris Valley	--	--	--	--
25	Lake Elsinore	--	--	--	--
29	Banning Airport	--	--	--	--
30	Coachella Valley1**	107	44.7	0	10.8
30	Coachella Valley2**	113	33.5	0	12.2
SAN BERNARDINO COUNTY					
32	NW San Bernardino Valley	--	--	--	--
33	SW San Bernardino Valley	113	71.2	2(1.8)	26.2
34	Central San Bern Valley1	114	74.8	4(3.5	24.8
34	Central San Bern Valley2	111	78.5	5(4.5)	26.2
35	East San Bernardino Valley	--	--	--	--
37	Central San Bern Mountains	--	--	--	--
38	East San Bern Mountains	57	34.6	0	10.9
	DISTRICT MAXIMUM		98.0	19	31.1

PPM – Parts Per Million parts of air, by volume
AAM = Annual Arithmetic Mean
-- - Pollutant not monitored.
*Less than 12 full months of data. May not be representative.
**Salton Sea Air Basin.
f) – PM2.5 samples were collected every 3 days at all sites except for the following sites: Station Numbers 060, 072, 087, 3176, and 4144 where samples were taken every day, and Station Number 5818 where samples were taken every 6 days.
i) – Federal PM2.5 standard is AAM > $\mu g/m^3$

Table 3-3 (Continued)

Source Receptor Area No.	Location of Air Monitoring Station	Particulates TSP g) No. Days of Data	Max. Conc. in $\mu g/m^3$ 24-hour	Annual Average AAM Conc. $\mu g/m^3$
LOS ANGELES COUNTY				
1	Central LA	61	131	75.4
2	Northwest Coast LA Co	60	81	46.5
3	Southwest Coast LA Co	61	118	71.4
4	South Coast LA Co	68	113	67.2
6	West San Fernando Valley	--	--	--
7	East San Fernando Valley	--	--	--
8	West San Fernando Valley	60	88	49.6
9	East San Gabriel Valley1	59	178	93.9
9	East San Gabriel Valley2	--	--	--
10	Pomona/Walnut Valley	--	--	--
11	South San Gabriel Valley	59	146	76.9
12	South Central LA Co	58	385	90.2
13	Santa Clarita Valley	--	--	--
ORANGE COUNTY				
16	North Orange Co	--	--	--
17	Central Orange Co	--	--	--
18	North Coastal Orange Co	--	--	--
19	Saddleback Valley	--	--	--
RIVERSIDE COUNTY				
22	Norco/Corona	--	--	--
23	Metropolitan Riv Co1	57	296	123.7
23	Metropolitan Riv Co2	61	182	86.8
24	Perris Valley	--	--	--
25	Lake Elsinore	--	--	--
29	Banning Airport	--	--	--
30	Coachella Valley1**	--	--	--
30	Coachella Valley2**	--	--	--
SAN BERNARDINO COUNTY				
32	NW San Bernardino Valley	58	171	69.7
33	SW San Bernardino Valley	--	--	--
34	Central San Bern Valley1	60	237	102.1
34	Central San Bern Valley2	55	224	101.3
35	East San Bernardino Valley	--	--	--
37	Central San Bern Mountains	--	--	--
38	East San Bern Mountains	--	--	--
	DISTRICT MAXIMUM		385	123.7

PPM – Parts Per Million parts of air, by volume
AAM = Annual Arithmetic Mean
-- - Pollutant not monitored.
*Less than 12 full months of data. May not be representative.
**Salton Sea Air Basin.
g) – Total suspended particulates, lead, and sulfate were determined from samples collected every 6 days by the high volume sampler method, on glass fiber filter media.

Table 3-3 (Continued)

Lead and Sulfate					
		Lead [g)]		Sulfate [g)]	
Source Receptor Area No.	Location of Air Monitoring Station	Max Monthly Average Conc.[j)] µg/m³	Max Quarterly Average Conc.[j)] µg/m³	Max Conc. in µg/m³ 24-hour	No. (%) Samples Standard State > 25 µg/m³ 24-hour
LOS ANGELES COUNTY					
1	Central LA	0.06	0.05	15.9	0
2	Northwest Coast LA Co	--	--	15.6	0
3	Southwest Coast LA Co	0.04	0.04	20.6	0
4	South Coast LA Co	0.05	0.04	15.9	0
6	West San Fernando Valley	--	--	--	--
7	East San Fernando Valley	--	--	--	--
8	West San Fernando Valley	--	--	13.4	0
9	East San Gabriel Valley1	--	--	14.1	0
9	East San Gabriel Valley2	--	--	--	--
10	Pomona/Walnut Valley	--	--	--	--
11	South San Gabriel Valley	0.07	0.05	14.5	0
12	South Central LA Co	0.23	0.12	15.4	0
13	Santa Clarita Valley	--	--	--	--
ORANGE COUNTY					
16	North Orange Co	--	--	--	--
17	Central Orange Co	--	--	--	--
18	North Coastal Orange Co	--	--	--	--
19	Saddleback Valley	--	--	--	--
RIVERSIDE COUNTY					
22	Norco/Corona	--	--	--	--
23	Metropolitan Riv Co1	0.04	0.03	10.7	0
23	Metropolitan Riv Co2	0.03	0.03	9.2	0
24	Perris Valley	--	--	--	--
25	Lake Elsinore	--	--	--	--
29	Banning Airport	--	--	--	--
30	Coachella Valley1**	--	--	--	--
30	Coachella Valley2**	--	--	--	--
SAN BERNARDINO COUNTY					
32	NW San Bernardino Valley	0.05	0.04	10.7	0
33	SW San Bernardino Valley	--	--	--	--
34	Central San Bern Valley1	--	--	10.7	0
34	Central San Bern Valley2	0.05	0.04	11.5	0
35	East San Bernardino Valley	--	--	--	--
37	Central San Bern Mountains	--	--	--	--
38	East San Bern Mountains	--	--	--	--
	DISTRICT MAXIMUM	0.23	0.12	20.6	0

PPM – Parts Per Million parts of air, by volume
AAM = Annual Arithmetic Mean
-- - Pollutant not monitored.
*Less than 12 full months of data. May not be representative.
**Salton Sea Air Basin.
g) – Total suspended particulates, lead, and sulfate were determined from samples collected every 6 days by the high volume sampler method, on glass fiber filter media.
j) – Federal lead standard is quarterly average > 1.5 µg/m³, and state standard is monthly average ≥ 1.5 µg/m³. No location exceeded lead standards. Special monitoring immediately downwind of stationary sources of lead was carried out at four locations in 2000. The maximum monthly average concentration was 0.57 µg/m³, and the maximum quarterly average concentration was 0.49 µg/m³, both recorded in Area 1, Central Los Angeles

Ozone

Unlike primary criteria pollutants that are emitted directly from an emissions source, ozone is a secondary pollutant. It is formed in the atmosphere through a photochemical reaction of VOC, NOx, oxygen, and other hydrocarbon materials in the presence of sunlight. As a precursor to ozone, VOC contributes to regional air quality impacts.

Ozone is a deep lung irritant, causing the passages to become inflamed and swollen. Exposure to ozone produces alterations in respiration, the most characteristic of which is shallow, rapid breathing and a decrease in pulmonary performance. Ozone reduces the respiratory system's ability to fight infection and to remove foreign particles. People who suffer from respiratory diseases such as asthma, emphysema, and chronic bronchitis are more sensitive to ozone's effects. In severe cases, ozone is capable of causing death from pulmonary edema. Early studies suggested that long-term exposure to ozone results in adverse effects on morphology and function of the lung and acceleration of lung-tumor formation and aging. Ozone exposure also increases the sensitivity of the lung to bronchoconstrictive agents such as histamine, acetylcholine, and allergens.

Recent studies have shown that asthmatic children in southern California are particularly susceptible to the adverse effects of air pollution. In an ongoing long-term study of nearly 3,700 children in 12 communities across Southern California, asthmatics had more frequent bouts of bronchitis and chronic phlegm than non-asthmatics. Other studies have linked air pollution with an increase in asthmatics' acute symptoms and emergency room visits and a decrease in their lung function. Asthma is a serious public health concern across the country since reported cases have risen dramatically during the last decade. Asthma is the number one cause of school absences, the leading cause of children's visits to emergency rooms and the cause of more than 5,000 deaths a year. Low-income and uninsured residents are particularly at risk because they do not have access to preventive and ongoing medical care that can control asthma and instead receive treatment only during acute asthma attacks in emergency rooms.

The national ozone ambient air quality standard is exceeded far more frequently in the SCAQMD's jurisdiction than almost every other area in the United States[10]. In the past few years, ozone air quality has been the cleanest on record in terms of maximum concentration and number of days exceeding the standards and episode levels. Maximum one-hour average and eight-hour average ozone concentrations in 2001 (0.19 ppm and 0.144 ppm) were 158 percent and 180 percent of the federal one-hour and eight-hour standards, respectively. Ozone concentrations exceeded the one-hour state standard at all, but two, monitored locations in 2001. In 1997, the EPA promulgated a new national ambient air quality standard for ozone. The new ozone standard is based on an eight-hour average exposure (the current federal ozone air quality standard is based on a one-hour average period). The new eight-hour standard (0.08 ppm) represents a tightening of the existing one-hour ozone standard (0.12 ppm) and is intended to provide for greater health protection against the effects of prolonged exposure. Soon thereafter, a court decision ordered that the

[10] It should be noted that in 1999 and 2000 Houston, Texas exceeded the federal ozone standards on more occasions than the district and reported the highest ozone concentrations in the nation.

EPA could not enforce the new standard until adequate justification for the new standard was provided. EPA appealed the decision to the Supreme Court.

On February 27, 2001, the Supreme Court upheld EPA's authority and methods to establish clean air standards. Thus, the one-hour ozone standard was retained. The Supreme Court, however, ordered the EPA to revise its *SIP* for the new ozone standard. Under a consent decree that was reached in response to a lawsuit that was filed by nine environmental groups, EPA has agreed to finalize its designations for the eight-hour ozone standard by 2004, though EPA has yet to promulgate the air quality designations of the various regions for the new ozone standards. Also, based on current information from EPA, the *SIP* for the eight-hour ozone standard is not expected to be due until approximately 2007. Thus, current regulatory control strategies will continue to focus on attaining the one-hour standard with the recognition that these controls will have benefits toward attaining the eight-hour standard. EPA is considering several options in transitioning from the one-hour to the eight-hour standard, while ensuring that no backsliding will occur. In addition, based on the same consent decree plus EPA's draft implementation guidance, it is most likely that the Basin will have to meet the eight-hour ozone standard by 2021.

Meanwhile, CARB and local air districts continue to collect technical information in order to prepare for an eventual *SIP* to reduce unhealthful levels of ozone in areas violating the new federal standard. California has previously developed a *SIP* for the current ozone standard, which has been approved by the EPA for the district.

Carbon Monoxide

CO is a colorless, odorless gas formed by the incomplete combustion of fuels. CO competes with oxygen, often replacing it in the blood, thus reducing the blood's ability to transport oxygen to vital organs in the body. The ambient air quality standard for carbon monoxide is intended to protect persons whose medical condition already compromises their circulatory systems' ability to deliver oxygen. These medical conditions include certain heart ailments, chronic lung diseases, and anemia. Persons with these conditions have reduced exercise capacity even when exposed to relatively low levels of CO. Fetuses are at risk because their blood has an even greater affinity to bind with CO. Smokers are also at risk from ambient CO levels because smoking increases the background level of CO in their blood.

CO was monitored at 23 locations in the district in 2001. The national and state eight-hour CO standards were not exceeded at any location. The highest eight-hour average CO concentration of the year (7.71 ppm) was 81 percent of the federal standard.

Nitrogen Dioxide

NO2 is a brownish gas that is formed in the atmosphere through a rapid reaction of the colorless gas nitric oxide (NO) with atmospheric oxygen. NO and NO2 are collectively referred to as NOx. NO2 can cause health effects in sensitive population groups such as children and people with chronic lung diseases. It can cause respiratory irritation and constriction of the airways, making breathing more difficult. Asthmatics are especially sensitive to these effects. People with asthma and chronic bronchitis may also experience headaches, wheezing and chest tightness at high ambient levels of NO2. NO2 is suspected to reduce resistance to infection, especially in young children.

By 1991, exceedances of the federal standard were limited to one location in Los Angeles County. The Basin was the only area in the United States classified as nonattainment for the federal NO2 standard under the *1990 Clean Air Act Amendments*. No location in the area of SCAQMD's jurisdiction has exceeded the federal standard since 1992 and the Basin was designated attainment for the national standard in 1998. In 2001, the maximum annual arithmetic mean (0.0419 ppm) was 78 percent of the federal standard (the federal standard is annual arithmetic mean NO2 greater than 0.0534 ppm.). The more stringent state standard (0.25 ppm) was never exceeded by any of the monitored stations in year 2001, and the Basin was designated attainment for the state standard in 1996. Despite declining NOx emissions over the last decade, further NOx emissions reductions are necessary because NOx emissions are PM10 and ozone precursors.

Particulate Matter (PM10)

PM10 is defined as suspended particulate matter 10 microns or less in aerodynamic diameter and includes a complex mixture of man-made and natural substances including sulfates, nitrates, metals, elemental carbon, sea salt, soil, organics and other materials. PM10 may have adverse health impacts because these microscopic particles are able to penetrate deeply into the respiratory system. In some cases, the particulates themselves may cause actual damage to the alveoli of the lungs or they may contain adsorbed substances that are injurious. Children can experience a decline in lung function and an increase in respiratory symptoms from PM10 exposure. People with influenza, chronic respiratory disease and cardiovascular disease can be at risk of aggravated illness from exposure to fine particles. Increases in death rates have been statistically linked to corresponding increases in PM10 levels.

In 2001, PM10 was monitored at 18 locations in the district. There were two exceedances of the federal 24-hour standard (150 $\mu g/m^3$), while the state 24-hour standard (50 $\mu g/m^3$) was exceeded at all 18 monitored locations. The federal standard (annual arithmetic mean greater than 50 $\mu g/m^3$) was exceeded in five locations, and the state standard (annual geometric mean greater than 30 $\mu g/m^3$) was exceeded at 14 locations.

In July 1997, the EPA adopted new national ambient air quality standards for particulates. Though the annual PM10 standard was retained, the form of the 24-hour PM10 standard was revised. In addition, the EPA established annual and 24-hour standards for the finest fraction, particulate matter with an aerodynamic diameter of 2.5 microns or less (PM2.5), to complement the PM10 standards. Based on health studies conducted, PM2.5 is considered to be the most injurious to health, and also impacts visibility more adversely than any other pollutant. The annual and 24-hour PM2.5 standards were set at 65 and 15 micrograms per cubic meter, respectively. The EPA has yet to promulgate the air quality designations of the various regions for the new PM2.5 standards. The EPA anticipates finishing its periodic review of the national PM standards in 2004.

Based on current information from EPA, the SIP for PM2.5 will not be due until approximately 2007. Thus, current regulatory control strategies will continue to focus on attaining the one-hour standard with the acknowledgment that these controls will have

benefits toward attaining the eight-hour standard. EPA is considering several options for transitioning from the one-hour to the eight-hour standard, while ensuring that no backsliding will occur. Based on the recent consent decree EPA reached with environmental groups plus EPA's draft implementation guidance, it is most likely that the Basin will be required to meet the federal PM2.5 standards by 2014.

On June 20, 2002, CARB also passed new, stricter standards for PM. The newly adopted standards include:

- a PM10 annual-average standard of 20 micrograms per cubic meter ($\mu g/m^3$) (reduced from 30 $\mu g/m^3$);
- a new PM2.5 (particulates with an aerodynamic diameter less than 2.5 microns) annual-average standard of 12 $\mu g/m^3$;
- retention of the 24-hour PM10 standard of 50 $\mu g/m^3$; and
- retention of the sulfates 24-hour average standard of 25 $\mu g/m^3$.

In addition, CARB also adopted several recommendations to revise the monitoring methods for these standards. During the adoption proceedings, CARB staff presented the current status of the 24-hour standard recommendations with the decision to delay those recommendations in light of recent findings related to statistical issues in several key short-term exposure health effects studies (see "Deferment of 24-Hour Average of PM2.5 Standard" at http://www.arb.ca.gov/research/aaqs/std-rs/2_5defer.htm). CARB directed its staff to continue reviewing the 24-hour standards for PM2.5 and PM10 to follow the work by the EPA and others to reanalyze the short-term PM studies affected by the statistical analysis issues and to return to CARB with recommendations for revising the 24-hour PM2.5 and PM10 standards. CARB also directed its staff to work closely with EPA as it reviews the national PM standards and recommended that it promulgate an equally health protective national PM standard.

Sulfur Dioxide

SO2 is a colorless, pungent gas formed primarily by the combustion of sulfur-containing fossil fuels. Health effects include acute respiratory symptoms and difficulty in breathing for children. Though SO2 concentrations have been reduced to levels well below state and federal standards, further reductions in emissions of SO2 are needed to comply with standards for other pollutants (sulfate and PM10).

Lead

Lead concentrations once exceeded the state and national ambient air quality standards by a wide margin, but have not exceeded state or federal standards at any regular monitoring station since 1982. Though special monitoring sites immediately downwind of lead sources recorded very localized violations of the state standard in 1994, no violations were recorded at these stations since that time.

Sulfates

Sulfates are a group of chemical compounds containing the sulfate group, which is a sulfur atom with four oxygen atoms attached. Though not exceeded in 1993, 1996, 1997, and 1998, the state sulfate standard was exceeded at three locations in 1994 and one location in 1995, 1999, 2000 and 2001. There are no federal air quality standards for sulfate.

Visibility

Since deterioration of visibility is one of the most obvious manifestations of air pollution and plays a major role in the public's perception of air quality, the state of California has adopted a standard for visibility or visual range. Until 1989, the standard was based on visibility estimates made by human observers. The standard was changed to require measurement (extinction coefficient > 0.23 inverse kilometers) of visual range (less than 10 miles) using instruments that measure light scattering and absorption by suspended particles with relative humidity of less than 70 percent on an eight-hour average.

Volatile Organic Compounds

It should be noted that there are no state or national ambient air quality standards for VOCs because they are not classified as criteria pollutants. VOCs are regulated, however, because reduction in VOC emissions reduces the rate of photochemical reactions that contribute to the formation of ozone. They are also transformed into organic aerosols in the atmosphere, contributing to higher PM10 and lower visibility levels.

Although health-based standards have not been established for VOCs, health effects can occur from exposures to high concentrations of VOCs because of interference with oxygen uptake. In general, ambient VOC concentrations in the atmosphere are suspected to cause coughing, sneezing, headaches, weakness, laryngitis, and bronchitis, even at low concentrations. Some hydrocarbon components classified as VOC emissions are thought or known to be hazardous. Benzene, for example, one hydrocarbon component of VOC emissions, is known to be a human carcinogen.

Non-Criteria Pollutant Emissions

Although the SCAQMD's primary mandate is attaining the State and National Ambient Air Quality Standards for criteria pollutants within the district, SCAQMD also has a general responsibility pursuant to the *Health and Safety Code §41700* to control emissions of air contaminants and prevent endangerment to public health. As a result, over the last few years the SCAQMD has regulated pollutants other than criteria pollutants such as TACs, greenhouse gases and stratospheric ozone depleting compounds. The SCAQMD has developed a number of rules to control non-criteria pollutants from both new and existing sources. These rules originated through state directives, CAA requirements, or the SCAQMD rulemaking process.

In addition to promulgating non-criteria pollutant rules, the SCAQMD has been evaluating AQMP control measures as well as existing rules to determine whether or not they would affect, either positively or negatively, emissions of non-criteria pollutants. Toxic emissions create adverse localized air quality impacts.

The following subsections summarize the existing setting for the two major categories of non-criteria pollutants: compounds that contribute to ozone depletion and global warming, and TACs.

Ozone Depletion and Global Warming

The SCAQMD adopted a "Policy on Global Warming and Stratospheric Ozone Depletion" on April 6, 1990. The policy commits the SCAQMD to consider global impacts in rulemaking and in drafting revisions to the AQMP.

In March of 1992, the SCAQMD Governing Board reaffirmed this policy and adopted amendments to the policy to include the following directives:

- phase out the use and corresponding emissions of chlorofluorocarbons (CFCs), methyl chloroform (1,1,1-trichloroethane or TCA), carbon tetrachloride, and halons by December 1995;
- phase out the large quantity use and corresponding emissions of hydrochlorofluorocarbons (HCFCs) by the year 2000;
- develop recycling regulations for HCFCs;
- develop an emissions inventory and control strategy for methyl bromide; and
- support the adoption of a California greenhouse gas emission reduction goal.

In support of these polices, the SCAQMD Governing Board has adopted several rules to reduce ozone depleting compounds. Several other rules concurrently reduce global warming gases and criteria pollutants.

Toxic Air Contaminants

Historically, the SCAQMD has regulated criteria air pollutants using either a technology-based or an emissions limit approach. The technology-based approach defines specific control technologies that may be installed to reduce pollutant emissions. The emission limit approach establishes an emission limit, and allows industry to use any emission control equipment, as long as the emission requirements are met. The regulation of toxic air contaminants (TACs) requires a similar regulatory approach as explained in the following subsections.

Control of TACs Under the TAC Identification and Control Program

California's TAC identification and control program, adopted in 1983 as Assembly Bill (AB) 1807, is a two-step program in which substances are identified as TACs, and airborne toxic control measures (ATCMs) are adopted to control emissions from specific sources. CARB has adopted a regulation designating all 188 federal hazardous air pollutants (HAPs) as TACs.

ATCMs are developed by CARB and implemented by the SCAQMD and other air districts through the adoption of regulations of equal or greater stringency. Generally, the ATCMs reduce emissions to achieve exposure levels below a determined health threshold. If no such threshold levels are determined, emissions are reduced to the lowest level achievable through the best available control technology for toxics unless it is determined that an alternative level of emission reduction is adequate to protect public health.

Under California state law, a federal National Emission Standard for Hazardous Air Pollutants (NESHAP) automatically becomes a state ATCM, unless CARB has already

adopted an ATCM for the source category. Once a NESHAP becomes an ATCM, CARB and the air pollution control or air quality management district have certain responsibilities related to adoption or implementation and enforcement of the NESHAP/ATCM.

Control of TACs Under the Air Toxics "Hot Spots" Act

The Air Toxics Hot Spots Information and Assessment Act of 1987 (AB2588) establishes a state-wide program to inventory and assess the risks from facilities that emit TACs and to notify the public about significant health risks associated with the emissions. Facilities are phased into the AB2588 program based on their emissions of criteria pollutants or their occurrence on lists of toxic emitters compiled by the SCAQMD. Phase I consists of facilities that emit over 25 tons per year of any criteria pollutant and facilities present on the SCAQMD's toxics list. Phase I facilities entered the program by reporting their air TAC emissions for calendar year 1989. Phase II consists of facilities that emit between 10 and 25 tons per year of any criteria pollutant, and submitted air toxic inventory reports for calendar year 1990 emissions. Phase III consists of certain designated types of facilities which emit less than 10 tons per year of any criteria pollutant, and submitted inventory reports for calendar year 1991 emissions. Inventory reports are required to be updated every four years under the state law.

In October 1992, the SCAQMD Governing Board adopted public notification procedures for Phase I and II facilities. These procedures specify that AB2588 facilities must provide public notice when exceeding the following risk levels:

- Maximum Individual Cancer Risk: greater than 10 in one million (10×10^{-6})
- Total Hazard Index: greater than 1.0 for TACs except lead, or 0.5 for lead

Public notice is to be provided by letters mailed to all addresses and all parents of children attending school in the impacted area. In addition, facilities must hold a public meeting and provide copies of the facility risk assessment in all school libraries and a public library in the impacted area.

The SCAQMD continues to complete its review of the health risk assessments submitted to date and may require revision and resubmission as appropriate before final approval. Notification will be required from facilities with a significant risk under the AB2588 program based on their initial approved health risk assessments and will continue on an ongoing basis as additional and subsequent health risk assessments are reviewed and approved.

Control of TACs With Risk Reduction Audits and Plans

Senate Bill (SB) 1731, enacted in 1992 and codified at Health and Safety Code §44390 et seq., amended AB2588 to include a requirement for facilities with significant risks to prepare and implement a risk reduction plan which will reduce the risk below a defined significant risk level within specified time limits. SCAQMD Rule 1402 - Control of Toxic Air Contaminants From Existing Sources, was adopted on April 8, 1994, to implement the requirements of SB1731.

In addition to the TAC rules adopted by SCAQMD under authority of AB1807 and SB1731, the SCAQMD has adopted source-specific TAC rules, based on the specific level of TAC emitted and the needs of the area. These rules are similar to the state's ATCMs because they are source-specific and only address emissions and risk from specific compounds and operations.

Cancer Risks from Toxic Air Contaminants

New and modified sources of toxic air contaminants in the SCAQMD are subject to Rule 1401 - New Source Review of Toxic Air Contaminants and Rule 212 - Standards for Approving Permits. Rule 212 requires notification of the SCAQMD's intent to grant a permit to construct a significant project, defined as a new or modified permit unit located within 1,000 feet of a school (a state law requirement under AB3205), a new or modified permit unit posing an maximum individual cancer risk of one in one million (1×10^{-6}) or greater, or a new or modified facility with criteria pollutant emissions exceeding specified daily maximums. Distribution of notice is required to all addresses within a ¼-mile radius, or other area deemed appropriate by the SCAQMD. Rule 1401 currently controls emissions of carcinogenic and non-carcinogenic (health effects other than cancer) air contaminants from new, modified and relocated sources by specifying limits on cancer risk and hazard index (explained further below), respectively.

Health Effects

One of the primary health risks of concern due to exposure to TACs is the risk of contracting cancer. The carcinogenic potential of TACs is a particular public health concern because it is currently believed by many scientists that there is no "safe" level of exposure to carcinogens. Any exposure to a carcinogen poses some risk of causing cancer. It is currently estimated that about one in four deaths in the United States is attributable to cancer. About two percent of cancer deaths in the United States may be attributable to environmental pollution[11]. The proportion of cancer deaths attributable to air pollution has not been estimated using epidemiological methods.

Noncarcinogenic Health Risks from Toxic Air Contaminants

Unlike carcinogens, for most noncarcinogens it is believed that there is a threshold level of exposure to the compound below which it will not pose a health risk. The California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment develops Reference Exposure Levels (RELs) for TACs which are health-conservative estimates of the levels of exposure at or below which health effects are not expected. The noncancer health risk due to exposure to a TAC is assessed by comparing the estimated level of exposure to the REL. The comparison is expressed as the ratio of the estimated exposure level to the REL, called the hazard index (HI).

[11] Doll and Peto, 1981

CHAPTER 4

ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

Introduction
Potential Environmental Impacts and Mitigation Measures
Potential Environmental Impacts Found Not to be Significant
Consistency

INTRODUCTION

The state CEQA Guidelines require environmental documents to identify significant environmental effects that may result from a proposed project [*CEQA Guidelines §15126.2(a)*]. Direct and indirect significant effects of a project on the environment should be identified and described, with consideration given to both short- and long-term impacts. The discussion of environmental impacts may include, but is not limited to, the resources involved; physical changes; alterations of ecological systems; health and safety problems caused by physical changes; and other aspects of the resource base, including water, scenic quality, and public services. If significant adverse environmental impacts are identified, the *CEQA Guidelines* require a discussion of measures that could either avoid or substantially reduce any adverse environmental impacts to the greatest extent feasible [*CEQA Guidelines §15126.4*].

State CEQA Guidelines recognize that the degree of specificity required in a CEQA document depends on the type of project being proposed (*CEQA Guidelines §15146*). The detail of the environmental analysis for certain types of projects cannot be as great as for others. For example, the environmental document for projects, such as the adoption or amendment of a comprehensive zoning ordinance or a local general plan, should focus on the secondary effects that can be expected to follow from the adoption or amendment, but the analysis need not be as detailed as the analysis of the specific construction projects that might follow. As a result, this *Draft SEA* analyzes impacts on a regional level and impacts on the level of individual industries or individual facilities where feasible.

The categories of environmental impacts to be studied in a CEQA document are established by CEQA (*Public Resources Code, §21000 et seq.*), and the CEQA Guidelines, as promulgated by the State of California Secretary of Resources. Under the state CEQA Guidelines, there are approximately 17 environmental categories in which potential adverse impacts from a project are evaluated. Projects are evaluated against the environmental categories in an Environmental Checklist and those environmental categories that may be adversely affected by the project are further analyzed in the appropriate CEQA document.

POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Pursuant to CEQA, an NOP/IS and 2001 Final EA were prepared for the 2001 amendments to Rule 1162, and these documents are the basis for the preparation of this Draft SEA to the current proposed amendments to Rule 1162. Of the 17 potential environmental impact categories previously analyzed, only one (air quality) was concluded to be affected by the gel coat requirements proposed by the 2001 amendments. Further, the current proposed amendments to Rule 1162 are directly related to the analysis for the 2001 amendments because the currently proposed project constitutes a modification of the previously adopted project. Thus, air quality is again expected to be potentially significantly adversely affected by the proposed project.

Therefore, the environmental impact area of air quality is the focus of the environmental evaluation in this chapter. The environmental impact analysis for air quality incorporates a "worst-case" approach. This entails the premise that whenever the analysis requires that assumptions be made, those assumptions that result in the greatest adverse impacts are typically chosen. This method ensures that all potential effects of the proposed project are documented for the decision-makers and the public.

Accordingly, the following analyses use a conservative "worst-case" approach for analyzing the potentially significant adverse environmental impacts associated with the implementation of the proposed project.

The proposed amendments will rescind the nonatomizing spray application technique requirements for gel coats, since when nonatomizing gel coat application techniques were tested under the same conditions that the UEF were developed (i.e., low pressure and low flow), the products did not meet performance specifications required by to maintain product integrity. When tested at operating conditions, nonatomizing gel coat application techniques could not achieve the UEF provided by the AMCA. Therefore, the expected emission reductions are considered infeasible and foregone. Because the emission reduction anticipated from nonatomizing gel coat application techniques would not be achieved, 853 pounds of VOC per day would be foregone.

The November 2001 amendments to Rule 1162 included resin application and gel coat monomer reduction requirements in addition to the nonatomizing gel coat application techniques. The resin application requirements were estimated to generate approximately 1,434 tons per year of VOC emission reductions. The gel coat monomer reductions were estimated to generate approximately 356 tons per year of VOC emission reductions. Therefore, the total VOC emissions reductions from resin application and gel coat monomer reductions were 1,790 tons per year. Approximately 730 tons per year were removed from the Rule 1162 emissions reductions inventory and applied as VOC credit towards Rule 1132. Therefore, the proposed project does not hinder the implementation of the AQMP because the November 2001 amendments to Rule 1162 achieved reduction of approximately 1,020 tons per year of VOC emissions (1,790 tons of VOC emissions less VOC credit towards Rule 1132) even without the emission reductions from nonatomizing gel coat application techniques.

Significance Criteria

The project will be considered to have significant adverse air quality impacts if any one of the thresholds in Table 4-1 are equaled or exceeded.

Construction Air Quality Impacts

PROJECT-SPECIFIC IMPACT: Since rescinding the use of nonatomizating application techniques for open mold systems does not require physical changes or modifications involving construction activities, there will be no construction air quality impacts resulting from the proposed project. Upon adoption of the proposed amendments, operators of affected facilities will continue existing operations.

PROJECT-SPECIFIC MITIGATION: Not applicable, no construction activities.

Table 4-1
SCAQMD Air Quality Significance Thresholds

Mass Daily Thresholds		
Pollutant	**Construction**	**Operation**
NOx	100 lbs/day	55 lbs/day
VOC	75 lbs/day	55 lbs/day
PM10	150 lbs/day	150 lbs/day
SOx	150 lbs/day	150 lbs/day
CO	550 lbs/day	550 lbs/day
Lead	3 lbs/day	3 lbs/day
Toxic Air Contaminants (TACs) and Odor Thresholds		
TACs (including carcinogens and non-carcinogens)	Maximum Incremental Cancer Risk ≥ 10 in 1 million Hazard Index ≥ 1.0 (project increment) Hazard Index ≥ 3.0 (facility-wide)	
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402	
Ambient Air Quality for Criteria Pollutants [a]		
NO2 1-hour average annual average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 0.25 ppm (state) 0.053 ppm (federal)	
PM10 24-hour average annual geometric average annual arithmetic mean	10.4 $\mu g/m^3$ (recommended for construction) [b] 2.5 $\mu g/m^3$ (operation) 1.0 $\mu g/m^3$ 20 $\mu g/m^3$	
Sulfate 24-hour average	1 ug/m^3	
CO 1-hour average 8-hour average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 20 ppm (state) 9.0 ppm (state/federal)	

[a] Ambient air quality thresholds for criteria pollutants based on SCAQMD Rule 1303, Table A-2 unless otherwise stated.
[b] Ambient air quality threshold based on SCAQMD Rule 403.

KEY: lbs/day = pounds per day ppm = parts per million ug/m^3 = microgram per cubic meter ≥ greater than or equal to

Operational Air Quality Impacts

PROJECT-SPECIFIC IMPACT: The overall objective of the proposed project is to rescind the nonatomizing gel coat application technique requirement. Since nonatomizing gel coat application techniques are unable to achieve VOC/ TAC emission reductions previously anticipated to occur by July 1, 2005, the requirement to use nonatomizing gel coat application technique is being rescended. Rule 1162 was expected achieve

approximately 853 pounds per day of VOC emission reductions after July 1, 2005 from the nonatomizing gel coat application technique requirement. Therefore, by removing the provision to use nonatomizing gel coat application techniques for gel coats an estimate 853 pounds per day of VOC emissions foregone is anticipated. The 853 pounds per day of would exceed the VOC significance threshold of 55 pounds per day. Therefore, the emissions foregone are significant for operational air quality. An analysis of this air quality impact is discussed below for completeness.

Nonatomizing Gel Coat Application Techniques

Non atomizing gel coat application techniques were estimated from the annual total gel coat usage, UEFs for nonatomized gel coat application techniques, and existing monomer requirements. Table 4-2 presents emission estimates for gel coats with nonatomizing applications.

Table 4-2
Previously Projected VOC Emissions Inventory with Nonatomizing Applications

Specific Type of Gel Coat, & Sub-Category	Allowed Monomer Percentage in Existing Rule after July 1, 2003 (%)	Unified Emission Factor[a] (in pounds of styrene per tons of gel coat)	Units Adjustment Factor (1 ton = 2000 pounds)	Estimated Annual Total Gel Coat Usage[b] (in tons per year)	Percentage of Estimated Annual Total Gel Coat Usage per Type & Sub-Category	Projected VOC Emissions From Gel Coats (in tons per year)
Clear, for marble resins	40	(259	÷ 2000)	x 2206	x 0.15 x 0.35	= 15.0
Clear, for other resins	44	(296	÷ 2000)	x 2206	x 0.15 x 0.65	= 31.8
Pigmented, White and Off White	30	(169	÷ 2000)	x 2206	x 0.85 x 0.85	= 134.7
Pigmented, Non-White	37	(232	÷ 2000)	x 2206	x 0.85 x 0.15	= 32.6
					TOTAL	**214**

a) Unified Emission Factors for Open Molding of Composites, July 23, 2001 (see Appendix C)
b) SCAQMD, Table 2-8, Final EA for PAR 1162, SCAQMD No. 010918BAR, Oct. 24, 2001.

Emission Reductions Foregone by PAR 1162

The emissions reductions expected from the November 2001 amendments Rule 1162 were estimated by subtracting the emissions with nonatomizing gel coat application techniques in Table 4-2 from the emissions without atomizing gel coat application techniques in Table 3-1, as shown in Table 4-3. These VOC emission reductions were updated with the most current UEF (July 23, 2001). The November 2001 amendment emissions reductions for Rule 1162 were estimated with April 7, 1999 UEF. Using the 2001 UEF, the expected emissions reductions from nonatomizing gel coat applications were expected to be 133 tons of VOC per year or 853 pounds of VOC per day. These expected emissions are considered foregone, since field tests demonstrated that nonatomizing gel coat application techniques that attain industry performance standards are unable to achieve the anticipated UEF estimated VOC emission reductions. The emission reductions foregone are over the 55 pounds per day

regional emissions threshold for operations. Therefore, air quality impacts are considered significant.

Table 4-3
Previously Expected VOC Emission Reductions

Emissions	Emissions with Atomizing Applications	Emissions with Nonatomizing Applications	Emissions Reduction Foregone
Emissions (ton per year)	347	214	133
Emission (pounds per day)	2,224	1,372	853

Emissions, pound/day = (Emissions, ton/year x 2,000 pounds per ton)/(312 days/year)

Toxic Air Contaminants

TACs associated with composite materials, such as gel coats, include styrene, MMA, methylene chloride, toluene, xylene, n-hexane, MEK, MIBK, and 1,1,1-trichloroethane.

Carcinogenic Risk

Methylene chloride is the only compound used at affected facilities, recognized as carcinogenic by either federal or state regulations. Methylene chloride, however, is not a component of gel coats, but was used at one time to etch or roughen the surface of gel coats so that resin could be applied. Since it is not a constituent of gel coats, methylene chloride emissions are not affected by gel coat application techniques. Therefore, PAR 1162 would not alter carcinogenic risk.

Non-Carcinogenic Chronic Risk

The SCAQMD assumes that all nonmonomer VOC TACs are emitted to the atmosphere; therefore, nonmonomer VOC TACs evaporate despite the application used. It is suspected that MMA may volatilize less when applied with nonatomizing applications. But emission factors have not been established by application for MMA; therefore, the difference in MMA emissions between atomizing and nonatomizing application techniques was not quantifiable at this time.

Since TAC emissions generate localized impacts, the analysis of non-carcinogenic risks is a facility-based analysis. To provide a "worst-case" analysis in the, the SCAQMD analyzed the risk from the emissions foregone from an affected composite facility with the highest reported emissions for the reporting year 1998-99 to determine whether or not the VOC/TAC emission reductions foregone in from implementing PAR 1162 would be significant for non-carcinogenic risk. Since no growth has been forecasted for the industry since 1998, this analysis is considered to be valid for the current proposed project. The usage of gel coats was calculated using the industry-wide percentage of emissions from gel coats and the AP-42 emission factor. Table 4-4 presents annual gel coat usage estimated from the highest reported VOC emissions.

Table 4-4
Estimated Highest Annual Usage of Gel Coats and Resins at a Rule 1162 Facility Based on Emission Data from Reporting Year 1998-99 & AP-42 Emission Factors

Reported VOC Emissions in 1998-99[a] (in tons per year)		Industry-wide Percentage of Emissions from Gel Coats[b]		AP-42 Emission Factor[b] (lb of VOC/lb of material)		Estimated Annual Gel Coat Usage[c] (in tons per year)
248	x	0.12	÷	0.10	=	298

a) Based on the highest VOC emissions reported to the AQMD from a single facility for 1998-1999
b) Table 8, Final Staff Report for PAR 1162, November 2001. Percentage is converted to a decimal number.
c) Estimated Annual Gel Coat Usage = (Reported VOC Emissions x Industry-wide Percentage of Emissions for Gel Coats)/AP-42 Emission Factor

The "worst-case" TAC throughput was estimated by assuming the maximum monomer content allowed by Rule 1162 (44 percent) for styrene. The "worst-case" styrene emissions are presented in Table 4-5. Emissions for both atomizing and non-atomizing techniques were estimated. The difference between the two techniques is the TAC emissions foregone.

Table 4-5
Estimated "Worst-Case" Toxic Facility Emissions Reduction Postponed

Description	Estimated Annual Gel Coat Usage[a] (in tons per year)	Unified Emission Factor[b] (in pounds of styrene per tons of gel coat)	Units Adjustment Factor (1 ton = 2000 pounds)	Estimated Styrene Emissions from Gel Coats[c] (in tons per year)	Estimated Styrene Emissions from Gel Coats[d] (in pounds per hour)
Atomizing	298	522	2000	78	62
Non Atomizing	298	296	2000	44	35
TAC Emission Foregone				34	27

a) Estimated Annual Gel Coat Usage from Table 4-4
b) Unified Emission Factors for Open Molding of Composites, July 23, 2001 (see Appendix C)
Styrene UEF = 552 pounds per ton of gel coat for atomized gel coat applications with 44% monomer content
Styrene UEF = 296 pounds per ton of gel coat for atomized gel coat applications with 44% monomer content
c) Emissions, ton/year = (Gel Coat Usage x UEF)/2,000 pound per ton)
d) Emissions, pound/hour = (Emissions, ton/year x 2,000 pounds per ton)/(312 days/year x 8 hours/day)

The chronic hazard index (HI) from usage of the toxics presented in Table 4-6 was estimated according to the Tier II methodology detailed in the *Risk Assessment Procedures for Rules 1401 and 212*, Version 6. The "worst-case" dispersion factor occurs for point sources operating 12 hours per day or less, with a stack height of below 24 feet, and a receptor at 25 meters downwind from the point source. The West Los Angeles meteorological correction factor produces the highest HI value. The Reference Exposure Level (REL) and the target organ were obtained from Attachment K of the *Risk Assessment Procedures for Rules 1401 and 212*, Version 6. The chronic REL is a concentration that is not likely to cause adverse effects in a human population, including sensitive subgroups, exposed to that concentration over an extended period of time. The ratio of the potential exposure to the substance and the level at which no adverse effects are expected is the HI. If the HI is calculated to be less than

1.0, then no adverse health effects are expected as a result of exposure. If the HI is greater than 1.0, then adverse health effects are possible.

Table 4-6 presents the chronic risk from the emissions foregone estimated for a Rule 1162 facility that reported the highest amount of VOC to the SCAQMD for 1998-99. Therefore, by removing nonatomizing gel coat application technique requirement, there are associated styrene emissions that could result in a significant impact. The hazard index is 1.9 for the nervous system, which is a significant adverse impact.

Table 4-6
"Worst-Case" Chronic Hazard Index

Compound	Emission Reduction[a] (in tons per year)	Dispersion Factor[b] X/Q (in [µg/m³]/[tons/year])	Meteorological Correction Factors[c] MET	Chronic Reference Exposure Level[d] REL (in µg/m³)	Multi Pathway Factor (MP)	Chronic Hazard Index (HI)
Styrene	34	51.18	1	900	1	1.9

SCAQMD, Attachment H, *Risk Assessment Procedures for Rules 1401 and 212*, Version 6.0, August 18, 2000
a) "Worst-case" Throughput estimate in Table 4-5
b) Dispersion Factor (X/Q) from Table-2A: point source, > 12 hr/day, ≥ 14 to 24 stack height, receptor distance 25 meters down wind
c) Meteorological Correction Factors (MET) from Table-2B: West L.A.
d) Reference Exposure Level (REL), Multi Pathway Factor (MP) and from Table-8A
e) Hazard Index (HI) = (Throughput x X/Q x MET x REL x MP)

Non-Carcinogenic Acute Risk

The styrene associated with gel coats has an acute REL. The acute REL is a concentration that is not likely to cause adverse effects in a human population, including sensitive subgroups, exposed on an intermittent basis to that concentration for one hour. TAC concentrations below the REL are not expected to create adverse health impacts to the surrounding community. The acute HI from usage of the toxics presented in Table 4-9 was estimated according to the Tier II methodology detailed in the *Risk Assessment Procedures for Rules 1401 and 212*, Version 6. The "worst-case" dispersion factor occurs for point sources with a stack height of below 24 feet, and a receptor at 25 meters downwind from the point source. The RELs and target organs were obtained from Attachment K of the *Risk Assessment Procedures for Rules 1401 and 212*, Version 6. If the HI is calculated to be less than 1.0, then no adverse health effects are expected as a result of exposure. If the HI is greater than 1.0, then adverse health effects are possible.

Table 4-7 presents the acute risk from the emissions foregone estimated for an affected Rule 1162 facility that reported the highest VOC emissions to the SCAQMD for 1998-99. Therefore, by removing nonatomizing gel coat application technique requirement, the associated styrene emissions could result in a significant impact. The hazard index is 2.6 for the eyes and respiratory system, which is a significant adverse impact.

Table 4-7
"Worst-Case" Acute Hazard Index

Compound	Emission Reduction[a] (in pounds per hour)	Dispersion Factor[b] X/Qhr (in [µg/m³]/ [pound/hour])	Acute Reference Exposure Level[c] REL	Acute Hazard Index[d] HI
Styrene	27	2,000	21,000	2.6

SCAQMD, Attachment K, *Risk Assessment Procedures for Rules 1401 and 212*, Version 6.0, August 18, 2000
a) Worst Case Throughput estimate in Table 4-5
b) Dispersion Factor (X/Q) from Table-6: point source, > 12 hr/day, ≥ 14 to 24 stack height, receptor distance 25 meters down wind
d) Acute Reference Exposure Level (REL) from Table-8A
e) Hazard Index (HI) = (Throughput x X/Q)/(REL)

Conclusion

The proposed project would directly result in significant adverse air quality impacts due to the rescinding of the nonatomizing gel coat application technique requirements. VOC/TAC emission reductions foregone occur as a result of the failure of nonatomizing application techniques to demonstrate emission reductions. Under the proposed project, the VOC emissions from gel coats applied to open molding surfaces would remain at current levels. The emission reductions foregone would diminish an existing air quality rule or future compliance requirement (existing Rule 1162), but does not conflict with or obstruct implementation of the applicable air quality plan (2003 AQMP). The emission reductions foregone would not cause a violation of any air quality standard or directly contribute to an existing or projected air quality violation, since emissions would remain the same the use of nonatomizing gel coat application techniques cannot produce the anticipated emission reductions. Air quality impacts from emission reductions foregone exceed the operational VOC air quality significance threshold of 55 pounds per day. The chronic and acute hazard indices estimated for the VOC reductions foregone at a "worst-case" Rule 1162 facility were both estimated to be greater than 1.0. Since nonatomizing gel coat application techniques did not demonstrate a reduction, this risk would continue for the foreseeable future. Therefore, the VOC/TAC emission reductions foregone are significant.

Project-Specific Mitigation

No commercial non-VOC or nontoxic substitutes were found that could replace styrene or MMA. Additional control technologies were analyzed in the Final Staff Report for PAR 1162 dated November 2001. No viable mitigation was identified.

Remaining Air Quality Impacts

The air quality analysis concluded that significant adverse air quality impacts could be created by the proposed amendments. As a result, a Statement of Findings and a Statement of Overriding Considerations will be prepared for the Governing Board's consideration and approval prior to the public hearing for the proposed amendments.

Cumulative Air Quality Impacts

In general, the preceding analysis concluded that air quality impacts from construction activities would not be significant from implementation of the proposed project. The UEF estimated VOC/TOC emission reductions from nonatomizing gel coat application techniques

that attain industry performance standards were not demonstrated by field test and; therefore, are considered foregone. These emissions reductions foregone (853 pounds of VOC per day) exceed the SCAQMD's threshold of significance. These emissions foregone should be viewed in context with the VOC emissions reductions achieved by the November 2001 amendments, which include 1,020 tons per year (6,538 pounds per day) of VOC emission reductions from resin applications and gel coat monomer reductions on top of the 730 tons per year (1,700 pounds per day) of VOC emissions reductions credited to Rule 1132. In addition, Rule 1162 is part of an overall program set forth in the AQMP to reduce ozone through reducing NOx and VOC emissions. Existing rules and further compliance dates will result in a net reduction in VOC emissions in the district as predicted by the AQMP.

In practice, VOC/ TAC emissions from gel coat application will remain the same and no new emissions would be added to any community. Styrene is both a VOC and a TAC. VOC emission reductions are based on monomer content. Significant noncarcinogenic acute and chronic risks were estimated from the styrene emission reductions foregone from an affected Rule 1162 facility with high styrene emissions to provide the basis of a "worst-case" analysis. The chronic and acute HIs were estimated to be 1.9 and 2.6, respectively. Significant adverse cumulative impacts are expected from HIs greater than 3.0. Since no new VOCs are anticipated to be directly added to any community and the facility wide (cumulative) threshold is less than 3.0, cumulative impacts would not be significant.

POTENTIAL ENVIRONMENTAL IMPACTS FOUND NOT TO BE SIGNIFICANT

While all the environmental topics required to be analyzed under CEQA were reviewed to determine if the proposed amendments would create significant impacts, a screening analysis concluded that the following environmental areas would not be significantly adversely affected by PAR 1162: aesthetics, agriculture resources, biological resources, cultural resources, energy, geology/soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, solid/hazardous waste and transportation/traffic. These topics were not analyzed in further detail in this environmental assessment, however, a brief discussion of each is provided below.

Aesthetics

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement.. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. Because operators would continue existing operations, no substantial adverse effect on any scenic vistas, substantially degrade the existing visual character or quality of any site and its surroundings, or create new sources of substantial light or glare which would adversely affect day or nighttime views of an area is expected by PAR 1162. Therefore, PAR 1162 is not considered to be significant for aesthetics.

Agriculture Resources

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. Because operators would continue existing operations, new construction of buildings or other structures that would convert farmland to non-agricultural use or conflict with zoning for agricultural use or a Williamson Act contract

is not expect as a result of implementing PAR 1162. There are no provisions in the amendments that would affect land use plans, policies, or regulations. Land use and other planning considerations are determined by local governments and no land use or planning requirements are expected to be altered by the existing Rule 1162. Since no significant adverse agricultural resource effects were found in continuing existing operations; no adverse effects are expected from rescinding the nonatomizing gel coat application technique requirement in PAR 1162. Therefore, PAR 1162 is not considered to be significant for agricultural resources.

Biological Resources

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. Because operators would continue existing operations, PAR 1162 is not expected to adversely impact existing commercial or industrial facilities that are should be located in appropriately zoned commercial or industrial areas, which typically do not support a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.

Since existing operations would continue, there are no provisions in the existing rule that would affect land use plans, policies, or regulations. Land use and other planning considerations are determined by local governments and no land use or planning requirements will be altered by the proposed project. Retaining existing operations is not expected to adversely affect habitat conservation or natural community conservation plans, agricultural resources or operations, and would not create divisions in any existing communities that did not already exist. Since no increase in adverse biological resource effects were determined by in allowing existing operations to continue; no adverse effects are expected from rescinding the nonatomizing gel coat application technique requirement in PAR 1162. Therefore, PAR 1162 is not considered to be significant for biological resources.

Cultural Resources

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. Because operators would continue existing operations at existing facilities which have been previously disturbed, no cultural resources are expected to be affected by the proposed amendments. There are existing laws in place that are designed to protect and mitigate potential impacts to cultural resources. Existing gel coat operations are not expected to cause a substantial adverse change a historical or archaeological resource, directly or indirectly destroy a unique paleontological resource or site or unique geologic feature, or disturb any human remains, including those interred outside a formal cemeteries. Since no adverse cultural resource effects were found in allowing existing operations to continue; no adverse effects are expected from rescinding the nonatomizing gel coat application technique requirement in PAR 1162. Therefore, PAR 1162 is not considered to be significant for cultural resources.

Energy

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat

application techniques would not be required. Because operators would continue existing operations at existing facilities which have been previously disturbed, no additional electricity or natural gas use was expected to be required by PAR 1162. Additionally, allowing existing operations to continue is not expected to substantially increase the number of businesses or amount of equipment in the district. An increase in energy consumption from non-renewable resources (e.g., diesel and gasoline) was not expected by continuing existing operations. Nor would continuing existing operations conflict with adopted energy conservation plans, result in the need for new or substantially altered power or natural gas utility systems, or be out of compliance with existing energy standards. Therefore, PAR 1162 is not considered to be significant for energy.

Geology and Soils

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. Allowing operators to continue existing operations is not expected to result in additional exposure of people to potential impacts involving seismicity, landslides, mudslides or erosion as no new development is anticipated. Existing operations are not expected to significantly disrupt or overcover soil, or change in topography or surface relief features, nor result in the erosion of beach sand, or a change in existing siltation rates. Therefore, PAR 1162 is not considered to be significant for geology and soils.

Hazards and Hazardous Materials

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. There are no provisions in the proposed amended rule that would increase the total amount of gel coat materials currently used by affected facilities. Since these facilities already use materials that contain toxics, such as styrene, methylene chloride, toluene, xylene, n-hexane, MEK, TCA and methanol, which all currently require solvent delivery and waste transport services, it is assumed that there will be no increase in potential truck trips in response to PAR 1162. In summary, since PAR 1162 would allow existing operations to continue at existing facilities, implementation of PAR 1162 is not expected to increase any existing hazard that the routine transport, use, or disposal of gel coat materials used may have or lead to a reasonably foreseeable accident involving the release of new formulations into the environment.

PAR 1162 would rescind the gel coat nonatomizing application techniques requirement for open molding surfaces. Facilities that switch from using atomized spray equipment to nonatomizing gel coat application techniques were expected to have a small increase (a few ounces) in the amount solvent(s) used to clean or flush the spray equipment. Rescinding the nonatomizing gel coat application technique requirement would eliminate these potential increases in cleaning solvent use. Therefore, rescinding the requirement for facilities to switch to using nonatomizing gel coat application techniques will not result in new adverse hazardous material impacts.

Since no change in existing operations would occur, PAR 1162 would not create a significant hazard to the public, possible nearby public airports or private airstrips or hazardous materials sites compiled pursuant to Government Code §65962.5.

The proposed amendments would not change practices at existing facilities; therefore, would not interfere with airport land use plans, adopted emergency response plans or emergency evacuation plans. There is no change in the composition of gel coats, so any wildlands intermixed with residences or areas with flammable materials would not be exposed to any increased fire hazards. Therefore, rescinding the requirement for facilities to switch to using nonatomizing gel coat application techniques will not result in new adverse hazard or hazardous material impacts. Therefore, PAR 1162 is not considered to be significant for hazards and hazardous materials.

Hydrology and Water Quality

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement, which in effect would allow existing operations to continue. As stated in the Hazards and Hazardous Materials solvent and gel coat usage is assumed to remain the same, since facilities would not be required to switch to nonatomizing gel coat application techniques. Because the proposed amendments would allow continued use at existing levels, additional groundwater supplies would be not depleted, existing drainage patterns and systems would not be altered, and water quality would not be degraded. The proposed project would not place housing within a 100 year flood hazard area, expose people to new flooding, seiche, tsunami or mudflow conditions. Compliance with all requirements of the applicable Regional Water Quality Control Board is expected for facility operators. Therefore, PAR 1162 is not considered to be significant for hydrology and water quality.

Land Use and Planning

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. Continuing existing operations is not expected to affect land use plans, policies, or regulations. Land use and other planning considerations are determined by local governments and no land use or planning requirements are expected to be altered by the proposed project, no changes to operations or land use are required. Since the proposed project allows existing operations to continue at existing facilities, PAR 1162 is not expected to affect in any way habitat conservation or natural community conservation plans, agricultural resources or operations, and is not expected to create divisions in any existing communities. Since PAR 1162 allows existing operations to continue at existing facilities, no new development or alterations to existing land designations are expected to occur as a result of the implementation of the proposed rule. Based on this analysis no adverse effects are expected from PAR 1162. Therefore, PAR 1162 is not considered to be significant for land use and planning.

Mineral Resources

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. Existing operations are not expected to result in the loss of availability of a known mineral resource of value to the region and the residents of the state, or of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan. PAR 1162 allows continued use of existing levels of materials. Therefore, PAR 1162 is not considered to be significant for mineral resources.

Noise

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. PAR 1162 allows continued use of existing materials and techniques; therefore, no changes in noise levels at the manufacturing facility or in residential areas are anticipated. Gel coat product manufacturers are located in existing industrial or commercial areas where noise levels are already relatively high. It is assumed that operations in these areas are subject to and in compliance with existing community noise ordinances and applicable United States Occupational Safety and Health Administration (OSHA) or California Occupational Safety and Health Administration (Cal/OSHA) workplace noise reduction requirements. In addition to noise generated by existing operations, noise sources in each area may include nearby freeways, truck traffic to adjacent businesses, and operational noise from adjacent businesses.

Since PAR 1162 would allow existing operations to occur at existing facilities, PAR 1162 is not expected to result in increased noise impacts in residential areas. As with industrial or commercial areas, it is assumed that these areas are subject to local community noise standards. Therefore, PAR 1162 is not considered to be significant for noise.

Population and Housing

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. PAR 1162 allows continued use of existing material levels and techniques; therefore, is not expected to affect in any way population growth or the supply and/or availability of houses. Human population in the SCAQMD's jurisdiction is anticipated to grow regardless of implementing the existing rule or proposed project. Maintaining current operations is not expected to create any industry that would induce or inhibit population growth or distribution. Continuing existing is not directly or indirectly expected to induce the construction of single- or multiple-family housing units. Accordingly, no significant adverse impacts on human population or housing are expected. Therefore, PAR 1162 is not considered to be significant for population or housing.

Public Services

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. There is no expected change in the formulation or new materials or procedures introduced as a result of the rescinding nonatomizing application techniques that could pose a need for additional public services above what was currently expected from the fire department, police, schools, parks, government, etc. Allowing existing operations to continue is not expected to result in the need for new or physically altered government facilities in order to maintain acceptable service ratios, response times or other performance objectives. Therefore, PAR 1162 is not considered to be significant for public services.

Recreation

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat

application techniques would not be required. As discussed under "Land Use" above, there are no amendments that affected land use plans, policies, or regulations. Land use and other planning considerations are determined by local governments; no land use or planning requirements were expected to be altered by PAR 1162. Continuing existing operations is not expected to increase the use of existing neighborhood and regional parks or other recreational facilities or include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment. Therefore, PAR 1162 is not considered to be significant for recreation.

Solid/Hazardous Waste

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. Rule 1162 required nonatomizing gel coat application techniques by July 1, 2005, which was expected to increase the transfer efficiency of the material being sprayed onto a given part while simultaneously decreasing the amount of overspray. A proposed a decrease in overspray was expected to reduce the amount of solid and hazardous waste from the disposable floor coverings, cured resin waste, and waste from personal protective equipment for workers. However the reduction was expected to be insignificant.

Switching from atomized spray equipment to nonatomizing gel coat application techniques was expected to cause a small increase in the amount of hazardous wastes depending on the application techniques used and the specific solvent(s) used to clean or flush the spray equipment. Rescinding the nonatomized gel coat application technology eliminates this increase in cleaning solvent (see Hazards and Hazardous Material above).

Therefore, there were no significant adverse solid and hazardous waste impacts associated with the existing Rule 1162. As a result, no net increase in the amount or character of solid or hazardous waste streams was expected to occur. Continuing existing operations is not expected to increase the volume of solid or hazardous wastes from polyester resin operations, require additional waste disposal capacity, or generate waste that does not meet applicable local, state, or federal regulations. Therefore, PAR 1162 is not considered to be significant for solid/hazardous waste.

Transportation/Traffic

PAR 1162 proposes to rescind the nonatomizing gel coat application technique requirement. Operators are expected to continue existing operations, since nonatomizing gel coat application techniques would not be required. Continuing existing operations is not expected to substantially increase the amount of businesses or equipment in the district, increase existing traffic load, worker commute trips, raw material or finished product transport trips, adversely affect parking, or conflict with adopted policies associated with alternative transportation. The level of service standard, traffic levels or existing emergency accesses is not expected to change because PAR 1162 would maintain the existing setting. Therefore, PAR 1162 is not considered to be significant for transportation/traffic.

CONSISTENCY

The Southern California Association of Governments (SCAG) and the SCAQMD have developed, with input from representatives of local government, the industry community,

public health agencies, the USEPA - Region IX and the California ARB, guidance on how to assess consistency within the existing general development planning process in the Basin. Pursuant to the development and adoption of its *Regional Comprehensive Plan Guide (RCPG)*, SCAG has developed an *Intergovernmental Review Procedures Handbook* (June 1, 1995). The SCAQMD also adopted criteria for assessing consistency with regional plans and the AQMP in its *CEQA Air Quality Handbook.* The following sections address analyzes consistency between PAR 1162 and relevant regional plans pursuant to the *SCAG Handbook* and *SCAQMD Handbook.*

Consistency with *Regional Comprehensive Plan and Guide (RCPG)* Policies

The *RCPG* provides the primary reference for SCAG's project review activity. The *RCPG* serves as a regional framework for decision making for the growth and change that is anticipated during the next 20 years and beyond. The Growth Management Chapter (GMC) of the *RCPG* contains population, housing, and jobs forecasts, which are adopted by SCAG's Regional Council and that reflect local plans and policies, shall be used by SCAG in all phases of implementation and review. It states that the overall goals for the region are to (1) re-invigorate the region's economy, (2) avoid social and economic inequities and the geographical isolation of communities, and (3) maintain the region's quality of life.

Consistency with Growth Management Chapter (GMC) to Improve the Regional Standard of Living

The Growth Management goals are to develop urban forms that enable individuals to spend less income on housing cost, that minimize public and private development costs, and that enable firms to be more competitive, strengthen the regional strategic goal to stimulate the regional economy. Proposed amended Rule 1162 in relation to the GMC would not interfere with the achievement of such goals, nor would it interfere with any powers exercised by local land use agencies. PAR 1162 will not interfere with efforts to minimize red tape and expedite the permitting process to maintain economic vitality and competitiveness. PAR 1162 would allow existing facilities to continue existing operations, thus, having no effect on public or private development cost or the regional economy.

Consistency with Growth Management Chapter (GMC) to Provide Social, Political and Cultural Equity

The Growth Management goals to develop urban forms that avoid economic and social polarization promotes the regional strategic goals of minimizing social and geographic disparities and of reaching equity among all segments of society. Consistent with the Growth Management goals, local jurisdictions, employers and service agencies should provide adequate training and retraining of workers, and prepare the labor force to meet the challenges of the regional economy. Growth Management goals also includes encouraging employment development in job-poor localities through support of labor force retraining programs and other economic development measures. Local jurisdictions and other service providers are responsible to develop sustainable communities and provide, equally to all members of society, accessible and effective services such as: public education, housing, health care, social services, recreational facilities, law enforcement, and fire protection. Implementing PAR 1162 is not expected to interfere with the goals of providing social, political and cultural equity. Further, PAR 1162 will allow gel coat operations to continue in the district, which will not require operation changes at any of the affected facilities.

Consistency with Growth Management Chapter (GMC) to Improve the Regional Quality of Life

The Growth Management goals also include attaining mobility and clean air goals and developing urban forms that enhance quality of life, accommodate a diversity of life styles, preserve open space and natural resources, are aesthetically pleasing, preserve the character of communities, and enhance the regional strategic goal of maintaining the regional quality of life. The *RCPG* encourages planned development in locations least likely to cause environmental impacts, as well as supports the protection of vital resources such as wetlands, groundwater recharge areas, woodlands, production lands, and land containing unique and endangered plants and animals. While encouraging the implementation of measures aimed at the preservation and protection of recorded and unrecorded cultural resources and archaeological sites, the plan discourages development in areas with steep slopes, high fire, flood and seismic hazards, unless complying with special design requirements. Finally, the plan encourages mitigation measures that reduce noise in certain locations, measures aimed at preservation of biological and ecological resources, measures that would reduce exposure to seismic hazards, minimize earthquake damage, and develop emergency response and recovery plans. PAR 1162 in relation to the GMC is not expected to interfere with attaining these goals. PAR 1162 would allow existing facilities to continue existing operations.

Consistency with *Regional Mobility Element (RMP)* and *Congestion Management Plan (CMP)*

PAR 1162 is consistent with the RMP and CMP since no significant adverse impact to transportation/circulation will result from the proposed project, which will allow existing operations to occur at existing facilities.

CHAPTER 5 - ALTERNATIVES

Introduction

Alternatives Rejected as Infeasible

Description of Alternatives

Comparison of Alternatives

Conclusion

INTRODUCTION

This *Draft SEA* provides a discussion of alternatives to the proposed project as required by state CEQA Guidelines. Alternatives include measures for attaining objectives of the proposed project and provide a means for evaluating the comparative merits of each alternative. A "No Project" alternative must also be evaluated. The range of alternatives must be sufficient to permit a reasoned choice, but need not include every conceivable project alternative. State *CEQA Guidelines §15126.6(c)* specifically notes that the range of alternatives required in a CEQA document is governed by a 'rule of reason' and only necessitates that the CEQA document set forth those alternatives necessary to permit a reasoned choice. The key issue is whether the selection and discussion of alternatives fosters informed decision making and meaningful public participation. A CEQA document need not consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative.

SCAQMD Rule 110 (the rule which implements the SCAQMD's certified regulatory program) does not impose any greater requirements for a discussion of project alternatives in an environmental assessment than is required for an EIR under CEQA.

SCAQMD's policy document Environmental Justice Program Enhancements for FY 2002-03, Enhancement II-1 recommends that all SCAQMD CEQA assessments include a feasible project alternative with the lowest air toxics emissions. In other words, for any major equipment or process type under the scope of the proposed project that creates a significant environmental impact, at least one alternative, where feasible, shall be considered from a "least harmful" perspective with regard to hazardous air emissions.

The Governing Board may choose to adopt any portion or all of any alternative presented below. The Governing Board is able to adopt any portion or all of any of the following alternatives because the impacts of each alternative are fully disclosed to the public and the public has the opportunity to comment on the alternatives and impacts generated by each alternative.

ALTERNATIVES REJECTED AS INFEASIBLE

A CEQA document should identify any alternatives that were considered by the lead agency, but were rejected as infeasible during the scoping process and explain the reasons underlying the lead agency's determination (*CEQA Guidelines §15126.6(c)*. These alternatives and the rationale for rejecting them as infeasible are discussed in the following bullet points.

- A possible lowest toxic alternative under consideration is an alternative requiring replacing styrene and MMA monomers with non-VOC and non-toxic polymer could offset or exceed the emissions reductions foregone by PAR 1162. Vinyl toluene is a possible replacement for styrene and MMA monomers; however, testing has not been completed. Thus, the lowest toxics alternative is dismissed as infeasible because significant commercial use of vinyl toluene is not expected by July 1, 2005.
- An alternative requiring the use of vapor suppressants to reduce VOC and toxic emissions. A vapor suppressants alternative was rejected as infeasible because vapor suppressants are typically waxes, which form a layer on the surface of the polymer and

minimize the outward diffusion of monomers into the atmosphere. Vapor suppression reduction which is used for resins in the bath and shower industry is not used for gel coats because it interferes with the surface desired by consumers.

- An alternative requiring fillers to be used with gel coats in lieu of requiring the applicant to use nonatomizing application techniques was also considered. Fillers are finely divided materials, which are added to resins to enhance the mechanical properties, extend the volume and lower the cost of plastic products. This alternative was rejected as infeasible because fillers are used with polyester resins not with gel coats because they interfere with the surface desired by consumers.

DESCRIPTION OF ALTERNATIVES

The following proposed alternatives were developed by modifying specific components of the proposed amendments. The rationale for selecting and modifying specific components of the proposed amendments to generate feasible alternatives for the analysis is based on CEQA's requirement to present "realistic" alternatives; that is, alternatives that can actually be implemented.

The following two alternatives were developed by identifying and modifying major components of PAR 1162. Specifically, the primary component of the proposed alternatives that has been modified is the final compliance date for implementing nonatomizing application techniques. The alternatives are described below and summarized in Table 5-1: Alternative A (No Project) and Alternative B (Two Year Delay in Compliance Dates). The following sections provide a brief description of each alternative.

Table 5-1
Project Alternatives

Component	PAR 1162 (Project)	Alternative A (No Project)	Alternative B (Two Year Delay in Compliance Date)
Nonatomized gel coat application techniques.	Rescind required.	No change. Requirement became effective July 1, 2005.	Postpone requirement until July 1, 2007.

Alternative A - No Project Alternative

Alternative A, the No Project Alternative, means no action would be taken and Rule 1162 would not be amended. Therefore, the existing SCAQMD Rule 1162 requirements for implementing nonatomizing application techniques would become effective July 1, 2005.

Alternative B - Two Year Delay in Compliance Dates

Alternative B would require the replacement of atomizing application techniques by nonatomizing application techniques by July 1, 2007. This alternative would allow the industry an additional two years to develop gel coat application techniques that could meet or exceed the emission reductions that were previously expected from nonatomizing gel coat application techniques.

COMPARISON OF ALTERNATIVES

The Environmental Checklist in the NOP for the 2003 FEA identified only air quality as an environmental area that could be significantly adversely affected by the proposed project.

Further evaluation of potential air quality impacts in Chapter 4 of this Draft SEA confirmed that significant adverse project-specific air quality impacts would occur as a result of implementing PAR 1162. Because of the narrow focus of the proposed project, no feasible mitigation measures were identified. Therefore, area of concern is air quality, and these impacts must be weighed against the public health benefits.

The following sections describe potential adverse air quality impacts that may be generated by each project alternative. The air quality discussion contains a brief description of the air quality impacts for each project alternative compared to impacts resulting from implementing the proposed amendments. A comparison of the air quality impacts for each of the environmental topics is summarized in Table 5-2.

Table 5-2
Comparison of Adverse Air Quality Impacts of the Alternatives

ENVIRONMENTAL TOPIC	PAR 1162	ALTERNATIVE A (No Project)	Alternative B (Two Year Delay in Compliance Date)
Criteria Pollutant (VOC)	Significant 853 pounds per day of VOC emission reductions foregone as of 07/01/05	Significant 853 pounds per day of VOC emission reductions foregone as of 07/01/05	Significant 853 pounds per day of VOC emission reductions (until January 1, 2007) Greater than PAR 1162
Toxic Air Contaminant (Styrene)	Significant Noncarcinogenic acute & chronic health effects from foregone styrene emissions	Significant Noncarcinogenic acute & chronic health effects from foregone styrene emissions	Significant Noncarcinogenic acute & chronic health effects from foregone styrene emissions (until January 1, 2007)

Alternative A - No Project Alternative

Theoretically, the effects of the No Project Alternative would be equivalent to the proposed project since the nonatomizing gel coat application techniques since the current emission limits are infeasible. Therefore, facilities would be required to implement techniques that would not generate any expected emission reductions. Since many of these techniques would require new equipment, facilities would be required to purchase and use equipment that would not generate benefits. .

Alternative B - Two Year Delay in Compliance Date

Alternative B would delay the date for complying with the required nonatomizing gel coat application technique requirement for two years. The expectation is that, during this delay, a nonatomizing gel coat application technique or alternative control would be found that could achieve or surpass the 853 pounds of VOC emission reductions previously expected. This alternative would result in a delay of 853 pounds of VOC emission reductions per day until July 1, 2007. Since risk estimates are based on annual (chronic) and hour (acute) effects the

same noncarcinogenic risk estimated for the proposed project would be the same as the proposed project for two years under Alternative B. Estimated emissions and noncarcinogenic chronic risk from the use of atomizing or nonatomizing application techniques can be found in Chapter 4 of this document.

CONCLUSION

The *CEQA Guidelines §15126.6(e)(2)* requires the environmentally superior alternative to be identified. Since the nonatomizing gel coat application technique emissions limit VOC/TAC was found to be infeasible, the project and all alternatives would generate the same emission reductions foregone until at least July 1, 2007. Alternative A is not considered appropriate, since it would require facilities to purchase, install and operate technologies without any environmental benefits. If a viable alternative is found before July 1, 2007, Alternative B would be the environmentally superior alternative. If no viable alternative is found, then the proposed project and all the alternatives would be equivalent. Since no feasible alternatives have been identified at this time, it is speculative to suggest that one would be identified, tested, implemented and used before July 1, 2007. Therefore, the proposed project is considered the best alternative, since it as the same emissions as both alternatives, does not burden gel coat operators with installing techniques without environmental benefit, and is not speculative.

However, while the proposed project provides the best alternative, the Governing Board may choose to adopt any of the alternatives in whole or in part in place of the proposed project, based on other considerations in addition to environmental concerns such as compliance costs, effects on future employment (jobs lost, for example), etc.

CHAPTER 6

OTHER CEQA TOPICS

Significant Irreversible Environmental Changes
Potential Growth-Inducing Impacts

SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

CEQA Guidelines §15126(c) requires an environmental analysis to consider "any significant irreversible environmental changes which would be involved if the proposed action should be implemented." The 2003 Final EA and associated Initial Study identified air quality as a potential impact area.

The environmental analysis for PAR 1162 has evaluated the use of atomizing gel coat application techniques and their replacement with nonatomizing gel coat application techniques. Since the nonatomizing gel coat applications did not demonstrate emission reduction (i.e., atomizing and nonatomizing gel coat applications generate the same VOC/TAC emissions), VOC/TAC emission would remain the same whether or not nonatomizing gel coat applications were used. Therefore, no significant irreversible environmental changes would occur. PAR 1162 would rescind the nonatomizing gel coat application technique requirement; no changes to gel coat materials or alteration of process are associated with the proposed rule. No compounds considered carcinogenic by state or federal agencies were identified with gel coatings in the *Final Staff Report for PAR 1162,* November 2001. As a result, no significant carcinogenic human health impacts are anticipated. Noncarcinogenic chronic and acute risks associated with the loss of emission reductions were found to be significant. However, in practice no change in risk will occur since existing operations at existing facilities would remain the same; therefore, no actual change in emission will occur. Since atomizing and nonatomizing gel coat application techniques generate the same environmental impacts; no actual environmental changes would occur by the implantation of PAR 1162; therefore, these environmental changes are not irreversible. As can be seen by the information presented in this *Draft SEA*, the proposed project would not result in irreversible environmental changes or irretrievable commitment of resources.

POTENTIAL GROWTH-INDUCING IMPACTS

CEQA Guidelines §15126(d) requires an environmental analysis to consider the "growth-inducing impact of the proposed action." The proposed amendments are not expected to foster economic or population growth or the construction of additional housing and primarily affect existing polyester resin facilities. The November 2001 Final EA and associated IS concluded that Rule 1162 would not affect in any way population growth in the district. No letters were received refuting this conclusion. Since PAR 1162 would in effect allow existing operations at existing facilities to continue; implementing PAR 1162 would not have any direct or indirect growth-inducing impacts on businesses in the SCAQMD's jurisdiction.

APPENDIX A

LIST OF ABBREVIATIONS AND ACRONYMS

Abbreviation/Acronym	Description
AAM	Annual Arithmetic Mean
AAQS	Ambient Air Quality Standard
AB	Assembly Bill
ACMA	American Composite Manufacturers Association
AGM	Annual Geometric Mean
AQMD	South Coast Air Quality Management District
AQMP	Air Quality Management Plan
ATCM	Airborne Toxic Control Measures
Avg	Average
Basin	South Coast Air Basin
Cal/OSHA	California Occupational Safety and Heath Administration
CalEPA	California Environmental Protection Agency
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CFA	Composites Fabricators Association
CFCs	Chlorofluorocarbons
CMP	*Congestion Management Plan*
CTS	Coatings and Solvents, Group 1 Control Measure
DBE	Dibasic Ester
DAA	Diacetone Alcohol
EA	Environmental Assessment
EPA	United States Environmental Protection Agency
ft	Foot
GMC	*Growth Management Chapter*
HAP	Hazardous Air Pollutant
HCFC	Hydrochlorofluorocarbons
HI	Hazard Index
hr	Hour
IS	Initial Study
lb	Pound
m	Meter
MDAB	Mojave Desert Air Basin
MEK	Methyl Ethyl Ketone
MET	Meteorological Correction Factors
mg/m^3	Milligram per Cubic Meter
MIBK	Methyl Isobutyl Ketone
MICR	Maximum Individual Cancer Risk
MMA	Methyl Methacrylate
MP	Multi Pathway
NAAQS	National Ambient Air Quality Standard
NESHAP	National Emission Standard for Hazardous Air Pollutants

LIST OF ABBREVIATIONS AND ACRONYMS (CONTINUED)

Abbreviation/Acronym	Description
NO	Nitric Oxide
NO2	Nitrogen Dioxide
NOC	Notice of Completion
NOE	Notice of Exemption
NOP	Notice of Preparation
NOx	Oxides of Nitrogen
NUT	n-Methyl Pyrolidone
OEHHA	Office of Environmental Health Hazard Assessment
OSHA	United States Occupational Safety and Heath Administration
PAR	Proposed Amended Rule
PM	Particulate Matter
PM2.5	Particulate of Less Than 2.5 Microns in Aerodynamic Diameter
PM10	Particulate of Less Than 10 Microns in Aerodynamic Diameter
PPM	Parts per Million
RCPG	Regional Comprehensive Plan Guide
REL	Reference Exposure Level
RMP	*Regional Mobility Element*
SB	Senate Bill
SCAG	Southern California Association of Governments
SEA	Supplemental Environmental Assessment
SIP	State Implementation Plan
SO2	Sulfur Dioxide
SOx	Oxides of Sulfur
SSAB	Salton Sea Air Basin
TAC	Toxic Air Contaminant
TBACT	Toxic Best Available Control Technology
TCA	Trichloroethane
TSP	Total Suspended Particulate
UEF	Unified Emission Factors
VOC	Volatile Organic Compound
X/Q	Dispersion Factor
$\mu g/m^3$	Micrograms per Cubic Meter

APPENDIX B

PROPOSED AMENDED RULE 1162

PROPOSED AMENDED RULE 1162

Version "PAR 1162 June 3, 2005" of the proposed amended rule was circulated with hard copies of this Draft Subsequent Environmental Assessment. An electronic version of "PAR 1162 June 3, 2005)" can be downloaded from the SCAQMD website at: http://www.aqmd.gov/ceqa/documents/2005/aqmd/draftEA/PAR1162.pdf

Hard copies of this Draft Subsequent Environmental Assessment, which include the version "PAR 1162 (June 3, 2005)" of the proposed amended rule, can be obtained through the SCAQMD Public Information Center at the Diamond Bar headquarters or by calling (909) 396-2039.

APPENDIX C

UNIFIED EMISSION FACTORS FOR OPEN MOLDING OF COMPOSITES

Unified Emission Factors for Open Molding of Composites[15]

July 23, 2001

Emission Rate in Pounds of Styrene Emitted per Ton of Resin or Gelcoat Processed

Styrene content in resin/gelcoat, % (1)	<33 (2)	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	>50 (2)
Manual	0.126 x %styrene x 2000	83	89	94	100	106	112	117	123	129	134	140	146	152	157	163	169	174	180	((0.286 x %styrene) - 0.0529) x 2000
Manual w/ Vapor Suppressed Resin VSR (3)	**Manual emission factor** [listed above] x (1 - (0.50 x specific VSR reduction factor for each resin/suppressant formulation))																			
Mechanical Atomized	0.169 x %styrene x 2000	111	126	140	154	168	183	197	211	225	240	254	268	283	297	311	325	340	354	((0.714 x %styrene) - 0.18) x 2000
Mechanical Atomized with VSR (3)	**Mechanical Atomized emission factor** [listed above] x (1 - (0.45 x specific VSR reduction factor for each resin/suppressant formulation))																			
Mechanical Atomized Controlled Spray (4)	0.130 x %styrene x 2000	86	97	108	119	130	141	152	163	174	185	196	207	218	229	240	251	262	273	0.77 x ((0.714 x %styrene) - 0.18) x 2000
Mechanical Controlled Spray with VSR	Mechanical Atomized Controlled Spray emission factor [listed above] x (1 - (0.45 x specific VSR reduction factor for each resin/suppressant formulation))																			
Mechanical Non-Atomized	0.107 x %styrene x 2000	71	74	77	80	83	86	89	93	96	99	102	105	108	111	115	118	121	124	((0.157 x %styrene) - 0.0165) x 2000
Mechanical Non-Atomized with VSR (3)	**Mechanical Non-Atomized emission factor** [listed above] x (1 - (0.45 x specific VSR reduction factor for each resin/suppressant formulation))																			
Filament application	0.184 x %styrene x 2000	122	127	133	138	144	149	155	160	166	171	177	182	188	193	199	204	210	215	((0.2746 x %styrene) - 0.0298) x 2000
Filament application with VSR (3)	0.120 x %styrene x 2000	79	83	86	90	93	97	100	104	108	111	115	118	122	125	129	133	136	140	0.65 x ((0.2746 x %styrene) - 0.0298) x 2000
Gelcoat Application	0.445 x %styrene x 2000	294	315	336	356	377	398	418	439	460	481	501	522	543	564	584	605	626	646	((1.03646 x %styrene) - 0.195) x 2000
Gelcoat Controlled Spray Application (4)	0.325 x %styrene x 2000	215	230	245	260	275	290	305	321	336	351	366	381	396	411	427	442	457	472	0.73 x ((1.03646 x %styrene) - 0.195) x 2000
Gelcoat Non-Atomized Application (8)	SEE Note 9 below	196	205	214	223	232	241	250	259	268	278	287	296	305	314	323	332	341	350	((0.4506 x %styrene) - 0.0505) x 2000
Covered-Cure after Roll-Out	**Non-VSR process emission factor** [listed above] x (0.80 for Manual <or> 0.85 for Mechanical)																			
Covered-Cure without Roll-Out	**Non-VSR process emission factor** [listed above] x (0.50 for Manual <or> 0.55 for Mechanical)																			

MMA content in gelcoat, % (6)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	³20
Gel coat application (7)	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	0.75 x %MMA x 2000

1 Including styrene monomer content as supplied, plus any extra styrene monomer added by the molder, but before addition of other additives such as powders, fillers, glass,...etc.

2 Formulas for materials with styrene content < 33% are based on the emission rate at 33% (constant emission factor expressed as percent of available styrene), and for styrene content > 50% on the emission rate based on the extrapolated factor equations; these are not based on test data but are believed to be conservative estimates. The value for "% styrene" in the formulas should be input as a fraction. For example, use the input value 0.30 for a resin with 30% styrene content by wt.

3 The VSR reduction factor is determined by testing each resin/suppressant formulation according to the procedures detailed in the ***CFA Vapor Suppressant Effectiveness Test.***

4 SEE the ***CFA Controlled Spray Handbook*** for a detailed description of the controlled spray procedures.

5 The effect of vapor suppressants on emissions from filament winding operations is based on the ***Dow Filament Winding Emissions Study.***

6 Including MMA monomer content as supplied, plus any extra MMA monomer added by the molder, but before addition of other additives such as powders, fillers, glass,...etc.

7 Based on gelcoat data from ***NMMA Emission Study.***

8 SEE the July 17, 2001 EECS report ***Emission Factors for Non-Atomized Application of Gel Coats used in the Open Molding of Composites*** for a detailed description of the non-atomized gelcoat testing.

9 Use the equation **((0.4506 x %styrene) - 0.0505) x 2000** for gelcoats with styrene contents between 19% and 32% by wt.; use the equation **0.185 x %styrene x 2000** for gelcoats with less than 19% styrene content by wt.

[15]Engineering Environmental Consulting Services, 2001

SACRAMENTO METROPOLITAN
AIR QUALITY MANAGEMENT DISTRICT

NEGATIVE DECLARATION
AND
INITIAL STUDY

2003 TRIENNIAL REPORT

PREPARED IN COMPLIANCE WITH
THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

JANUARY 2005

SACRAMENTO METROPOLITAN
AIR QUALITY
MANAGEMENT DISTRICT

Larry Greene
AIR POLLUTION CONTROL OFFICER

PROPOSED NEGATIVE DECLARATION

2003 TRIENNIAL REPORT

Pursuant to Division 6, Title 14, Chapter 3, Article 6, Sections 15070 through 15073 of the California Administrative Code, the Environmental Coordinator of the Sacramento Metropolitan Air Quality Management District, State of California, does prepare, make, declare, publish, and cause to be filed with the County Clerk of Sacramento County, State of California, this Negative Declaration of environmental impact for the project described as follows:

2003 Triennial Report. The 2003 Triennial Report includes the selection of air pollution control measures for study or adoption over the next three years. The rules would limit emissions from stationary sources including water heaters, boilers, steam generators, space heaters, internal combustion engines, natural gas fired water heaters, fugitive emissions from oil and gas production and processing facilities and organic liquid loading. The Report also proposes programs to provide incentives for mobile heavy duty vehicles/engines, CEQA mitigation for construction and land use development and a Spare The Air program to reduce vehicle trips. The rules would reduce emissions from degreasing and solvent cleaning operations, adhesives and sealants, solvents and unspecified coatings. In addition, control measures to limit emissions from automotive refinishing, concentrated animal feeding operations, food product manufacturing and processing, polyester resins, accelerated vehicle retirement, free gas caps and construction equipment will be studied. The negative declaration focuses on the potential secondary adverse environmental impacts of the measures that may be adopted. The initial study evaluated less than significant impacts on air quality, hazards/hazardous materials, water quality, noise and solid waste management.

The Sacramento Metropolitan Air Quality Management District has reviewed the proposed project and has determined that the project, as identified in the Initial Study, will not have a significant effect on the environment. Therefore, the preparation of an environmental impact report pursuant to the California Environmental Quality Act (Division 13 of the Public Resources Code of the State of California) is not required.

This Negative Declaration is being circulated for public review beginning February 2, 2005. Written comments on the Negative Declaration will be accepted until 5:00 p.m., March 4, 2005. Written public comments will be considered by the District Board of Directors prior to adoption of this negative declaration. Upon adoption of this Negative Declaration, the Sacramento Air Quality Management District intends to adopt the 2003 Triennial Report.

The following public workshop will be held on the project:

Date	Time	Place
2/23/2005	1:00 p.m.	SMAQMD Conference Room A 777 12th Street, 3rd Floor, Sacramento, CA

A copy of this document is available at the Sacramento Metropolitan Air Quality Management District, 777 12th Street, 3rd Floor, Sacramento, CA, 95814-1908, (916) 874-4800, and online at www.airquality.org.

Sacramento Metropolitan Air Management District

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SACRAMENTO METROPOLITAN
AIR QUALITY MANAGEMENT DISTRICT

2003 TRIENNIAL REPORT

INITIAL STUDY

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SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

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LARRY GREENE

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I. INTRODUCTION

This initial study evaluates the potential environmental impacts of the Sacramento Air Quality Management District's proposed 2003 Triennial Report, prepared pursuant to the California Clean Air Act.

A) California Clean Air Act Plans

The California Clean Air Act (CCAA) of 1988 requires each air district to adopt and implement plans to achieve and maintain the state ambient air quality standards by the earliest practicable date. Plans implementing the CCAA must achieve a 5% average annual emission reduction. However, if a 5% reduction is not achievable, the plan must include an expeditious schedule for adopting every feasible emission control measure. (Health & Safety Code, sec. 40914.) The CCAA also requires that, by the end of 1994 and once every three years thereafter, the air districts are to assess their progress toward attaining the state ambient air quality standards. These triennial assessments report the extent of air quality improvement over previous three years. The report must include the "expected and revised emission reductions for each measure scheduled for adoption in the preceding three–year period." (Health & Safety Code, sec. 40924.) During the plan review, each district must "review and revise the attainment plan to correct for deficiencies in meeting the interim measures of progress incorporated into the plan." (Health & Safety Code, sec. 40925.) "The main purpose of the assessments and plans is to identify rulemaking commitments for the next triennial cycle and document past progress in adopting control measures, reducing emissions, and improving air quality." (CARB, 2003 Triennial Assessment and Plan Revisions, p. 2.)

The Sacramento Metropolitan Air Quality Management District has prepared its 2003 Triennial Report to fulfill these requirements of the CCAA. The 2003 Triennial Report describes the historical trends in ambient air quality levels, provides updates to the emission inventories, and evaluates the implementation of stationary and mobile source control measure commitments made in the 2000 Triennial Report. In addition, ozone transport mitigation requirements for upwind districts are addressed. Finally, the report identifies new air pollution control measures the District will adopt or study further over the next three years.

B) Focus of CEQA Review

The California Environmental Quality Act (CEQA) requires that an agency identify and evaluate the potentially significant environmental impacts of its discretionary decisions. Whenever feasible, the agency is required to mitigate the significant environmental impacts of its decision.

The purpose of an initial study is to determine if a project may have a significant impact on the environment. If a fair argument can be made that a project may have a significant impact on the environment, then the lead agency must prepare an EIR. (CEQA Guidelines, Sec. 15064, subd. (f)(1).) However, if the project has no significant impacts,

or is modified to reduce impacts to a level of insignificance, then the lead agency may complete a negative declaration. (CEQA Guidelines, Sec. 15064, subd. (f)(2).)

By approving the 2003 Triennial Report, the District Board would add new air pollution control measures to the District's CCAA Plan. Although designed to improve air quality, these measures could have secondary impacts on the environment. This initial study will explore these possible secondary environmental impacts.

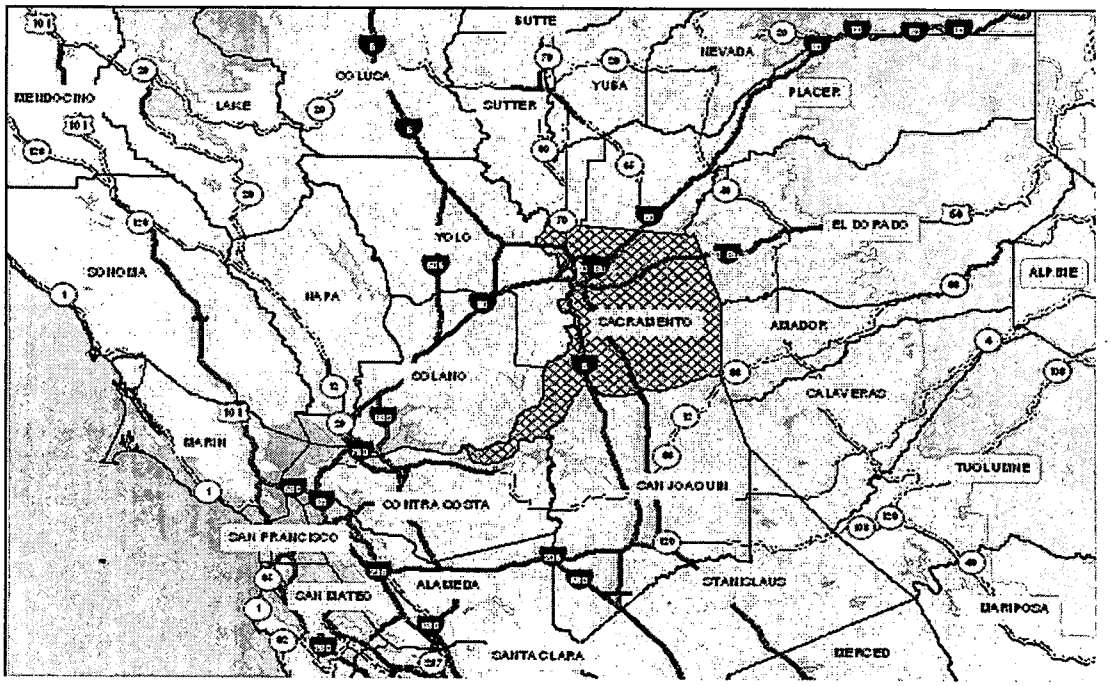
II. PROJECT DESCRIPTION

A) Project Location

The 2003 Triennial Report and its proposed air pollution control measures apply within the jurisdiction of the Sacramento Metropolitan Air Quality Management District. The District covers all of Sacramento County, California (Figure 1).

Sacramento County encompasses approximately 994 square miles in the middle of the 400-mile long Central Valley. Sacramento County is bounded by Contra Costa and San Joaquin Counties to the south, Amador and El Dorado Counties on the east, Placer and Sutter Counties to the north, and Yolo and Solano Counties on the west. Sacramento County extends from the low delta lands between the Sacramento and San Joaquin Rivers north, to about ten miles beyond the State Capitol in downtown Sacramento, and east, to the foothills of the Sierra Nevada Mountains.

FIGURE 1: LOCATION OF SACRAMENTO COUNTY



B) Project Objectives

The objective of the 2003 Triennial Report is to meet the California Clean Air Act's reporting and plan revision requirements.

To comply with the CCAA's reporting requirements, the 2003 Triennial Report describes the historical trends in ambient air quality levels, provides updates to the emission inventories, and evaluates the implementation of stationary and mobile source control measure commitments made in the 2000 Triennial Report.

To comply with the CCAA's plan revision requirements, the 2003 Triennial Report identifies mobile source, stationary source, area source, and indirect source rules for adoption, amendment or further study during the next triennial period (2004-2006). These control measure commitments are being proposed for incorporation into the District's attainment strategy as a triennial plan revision to satisfy the "all feasible measures" progress requirement.

C) Technical, Economic & Environmental Characteristics

1) Report Findings

Generally, the 2003 Triennial Report presents many favorable air quality findings:

"Air quality indicators show significant overall progress toward reducing exceedances of the ambient ozone standards and region-wide exposure to unhealthy concentrations since the late 1980's."

"Between 1990 and 2005, emission inventory trends in Sacramento County indicate reactive organic gas emissions and nitrogen oxide emissions are estimated to decline about 50% and 40%, respectively.

"Overall, the recent stationary source controls surpassed the District's 2000 Triennial ROG emission reduction commitments of 0.6-1.5 tons per day for 'all feasible measures' evaluations."

"NOx reductions from the District's mobile source program surpassed the expected 0.5 tons per day region-wide commitment from the 2000 Triennial Report." (2003 Triennial Report, pp. 1-1 to 1-4.)

2) Control Measures & Programs

If approved, the 2003 Triennial Report will commit the District to act on the control measures and programs in Table 1. For more general details regarding these measures, consult the 2003 Triennial Report, Appendix A.

Table 1
Summary of Proposed Triennial Commitments for 2004-2006
Sacramento Metropolitan AQMD Control Programs
"Committed – All Feasible Measures"

District Control Programs	Proposed Action and Schedule	Expected ROG Emission Reduction (TPD)	Expected NOx Emission Reduction (TPD)	Cost Effectiveness ($/ton)
Stationary Source Measures (Rule No.)				
Adhesives and Sealants (460)	To be amended 2006	0.06	-	$373
Degreasing Operations/ Solvent Cleaning (454/466)	To be amended 2006	0.37[a]	-	$0 - $4,200
Natural Gas Fired Water Heaters (414)	To be adopted 2005	-	0.08	$1,200 - $10,600
Unspecified Coatings (440)	To be adopted 2005	0.27	-	$800 - $14,400
Oil and Gas Fugitive Emissions (461)	To be adopted 2005	0.17	-	$9,957
Boilers, Steam Generators, and Process Heaters/Space Heaters (411)	To be amended 2005	-	0.09	$12,664 - $40,000
Organic Liquid Loading (447)	To be amended 2006	-	-	Low
Stationary IC Engines (412)	To be amended 2006	-	tbd	Tbd
District Mobile Source NOx Programs				
Vehicle and Engine Technology Market-Based Incentive Program - On-Road Heavy-Duty Vehicles - Off-Road Vehicles and Ag. Pumps	To be implemented 2004-2006	-	0.18 (On-Road) 0.4 (Off-Road)	$10-11,000 (On-Road) $3-4,000 (Off-Road)
Land Use and Transportation Control Measures				
CEQA Construction Mitigation Program	To be implemented 2004-2006	-	0.07	$13,600
CEQA Land Use Operational Mitigation Program	To be implemented 2004-2006	0.04	0.04	Unknown[b]
TCM Projects – Folsom Light Rail Extension[c]	To be implemented 2005	tbd	tbd	Tbd
Community Education Programs				
Spare The Air Program[d]	To be implemented 2004-2006	0.1-0.5	0.1-0.5	$10,000 - $50,000

tbd – to be determined

[a] Implementation and emission reductions are expected to occur in 2007.

[b] Cost effectiveness data not quantified. Actual cost effectiveness depends on the project-specific emission reduction measures selected by the developer.

[c] Emission reductions from Regional Transit light rail line extension to Folsom are yet to be determined.

[d] Emission reductions and cost effectiveness are dependent on the varying number of Spare The Air days and public response each year.

In addition, the District will give further study to several measures listed in Table 2. For more general details regarding these measures, consult the 2003 Triennial Report, Appendix A.

Table 2
Summary of Proposed Triennial Commitments for 2004-2006
Sacramento Metropolitan AQMD Control Programs
Further Study Measures and Model Ordinances

District Control Programs	Proposed Action and Schedule	Expected ROG Emission Reduction (TPD)	Expected NOx Emission Reduction (TPD)	Cost Effectiveness ($/ton)
Stationary Source Measures (Rule No.)				
Automotive Refinishing (459)	To be re-evaluated 2006	Further study	-	tbd
Concentrated Animal Feeding Operations (New)	To be evaluated 2006	Further study	-	tbd
Food Product Manufacturing and Processing (New)	To be evaluated 2006	Further study	-	tbd
Polyester Resins (465)	To be re-evaluated 2006	Further study	-	tbd
District Mobile Source NOx Programs				
Accelerated Vehicle Retirement	To be evaluated 2006	Further study	Further study	tbd
Free Gas Caps	To be evaluated 2006	Further study	-	tbd
Land Use and Transportation Control Measures				
Indirect Source Rule for Construction	To be evaluated 2004-2006	Further study	Further study	tbd
Indirect Source Rule for Land Use Operational Phase	To be evaluated 2005-2006	Further study	Further study	tbd
Community Education Programs				
Clean Air Consortium for Spare The Air	To be evaluated 2005-2006	Further study	Further study	tbd
Mobile Source Ordinances for Local Jurisdictions				
Model Low Emission Vehicle & Fleet Ordinance	Developed for local implementation 2004-2006	-	tbd	tbd
Model Low Emission Vehicle "Green" Contracting Ordinance	Developed for local implementation 2004-2006	-	tbd	tbd
Model Limitation on Engine Idling Ordinance	Developed for local implementation 2004-2006	-	tbd	tbd

tbd – to be determined

a) Some Control Measures are Not Subject to Detailed CEQA Review

Some control measures listed in Table 1 and Table 2 are not subject to detailed CEQA review at this time. These measures include ongoing programs, planning studies, and measures that do not involve discretionary decisions by the District. These measures are examined below, in subsections "b", "c", and "d". These measures receive no subsequent environmental impact analysis elsewhere in this initial study. Subsection "e" describes the control measures that are the focus of this environmental review.

b) No Significant Impacts from On-going Programs

The 2003 Triennial Report includes the District's commitment to continue existing programs. Prior to their inception, these programs were analyzed in CEQA documents. Environmental review of these existing programs is limited to project changes, circumstance changes, or new information that has come to light since the previous environmental impact report or negative declaration. If the new information or the changed circumstances shed new light on significant adverse impacts, alternatives, or mitigation measures, subsequent environmental review may be needed. (CEQA Guidelines, sec. 15162.) For most of the District's ongoing programs, no further environmental review is required.

For example, the Vehicle and Engine Technology Market-Based Incentive Program was originally evaluated the subject of environmental review in 1994. (SMAQMD, Negative Declaration: Sacramento Area Proposed Regional Ozone Attainment Plan, 1994.) This year, it is possible that the program may receive larger and more stable annual funding. If this funding is approved, more high-emission vehicles and engines will enter the solid waste stream annually. However, some parts from these engines and vehicles are reused, and the rest are recycled, so no significant solid waste impact is expected. (Mike Neuenberg, Personal Communication, 8/4/04.)

The CEQA Land Use Operational Mitigation Program was reviewed for environmental impacts in 1991. (SMAQMD, Environmental Impact Report on the Draft 1991 Air Quality Attainment Plan, SCH# 90021130.) No new information or changed circumstances suggest that this program will have an adverse environmental impact. (Ron Maertz, Personal Communication, 9/14/04.)

The community education program, that now includes Spare The Air, was also subject to environmental review in 1991. (SMAQMD, Environmental Impact Report on the Draft 1991 Air Quality Attainment Plan, SCH# 90021130.) Spare The Air is an outgrowth of those early educational programs. The mere alteration of educational programs is categorically exempt from CEQA review. (CEQA Guidelines, sec. 15322.) No new information or changed circumstances suggest that this program will have an adverse environmental impact. (Kerry Shearer, Personal Communication, 9/14/04.)

However, there is new information suggesting that the CEQA Construction Mitigation Program may have a significant adverse impact. As a result, this measure will be analyzed in more detail in this initial study. (See page 28.)

c) Planning Studies Not Requiring a Negative Declaration

A number of measures are merely under study (i.e. Automotive Refinishing, Concentrated Animal Feeding Operations, Food Product Manufacturing and Processing, Polyester Resins, Accelerated Vehicle Retirement, Free Gas Caps, Indirect Source Rule for Construction, Indirect Source Rule for Land Use Operational Phase, and Clean Air Consortium for Spare The Air). There are no potentially significant impacts associated with these investigations. There are no hazardous experiments. These studies merely involve gathering existing information, analyzing data, and preparing reports. Also, the inclusion of these study measures in the plan is for informational purposes only, and does not legally bind the District to adopt the measures in the future. Such preliminary feasibility and planning studies do not require analysis in a negative declaration. (CEQA Guidelines, secs. 15262 & 15306.) Also, attempting an environmental review at this time; when the proposed control measures, their exceptions, and the sources they affect are not yet refined, would require too much speculation. In general, the CEQA Guidelines discourage the analysis of impacts that are "too speculative for evaluation." (CEQA Guidelines, sec. 15145.) Should these studies lead to the development of definitive, feasible and cost effectiveness air pollution control measures, they will provide a subject suitable for environmental evaluation.

d) Measure Receiving no Discretionary Approval

The TCM project is the Regional Transit light rail line extension to Folsom. The District has no discretionary approval over this project. The District is neither a lead nor a responsible agency for this project. The District provides no financial assistance to this project. This project is included in the Triennial Report simply to accurately depict regional TCM efforts to reduce passenger vehicle trips. CEQA applies only to the discretionary actions of a government agency. (CEQA Guidelines, sec. 15002, subd. (i).) Since the District exercises no discretion over Regional Transit's light rail line extension to Folsom, no environmental review is of this measure is required at this time.

e) Measures Evaluated Further in the Initial Study

The proposed control measures described below are the focus of this environmental review.

1) Rule 460, Adhesives and Sealants.

Adhesives are used to bond one surface to another. Adhesives are used to bond rubber, plastic, metal, and fiberglass. Adhesives are used in the construction industry during the installation of carpeting, flooring, and roofing. Large amounts of adhesives are used in

manufacturing furniture and automobiles. Sealants are used heavily in the construction industry to fill, seal, waterproof, or weatherproof gaps or joints between two surfaces.

VOC emissions result from the use of organic solvent-based adhesives. This rule would reduce the VOC limit for adhesives and sealants. This would result in a reduction in emissions from solvent-based adhesives of 0.06 tons per day. The cost effectiveness analysis estimates that this rule costs $373 for every ton of VOC reduction. Since the rule is already being implemented in the South Coast AQMD, the industry already has adhesives and sealants that meet these limits.

Available reformulated products do not generally contain greater amounts of materials that could be hazardous to human health. One exception is the use of the toxin methylene chloride as a solvent. A toxic risk evaluation found that, to trigger the toxic risk threshold of one cancer case per million exposed, an individual would have to be exposed to approximately 1 gallon of methylene chloride per day. (Wilson, "Control Measure Number: D3", from Sacramento Region Clean Air Plan Update, 10/14/03.)

2) Rule 454/466 Degreasing Operations/Solvent Cleaning

Solvents are used by coating operations for cleaning application equipment such as brushes and spray guns. Degreasing is used by automotive maintenance and repair facilities, and a variety of other manufacturing and commercial sources.

The rule would lower the VOC limit to 25 grams per liter for materials used in general cleaning and degreasing operations. This would reduce ROG emissions from these operations by 0.37 tons per day.

Sacramento reduced the VOC limit for degreasing to 50 grams per liter in May of 2002. The environmental evaluation at that time concluded there were no significant impacts associated with reducing the VOC limit for degreasing operations. (SMAQMD, Initial Study: Amendment to Rule 454 and Adoption of Rule 466, April 2002, Board Packet pp. 100-112.) However, there is a potential for manufacturers to substitute exempt solvents (such as acetone and methylene chloride), that could increase people's exposure to toxic substances.

3) Rule 414 Natural Gas Fired Water Heaters

This rule would require new boilers and water heaters with the heat input range of 75,000 – 1,000,000 Btu/hr. to meet low NOx limits. These small commercial/industrial boilers generally burn natural gas, and are used by restaurants, retail stores, schools, hotels, and office buildings. The rule is expected to reduce NOx emissions by about 0.08 tons per day. (2003 Triennial Report, Appendix A, Rule 414 Natural Gas Fired Water Heaters.) No significant adverse environmental impacts are expected from this measure. (Friesen, "Control Measure Number: SN-111A," from Sacramento Region Clean Air Plan Update, 10/14/03.)

4) Rule 440 Unspecified Coatings

This category includes VOC emissions coatings that are not otherwise covered by specific coating rules. These sources include coatings of glass or plastics parts and products, wood and metal parts and products, aerospace coatings, and automotive refinishing.

Because of the diverse and currently unregulated nature of these sources, the emission reductions should be treated as rough estimates. These sources generally emit an average of about 4.2 pounds of VOC per gallon. The rule would limit average emissions to about 3.5 pounds of VOC per gallon. This would result in a reduction in emissions of about 0.27 tons per day of VOC. (2003 Triennial Report, Appendix A, Rule 440 Unspecified Coatings.)

To meet the lower VOC limits, manufacturers would most likely choose to reformulate their products using exempt solvents, or develop waterborne products. The analysis of this rule did not reveal any potentially significant environmental impacts. (Prasetyo Jo, "Control Measure Number: D9," from Sacramento Region Clean Air Plan Update, 10/14/03.)

5) Rule 461 Fugitive Emissions – Oil and Gas

The focus of this rule is to limit fugitive emissions from natural gas production facilities. Emissions come from well cellars, compressors, valves, and flanges. The primary means used to reduce emissions is to increase the frequency of inspections and repairs.

It is estimated that applying control measure would reduce ROG emissions from these sources by 0.17 tons per day. (2003 Triennial Report, Appendix A, Rule 461 Oil and Fugitive Gas Emission.) The consultant's analysis identified no potentially significant impacts associated with this control measures. (Friesen, "Control Measure Number: SN-58," from Sacramento Region Clean Air Plan Update, 10/14/03.)

6) Rule 411, Boilers, Steam Generators, and Process Heaters/Space Heaters

Boilers and steam generators provide steam and hot water for space heating, food processing, laundry, and for manufacturing processes. The purpose of the rule is to reduce NOx emissions from boilers and process heaters rated at 1 million btu/hour or greater. By adding new requirements for such units, the rule would reduce NOx emissions about 0.09 tons per day.

For some large boilers, it may be cost effective to use selective catalytic reduction (SCR) to reduce emissions. This technology uses ammonia. Adherence to the State and local safety regulations governing the transport and storage of ammonia should prevent any significant ammonia-related impacts. Use of (SCR) will result in a very small amount of extra ammonia emissions, relative to the very large NOx emission reduction. These ammonia emissions can be minimized by properly maintaining the emission control

equipment. Application of SCR technology ultimately requires the disposal or recycling of the hazardous material in the used catalyst.

7) Rule 447 Organic Liquid Loading

Terminals receive gasoline from a pipeline and store it in very large (300,000 gallon to 3 million gallon) aboveground tanks, then when needed, transfer the gasoline through a network of pipes to a loading rack to fill tanker trucks, which deliver the gasoline to local gas stations.

Bulk plants generally receive their gasoline from tanker trucks, unload into tanks through a loading rack, and store it in large (approximately 20,000 to 40,000 gallon) aboveground tanks. Then, when needed, the gasoline is transferred through a loading rack into tanker trucks for delivery to gas stations.

VOC emissions arise from a number of points, including the fittings on the fixed-roof or floating-roof tanks, fugitive emissions from the piping (valves and flanges), and from the loading rack (displaced vapor space from the tankers).

The proposed rule would lower the emission limitation to 0.5 lbs/mgal rather than 0.6 lbs/mgal. In addition, the rule would establish inspection requirements and repair time requirements. Since the practical application of the existing and the proposed rule is very similar, at this time, the District is unable to identify any emission reduction (and therefore cost effectiveness) associated with modifying its existing rule. (See 2003 Triennial Report, Appendix A, Rule 447 Organic Liquid Loading.)

8) Rule 412 Stationary IC Engines

Internal combustion engines provide primary or emergency power at a variety of stationary sources. Small standby engines may be less than 300 horsepower, while large engines providing a primary power source may be over 600 horsepower. Emergency engines commonly use diesel fuel, while primary power sources generally use natural gas.

The District is considering three control measure options to reduce NOx emissions from these engines. To comply with the more stringent emission limits, sources would most likely use selective catalytic reduction (SCR), or non-selective catalytic reduction. Selective Catalytic Reduction results in a negligible decrease in fuel efficiency. As discussed above, selective catalytic reduction results in a small increase in ammonia emissions. (See 2003 Triennial Report, Appendix A, Rule 412 Stationary I.C. Engines.)

9) Model Low Emission Vehicle & Fleet Ordinance

The District will encourage Sacramento County, and the incorporated cities within it, to adopt a model ordinance or policy that commits the jurisdiction to purchase low emission vehicles for its fleets. Preliminary analysis of this measure indicated that it may

adversely affect public transit, because it would increase the cost of local buses. (Fable, "Control Measure Number: OMNS-375," Sacramento Region Clean Air Plan Update, 10/14/03.) However, both Regional Transit and Yolobus already have purchased compliant low emission vehicles without problems. In addition, as Elk Grove prepares its plans to develop its own transit service, the city is planning to purchase low emission gasoline/hybrid vehicles. Furthermore, the City of Sacramento has already adopted the model ordinance. (Neuenburg, Personal Communication, 8/4/04.) Thus, the ordinance is not expected to adversely affect local bus service.

10) Model Low Emission Vehicle "Green" Contracting Ordinance

The District will encourage Sacramento County, and the incorporated cities within it, to adopt a model ordinance or policy that gives bidding preference on government projects to companies that operate clean vehicle and equipment fleets, and that encourage employees to use mass transit.

11) Model Limitation on Engine Idling Ordinance

The District will encourage Sacramento County, and the incorporated cities within it, to adopt a model ordinance to restrict the idling of all heavy duty off-road vehicles and equipment to no more than 5 minutes in a given location. Engine idling is a significant NOx source, and is unnecessary in most cases. In many cases, the end user will save money as a result of the ordinance, due to lower fuel and maintenance costs.

Preliminary analysis indicated that the automatic start/stop mechanisms that might be used in some trucks to comply with such a limitation might result in adverse noise impacts. (Schubert, "Control Number: ONMS-45," Sacramento Region Clean Air Plan Update, 10/14/03.) The impact analysis that follows concludes that the adverse noise impact is less than significant.

12) CEQA Construction Mitigation Program

The District currently reviews construction projects within the District that are subject to CEQA review. The District proposes air quality mitigation measures for construction projects that would otherwise result in a significant air quality impacts. Generally, this program has a beneficial impact on the environment, by reducing NOx, ROG, and particulate emissions. However, since the prior environmental review for this program, it has been learned that one of the proposed NOx emission mitigation measures (the Use of PuriNOx fuel) may have adverse ROG impacts.

D) Use of the Initial Study

This initial study will be used by the Board of the Sacramento Metropolitan Air Quality Management District in approving the 2003 Triennial Report. The initial study may also be used by the State Air Resources Board in approving the 2003 Triennial Report. This initial study may be used as a reference by other air districts, as they prepare their 2003

triennial reports. This report may be used when air districts adopt the rules that implement their plans.

III. ENVIRONMENTAL SETTING

CEQA requires that an initial study identify the project area's environmental setting. (CEQA Guidelines, sec. 15063, subd. (d)(2).) Appendix G of the CEQA Guidelines also suggests that an initial study should include a discussion of the project's environmental setting. The environmental setting section provides a description of the physical environmental conditions in the vicinity of the project. Special emphasis is placed upon the investigation and discussion of resources affected by the project. The project is compared to adopted plans to determine if there are inconsistencies. The purposes of an environmental setting section are to identify baseline conditions for evaluating the significance of impacts, and to identify conflicts between the proposed project and existing plans. The section should provide a basis for understanding the significant effects of the proposed project. (CEQA Guidelines, sec. 15125.)

A) Physical Conditions

Sacramento County is located at the southern end of the Sacramento Valley, which is bounded by the Coast and Diablo ranges on the west and the Sierra Nevada on the east. The county is 55 miles northeast of the Carquinez Strait, a sea-level gap between the Coast Range and the Diablo Range; the intervening terrain is flat.

The prevailing wind is from the south, primarily because of marine breezes through the Carquinez Strait, although during winter, the sea breezes diminish and winds from the north occur more frequently.

Between late spring and early fall, a layer of warm air often overlays a layer of cool air from the Delta and San Francisco Bay, resulting in an inversion. Typical winter inversions are formed when the sun heats the upper layers of air, trapping below them air that has been cooled by contact with the colder surface of the earth during the night. Although each inversion type predominates at certain times of the year, both types can occur at any time of the year. Local topography produces many variations that can affect the inversion base and thus influence local air quality. (SMAQMD, Proposed Amendments: Rule 442 – Architectural Coatings DEIR, (SCH No: 2001012006), 2001, p. III-1.)

Aesthetics

Sacramento County includes vistas of the surrounding Sierra Nevada Mountains to the east, the Coast Range to the west, and Mount Diablo to the southwest. These vistas can be obscured by visible emissions. Also, visibility reducing particles are transported from the valley to the Tahoe Basin. (Elliot-Fisk, et al., "Lake Tahoe Case Study," SNEP: Final Report to Congress, 1996, Addendum, Chapter 7, p. 226-227.)

Agriculture

The agricultural lands in Sacramento County are dominated by crop lands in the valley and rangelands in the foothills. Sacramento County produces a wide variety of crops including hay, melons, fruits and vegetables, beans and peas, flowers and seeds. The value of these crops exceeds 200 million dollars per year. (Sacramento County 2002 Crop and Livestock Report.) Crop yields can decline as a result of long-term exposure to elevated concentrations of ground-level ozone. Ozone sensitive crops include four of the most valuable crops grown in Sacramento County: grapes, corn, alfalfa hay, and rice. (Thompson, Crop Loss From Air Pollutants Assessment Programs, 1986.)

Air Quality

Sacramento County's air quality exceeds the California ambient standard for ozone. (2003 Triennial Report, p. 4-1.)

In the lower atmosphere, ozone is the main component of photochemical smog. Ozone is not directly emitted into the air, but is generated through photochemical reactions between nitrogen oxides (NOx) and reactive organic gases (ROG). Mobile sources (vehicles) represent the primary source of these ozone precursors in Sacramento County. Some ozone is transported to the Sacramento region from other regions to the south and to the west. Ozone generally remains in the atmosphere for one or two days. It can be eliminated through chemical reactions with plants, through absorption by water droplets in clouds, or by attaching to rain droplets. (SMAQMD, DEIR Proposed Amendments: Rule 442 – Architectural Coatings. (SCH No: 2001012006), 2001, p. III-2.) Exposure to ozone levels above the State standard can cause inflammation and irritation of the respiratory tract, coughing, chest tightness, shortness of breath, worsening asthma symptoms, and exacerbation of respiratory and cardiovascular diseases. (CARB, Recent Research Findings: Health Effects of Particulate Matter and Ozone Air Pollution, January 2004 , pp. 1,2, 5.)

The State 1-hr. standard for ozone is .09 parts per million (ppm). In 2003, the District exceeded State 1-hour standard on 40 days. (2003 Triennial Report, p. 4-1.) The Expected Peak Day Concentration (EPDC) for ozone is calculated for specific monitoring sites. For example, for the 2000-2002 period, the EPDC for Folsom was 0.135 ppm., for Del Paso Manor was 0.128 ppm., for North Highlands was 0.118 ppm., and for T Street was 0.109 ppm. Another measure, the population-weighted exposure indicator, identifies the annual exposure per person to ozone concentrations above the State standard. Both the EPDC and the population-weighted exposure indicator reflect a downward trend in ambient ozone concentrations, and in personal exposure to ozone levels above the state standard. (2003 Triennial Report, pp. 4-1 to 4-6.)

Biological Resources

Sacramento County hosts an array of habitat types. These include annual grasslands and croplands, valley-foothill riparian habitat, valley-foothill woodlands, freshwater emergent wetlands, and riverine habitat. These habitats support a variety of protected special status

plant and animal species, as well as game animals. (See Sacramento County General Plan Update Environmental Impact Report, Volume I, 1992, Chapter 4, pp. 4.4-1 – 4.4-13.)

To the east of Sacramento, the middle elevation landscape is dominated by the conifer forests of the Sierra Nevada. Studies show that long-term exposure to ozone concentrations above 60 parts per billion can cause foliar damage to conifers. (Arbaugh, et al., Ambient Ozone Patterns and Ozone Injury Risk to Ponderosa and Jeffrey Pines in the Sierra Nevada, 2002.) This forested region is among the downwind areas to which ozone is transported from Sacramento County. (2003 Triennial Report, pp. 3-1 to 3-3.)

Hydrology & Water Quality

Surface water resources in Sacramento County include the Sacramento, American, Cosumnes and Mokelumne Rivers, all of which flow to the Sacramento-San Joaquin Delta. The County includes the southern portion of Folsom Lake, as well as Stone Lake, and Beach Lake. Sacramento County also relies on groundwater for a significant portion of its water supply. A network of dams, levees, and bypasses provides flood control for much of the urbanized areas of the County.

Beyond the crest of the Sierra Nevada, lie the uniquely clear waters of Lake Tahoe. Studies indicate that the lake's water clarity is diminishing, due to the presence of higher concentrations of algae in the water. The algae are nourished by nitrogen compounds in the lake water. (Elliot-Fisk, et al., "Lake Tahoe Case Study," SNEP: Final Report to Congress, 1996, Addendum, Chapter 7, p. 227.) One source of these nitrogen compounds is emissions from the Sacramento area that are transported over the mountain crest, and deposited into the lake. (Carroll, et al., Keeping Lake Tahoe Blue through Atmospheric Assessment: Aircraft & Boat Measurements of Air Quality & Meteorology near and on Lake Tahoe, 2004, pp. 17-18, 20-21.)

Land Use

A broad spectrum of land uses characterizes the developed lands in Sacramento County. Sacramento County has high-rise office buildings and high density housing in downtown Sacramento, surrounded by sprawling suburban development to the north, south and east. Land use patterns have an impact on motor vehicle use. Land uses that generate many vehicle trips are considered indirect sources of air pollution.

Population and Housing

The population of Sacramento County continues to grow. From 1990 – 2000, the County's population grew from approximately 1,047,000 to 1,213,000. (CARB, e-mail from Larry Hunsaker, 7/9/04.)

Public Services

Residents of Sacramento are provided with a number of public services, including fire protection, police protection, schools and libraries. The rules under consideration could affect these services. Government buildings throughout Sacramento County use large

water heaters and small boilers. Thus, if a rule required more expensive replacement units, there might be a fiscal impact, though not an environmental impact. Similarly, if lower volatile organic compound (VOC) limits on solvents resulted in the use of more flammable substitute solvents, fire protection services could be in greater demand.

Recreation

Sacramento affords visitors and residents a number of outdoor recreational opportunities. Some choose to hike or bike along regional trails; others will swim, or fish, or boat in the rivers; while other will run or play ball at neighborhood parks and golf courses. These outdoor activities can be limited on spring and summer days when ozone exceedances make outside recreation unpleasant and/or hazardous to human health.

Transportation

Sacramento County has a well-established and comprehensive transportation system. The infrastructure is dominated by highways and freeways. The City of Sacramento is the hub where Highway 50, Highway 99, Interstate 5, Interstate 80 crisscross. Rail transit in the area includes Amtrak and Sacramento Regional Transit's Light Rail. In addition, to Sacramento Regional Transit's intra-county bus service, there are many public and private bus services that provide inter-county transportation. From 1990-2000, vehicle miles traveled in Sacramento County grew from 24,774,000 per day to 27,090,000 per day. (CARB, http://www.arb.ca.gov/app/emsinv/trends/ems_trends.php, 4/7/04.) On-road mobile sources have been, are, and are projected to remain the largest source of NOx emissions in Sacramento County. (2003 Triennial Report, Table 5-2.)

Utilities and Service Systems

The State of California has experienced electricity supply shortages in recent years. The adequacy of future electricity supplies in the State of California is a matter of great concern. A potential control measure that increases the peak period demand for electricity may contribute to brown outs and black outs that adversely affect the human environment.

B) Comparison to Adopted Plans

The 2003 Triennial Report includes measures to reduce air pollution in Sacramento County. In this respect, it is consistent with the State Implementation Plan. (SMAQMD, et al., Sacramento Regional Ozone Attainment Plan, 1994.)

As listed in Table 1 of this initial study, the 2003 Triennial Report includes control measures to reduce emissions from stationary, mobile, and indirect sources of air pollution. The measures encourage the use of low-emission vehicles and other transportation alternatives. The measures promote public education on air quality issues, and the mitigation of air quality impacts from new developments. These air pollution control measures in the 2003 Triennial Report are consistent with the goals and policies found in the Sacramento County General Plan, and with the general plans of cities in the District:

- The City of Rancho Cordova's Vision Book and Interim General Plan calls for improving air quality, expanding the use of alternative transportation, and for using low-emission vehicles in the City's fleet. (Rancho Cordova Vision Book and Interim General Plan, p. 20.)

- The City of Elk Grove has 8 air quality policies and 18 air quality actions in its general plan. These provisions promote the use of transportation alternatives, encourage city vendors to use low-emission vehicles, require new developments to assess and mitigate their air quality impacts, and support public education on air quality issues. (Elk Grove General Plan, 2003, pp. 53-55.)

- The City of Citrus Heights has 7 air quality policies and 10 air quality actions in its general plan. These provisions support mitigating the air quality impacts of new development, require the City to incorporate low-emission vehicles into its fleet, encourage city vendors to use low emission vehicles, promote the use of alternative transportation, and support public education on air quality issues. (Citrus Heights General Plan, pp. 94 -96.)

- The Circulation Element of the Sacramento City General Plan includes numerous policies to improve air quality through supporting buses and light rail use, increasing vehicle occupancy, increasing the use of the pedestrian mode, improving bikeways, and encouraging mixed use development. (Sacramento City General Plan, pp. 5-7 to 5-14, 5-21 to 5-27.)

- The 1993 County of Sacramento General Plan includes a detailed air quality element that supports SMAQMD efforts to minimize emissions from point sources, mobile sources, and indirect sources. The element includes many policies to encourage the use of transportation alternatives, to promote public education on air quality issues, and to mitigate the air quality impacts of new development. (1993 County of Sacramento General Plan, Air Quality Element, pp. 11-19.)

In addition, the 2003 Triennial Report includes air pollution control measures that will reduce ozone transport to neighboring air districts. These control measures supplement the primary efforts of these districts to reduce their ozone levels.

Finally, the reduction of NOx pollutants that may be transported to the Tahoe Basin is consistent with plans to maintain water clarity at Lake Tahoe, and to improve visibility in the Tahoe Basin. (TRPA, Regional Plan for the Lake Tahoe Basin, 1986.) The ozone reduction is consistent with the United States Forest Service's plans to improve forest health in the Sierra Nevada. (USFS, Sierra Nevada Forest Plan Amendment, 2004.)

GENERAL INFORMATION

Name of Proponent:	Sacramento Metropolitan Air Quality Management District
Address of Proponent:	777 12th Street, 3rd Floor Sacramento, CA 95814
Lead Agency:	Sacramento Metropolitan Air Quality Management District
CEQA Contact Person:	Greg Tholen (916) 874-4834
Triennial Report Contact Person:	Bruce Katayama (916) 874-4844
Name of Project:	2003 Triennial Report

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The following environmental factors checked below would be potentially affected. An explanation relative to the determination of impacts can be found following the checklist for each area.

☐	Aesthetics	☐	Geology and Soils	☐	Population and Housing
☐	Agricultural Resources	☑	Hazards and Hazardous Materials	☐	Public Services
☑	Air Quality	☑	Hydrology and Water Quality	☐	Recreation
☐	Biological Resources	☐	Land Use and Planning	☑	Solid/Hazardous Waste
☐	Cultural Resources	☐	Mineral Resources	☐	Transportation/ Traffic
☐	Energy	☑	Noise	☐	Mandatory Findings

DETERMINATION

On the basis of this initial evaluation:

☑ I find that the proposed project could NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will NOT be significant effects in this case because revisions in the project have been made by or agreed to by the project proponent. A NEGATIVE DECLARATION will be prepared.

☐ I find that the project MAY have a significant effect(s) on the environment, and an ENVIRONMENTAL IMPACT REPORT will be prepared.

☐ I find that the proposed project MAY have a "potentially significant impact" on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Date: January 24, 2005 **Signature:**

ENVIRONMENTAL CHECKLIST AND DISCUSSION

I. AESTHETICS. Would the project:	Potentially Significant Impact	Less Than Significant Impact	No Impact
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☑
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☑
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☑
d) Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?	☐	☐	☑

No Impacts

The potential control measures under consideration are measures that affect stationary and area sources at school, office, construction, commercial or industrial sites. No aspects of the rules adversely affect scenic vistas, damage scenic resources, degrade the visual quality of the surroundings, or create light and glare problems. These land uses are located in appropriately zoned areas, which are normally removed from scenic vistas and scenic resources. Moreover, modifications to stationary sources would almost always occur within the confines of existing facilities. Most of the equipment would typically be located inside the buildings of the affected facilities where they will not be noticeable. Modifications to the formulations of adhesives, sealants, unspecified coatings and solvents will not alter the visual quality of scenic resources. Measures to reduce vehicle and equipment emissions, and to reduce the air quality impacts of construction activity, will not adversely impact scenic resources.

Scenic vistas can be adversely affected by high ambient concentrations of particulate matter. Historically, both the nitrates formed from NOx emissions, and the direct emission of particulates from motor vehicles, have been significant components of PM2.5 in Sacramento. (CARB, Characterization of Ambient PM10 and PM2.5 in California, 2001, pp. 31-32.) The control measures in the 2003 Triennial Report both reduce NOx

emissions, and encourage the use of alternative transportation. These measures should have beneficial effects on visibility in the area.

Conclusion

Based on the above considerations, significant adverse aesthetic impacts are not expected to occur and no further environmental analysis is required.

II. AGRICULTURE RESOURCES. Would the project:	Potentially Significant Impact	Less Than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☑
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☑
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☑

No Impacts

The potential control measures under review would not encourage the conversion of farmland to other non-agricultural uses or conflict with existing agricultural zoning. These potential control measures affect stationary and area sources at school, office, construction, commercial or industrial sites. They also reduce vehicle and equipment emissions, and reduce the air quality impacts of construction activity.

Rule 411 will reduce emissions from food and agricultural processing boilers and process heaters. Also, the Vehicle and Engine Technology Market-Based Incentive Program for Off-Road Vehicles and Ag. Pumps provides financial incentives for replacing agricultural water pumping engines with lower emission models. These measures should not result in the conversion of farmland to non-agricultural uses.

As mentioned earlier, the District is only studying the possibility of developing a Food Product Manufacturing and Processing rule, and a Concentrated Animal Feeding Operations rule. The mere studying of the concepts does not have any environmental impacts. As noted previously, there is insufficient information regarding the nature and extent of these rules to assess their impacts at this time.

Conclusion

Based on the above considerations, significant adverse impacts to agricultural uses are not expected to occur, and no further environmental analysis is required.

	Potentially Significant Impact	Less Than Significant Impact	No Impact
III. AIR QUALITY. Would the project:			
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☑
b) Violate any air quality standard or contribute to an existing or projected air quality violation?	☐	☐	☑
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	☐	☐	☑
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☑	
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☑
f) Diminish an existing air quality rule or future compliance requirement resulting in a significant increase in air pollutant(s)?	☐	☐	☑

The purpose of the 2003 Triennial Report is to move toward attainment of the State ambient air quality standards for ozone, through implementation of additional control measures. Updating the District's California Clean Air Act Plan will have the effect of reducing overall emissions from stationary, area, and mobile sources. In order to realize some of the potential reductions from stationary and off-road mobile sources, it may be

necessary for these sources to make modifications to their processes and equipment. While these modifications are designed to reduce ozone precursors, some control equipment and reformulated products may have the secondary effect of increasing other pollutants.

Similarly, it will be necessary for manufacturers to modify the formulations of their products. Changes in the manufacturing processes may also have the effect of increasing amounts of toxic air contaminants (TACs) if sources decide to comply with new or strengthened regulations by replacing high Reactive Organic Gas (ROG) materials with substitute materials that are lower in VOCs but contain higher amounts of TACs. TACs have been shown to increase the risk of cancer at certain concentrations.

Finally, one existing program, the CEQA Construction Mitigation Program, has had to address the issue of limiting excess ROG emissions from the alternative fuel PuriNOx. (See page 25.)

Less Than Significant Impacts

The control measures discussed within this category have been identified as resulting in less than significant impacts. Existing Air District regulations, authority or programs would help ensure this conclusion.

A) Reformulated Products

Three of the control measures (Rules 460, 454/456, and 440) would require the reformulation of products by replacing high-ROG materials with alternative chemicals or water-based formulations that may contain toxic compounds. As a result, material replacement or reformulation to reduce the use of high-ROG materials has the potential to result in health risks associated with exposure to both carcinogenic and non-carcinogenic toxic air contaminants. The potential impacts associated with toxic air contaminants will need to be evaluated for each control measure during the rulemaking process. In addition, most of the control measures are aimed at reducing emissions of VOCs and many toxic air contaminants are also VOCs. Therefore, reducing emissions of VOCs also tends to reduce emissions of toxic air contaminants as well. Therefore, no significant impacts on non-criteria or toxic air contaminant emissions are expected.

1) Rule 460, Adhesives and Sealants.

This rule would reduce the VOC limit for adhesives and sealants. This would result in a reduction in emissions from solvent-based adhesives of 0.06 tons per day. Available reformulated products do not generally contain greater amounts of materials that could be hazardous to human health. One exception may be the use of the toxin methylene chloride as a solvent. A toxic risk evaluation found that, to trigger the toxic risk threshold of one cancer case per million exposed, an individual would have to be exposed to approximately 1 gallon of methylene chloride per day. Methylene Chloride would only be one ingredient in reformulated adhesives and sealants. Under normal conditions,

one would not typically be exposed to 1 gallon of methylene chloride per day. (Wilson, "Control Measure Number: D3", from Sacramento Region Clean Air Plan Update, 10/14/03.)

2) Rule 454/466 Degreasing Operations/Solvent Cleaning

The rule would lower the VOC limit to 25 grams per liter for materials used in general cleaning and degreasing operations. Sacramento reduced the VOC limit for degreasing to 50 grams per liter in May of 2002. The environmental evaluation at that time concluded there were no significant impacts associated with reducing the VOC limit for degreasing operations. (SMAQMD, Initial Study: Amendment to Rule 454 and Adoption of Rule 466, April 2002, Board Packet pp. 100-112.) No circumstances have changed since that environmental evaluation to suggest a different conclusion at this time.

The rule change would have had an adverse impact, if the replacement solvents exposed individuals to more toxic air contaminants than the conventional solvents they replace. This issue was reviewed by the South Coast Air Quality Management District. It compared the toxicity of conventional solvents to that of likely replacement solvents, such as acetone, methyl acetate, and PCBTF. It found that the replacement solvents were no more toxic than the conventional solvents. It concluded that, "there is no substantive evidence that shows the use of those solvents identified as possible replacement solvents would result in significant adverse toxic air contaminant impacts." (SCAQMD, Final Environmental Assessment for: Proposed Amended Rule 1171 – Solvent Cleaning Operations, 10/28/2003, pp. 2-13 to 2-19.)

3) Rule 440 Unspecified Coatings

This category includes VOC emissions coatings that are not otherwise covered by specific coating rules. These sources include coatings of glass or plastics parts and products, wood and metal parts and products, aerospace coatings, and automotive refinishing. To meet the lower VOC limits, manufacturers would most likely choose to reformulate their products using exempt solvents, or to develop waterborne products. It is possible that manufacturers could comply with the rule by using more acetone. However, ARB indicates that the industry trend is to replace traditional solvents with new solvents that are both less toxic and less hazardous. The analysis of this rule did not reveal any potentially significant environmental impacts. (Prasetyo Jo, "Control Measure Number: D9," from Sacramento Region Clean Air Plan Update, 10/14/03.)

B) Stationary Source Controls:
Rule 411 Boilers, Steam Generators, and Process Heaters/Space Heaters & Rule 412 Stationary I.C. Engines

The purpose of these rules is to reduce NOx emissions from boilers, process heaters, and stationary internal combustion engines. Some sources may use selective catalytic reduction (SCR) to reduce emissions. This technology uses ammonia. Use of SCR will result in a very small amount of extra ammonia emissions, relative to the very large NOx

emission reduction. These ammonia emissions can be minimized by properly maintaining the emission control equipment. Furthermore, the use of SCR is only cost effective for larger boilers; those rated at 40 mmBtu/hr or greater. Currently, there are only approximately 14 boilers of that size in the District. (Mohamad, personal communication, 8/23/04.) Thus, both the potential application of SCR, and its potential impacts, are very limited, and less than significant.

C) Land Use Construction Mitigation

With regard to the existing program for land use construction mitigation, new information has come to light about a low NOx emission fuel, PuriNOx. To meet District mitigation targets for NOx emissions, contractors have used PuriNOx instead of conventional diesel fuel in heavy-duty construction equipment. The District also has funds to provide an economic incentive of up to $0.25 per gallon to promote the use of PuriNOx.

However, it has been learned that PuriNOx produces more ROG emissions than conventional diesel fuel. The District has determined that, if the increased ROG emissions exceeded a threshold level of 65 lbs. per day, the impact would be significant. District calculations show that usage of PuriNOx would have to exceed 3,400 gals./day in order to increase ROG emissions 65 lbs. per day. (Damkier, PuriNOx Numbers, 8/23/04.) Thus, the District now limits its use recommendations and its PuriNOx incentives to avoid triggering PuriNOx use in excess of 3,400 gallons per day.

No Impacts

It is anticipated that the odor impacts of lower-VOC products will be similar to the odor impacts from the products currently in use. (SCAQMD, Final Environmental Assessment for: Proposed Amended Rule 1171 – Solvent Cleaning Operations, 10/28/2003, p. 2-21.)

The remaining control measures under consideration (Rules 414 Natural Gas Fired Water Heaters, 461 Oil & Gas Fugitive Emissions, 447 Organic Liquid Loading, Model Low Emission Vehicle & Fleet Ordinance, Model Low Emission Vehicle "Green" Contracting Ordinance, and Model Limitation on Engine Idling Ordinance) are not expected to have any adverse impact, either directly or indirectly, on local or regional air quality, existing air quality plans, or create objectionable odors impacting a large number of people. The 2003 Triennial Report recommends new control measures, or improves and strengthens existing control measures. Consequently, no existing air quality rules will be weakened. This will help the Sacramento Region meet its air quality goals.

Conclusion

Based on the above considerations, significant adverse impacts to air quality are not expected to occur, and no further environmental analysis is required.

	Potentially Significant Impact	Less Than Significant Impact	No Impact
IV. BIOLOGICAL RESOURCES. Would the project:			
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☑
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☑
c) Have a substantial adverse effect on federally protected wetlands as defined by §404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☑
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☑
e) Conflicting with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☑
f) Conflict with the provisions of an adopted Habitat Conservation plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☑

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

PROPOSED AMENDMENTS TO REGULATION 8, RULE 3: ARCHITECTURAL COATINGS

FINAL

ENVIRONMENTAL IMPACT REPORT

State Clearinghouse # 2001092074

November 8, 2001

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1. INTRODUCTION

1.1 Background

Architectural coatings are coatings applied to stationary structures and their appurtenances at the site of installation, to portable buildings at the site of installation, to pavements or to curbs. Architectural coatings include house paints, stains, sealers, primers, industrial maintenance coatings, roof coatings, swimming pool coatings and traffic coatings. The use of architectural coatings in California results in substantial emissions of volatile organic compounds which contribute to the formation of ozone and particulate matter. These two pollutants pose the Bay Area's, and California's, most serious air quality problems.

Control of emissions from architectural coatings has historically been the responsibility of local air pollution control and air quality management districts. Widespread regulation of architectural coatings began in 1977, when the California Air Resources Board (CARB) adopted a Suggested Control Measure (SCM) for architectural coatings. Many districts adopted architectural coatings rules based on this SCM and on revisions to the SCM approved by CARB in 1985 and 1989. The Bay Area Air Quality Management District Board of Directors adopted Regulation 9: Architectural Coatings, on March 1, 1978, and later recodified it as Regulation 8: Organic Compounds, Rule 3. Rule 3 was subsequently amended the Rule in 1982, 1983, 1986, 1990, and 1998.

In September, 1998, the Environmental Protection Agency promulgated a national rule for architectural coatings, based on authority derived from Section 183 (e) of the Clean Air Act. The national rule does not preempt state or local authority, nor did the promulgation of the national rule provide emission reductions for the Bay Area. From 1998 through June of 2000, staff of CARB, in cooperation with the staff from air districts and based on a comprehensive coating survey, developed another SCM for architectural coatings. This SCM and the accompanying Program Environmental Impact Report was adopted and certified, respectively, by the California Air Resources Board on June 22, 2000. It is this SCM on which the District's proposed amendments are based.

In accordance with the California Environmental Quality Act (CEQA)[1], the CARB, as lead agency, prepared a Program Environmental Impact Report prior to approving the architectural coatings SCM. The CEQA Guidelines permit the use of a Program EIR when agencies are evaluating the issuance of "rules, regulations, plans, or other general criteria."[2] CARB anticipated that local air districts would rely upon the Program EIR when conducting their own environmental evaluation of amendments to district rules based on the SCM.[3]

The Program EIR developed by CARB staff included an analysis of environmental impacts that could potentially result from implementation of architectural coatings rules based on the SCM. CARB staff prepared and published a Notice of Preparation and Initial Study (NOP/IS) for the Program EIR and allowed a 30-day review and comment period, which ended July 22, 1999. The NOP/IS identified the potential for adverse impacts in the following areas: air quality, water, public services, transportation and circulation, solid and hazardous waste, and hazardous substances. CARB staff prepared a Draft Program EIR, which was distributed to responsible agencies and interested parties for a 45-day review and comment period. The comment period ended April 7, 2000. The Draft Program EIR contained a detailed discussion of the environmental impacts identified in the NOP/IS, mitigation measures for the potentially significant impacts, and alternatives to the adoption of the proposed SCM. CARB staff then prepared a final Program EIR, which was certified on June 22, 2000.

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[1] Pub. Resources Code, § 21000 et seq.
[2] 14 CCR § 15168, subs. (a)(3)
[3] ARB Final Program EIR, pp. I-2 to I-4.

The draft EIR and final EIR are tiered from the CARB-certified Program EIR. CEQA allows environmental impact reports be tiered whenever feasible. Tiering means that the use of information and analyses of matters contained in a broader EIR may be incorporated into an EIR for a specific project.[4] Accordingly, this draft Environmental Impact Report incorporates the CARB Program EIR by reference. Relevant sections of the CARB Program EIR are summarized as appropriate throughout this final EIR.

In addition, this final EIR looks at the CARB Program EIR and analyzes whether the proposed amendments to Rule 3 may cause significant effects on the environment as a result of unique or peculiar conditions of the Bay Area environment that may not have been examined in the CARB Program EIR.

Copies of the CARB Final Program EIR are available at:

Street Address:	California Air Resources Board CalEPA Headquarters Building 1001 I Street Sacramento, CA 95814	*or*	Bay Area AQMD 939 Ellis Street San Francisco, CA 94109

Internet Address: www.arb.ca.gov/arch/CEQA/FEIR.htm

A discussion of the technical, economic and legal rationale for the proposed rule amendments will be contained in the staff report developed for the amendments to Rule 3: Architectural Coatings.

1.2 Legal Authority

The California Clean Air Act (CCAA) establishes a comprehensive air pollution control program[5]. Under this program, the responsibility for controlling air pollution in California is shared by CARB and the local districts. The districts have the primary responsibility, subject to CARB oversight, to adopt control measures for nonvehicular sources of air pollution, including architectural coatings.[6]

CARB has the responsibility to adopt control measures for vehicular sources of air pollution,[7] . The CCAA also assigned numerous other duties to CARB. For example, CARB is charged with coordinating efforts to attain and maintain ambient air quality standards, and conducting research into the causes of and solution to air pollution[8]; providing technical assistance to the districts when appropriate;[9] coordinating, encouraging, and reviewing the districts' efforts to attain and maintain air quality standards[10]; and doing such acts as may be necessary for the proper execution of the powers and duties imposed upon the CARB by the CCAA and any other provision of law.[11] To fulfill these statutory mandates, the CARB often provides guidance and other assistance to the districts, including the development of model rules such as the SCM for Architectural Coatings.

The District is designated as a serious nonattainment area for the California ozone standard. The California Clean Air Act requires areas designated as serious nonattainment for ozone to

[4] 14 CCR, § 15152, subs. (a)
[5] California Health & Safety Code, § 39000 et seq.
[6] California Health & Safety Code, §§39002, 40000, 40001, and 40702
[7] California Health & Safety Code, §§39002 and 40000
[8] California Health & Safety Code, §39003
[9] California Health & Safety Code, §§39605, 40916
[10] California Health & Safety Code, §§39500, 41500
[11] California Health & Safety Code, §39600).

adopt control measures required in Sections 40913, 40914, and 40919 of the California Health and Safety Code (CHSC).

Section 40913 requires districts to develop a plan to achieve California's ambient air quality standard by the earliest practicable date. The District's 1991 Clean Air Plan for attaining the state ambient air quality standard for ozone includes proposed amendments to the architectural coatings rule. The proposed amendments to Rule 3 that constitute the scope of this project will meet this requirement.

Section 40914 requires each district plan to demonstrate that the plan includes "every feasible measure". Districts must adopt the most effective control measures to reduce VOC emissions from architectural coatings. A CARB letter dated December 8, 2000 identifies the SCM as a "feasible measure" that should be adopted by districts that are required to prepare California Clean Air Act triennial progress reports and plan revisions. The proposed amendments to Rule 3 will meet this requirement.

Section 40919 requires districts with serious nonattainment for ozone to adopt Best Available Retrofit Control Technology (BARCT) for all existing sources. BARCT means an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of sources (CHSC Section 40406). Staff have found that the SCM requirements meet the BARCT requirement and therefore the proposed rule will meet the requirements of CHSC Section 40919.

1.3 Purpose and Intended Use of the Draft and Final Environmental Impact Report

The draft Environmental Impact Report was intended to identify any significant effects that the proposed amendments to Rule 3: Architectural Coatings may have on the Bay Area environment. The draft EIR also identifies several alternatives to the proposed amendments and analyzes those alternatives.

The draft EIR was circulated and available for review by the public, interested parties, agencies and organizations for a forty-five day period, and the review process included a public workshop at which staff was available to receive comments on the draft EIR as well as on the proposed amendments to Rule 3. No comments were submitted at the workshop. The comment period closed on November 5, 2001 with only one comment submitted. This Final Environmental Impact Report, consisting of this draft EIR incorporating any changes, the sole comment letter and the responses to those comments will accompany the proposed amendments to Rule 3 when the Board of Directors of the Bay Area Air Quality Management District considers adoption of those amendments.

Reviewers were requested to focus on the adequacy of the environmental review in discussing possible impacts on the environment, ways in which potentially significant adverse effects might be minimized, and any alternatives to the proposed amendments to Rule 3 that might accomplish the same objectives. The sole comment was received on November 5, 2001, but was not characterized as commentary on the EIR, nor were most of the comments directed towards environmental impacts associated with the rule, but rather on technical feasibility of the suggested VOC limits in the proposed Rule 3 and costs associated with meeting those limits. Nevertheless, staff have responded to those comments which infer environmental impacts in this Final EIR. The comments regarding technical feasibility and economic impacts are responded to in the staff report accompanying the propopsed amendments. The Final EIR has been prepared by:

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4 EXECUTIVE SUMMARY

2.1 Introduction

Architectural coatings are coatings applied to stationary structures and their appurtenances. They include a wide variety of products for use on a wide variety of substrates. The use of architectural coatings in California results in substantial emissions of volatile organic compounds (VOC) which contribute to the formation of ozone, for which the District is classified as a nonattainment area. District Regulation 8, Rule 3 controls emissions from architectural coatings. The project for which this document is being prepared consists of proposed amendments to Rule 3 that will reduce the emissions from architectural coatings. The proposed amendments are derived from a Suggested Control Measure (SCM) for Architectural Coatings adopted by the California Air Resources Board on June 22, 2000. Along with the SCM, a Final Program Environmental Impact Report (EIR) was certified.

Legal authority to produce the SCM is derived from the California Clean Air Act. The California Environmental Quality Act requires projects that may have a significant impact on the environment to be analyzed so that decision making bodies can understand any environmental consequences of their actions. The authority and necessity for the proposed amendments are derived from the California Health and Safety Code and from the California Clean Air Act. Staff distributed the draft EIR for comments prior to producing this final EIR for consideration by the District Board along with proposed amendments to Rule 3.

2.2 Project Description

The project location is defined as the boundaries of the Bay Area Air Quality Management District. The project consists of amendments to the existing VOC limitations in Rule 3 which would reduce the allowable VOC contents of many types of architectural coatings, resulting in an emission reduction of 3.75 tons VOC per day. This is an integral part of the proposed 2001 San Francisco Bay Area Ozone Attainment Plan and of the stationary source control measures in the 2000 Bay Area Clean Air Plan and Triennial Assessment.

2.3 Environmental Settings, Impacts and Mitigation Measures

CEQA Guidelines §15126.2(a) require the following: "An EIR shall identify and focus on the significant environmental effects of the proposed project. Direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects."

The following subsections briefly summarize the analysis of environmental impacts that were identified as potentially resulting from implementation of the proposed rule amendments.

2.3.1 AIR QUALITY

The adoption and implementation of the proposed amendments into Rule 3 are expected to produce substantial VOC emission reductions. The analysis concludes that no significant adverse air quality impacts will result from the proposed rule amendments. Some companies in the architectural coatings industry have claimed that lowering the VOC content of coatings will result in increased VOC emissions for a variety of reasons, including an increase in coating thickness, an increase in thinning, an increase in topcoats used to do an adequate job, an increase in the amount of touch-up and recoating required to do an adequate job, an increased need for priming, an increase in the amount of substitution of low VOC coatings with higher VOC coatings, and greater reactivity of low-VOC coating solvents. The analysis reveals that, overall, the proposed rule amendments will achieve significant VOC emission reductions and the claimed adverse impacts will not occur. Also, staff analyzed the potential impacts of the proposed

exemption for methyl acetate and found that, although methyl acetate emissions would be expected to increase, there would not be any significant adverse impacts expected. The analysis also concludes that cumulative impacts are insignificant, and that no mitigation measures are necessary.

2.3.2 WATER

Impacts on water resources are divided into two categories - water demand and water quality. Increased water demand from the manufacturing and use of compliant water-borne coatings was evaluated. The analysis concluded that water demand impacts associated with the proposed rule amendments will be insignificant. The proposed rule amendments are also not expected to adversely impact water quality for several reasons. Due to the existing knowledge of and education programs for coating users, improper disposal is not currently and is not expected to be a problem. The use of toxic solvents that might impact water quality is expected to decline. Also, because many currently available coatings are already water-borne technology, the current impacts on publicly owned treatment works are not expected to significantly change. Finally, any increase in water demand cannot possibly impact the salinity of the Bay. The analysis also concludes that cumulative impacts are insignificant, and no mitigation measures are necessary.

2.3.3 PUBLIC SERVICES

Public service impacts were examined from the viewpoint of potential adverse impacts on public facility maintenance and on the need for increased fire protection. Infrastructure needs at public facilities are not expected to be impacted due to more frequent touchups or recoating to maintain any facility appearance, function or safety. Implementation of the proposed rule amendments is also not expected to result in the need for new or altered public facilities. The increased use of exempt solvents or other replacement solvents as a result of implementing the proposed rule amendments will not result in any significant increased need for fire protection. Although acetone, which is flammable, is expected to be used to reformulate a limited number of coatings it is unlikely that implementation of the proposed rule amendments will increase the need for fire protection, because the solvents that acetone would replace carry the same fire hazards. Finally, risks from accidents or spills was analyzed as a result of the proposed rule amendments and the risk was anticipated to stay the same or decrease. The analysis concludes that cumulative impacts are insignificant, and no mitigation measures are necessary.

2.3.4 TRANSPORTATION AND CIRCULATION

The potential for additional trips to supply newly compliant coating to retailers and distributors, additional trips to solid waste disposal sites to dispose of unusable coating, and additional trips to job sites to finish jobs made longer by inadequate coating were analyzed. Among the reasons cited for these trips were the possibility of shorter shelf or pot lives of coatings or lesser freeze-thaw capabilities, as well as the need for more topcoats. The analysis found that there was no expectation for additional trips and that no adverse impacts were anticipated. The analysis concludes that cumulative impacts are insignificant, and no mitigation measures are necessary.

2.3.5 SOLID AND HAZARDOUS WASTE

The solid and hazardous waste analysis examined increased disposal of compliant coatings due to the possibility of shorter shelf or pot lives or lesser freeze-thaw capabilities, and as, for the potential for additional trips, found that any impact could not be significant. In addition, as hazardous compounds are expected to decrease in the future, the analysis found no potential for additional hazardous waste impacts. The analysis concludes that cumulative impacts are insignificant, and no mitigation measures are necessary.

2.3.6 HAZARDS

Hazards impacts were analyzed for risk of accidental releases that would expose hazardous response workers or members of the public to an increase in exposure to a hazardous substance. It was found that, consistent with the public facilities impacts, no significant adverse impacts were anticipated. In addition, human health impacts were analyzed for short term and long term exposure to solvents used to replace conventional solvents. The analysis concluded that the general public would not be impacted from additional exposure to replacement solvents. Manufacturers are replacing toxic solvents with less toxic solvents in existing low VOC coating formulations. Furthermore, professional coatings applicators' long-term exposure to more toxic replacement solvents such as diisocyanates in industrial maintenance coatings is expected to be minimal due, in part, to existing required and recommended safety procedures. The analysis concludes that cumulative impacts to human health, including lifetime exposures, are insignificant, and no mitigation measures are necessary.

2.4 Other Required CEQA Topics

2.4.1 ENVIRONMENTAL IMPACTS FOUND NOT TO BE SIGNIFICANT

The CEQA Initial Study prepared by CARB staff for the SCM includes an environmental checklist of 15 environmental categories. For the remaining nine environmental areas not analyzed above, the Initial Study concluded that the project would have no significant direct or indirect adverse effects. In addition, no comments were received on these topics at the public meetings for development of the SCM that changed this conclusion. District staff also conclude that there is not possibility of significant impacts to the following environmental resources in the Bay Area resulting from proposed amendments to Rule 3: Land Use and Planning; Population and Housing; Geophysical; Biological Resources; Energy and Mineral Resources; Noise; Aesthetics; Cultural Resources; and Recreation.

2.4.2 IRREVERSIBLE ENVIRONMENTAL CHANGES

CEQA requires EIR's to address the potential for irreversible environmental changes. Consistent with CEQA, additional analysis of the proposed amendments confirms that it would not result in irreversible environmental changes or the irretrievable commitment of resources.

2.4.3 POTENTIAL GROWTH INDUCING IMPACTS

CEQA requires EIR's to address the potential for growth-inducing impacts. Consistent with CEQA, additional analysis of the proposed amendments confirms that it would not foster economic or population growth or the construction of new housing.

2.4.4 CONSISTENCY WITH OTHER PLANS

CEQA requires that an EIR address any inconsistency between the proposed project and applicable general plans and regional plans. Analysis of the proposed amendments to Rule 3 confirms that the project is consistent with the State Implementation Plan, the District's Clean Air Plan, and other regional plans, including the San Francisco Bay Plan, the Suisun Marsh Protection Plan, the Regional Airport System Plan, the San Francisco Bay Area Seaport Plan, regional housing allocation plans, habitat conservation plans, natural resource conservation plans, and smart growth plans.

2.4.5 PROJECT ALTERNATIVES

The alternatives analyzed include alternate measures for attaining the objectives of the proposed amendments to Rule 3. There were alternative methods of structuring a regulation that were analyzed that were rejected as infeasible because they did not meet the project objectives or they were deemed inconsistent with other rule elements, such as EPA policies. These included a rule

with performance based standards, seasonal regulation, regional regulation, exceedance fees for non-compliant coatings, an exemption based on tonnage excess emissions, a low vapor pressure exemption, and reactivity based standards.

Some alternatives were also analyzed that were deemed to be feasible. Those were: No Project, Extended Compliance Dates, Further VOC Reductions, Permanent Product Line Averaging and Different VOC Limits. Although an analysis of each of these alternatives revealed a varying degree of environmental impact with each alternative, staff concluded that the most desirable project alternative is the amendments to Rule 3, as proposed.

3. PROJECT DESCRIPTION

3.1 Project Location

This project location is coincident with the boundaries of the Bay Area Air Quality Management District. The District includes all of seven counties; Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, and Napa, and portions of two others; southwestern Solano and southern Sonoma.

The San Francisco Bay Area is an area of exceptional physical and cultural diversity. It covers 5,600 square miles or 3.6 million acres. It includes 98 cities and approximately 6.75 million people, living in approximately 2.5 million homes. The Pacific Ocean, San Francisco Bay, coastal mountain ranges and inland valleys are among the more prominent features that create a physical setting among the most distinct in the world.

The climate and physical features of the Bay Area in combination with emissions from natural and human activities can result in the buildup of pollutants in the atmosphere, causing periodic exceedances of air quality standards. The combination of the amount of emissions generated and the natural factors acting on those emissions to disperse the pollutants or allow them to accumulate and react is referred to as the atmospheric pollution potential. The sheltered inland valleys of the Bay Area with their tendency for light winds, atmospheric stability, abundant sunshine and high summer temperatures, have a high pollution potential. Coastal areas, which experience less atmospheric stability, less sunshine, higher winds and more moderated temperatures, have a lower pollution potential.

3.2 Background

The project consists of amendments to an existing rule. Regulation 8, Rule 3: Architectural Coatings imposes volatile organic compound (VOC) limits on paints and coatings applied to architectural structures. Coatings with VOC contents (a measure of the amount of organic solvent) above the limits may not be sold, distributed or used in the District. Architectural coatings are those coatings to be applied to stationary structures and their appurtenances at the site of installation, to portable buildings at the site of installation, to pavements and to curbs. The rule was originally adopted in 1978, and subsequently amended in 1982, 1983, 1986, 1990 and 1998[12]. Staff of the California Air Resources Board (CARB) , in conjunction with staff of California air districts and under the direction of the California Air Pollution Control Officers Association (CAPCOA), developed a suggested control measure (SCM) for architectural coatings in 1999 and 2000. Although control of stationary sources, including architectural coatings, is the jurisdiction of air pollution control districts, the CARB staff was able to devote sufficient resources to conduct and analyze a survey of architectural coatings sold in 1998 in California, which in turn became the basis for proposed VOC limits in the SCM. Because of the nature of distribution patterns of various companies, a greater resolution of sales data, such as on a district by district basis, is often not possible. In addition, the state had the resources to conduct a series of public workshops for manufacturers, distributors, sellers and users of coatings in a more efficient manner than would each district, if done separately. The SCM was approved by the CARB on June 22, 2000. The proposed amendments to District Rule 3 are derived from the SCM, as was expected from the statewide process.

In association with the development and adoption of the SCM, CARB staff, as lead agency under the California Environmental Quality Act, also prepared a Program Environmental Impact Report

[12] Of these amendments, in 1990 the District adopted amendments that were overturned by action of the San Francisco Superior Court, Dunn-Edwards Corp. v. Bay Area Air Quality Management District (1992) 9 Cal. App. 4th 644,650

(State Clearinghouse No. 99062093). The Program Environmental Impact Report was certified at the June 22, 2000 CARB hearing when the SCM was approved.

The California Environmental Quality Act (CEQA) allows a Program Environmental Impact Report to be prepared when a series of actions that can be characterized as one large project are related either as logical parts in the chain of contemplated actions, or in connection with issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program.[13] The SCM, as designed to be adopted into law in California districts, may be considered the large project that leads logically to actions at the district level. CARB anticipated that local air districts would use the Program Environmental Impact Report when conducting their own environmental assessments as part of adoption of the SCM.[14] The draft and final Environmental Impact Reports (EIR) are tiered from the CARB certified Program Environmental Impact Report. CEQA allows tiering when agencies prepare separate but related projects. Tiering is appropriate when the sequence of analysis is from an EIR prepared for a general program to an EIR for another program of lesser scope, such as a rule adopted based on, and not different from, an SCM.[15] Consequently, the CARB certified Program Environmental Impact Report is adopted by reference as part of this analysis, and this analysis will concentrate environmental impacts unique or peculiar to the Bay Area.

The Bay Area District is designated as a non-attainment area for the federal one hour ozone standard. Ozone, a criteria pollutant, is formed from a reaction of hydrocarbon and oxides of nitrogen in the presence of ultraviolet light. Ozone in the lower atmosphere is an air pollutant that is harmful to humans because it causes respiratory problems. Ozone also reduces crop yields, and accelerates deterioration of paints, finishes, rubber products, plastics and fabrics. The EPA has set primary national ambient air quality standards (NAAQS) for ozone and other air pollutants to define the levels considered safe for human health The District is designated as an unclassified non-attainment area, meaning that the District is not classified into one of the federal categories of moderate, serious or extreme pursuant to the 1990 Clean Air Act Amendments. EPA had redesignated the Bay Area to attainment status for the national 1-hour ozone standard on May 22, 1995. The agency did this because the Bay Area attained the ozone standard at the end of the 1992 ozone season (having had three "clean" years – 1990, 1991 and 1992), and had maintained the standard in 1993 and 1994. In the summers of 1995 and 1996, the Bay Area experienced a number of episodes of hot, stagnant weather. This led to exceedances of the standard. EPA received two petitions requesting redesignation of the Bay Area to nonattainment status (see 63 Fed. Reg. 37261). EPA determined that the "contingency measures" in the *Ozone Maintenance Plan*, approved by EPA in 1995 were not adequate to bring the region back into compliance with the standard and that the region's adopted and projected actions would not be sufficient to re-establish attainment of the standard.[16]

EPA published a final notice that revoked the region's ozone attainment status on July 10, 1998.[17] The co-lead agencies responsible for air quality planning in the Bay Area, the District, the Association of Bay Area Governments, and the Metropolitan Transportation Commission, prepared the *1999 Ozone Attainment Plan* to comply with these requirements. The 1999 Plan was submitted to EPA in August, 1999. The deadline EPA set for attaining the 1-hour national ozone standard was November 15, 2000. The region continued to experience exceedances of the 1-hour ozone standard in 1999 and 2000. Emission reductions from control measures in the *1999 Ozone Attainment Plan* did not prove to be sufficient to bring the Bay Area back into compliance. On March 30, 2001, EPA proposed to make a formal finding that the Bay Area has not attained the national 1-hour ozone standard. The notice also proposed partial approval and

[13] 14 California Code of Regulations, §15168
[14] Final Program Environmental Impact Report; CARB; June, 2000; I-4
[15] 14 California Code of Regulations, §15152
[16] San Francisco Bay Area Ozone Attainment Plan, June 2001, BAAQMD
[17] 63 FR 37258

partial disapproval of the 1999 Plan[18]. The notice set new planning requirements for the District and co-lead agencies. On October 17, 2001, the Board of Directors of the District approved the San Francisco Bay Area Ozone Attainment Plan for the 1-Hour National Ozone Standard. The Plan, submitted to the CARB as an amendment to the California State Implementation Plan, and approved on November 1, contains new transportation, mobile source and stationary source control measures. Among the stationary source control measures is a commitment to adopt amendments to District Regulation 8, Rule 3: Architectural Coatings, based on the provisions of the SCM.

The Bay Area District is also designated as a non-attainment area for the state one hour ozone standard. The CARB set the ozone standard at a level of 9 parts per hundred million (pphm) for a one-hour average, significantly more stringent than the national standard of 12 pphm. Under the requirements of the California Clean Air Act of 1988, areas not complying with the standard must prepare plans to reduce ozone. Plans were required in 1991 and each three years thereafter. The most recent District Clean Air Plan to meet this requirement was prepared in 2000 and adopted by the District Board of Directors on December 20, 2000.[19] In the 2000 Plan, and in fact, in every triennial Clean Air Plan, a control measure has been listed to reduce emissions of VOC by amendments to Regulation 8, Rule 3 that would lower allowable VOC limits for architectural coatings. Initially, as the 1991 Clean Air Plan was adopted, the District was still subject to the lawsuit that eventually overturned the 1990 amendments to Rule 3. Subsequently, District staff, along with staff of CARB and representatives of industry, other state agencies, environmental groups and EPA, participated in a national regulatory negotiation for architectural and industrial maintenance coatings[20]. EPA chose to regulate architectural coatings under Section 183(e) of the Clean Air Act. This effort lasted nearly two years, until 1994, but concluded without consensus on a regulation. EPA then promulgated a national rule for architectural coatings on August 14, 1998.[21] Generally, it is believed that California districts would not see emission reductions from the national rule, as the majority of VOC limits set were higher than, or, at best, equal to, VOC limits in effect in the District, and in many areas of California, since the late 1980's. The significant exception was for traffic coatings. However, Caltrans, the largest user of traffic coatings, already used coatings that were in compliance with the national VOC standard, except in the extreme northwest area of California. It was estimated in the SCM that the national rule would only reduce VOC emissions from traffic coatings by 0.36 tons/day statewide.[22]

3.3 Purpose and Objectives of the Project

The purpose of this project is to reduce ozone forming emissions of volatile organic compounds from architectural coatings by setting maximum allowable VOC contents for various categories of architectural coatings sold and used in the Bay Area. The objective of this project is to reduce emissions of VOC by 3.75 tons/day from an architectural coatings emissions inventory of about 24.7 tons/day. According to the proposed 2001 Ozone Attainment Plan, these emissions reductions are necessary to meet and maintain the federal ambient air quality standards for ozone.[23] They are also necessary to make progress toward the California state ozone standard of 0.08 ppm.

3.4 Description of the Proposed Amendments to Regulation 8, Rule 3

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[18] 66 FR 17379
[19] Bay Area 2000 Clean Air Plan and Triennial Assessment, December 2000, BAAQMD
[20] 57 FR 1443
[21] 63 FR 48877
[22] Staff Report for the Proposed Suggested Control Measure for Architectural Coatings, CARB, June 2000, p. 218.
[23] SF Bay Area 2001 Ozone Plan, op. cit.

The proposed project is to revise BAAQMD Regulation 8, Rule 3: Architectural Coatings, to incorporate, with minor modifications, the VOC maximum allowable limits and other requirements contained in the state SCM for Architectural Coatings approved by the California Air Resources Board on June 22, 2000. The SCM sets allowable VOC content limits based on existing and currently developing coating technologies for a number of architectural coating categories, including flats, nonflats, industrial maintenance, lacquers, floor, roof, rust preventative, stains, and primers, sealers, and undercoaters.

The amended Rule 3 would apply to any person who supplies, sells, offers for sale, or manufactures any architectural coating for use within the District, as well as any person who applies or solicits the application of any architectural coating within the District. The appendix presents the proposed amendments to Rule 3 in strikeout/underline regulatory format. Further information regarding CARB's SCM for architectural coatings is presented in the CARB Final Program EIR.

The proposed revisions to Rule 3 involve lowering the VOC content limit for a number of architectural coating categories. The proposed revisions also include increasing VOC content limits for several coating categories. The proposed revisions to increase the VOC content limits for certain architectural coating categories are being proposed because coatings that meet the current VOC limits in Rule 3 for those categories may not be available, or the lowered VOC content limits require new categorization of these coatings. These revised VOC limits will be consistent with the corresponding limits in the SCM. The subject categories are Antenna Coatings, Anti-fouling Coatings, Faux Finishing Compounds, Flow Coatings, Rust Preventative Coatings, and Temperature-Indicator Safety Coatings. The current and proposed VOC limits for these categories are indicated in the appendix.

Provisions for product-line averaging are included in the proposed rule amendments. These provisions add an averaging compliance option to the rule. It allows manufacturers to average designated coatings such that their average cumulative emissions are less than or equal to the cumulative emissions that are allowed under the rule. The averaging compliance option is only in effect from January 1, 2003 until January 1, 2005. The language includes a VOC ceiling, or maximum VOC limit for coatings that may be used in an averaging compliance option. This issue came up as ARB and the South Coast AQMD were working on specific guidelines for the averaging program. The VOC ceiling was adopted by the Sacramento Metropolitan Air Quality Management District at the first District adoption of the state SCM in May, 2001. The maximum limits represent the most common district limits in effect when the SCM was approved in June, 2000. On June 7, 2001, Michael P. Kenny, Executive Officer of CARB, reinforced the emissions averaging VOC limit ceiling in a letter to the air districts. In an effort to maintain statewide consistency, an important element of the averaging compliance option since the averaging may be done on a statewide basis, and to prevent high VOC coatings that have previously been illegal entering the District, Rule 3 proposes the same maximum VOC ceiling limits for averaging.

4. ENVIRONMENTAL SETTINGS, IMPACTS AND MITIGATION MEASURES

4.1 Introduction

Under CEQA, an Environmental Impact Report must identify the potentially significant adverse environmental effects that may result from a proposed project. The EIR analysis must include direct and indirect significant adverse effects of a project, including short and long-term impacts. The discussion of environmental impacts should include, but is not limited to: the resources involved; physical changes; alterations of ecological systems; health and safety problems caused by physical changes; and other aspects of the resource base, including water, scenic quality, and public services. If potentially significant adverse environmental impacts are identified, the EIR must then discuss mitigation measures that could either avoid or substantially reduce those adverse environmental impacts.

This section describes the environmental setting for the project, any adverse impacts that may result from the project, and mitigation measures that would be proposed to lessen or reduce the adverse impacts fro the project. CEQA Guidelines establish a checklist for use by public agencies, which lists 16 environmental categories to be addressed when determining whether to prepare an EIR. CARB staff prepared an initial study based upon this checklist prior to preparing the Draft Program Environmental Impact Report for the SCM. District staff reviewed the CARB Initial Study, draft Program EIR and final Program EIR, as well as the Sacramento Metropolitan Air Quality Management District's draft and final EIR prior to preparation of the draft EIR for the Bay Area. On August 2, 2001, District staff sent a Notice of Preparation to responsible and trustee agencies. Of the 16 potential environmental impact categories on the checklist, District staff determined that an EIR should be prepared to address potential adverse effects on the following environmental categories: air quality, water, public services, transportation and circulation, solid and hazardous waste, and hazards. The following sections analyze the potential adverse environmental impacts associated with implementing the proposed amendments to Regulation 8, Rule 3: Architectural Coatings.

4.2 Air Quality

4.2.1 ENVIRONMENTAL SETTING

The jurisdictional boundaries of the Bay Area Air Quality Management District, known as the Bay Area air basin, encompasses the Counties of Alameda, Contra Costa, Marin, Napa, San Francisco, Santa Clara and portions of western Solano and Southern Sonoma, totaling approximately 5,600 square miles. The Bay Area physiograpy is characterized by a large shallow basin surrounded by coastal mountain ranges tapering into sheltered inland valleys. The combined climatic and topographic factors present in the Bay Area result in an increased potential for accumulation of air pollutants in the inland valleys and a reduced potential for buildup of air pollutants along the coast.

The climatology of the Bay Area, in combination with the topography and pollutant emissions, determines the atmospheric pollution potential. The atmospheric pollution potential is the potential for a given quantity of air emissions to be dispersed as a result of the combined influence of atmospheric and geographic conditions, either lowering or increasing the potential for exceedances of ambient air quality standards. In the Bay Area there is a wide range of atmospheric pollution potential resulting predominantly from four factors; winds, atmospheric stability, solar radiation and sheltering terrain.

Winds can disperse pollutants. Atmospheric pollution potential increases in the sheltered valleys of the Bay Area because the terrain tends to reduce wind speeds. Reduced wind speed in the valleys combined with daytime up-valley and nighttime down-valley air flow can result in the accumulation of pollutants. Temporally, these low wind speeds usually occur in conjunction with periods of high pollution emissions, typically during the early morning and late afternoon or evening commute traffic, and on clear, cold winter nights.

Whereas winds are indicative of horizontal dispersion of air pollution, atmospheric stability determines the ability of air pollutants to dispersed vertically. In the Bay Area, the ability of air pollutants to be dispersed vertically is frequently limited by inversions. An inversion, a blanket of warm air trapping a layer of cooler air underneath, forms an almost impenetrable barrier to the vertical dispersion of air pollutants at the boundary between the two air masses. Inversions result from a variety of climatic factors and the different types of inversion have a wide seasonal variation.

Between late spring and early fall, a layer of warm air often overlays a layer of cool air from the Delta and San Francisco Bay, resulting in an inversion. Typical winter inversions are formed when the sun heats the upper layers of air, trapping below them air that has been cooled by contact with the colder surface of the earth during the night. Although each inversion type predominates at certain times of the year, both types can occur at any time of the year. Local topography produces many variations that can affect the inversion base and thus influence local air quality.

Solar radiation plays an integral role in the formation of photochemical smog. In the presence of sunlight and warm temperatures, hydrocarbons, referred to as volatile organic compounds, or VOC, and oxides of nitrogen (NO_x) combine through a complex series of chemical reactions to produce photochemical smog, the largest fraction of which is ozone. The inland valleys of the Bay Area experience higher temperatures and more abundant sunshine than coastal areas and, therefore, have a higher atmospheric pollution potential with respect to the formation of photochemical smog.[24] Ozone is primarily a summer and fall pollution problem due to the hotter temperatures, longer exposure of precursor pollutants to solar radiation, and potential for less vertical and horizontal dispersion.

The Bay Area violates the federal and state standards for ozone. According to the 2001 Ozone Plan, emissions of VOC from stationary sources must be reduced by over 8 tons/day to meet the federal air quality standard for ozone.[25] Figure 4.1 illustrates the contribution of various sectors of VOC producing activities to the Bay Area total.[26] It is important to note that the BAAQMD does not have jurisdiction over all sources of VOC. Motor vehicles and other mobile sources are under the jurisdiction of CARB and the federal government. Also, CARB has jurisdiction over consumer products and aerosol paints. In Figure 4.1, architectural coatings are included in the category labeled, "Petroleum and Solvent Evaporation". Architectural coatings, specifically excluded from the definition in the California Health and Safety Code as consumer products[27], emit about 25 tons/day of the approximately 550 tons/day Bay Area VOC emissions, or about 4.5 % of the total. Of the VOC emissions that BAAQMD has jurisdictional control of, emissions from architectural coatings represent a little over 14%. Figure 4.2 shows the contributions of various sectors of NO_x producing activities. NO_x functions as both a precursor to ozone and as a reactant with ozone, acting, in effect, to scavenge ozone out of the atmosphere.

[24] Environmental Impact Report for the 1991 Bay Area Clean Air Plan, BAAQMD, 1991
[25] 2001 SF Bay Area Ozone Plan, op. cit.
[26] Bay Area 2000 Clean Air Plan, op. cit.
[27] CH&C 41712(a)(1)

FIGURE 4.1
2000 Summer Emissions: Ozone Precursors
Volatile Organic Compounds (VOC)
551 tons/day

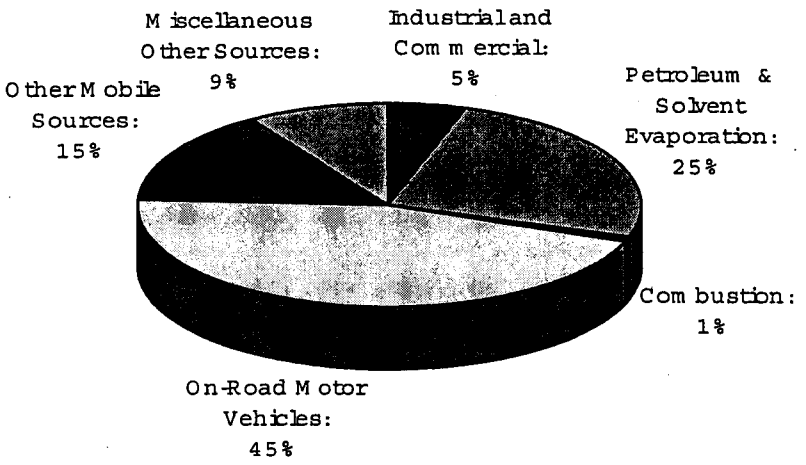
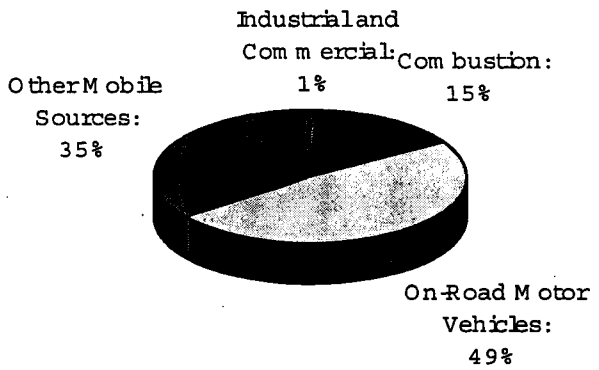


FIGURE 4.2
2000 Summer Emissions: Ozone Precursors
Oxides of Nitrogen (NOx)
571 tons/day



Under Section 185B of the federal Clean Air Act, the National Academy of Sciences was charged with studying the role of VOC and NO_x emissions in ozone formation. Its study, *Rethinking the Ozone Problem in Urban and Regional Air Pollution*, was conducted by the National Research Council and published in 1991. A central finding of the study was that the relative effectiveness

of VOC and NO_x controls for reducing ozone depends on the ambient VOC to NO_x ratios within an air basin. At ambient VOC to NO_x ratios of about 10 or less, VOC control is more effective, and NO_x controls may be counterproductive. At VOC to NO_x ratios of 20 or more, NO_x control is generally more effective. The Bay Area ratio of VOC to NO_x is less than 10. The Bay Area is a VOC limited area, meaning that formation of ozone is limited by the amount of VOC in the air, and NO_x is in excess. Therefore, the most effective strategy for reducing Bay Area ozone concentrations is to limit VOC emissions.[28] It is estimated that VOC reduction alone is sufficient to meet the federal standards for ozone, however, both VOC and NO_x reductions are necessary to meet the more stringent California standards. Also, reductions in NO_x are required to reduce transport emissions to air districts downwind from the Bay Area.

4.2.2 SIGNIFICANCE CRITERIA

The District has established thresholds of significance for air quality impacts. The threshold of significance for a given environmental effect is that level at which the District finds the effects of the project to be significant. According to the California Office of Planning and Research (OPR), a threshold of significance can be defined as: "A quantitative or qualitative standard, or set of criteria, pursuant to which the significance of a given environmental effect may be determined." The following table lists the threshold of significance established in 1996.[29]

Table 1. Thresholds of Significance for Air Quality Impacts

Pollutant	ton/yr	lb/day	kg/day
VOC	15	80	36
NO_x	15	80	36
PM_{10}	15	80	36

In addition, thresholds of significance exist for potentially odorous projects and for toxic air contaminants. The threshold of significance for toxic air contaminants is defined as a project that has either; 1) a probability of contracting cancer for the Maximally Exposed Individual (MEI) that exceeds ten in one million, or 2) a ground level concentration of non-carcinogenic toxic air contaminants that would result in a Hazard Index of greater than 1 for the MEI. The threshold of significance for odorous projects is somewhat more subjective. It is based on distance between potential receptors and the project source, the type of source and any history of complaints.

4.2.3 ANALYSIS OF POTENTIAL ENVIRONMENTAL IMPACTS

The following is a discussion and analysis of issues raised by some members of the coating industry. For each issue area, District staff reviewed the detailed analysis of these issues prepared by CARB staff and contained in Section IV, Subsection C of the Program EIR prepared for the SCM for architectural coatings. Staff also reviewed the comments received in response to the Program EIR, and the responses to those comments. In addition, staff considered the information compiled to date through ongoing studies by the South Coast Air Quality Management District (SCAQMD) with National Technical Systems (NTS), a testing program by the essential public service agencies (EPSA), a testing program by the Southern California Alliance of Publically Owned Treatment Works (SCAP), and an analysis of the Harlan Associates Study prepared by Stan Cowen of the Ventura County Air Pollution Control District. The analysis and discussion in this EIR also considers the following update of the studies prepared since certification of the CARB Program EIR.

<u>SCAQMD Phase II Assessment Study of Architectural Coatings</u>. In 1998, the SCAQMD initiated a performance study with National Technical Systems (NTS) to evaluate the following six

[28] Bay Area 1997 Clean Air Plan and Triennial Assessment, BAAQMD, December 17, 1997
[29] BAAQMD CEQA Guidelines, Assessing the Air Quality Impacts of Projects and Plans, BAAQMD, April, 1996 and December, 1999

architectural coating categories: Industrial Maintenance, Non-flats, Primers/Sealers/Undercoaters, Quick Dry Enamels, Quick Dry Primers/Sealers/Undercoaters, and Waterproofing Sealers. The objective of the performance study was to conduct side-by-side laboratory and outdoor exposure tests for coatings with varying VOC contents.

The study involved 31 manufacturers or brands, 94 coatings, 46 coating systems (e.g., primer and topcoat), and over 3000 test panels. The laboratory portion of the study was completed in 1999, and is summarized in Appendix E of the CARB staff report for the proposed SCM, which was approved by CARB concurrent with the adoption of the SCM on June 22, 2000. In general, the laboratory portions of the study revealed similar performance among high and low-VOC coatings.

The outdoor real time exposure testing is ongoing and includes a desert and coastal environment. The outdoor real time exposure will last for two years, and will not be completed until 2002. CARB staff will summarize the data at that time.

Essential Public Service Agencies Testing Program. In response to comments provided by the essential public service agencies (EPSA), the SCAQMD's May, 1999 architectural coatings rule amendments established a new specialty category called "essential public service coating." The category is for protective coatings applied to components of power, municipal wastewater, water, bridges and other roadways, transmission or distribution systems during repair and maintenance procedures. The category includes coatings used by the EPSA that were previously included in the industrial maintenance coatings category. The essential public service category was created to allow additional time for the ESPA to complete the lengthy administrative processes to identify, evaluate, budget and purchase new coatings to replace those currently used for public infrastructure. The category's VOC limit decreases to 100 g/l by 2006 in the South Coast rule, then matching the SCAQMD industrial maintenance category limit. Thus, the ESPA testing program will primarily focus on coatings capable of meeting the 100 g/l VOC limit. However, the program is also evaluating some coatings at the 250 g/l VOC level.

Earlier this year, the members of EPSA entered into a memorandum of understanding (MOU) to accomplish their common coating performance testing goals. The EPSA membership consists of: Caltrans (California Department of Transportation); California Department of Water Resources; Los Angeles Department of Water and Power; and Metropolitan Water District of Southern California.

A technical steering committee consisting of representatives from each public service agency, SCAQMD, and CARB has been established. The technical steering committee has approved a test program design that includes test sequences, test procedures, and performance evaluation criteria. Coating selection and application is ongoing. The scope of testing will involve laboratory and field tests of compliant coatings and is expected to last a number of years even with expedited testing efforts. For example, the coating evaluation process at Caltrans entails a laboratory screening and characterization, including health and safety review (4 months), cyclic corrosion testing in the laboratory (8 months), field application tests (2 years), and specification development (2 years).

Southern California Alliance of Publicly Owned Treatment Works Testing Program. The Southern California Alliance of Publicly Owned Treatment Works (SCAP) represents over 55 government agencies involved in the treatment and recycling of water and wastewater. As a result of VOC limits specified in SCAQMD Rule 1113 and the SCM, SCAP has committed to evaluate the performance, durability and application requirements of low VOC (less than 100 g VOC/liter to 340 gram VOC/liter) coatings suitable for wastewater environments. The testing program includes laboratory and field tests and is scheduled to conclude in 2003.

Harlan Associates Study. In February 1995, CARB published the results of performance testing of architectural coatings by Harlan Associates, Inc. The purpose of the study was to determine

the physical properties and performance of representative products in eight coating categories. A total of 110 coating products, purchased during late 1993 and throughout 1994, were tested in the following categories: industrial maintenance primers and topcoats, high-temperature industrial maintenance coatings, lacquers, varnishes, non-flats (including quick-dry enamels), primer/sealers (including quick-dry primer/sealers), sanding sealers and waterproofing sealers (wood and concrete).

While the raw data from this study were published in 1995, an analysis of the overall comparison of the coatings' test performance was not published. In developing the proposed SCM, CARB and districts' staff analyzed and summarized the raw data. This performance study, although somewhat dated, is used to supplement the newer NTS study.

i) Industry Issue: Increased Thickness of Lower VOC Coating Films

Industry has commented that, in order to meet the VOC limits proposed, manufacturers would need to reformulate many of their coatings to increase the amount of solids contained in those coatings, and would correspondingly reduce the amount of solvent. According to industry, this increase in solids content would lead to an increased thickness of the low-VOC coatings being applied. Increased coating thickness would have two main effects. First, the coatings would become more difficult to handle during application due to increased viscosity. Secondly, a set amount of coating would cover less surface area, resulting in application of more coating to cover the desired surface, canceling the benefit of a lower VOC content per unit of coating. Industry representatives have contended that it is mainly high-solid, solvent-based alkyds, non-flats in particular, that will have this problem. During the review period of the draft Program EIR, CARB received comments from industry that they had misinterpreted earlier comments that addressed this issue. Industry stated that CARB had focused too narrowly on increased thickness as it applied to waterborne coatings, not high solid, solvent-based alkyds.

CARB staff response to these comments indicated that more attention was paid to water-borne coatings because water-borne coatings made up a very large percentage (95%) of non-flats. CARB also stated that there are a number of options manufacturers could choose which would allow them to reformulate coatings that would comply with the rule while not increasing solids. These include using exempt solvents or moving to a water-based system. If a manufacturer does decide to reformulate a coating to increase solids content, less viscous resins exist which would allow compliant coatings to be manufactured while not increasing overall thickness. CARB used labels and product data sheets in part to determine the coverage expected from use of coating products. According to CARB staff, in evaluating product data sheets[30] from 500 different coatings and the results of its 1998 Architectural Coatings Survey, there was no apparent relationship between VOC content and the amount of solids that are present in the coating and no relationship between solids content and coverage. CARB also stated that an indicative way to determine whether low-VOC levels corresponded to increased solids and increased thickness was to see whether there had been an increase in overall per-capita sales over time. It was found that coatings sales had remained constant on a per-capita basis over the last 12 years.

CARB staff analysis of this issue in the Program EIR is relevant to the Bay Area. District staff looked at this issue to see if there were any local issues that might alter CARB's conclusion and found that CARB's analysis is applicable to the Bay Area. There is nothing to suggest that reformulated coatings that work in other parts of the state would not also work in the Bay Area, nor is there any reason why coatings would exhibit an increase in viscosity or film thickness in humid coastal areas. Although a decrease in temperature would result in higher viscosity, coatings typically carry advisories regarding application temperatures. For example, labels on

[30] Product data sheets contain the performance specifications made by coatings manufacturers to their customers. These specifications are generally based on laboratory tests performed by the manufacturers. Manufacturers usually use test methods approved by the American Society for Testing and Materials (ASTM).

water based coatings often advise application at 50°F or above. Typically, although coastal regions are cooler than inland areas in the summer, they are often warmer in the winter and rarely have diurnal temperatures of less than 50°F.

ii) Industry Issue: Illegal Thinning of Lower VOC Coatings

When commenting on CARB's draft Program EIR, industry representatives also raised the issue of possible illegal thinning that would occur if the proposed VOC limits were adopted. The coatings affected by this are supposedly the same kinds of coatings that would be affected by the increased thickness problem discussed previously. According to industry, individual users will add solvent to thin products that have been made more viscous due to increased solids content, potentially exceeding the maximum allowable VOC limits. Representatives from industry also commented that the CARB field study on thinning was flawed due to inaccurate sampling because the focus was on higher-VOC specialty coatings that are less likely to be thinned.

Coatings can be reformulated to a lower VOC content in three ways: 1) by the use of solvents, determined by the US EPA to have a negligible contribution to photochemical reactivity and exempted by the District in Rule 3, as substitutes for regulated organic solvents; 2) by the substitution of water for organic solvent; and 3) by an increase in the solids content and a corresponding decrease in organic solvent per unit volume of coating. In the case of the first two options, the addition of exempt solvents or water to further thin coatings does not increase the VOC content of coatings. The third option could be thinned with organic solvents as alleged, however, as stated previously, low-VOC coatings were found to exhibit similar thickness and coverage to higher VOC coatings when applied without excessive thinning. In addition to the 1991 CARB field study on thinning, South Coast AQMD staff conducted two field studies in connection with amendments to the South Coast architectural coatings rule (Rule 1113). The studies, conducted in 1993 and 1996, summarized in the CARB Program EIR, indicated that coating applicators rarely thinned coatings, and, when they did, most of the time they followed the manufacturer's instructions and so did not exceed allowable VOC limits.

In the Bay Area, lower coastal temperatures and higher humidity would not encourage a coating applicator to thin coatings to decrease viscosities or film thickness, in fact, these Bay Area attributes would discourage thinning. Inland valleys in the Bay Area have a climate more akin to the other areas in the state where amendments to architectural coating rules have already been adopted, the South Coast and Sacramento County. Coatings should be expected to be used and thinned in the same way.

iii) Industry Issue: Lower VOC Coatings Require More Priming

Industry representatives have commented that adopting the proposed VOC limits will lead to an increase in the application of primers that would be necessary to get low-VOC water-based latex enamels to adhere and perform adequately. The contention is that water-based latex enamels have poorer adhesion when being used to coat difficult substrates, and because the coatings have poor sealing and stain-blocking properties.

Product data sheets reviewed by CARB staff for low-VOC coatings do not indicate that priming is recommended to a greater extent than for higher VOC coatings. Typically, both high and low-VOC coatings are recommended to be applied only to "clean, dry surfaces." Many products are marketed as having excellent adhesion properties. Also, the NTS study demonstrated that adhesion characteristics of low-VOC coatings are similar to conventional coatings. No increase in primer sales is evident that would correspond with previous restrictions on VOC contents of topcoats. Finally, the SCM includes a category for "Specialty Primers." Those are primers that are recommended for use to seal fire, smoke or water damage, condition chalky surfaces, or block stains. The VOC content limit set by the proposed amendments to Rule 3 for specialty primers will be the same as currently exists, 350 g VOC / liter.

The allegation of increased use of primers associated with low VOC topcoats is a function of the surfaces to be coated and the preparation of those surfaces. In cooler coastal conditions, higher humidity might be expected to be a factor if surfaces are wetter as a result. However, if surfaces are excessively wet, neither low nor higher-VOC primers nor topcoats should be applied, and application in these conditions is not recommended by manufacturers. The proposed amendments to Rule 3 incorporate several provisions to address exposure of substrates to humid environments. The first is the creation of a category for "Rust Preventative" coatings. This category is not found in the existing Rule 3. The category is specifically for prevention of corrosion of non-industrial metal surfaces, as might be expected in high-humidity environments. The VOC limit proposed is 400 g/liter, sufficient to accommodate existing solvent-borne coatings used for this purpose. Also, although the amendments propose a reduction in the allowable VOC content for Industrial Maintenance Coatings in 2004, from 420 g VOC/liter to 250 g/VOC/liter, there is a special provision in the SCM and in the proposed amendments that allow the Bay Area to allow Industrial Maintenance coatings of up to 340 g VOC/liter, provided the applicator can demonstrate a need (for example, application to coastal bridges). This allowance was instituted by CARB in the SCM after consultation with Caltrans about the need for non-water borne coatings for some applications in high-humidity environments. The allowance, however, can also be used for the use of other industrial maintenance painting projects throughout the Bay Area, provided need for a coating with a VOC content greater than 250 g/l is demonstrated.

iv) Industry Issue: The Necessity for More Topcoats

Industry representatives have commented that the proposed VOC reductions will result in an increased usage of topcoats. This is because low-VOC products will not exhibit satisfactory coverage, film build, or flow-and-level, described as the movement of a coating during and after application so as to obliterate surface irregularities caused by the application equipment such as brush marks or of the coating itself during drying and curing, such as cratering or "orange peeling". The contention is that the problems that would lead to more topcoat use are mostly exhibited in water-based latex topcoats and that CARB staff, in producing the Program EIR, relied in part on studies that focused mostly on solvent based products. Industry also stated that the NTS study used by CARB was flawed because test panels were coated by draw down method that does not reflect real-world application, and because industrial maintenance topcoats were not subjected to real-world exposure levels for a sufficient amount of time. Industry representatives, however, were on the NTS technical advisory committee that approved the testing protocol, including draw downs.

CARB staff have noted that the data showed that water based latex products did not demonstrate the deficiencies iterated by industry. These products examined make up the majority of latex non-flats available on the market. The use of the draw down method to coat test panels was thought to be appropriate because this helps to standardize the application process, important to establish a consistent base from which to judge results. CARB staff also responded to the issue of insufficient exposure, stating that the tests represent a reasonable amount of exposure, and that to subject coatings to all possible types of exposure and lengths of service would be an unrealistic undertaking. The length of exposure was not deemed to be an important factor for measuring characteristics that can be measured shortly after application, such as coverage, build, and flow-and-level.

There is nothing in the characteristics of the Bay Area climate that indicate that there would be any difference in these issues. Cooler summertime temperatures and higher coastal humidity would, if anything, help expand the window of time for coatings to flow-and-level. Nothing in climatic conditions would indicate greater or lesser film build or coverage.

v) Industry Issue: More Touch-Ups and Coating Repair Will Be Needed

Some coatings manufacturers and contractors claim that water-borne and low-VOC solvent-borne formulations do not dry as fast as conventional coatings and, therefore, are susceptible to damage such as sagging, wrinkling, or "alligatoring" during drying or curing, or becoming scraped

and scratched before forming a sufficiently resistant coating film. Also, some industry representatives contend that low-VOC and water-borne topcoats will require more touch-up and repair work because longer drying times allow for the contamination of the coated surface with airborne dust and construction debris. Industry representatives also claim that water-based coatings tend result in severe blocking problems, the undesirable sticking together of two coated surfaces. Because of these problems, there will be a need to apply additional coating to touch-up or repair surfaces.

CARB staff reviewed product data sheets to analyze the recommended drying time between coats, which would be the cause of wrinkling or sagging, and found that the dry time recommended for low-VOC coatings was similar or less than the average drying time for conventional coatings in all categories except lacquers. Also, per-capita coating sales have not increased since 1988 which indicates that there is no increase in touch-up and repair due to the increased use of water-borne coatings. The NTS study examined blocking characteristics of coatings, and results of the study demonstrated that blocking characteristics of low-VOC coatings are similar to conventional coatings. Consequently, more coating usage due to an increased need for touch-up and repair work is not anticipated. The NTS study did note a greater dry time for lacquers, specifically acetone based lacquers. The difference noted was a 1/2 hour longer dry time between lacquers of greater than the current standard of 680 g/l VOC, and lacquers compliant with the proposed 550 g/l standard, and 18 minutes longer between lacquers of less than 680 g/l and the proposed 550 g/l standard.

The climatic conditions of the Bay Area, cooler and more humid environments along the coast, might create a longer dry time for lacquer products, particularly water based lacquers. However, acetone based lacquers should not experience this problem. Acetone is a very fast evaporating solvent, to the extent that blushing, a product of over-rapid drying can sometimes occur. This is the reason for the provision to add VOC in cool and humid conditions, to retard drying to aid film formation. For other categories of coatings, as demonstrated by the NTS study and analysis of product recommendations, there would not be expected to be any significant impact on coating application in coastal areas.

vi) Industry Issue: The Necessity for More Frequent Re-coating

Some coating manufacturers and contractors assert that durability of compliant water-borne and low-VOC solvent-borne coatings are inferior to that of traditional solvent-borne coatings. They claim that the new coatings have many finish and durability problems that become apparent over time, such as cracking, peeling, excessive chalking, blistering and color fading. Therefore, low-VOC coatings result in more frequent re-coating and, consequently, result in more VOC emissions than traditional coatings over time due to this lack of long term durability.

The long term durability of a coating is affected by many factors, such as surface preparation, application method, environment (mechanical stress, thermal weathering), type of binder or resin in the formulation, and the substrate coated. Generally, of these factors, surface preparation recommendations, application methodology, environment and substrate are the same for older high-VOC coatings as for newer low-VOC ones. Although conventional binder systems and newer low-VOC compatible binder systems have different performance attributes, results of the NTS study show that low-VOC coatings overall have similar or superior performance and application characteristics to higher-VOC coatings. The CARB Program EIR found that low-VOC coatings are as durable and long lasting as conventional coatings. In addition, poorer long term performance would result in higher coating sales, which would be evident on a per capita basis. This is not the case. Advancements in coatings technology, including modification of the binder systems and in the many additives that impart special characteristics such as UV light resistance, color retention, flexibility, and preservatives have resulted in improvement of the durability of new coatings. Therefore, claims of increased VOC emissions from more frequent re-coating are unfounded.

In the Bay Area, cooler or more humid coastal conditions would not result in long term durability consequences. In fact, many of the allegations are based on exposure to solar radiation, which would be less of a factor at the coast. One other attribute of coastal conditions that could affect coatings is the corrosive properties of a salt spray environment. The NTS study did examine salt spray, and found that newer, low-VOC coatings tend to resist salt spray environments equally well as do higher-VOC coatings. As mentioned above, the Bay Area is incorporating special provisions from the SCM into the proposed Rule 3 that will allow for a higher VOC content for industrial maintenance coatings when surface needs dictate. Consultation with Caltrans, especially regarding coastal structures such as bridges, led to the implementation in the SCM of this provision.

vii) Industry Issue: Illegal Substitution of Higher-VOC Coatings for Lower Due to Consumer Dissatisfaction

Some coating manufacturers and contractors assert that because water-borne and low-VOC solvent-borne coatings are inferior in durability and more difficult to apply than conventional coatings, consumers and contractors will substitute allegedly better performing, higher VOC coatings, the use of which might be applicable to other categories, for use in coating categories with low VOC compliance limits (e.g., use of a rust preventive coating, which has a higher VOC content limit allowance, in place of an industrial maintenance coating or nonflat coating with a lower VOC limit.)

The Program EIR did not find that widespread substitution is likely as a result of adopting a rule based on the SCM for several reasons: 1) the results from the NTS study show that low-VOC coatings with similar performance characteristics to conventional coatings are currently available; 2) the SCM, on which the Rule 3 proposal is based, does not allow the application of certain categories of coatings except in some specific settings. For those coatings, labeling requirements make it clear for what uses the coating is recommended and where it is prohibited (e.g., rust preventative coatings cannot be used in industrial settings.); and, 3) the SCM requires that when a coating can be used in more than one coating category, the lower VOC limit of the two categories is applicable, with the exception of some specified categories where the performance needs of the higher VOC coatings are paramount. It is not expected that consumers and contractors will substitute higher-VOC coatings for low-VOC coatings when recommendations make it clear that coatings are recommended for specific purposes and additional uses are restricted. In addition, reporting requirements for some categories that require manufacturers to report California sales in will highlight a shift from one category to another if one occurs.

This allegation of substitution based on dissatisfaction has no bearing on any special climatic considerations that might be present in the Bay Area. As iterated above, tested performance characteristics that compare low-VOC coatings to high-VOC coatings do not lead to a conclusion that consumers will be less than satisfied with low-VOC products.

viii) Industry Issue: Solvent Species Used in Low-VOC Coatings Have More Reactivity

Some industry representatives claim that requiring manufacturers to reformulate to water-borne technology will lead to increases in ozone formation because the VOC's used in water-borne coatings are more reactive than those used in solvent-borne coatings. Industry also suggested that the VOC's used in architectural coatings, such as mineral spirits, have an atmospheric reactivity potential that is low enough to have an effectively negligible contribution to ozone formation. It has also been also suggested that NOx control alone may be most appropriate for reducing ground level ozone. Finally, it has been claimed that mass-based controls may not be effective and that reducing VOC under certain conditions may be counterproductive and may actually lead to ozone nonattainment.

Existing data do not support the claim that water-borne coatings are more reactive than solvent-borne. Using the Maximum Incremental Reactivity (MIR) scale developed by Dr. William Carter

at UC Riverside, and others, as the basis for comparing reactivities of different species of VOC, it is true that, on a per gram basis, a typical VOC used in water-borne coatings, such as propylene glycol, is two to three times more reactive than a typical mineral spirit used in a solvent-based coating. However, considering the typical difference in mass of VOC between waterborne low-VOC coatings and solvent-borne high-VOC coatings, which can be characterized as the total, or weighted, reactivity of a product (or product category), CARB staff found out that solvent-borne coatings are over two times more reactive than water-borne coatings. In addition, the reactivity of propylene glycol is approximately three times less reactive (on a per gram basis) than that of some species of VOC used extensively in solvent-borne coatings, such as xylene and toluene. Analysis also showed that the reactivity of some solvents used in water-borne coatings is similar to a typical mineral spirit used in solvent-borne coatings. An additive complication is that "mineral spirits" is a generic term used to describe a non-specific mix of petroleum distillates. The reactivity of some blends of mineral spirits may be low, however, as the proportion of some species, such as aromatic hydrocarbons, increases, the reactive potential increases. In any case, studies show that the reactivity of mineral spirits is several times that of ethane, which is considered by EPA to be the cut point for determination of whether a VOC should be regulated or would be considered a negligible contributor to photochemical smog, and therefore not regulated. Therefore mineral spirits cannot be unregulated. The analysis is described in greater detail in CARB's Program EIR for the SCM.

The allegation that VOC control is less effective than NOx control at reducing ozone is true in some conditions in atmospheres characterized by ratios of VOC to NOx where VOC is predominant. However, those conditions are not typical in California and are certainly reversed in the Bay Area, where ozone formation is VOC limited, as discussed previously. Quite the opposite of this allegation, in the Bay Area, NOx control may be counterproductive, however, is believed to be necessary for long term ozone attainment planning and ozone transport considerations. The allegation that mass based controls are counterproductive is refuted by the long history of mass based controls in California and in the Bay Area and, in spite of increased population, the declining levels of measured ozone over the time period.

ix) Industry Issue: The Synergistic Effects of the Eight Issues

Industry representatives have stated that the synergistic effect of the eight issues discussed above should be analyzed. Synergy occurs when two or more effects interact to produce a subsequent effect and the subsequent effect is not evident in any individual effect. However the information analyzed in the Program EIR does not indicate any significant adverse impacts as a result of the individual impacts that would combine in a way to produce a synergistic effect. Most of the impacts are related to application and performance issues, including long term performance. The analysis of information available found that low-VOC coatings have similar application and performance characteristics to conventional higher-VOC coatings. Further, manufacturers' recommendations are consistent, indicating that the alleged need for extra primers or topcoats is not founded. Finally, the allegations of synergistic issues should be especially borne out over time and reflected in sales data on a per capita basis. This is not the case, as the sales data per capita analyzed by CARB staff in the Program EIR shows there to have been no significant increase in sales.

In the Bay Area, characterized by some cooler and more humid coastal regions, but inland areas climatologically consistent with the rest of the state, there is no evidence of a synergistic effect of the above alleged impacts. The Bay Area Rule 3 proposes to include a provision in the SCM for the Bay Area and other coastal districts that will allow for a limited amount of industrial maintenance coating to be used that does not meet the proposed VOC limit for the industrial maintenance category of 250 g / liter. This provision, negotiated with Caltrans and applicable to more than just Caltrans' areas of responsibility (roads, bridges, etc), will alleviate some concerns associated with implementation of lower VOC coating limits in cool, humid coastal areas.

x) Issue: Exemption of Methyl Acetate

On April 1, 1998, the US EPA exempted methyl acetate from control based on a determination that methyl acetate had a negligible effect on atmospheric photochemical reactions.[31] An exemption from the definition of VOC in a district rule serves as an encouragement to consider formulations with an increased amount of that exempt compound. Therefore, the environmental effects of a possible increase in the use, and subsequent evaporation into the atmosphere, of an exempt compound must be considered. In November, 1991, the Board of Directors of the BAAQMD adopted an ozone depletion policy that stated that staff should consider the environmental effects of any exemption, including possible toxic exposure. Since that time, staff have considered the possible ramifications of increased usage of any chemical compound via an exemption in a District rule, and not recommended any without consideration of the potential benefits of reducing VOC emissions balanced against the potential environmental detriments and the need for a test method to quantify the compound for compliance testing purposes. In Rule 3, the currently exempt compounds are all useful as replacements for regulated solvents to varying degrees. They are: acetone, methylene chloride (a toxic air contaminant), 1,1,1 trichloroethane (an ozone depletor), parachlorobenzotrifluoride, and the family of volatile, completely methylated siloxanes. To this list, staff propose to add methyl acetate.

Methyl acetate is a low boiling ester solvent that rapidly evaporates. It usefulness is suggested because it is soluble in water, alcohol, acetone and a variety of other solvents. It is not an ozone depleting chemical and has not been found to be toxic by the US EPA or state of California. It is flammable and has a fruity odor characteristic of esters. The odor threshold, that concentration at which the chemical can be detected, is 4.6 parts per million, just slightly lower than methyl ethyl ketone, a commonly used coating solvent. It is not considered to be a significant contributor to global warming.[32]

Staff have examined the "de-listing" or de-regulation of methyl acetate and found that, even if usage increases as a substitute for ozone forming solvents, it should not present any potential adverse air quality impacts. Typically, the odor of esters is not found to be unpleasant to most people compared to a variety of other solvents. Architectural coatings often have esters already in the solvent mixture so it is not expected that the addition or substitution of methyl acetate will result in the creation objectionable odors.

xi) Issue: VOC Definition for Low Solids Coating

On November 4, 1998, the Board of Directors amended Rule 3 to include provisions for low solids coating. Those provisions include a definition for low solids coating, "A coating containing 0.12 kilograms or less of solids per liter (1 pound or less of solids per gallon) of coating material"; a VOC standard for low solids coating, 120 grams VOC per liter; a reference to the appropriate test method, Laboratory Method 31: Determination of Volatile Organic Compounds in Paint Strippers, Solvent Cleaners and Low Solids Coatings; and an amendment to the definition of Volatile Organic Compounds, "For the purposes of calculating VOC content of a low solids coating, any water shall be considered part of the coating." These amendments were based on a variance request by the Sherwin Williams Company in 1991, re-granted by the District Hearing Board until the 1998 amendments, to manufacture and sell a water based low solids exterior stain in the District that did not meet the VOC limit for stains as calculated in the test methods for water based coating. The reason the product, which was demonstrated to have coverage equivalent to a compliant stain and has only a small portion of organic solvent in the coating, did not meet the VOC limit is because the calculation to measure VOC content is what is termed a "less water calculation".

A "less water calculation" subtracts water and any volatile organic solvents that do not contribute to the formation of photochemical smog from the mass of the total volatile content and also

[31] 63 Fed Reg 17331, US EPA, April 9, 1998
[32] Hazardous Substance Fact Sheet, New Jersey Dept. of Health and Senior Services, Dec., 1996

subtracts the volume of these components from the total volume of the coating. Because the standard is stated in terms of mass of VOC per volume of coating, a smaller volume of coating, due to the subtraction, "calculates" to a greater VOC mass. For example, a liter of coating with 0.5 liters water, 0.25 liters VOC and 0.25 liters coating solids would calculate to a volume of 0.5 liters, because the water is subtracted from the total volume. The mass, then, of the VOC would be multiplied by 2 because the standard is in terms of grams VOC per (full) liter of coating. For a coating which is not intended to form a significant surface film, such as a stain that is only intended to color but not hide the surface, the amount of coating solids is typically low. For a coating which has a large amount of water, but only a little coating solids and VOC, the less water calculation would show a large amount of VOC, in some cases making it impossible for the coating to comply. A liter of the Sherwin Williams exterior stain for which the variance was sought had only 100 grams of VOC, but calculated to 570 grams per liter, exceeding the 400 grams/liter VOC limit for stains.

The effect of the 1998 amendments was allow low solids coatings to include the water in the volume of the coating, but it did not allow the inclusion of any exempt VOC. The purpose was to allow and encourage water based low solids coating but not to encourage inclusion of large amounts of exempt VOC solvent in the calculation of the volume of a coating, due to the deleterious environmental effects of some exempt solvents. However, for the proposed amendments, staff propose to allow exempt solvents to be included in the volume for the purposes of the VOC calculation of a low solids coating. There are two exempt compounds in the list that have the potential for significant adverse environmental effects, should a significant amount of low solids coating be manufactured using these compounds. They are methylene chloride, a hazardous air pollutant and a carcinogen; and 1,1,1 trichloroethane, or methyl chloroform, a hazardous air pollutant, mutagen and ozone depleting substance. The other exempt compounds, including methyl acetate, have not been identified as being hazardous air pollutants, toxic or ozone depleting substances. The proposed amendments will allow exempt compounds to be included in the calculation of the volume of a low solids coating, but will not allow methylene chloride or 1,1,1 trichloroethane to be considered exempt for any coating, low solids or not. Although this would not prohibit the use of these substances, it would remove any incentive to use them, fulfilling the objectives of the District's 1991 Ozone Depletion Policy.

The proposed change in the VOC definition for low solids coating could have adverse environmental impacts if a significant amount of low solids coating were manufactured and used that contained acetone or methyl acetate as a base or large volume diluent instead of water. This is because acetone has an approximately 33% greater reactivity than ethane, generally the cut point for EPA's consideration of whether or not the compound is a negligible contributor to ozone formation, although that of methyl acetate and the other exempt compounds are significantly less reactive than ethane.[33] The use of a large amount of acetone instead of water or a less reactive compound could create more ozone than would otherwise be formed under the current definition which only encourages water based low solids coating.

It is not expected that an increase in acetone as a result of the proposed change in the low solids coating definition would result in a significant increase in ozone formation for two reasons. First, although the impact of acetone is greater than water, the VOC standard for low solids coating is quite low at 120 grams/liter, so that the use of a low solids coating, even containing a low reactive compound like acetone, would displace the use of a higher VOC non-low solids coating, most likely a waterproofing sealer with a current VOC limit of 400 g/l and a proposed future VOC limit of 250 g/l (wood waterproofing sealers only, concrete and masonry waterproofing sealers proposed to remain at 400 g/l), a stain with a current VOC limit of 350 g/l and a proposed future VOC limit of 250 g/l, or a wood preservative with a current and proposed future VOC limit of 350 g/l. Second, low solids coatings accounted for only 4 tons of emissions statewide per year in

[33] Regulation for Reducing the Ozone Formed from Aerosol Coating Product Emissions, 17 CCR 95420 *et. seq.*

CARB's 1998 Architectural Coatings Survey (1996 data). This is the result of sales volumes too low to be reported on the survey due to confidentiality. The use of low solids coating technology is not expected to grow to a degree that the use of acetone could be expected to promote ozone formation to a greater degree than it would reduce. Finally, it should be noted that the proposed deletion of toxic and ozone depleting exempt compounds from the list of exempt compounds in the VOC definition is expected to reduce emissions of methylene chloride in the Bay Area by approximately 52 tons per year and the emissions of 1,1,1 trichloroethane by approximately 80 tons per year, again based on the CARB survey.

4.2.4 CUMULATIVE IMPACTS

There is no evidence of any incremental adverse impacts to air quality from review of the nine industry concerns, nor from the issue of the exemption of methyl acetate, nor from the addition of non-toxic, non-ozone depleting substances to the definition of VOC for low solids coatings. Adoption of the proposed amendments to Rule 3 based on the SCM will result in a net air quality benefit to the District, and no adverse impacts, individually or in combination, are expected to be significant.

4.6.5 MITIGATION MEASURES REQUIRED TO REDUCE SIGNIFICANT IMPACTS

Since the proposed project is not expected to result in significant adverse environmental impacts to the air quality of the Bay Area District, no mitigation measures are required.

4.3 Water

4.3.1 ENVIRONMENTAL SETTING

The San Francisco Bay Basin includes all or major portions of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma Counties. The Bay Basin is bounded by the Santa Cruz Mountains to the west, the Diablo Range to the east, and the Bayside foothills to the north and northeast. About 40 percent of the land in California drains into the San Francisco Bay and the Bay functions as the only drainage outlet for waters of the Central Valley. The San Francisco Bay system is the most extensive and significant estuary on the California coast.

San Francisco Bay has been greatly altered from its natural condition by human activities. Between 1853 and 1884, hydraulic mining of gold in the Sierra Nevada washed tens of million of tons of sand and mud into San Francisco Bay, reducing the extent of open water and creating new mud banks. Later, much of the tidal marsh surrounding the Bay was filled for urban and agricultural use. In this century, as industry expanded and urban sewerage systems were built, increasing quantities of wastewater were discharged into the Bay. Freshwater inflows to the Bay diminished, as large quantities of water were diverted, and exported to the San Joaquin Valley and Southern California for urban and agricultural use. Despite the changes, the Bay remains a prized natural resource.

The Sacramento and San Joaquin Rivers contribute almost all the of the fresh water inflow to the Bay. These major rivers are at the eastern boundary of the San Francisco Bay Basin and enter the Bay system through the Delta at the eastern end of Suisun Bay. There are many small streams and rivers within the basin, including the Petaluma River, Sonoma Creek, Napa River, Suisun Marsh and Alameda Creek. Other major receiving water segments, in addition to the Pacific Ocean and Bay include Suisun Bay, San Pablo Bay, Richardson Bay and Tomales Bay.

Rainfall ranges in the Bay Area from an average of 12 inches a year in San Jose to over 60 inches in parts of the Santa Cruz Mountains. Stream flow in the Bay Area is highly seasonal with 90 percent of the average runoff occurring between November and April. Many streams go dry during the summer months.

The quality of San Francisco Bay and other major receiving waters in the Bay Area varies seasonally. For most of the year, the quality of these waters is similar to that of the water of the Pacific Ocean. From December through April, water quality is affected by freshwater inflow from the Sacramento-San Joaquin delta and from other, smaller tributaries. The rivers that feed the Bay are it's major source of metal pollutants. City streets are the major source of hydrocarbons in the Bay.

The San Francisco Bay Area has 18 major reservoirs with a total capacity of 697,000 acre-feet of water. Historically, the average amount of water in these reservoirs is 403,900 acre-feet. All private an public suppliers of municipal and domestic water are required to meet the water quality standards set forth in the California Code of Regulations.

There are several major groundwater basins in the Bay Area. The Regional Water Quality Control Board (RWQCB) maintains a groundwater monitoring network of wells in the Bay Area. The network is used to record existing conditions, establish baseline conditions, evaluate trends in quality, detect pollution and water quality degradation at an early stage, and evaluate the effect of point and non-point source pollution on groundwater quality.

Areas susceptible to groundwater contamination include areas where wells or permeable soils serve as pathways for contaminants; areas of rapid percolation; areas susceptible to flooding; surface water infiltration areas; and areas where there are no impermeable layers of clay or other material to shield the natural aquifers. Sources of groundwater contamination include wastewater treatment facilities; septic tank leach field; agriculture or landscaping activities that use pesticides or fertilizers; spills or leaks of hazardous materials and waste; leachate from improperly located or mismanaged solid waste disposal sites; and illegally dumped materials and wastes. Abandoned and unused wells can act as conduits to transfer contaminated water form an upper to a lower aquifer.[34]

4.3.2 SIGNIFICANCE CRITERIA

A significant adverse impact to water resources could result if the project would result in either an increase in demand for water or if the project would result in a decline in water quality. As determined by CARB in the Program EIR, a significant impact would result if the proposed amendments to Rule 3 would result in a demand for water by more than 5,000,000 gallons per day, or if the project would result in the construction of any new water conveyance infrastructure. If any one of the following resulted from adoption and implementation of the proposed amendments, there would be a significant impact on water quality: 1) a substantial increase in mass inflow of effluents to public wastewater treatment facilities; 2) a substantial degradation of surface water or groundwater quality; 3) a substantial increase in the area of impervious surfaces, so that interference with groundwater recharge efforts occur; or 4) an alteration to the course or flow of floodwaters. In addition, in the San Francisco Bay, a variety of salinities due to the variable influx of fresh water from the Sacramento River and San Joaquin River and from many other smaller water courses mix with the salt water from the Pacific Ocean that is pushed into the Bay by tidal actions. The varying degrees of salinity are closely associated with Bay and river plant and animal communities. A significant impact would result if the project resulted in a change in salinities by diluting saline water or by diverting fresh water that would normally dilute saline or brackish water, resulting in an increase in salinity in an area.

4.3.3 ANALYSIS OF POTENTIAL ENVIRONMENTAL IMPACTS

i) Water Demand

[34] EIR for the 1991 Clean Air Plan, op. cit.

A projected increase in water demand as a result of the proposed project could occur based on the manufacturing, use and cleanup of water-borne coatings. The CARB Program EIR presented a worst-case scenario for water demand, which assumes that all currently solvent-borne coatings would be replaced by waterborne coatings, and that all waterborne coatings used in California would be manufactured in California. In reality, other coating technologies might be used to substitute for solvent technology, exempt solvent formulations or very high solids formulations. Also, an assumption of no imports of coatings when currently, many major coating manufacturers are based outside of California, is unrealistic. However, based on that scenario, the total demand on water resources from an increase in manufacture of waterborne coatings and water usage to clean up waterborne coatings would be 17,196 gallons per day by 2010. This represents an increase in demand of 0.000334% (3.34×10^{-4}%). This increase in demand, one third of one thousandth of one percent, could not be considered a significant impact.

ii) Water Quality

Potential impacts that might occur as a result of implementing the proposed rule include an increase in the improper disposal of waste. A significant impact could result if there were difficulties associated with waste disposal, however it is relatively easy for sources to safely dispose of waste generated from architectural coatings. As described in the CARB Program EIR for the SCM, based on the South Coast Air Quality Management District's unannounced site visits conducted for its 1996 architectural coatings rule amendments, the majority of contractors currently either dispose of the waste material properly or recycle the waste material.

In addition, the National Paint and Coatings Association has made significant efforts to educate coating users about potential re-use and proper disposal of painting waste products. They have developed online guidance and manuals to assist consumers and communities to set up paint disposal facilities[35]. Also, a number of communities around the Bay Area have set up city or county household hazardous waste disposal programs, often with specific facilities for water based paint. These programs often include educational material for consumers about proper disposal to prevent water and air contamination. The availability of these programs is expected to significantly reduce the amount of paint, especially from consumers, that would be disposed of in a way that would impact water quality, and, in fact, the improper disposal of paint waste products is expected to decline.

Based on a concern for usage of materials determined to be toxic, one trend in the paint and coatings industry is to replace more toxic solvents with less toxic solvents, resulting in less impact on the environment for any waste materials that are improperly disposed. The staff report for the SCM concludes that manufacturers will be able to formulate coatings that will meet the proposed VOC limits without increasing the amount of toxic air contaminants (TAC's) used in coatings. However, to verify this, the SCM and the proposed Rule 3 provide for new annual reporting requirements for coatings containing perchloroethylene or methylene chloride. The purpose of these reports is to assess the need for further regulation of these toxic solvents.

If more water is used for clean up of waterborne coatings, there could be expected to be an increase in the amount of wastewater that would require treatment at publicly owned treatment works (POTW's). In the CARB Program EIR, this increase has been projected for the year 2010 as a result of adoption of the SCM. The following table, part of Table IV-9 in the CARB Program EIR, gives the results for the nine Bay Area counties:

Table 2: Projected POTW Impact from Reformulated Coatings

County	2010 Coatings Disposal (gal/day)	Percentage Increase in Wastewater due

[35] NPCA 2001 Publications and Online Services Update, National Paint and Coatings Association, July/August, 2001

		to Rule 3
Alameda	2,207	0.0014 %
Contra Costa	1,368	0.0021 %
Marin	345	0.0018 %
Napa	191	0.0113 %
San Francisco	1,044	0.0012 %
San Mateo	1,088	0.0019 %
Santa Clara	2,696	0.0016 %
Solano*	639	0.0018 %
Sonoma*	726	0.0029 %
Bay Area Total	**10,304**	**0.0062 %**

* Only a portion of Solano and San Francisco Counties are included in the proposed amendments to Rule 3, however, the table includes projected wastewater increases for the entire county.

The table shows that the impact on the amount of wastewater generated in the Bay Area from adoption of the proposed amendments to Rule 3, less than two thirds of one hundredth of one percent, would not have a significant impact.

iii) Salinity

An increase in water usage would reasonably be expected to be commensurate with a decrease in the availability of water for other uses, including dilution of saline or brackish water with fresh. The assumption, however, of an increase in water usage being all derived from surface water is not founded. However, even if the expectation of increased water usage would all result from surface waters, the amounts projected above could not be expected to have any significant impact on salinities associated with areas in or around San Francisco Bay.

4.3.4 CUMULATIVE IMPACTS

There is no evidence of any adverse incremental effect on water quality. However, there is a potential cumulative impact on salinity if the increase on water demand is considered for the up river regions of the Sacramento and San Joaquin Rivers. An analysis of the increase in water demand, similar to the above for San Francisco Bay, shows an increase in demand of 6,493 gallons/day for manufacture and clean up of waterborne coatings for the Sacramento River and an increase in demand of 6,460 gallons/day for the San Joaquin River, both of which are major tributaries of the San Francisco Bay. Combined with the increase in demand of 17,196 gallons/day for the Bay, one might assume that, if the water reaching and in the Bay would be decreased, there would be less fresh water to dilute the salinity of ocean water coming into the Bay by a total of 30,149 gallons/day. This, however, equates to a decrease in available water of only 5.85×10^{-4}%,or less than six tenths of one thousandth of one percent. This cannot be considered a significant cumulative impact.

The negligible incremental increase in wastewater flow to wastewater treatment plants as well as the negligible increase in water demand cannot be considered cumulatively significant when viewed in context of past, present and future projects.

4.3.5 MITIGATION MEASURES REQUIRED TO REDUCE SIGNIFICANT IMPACTS

Since the proposed project is not expected to result in significant adverse environmental impacts to the hydrology, water quality or salinity of the San Francisco Bay or any of the associated waters or groundwater, no mitigation measures are required.

4.4 Public Services

4.4.1 ENVIRONMENTAL SETTING

Residents of the San Francisco Bay Area are provided with a number of essential public services. These services include fire and police protection, schools, water, electricity and natural gas, sewage and waste disposal, and library services. The services are provided by cities or counties or special districts, such as flood control districts, transit districts and school districts funded through tax monies; or private companies, such as electricity and gas providers or waste disposal funded directly by service users.

Architectural coatings are used by public facilities and public utilities to the extent that they have structures or appurtenances subject to Rule 3, which include bridges owned by the state of California or transit districts, streets and highways owned by the cities, counties and state, school buildings owned by the various school districts, power plants and gas and electricity transmission infrastructure owned by private power providers and distributors, and water storage and transmission infrastructure owned by cities and wastewater infrastructure and processing facilities owned by cities, counties or special districts. Additional examples of publicly owned buildings and structures, the coating of which is subject to this rule, are police and fire stations, prisons, hospitals, administrative buildings, park structures, streetlights and statues.

4.4.2 SIGNIFICANCE CRITERIA

The proposed amendments to Rule 3 would have significant impacts to public services if they resulted in either new or altered government services in any of the following areas: fire protection, police protection, schools, parks and recreational facilities, maintenance of public facilities, or other governmental services. The proposal would have a significant impact on utilities if it would result in a need for new systems or substantial alterations to water, wastewater or solid waste facilities. Public service impacts may also include increased demand on local city or county agencies. Condition baselines for public services in the Bay Area are established by local service standards or ratios. The impacts on utilities must be evaluated based on whether or not the proposal would result in a substantial increase in the consumption of potable water or a substantial increase in demand for water supply treatment or distribution facilities, wastewater treatment and collection capacity, storm water drainage systems, or landfill capacity. Utility impacts may also include an increased demand for hazardous waste-related services and wastewater treatment.[36]

4.4.3 ANALYSIS OF POTENTIAL ENVIRONMENTAL IMPACTS

i) Industry Issue: Additional Maintenance of Public Facilities

A potential significant impact could occur if local agencies were forced to use inferior coatings as iterated under industry issues associated with air quality, above, which would lead to increased maintenance under the proposed rule. Industry has commented that the proposed VOC limits for coatings may cause local agencies to use products that are of an inferior quality or lack the durability of coatings that are currently used. This could lead to an overall greater use of architectural coatings and of agency staff resources to use them. Also, a longer drying time could restrict coating operations in parks to the sunniest and driest time of the year, the summer, when park usage is highest. This would create an impact by restricting public access to at least part of the park in the time period when access was most desirable.

In addition to all the coatings used on the interiors and exteriors of any building, public or private, the following coatings, derived from the specialty coating category in the SCM and the proposed amendments, might see particular use by public agencies: fire resistive and fire retardant coatings, flow coatings, industrial maintenance coatings, recycled coatings, rust preventative coatings, swimming pool and swimming pool repair and maintenance coatings, and traffic marking coatings. Among these coating categories, the ones that currently do not exist in Rule 3

[36] EIR for the 1991 Clean Air Plan, op. cit.

are fire resistive coatings, flow coatings, recycled coatings, rust preventative coatings and swimming pool repair and maintenance coatings. Of the remaining categories, fire retardant coatings and swimming pool coatings are presently exempt, meaning that the VOC content of these coatings is not limited. Fire resistive coatings are a subcategory of the existing category of fire retardant coatings. It was created to accommodate a need for a VOC limit that is not as low as the general flat or non-flat category, as the definition of a fire retardant coating has become more restrictive, allowing only coatings that meet certain flame spread standards and are required by state or local building officials to meet the definition. Flow coatings address a need for a high VOC coating for electrical transformer units. Recycled coatings are an attempt to reduce liquid or solid waste by the reuse of water based latex emulsion coatings, they are required for use by state and some local agencies. The VOC limits accommodate existing formulations even though new latex emulsions will have a lower VOC limit as the proposed limits go into effect. Rust preventative coatings are in part a subcategory of industrial maintenance coatings, used for exterior exposure of metal surfaces, and in part a method to preserve solvent based alkyd technology formerly sold under the category of quick dry enamels when necessary for use on metal. The VOC limit proposed for this category is higher than the proposed future limit for industrial maintenance coatings and quick dry enamels. Finally, swimming pool repair and maintenance coatings are a subcategory of swimming pool coatings. Although the proposed VOC limit, to become effective in January, 2003 would unify the VOC limits for these two categories at 340 grams VOC per liter, in many districts the limits are currently different, usually with a higher VOC limit for the repair and maintenance coatings, so as to repair and maintain older coating systems. In the proposed Rule 3, the 340 g/l limit is effective on different dates for the two categories.

Data collected by CARB staff show that there are many coatings available that will perform at a level equal to that of coatings with higher VOC limits. In fact, these tests conclude that low-VOC coatings compare well with other coatings in all areas of performance, including drying times and durability. CARB analysis of the coatings currently sold in California also found that a fairly large percentage of the coatings marketed meet the proposed VOC limits. Also, the SCM and proposed Rule 3 have many new categories of coating utilized by public service agencies where consideration of coating needs have been shown, resulting in higher VOC limits. Regarding park usage, low VOC coatings were found to have dry times similar to conventional higher VOC coatings, and many of the structures found in a park would tend to be coated with rust preventative coatings, which accommodate solvent-borne formulations as explained above. In the Bay Area, summertime is often not the driest time of the year, particularly in coastal regions. As the rest of the land mass cools in the autumn, or before it heats up in the spring, coastal areas are likely to see more sunny and dry days amenable to painting activities. It cannot be concluded that the public's ability to use parks will be significantly impacted by the proposed amendments. Potential impacts to public services related to water demand and wastewater discharge have been previously discussed, above, in Section 4.3.

ii) Industry Issue: Increased Need for Fire Protection Due to the Increased Use of Acetone

A potential impact could occur if the use of coatings dictated by the SCM and proposed amendments to Rule 3 would result in releases of hazardous or flammable material that would cause a greater fire hazard or a need to store greater quantities of hazardous or flammable material that would need to be inspected by fire agencies at a greater frequency. Industry representatives have commented that the lower VOC limits proposed will lead to a greater use of acetone based coatings, which would result in a greater fire hazard.

CARB staff responded to this concern in the Program EIR for the SCM. It is unlikely that most coatings will be reformulated with acetone to meet VOC limits. The exceptions are lacquers, some floor coatings and some waterproofing sealers. Storage requirements for acetone based coatings are the same as the requirements for other solvent based coatings. In fact, the National Fire Protection Association assigns the same flammability classification to acetone as to toluene, xylene, methyl ethyl ketone, ethyl alcohol and methyl alcohol, all commonly used coating

solvents. Among these compounds, acetone has the lowest flashpoint, the temperature at which the solvent will form an ignitable mixture with air, but the highest lower explosive limit (LEL), the concentration in air at which ignition will cause an explosion. An expected painting temperature of 60°F is above the flashpoints of all the solvents listed except xylene. Acetone also has the highest evaporation rate of the solvents listed, and a lower odor threshold than the two alcohols, approximately the same as methyl ethyl ketone and much higher than toluene and xylene[37]. This indicates that the distinctive odor of acetone may be more noticeable or noticeable sooner than the other solvents. Although it is dangerous to rely on odor as an indicator of fire or explosive danger, this analysis indicates that acetone based coatings do not present a significant increase in flammability or explosivity danger than the solvent-borne coatings they replace. Existing fire codes address paint spraying in confined and open situations, as would be the case with most architectural coating applications. There would, therefore, not be an additional impact on fire service resources.

The Bay Area has no climatic conditions or special provisions of local public services that would suggest a different or more severe impact than those discussed above. In a cooler coastal area, there might be a greater incentive to use coating reformulated with acetone, if both waterborne and solvent-borne formulations were available, but the cooler and more humid air would retard the evaporation rate of any solvent. The provision previously discussed that will allow the use of a higher VOC content for industrial maintenance coatings, based on a petition demonstrating need, was discussed extensively with and agreed to by Caltrans, the state agency primarily responsible for maintaining bridges and road works along coastal areas in the Bay Area. The provision, however, is also available to other users of industrial maintenance coatings, which include many public agencies. Although CARB staff believe that many low-VOC coatings are available, the provision will alleviate expressed concerns about potential difficulty of coating application and curing.

4.4.4 CUMULATIVE IMPACTS

There is no evidence of any adverse incremental impact on the maintenance of public facilities due to the application, performance or durability of coatings subject to this proposal. There is also no indication that any public services would be adversely impacted, including fire services. Consequently, there cannot be considered to be any cumulative impacts that would be considered significant.

4.4.5 MITIGATION MEASURES REQUIRED TO REDUCE SIGNIFICANT IMPACTS

Since there will be no increase in the amount of public services needed to provide maintenance for public facilities, and no increase in the amount of fire protection necessary, the proposed rule amendments to Rule 3 will not exceed any significance threshold in place for the Bay Area. Because there is no significant impact to public services or to fire protection needs from the proposed project, no mitigation measures are required.

4.5 Transportation and Circulation

4.5.1 ENVIRONMENTAL SETTING

The proposed project, amendments to Rule 3 based on the SCM for architectural coatings developed by the staff of the CARB, will affect the jurisdictional area of the BAAQMD. In the District, the nine counties, incorporated cities in the counties and District 4 of Caltrans are the primary agencies responsible for planning, funding, designing, constructing, operating and maintaining streets and highways in the region. The Metropolitan Transportation Commission is responsible for regional transportation planning and general oversight of the efforts of local

[37] New Jersey Hazardous Substance Fact Sheet, op. cit.

agencies. A special service district, the Golden Gate Bridge, Highway and Transportation District, maintains the Golden Gate Bridge and operates inter-county bus and ferry services between Marin, Sonoma and San Francisco counties. Some public transit services in the Bay Area are funded and operated by counties and cities. These include the City and County of San Francisco (MUNI), Fairfield and Suisun City (Fairfield Transit), the City of Napa (Napa Transit), Santa Rosa (CityBus), Sonoma County (Sonoma County Transit), Vallejo (Vallejo Transit), and Marin County (Marin Transit). Various other special service districts also plan, fund, design, construct, and operate public transit services. These include the Alameda Contra Costa Transit District (AC Transit), the Bay Area Rapid Transit District (BART), the Central Contra Costa Transit Authority (CCCTA), the Livermore Amador Valley Transit Authority (LAVTA), the San Mateo County Transit District (SamTrans), the Santa Clara County Transit District (SCCTD), the West Contra Costa Area Transit District (WestCat), and the Delta Transit District (Tri-Delta). Caltrans operates CalTrain service between San Jose and San Francisco.[38]

In spite of a variety of public transit options, the majority of trips in the Bay Area are by automobile. The Bay Area road network is characterized by interstate highways running along both sides of the San Francisco Bay, by highways coming into and exiting the Bay Area from the south, the east along the Sacramento River and over the Altamont Pass, and from the north along through Marin and Sonoma Counties to the Golden Gate. Major arteries also exist along the spine of the San Francisco-San Jose peninsula, and roughly parallel to and further east from the Bay in Contra Costa, Alameda and Santa Clara Counties. The Bay and major rivers are transversed by bridges, the Golden Gate Bridge from Marin to San Francisco Counties, the Bay Bridge, San Mateo Bridge and Dumbarton Bridge across the South Bay, and the Carquinez Bridge, Benicia Bridge and, further east, the Antioch Bridge across the Carquinez Straights, and Sacramento River. The Caldecott Tunnel bores through the hills of the East Bay between Orinda and Oakland. Between the year 2000 and 2010, the number of auto-person trips is expected to increase by over 2,000,000 per weekday, and the vehicle miles traveled per weekday is expected to increase by over twenty million miles. In this time period, trips on public transit are expected to increase by somewhat less than 200,000 per weekday.[39] Traffic congestion is a major concern for Bay Area residents. The bridges and the Caldecott Tunnel, as well as intersections between major traffic arteries, represent congestion points during heavy traffic times. According to the 1998 Highway Congestion Monitoring Program by Caltrans, 112,000 vehicle hours are spent in congested traffic each weekday and the Bay Area has 327 miles of congested roadways each weekday at a daily cost to motorists of over $1.2 million. It has been estimated that commute hours, at which times traffic peaks, now occupy over 5 hours each weekday.

4.5.2 SIGNIFICANCE CRITERIA FOR TRANSPORTATION AND CIRCULATION

During development of the Program EIR for the SCM, CARB staff considered that an impact on transportation or circulation would be considered significant if one of the following criteria were met in any district: 1) the project would result in the need for 350 or more employees; 2) the project would increase heavy-duty truck traffic to or from any facility by more than 350 truck trips per day; or 3) the project would increase customer traffic by more than 700 trips per day. However, in the EIR for the 1991 Bay Area Clean Air Plan, a project impact was considered significant if one of the following criteria were met: 1) a 10 percent increase at any location or time of day in travel time or delay to vehicle drivers, transit passengers, bicycle riders and/or pedestrians associated with increased traffic congestion; 2) an increase in accident hazards for vehicle drivers, transit passengers, bicycle riders, and/or pedestrians associated with an increase in the number of persons or vehicles exposed to a potential accident hazard situation; 3) an increase in travel discomfort associated with overcrowding of passengers on transit vehicles; or 4) an increase in parking demand likely to overflow existing lots and impact local streets.

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[38] 1991 Bay Area Clean Air Plan, op. cit.

[39] San Francisco Bay Area Regional Demographic and Traffic Characteristics, Metropolitan Transportation Commission, (www.mtc.ca.gov, accessed 8/23/01)

4.5.3 ANALYSIS OF POTENTIAL ENVIRONMENTAL IMPACTS

Concern was expressed by industry representatives that the cost analysis does not take into account the additional distribution costs associated with distribution of reformulated coating as a result of modified VOC limits. Based on available data, however, there is no reason to believe distribution costs would increase in a significant way. The proposed amendments to Rule 3 include a sell-through provision. This means that coatings manufactured before the effective dates for VOC limit changes, provided they were in compliance with the requirements of Rule 3 before the changes, could be distributed, offered for sale or sold for three years after the effective dates, and applied at any time after the effective dates. An expectation that stores would be likely to carry coating inventory for over three years, resulting in a necessity for increased distribution trips to deliver newly reformulated coating and take away old, unsellable coating is unrealistic. This is reinforced by manufacturers' recommendations regarding dates by which the coating should be used.

Another issue expressed was the potential for transportation or circulation impacts created by increased trips to landfills due to a need to dispose of additional waste materials. This waste, it was proposed, would come from coatings and containers due to problematic performance characteristics, including shelf life, pot life and freeze-thaw characteristic of certain waterborne low VOC coatings. Comments were also received indicating that out-of-state manufacturers would have to ship coatings to California during the three non-winter seasons to avoid potential freezing en route. It was proposed that this would cause an increase in traffic during spring, summer and fall, especially impacting the high ozone periods.

However, manufacturers have indicated that addition of surfactants will improve freeze-thaw capabilities of water-borne coatings. Large amounts of waterborne coatings are currently in use, and the assertion does not take into account the propensity of consumers to use coatings, especially waterborne coatings, during warmer and dryer weather anyway. Water-borne technology is not new, and consumers can be considered to be familiar with manufacturers' recommendations regarding ambient temperatures and humidity for painting. Also, the NTS study showed that compliant water-borne coatings passed freeze-thaw stability tests. Based on this information, it is determined that there would be no significant increase in distribution or landfill trips.

Another commenter stated that drying times would be longer for low-VOC coatings. As a result, more commute trips would be generated due to the additional days required to complete a project. However, the NTS evaluation of coating products indicates that low-VOC coatings in all categories except lacquers have comparable drying times to conventional coatings. Thus, additional commute trips would not be required for the workers applying the low-VOC coatings. The lacquer category has dry times of from 18 to 30 minutes longer than higher VOC lacquers. This additional dry time is unlikely to result in additional commute trips.

In the Bay Area, one might expect concerns about the impacts from application of coatings in cool and moist climates to be most raised in coastal areas. As mentioned above, concerns about the application of lacquer should be partly alleviated by the provision to add some VOC solvent. In addition, the proposed amendment to Rule 3 that will allow a higher VOC content for industrial maintenance coating upon approval of a petition will also alleviate concerns about application of industrial maintenance coatings. Consequently, there should be no additional amount of truck traffic generated that could be considered significant. In addition, there is nothing in the characterization of the transportation network in the Bay Area that would indicate that there would be any unique or additional impacts beyond what has been considered in the context of the CARB Program EIR.

4.5.4 CUMULATIVE IMPACTS

The expected impacts of the proposed project cannot be considered significant individually. In addition, there is insufficient evidence of individual impacts that could be considered significant if combined. Therefore, the proposed amendments to Rule 3 would not result in cumulative impacts.

4.5.5 MITIGATION MEASURES REQUIRED TO REDUCE SIGNIFICANT IMPACTS

No significant impacts in transportation or circulation are anticipated from the proposed project. Staff does not find any of the significance criteria, either that used by the state or by the district, to have been exceeded. Thus, there are no significant impacts that will require mitigation measures.

4.6 Solid and Hazardous Waste

4.6.1 ENVIRONMENTAL SETTING

The Bay Area has a number of solid waste disposal sites, both active, inactive and closed. Neither closed nor inactive solid waste disposal sites accept waste, however to be closed a site must complete satisfy all the requirements of a solid waste disposal site closure plan filed with the California Integrated Waste Management Board. The Bay Area sites are:

County	Site	Status
Alameda	City of Alameda	Closed
	City of Berkeley	Closed
	Tri-Cities Recycling	Active
	Waste Management of Alameda County	Active
	Browning-Ferris Industries	Active
	Pleasanton Garbage Service	Closed
	GSF Energy	Active
	Turk Island Solid Waste Disposal Site	Closed
	Tony Lema Landfill	Closed
Contra Costa	Contra Costa Sanitary Landfill	Inactive
	Acme Fill Corp	Active
	Keller Canyon Landfill Company	Active
	West Contra Costa Sanitary Landfill	Active
Marin	Redwood Landfill, Inc.	Active
	West Marin Landfill	Closed
Napa	Clover Flat Landfill	Active
	Napa-Vallejo Waste Management Authority	Active
San Mateo	Sunquest Properties (Tuntex)	Inactive
	City of Burlingame	Inactive
	Cypress Amloc Land Company	Active
	Metro Bay Centre	Closed
	Browning-Ferris Industries	Active
	City of Menlo Park	Closed
Santa Clara	South Valley Refuse Disposal	Active
	International Disposal Corporation	Active
	Shoreline Amphitheatre	Closed
	City of Mountain View	Closed
	City of Palo Alto Landfill	Active
	City of San Jose (Singleton Road Landfill)	Closed
	County of Santa Clara	Closed
	Guadalupe Rubbish Disposal	Active

County	Site	Status
	Kirby Canyon Landfill	Active
	Zanker Road Resource Management	Active
	City of Santa Clara	Closed
	City of Sunnyvale Solid Waste Program	Closed
Solano	Potrero Hills Landfill	Active
Sonoma	Sonoma County Department of Public Works	Active

There is currently in excess of 200 million tons of solid waste currently in these Bay Area landfills, which does not include that which is in dozens of small, old landfills that have long since closed. About eight and a half million tons of waste is accepted each year into Bay Area landfills and existing landfills have a total maximum design capacity of approximately 385 million tons.

Leftover coating that has dried may be disposed of as solid waste. Coating which have not dried must be disposed of at a Class I landfill. None of the disposal sites in the Bay Area are active for disposal of Class I hazardous waste. However, most active landfills have hazardous waste collection facilities, often free for consumers for household hazardous waste, which includes paint products. In addition, counties and cities often offer separate locations for disposal of household hazardous waste. Waterborne latex emulsions are often collected for recycling into usable paint product as part of the household hazardous waste disposal program. Contractors can usually use the same disposal facilities, but for a fee.

4.6.2 SIGNIFICANCE CRITERIA FOR SOLID AND HAZARDOUS WASTE

According to the Program EIR for the SCM developed by CARB staff, the proposed amendments would have significant adverse impact on solid or hazardous waste if either: 1) the generation and disposal of hazardous or non-hazardous waste would exceed the capacity of designated landfills; or, 2) the project would not comply with federal state or local statutes and regulations related to solid waste and hazardous waste. In addition, it could be considered a significant impact if the project generated an amount of waste significant enough to impact existing solid waste reduction plans.

4.6.3 ANALYSIS OF POTENTIAL ENVIRONMENTAL IMPACTS

The potential environmental impacts for the proposed amendments deal with increased generation of solid waste or hazardous waste and its disposal. Comments received by CARB staff related to the Program EIR allege that compliant lower-VOC coatings that are water based will not have the same freeze-thaw capabilities as existing coatings, resulting in coating shipped during colder months becoming unusable and requiring disposal in landfills. Also, reformulated coatings will have shorter shelf lives, and, therefore, a certain portion of inventories will have to be disposed of. Further, it was alleged that, as a result of more stringent VOC content limits, specifically for industrial maintenance and floor coatings, manufacturers will formulate more two-component systems that may have, on average, a shorter pot life compared to conventional coatings. Therefore, low-VOC coatings could cure and solidify during the application process, resulting in a portion of coating being unusable, and would need to be discarded into a landfill. Finally concern was expressed that, because the proposed amendments to Rule 3 will require the use of water-borne technologies, more surface preparation in the form of sandblasting will be required. Because sand mixed with cured coating would need to be disposed of in a landfill, this would increase the total amount of waste deposited.

The issue of freeze-thaw characteristics of new water-borne coatings was previously discussed in connection with Section 4.5, Transportation and Circulation, above. A CARB staff investigation into manufacturers' recommendations regarding shelf life revealed that low VOC coating has a recommended shelf life at least as long as conventional higher-VOC coating. In response to the issue of shorter pot life, coating for metal parts and products, subject to another District rule, was reformulated to two component, lower-VOC content coating in the mid-1980's. Although initial

formulations had significantly shorter pot lives, manufacturers quickly added retarders to slow catalytic reactions and allow paint to stay usable longer. The technology since that time has become widely recognized and adopted. Two component coatings are typically not used by consumers. They are used by professional contractors, often for industrial maintenance applications. The contractors are well acquainted with calculations of necessary paint for a job without creating excess waste and with manufacturers' recommendations concerning pot life. Finally, because surface preparation recommendations are the same for low VOC coating as for higher VOC coating, there should not be an expectation of additional sand/paint waste to be disposed of.

For the purpose of the Program EIR, CARB staff estimated impacts on solid waste generation if 5% of coating that currently does not comply with the VOC limits in the SCM and proposed in Rule 3 were produced, suffered freeze-thaw problems and had to be disposed of in landfills, 1% of these coatings were produced, suffered unacceptably short shelf lives and had to be disposed of in landfills, and 10% of floor and industrial maintenance coatings were produced, suffered unacceptably short pot lives and had to be disposed of in landfills. Although this probably overestimates the actual amount of waste that would be generated, the analysis shows that the total amount of solid waste and hazardous waste materials created would not be a significant impact. For the Bay Area, anticipated solid waste impacts based on this analysis would equal 1.7 tons per day. This equates to 0.003%, three thousandths of one percent, of the total permitted Bay Area throughput. Since the average capacity of a refuse truck is 10 tons, the total Bay Area daily waste generated according to this analysis would be less than one fifth of one truck. This cannot be considered a significant increase in the amount of hazardous waste generated.

4.6.4 CUMULATIVE IMPACTS

The analysis referenced above combines estimates of increases in solid waste from separate issues and found that the impacts, considered separately or together, cannot be considered significant. Even in the unlikely event that waste increases as described above, in future years, that waste would decrease as manufacturers improve freeze-thaw characteristics, transportation of product is arranged to avoid freezing conditions, manufacturers adjust formulations to lengthen shelf life, stores arrange more rapid inventory turn-around, and manufacturers will two component coating reaction times or users will mix less for use to avoid product setting before application can be complete. Consequently, any solid waste impacts from new formulations over time will be reduced. Therefore, cumulative impacts cannot be considered significant.

4.6.5 MITIGATION MEASURES REQUIRED TO REDUCE SIGNIFICANT IMPACTS

District staff reviewed potential solid waste impacts regarding local issues that might alter the conclusions reached in the CARB Program EIR and that the analysis and conclusions are equally applicable to the Bay Area. The proposed amendments to Rule 3 would not result in a significant increase in the generation and disposal of solid wastes or hazardous wastes. Disposal of wastes and landfill development and maintenance practices are extensively regulated on a local, state and federal level. The proposed project will not alter any of these requirements. Therefore, staff conclude that no mitigation measures are required.

4.7 Hazards

4.7.1 ENVIRONMENTAL SETTING

When considering hazards associated with the proposed amendments to Rule 3, the environmental setting must consider the context in which architectural coatings are manufactured, distributed and used. Although many coatings used in the Bay Area are not manufactured locally, some are. The basic ingredients of an architectural coating can be broken down into solids and liquids. The solid portion of the coating includes resins, also called binders, and pigment, and some minor ingredients. This is the portion of the coating that ultimately

remains on the surface coated. The liquid portion includes solvent to dissolve and suspend the solid portion, and liquid additives that add a number of functional properties, such as preservatives, flow levelers, wetting agents and freeze-thaw stabilizers. For one component coatings, the liquid portion, which include water and organic solvents, may be generally be considered to enter the atmosphere as the coating dries and cures. For two component coatings, mixed at the application point or shortly before application, some of the liquid may function as a catalyst to a chemical reaction that forms the coating film, and may not enter the atmosphere, although a reaction by-product might.

Coating manufacturers receive solid and liquid ingredients in bulk and process and mix those ingredients at their facilities. The transportation of these bulk materials, depending on the nature of the material, may present certain hazards, the use of these materials may present others. The distribution of manufactured coating may represent hazards, either distribution into the Bay Area from outside or distribution to sales outlets and directly to users from manufacturing facilities inside the District. Finally, use of coating may present hazards, through exposure of users or the public at large to the coatings in the process of application or drying and curing. Hazards include the risk of fire, explosion or the release of hazardous materials in the event of an accident or upset, and the hazards associated with human health through exposure to toxic or carcinogenic materials, either acutely or chronically.

There are certain hazards associated with architectural coating that exist as background for the proposed project. Those include the transportation of solvents in bulk to manufacturers that have flammable, explosive and human health properties associated with them. Those solvents have the potential to cause problems in the event of an accident or upset. In addition, the use of solvents in bulk in manufacturing may cause workers to be exposed to compounds that might have an impact on human health. Generally speaking, the solid content of coating presents much less of a potential for a hazard in the manufacturing process. One exception is the use of pigments. Some pigments traditionally have been made from materials, or compounds of materials, that are considered toxic, such as cadmium and chromium. These can present a hazard in manufacturing when workers are exposed to the materials in dry bulk form that may not be present in the final product, when pigments are bound in resin systems and emulsified in liquid. The distribution of coating presents the potential for additional hazards. The coatings in finished form may be flammable or explosive and may, if released in bulk in the event of an accident, present a human health hazard that may be absent in smaller quantities. Finally, the application of coatings may present hazards. Of particular concern in this final category is the exposure of either coating applicators or the general public to materials that may be released as the coating is applied or as it dries and cures. In this final category, liquids and reaction by-products that do not end up in the final coating film must be considered for their impact on human health.

Coatings use a number of solvents in the manufacturing at present that are flammable, explosive or have human health impacts. A partial list of solvents used in existing coating formulations, both water-borne and solvent-borne, follows: toluene, xylene, methyl ethyl ketone, stoddard solvent, ethyl alcohol, methyl alcohol, ethylene glycol monobutyl ether (EGBE), ethylene glycol monoethyl ether (EGEE), and ethylene glycol monomethyl ether (EGME). These represent the most commonly occurring solvents, by volume. There are established health effects associated with these solvents. Threshold Limit Values (TLV's) have been established by the American Conference of Governmental Industrial Hygiene, Permissible Exposure Limits (PEL's) and Short Term Exposure Limits (STEL's) have been established by the Occupational Safety and Health Administration, and Immediately Dangerous to Life and Health (IDLH's) levels have been established by the National Institute for Occupational Safety and Health. In addition to these, in development of the Program EIR, CARB staff utilized established Health Risk Assessments (HRA's) to evaluate conventional and replacement solvents. An HRA determines the likelihood of an individual contracting cancer or experiencing other adverse health effects from exposure to a toxic air contaminant. Risks from exposure to carcinogens are expressed as an added lifetime risk of contracting cancer due to exposure to a carcinogen.

4.7.2 SIGNIFICANCE CRITERIA

The proposed amendments to Rule 3 would be considered to have significant adverse hazard impacts if any one of the following criteria is exceeded: 1) the project results in a substantial number of people being exposed to a substance that causes irritation; 2) the project results in one or more people being exposed to a substance causing serious injury or death; or 3) the project creates substantial human exposure to a hazardous chemical. In the April 1996 BAAQMD CEQA Guidelines, the threshold for significance for exposure to toxic air contaminants is when either: 1) the probability of contracting cancer for the Maximally Exposed Individual (MEI) exceeds 10 in one million; or 2) ground level concentrations of non-carcinogenic toxic air contaminants would result in a Hazard Index greater than 1 for the MEI. The Hazard Index (HI) is defined as the ratio of the estimated exposure level to the reference exposure level.

4.7.3 ANALYSIS OF POTENTIAL ENVIRONMENTAL IMPACTS

i) Industry Issue: Increased Use of Acetone Might Increase Exposure to Hazards

The proposed rule amendments will require the reformulation of prospectively non-compliant coatings in order to achieve more stringent VOC standards. Coating manufacturers may choose to reformulate coatings using exempt solvents as a replacement for existing, regulated solvents. To the extent that exempt solvents, in particular, acetone, could be accidentally released into the environment, exposure to this hazardous substance could result. Acetone usage has been increasing as a result of a finding of negligible photochemical reactivity by the US EPA and exemption in district coating rules. Acetone was made exempt in Rule 3 by action of the District Board on November 4, 1998.

An increase in the amount of acetone used to reformulate coatings may increase the number of trucks or rail cars that transport acetone to Bay Area manufacturers. However, individual trucks and rail cars that ship flammable and hazardous materials are already equipped to safely transport this solvent and will not be affected by the proposed rule amendments. In the event of a spill, the procedures involved are not different for acetone than for solvents that acetone would replace, which are also flammable. Therefore, the probability of a release of acetone that would expose a proportion of the population to this hazardous substance would be offset by the reduction in probability of a release of some conventional solvent. The flammability characteristics of acetone compared to other solvents have previously been discussed in Section 4.4, Public Services, above. There is also a risk of exposure to hazards associated with an increased use of acetone in a manufacturing facility. Manufacturing facilities routinely deal with solvents and must be cognizant of the flammability and explosivity of each solvent they deal with. Consequently, they are already equipped with grounded equipment to eliminate the possibility of an explosion due to an electrical spark, and have numerous safety procedures associated with handling and blending solvents to produce coatings. The coatings themselves, once reformulated with acetone, would not become significantly more flammable than solvent based coatings using regulated solvents. For users, handling, storage of and solvent laden waste from acetone reformulated coatings might be an issue. Manufacturers of conventional solvent based coatings, however, already include use, handling and storage instructions. For example, recommendations for storage, cleaning and disposal of brushes and rags might proscribe procedures to avoid spontaneous combustion, such as immersion of rags in water. The CARB Program EIR did not find any significant increase in hazards associated with reformulation using acetone. It should be noted that reformulation with exempt solvents is only one of the potential avenues for a manufacturer, and acetone is only one of the possible solvent replacements, although it is attractive given it's relatively inexpensive price and good solvency characteristics. The other possibilities are water-borne formulations and higher solid formulations. Each of these possibilities, especially water-borne, represents a probable decrease in exposure to flammable or explosive hazards.

ii) Industry Issue: Low VOC Compounds Increase Exposure to More Toxic Compounds

Waterborne coatings may contain glycol ethers (EGBE, EGME or EGEE) or their acetates, useful as coalescing solvents. These solvents have TLV's that are significantly lower than many standard coating solvents. In addition, the OSHA PEL's are lower, with the exception of EGEE, and STEL's have not been established. The IDLH for EGBE and EGEE is comparable to xylene and toluene, all of which are higher than the IDLH for EGME. The National Institute for Occupational Safety and Health recommended occupational exposure limit to EGME and it's acetate is only 0.1 part per million, and the recommended occupational exposure limit for EGBE and EGEE and their acetates is 0.5 parts per million. The CARB Program EIR indicates that the trend in coatings technology is to replace EGME with less toxic/less hazardous coalescing solvents such as Texanol® and propylene glycol. Additionally, the Program EIR indicates that a majority of water-based formulations (flats and nonflats) do not contain solvents that are classified as hazardous air pollutants (HAP's). The CARB Program EIR concluded that the potential for increased use of toxic compounds to reformulate coatings is not significant. In addition, there is a provision in the SCM, and proposed in Rule 3, that requires annual reporting of the amount of exempt, but toxic, solvents used to monitor for the possibility of increased use. These toxic compounds, methylene chloride and perchloroethylene, are unlikely to be significantly used as reformulation alternatives. Although exempt, they are not particularly good solvents for many coating resin systems. Perchloroethylene is not exempt in Rule 3. Methylene chloride is proposed to be deleted from the list of exempt compounds in the VOC definition.

Some reformulated two-component industrial maintenance coatings contain diisocyanate compounds. Diisocyanates are liquids that are part of the chemical reaction of the two component systems. One particular diisocyanate, TDI, is a carcinogen, however, there are replacement diisocyanates which are not. Industry representatives have alleged that two-component systems may increase to replace water-borne systems as a result of the proposed low-VOC standards. The use of diisocyanates in the manufacturing process may cause worker exposure, however, manufacturers routinely deal with toxic compounds and would be able to properly equip workers to deal with all manner of potentially hazardous chemicals. The greater concern is exposure of applicators and of any downwind receptors to diisocyanates released in the coating application process. As mentioned, diisocyanates are not intended to be emitted in the way that solvents used in one component coatings are, instead they are designed to be part of the catalytic reaction that forms the coating film. The application of two-component industrial maintenance coating is usually done by applicators who are specialists in this type of application. Training courses exist which feature safety procedures, and coating application companies frequently participate in these courses so that they can add that certification to their advertising. The specialization required to apply diisocyanate systems implies that applicators will likely be acquainted with employing proper respiratory procedures to protect workers. Also, the use of a plural component application system, a spray gun that mixes to a specification in the gun, can reduce the probability of diisocyanate emissions caused by improper mixing. It is therefore unlikely that an increase in diisocyanate-containing systems will result in a significantly higher amount of worker exposure to toxic compounds.

The CARB Program EIR evaluated the potential for impacts on downwind receptors. For TDI, the increase in cancer risk of one in one million for a MEI would occur at less than a gallon of coating usage per day for individuals less than 100 meters away. However, the calculation is based on chronic exposure, that is, for individuals exposed for seventy years or for forty-six years in a worker setting. Because exposure is expected to be limited due to the infrequent nature of painting and to the industrial setting of most applications of industrial maintenance coating, the risk to a receptor exposed occasionally every several years for several days or, at most, several weeks is significantly less. For example, for painting once every five years for five days, the worker exposure level would not be significant until the project used over 85 gallons of coating per day. The residential exposure level would not be significant until the project used 130 gallons of coating per day. The Program EIR concludes that potential impacts to downwind receptors from diisocyanate exposure are not significant.

There is no discernable reason why any aspect of the Bay Area environment should create any significantly greater hazard for workers or the general public from the adoption of the proposed amendments to Rule 3 than would any other area of the state. Therefore, the findings in the CARB Program EIR are equally applicable to the Bay Area. As previously noted, the proposed amendments to Rule 3 also include a provision to allow a limited amount of industrial maintenance coating at higher VOC levels than would otherwise be required. This provision would offset some of the potential impacts from conversion to low-VOC coating alleged by industry representatives, such as increased use of diisocyanates and increased use of glycol ethers.

One aspect of the Bay Area environment that might lead one to conclude that more industrial maintenance type coating would be used, is in coastal environments where it is cooler and more humid. However, in addition to the provision mentioned above, rust preventative coating is a new category created in the SCM and in proposed amendments to Rule 3. Rust preventative coating is to be used on metal substrates, to protect them from corrosion. The category accommodates existing solvent-borne formulations, so it can reasonably be expected that metal substrates that were formerly protected with industrial maintenance coating, but that were not in industrial settings, such as schools, hospitals, and commercial establishments, will now be protected with solvent-borne rust preventative coating.

4.7.4 CUMULATIVE IMPACTS

Potential cumulative impacts related to a potential increase in fire danger or accidental spills are not considered to be significant. This is because any new solvents used in manufacturing coating would be replacing existing solvents with equally as great a potential to cause a fire or accident hazard. Potential cumulative impacts related to human health due to potential exposure to toxic or carcinogenic compounds over time may be assessed by examining chronic exposure. The CARB Program EIR examined chronic exposure of conventional and replacement solvents in terms of gallons per day use that would result in a downwind receptor experiencing a Chronic Hazard Index of 1.0. To exceed the Chronic Hazard Index (ratio of lifetime expected exposure to a lifetime reference exposure) of 1.0, far fewer gallons of coating containing the conventional solvents toluene, xylene and methyl ethyl ketone need be used than do coatings containing replacement solvents propylene glycol or ethylene glycol. Although unlikely to be used as a replacement, even methylene chloride-containing coating usage may exceed that of toluene, xylene or methyl ethyl ketone-containing coating usage before triggering the Chronic HI of 1.0. The glycol ether-containing coatings (EGBE, EGEE, and EGME) have a lesser gallonage allotment to exceed the HI than do conventional solvent-containing coatings for downwind receptors (EGEE-containing coating is equivalent to toluene-containing coating). The glycol ethers are used in coatings currently. CARB staff reviewed product data sheets for coatings that currently comply with the proposed VOC limits and found that the use of glycol ethers is being replaced by less hazardous coalescing solvents.

For downwind receptors at a distance of 25 meters, the only coating usage that would exceed the Chronic Hazard Index of 1.0 at an expected usage of 25 gallons per day or less is the diisocyanates. However, as previously discussed, chronic exposure is based on continuous exposure for 46 years or 70 years for workplace or residential exposure. Exposure to emissions from architectural coatings, in particular, to industrial maintenance coatings that might contain diisocyanates, is infrequent. Industrial maintenance coating is expected to be durable and provide long-lasting protection for substrates in harsh conditions. The exposure of a downwind receptor to emissions from industrial maintenance coating would be expected to be less than would be expected from non-industrial types of coating, more often single component systems designed for the non-sophisticated consumer or unspecialized contractor.

Cumulative impacts should also be considered for any potential impacts due to combined usage of industrial maintenance coating and other architectural coating. However, as previously

mentioned, the use of toxic materials such as glycol ethers and their acetates in coating that complies with the proposed VOC limits is declining. That trend is expected to continue. The exposure to emissions from non-industrial architectural coating and to industrial maintenance coating has little probability of being additive. This is because existing sites are set in different areas, and planning requirements, already in place in all cities and counties in the Bay Area will not allow the type of industry that would typically use industrial maintenance coating to be located in or near residential settings. Consequently, any cumulative impacts from adoption of the proposed amendments to Rule 3 cannot be considered to be significant.

4.7.5 MITIGATION MEASURES REQUIRED TO REDUCE SIGNIFICANT IMPACTS

Potential hazard impacts in the Bay Area that result from the proposed Rule 3 amendments are not expected to be significant. The increased use of acetone will generally be balanced by reduced usage of other hazardous materials. Emergency contingency plans that are already in place throughout the Bay Area are expected to minimize potential hazards impacts posed by an increased use of acetone in future compliant coatings. In addition, existing fire codes ensure adequate conditions are in place to protect against hazard impacts. Thus, no mitigation measures are required.

It is expected that resin manufacturers and coatings formulators will continue the trend of away from usage of toxic or hazardous solvents in future low-VOC coatings. Future architectural coatings, even projecting changes due to the imposition of lower VOC limits, will likely contain less toxic and carcinogenic compounds than do existing architectural coatings. Although manufacturers will continue the trend away from these compounds, the a reduction in the allowable VOC content of industrial maintenance coating might increase the use of diisocyanates. However, applicators of these coatings will have adequate safety procedures to protect against exposure and the exposure of downwind receptors is not expected to be individually or cumulatively significant. Consequently, no mitigation measures to protect human health are required.

5. OTHER REQUIRED CEQA TOPICS

5.1 Introduction

This section presents the following topics that are required to be addressed in the EIR pursuant to CEQA and the CEQA Guidelines: Environmental Impacts Found Not to be Significant, Irreversible Environmental Changes, Potential Growth-Inducing Impacts, and Consistency with Other Plans. The findings in this section incorporate, by reference, the findings in the CARB Program EIR.

5.2 Environmental Impacts Found Not to be Significant

The CARB Program EIR found no possibility of significant impacts resulting from adoption and implementation of the SCM for each of the following CEQA considerations. In addition, District staff reviewed the following considerations and found that there were no potential significant impacts in the Bay Area based on the proposed amendments to Rule 3: Architectural Coatings.

5.2.1 LAND USE AND PLANNING

Implementation of proposed amendments to Rule 3 will not cause any adverse impacts to land uses or land use planning in the Bay Area. Although no significant increase in architectural coating activity is expected, if it were, it would not result in any new construction not already planned or that would be planned and would not result in any land use impacts.

No new development or alterations to existing land use designations will occur as a result of the proposed Rule 3 amendment adoption. It is not anticipated that existing land uses would require additional land or require rezoning to continue current operations. Land use and other planning considerations are determined by local governments. No additional planning considerations are necessary nor will existing planning considerations be altered by adoption of the proposed project. Therefore, no adverse impacts affecting existing or future land uses are expected.

5.2.2 POPULATION AND HOUSING

Adoption of the proposed amendments will primarily affect the formulation of architectural coatings and cannot be expected to generate any significant effects, either direct or indirect, on the Bay Area population, as no significant amount of additional workers are anticipated to be required. Furthermore, adoption of the proposed amendments is not expected to cause a relocation of population within the Bay Area. As a result, housing is not expected to be affected by the proposed amendments. The amount or types of new housing construction is not expected to be affected by the use of reformulated lower-VOC coatings.

Additionally, adoption of the amendments to Rule 3 is not expected to contribute to any significant housing cost increases. As part of the staff report to accompany the proposed amendments to Rule 3, cost and socioeconomic conclusions are developed. It is anticipated, based on the CARB Staff Report that accompanied the SCM adoption, that there would be no significant difference in cost to consumers between compliant and existing non-compliant coatings. Direct economic impacts are not required to be analyzed pursuant to CEQA unless they also have a significant, direct effect on physical environmental parameters

5.2.3 GEOPHYSICAL

Architectural coatings are applied to buildings, stationary structures, roads, etc. The proposed amendments to Rule 3 limit the VOC content of these coatings and require certain labeling and reporting requirements of manufacturers. There is no possibility that the proposal will have

effects on any geophysical formations, nor is there any possibility that residents will be exposed to any additional geophysical hazards.

5.2.4 BIOLOGICAL RESOURCES

Adoption of the proposed amendments have no possibility to cause any adverse impact to sensitive habitats of plants or animals because all activities will occur at construction, industrial, institutional, commercial or residential sites either already in operation or planned. No new development that could potentially adversely affect plant and animal life is anticipated as a result of these amendments. Potential impacts to aquatic life from releases of any paint and associated wastewater disposed of in sewers and storm drains are discussed in Section 4.3: Water, above. The analysis of water quality impacts to both groundwater and surface water concluded that implementing the revised rule would not generate significant adverse water quality impacts.

5.2.5 ENERGY AND MINERAL RESOURCES

i) Electricity

The proposed project relies on limitations of VOC content in each container of architectural coating. Unlike many District rules, there is no alternative control potential in the Rule based on the use of add-on control equipment such as thermal oxidization or carbon adsorption. Because add-on control equipment will not be used to comply with the provisions of Rule 3, no additional energy use is expected from such equipment. Any energy use associated with increased use of specialized spray equipment (plural systems) to apply reformulated two-component coatings can be expected to be negligible. There will be no increases in electricity consumption from implementation of the proposed amendments. Consequently, electricity use impacts are not considered to be significant.

Some industry representatives have asserted that adoption of lower VOC limits in the SCM and proposed in Rule 3 would increase the demand for electrical power to manufacture more coatings than are currently manufactured. This comment is based on the allegation that low-VOC coatings are inferior to high-VOC coatings, therefore an overall increase in coatings use will result. The issues that were alleged to result in greater coating manufacturing and usage have been analyzed in the CARB program EIR and in Section 4.2: Air Quality, above. Although manufacturers in and outside of the Bay Area will be manufacturing coatings to new formulations, the potential for a significant increase in manufacturing demand is not founded, therefore an increase in electricity demand is not expected.

ii) Natural Gas

Electricity will be the source of energy used to power any additional spray equipment or manufacturing equipment operated at various sites in the Bay Area. Consequently, there are not expected to be any impact foreseeable to the usage of natural gas.

iii) Fossil Fuels

Implementation of the proposed amendments to Rule 3 is not expected to increase the consumption of nonrenewable fossil fuel resources (diesel and gasoline) within the Bay Area. As analyzed in the CARB Program EIR and under Section 4.6: Transportation and Circulation, above, it is not anticipated that there will be additional trips associated with more frequent application of reformulated coatings, nor will there be additional trips due to increased disposal of coatings. Any incremental increase in fuel usage is expected to be negligible. Therefore, fossil fuel energy impacts from implementing of this proposal cannot be considered significant.

iv) Mineral Resources

Some industry representatives have asserted that implementation of the VOC limits proposed in the SCM would require the increased production of coatings in the future. It has been alleged

that this would result in the disposal of more paint cans, resulting in a wasteful use of a mineral resource (metal). As discussed previously, available information on low-VOC coatings contradicts the assertion that more low-VOC coatings would need to be manufactured than would otherwise be necessary with conventional coatings. In addition, metal paint cans are recyclable, once emptied of paint. Recycling centers already exist for paint and metal containers. Consequently, the SCM and proposed amendments to Rule 3 cannot be expected to result in a wasteful use of mineral resources.

A comment received during the environmental review process for the CARB SCM for Architectural Coatings stated that there could be non-renewable resources impacts resulting from the use of non-paint alternatives such as vinyl or aluminum siding or interior wall coverings, in lieu of unsatisfactory paints. The allegation is highly speculative. The use of non-painted substrates such as siding or unpainted concrete are used throughout the Bay Area currently. However, the use of these products has nothing to do with the availability of coatings, but more with stylistic preferences. Implementation of proposed lower VOC limits is not expected to result in substitution of paint with non-paint alternatives.

5.2.6 NOISE

No significant noise impacts are associated with the use of architectural coatings. Coatings formulators that are potentially affected by proposed amendments to Rule 3 are predominantly located in existing industrial or commercial areas. These facilities are subject to existing local noise standards. In addition to noise generated by current operations, noise sources in each area include nearby freeways, truck traffic to adjacent businesses, and operational noise from adjacent businesses.

In general, the primary noise source at existing facilities is from vehicular traffic. Noise is primarily generated during operating hours, which generally range from 6 a.m. to 5 p.m. Monday through Friday. The proposal is not expected to alter noise from any existing noise-generating source. Because local noise ordinances are already in effect, no additional noise impacts are expected from the proposed project.

A comment received by CARB staff on the draft Program EIR indicated that because water-borne coatings require more thorough surface preparation compared to solvent-borne coatings, and because solvent-borne primers would no longer be available if the lower VOC limits in the SCM were implemented, more power washing and abrasive blasting would occur, generating noise in residential as well as industrial areas. The likelihood of the necessity of additional surface preparation was discussed in Section 4.2: Air Quality, above, as was the likelihood of the necessity of additional coats, creating the need to operate spray equipment more in residential areas, as was alleged in another comment. Low-VOC coatings do not require substantially different surface preparation than conventional coatings, nor is additional preparation recommended. Were there additional power washing or abrasive blasting, it would be subject to the same local community noise standards as are current practices. The alleged necessity for additional coats because of low VOC content is unfounded. Consequently, no additional noise is expected as a result of adoption of the proposed amendments.

5.2.7 AESTHETICS

The proposed amendments to Rule 3 do not require any changes in the physical environment that would obstruct any scenic vistas or views of interest to the public. In addition, no major changes to existing facilities or stockpiling of additional materials or products outside of existing facilities are expected because any physical changes would occur at existing industrial or commercial sites. Therefore, there is no possibility that an adverse significant impact to existing visual resources such as scenic views or vistas would occur.

A comment received by CARB staff on the draft Program EIR was that the aesthetics impacts resulting from the ban of over 90 percent of all architectural coatings must be analyzed. Implementation of the VOC limits contained in the ARB SCM and proposed for Rule 3 will not result in the ban of over 90 percent of all architectural coatings, as low VOC coatings that meet the proposed VOC limits are already available and are being used for many applications. In addition, the provisions of Rule 3 that will allow a limited amount of higher VOC industrial maintenance coating to be used and the provision that will allow rust preventative coating and a number of small volume coating categories will preserve many conventional solvent based formulations. The analysis by CARB staff on currently available coating products that will comply with the proposed VOC limits and which have performance characteristics comparable to conventional coatings, indicates that coatings will be available to meet the lower VOC limits and far fewer than 90 of coating products will be banned. Therefore, no aesthetic impacts can be expected.

Another comment received during the by CARB staff on the Program EIR stated that the aesthetics impacts from the elimination of the anti-graffiti coatings category must be analyzed. The existing Rule 3 has no anti-graffiti coatings category. Anti-graffiti coatings were traditionally either classified as tile-like glaze coatings or industrial maintenance coatings. There is no proposed category for tile-like glaze coatings in the SCM or proposed in Rule 3. Based on the availability of anti-graffiti systems that comply with the proposed VOC content limits, CARB staff found that anti-graffiti coatings will not be banned by imposition of the low VOC limits. Anti-graffiti coatings willfall into the categories of industrial maintenance coatings, flats or non-flats. Adoption of proposed amendments to Rule 3 cannot be expected to result in any significant aesthetic impacts.

5.2.8 CULTURAL RESOURCES

There are existing laws that protect and mitigate potential impacts to cultural resources. Should archaeological resources be found during the application of architectural coatings to newly constructed or existing structures, the application of such coatings, and of construction, would cease until a thorough archaeological assessment was conducted. Furthermore, the application of architectural coatings would almost always occur after construction, where archaeological resources would have already been discovered. The proposed amendments to Rule 3 are therefore not anticipated to result in any adverse impact on any cultural resources in the Bay Area.

A comment received by CARB staff on the draft Program EIR stated that implementation of the VOC limits in the SCM may jeopardize the maintenance of historic buildings because the unavailability of traditional coatings will make maintenance of these buildings more difficult. The commentator stated that it might not be possible to find acceptable substitute products to maintain both the historical and physical integrity of these structures, which is considered especially problematic with the elimination of solvent-borne primers. CARB staff did not agree that there would be any such impacts. Based upon information on currently available products that comply with proposed VOC limits, performance characteristics of low-VOC products should be sufficient to meet the weathering impacts on outdoor structures. As discussed previously in Section 4.2: Air Quality, the review of the NTS study and product data sheets indicated that water-borne coatings have durability characteristics similar to conventional, solvent-borne coatings and thus do not require more touch-up and repair work. Water-borne primers also have performance characteristics similar to solvent-borne primers. Consequently, historic structures will be adequately protected after low VOC coatings replace existing higher-VOC formulations. Also, the historic integrity of structures is not based on the use of historic coating systems, but rather the architectural detailing. Typically, historic structures, including statuary and architecture, that are by nature more difficult to preserve because of the age of their construction materials, are protected with the best technology available. The history of regulation of architectural coatings, which dates from 1978, has not resulted in the destruction of historic buildings or the degradation of historic integrity. Therefore, the historic integrity of historic

structures cannot be expected to be compromised because of proposed lower VOC limitations. No significant adverse impacts to cultural resources can be anticipated as a result of adoption of the proposed amendments to Rule 3.

5.2.9 RECREATION

It cannot be expected that adoption of proposed amendments to Rule 3 will generate additional demand for or otherwise affect land used for recreational purposes. Further, as already explained in the Land Use and Planning, Aesthetics, and Cultural Resources sections above, the proposed revisions are not expected to have any adverse effects on land uses in general. No adverse effects on recreational facilities can be expected.

In comments received by CARB staff on the SCM, some industry representatives have indicated that demand for parks would increase due to increased job losses and unemployed workers. This allegation is directly contrary to claims of increased coating usage due to lower VOC, which would create additional jobs. Adoption of lower VOC content limits as are proposed in Rule 3 is not expected to result in significant job losses and any job loss impact is properly assessed in socioeconomic analysis that will accompany the staff report for the proposed amendments. The implication that job losses would result in a significant impact on parks and recreation areas is speculative.

5.2.10 ECONOMIC IMPACTS

Under CEQA, detailed analyses of economic effects are necessary only when such effects have significant impacts on physical environmental parameters. Proposed amendments to Rule 3 would establish VOC content limits for various categories of architectural coatings, and this would have no impact on physical or environmental parameters. However, the staff report that will accompany the proposal will contain an analyses of the economic impacts associated with the rule revision.

5.3 Irreversible Environmental Changes

CEQA Guidelines § 15126(c) requires an environmental analysis to consider "any significant irreversible environmental changes which would be involved if the proposed action should be implemented." In particular, CEQA Guidelines § 15126.2(c) indicates that "[u]ses of nonrenewable resources during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also, irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified."

The following impact areas have been evaluated in this draft EIR, as well as in the CARB Program EIR: air quality, water, public services, transportation and circulation, solid and hazardous waste, and hazards. The analyses presented in this draft EIR and in the CARB Program EIR concluded that no significant adverse project-specific or cumulative impacts would occur to any of these environmental areas.

For example, the air quality impacts analysis included an evaluation of eleven issues, nine identified by industry, regarding potential adverse air quality impacts of the project. The analysis of these issues concluded that the proposed project would not have a significant adverse impact on air quality. Likewise, the analysis of potential water impacts, potential public service impacts, potential transportation and circulation impacts, potential solid and hazardous waste impacts, and potential hazards impacts showed that there could not be a reasonable expectation of significant adverse impacts associated with the adoption of the proposed amendments to Rule 3.

Architectural coatings are used on stationary structures and their appurtenances, and on pavements and curbs. The planning, design and construction of structures and pavements such as highways could lead to irreversible environmental changes, such as providing ready access to previously inaccessible areas or the creation of structures on what was previously undeveloped or agricultural land. These projects in themselves require CEQA analysis, however, the application or re-application of architectural coatings to structures or pavements would not trigger any irreversible changes to any environment.

The production of coatings does use a number of irreplaceable natural resources, among them minerals to produce pigments and oil resources to produce solvents. As architectural coatings are already being produced that use these resources, the proposed amendments will only dictate a change in the types of solvents being used. The natural mineral resources in use to produce pigments are expected to remain relatively unchanged. The use of oil resources are expected to decrease, as allowable VOC contents of various categories of coatings are reduced. The oil resources are expected to be replaced by water, and, to a lesser extent, synthetic chemicals. As examined previously, in Section 4.2: Air Quality, the amount of coating used is not expected to significantly increase, and, based on the CARB survey of coatings currently available to meet the proposed VOC limits, much of the potential replacement of solvents has already occurred. Also, based on the analysis presented in Section 4.3: Water, the potential impact on water resources has been determined to be less than significant. Consequently, the proposed amendments to Rule 3 are not expected to produce any irreversible environmental changes or produce any irretrievable commitment of resources.

5.4 Potential Growth-Inducing Impacts

CEQA Guidelines § 15126(d) requires an environmental analysis to consider the "growth-inducing impact of the proposed action." CEQA Guidelines § 15126.2(d) states that the EIR shall "[d]iscuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment."

Adoption and implementation of the proposed amendments to Rule 3 and will not have any direct or indirect growth-inducing impacts on population or on the economy. The production and application of architectural coatings does not affect the decision making process concerning new development or housing allocation. As iterated in Section 5.2.1: Land Use and Planning, Section 5.2.2: Aesthetics, and Section 5.2.8: Cultural Resources sections, amendments to Rule 3 will not have any effect on planning or land use decisions, or on California or Bay Area population. Any potential adverse impacts on the Bay Area economy, such as job losses, will be assessed in the economic analyses as part of the staff report for the proposed amendments.

5.5 Consistency With Other Plans

CEQA Guidelines § 15125(d) states that "[t]he EIR shall discuss any inconsistencies between the proposed project and applicable general plans and regional plans. Such regional plans include, but are not limited to, the applicable air quality attainment or maintenance plan or State Implementation Plan, area wide waste treatment and water quality control plans, regional transportation plans, regional housing allocation plans, habitat conservation plans, natural community conservation plans and regional land use plans for the protection of the Coastal Zone, Lake Tahoe Basin, San Francisco Bay, and Santa Monica Mountains." The following is a brief discussion of how the proposed amendments to Rule 3 is consistent with these plans.

5.5.1 CONSISTENCY WITH STATE IMPLEMENTATION PLAN

It has been determined that the proposed amendments to Rule 3 will result in a net benefit to air quality, so the project is consistent with EPA policy associated with the State Implementation

Plan (SIP). In the San Francisco Bay Area 2001 Ozone Attainment Plan for the One Hour Standard, there is a commitment to reduce emissions from architectural coatings based on adoption of the SCM. This commitment is expected to reduce VOC emissions to the atmosphere by 2.9 tons per day, which represents 35 percent of the specifically iterated total VOC emissions reductions from stationary sources. Consequently, the proposed amendments are not only consistent with the SIP, but an integral part of it.

5.5.2 CONSISTENCY WITH DISTRICT PLANS UNDER THE CALIFORNIA CLEAN AIR ACT

It has been determined that the proposed amendments to Rule 3 will result in a net benefit to air quality, so the project is consistent with the California Clean Air Act. Reduction in VOC emissions from architectural coatings based on Rule 3 amendments is included in the District's 1991 Air Quality Plan for attaining the state ambient air quality standard for ozone, and has been included as a stationary source control measure in each subsequent Clean Air Plan Update and Triennial Assessment, including the 2000 CAP.

5.5.3 CONSISTENCY WITH AREA-WIDE WASTE TREATMENT AND WATER QUALITY CONTROL PLANS

It has been determined that adoption of the proposed amendments to Rule 3 will not cause a significant adverse impact on the ability of Publicly Owned Treatment Works to treat and handle wastewater. It has also been determined that the proposed amendments cannot be expected to create any significant adverse impact on water usage or water quality through illegal discharge. Finally, it has been determined that the amendments will not have a significant adverse impact on the amount of solid waste that must be disposed of. Therefore, the project is consistent with existing waste treatment and water quality plans.

5.5.4 CONSISTENCY WITH REGIONAL TRANSPORTATION PLAN

The Metropolitan Transportation Commission is responsible for development of the Regional Transportation Plan. The update, required each three years, is currently in draft form and will be the subject of upcoming hearings.[40] The goals of the plan are to improve mobility of persons and freight, improve safety, promote equity for transportation system users, enhance environmental sensitivity, sustain economic vitality and to promote livable communities. In Section 4.5: Transportation and Circulation, above, it was determined that the proposed amendments to Rule 3 will not create any significant adverse impacts on traffic or congestion as a result of the low-VOC limits proposed. Any additions to the transportation infrastructure, roadways, bridges, public transit systems, stations or stops will require the use of architectural coatings, however, due to the expected availability and performance of currently available and project coating systems, it cannot be expected that any element of the regional transportation plan can be impacted by the proposed amendments.

5.5.5 CONSISTENCY WITH THE SAN FRANCISCO BAY PLAN

The San Francisco Bay Plan, and the McAteer-Petris Act, adopted by the California Legislature in 1969, and the federal Coastal Zone Management Act of 1972, recognizes the Bay as the most valuable natural asset in the Bay Area and provides for protection of the Bay from gradual destruction. The Bay Plan balances conservation requirements with appropriate shoreline development, and among the primary objectives is to prevent filling of the Bay.[41] Although architectural coatings will be used on any structures built into or on the Bay, or on any Bay fill, the

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[40] Draft Regional Transportation Plan, Metropolitan Transportation Commission, (www.mtc.ca.gov), August 14, 2001

[41] San Francisco Bay Plan, Bay Conservation and Development Commission, (www.bcdc.ca.gov), April 15, 1999

use of architectural coatings themselves, either before or subsequent to the proposed amendments to Rule 3, will have no impact on any plans or proposals that would be consistent with, or contrary to, the provisions of the Bay Plan. Therefore, the proposed amendments cannot be considered to be inconsistent with the provisions of the San Francisco Bay Plan.

5.5.6 CONSISTENCY WITH SUISUN MARSH PROTECTION PLAN

The Suisun Marsh Protection Plan, and the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act, adopted by the California Legislature in 1974, provide for the preservation and enhancement of the quality and diversity of the 85,000 acre Suisun Marsh aquatic and wildlife habitats and for compatible uses of upland areas adjacent to the Marsh[42]. The plan is focused on lack of development, however, to the extent that bridges on walking trails or roadways, culverts for water flow, or embankments are constructed to help preserve the marshland area, any structure that requires painting will be coated with architectural coatings. However, the proposed amendments to Rule 3 do not have any possibility of impacting potential decisions regarding construction or placement of these structures in the marshland or upland area. Therefore, the proposed amendments cannot be found to be inconsistent with the Suisun Marsh Protection Plan.

5.5.7 CONSISTENCY WITH THE REGIONAL AIRPORT SYSTEM PLAN

The Regional Airport System Plan provides a recognition of the need for additional airport system capacity. It's objectives include consideration of alternatives to provide capacity, and an analysis of the significant environmental tradeoffs.[43] The Regional Airport System Plan may project additional runway capacity and to the extent that it does, that additional capacity would require the use of architectural coatings such as traffic marking coatings. Any associated structures would also require the use of architectural coatings. However, the proposed amendments to Rule 3 could not have the possibility of impacting any decisions made concerning the construction or siting of any structures associated with airport expansion. Therefore, the proposed amendments cannot be considered to be inconsistent with the provisions of the Regional Airport System Plan.

5.5.8 CONSISTENCY WITH THE SAN FRANCISCO BAY AREA SEAPORT PLAN

The San Francisco Bay Area Seaport Plan designates port priority areas, and suggests needs and improvements for those port areas.[44] As with airports, above, port structures require architectural coatings, yet the proposed amendments to Rule 3 could not possibly affect any decisions made concerning the construction or siting of any structures associated with port structures, either buildings, cranes or docks. Therefore, the proposed amendments cannot be considered to be inconsistent with the provisions of the San Francisco Bay Area Seaport Plan.

5.5.9 CONSISTENCY WITH REGIONAL HOUSING ALLOCATION PLANS

The proposed amendments to Rule 3 will not have any impact on projected population, land use, or housing in the Bay Area, as iterated above in Section 5.2.1: Land Use and Planning, and Section 5.2.2: Population and Housing. Any projected marginal increase in cost for new coatings to comply with the proposed VOC limits will not create a significant enough effect on the cost of housing so as to create an impact on the availability of housing for any income group. Furthermore, the proposed amendments will not affect how housing is planned or allocated within the Bay Area. Therefore, the proposed amendments cannot be considered to be inconsistent with any housing element in any Bay Area City or County General Plan.

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[42] Suisun Marsh Protection Plan, Bay Conservation and Development Commission, (www.bcdc.ca.gov), June 28, 2001
[43] Regional Airport System Plan, Draft Regional Transportation Plan, MTC, op.cit.
[44] San Francisco Bay Area Seaport Plan, Draft Regional Transportation Plan, MTC, op.cit.

5.5.10 CONSISTENCY WITH HABITAT CONSERVATION PLANS

The use of architectural coatings do not create or cause impacts to sensitive habitats of plants or animals because all activities occur at construction, industrial, commercial, institutional or residential sites. The proposed amendments to Regulation 3 could not have any possible effect on any existing or proposed habitat conservation area or on any proposed construction activity that might be affected by a habitat conservation plan. Therefore, the proposed amendments cannot be considered to be inconsistent with any conservation element in any Bay Area City or County General Plan.

5.5.11 CONSISTENCY WITH NATURAL COMMUNITY CONSERVATION PLANS

The proposed amendments to Rule 3 cannot be found to have any impacts on any natural community conservation plans. As iterated previously in Section 5.2.4: Biological Resources, 5.2.7: Aesthetics, and 5.2.8: Cultural Resources, although architectural coatings are used on structures that may have impacts on one of these areas of concern, the coatings themselves would not have any impact on decisions made concerning construction or siting of any structures subject to these plans. Therefore, the proposed amendments cannot be considered to be inconsistent with any natural resource conservation element in any Bay Area City or County General Plan.

5.5.12 SMART GROWTH PLANS

Smart Growth Plans, or Programs, which may be integrated into the general plans of cities and counties, provide for linkages between land use and transportation plans so as to promote sustainable development, direct growth toward areas that can be served by public transit, and encourage the use of public transit.[45] Architectural coatings would be used on structures associated with housing and infrastructure elements of smart growth plans, but proposed amendments to the VOC limits for the coatings could not have any impact on decisions made concerning development connected with smart growth plans or programs. As iterated previously in Section 5.2.1: Land Use and Planning and Section 5.2.2; Population and Housing, the proposed amendments will not create any impact on the land use or housing decisions. Therefore, the proposed amendments to Rule 3 cannot not be considered to be inconsistent with any smart growth element in any Bay Area City or County General Plan.

[45] Smart Growth Programs, Draft Regional Transportation Plan, MTC, op.cit.

6. PROJECT ALTERNATIVES

6.1 Introduction

CEQA requires a description of a range of reasonable alternatives to the project that would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and an evaluation of the comparative merits of the alternatives. CEQA also requires consideration of a reasonable range of potentially feasible alternatives; it does not require consideration of alternatives that are not reasonable. The discussion and analyses of project alternatives presented below is based on and consistent with the analyses of project alternatives in the CARB Program EIR.

The following project alternatives present varying methods of regulation. They were developed by industry representatives and proposed during an public consultation meeting with CARB staff in August, 1998.

6.2 Project Alternatives Rejected as Infeasible

The Program EIR generated by CARB staff and certified at the CARB hearing on June 22, 2000 examined seven alternatives that were found to be infeasible. Following is a brief description of these alternatives, and a discussion of why these alternatives were found to be infeasible.

6.2.1 PERFORMANCE BASED STANDARDS

Rather than establish lower VOC content requirements for specified categories of coatings, this alternative would establish emission standards based on performance standards such as "substrate protectivity" or coating durability. This alternative has been rejected as infeasible by CARB staff because it would be difficult, if not impossible, to reach a consensus among involved parties as to how to create the standards to cover the multitude of coatings reformulations with varying performance characteristics, including how to characterize the degree of substrate protection. In addition, to create a regulation that relied on durability of coatings as a standard, it would take years or in some cases tens of years to enforce regulatory limits. The manufacturer, distributor, seller and applicator could all be impossible to trace in that time period. As well, because coating durability is a market driven phenomena, unlike lower VOC content, there is a natural incentive for manufacturers to create a more durable product. A performance based standard based on durability would encourage structure owners to leave coating on as long as possible to avoid enforcement actions, possibly risking damage to the structure itself. In the case of public agencies who are responsible for the maintenance of bridges, water supply systems and sewage systems, for example, the results of delayed maintenance could be disastrous. Finally, decisions to paint are often made for reasons other than that to protect substrates. Consequently, even though a coating might meet a performance or durability standard, it might be recoated, losing the benefit of the durability.

6.2.2 SEASONAL REGULATION

Under this alternative, the VOC content limits proposed for various architectural coatings would be in effect during the "high ozone season" (typically the summer months). During the "low ozone season" (typically the winter months), coatings formulators could sell and distribute, and contractors and do-it-yourself consumers could use coatings with higher VOC contents. This alternative was found infeasible for the project area because it is too difficult to implement and enforce. It would be difficult for coatings formulators, distributors, and retail stores to manage their inventories to ensure that only complying coatings are sold during the high ozone season. In addition, regulation of end users is effective only when there can be a presumed knowledge base at the level of the end user and the numbers and locations of end users were within reason to contact and inspect. In the case of architectural coatings, end users are potentially everyone

in the Bay Area. As the use of architectural coatings is not connected with most peoples' jobs, it is unlikely that users would be able to develop a sufficient knowledge base to be able to predict the likelihood that their use of any of the many architectural coatings were being done in compliance with the law. It is for this reason that sales of non-compliant products are prohibited. Finally, because of different ozone seasons in different areas of California, typically longer in the south than in the north, the rule would not be consistent across regulated areas of the state at some times of the year. There have been exceedances of the California state ozone in all months of the year except February and December, based on data from 1980-1995.

6.2.3 REGIONAL REGULATION

Under this alternative, areas within the District that do not have an ozone problem or contribute to the District's ozone problem would be exempted from the VOC requirements of Rule 3. This alternative was rejected as infeasible for two main reasons. First, in order to determine the viability of such an approach, the District would have to conduct an extensive analysis involving ambient air quality modeling to determine which geographical areas would be subject to the lower VOC requirements and which would be exempted. The proposal also ignores the fact that ozone is a regional and trans-regional problem, emissions from one part of the District will impact other parts of the District and may impact other air districts.

Second, the problem of enforcing this regulatory approach remains. Enforcement at the retail level, as well as the end-user level would be difficult and would require significant additional resources from distributors to ensure that only compliant products were delivered to the "clean air" areas, as well as significant additional enforcement resources. District boundaries already present a problem for activities conducted barely inside as opposed to barely outside the district. With the creation of boundaries within the largely urbanized Bay Area, this problem would be severely compounded.

6.2.4 EXCEEDANCE FEES

This alternative would allow manufacture, sale and purchase of non-compliant coatings on payment of a fee, similar to the system that exists in the national Architectural and Industrial Maintenance coatings rule. The system used in the national AIM rule allows coatings manufacturers and importers to sell coatings that exceed the applicable VOC limit if they pay a fee of $0.0028 per gram of excess VOC. This is sometimes termed a "pay-to-pollute" approach. It is a market based program, the theory being that companies would be driven to reduce the VOC content of their coating to avoid the fee. However, there are several unknowns associated with any market based approach of this type. Chief among them is that there is a presumption that this fee will steer the market for architectural coatings. If it does not, the rule will generate revenue but it will not produce the intended emission reductions and may actually hinder efforts to attain both the state and federal ozone standards. In a typical gallon of flat house paint, a company that chose to not reformulate their coating from the existing standard of 250 grams VOC per liter to the proposed standard of 100 grams VOC per liter would have to pay a fee of $1.59 per gallon. The question of whether a consumer who purchased a gallon of paint that might range in price from $15 to $40 a gallon, depending on brand and quality, would notice and react to this increment cannot be answered, and has not been answered as a result of the exercise of the exceedance fee in the national rule. The company that chose to pass this cost on to the consumer would reasonably be expected to have that cost partly balanced by the expected cost increase to recover the research and testing that went into reformulation efforts made by a competitor.

An additional problem is that, if it were determined that the fee was insufficient to drive the market, this approach would necessitate more rulemaking, putting a strain on District resources. Even if the fee would be sufficient to drive market behavior, rulemaking would be required periodically simply to recover value lost to inflation that would be expected to retard market driven behavior. Finally, the District does not have the legal authority to directly levy taxes, which is

what the exceedance fee would be considered. For all of these reasons, an exceedance fee approach is not considered a feasible alternative.

6.2.5 TONNAGE EXEMPTION

As with the "Exceedance Fees" alternative, this type of alternative is part of the national Architectural and Industrial Maintenance Coatings rule. A tonnage exemption would allow coatings manufacturers to produce and sell some quantities of coatings that exceed the applicable VOC limit in Rule 3, based on the mass of VOC emissions that were in excess of the limits in the Rule. The tonnage would set a limit on these excess emissions. The national rule contains a 25 ton per manufacturer exemption in the first year of the rule that would decrease in subsequent years to 10 tons.

The tonnage exemption approach in the national rule is additive with the small container exemption (also in the existing and proposed District Rule) and the exceedance fee. The District would have to calculate the foregone emissions due to each manufacturer's share of the exemption that would reach the Bay Area market, and, given the pressures to create emission reductions to satisfy state and federal ozone attainment plans, produce emission reductions from other source categories or from within the source category of architectural coatings. Also, to enforce this sort of provision on a district level, labeling, reporting and record keeping would have to be instituted which would include tracking of "tonnage exempt" coatings through distribution and sales channels. For these reasons, a tonnage exemption is not considered a feasible alternative.

6.2.6 LOW VAPOR PRESSURE (LOW VOLATILITY) EXEMPTION

Under this alternative, VOC's with low vapor pressures (i.e., "low vapor pressure VOC's" or "LVP-VOC's") would be exempted from the determination of the overall VOC content of a coating. This type of exemption is based on an assumption that low vapor pressure VOC's volatilize more slowly, so contribute very little to ozone formation in the atmosphere. The Program EIR developed by CARB identified a number of reasons why this alternative should be rejected as infeasible. First, EPA would not approve any rule into the SIP that had a less restrictive definition of what constitutes a regulated VOC than does EPA. Second, LVP compounds do contribute to ozone formation when they are in the atmosphere, it is just that they are emitted in lesser quantity or over a much greater time period. The CARB consumer product regulations exempted LVP compounds as a way of streamlining the development of consumer product rule, minimize economic impacts on industry and provide formulation flexibility. Most importantly, the test method for determining VOC content of consumer products, which consists of a compendium of existing test methods appropriate for different types of substances, had a instrumentation limit of detection of 0.1 mm Hg, which was the vapor pressure "cutoff" between LVP compounds and regulated VOC.

The CARB Program EIR points out that consumer products and architectural coatings may be quite different in nature. Architectural coatings are (mostly) designed to have the solvent portion evaporate from a thin coating film to produce a dry film. The low vapor pressure compounds in architectural coatings, such as propylene glycol, ethylene glycol, or Texanol®, are eventually almost completely emitted into the atmosphere, so are then available for photochemical reaction.

From one perspective, the test method determines the VOC content of a coating rather than the definition. EPA Method 24 and the equivalent District methods, Laboratory Methods 21 and 22, determine volatile content by heating a coating sample at 110°C for one hour. Regardless of definition, those organic compounds that do not evaporate during this procedure, which include resin systems, organic pigments, and any other components that do not volatilize, are not measured as VOC. The assumption that exempting low vapor pressure compounds in order to reduce the VOC inventory of architectural coatings would somehow lessen the need to regulate this source category is not founded. It would simply result in an exercise in paperwork, but do

nothing to reduce the need to regulate and reduce the significant emissions from this source category. Nor would this exercise change either the cost efficiency or the technical feasibility of regulating architectural coatings relative to other source categories. Consequently, the alternative of a low vapor pressure exemption for the SCM and for Rule 3 is not considered to be feasible.

6.2.7 REACTIVITY BASED VOC LIMITS

This alternative would involve establishing coating VOC limits based on the reactivity characteristics (i.e., the tendency to react in the atmosphere to form ozone) of the compounds contained in the coating, instead of the mass-based VOC limits that are used in other District rules including the current and proposed amendments to Rule 3. Historically, control of VOC emissions has been through mass-based reductions, and the efficacy of this approach has been borne out by the significant reductions in both absolute levels of ozone and population based exposure levels.

The CARB has committed to evaluating the feasibility of reactivity-based regulations for certain VOC source categories, and has an ongoing reactivity research program that includes funding for scientific studies of reactivity and a Reactivity Research Advisory Committee consisting of interested representatives of industry, academia, air district and CARB staff. In addition, CARB has begun to incorporate reactivity characteristics of compounds into some existing regulations, such as the California state rule for aerosol coatings. However, at this time, a number of issues need to be addressed before this type of control strategy could be developed and implemented for architectural coatings.

First among these is the need to fully speciate VOC for each product. To establish viable limits and calculate the potential of new limits to reduce ozone formation, a survey much more complex than the previous CARB survey would need to be completed. This would be a complex administrative task, although CARB has embarked on a survey to obtain this data. For large companies with dedicated environmental specialists, this may prove achievable, however many small companies exist that produce architectural coatings for which the task of speciation for each product might constitute a significant burden. Complicating this task is the problem that not all solvent ingredients in a coating constitute a single VOC species. For example, mineral spirits is a blend of hydrocarbons that will vary from manufacturer to manufacturer. A coatings formulator looks at his ingredients form the standpoint of functionality, not speciation. It is doubtful that a coatings formulator could speciate mineral spirits, and more doubtful whether mineral spirits are made up of the same species and same percentage of species from manufacturer to manufacturer and batch to batch.

Second, there is not yet full consensus on the scale of reactivity that is most appropriate for regulatory purposes. Each scale that has been sufficiently developed measures an increment of ozone produced for an amount of a specific compound added to a sample of air. The air samples are intended to replicate air in urban, polluted environments. Dr. William Carter, at the University of California at Riverside, a leading researcher into reactivity, has evaluated potential scales and concluded that the Maximum Incremental Reactivity (MIR) scale, which measures grams ozone formed per gram VOC added to the base, is the most appropriate for California. This scale best replicates ozone formation in low VOC to NO_x ratios, typical of California. Development of appropriate scales is ongoing.

Also, the reactivity of different species varies with atmospheric conditions. There is variability in the reactivity estimates for species, and the reliability of estimates for some species is not good. Uncertainty estimates have been assigned for species for the purposes of establishing the MIR scale, in some cases the uncertainty may prove to be sufficient to overwhelm reactivity calculations for small volume ingredients. There is currently research ongoing to attempt to reduce uncertainties, and consensus as to the feasibility of enacting reactivity scales for

environmental regulations is growing. However, these factors are not sufficiently established at this time to consider this a feasible project alternative.

Lastly, the problem remains of a test method to speciate hydrocarbons. Although with the use of gas chromatography or gas chromatography/mass spectrophotometry, speciation is possible, it is more time consuming and expensive by a factor of ten than is the test method based on mass. Because of this, the District would have to allocate significantly more resources to testing coating samples with a reactivity based regulation than with a mass based regulation. For all of these reasons, a reactivity based project alternative. Although promising, is not considered to be feasible at this point in time.

6.3 Description of Alternatives Considered Feasible

The Program EIR developed by CARB staff included an evaluation of four project alternatives, one of which was Alternative D: Product Line Averaging. The CARB eventually incorporated a version of this alternative into the SCM, and this provision is reflected in the proposed amendments to Rule 3. Alternative D: Product Line Averaging in this draft EIR is slightly different than this provision. In addition, one other alternative is presented. These alternatives may also be considered feasible alternatives to the proposed amendments to Rule 3. They are briefly described below:

6.3.1 ALTERNATIVE A: NO PROJECT

This alternative assumes that the proposed revisions to Rule 3 will not be implemented, and that the existing VOC limits in Rule 3 would continue to apply. As a result, VOC emissions from architectural coatings in the Bay Area would remain at the same level for an equivalent volume of coating used. No emission reductions would be achieved.

6.3.2 ALTERNATIVE B: EXTENDED COMPLIANCE DEADLINES

This alternative would extend all of the effective dates for compliance with the proposed lower VOC content limits to January 1, 2004. The amendments currently proposed for Rule 3 set effective dates for compliance with lower VOC content limits of January 1, 2003, except for a January 1, 2004 compliance date for industrial maintenance coatings. As a result, VOC emissions reductions from architectural coatings would be equivalent, but delayed.

6.3.3 ALTERNATIVE C: FURTHER REDUCTION OF VOC CONTENT LIMITS

This alternative would reduce the VOC content limits for architectural coatings to lower limitations than the currently proposed amendments require. As a result, VOC emission reductions from architectural coatings would be greater than those projected from the proposed amendments to Rule 3.

6.3.4 ALTERNATIVE D: PERMANENT PRODUCT LINE AVERAGING

The SCM and proposed amendments to Rule 3 contain a provision to allow a company to average the VOC contents of architectural coatings sold from January 1, 2003, when the lower VOC limits go into effect, until January 1, 2005. This provision is intended to provide flexibility for companies that would have a considerable number of coatings to reformulate and to improve the cost effectiveness of the rule. This alternative would allow any company to average coating products sold into California on a permanent basis. As a result, VOC emission reductions expected as a result of adoption of amendments to Rule 3 might be reduced or delayed to the extent that averaging was employed.

6.3.5 ALTERNATIVE E: DIFFERENT VOC LIMITS

This alternative would provide for equivalent emission reductions as would the proposed amendments to Rule 3, but would accomplish the emission reductions by a different mix of VOC limitations than are proposed. As a result, projected VOC emission reductions would be retained.

6.4 Comparison of Alternatives

The Program EIR developed by CARB staff included an assessment of impacts for air quality, water supply, water quality, public services, transportation and circulation, solid and hazardous waste, and hazards for the proposed SCM. There were no significant impacts identified for these resource areas for the proposed SCM. There were also no significant impacts associated with any attributes of the Bay Area's environment. However, a brief discussion of the potential environmental impacts that may be generated by each project alternative is described below:

6.4.1 AIR QUALITY

Alternative A: No Project, assumes that the proposed revisions to Rule 3 would not be adopted, and that the VOC limits in the current Rule 3 would remain in effect. As a result, approximately 3.75 tons per day of VOC emission reductions from architectural coatings would not be achieved throughout the Bay Area. This scenario would jeopardize the ability of the District to meet the target emission reductions contained in the federal 2001 Ozone Attainment plan, and would, should replacement emission reductions be unable to be found, render the Plan unapproveable by the EPA.

Alternative B: Extended Compliance Deadlines, would extend the VOC content limits to January 1, 2004. This alternative would ultimately achieve the same VOC emission reductions as the SCM, however the reductions would be achieved one year later. Under the California Clean Air Act, "... priority shall be placed on expeditious progress toward the goal of healthful air", and air districts must adopt a plan "to achieve attainment of the state standards by the earliest practicable date."[46] Extended compliance deadlines may result in a violation of these requirements.

Alternative C: Further Reduction of VOC Content Limits, would implement lower VOC content limits than those included in the proposed amendments to Rule 3. This alternative, assuming the lower VOC limits were feasible, would reduce emissions to a greater extent than would the proposed amendments. If the limits proved to be infeasible, the alternative could actually hinder progress toward clean air. This is because, based on technical reasons and good faith efforts, manufacturers, distributors, sellers, and users could apply for variances, and there would be a good likelihood of those variances being granted. If granted, because a company would have put all its' efforts into meeting a VOC limitation in the Rule, no lower-VOC-yet-feasible coating may have been developed, so no emission reductions would be achieved.

Alternative D: Permanent Product Line Averaging, would make permanent a provision to allow averaging until 2006. Although the record keeping and reporting associated with a temporary or permanent averaging scheme would act as a natural disincentive to use the scheme unless a company felt it necessary until such time as product could be reformulated to meet a lower VOC limit, or unless a company felt it could improve market share for a given coating, there would be, to the extent that companies used the provision, fewer emission reductions achieved from the Rule, or emission reductions would be delayed or both. Similar to Alternative B, this might be contrary to the provisions of the California Clean Air Act.

Alternative E: Different VOC Limits, would create a different mix of VOC content limits for the amendments to Rule 3. This would achieve the same emission reductions as the proposed amendments. However, companies would have to formulate specifically for the Bay Area and

[46] California Health and Safety Code §40910 and 40913 (b)

there would be considerable confusion over products legal in other regulated areas in California but illegal in the Bay Area and vice versa. The proposed limits for Rule 3 are based on the SCM. The driving consideration behind the SCM was to reduce emissions from architectural coatings to the maximum extent feasible. Therefore, it is doubtful that an alternate mix of VOC limits could be found that would achieve the same emission reduction result and be technically feasible.

6.4.2 WATER

i) Water Demand

Alternative A would not change current water demands. It would, therefore, have fewer water demand impacts than would the proposed Rule 3 amendments.

Alternative B would produce the same water impact demands as the currently proposed amendments, but the water demands would occur at a later date.

Alternative C would probably result in an increase in water demand impacts as the proposed amendments, but, conceivably, could result in fewer impacts. This is because, although many industrial maintenance formulations are expected to be based on water-borne technology, if the VOC limits were even lower, some coatings would be replaced by two component coatings, formulated without water. Were more water used, it is anticipated that the water demand impacts would still be considered insignificant.

Alternative D would probably result in somewhat less water demand, however the water demand could be equivalent. If higher VOC coatings could be permanently averaged, they would not have to be reformulated, but other coatings might have to be reformulated to lower VOC contents for those coatings to average against. Overall, water demand would be impossible to predict but should be close to the demand created by the proposed amendments.

Alternative E would result in a different water demand for different coating categories than would the proposed amendments. Overall, it is impossible to predict whether the overall impact would be greater or less. If in some categories it was greater and in some less, the overall impact would probably still be considered insignificant.

ii) Water Quality

Alternative A would result in no change in the current quantities of coatings entering the sewer systems, storm drainage systems, or groundwater in the Bay Area. Therefore, Alternative A would not create any new or additional water quality impacts.

Alternative B would result in the same coatings that would be reformulated with water in the proposed amendments but they would be reformulated with water one year later. Therefore, to the extent that this alternative would result in water quality impacts, they would be delayed by one year.

Alternative C may require increased use of waterborne technology. Although the worst-case scenario analyzed in the CARB Program EIR, that all affected coatings would be reformulated using waterborne technology, showed that water quality impacts were insignificant for the proposed project, Alternative C would reasonably be expected to have greater impacts. Whether those impacts would be still considered insignificant cannot be projected at this time.

Alternative D would have similar water quality impacts as would the proposed amendments. If there were any water quality impacts that would arise after the sunset of the averaging provision in the proposed amendments, those impacts would not occur under Alternative D. The water quality impacts in the CARB Program EIR were analyzed, and found to be insignificant, without considering averaging.

Alternative E would probably have similar water quality impacts to the proposed amendments. A different mix of VOC limits might create water quality impacts in some categories more so than in others, in a different mix than would the proposed amendments, but it is impossible to say whether the impacts would be greater overall or lesser.

6.4.3 PUBLIC SERVICES

i) Public Facility Maintenance

Alternative A would not require any change to coatings application practices done for maintenance purposes at public facilities. Thus, Alternative A would not create any new or additional public facility maintenance impacts.

Alternative B would only delay any potential public facility maintenance impacts. The impacts were found to be insignificant, so it would be expected that the delayed compliance limits, when they became effective, would also be insignificant.

Alternative C would result in the use of coatings with a lower VOC content than those in the proposed amendments. To the extent that the lower coating VOC limits proved feasible, the impacts on public facility maintenance would be insignificant, as was determined for the proposed amendments. However, were the lower VOC limits infeasible, maintenance of public facilities could be impacted.

Alternative D would result in a product line averaging system that, to the extent that coating companies chose to average coatings used on public facilities, could result in fewer changes to coatings currently in use. This could reduce, by some small amount, the impacts, both environmental and economic, on public facility maintenance. However, any reduction in impacts would probably be offset by greater impacts on other coating users.

Alternative E could result in fewer impacts on public facility maintenance or could result in greater impacts on public facility maintenance. Without an iteration of which categories of coatings would get lower VOC limits and which would get higher VOC limits, the impacts on public facility maintenance are impossible to predict.

ii) Fire Protection

Alternative A will not change the current requirement on fire department servicing. Because the alternative would not create the need for the use of any new coatings, it would not create any new or additional fire department impacts.

Alternative B is expected to result in some coatings formulators using waterborne technology containing less flammable solvents. The exception to this would be the use of acetone in some specific coating categories. However, fire departments treat all National Fire Protection Act Class 3 flammable liquids the same. Because the same replacement and coalescing solvents used to meet the proposed project VOC content limits would be used to meet the Alternative B VOC content limits, this alternative would result in similar insignificant impacts to fire departments as do the proposed amendments, but the impacts would occur one year later.

Alternative C would probably require an increased use of waterborne technology. Manufacturers might be able to reformulate solvent-borne coatings with exempt solvents, some of which would contain more flammable solvents. The overall impact would be impossible to quantify, however, due to the anticipated increase in waterborne technology containing smaller amounts of flammable solvents to meet even lower VOC limits, Alternative C would probably result in fewer fire department impacts than would be expected from the proposed amendments to Rule 3.

Alternative D would result in an increased use of waterborne technology, and if so, it could conceivably be used to offset traditional solvent-borne coatings rather than reformulate those

coatings with acetone. Even though the traditional solvents are considered flammable, it is conceivable that Alternative D could result in fewer impacts on fire protection demands than would the proposed amendments.

Alternative E could conceivably result in fewer fire protection demands than would the proposed amendments to Rule 3. This is because it is expected that the greatest use of water-borne technology will be for the large categories of coatings already largely water-borne, that is, flats, non-flats and high gloss non-flats. Should these categories of coatings be assigned lower VOC limits than are in the proposed amendments, other solvent-borne categories might be assigned higher VOC limits. If that were the case, they might not have to be reformulated with acetone, resulting in overall fewer fire protection demand impacts.

6.4.4 TRANSPORTATION AND CIRCULATION

Alternative A would not result in changes to the volume of traffic or traffic circulation patterns associated with the manufacturing, distribution, and use of architectural coatings. Thus, Alternative A would not create any new or additional transportation or circulation impacts.

Alternative B would result in the same impacts to transportation and circulation as would the currently proposed amendments, however, the impacts would occur one year later. Based on the allegations raised by industry that transportation and circulation demands would be a result of poorer or less stable coating, those impacts one year later might conceivably be somewhat less than they would be under the proposed amendments due to anticipated coating improvements over time. In both cases, the expected impacts would be expected to be insignificant.

Alternative C could result in greater impacts to transportation and circulation than would the proposed amendments. If coatings increasingly had to rely on water-borne technology and the VOC limits were such that solvent that performed functions such as freeze-thaw stabilizers were minimized, transportation and circulation could be impacted. Any additional trips associated with the disposal of reformulated low-VOC waterborne coatings due to freeze-thaw, shelf life, or pot-life problems could potentially be greater than would be the case for the proposed amendments.

Alternative D would result an insignificant change to the transportation and circulation impacts. This alternative would make it somewhat easier to meet the VOC limits on a permanent basis by requiring fewer coatings above the proposed VOC limits to be reformulated. The proposed amendments have been determined to result in insignificant impacts, so it is reasonable to expect that this alternative would also have insignificant impacts.

Alternative E would probably also result in an insignificant change to transportation and circulation impacts for the same reasons as iterated for Alternative D, except that, with a different mix of VOC limits, the coatings shipped into the Bay Area for distribution and sale would result in more truck traffic. This is because the Bay Area shipments would have to be segregated because their legality would be different than for the rest of the regulated areas in the state.

6.4.5 SOLID AND HAZARDOUS WASTE

Alternative A would not require any changes to existing coatings manufacturing processes or coatings application practices. The volume of solid waste and hazardous waste generated from the manufacturing, distribution, and use of architectural coatings would not change under this alternative. Alternative A would not create any new or additional solid waste/hazardous waste impacts.

Alternative B would be expected to generate an equivalent amount of solid waste or hazardous waste from the manufacturing, distribution, and use of architectural coatings as would the proposed amendments, it would only be delayed by one year. Because the proposed

amendments were determined to result in insignificant impacts to solid or hazardous waste demands, the demands from Alternative B would also be insignificant.

Alternative C might result in increased demand on solid waste disposal sites. If the coatings produced to meet even lower VOC limitations suffered from reduced freeze-thaw characteristics, shelf life, or pot-life, additional need for disposal could result. The proposed amendments will not produce a significant impact, so it is likely that, in the case of even lower VOC limits, solid or hazardous waste disposal impacts could also be insignificant, however, they would likely increase.

Alternative D would not result in a change in the solid or hazardous waste disposal impacts. Because the impacts of the proposed amendments were found to be insignificant, and averaging would require the reformulation of many of the same coatings as would the proposed amendments, Alternative D would probably result in the same impacts.

Alternative E could result in an increase in impacts or could result in no change in impacts. If the coating categories selected for more stringent regulation proved to be less technically viable, there could conceivably be more waste generated. If, on the other hand, coatings under a different mix of VOC limits were to prove, individually or overall, to be as technically viable, then waste impacts would be expected to be about the same as under the proposed amendments.

6.4.6 HAZARDS

i) Increased Exposure to Hazards

Alternative A will not change the current risk of exposure to hazards associated with the manufacture, distribution, and use of architectural coatings. Therefore, Alternative A would not create any additional risk of exposure to hazards than currently exists.

Alternative B would be expected to create the same risk of exposure to hazards as would the proposed amendments to Rule 3, but would create them one year later. The potential exposure to hazards has been found to be insignificant for the proposed amendments, therefore the risk of exposure to hazards under Alternative B would also be considered insignificant.

Alternative C might require the increased use of waterborne technology. In this context, exposure to flammable or explosive hazards could reasonably be expected to be less. Conversely, if industrial maintenance coatings formulators increased the use of exempt solvent based systems, the potential for exposure to flammable or explosive situations could possibly increase for these coatings. It can be surmised that, overall, Alternative C would result in a similar risk of exposure to hazards as would the proposed amendments. The risk of exposure to hazards for the proposed amendments was found to be insignificant.

Alternative D might allow the continued use of some existing solvent-borne coatings that would otherwise be reformulated. To offset the higher VOC levels of these coatings, some other coatings might be reformulated to water-borne technology to lower VOC levels. As do the VOC levels, the net result might average to no change in the exposure to hazards from the proposed amendments.

Alternative E might produce the same resultant exposure to hazards as would Alternative D, for the same reasons. Overall, the level of exposure to hazards would be impossible to predict without an iteration of the coating categories that might be involved, but it would be expected that the exposure to hazards would be considered insignificant.

ii) Exposure to Toxic Substances

Alternative A would allow the same coatings to be used as were currently in use. This alternative would not create any change in possible health impacts derived from exposure to toxic substances.

Alternative B anticipated that the same health impacts would be present as would be present under the proposed amendments to Rule 3, but they would be present one year later. As manufacturers strive to replace toxic solvents with less toxic ones, an additional year might conceivably give manufacturers more time to find alternative solvents to use. Therefore, Alternative B could result in slightly fewer human health impacts than would the proposed amendments.

Alternative C would require more reformulation, because more existing coatings would not be able to meet the VOC limits. To the extent that coating reformulation would require the use of toxic solvents, it would be reasonable to expect the potential exposure to toxic solvent to be higher, regardless of warnings and protective equipment recommendations. Whether the risk would still be considered insignificant, as is the risk for the proposed amendments, is impossible to predict.

Alternative D would probably result in equivalent exposure to toxic solvents. This is because, if, due to averaging, the net result would probably be about the same amount of reformulation as the proposed amendments, the net exposure would also probably be about the same. However, it is also conceivable that a permanent averaging provision would allow manufacturers a little more flexibility in their product formulations and they could use that flexibility to reduce toxic solvents used. In this scenario, it could be expected that Alternative D would result in fewer health impacts due to exposure to toxic solvents.

Alternative E would probably result in equivalent exposure to toxic solvents. This is because some coatings would require more reformulation, or reformulation to a greater degree, and some coatings would require less reformulation. The net result would probably produce about equivalent exposure. However, if, in selecting categories of coatings that would be granted higher VOC limits and others that would be granted lower VOC limits, attention was paid not only to overall emission reductions, but also to potential exposure of coating applicators and the general public based on expected reformulation technology, it is conceivable that Alternative E could result in fewer health impacts due to exposure to toxic solvents.

6.5 Conclusion

Following is a brief explanation of why the District staff is recommending the proposed amendments to Rule 3 instead of Alternatives A, B, C, D, or E.

Pursuant to CEQA Guidelines Section 15126.6(e)(2), if the environmentally superior alternative is the "no project" alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives. Since Alternative A: No Project would not achieve any VOC emission reductions resulting in air quality benefits, it cannot be considered environmentally superior. Therefore, this section of the CEQA Guidelines does not apply.

Alternative A: No Project is not supported by District staff because it would not result in any emission reductions. The District needs VOC emissions reductions specifically from the source category of architectural coatings in order to comply with the proposed 2001 San Francisco Bay Area Ozone Attainment Plan, to fulfill the objectives of Stationary Source Control Measure A1 in the 2000 Bay Area Clean Air Plan and Triennial Assessment, and progress toward the California ambient air quality standards for ozone. The proposed amendments, based on the SCM approved by CARB, appear to be a technically feasible and cost effective way to achieve VOC emission reductions. For these reasons, staff does not recommend Alternative A.

Alternative B: Extended Compliance Deadlines is not supported by District staff because the VOC limits in the proposed rule appear to be feasible by January 1, 2003, with the exception of January 1, 2004 for industrial maintenance coatings, and additional time to comply is not necessary. Both the federal and California Clean Air Acts mandate that air quality standards be attained as expeditiously as practicable. It should be noted that the SCM, on which the proposed amendments to Rule 3 is based, is itself based on a coatings survey that found many coatings at the proposed VOC limits already available. The delay would give more time to industry to produce compliant coating formulations, however, the coating limits in this alternative would be the same, as would any adverse environmental impacts associated with the coating limits. As any impacts would only be delayed, but otherwise equivalent, and the delay in air quality benefits would be detrimental and would appear unwarranted, staff does not recommend Alternative B.

Alternative C: Further Reduction of VOC Content Limits is not recommended by District staff because staff has not had the opportunity to review product data and testing for lower VOC products for technical feasibility or economic impact. Therefore, staff cannot recommend lower limits within the time period for implementation of the proposed limits in Rule 3. There is the possibility that, should lower limits not prove either technically or economically feasible, significant adverse air quality impacts may occur due to manufacturers, sellors or applicators, or all three, seeking variance relief and not achieving any emission reductions. For these reasons, although it may appear that emission reductions might be greater than from implementation of the proposed amendments to Rule 3, staff does not recommend Alternative C.

Alternative D: Permanent Product Line Averaging is not recommended by District staff because, although it would provide a permanent degree of flexibility and create rule amendments that would be more cost effective, it would also impact the emission reductions achieved by the rule amendments to an unknown degree, depending on how many companies decided to take advantage of the averaging provision. It should be noted that enforcement of the averaging provision is problematic. In the proposed amendments to Rule 3, averaging is a statewide program, however, the Rule in total must be enforceable by each district. That means that enforcement of the averaging provision is dependent on staff at the California Air Resources Board to approve averaging plans and review record keeping and reporting requirements in Rule 3 and to relay that information to each district. To the extent that CARB staff were unavailable to administer the averaging provisions due to disruption or reallocation between programs, the "enforceability" of Rule 3 would suffer. The staff report that accompanied the SCM stated that the averaging provision was a way of making the rule more cost effective in the short term, but in no way was reflective of the infeasibility of the proposed VOC limits. Finally, should other districts not adopt a permanent averaging provision, this alternative would revert to averaging only within the District. Representatives have already stated that averaging, which involves tracking of high VOC and low VOC coatings within each district, is impossible. For these reasons, staff does not recommend Alternative D.

Alternative E: Different VOC Limits, is not recommended by District staff because, although the air quality benefits and environmental impacts would probably be equivalent. Adoption of different VOC limits would require coating formulators to develop different formulations for the Bay Area, some of lower VOC content, and would also allow them to import coatings with a higher VOC content than were allowed in other regulated areas. This would involve additional, potentially complex administrative procedures for the Bay Area alone and also the added cost of producing additional formulations, even assuming the VOC limits in the alternative were technically feasible to the extent that they appear to be in the proposed Rule 3 amendments. In addition, enforcement of different VOC limits would become difficult. Coating users could not purchase coatings outside of the District with any surety that they would be legal inside the District and vice versa, unless those users, including both professional and non-professional users, would have a working knowledge of both Rule 3 and the applicable architectural coating rule in the other district. For these reasons, staff does not recommend Alternative E.

Based on the information and analyses in this draft EIR and the CARB Program EIR, District staff has concluded that the proposed amendments to Rule 3 are necessary to achieve the objectives of the proposed 2001 San Francisco Bay Area Ozone Attainment Plan, to fulfill the objectives of Stationary Source Control Measure A1 in the 2000 Bay Area Clean Air Plan and Triennial Assessment and progress toward the California ambient air quality standards for ozone. Also, staff has concluded that the proposed amendments to Rule 3 is the most feasible of the alternatives presented, considering potential environmental impacts.

7. PERSONS AND AGENCIES CONSULTED

7.1 Individuals, Organizations and Agencies Consulted

William Guy, Principal Air Quality Specialist, BAAQMD
Henry Hilken, Principal Environmental Planner, BAAQMD
Jean Roggenkamp, Manager, Planning and Transportation, BAAQMD
Barb Fry, Manager, Measures Development Section, CARB
Christian Hurley, Air Resources Engineer, CARB
Mike Jaczola, Air Pollution Specialist, CARB
Robert Jenne, Senior Staff Counsel, CARB
Jim Nyarady, Manager, Strategy Evaluation Section, CARB
Cheryl Young, Air Pollution Specialist, CARB
Aleta Kennard, SMAQMD

Sacramento Metropolitan Air Quality Management District (Final Environmental Impact Report, SCH 2001012006

7.2 Persons Preparing the draft Environmental Impact Report

Daniel Belik, Air Quality Specialist, BAAQMD

8. COMMENTS AND RESPONSES

8.1 Description of Comments

No comments were received on the draft EIR at the public workshop held on October 22, 2001. One comment letter was received from Jim Sell, Senior Counsel at the National Paint and Coatings Association on the last day of the 45 day comment period, November 5, 2001. The National Paint and Coatings Association (NPCA), located in Washington D.C., is the largest national trade group for U.S. coatings manufacturers. Their comment, delivered via e-mail, consisted of a general submission to air districts considering adoption of AIM coatings SCM, dated October 18, 2001, and attachments. The attachments consist of: 1) Position paper on the July, 2001 annual SCAQMD status report concerning implementation of South Coast Rule 1113 (dated 10/18/01); 2) Comments addressed to Aleta Kennard and Greg Tholen at the Sacramento Metropolitan AQMD regarding Rule 442 (5/18/01); 3) Comments addressed Aleta Kennard and Greg Tholen at the Sacramento Metropolitan AQMD regarding Rule 442 (4/20/01); 4) Comments addressed to CARB staff regarding the SCM (6/21/00); 5) Comments submitted by Duane De Young, Rustoleum Corporation, to CARB regarding the SCM (6/19/00); 6) Comments submitted to Rob Sliwinski, New York State Department of Environmental Conservation, representing the Northeast Ozone Transport Commission (8/21/00); 7) Comments submitted to CARB staff regarding the CARB Draft EIR (8/21/00); 8) Comments submitted to Rob Sliwinski, New York State Department of Environmental Conservation, representing the Northeast Ozone Transport Commission (12/11/00).

The attachments result in 46 pages of comments. However, these comments are directed at the SCM or architectural coatings rule amendments in South Coast or Sacramento rather than at the environmental impacts of the rule amendments, in spite of the fact that attachment 7 is in response to the CARB draft EIR. Generally, these comments are about the technical feasibility of the VOC limits in the rule, and about the projected costs of compliance. In addition, there are comments on the process used to arrive at the VOC limits and concern expressed about the opportunity for public input in the SCM process. These comments are more properly responded to in the staff report that accompanies the proposed rule amendments. However, from a careful review of comments, some comments contain implications of adverse environmental impacts. These implications are responded to, below.

8.2 Staff Response to Comments

Attachment number 1 concerns the South Coast architectural coatings rule, Rule 1113, which contains more stringent VOC limits than does the SCM or the proposed amendments to Rule 3. As such, the comments are, in part, not pertinent to the Rule 3 amendments, even though they reference ongoing coating studies at both South Coast and SCM VOC limits. Comments number 2 and 3 address the Sacramento Metropolitan AQMD Rule 442 amendments. These, while pertinent to the proposed Rule 3 amendments, have been responded to by staff at SMAQMD. Comments number 4, 5 and 7 address the SCM and, while also pertinent, have been responded to by CARB staff. Comments number 6 and 8 are submitted regarding rule development in New York and the northeastern states. As such, even though those rules may be based on the model rule for architectural coatings developed by STAPPA/ALAPCO based on the SCM, the issues raised in these letters either replicate those raised in the letters to CARB and Sacramento AQMD or encourage any proposed rule to be sensitive to northeastern U.S. environmental conditions. For a summary of responses to these comments, and staff responses to the issues raised regarding the proposed amendments to Rule 3, please refer to the staff report.

In the May 18 comment letter to the Sacramento Metropolitan AQMD concerning proposed amendments to their architectural coatings rule, Rule 442, it is stated, "In some cases, the use of 'compliant' coatings will require the application of more material and diminish the durability of the coating, meaning that more VOC emissions will occur from compliant coatings than from coatings

that will be prohibited." This comment parallels the industry comments addressed above in Section 4.2.3, Air Quality, Analysis of Potential Environmental Impacts, i) Increased Thickness of Low VOC Coating Films, and vi) The Necessity for More Frequent Re-coating. It is not necessarily true that low VOC coatings produce thicker coating films, and, even if they do, the resultant thickness does not necessarily produce more VOC emissions. If a volume of coating is reformulated to decrease VOC, the volume of VOC lost could be replaced by another organic solvent, water, or solids. In the first two cases, VOC emissions would be less for an equivalent coating thickness, perhaps significantly less due to the "less water calculation" as described in Section 4.2.3, xi) VOC Definition for Low Solids Coating, above. If the coating increased solids, the VOC emissions would also be less even if the coating film increased. The comment would only be true in the case where coating technology shifts were mandated by the VOC requirements, such that the substrate coated required significantly thicker coating films for protection. As mentioned above, this has not been shown to be the case based on coating sales on a per capita basis associated with reduction in VOC limits. Also, the CARB Program EIR found that low-VOC coatings are as durable and as long lasting as conventional coatings, based on available test data to date and on manufacturers' recommendations. No revision to the EIR is necessary based on this comment.

In the June 21, 2000 submission to CARB staff regarding the SCM, Mr. Sell states that the CARB EIR is deficient because the EIR fails to address the widely differing climatic conditions in California on a region-by region basis. The District EIR has addressed Bay Area climatic conditions. For the most part, the Bay Area is characterized by conditions similar to much of California; hot, dry summers and cool, damp winters with temperatures rarely reaching freezing. However, the Bay Area also is unique in its proximity to San Francisco Bay and predominantly cool and humid conditions along the coast in the summer. This EIR addresses those topics, so no revisions based on this comment are necessary. Also, although previously noted, the Rule 3 amendments propose a limited allowance for industrial maintenance coating at a VOC limit above that of the proposed VOC limit of 250 g/l. This is specifically intended to compensate for cooler and more humid conditions.

In the August 20, 2000 submission to CARB staff regarding the CARB draft EIR, Mr. Sell, and Robert Nelson, Director of Environmental Affairs for NPCA, remark on what they consider to be proper attributes of coating to be considered in comparison tests between low VOC and high VOC coatings. In addition to performance characteristics, application and surface preparation characteristics, and cost effectiveness, waste considerations should be compared. Specifically, will the use of a particular coating generate a high amount of waste product and will the amount of solid or hazardous waste generation increase due to different surface preparation requirements. Although in the context of this statement about what should be considered as test parameters, no allegations are made regarding increases in waste from lower VOC coatings, this issue has been previously raised. It is addressed in the EIR in Section 4.6, Solid and Hazardous Waste. The analysis found that any increase in solid or hazardous waste anticipated by implementation of the rule could not be considered significant. Consequently, no revisions to the EIR are necessary.

In conclusion, none of the comments submitted by NPCA related to environmental impacts require revisions to this EIR. For a complete response to comments, please see the staff report accompanying the proposed amendments. To the extent that those comments can be further construed to raise any environmental issues other than those addressed above, the comments and responses are incorporated by reference.

UNITED ASSOCIATION
of Journeymen and Apprentices of the
Plumbing and Pipe Fitting Industry of
the United States and Canada

William P. Hite
General President

Patrick R. Perno
General Secretary-Treasurer

Stephen F. Kelly
Assistant General President

Founded 1889

UA Local Union: 78

1111 W. James M. Wood Blvd
Los Angeles, CA 90066

Letters should be confined to one subject

Subject:

April 7, 2005

Richard Drury
Adams Broadwell Joseph & Cardozo
651 Gateway Blvd., Suite 900
South San Francisco, CA 94080

RE: Issues Related to CPVC Plastic Pipe

Dear Mr. Drury:

I am the Business Manager of UA Plumbers' Local 78, located at 1111 West James M. Wood Blvd., Los Angeles, CA 90015. I have personal knowledge of the matters set forth in this letter from many years of working in the plumbing industry.

1. I am a licensed Journeyman Plumber in the County of Los Angeles. I spent five years as an apprentice plumber, nine years as a journeyman plumber in the field, and worked as a foreman and general foreman. For nine years I was an apprentice instructor at the Apprentice and Journeyman Training Trust in Dominguez Hills, California. I am a graduate of the Journeyman and Apprentice Instructor Training Program at Ann Arbor, Michigan. I have personally participated in the installation of plumbing systems in well over one thousand single and multi-family residential units.

2. In a large residential development involving partially pre-fabricated units, it is common to install CPVC plastic pipe in as many as 20 housing units per day.

3. It is common to install electrical wiring adjacent to CPVC plastic pipe since the same holes are often used for both plumbing and electrical service. Nothing in the Building Code prohibits placement of electrical wiring adjacent to CPVC plastic pipe, and it saves time and expense to place both services in the same holes.

4. It is common for contractors to use more cement, primer and solvents than suggested by manufacturers' instructions when installing CPVC pipe.

5. Propane gas is the fuel of choice in the installation of copper residential water pipe systems. Acetylene is very rarely used. I estimate that acetylene is used in less than one percent of residential copper plumbing installations.

6. A typical fourteen-ounce canister of propane gas is sufficient to plumb two to three typical residential homes with copper pipe.

7. Less than one percent of propane gas is vented to the atmosphere during the installation of copper drinking water pipe systems. Modern propane torches have electronic ignition triggers that light the propane almost immediately, resulting in almost no discharge of unburned propane to the atmosphere. Older propane torches

are ignited with a hand-held striker that is used to ignite the propane almost immediately after turning on the propane flow. Even with the older units, plumbers release very little unburned propane into the atmosphere prior to lighting since this would constitute waste of a valuable product. I estimate that less than one percent of propane is vented to the atmosphere prior to combustion even with the older hand-lit propane torches.

11. Plumbers are trained not to overheat flux, as this can ruin a joint. Plumbers are trained to use just enough heat to melt the flux and solder.

12. Construction activity varies month-by-month due largely to rainfall. Most residential construction is halted during rainfall. Since most rainfall in California occurs during the winter, this results in a decrease in construction activity during the winter months. There is generally a 25-30% decrease in construction activity during the winter months.

13. Plumbers typically work five days per week and typically do not work on federal holidays.

14. I have reviewed calculations prepared by Mr. Nick Kavanaugh, former Training Director, Joint Apprenticeship and Training Committee, Pipe Trades Training School, PMCA, Kern, Inyo and Mono Counties (Aug. 19, 1998). Mr. Kavanaugh calculated the number of joints required for a typical residential home plumbed with CPVC. I conclude that Mr. Kavanaugh's calculations are still reasonable and accurate. Also, the size of the average new home continues to expand in California, with additional bathrooms, kitchen sinks and other amenities becoming increasingly common. Therefore, Mr. Kavanaugh's calculations may underestimate the number of joints required for a typical home today.

Thank you. Feel free to contact me with any questions.

Sincerely,

John C. Hall

John Hall
Business Manager
UA Local 78

JCH/dt/opeiu#537/afl-cio

April 15, 2005

Richard Drury
Adams Broadwell Joseph & Cardozo
651 Gateway Blvd., Suite 900
South San Francisco, CA 94080

RE: Issues Related to CPVC Plastic Pipe

Dear Mr. Drury:

I am a certified plumbing instructor with UA Plumbers' and Steamfitters Local 159, located at 1308 Roman Way, Martinez, CA 94553. I have personal knowledge of the matters set forth in this letter from many years of working in the plumbing industry.

1. I am a certified plumbing inspector. I have over 31 years of experience as a plumber and 11 years of experience as a general superintendent. I have also been a plumbing instructor at the apprenticeship school for over 20 years.

2. Plumbers almost always use more cement, primer and solvents than suggested by manufacturers when installing CPVC pipe. This is because it is expedient, (there is no bonus for saving and there is a large penalty for leaks). Additionally, manufacturer-supplied daubers used to apply solvent and cement are substantially larger than the inside diameter of most in-house fittings leading to a large amount of waste. It would be common to waste as much as 50% of the cement and solvents due to these factors, which would result in use of twice as much material than specified by manufacturers.

3. Our office conducted an informal survey of professional plumbers in Contra Costa County to determine common fuels used when installing copper. Our survey indicated that most plumbers in this area use MAPP gas (10 of 14 surveyed, or 71%); the next most common fuel is acetylene (3 of 14 surveyed, or 21%); while propane is used by some plumbers (1 of 14 surveyed, or 7%). MAPP gas is C_3H_4. MAPP gas is made by combining liquefied petroleum gas with methylacetylene-propadiene. The neutral oxy-MAPP gas flame produces 2405 BTUs/cf with a 5301° F (2927° C) flame temperature. (http://www.corpbrothers.com/productcgc/mapp.htm)

4. Professional plumbers waste very little gas prior to lighting the torch, since wasting fuel results in a loss of profits. A minimum amount of gas is vented to atmosphere. The torch is turned on and immediately lit within one to two seconds. The torch is then used to join numerous joints which are set ahead of time. The result is a loss to the atmosphere of less than 1% of fuel.

5. One 7.5 lb. MAPP gas cylinder is typically adequate to plumb 4-5 houses, although this of course will vary with the size of the house and the complexity of the job.

6. The number of joints per house will be identical whether the house is plumbed with copper of CPVC. The number of joints in a typical house will range from 225-250, although this will, of course, vary with the size of the house and the complexity of the job.

7. Construction activity varies month by month due to rain. We have experienced a 20% reduction this winter.

8. Plumbers generally work 5-days a week, 8 hours a day by contract, and when work is available. Overtime work on residential construction is unusual.

9. Plumbers generally do not work on Federal holidays, except for emergencies or rush jobs.

10. It is typical to use one pound of solder and two ounces of flux to plumb a typical house with copper pipe.

11. We conducted a survey of professional plumbers in Contra Costa County to determine the flux brands that are typically used. Our survey indicated that No Korod flux is the most common (used by 8 of 16 surveyed, or 50%); No Korod Aqua is the next most common (used by 6 of 16 surveyed, or 37%), while Oatey #5 and Laco were each used less frequently (1 each of 16 surveyed, or 6% each).

Thank you. Feel free to contact me with any questions.

Sincerely,

Robert J. Calone 4/18/05

Robert Calone
Certified Inspector #016380
UA Local 159

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Facility : BEAUMONT, CA

Potable Water - Pipe and Fittings

Product Type	Material Type	Trade Name	Product Standard
Fittings+	*CPVC*	*DURA*	*ASTM D2846*

90° Street Ell (Spg x S) CTS
1/2"

Cap (S) CTS
1/2", 3/4"

Coupling (S x S) CTS
>= 1/2"

Ell (S x S) CTS
1/2", 3/4"

Reducer Bushing (Spg x S) CTS
3/4" x 1/2"

Tee (S x S x S) CTS
1/2", 3/4", 1"

Tee Reducing (S x S x S) CTS
1" x 1" x 1/2" 1" x 1" x 3/4" 3/4" x 1/2" x 1/2" 3/4" x 3/4" x 1/2"

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

HARVEL PLASTICS, INC.

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Facility : BAKERSFIELD, CA

Potable Water - Pipe and Fittings

Product Type	Material Type	Trade Name	Product Standard
*Pipe** + 1/4" thru 16" Sch 40 1/4" thru 16" Sch 80	*CPVC 4120*	*HARVEL CPVC*	*ASTM F441*

* Sockets and gasketed bell ends are not tested or Listed by NSF for this production facility.
+ Material complies with NSF/ANSI Standard 61 health effects requirements.

*Pipe** + 1/4" thru 16" Sch 40 1/4" thru 16" Sch 80	*CPVC 4120*	®	*ASTM F441*

* Sockets and gasketed bell ends are not tested or Listed by NSF for this production facility.
+ Material complies with NSF/ANSI Standard 61 health effects requirements.

*Pipe** + 3/4" thru 3" SDR 13.5	*CPVC 4120*	*HARVEL BLAZEMASTER®*	*ASTM F442*

* Sockets and gasketed bell ends are not tested or Listed by NSF for this production

facility.
+ Material complies with NSF/ANSI Standard 61 health effects requirements.

*Pipe** + *CPVC 4120* ® *ASTM F442*
3/4" thru 3" SDR 13.5

* Sockets and gasketed bell ends are not tested or Listed by NSF for this production facility.
+ Material complies with NSF/ANSI Standard 61 health effects requirements.

IPS CORPORATION

17109 SOUTH MAIN
P.O. BOX 379
GARDENA, CA 90247
310-898-3352

Facility : GARDENA, CA

Joining Materials

Product Type	General Material	For Use With	Trade Name	Product Standard
Solvent Cement (1,2,3)	CPVC	PW	Weld-On "All Weather" Flowguard Gold Low-VOC CPVC*	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 2713 Green CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 2714 Beige, Gray or Orange Low-VOC CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 2714 Red or Tan Low-VOC CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 713 Orange CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 714 Orange or Gray CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 724 Gray or Orange CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 724 Yellow CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On Low-VOC Flowguard Gold 1-Step CPVC*	ASTM F493

* This cement is yellow color.

(1) This product was evaluated by NSF according to the requirements of NSF/ANSI Standard 61, Section 4.
(2) The compliance of this product with the health effect requirements of NSF/ANSI Standard 61 was determined based on the testing of pipe and fittings assembled using the cement and P-70 and P-72 Primers.
(3) This product is acceptable for use with pipe and fittings sized 1/2" and greater diameter.

KING BROS. INDUSTRIES

Cert-Link (Click here to visit this Company's Website)

29101 THE OLD ROAD
VALENCIA, CA 91355
661-257-3262

Facility : VALENCIA, CA

Potable Water - Pipe and Fittings

Product Type	Material Type	Trade Name	Product Standard
Fittings, Elbow PW+	*CPVC 41xBrass C3600*	*KBI*	*ASTM D2846*

Drop Ear Ell (Brass Elbow) 1" CTS x 1" FIPT
Drop Ear Ell (Brass Elbow) 1/2" CTS x 1/2" FIPT
Drop Ear Ell (Brass Elbow) 3/4" CTS x 3/4" FIPT
Drop Ear Ell (CPVC Elbow) 1/2" CTS x 1/2" FIPT

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

*Transition Fittings PW+ ***	*CPVC 41xBrass C36000*	*KBI*	*ASTM D2846*

1 1/2" CTS X 1 1/2" FIPT
1 1/2" CTS X 1 1/2" MIPT
1 1/4" CTS X 1 1/4" FIPT
1 1/4" CTS X 1 1/4" MIPT
1" CTS x 1" FIPT
1" CTS x 1" MIPT
1/2" CTS x 1/2" FIPT
1/2" CTS x 1/2" MIPT
2" CTS X 2" FIPT
2" CTS X 2" MIPT
3/4" CTS x 3/4" FIPT
3/4" CTS x 3/4" MIPT
Drop Ear 1" CTS x 1" FIPT
Drop Ear 1/2" CTS x 1/2" FIPT
Drop Ear 3/4" CTS x 3/4" FIPT

+ Material complies with NSF/ANSI Standard 61 health effects requirements.
** CPVC Transition Fittings rate at 100 psi at 150°F.

Transition Fittings PW+	*CPVC 41xBrass C36000*	*KBI*	*ASTM F1807*

1/2" CTS x 1/2" PEX
3/4" CTS x 3/4" PEX

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

SPEARS MANUFACTURING COMPANY

Cert-Link (click here to visit this Company's Website)

15853 OLDEN STREET
P.O. BOX 9203
SYLMAR, CA 91342
818-364-1611

Facility : GARDENA, CA

Joining Materials

Product Type	General Material	For Use With	Trade Name	Product Standard
Solvent Cement	CPVC	PW	Blazemaster FS-3	ASTM F493
Solvent Cement	CPVC	PW	Blazemaster FS-4	ASTM F493
Solvent Cement	CPVC	PW	LW5 VOC Yellow One-Step CPVC Cement	ASTM F493
Solvent Cement	CPVC	PW	Low VOC One-Step FS-5	ASTM F493

SPEARS MANUFACTURING COMPANY

Cert-Link (click here to visit this Company's Website)

15853 OLDEN STREET
P.O. BOX 9203
SYLMAR, CA 91342
818-364-1611

Facility : SYLMAR, CA

Potable Water - Pipe and Fittings

Product Type	Material Type	Trade Name	Product Standard
Fittings+	*CPVC 41*	*SPEARS*	*ASTM F437*
45° Ell 819-xxx			
90° Ell 808-xxx			

Bushing
839-xxx

Cap
848-xxx

Coupling
830-xxx

Plug
850-xxx

Tee
805-xxx

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

Fittings+	*CPVC 41*	*SPEARS*	*ASTM F439*
22 1/2° Ell 4216-xxx	816-xxx		
22 1/2° Street Elbow 4242-xxx	842-xxx		
30° Ell 815-xxx			
45° Ell 4217-xxx	817-xxx		
45° Street Elbow 827-xxx			
90° Ell 4206-xxx 809-xxx	4209-xxx	806-xxx	807-xxx
Adapter 835-xxx	836-xxx		
Cap 4247-xxx	847-xxx		
Coupling 4229-xxx	829-xxx		
Cross 4220-xxx	820-xxx		

Plug 849-xxx			
Street Tee 4244-xxx	844-xxx		
Tee 4201-xxx	801-xxx	802-xxx	

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

Fittings+	*CPVC 41*	*SPEARS MANUFACTURING CO.*	*ASTM F438*
22 1/2° Ell 816-xxx			
22 1/2° Street Elbow 4242-xxx	842-xxx		
45° Ell 417-xxx	4217-xxx		
90° Ell 406-xxx	409-xxx	4206-xxx	4209-xxx
Cap 4247-xxx	447-xxx		
Coupling 4229-xxx	429-xxx		
Cross 4220-xxx			
Street Tee 4244-xxx	844-xxx		
Tee 401-xxx	4201-xxx		

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

Fittings+	*CPVC 41*	*SPEARS*	*ASTM D2846*
45° Ell (S x S) 1/2" thru 2" (4117-xxx)			
45° Street Ell (Spg x Soc) 1/2" thru 2" (4127-xxx)			

90° Ell (S x S)
1/2" thru 2" (4106-xxx)

90° Street Ell (S x FIPT)
1/2" thru 2" (4109-xxx)

Cap (Socket)
1/2" thru 2" (4147-xxx)

Coupling (S x S)
1/2" thru 2" (4129-xxx)

Male Adapter (Soc x MIPT)
1/2" thru 2" (4136-xxx)

Reducer Bushing (Spg x Soc)
1/2" thru 2" (4137-xxx)

Tee (S x S x S)
1/2" thru 2" (4101-xxx)

Transition Bushing (IPS x CTS)
1/2" thru 2" (4140-xxx)

Transition Coupling (IPS x CTS)
1/2" thru 2" (4141-xxx)

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

Reinforced Male Thread+ *CPVC 41* *SPEARS* *ASTM D2846*

Transition Adapter
1/2" thru 2"

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

Stainless Steel+ [1] *CPVC 41* *SPEARS* *ASTM D2846*

Female Adapter
1/2" thru 2"

+ Material complies with NSF/ANSI Standard 61 health effects requirements.
[1] Reinforced

Stainless Steel+ [1] *CPVC 41* *SPEARS* *ASTM D2846*

90° Ell
1/2" thru 2"

+ Material complies with NSF/ANSI Standard 61 health effects requirements.
[1] Reinforced

NOTE: xxx = different size code designation

T. CHRISTY ENTERPRISES, INC.

403 WEST BRENNA LANE
ORANGE, CA 92667
213-321-6515

Facility : GARDENA, CA

Joining Materials

Product Type	General Material	For Use With	Trade Name	Product Standard
Solvent Cement (1,2,3)	CPVC	PW	Low VOC Big Orange CPVC	ASTM F493

(1) This product was evaluated by NSF according to the requirements of NSF/ANSI Standard 61, Section 4.
(2) The compliance of this product with the health effect requirements of NSF/ANSI Standard 61 was determined based on the testing of pipe andfittings assembled using the cement and Christy Red Hot Clear primer.
(3) This product is acceptable for use with pipe and fittings sized 1/2" and greater diameter.

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Number of matching Products is 117
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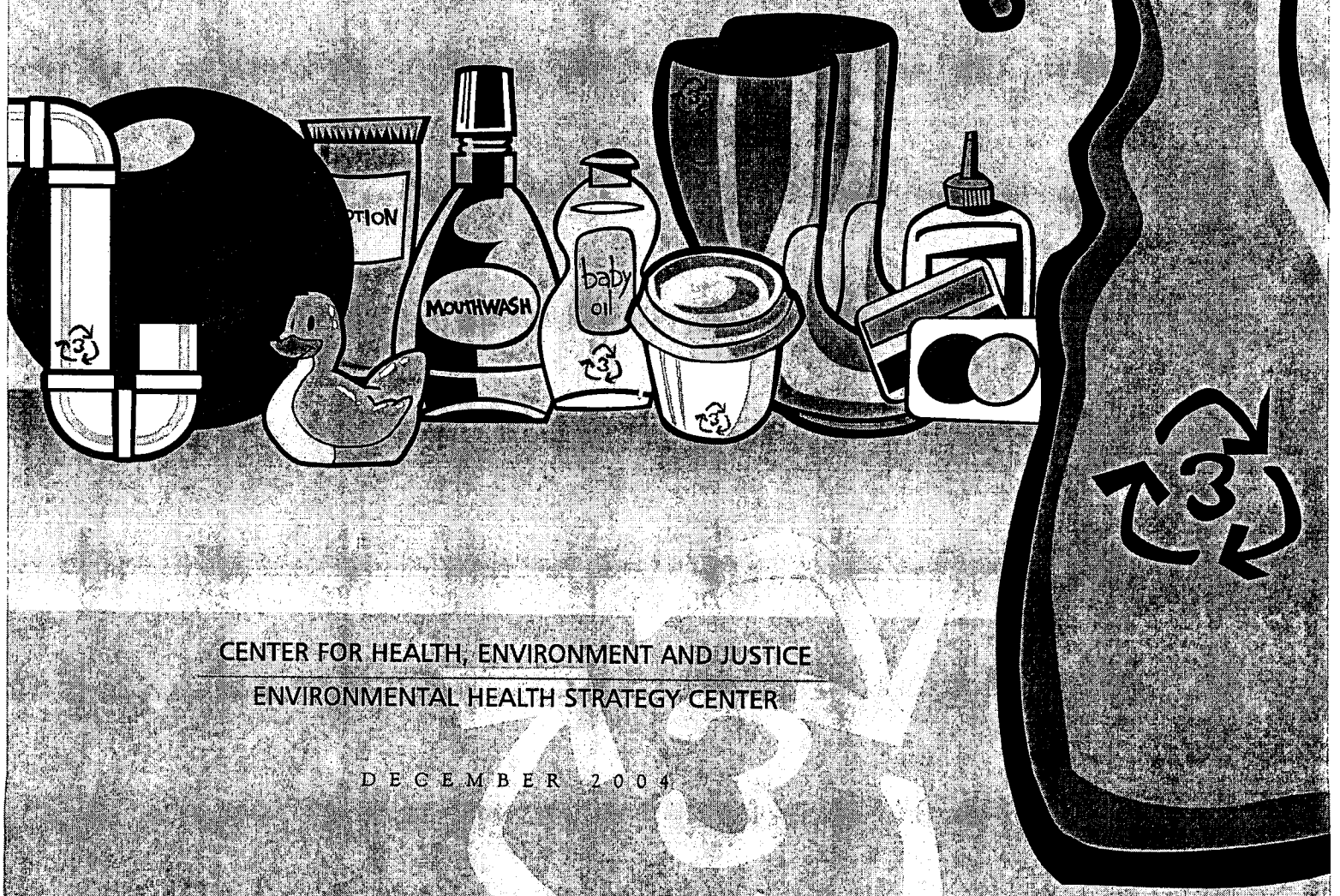
PVC

Bad News Comes in 3s

The Poison Plastic, Health Hazards and the Looming Waste Crisis



CENTER FOR HEALTH, ENVIRONMENT AND JUSTICE

ENVIRONMENTAL HEALTH STRATEGY CENTER

DECEMBER 2004

PVC

Bad News Comes in 3s

The Poison Plastic, Health Hazards and the Looming Waste Crisis

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The Center for Health, Environment and Justice was founded in 1981 by Lois Gibbs, the community leader at Love Canal. CHEJ empowers local groups to be active, ongoing, democratic forces working to protect people and the environment from health-threatening contaminants. We provide one-on-one organizing and technical assistance, and coordinate nationwide issue-focused campaigns that strengthen and broaden the movement.

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The Environmental Health Strategy Center is a public health organization that exists to protect human health from exposure to toxic chemicals. The Center promotes safe alternatives and clean industry and builds partnerships that focus on environmental solutions as a public health priority. The Center conducts strategic issue campaigns that help set the pace for national chemicals policy reform.

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*Organizations listed for identification purposes.

Keeping the American Promise:

Achieve Safer and Healthier Future By Eliminating PVC, The Poison Plastic

Dear Friends,

This report provides the facts and a plan of action for one of the most important changes society can make to protect the public's health and the environment.

PVC is a poison plastic. It has earned the title after decades of harming our health and environment. PVC's destructive toxic life begins with manufacturing, continues during product use, and then creates devastating pollution problems when it is disposed. I cannot think of another product that is so destructive throughout its entire life cycle as PVC.

In Louisiana, families gather to talk about how growing health problems in their neighborhood are connected to the local plastic chemical plant's emissions. In Massachusetts, families meet to discuss the rising cancer rates in their valley and the nearby incinerators burning large amounts of PVC and releasing dioxin into the air.

I have traveled across the nation visiting neighborhoods that confront the hazards from manufacturing or disposing of PVC plastics every day. These American families find their homes are suddenly worthless and they are trapped in a nightmare of frustration—trying to prove the pollution from the plant or incinerator has caused the damage to their health. Many of these community stories are briefly described in this report.

Our country's fire fighters and first responders are worried about exposures to PVC's toxic fumes every time they encounter a fire. Consumers are concerned about vinyl plastic tablecloths or shower curtains that release toxic fumes, often referred to as "that new smell." Parents are worried about the leaching of toxic chemicals from PVC toys that their children used in the past.

The sad truth behind the destruction and harm caused by PVC, is that in most cases it is not needed. There are plenty of alternatives that are readily available on the market today. On store shelves, consumers can choose shampoo with a PVC bottle (marked with a #3 or V in the recycle symbol triangle) or a safer PVC-free plastic bottle. A growing number of responsible corporations have decided to stop using PVC. Irresponsible corporations, on the other hand, have refused to move to safer plastics.

An important part of this report is the well-documented fact that there is no "away" for PVC. There is no way to get rid of the product once manufactured. It is with us forever—a legacy left to the next generation. You can't burn it—it just changes to dioxin, another very toxic pollutant. You can't bury it—chemicals leak out into the surrounding soil and groundwater. You can't recycle it—it contaminates the recycling process.

This report gives us hope by outlining how we as a society can phase out PVC in the future, with clear models to begin that phase out now. You'll learn in this document about the many safer, affordable alternatives to PVC that are available today.

We need to begin a nationwide conversation, community by community, on how to phase out PVC. As consumers we need to send a strong message to corporations who are resisting the effort to eliminate PVC and let them know we will not purchase their products. We need to encourage companies to use their entrepreneurial ingenuity to develop new products without PVC, the poison plastic. And, we need to enlist all levels of government to pass strong policies to phase-out PVC.

We must move quickly. Generating as much as seven billion pounds of PVC waste each year cannot continue. We can't bury it, burn it or recycle it. PVC wastes will live beyond the lifetime of everybody on this planet—a terrible legacy to leave for future generations.

A road map for how society can eliminate PVC is included in this report. If everyone takes a step down this road we can achieve a phase-out and begin to safeguard public health and the environment. I hope you will join us and help to leave our children a healthier, more sustainable world.

Lois Marie Gibbs
Executive Director
Center for Health, Environment and Justice

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EXECUTIVE SUMMARY

"Billions of pounds of PVC, the 'poison plastic,' are being thrown 'away' in the U.S.— but there is no away for the health threatening chemicals associated with PVC."

The disposal of polyvinyl chloride (PVC) plastic threatens public health and the environment. Although problematic throughout its lifecycle – from production through final use – the discarding of PVC as waste poses perpetual hazards. PVC is widely used in plastic pipes, building materials (e.g., vinyl siding, windows), consumer products, disposable packaging and many everyday products. We can prevent harm from PVC by replacing it with safer, cost-effective alternatives that are available, and by diverting PVC waste away from incineration and open burning. This report summarizes data on PVC production, use and disposal in the United States, though its conclusions about the environmental health hazards of PVC are applicable to every country.

How much PVC do we use?

Billions of Pounds of PVC are Discarded Each Year

Large and growing amounts of PVC are discarded daily in the U.S. As much as 7 billion pounds of PVC is discarded every year in municipal solid waste, medical waste, and construction and demolition debris. PVC disposal is the largest source of dioxin-forming chlorine and hazardous phthalates in solid waste, as well as a major source of lead, cadmium and organotins. Dioxins are a family of highly toxic chemicals that are known to cause cancer, reproductive, developmental and immune problems. More than 2 billion pounds per year of nondurable (short-lived) PVC products are discarded with U.S. household trash, including blister packs and other packaging, plastic bottles and containers, plastic wrap and bags, and more. In fact, nondurable products account for more than 70% of the PVC disposed of in U.S. municipal solid waste. Worldwide, an estimated 300 billion pounds of PVC, which was installed in the last 30 to 40 years in construction and other long lasting uses, will soon reach the end of its useful life and require disposal.

What's so bad about PVC plastic?

PVC: A Truly "Poison" Plastic

Unlike the many plastics made without chlorine, PVC

poses serious environmental health threats from the start. The production of PVC requires the manufacture of raw chemicals, including highly polluting chlorine, and cancer-causing vinyl chloride monomer (VCM) and ethylene dichloride (EDC). Communities surrounding U.S. vinyl chloride chemical facilities, half of which are in Louisiana, suffer from serious toxic chemical pollution of their groundwater supplies, surface waters and air. Residents of the town of Mossville, Louisiana had dioxin levels in their blood that were three times higher than normal. PVC plastic also requires large amounts of toxic additives to make it stable and usable. These additives are released during the use (and disposal) of PVC products, resulting in elevated human exposures to phthalates, lead, cadmium, tin and other toxic chemicals. Dioxin emissions from PVC combustion occur regularly due to the 1 million annual fires that burn buildings and vehicles, two sectors that use substantial amounts of PVC.

What are the options for disposing of used PVC?

PVC Products + Waste Incinerators or Open Burning = Dioxin Emissions

Dioxin formation is the Achilles heel of PVC. Burning PVC plastic, which contains 57% chlorine when pure, forms dioxins, a highly toxic group of chemicals that build up in the food chain. PVC is the major contributor of chlorine to four combustion sources—municipal solid waste incinerators, backyard burn barrels, medical waste incinerators and secondary copper smelters—that account for a significant portion of dioxin air emissions. In the most recent USEPA Inventory of Sources of Dioxin in the United States, these four sources accounted for more than 80% of dioxin emissions to air based on data collected in 1995. Since then, the closure of many incinerators and tighter regulations have reduced dioxin air emissions from waste incineration, while increasing the proportion of dioxin disposed of in landfills with incinerator ash. The PVC content in the waste steam fed to incinerators has been linked to elevated levels of dioxins in stack air emissions and incinerator ash.

Incineration and open burning of PVC-laden waste seriously impacts public health and the environment. More than 100 municipal waste incinerators in the U.S. burn 500 to 600 million pounds of PVC each year, forming highly toxic dioxins that are released to the air and disposed of on land as ash. The biggest PVC-burning states include Massachusetts, Connecticut, Maine—which all burn more than half of their waste—Florida, New York, Virginia, Pennsylvania, Maryland, Minnesota, Michigan, New Jersey, Indiana and Washington. The incineration of medical waste, which has the highest PVC content of any waste stream, is finally being replaced across the U.S. by cleaner non-burn technologies after years of community activism and leadership by environmentally-minded hospitals. Backyard burning of PVC-containing household trash is not regulated at the federal level and is poorly regulated by the states. There are no restrictions on backyard burning in Michigan and Pennsylvania. It is partially restricted in 30 states, and banned in 18 states.

PVC Products + Landfill Disposal = Groundwater Contamination

Land disposal of PVC is also problematic. Dumping PVC in landfills poses significant long-term environmental threats due to leaching of toxic additives into groundwater, dioxin-forming landfill fires, and the release of toxic emissions in landfill gases. Land disposal is the final fate of between 2 billion and 4 billion pounds of PVC that are discarded every year at some 1,800 municipal waste landfills in the U.S. Most PVC in construction and demolition debris ends up in landfills, many of which are unlined and cannot capture any contaminants that leak out. An average of 8,400 landfill fires are reported every year in the U.S., contributing further to PVC waste combustion and dioxin pollution.

PVC Products + Recycling = Contamination of the Entire Plastics Recycling Process

Unfortunately, PVC recycling is not the answer. The amount of PVC products that are recycled is negligible, with estimates ranging from only 0.1% to 3%. PVC is very difficult to recycle because of the many different formulations used to make PVC products. Its composition varies because of the many additives used to make PVC products. When these different formulations of PVC are mixed together, they cannot readily be separated which is necessary to recycle the PVC into its original formulation. It's also virtually impossible to create a formulation that can be used for a specific application. PVC can never be truly recycled into the same quality material—it usually ends up being made into lower quality products with less stringent requirements such as park benches or speed bumps.

When PVC products are mixed in with the recycling of non-chlorinated plastics, such as in the "all-bottle" recycling programs favored by the plastics industry, they contaminate the entire recycling process. Although

other types of non-chlorine plastics make up more than 95% of all plastic bottles, introducing only one PVC bottle into the recycling process can contaminate 100,000 bottles, rendering the entire stock unusable for making new bottles or products of similar quality. PVC also increases the toxic impacts of other discarded products such as computers, automobiles and corrugated cardboard during the recycling process.

Safer alternatives are available to replace PVC

Safer alternatives to PVC are widely available and effective for almost all major uses in building materials, medical products, packaging, office supplies, toys and consumer goods. PVC is the most environmentally harmful plastic. Many other plastic resins can substitute more safely for PVC when natural materials are not available.

PVC alternatives are affordable and already competitive in the market place. In many cases, the alternatives are only slightly more costly than PVC, and in some cases the costs of the alternative materials are comparable to PVC when measured over the useful life of the product. Phasing out PVC in favor of safer alternatives is economically achievable. A PVC phase-out will likely require the same total employment as PVC production. The current jobs associated with U.S. PVC production (an estimated 9,000 in VCM and PVC resin production, and 126,000 in PVC fabrication) would simply be translated into production of the same products from safer plastic resins.

How can we get rid of PVC?

To end the myriad of problems created by PVC disposal, we recommend the following policies and activities.

- Policymakers at the local, state and federal level should enact and implement laws that steadily reduce the impacts of PVC disposal and lead to a complete phase-out of PVC use and waste incineration within ten years (see box below).
- A new materials policy for PVC that embraces aggressive source reduction of PVC should be adopted to steadily reduce the use of PVC over time.
- Federal and state waste management priorities should be changed to make incineration of PVC waste the least preferable option.
- In the interim, any PVC waste generated should be diverted away from incineration to hazardous waste landfills.
- Consumers should take personal action to buy PVC-free alternatives and to remove PVC from their trash for management as household hazardous waste.
- Communities should continue to organize against PVC-related dioxin sources such as waste incinerators while working to promote safer alternatives.

A PVC-Free Policy Action Agenda

▶ Accomplish Within Three Years ◀

1. Ban all open waste burning.
2. Educate the public about PVC hazards.
3. Ban the incineration of PVC waste.
4. Collect PVC products separately from other waste.
5. In the interim, divert PVC away from incineration to hazardous waste landfills.

▶ Accomplish Within Five Years ◀

6. Establish our Right-to-Know about PVC.
7. Label all PVC products with warnings.
8. Give preference to PVC-free purchasing.
9. Ban PVC use in bottles and disposable packaging.
10. Ban sale of PVC with lead or cadmium.

▶ Accomplish Within Seven Years ◀

11. Phase out other disposable PVC uses.
12. Phase out other high hazard PVC uses.
13. If safer alternatives are not yet available, extend the PVC phase-out deadlines for specific purposes.
14. Fund efforts to reduce the amount of PVC generated through fees on the PVC content of products.

▶ Accomplish Within Ten Years ◀

15. Phase out remaining durable PVC uses.
16. Decommission municipal waste incinerators in favor of zero waste.

INTRODUCTION

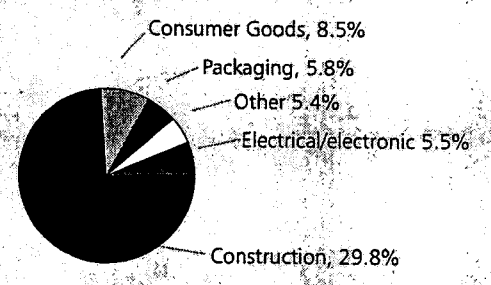
PVC—The Poison Plastic

Polyvinyl chloride, commonly referred to as "PVC" or "vinyl," is the second largest commodity plastic in production in the world today. An estimated 59 billion pounds were produced worldwide in 2002 (CEH 2003). Over 14 billion pounds are produced annually in the U.S. (VI 2004). PVC is used in a wide range of products including pipes and tubing, construction materials, packaging, electrical wiring and thousands of consumer goods (Ackerman 2003). The diverse and widespread use of PVC plastic in disposable and durable goods leads to the many immediate and long-term disposal challenges reviewed in this report.

Figure 1 provides a general breakdown of the many uses of PVC. Because of its low cost and aggressive marketing, PVC is found in hundreds of consumer products that are used everyday, including children's toys, credit cards, clothing, carpeting, furniture, flooring, automotive seats, garden hoses, cellular phones, computer parts, office supplies, siding on our homes, roofing and other building materials. A partial listing of common household products made of PVC can be found in Appendix A.

Plastic pipes and construction uses account for 75% of all PVC consumption in North America. Construction is also the fastest growing PVC sector, with a projected annual average growth rate of 3.5% between 2002 and 2007. Within the construction sector, the fastest growing PVC products are special applications, such as gutters, fencing and decking (growing at 8.1% per year), windows and doors (6.1%), vinyl siding (4.5%) and pipes and tubing (2.5%). PVC use in electrical equipment and electronics is increasing at 2.5% per year. Disposable PVC packaging and transportation-related

Figure 1. Uses of PVC in U.S. and Canada (2002)



Source: Ackerman 2003, CEH 2003

PVC uses will grow by 2.0% every year over the same five-year period (CEH 2003).

This report reviews the many hazards associated with the disposal of PVC in the United States. Although the report relies primarily on U.S. data on PVC production, use and disposal, the information on the environmental health impacts of PVC are applicable to every country. This report is not intended to be a comprehensive review of all the health and environmental risks posed during the lifecycle of PVC throughout its production, use, and disposal. The key impacts of PVC production and use are summarized in order to provide context for assessing the impacts of the disposal of PVC waste.

Throughout the text we have included a number of case studies that illustrate the impact that PVC has on people. In addition, there are a number of sidebars that highlight actions that some organizations have taken to address the public health or environmental impacts of PVC. The following is a brief summary of the report's findings listed by chapter.

Chapter 2, The PVC Generation: Large and Growing Amounts of PVC Waste,

provides an overview of the amount of PVC waste generated in the U.S. each year and estimates how much ends up in different waste streams. This chapter also addresses how PVC increases the toxicity of these waste streams.

Chapter 3, Trouble From The Start: The Production and Use of PVC,

reviews the production and processing of PVC, which involves chlorine and an array of additives that have serious consequences for public health and the environment during PVC use and disposal. The toxic hazards of PVC additives, including phthalates, heavy metals and flame retardants, are described in this chapter.

Chapter 4, The Deadly Connection: PVC, Chlorine and Dioxin,

reviews the relationship between PVC, chlorine and dioxin, which is especially troubling. Dioxin, one of the most toxic chemicals ever tested, is generated when any form of burning is used as a disposal option for PVC.

Chapter 5, Don't Burn It: The Hazards of Burning PVC Waste,

provides a detailed description of the specific hazards of PVC incineration. Open burning of PVC waste in backyard burn barrels or waste piles is especially troubling because of the large amount of dioxins generated.

Chapter 6, No Place Left: Problems with PVC in Landfills,

reviews the specific toxic hazards associated with the land disposal of PVC. Many PVC additives, including phthalates, heavy metals such as lead and cadmium and organotins, slowly leach out of PVC over time when placed in a landfill, eventually contaminating groundwater and surface water. PVC also worsens the impacts of landfill fires and landfill gases that are generated as materials in the landfill decay.

Chapter 7, Recycling Menace: PVC Undermines Recycling Efforts,

reviews efforts to recycle PVC and details its impacts on plastic recycling programs due to its incompatibility with other commonly recyclable plastics. PVC is extremely hard to recycle because of the numerous additives that are used to make a wide range of PVC products. The toxic by-products of PVC also significantly undermine the recycling of other products.

Chapter 8, Don't Buy It: Safer Alternatives to PVC are Available, Effective and Affordable,

looks at the widespread availability of safer alternatives to PVC and provides a summary of an economic analysis conducted by the Global Development and Environment Institute at Tufts University in Medford, MA. This analysis found that cost-competitive alternatives do exist for most uses of PVC. This chapter includes information on resources that can be used to identify alternatives to PVC.

Chapter 9, Take Action: Preventing Harm from PVC Use and Disposal,

describes actions that can be taken by individuals, local grassroots community-based organizations, statewide organizations, and as part of national efforts to prevent harm from the use and disposal of PVC.

In researching this report, we identified a number of important references that we used, and in some cases relied on heavily in writing this report. We appreciate the pioneering work on PVC's hazards and alternatives achieved by the researchers, analysts and authors responsible for these publications. We are especially in debt to these colleagues. We encourage you to consult these resources for more detailed documentation and useful information on the hazards and alternatives to PVC. These and other references are listed at the end of this document.

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THE PVC GENERATION
Large and Growing Amounts of PVC Waste

MAJOR FINDINGS

- As much as 7 billion pounds of PVC are discarded every year in the U.S. in municipal solid waste, medical waste and construction and demolition debris.
- PVC disposal is the largest source of dioxin-forming chlorine and phthalates in solid waste, as well as a major source of lead, cadmium and organotins.
- More than 2 billion pounds per year of non-durable (short-lived) PVC products are discarded in U.S. household trash, including blister packs and other packaging, plastic bottles and containers and plastic wrap and bags.
- Non-durable (short-lived) products account for more than 70% of PVC disposed in municipal solid waste in the U.S.
- Worldwide, an estimated 300 billion pounds of longer-lasting PVC products, such as construction materials that last 30 to 40 years, will soon reach the end of their useful life and require replacement and disposal.

Every day, PVC plastic becomes the problem waste that nobody wants to talk about. Why? Because it enters the waste stream in large amounts as the least recyclable and most environmentally harmful plastic. If there were an honest national dialogue about PVC and dioxin pollution prevention, support for waste incineration would crumble and the government would phase out PVC production and use. Landfills can't contain the toxic components of PVC. PVC contaminates the recycling of so many products that could otherwise be safely reprocessed into useful materials. PVC waste adds daily to a looming waste crisis as more and more long-lasting products made of PVC, such as building materials, are removed from use. And perhaps most of all, because powerful elements of the chemical industry are wedded to promoting PVC use and the chlorine industry involved in its production.

We should care about PVC disposal because that's when the toxic components and by-products of this seemingly benign and ubiquitous plastic are discarded and dispersed throughout the environment. Not everyone lives next to the chemical plant that emits the dangerous raw materials of PVC production. Not everyone experiences the vinyl building fire, the dioxin-spewing burn barrel, or the medical procedure that leaches dangerous chemicals from the intravenous (IV) tubing made of PVC.

Yet all of us generate PVC waste even if we try to avoid doing so. By learning about the harm posed by PVC disposal, we can spur political, business, and consumer

action to break the cycle of dependence on this incredibly toxic and problematic material. If we don't burn it, we can reduce the worst impacts of PVC. And if we don't buy it, we can avoid all of the problems associated with PVC production, use, and disposal.

The Quantity of PVC in the Waste Stream

The useful life of a PVC product may come to an end minutes after a purchase in the case of disposable packaging, or a few decades later when PVC building materials must be replaced. Given the widespread use of PVC and its highly variable lifespan across many types of products, it is no wonder that huge amounts of PVC waste are generated on a daily basis in every community.

Table 1 summarizes available information on the PVC content of solid waste in the U.S. The five major waste streams shown in Table 1 account for almost all post-industrial PVC waste: (1) municipal solid waste (MSW); (2) medical waste; (3) construction and demolition (C&D) debris; (4) discarded products collected for recycling; and (5) industrial solid waste generated during manufacturing.

Table 1

Annual PVC Waste Production in the U.S.

Waste Stream Total Quantity Generated	Description of PVC Portion of Waste Stream	PVC Content of Waste Stream	
		Percent	Amount (tons)
Municipal Solid Waste (MSW) 229 million[1] - 369 million[2] tons	Packaging and other disposable vinyl products	0.62%[1]	1,420,000[1] to 2,290,000[2]*
Medical Waste (Biomedical/Infectious) 3.4 million tons[3]	Mostly medical tubing and bags with some vinyl gloves and supplies	5% to 15% [4]	170,000 to 510,000
Construction & Demolition (C&D) Debris 136 million tons[6]	Vinyl pipes only[5] and vinyl pipes and siding[6] (Does not account for other types of PVC C&D debris)	0.18%[5] to 0.63%[6]	245,000 to 856,000
Discarded Products Collected for Recycling Unknown amount	PVC-contaminated plastics from bottles, electronics, automobiles, scrap wood, cardboard, etc.	Varies	Unknown
Manufacturing Waste Unknown amount	Complete range of PVC products including manufactured homes and plastics fabrication	Varies	Unknown
TOTAL Amount of PVC Discarded Annually in MSW, Medical Waste and C&D Debris			1.8 to 3.6 million tons (3.7 to 7.2 billion pounds) Average = 2.75 million tons (Average = 5.5 billion pounds)

Sources and Notes: 1 - USEPA 2003; 2 - Kaufman 2004; 3 - USEPA 1994; 4 - Marrack 1988, Hasselriis 1993, DTI 1995, USOTA 1988; 5 - Cascadia 2003; and 6 - FA 1998. *These two estimates of total PVC content in MSW are derived using USEPA (2003) and Kaufman (2004) data to generate the low and high estimates, respectively. **Note:** There are many inherent uncertainties in any estimate of the amount of MSW generated. This is reflected in the 140 million ton difference between the USEPA estimate of 229 million tons and the Kaufman estimate of 369 million tons of MSW generated. Part of the reason for this difference is due to the methods used to derive the estimates. The USEPA relied on economic and population data to estimate MSW generated on a per capita basis. Kaufman used a survey sent to state management agencies to collect data on solid waste. The EPA estimate only included household garbage, while Kaufman collected data on a number of solid waste categories and then calculated the MSW portion, which included residential and commercial waste, organics, tires, and "other." In both cases, the MSW estimates included primarily household garbage. A third estimate, not used in this report, was made by the Environmental Research and Education Foundation (EREF 2001) which estimated that 545 million tons of MSW were generated in the U.S. in 1999. This estimate was generated from a survey distributed to both public and private waste disposal companies and included all non-hazardous waste sent off-site for final disposal including household waste, commercial and institutional waste, special waste, C&D waste, regulated medical waste, yard waste, sludge and scrap tires. This estimate clearly includes a much broader universal of waste targeted for recycling or disposal.

Waste versus Discards

This report often refers to PVC in the waste stream. In fact, what we often call 'waste' is actually discarded products that we end up wasting. When products reach the end of their useful life, they should be collected to be taken apart and recycled back into their original materials. This is the concept of 'Zero Waste', which maximizes recycling, minimizes waste, reduces consumption and ensures that products are made to be reused, repaired or recycled back into nature or the marketplace (GRRN 2004). Unfortunately, PVC is very difficult to recycle and when present in discarded products tends to contaminate the recycling process. Therefore, almost all PVC products are wasted sooner or later.

Table 1 shows that three of the five major waste streams—municipal solid waste, biomedical/infectious medical waste and construction and demolition debris—account for on average about 5.5 billion pounds of PVC discarded every year in the U.S. An estimated 7.2 billion pounds are generated annually in the European Union (EU) (AEA 2000). In the U.S., 63% to 77% of the total amount of PVC waste known to be discarded each year ends up in the municipal solid waste stream. Medical waste has the highest PVC content due to the high reliance of hospitals on vinyl medical bags and tubing. PVC also makes up as much as 18% of non-infectious hospital waste (Hasselriis 1993), which is typically disposed of as municipal solid waste. The PVC content of C&D waste is similar to that of MSW but is expected to grow significantly—mirroring the growth in PVC building materials used in the last thirty years as they are replaced because of aging (CEC 2000). Each of these five major waste streams are described in the subsections that follow.

Although PVC generally contributes only a modest amount to the total volume of a waste stream, as shown in Table 1, there are exceptions such as hospital waste (Marrack 1988, Hasselriis 1993, DTI 1995, USOTA 1988) and consumer electronics waste (MCTC 1996) that have particularly high PVC content. Furthermore, the amount of PVC waste generated which requires disposal appears to be growing due to the expiration of products placed in use 20 to 30 years ago when PVC materials were introduced (CEC 2000). This adds to concerns about the toxic impacts of PVC disposal due to dioxin formation when burned (see Chapter 5) and the leaching of lead, cadmium, tin, and other toxic additives from the plastic when landfilled (see Chapter 6).

PVC in Municipal Solid Waste

In the U.S., about 79% of PVC in the municipal solid waste (MSW), or about 2.2 billion pounds of PVC, ends up in landfills every year (USEPA 2003). About 21% or about 600 million pounds of PVC in MSW is incinerated every year, leading to the formation of dioxins in air emissions and ash. EPA estimated that a "negligible" amount of PVC is collected for municipal solid waste recycling. MSW includes solid waste generated by households as well as commercial and institutional sources. These figures are based on 2001 data (USEPA 2003).

Non-durable goods (materials with a relatively short useful life) make up 71% of the PVC found in municipal solid waste as shown in Table 2. Over one million tons (2 billion pounds) of these materials were discarded in the U.S. in 2001 (USEPA 2003). The largest portion of these materials was PVC Blister packs (hard plastic packaging often used for toys or computer supplies) and other vinyl packaging that accounted for more than 250,000 tons (500 million pounds). About 500,000 tons (one billion pounds) of these short-lived PVC products are tossed in household trash every year from disposable plastic blister packs, other packaging, film wrap, bags, bottles and other containers. Even more PVC is discarded annually as other non-durable goods, such as shower curtains, beach balls, credit cards and checkbook covers.

The third major category of PVC waste in household trash is durable goods, accounting for 411,000 tons (822 million pounds) per year. "Durable" trash containing PVC could include building materials such as piping, siding, windows and flooring, and consumer electronics and appliances.

PVC in Medical Waste

Until recently, the majority of medical waste was incinerated and much of that was burned on-site at hospitals. By 1990, about 60% to 70% of all medical waste was incinerated (USEPA 1994, USOTA 1990). This included biomedical waste produced by hospitals, labs,

Table 2

PVC Products Disposed in U.S. Municipal Solid Waste (MSW) in 2001

Type of PVC Product		Amount of PVC (tons)	(%)
Non-durable Goods (Short useful life)	Blister packs and other packaging	255,000	18%
	Plastic bottles and containers	147,000	10%
	Plastic wrap and bags	68,000	5%
	Other nondurable goods	539,000	38%
	SUBTOTAL - Nondurables	1,009,000	71%
Durable Goods	SUBTOTAL - Durables	411,000	29%
TOTAL Amount of PVC in MSW (tons)		1,420,000	100%

Source: USEPA 2003

clinics, physician offices and other sources. Since then, the amount of medical waste burned and the number of operating incinerators have dramatically declined due to overwhelming evidence of enormous dioxin emissions, leading to government regulation and powerful community opposition.

As the health care industry continues its transition to non-incineration methods for disinfecting medical waste, the problems caused by vinyl medical products in the waste stream may not be solved. For example, until recently almost all of the medical waste generated in the state of Maine was sent to an out-of-state commercial incinerator. After local community opposition, this regional incinerator was closed and Maine's medical waste was shipped to a microwave disinfection treatment facility. However, the disinfected residue after treatment is now sent to a municipal solid waste incinerator in Massachusetts. The Maine Hospital Association (MHA) is in the process of siting an autoclave facility in the state to disinfect medical waste (see Chapter 5). Due to concerns raised about dioxin emissions, the MHA has pledged to dispose of disinfected PVC-rich residue in a landfill rather than a municipal waste incinerator (Belliveau 2002, Huang 2004).

In states like Maine that are highly dependent on incineration to handle municipal waste, the closure of medical waste facilities may not prevent PVC medical waste from being burned elsewhere, releasing toxic additives and by-products to the environment. Efforts to phase out PVC by the health care industry will prevent such a dilemma.

PVC in Construction and Demolition Debris

More PVC ends up in construction and demolition (C&D) waste each year than in medical waste (See Table 1). About 850,000 tons (1.7 billion pounds) of PVC is disposed of every year in nearly 2,000 C&D landfills across the U.S. (Kaufman 2004). Very little C&D waste is incinerated, except for a portion that enters municipal solid waste when generated by households or small businesses. However, many if not most C&D landfills are unlined or poorly lined compared to municipal solid waste landfills. Thus, there are even fewer barriers to keep chemicals from leaking out than those provided by MSW landfills. This is a serious problem that will likely result in more contaminants from PVC entering the environment.

The amount of PVC in C&D waste may be seriously underestimated. The available waste characterization data included in Table 1 only accounts for PVC pipes (Cascadia 2003) or pipes and vinyl siding (FA 1998). There are many other applications of PVC in building materials and furnishings that may become C&D waste, including vinyl window frames, flooring, roofing foils and carpet backing (Thornton 2002).

Also, the growth in the installation of durable PVC building products over the last twenty to thirty years has built up a stockpile of PVC still in use. As these materials reach the end of their useful life, the amount of PVC in the construction and demolition debris will inevitably and rapidly increase in content and amount. An estimated 300 million pounds of PVC materials will require disposal worldwide in the coming years (van der Naald 1998).

PVC as a Contaminant in the Recycling of Other Products

Another poorly quantified PVC waste stream is the discarded products and materials that are collected for recycling. PVC is very difficult to recycle because of the many different formulations used to make PVC products. Its composition varies widely due to the many additives used to make PVC products. When these different formulations are mixed together, they cannot readily be separated which is necessary to recycle the PVC into its original formulation. It is also virtually impossible to create a formulation that can be used for any application. At best, only about 3% of PVC products and materials are recycled in the U.S.

Two additional problems are created by the presence of PVC in the waste stream targeted for recycling. The first is the difficulty in separating PVC from other plastics, such as PET bottles or nylon carpet facing. This makes it extremely difficult, if not impossible, to recycle these otherwise recyclable materials. Second, the presence of PVC impedes the successful recycling of other valuable commodities such as copper from wiring and cable used in electronics such as computers, steel from scrapped automobiles and corrugated cardboard containers sealed with PVC tape. PVC increases the toxic impacts of recycling these materials. Each of these problems is discussed in more detail in Chapter 7.

PVC as a Manufacturing Waste

In addition to the health care industry, other industrial, commercial and institutional facilities generate PVC waste. Two manufacturing industries are known users of large volumes of PVC—plastics fabricators where PVC consumer products are manufactured from PVC resin (see Chapter 3) and makers of pre-manufactured homes. Fabricators blend PVC resin with additives to form a variety of rigid and flexible PVC products. Manufacturers of modular and pre-made homes use a large proportion of PVC building materials and furnishings. Some amount of pre-consumer PVC waste should be recycled by these industries. Recycling rates for PVC waste from these types of industries are not readily available.

PVC Increases the Toxicity of Solid Waste

PVC contributes a disproportionate share of toxic contaminants to solid waste relative to its modest weight and volume in the waste stream. The different components of PVC add significantly to the hazardous constituents of solid waste as shown in Table 3. The Table shows that PVC contributes from 38 to 67% of the total chlorine found in solid waste, from 90 to 98% of phthalates, from 1 to 28% of the lead and about 10% of the cadmium. Phthalates, lead and cadmium are all added to the PVC resin to achieve different product features. The toxicity of these and other additives is discussed in Chapter 3.

Chlorine is the primary component of PVC making up 57% by weight of the raw material used to make the pure PVC resin (VI 2004). There have been several efforts to estimate the contribution of PVC to total chlorine found in municipal solid waste (MSW). In MSW, at least 80% of the organically bound chlorine, which is thought to be more conducive to dioxin formation than inorganic chlorine, is from PVC (Thornton 2000). In medical waste, PVC's contribution of chlorine is even higher, accounting for more than 90% of organic chlorine and more than 80% of total chlorine (Thornton 2000, Green 1993). Based on these estimates, PVC could reasonably account for as much as 50% of all chlorine found in MSW.

About 90% of all phthalates consumed in the U.S. are used in PVC products (Thornton 2000). In England, an estimated 98% of phthalates are used in PVC products (OECD 2004). Thus, the disposal of PVC in landfills can be expected to account for a substantial portion of the phthalates found in landfills. Phthalates are a group of chemicals used as plasticizers to make the otherwise brittle PVC resin soft and flexible. The proportion of phthalates leaching from PVC in medical waste could be even higher given the prevalence of pliable vinyl medical products, such as tubing and bags, that are disposed of as infectious medical waste (see Chapter 5).

PVC disposal contributes several toxic metals to the solid waste stream, including compounds of lead, cadmium and tin. These metals are added to PVC as stabilizers to help inhibit the plastic's tendency to degrade in the presence of sunlight or heat. Lead is still commonly used in the plastic vinyl sheathing of wires and cables. Older vinyl mini-blinds also contain lead. Estimates of the amount of lead in solid waste attributable to PVC ranges widely from a low of 1% to a high of 28% (CEC 2000). One study found that 10% of the lead stabilizer from one type of flexible PVC cable containing a mixture of additives was released from the PVC (Mersiowski 1999). Lead in rigid PVC is expected to

Table 3

PVC Increases the Toxicity of Municipal Solid Waste (MSW)

Toxic Substance Present in PVC	Use in PVC	PVC's Contribution of Toxic Chemicals in MSW
Chlorine	Part of polymer; pure PVC is 57% chlorine	38% - 67% of total chlorine[1,2] and at least 80% of organic chlorine[2]
Phthalates	Added as plasticizer to make PVC soft and flexible	From 90 to 98%[3]
Lead	Added as a heat stabilizer to slow degradation	1% - 28%[1]
Cadmium	Added as a heat stabilizer to slow degradation	About 10%[4]
Tin (organotins)[5]	Added as a heat stabilizer to slow degradation	Unknown
Antimony[6]	Added to enhance flame retardant effect of chlorine in PVC	Unknown
Organochlorines[6]	Added as a flame retardant to reduce risk of ignition and retard combustion	Unknown

Sources and Notes: 1 - CEC 2000; 2 - Thornton 2000 reports PVC makes up 50% to 67% of total chlorine and at least 80% of organically bound chlorine; 3 - Thornton 2002, OECD 2004; since from 90 to 98% of phthalates consumed are used in PVC products, we assume an equal amount will end up in the waste stream; 4 - Bertin 2000; 5 - Organotin compounds represent about 9.3% of European consumption of stabilizers (CEC 2000); and 6 - UBA 2001.

stay encapsulated in the PVC waste (CEC 2000). Various organotin additives have replaced some use of lead and cadmium as a stabilizer in PVC. Organotin stabilizers are added to rigid packaging film, bottles, roofing and clear rigid construction sheeting and account for 9.3% of the stabilizers on the market (CEC 2000). These estimates are based on European formulations of PVC that may differ slightly from those used in the U.S.

Certain flexible PVC products are a source of the toxic metal antimony in solid waste. Antimony trioxide (ATO) is added to PVC used in flexible electrical cables and roofing foils (an alternative to roofing felt on flat roofs) to inhibit the formation and spread of flames during a fire (UBA 2001, DEPA 1999). Antimony from PVC would show up in electronic waste (cables) and construction and demolition debris (foils).

Other toxic and persistent organochlorine flame retardants are present in solid waste as a result of their use in PVC. These include chlorinated flame retardants such as chloroparaffins and phosphate esters, which are organic phosphorus compounds that may also contain chlorine in their chemical structure (UBA 2001). Chlorinated paraffins and antimony are added as a flame retardant formulation for some PVC textile fibers that are resistant to soaking and weather (UBA 2001).

TROUBLE FROM THE START
The Production and Use of PVC

MAJOR FINDINGS

- The production of PVC poses serious environmental health threats due to the manufacture of raw chemicals, including chlorine, cancer-causing vinyl chloride monomer (VCM) and ethylene dichloride (EDC).
- U.S. communities surrounding vinyl chloride chemical facilities, half of which are in Louisiana, suffer from serious toxic chemical pollution of their groundwater supplies, surface waters and air. Residents of the town of Mossville, LA had dioxin levels in their blood that were three times higher than normal.
- PVC includes high amounts of toxic additives, which are released during the use (and disposal) of the product, resulting in elevated human exposures to phthalates, lead, cadmium, tin and other chemicals.
- The use of PVC results in dioxin emissions from PVC combustion which occurs regularly in the U.S due to 1 million annual fires that burn buildings and vehicles—two sectors that consume large amounts of PVC in construction materials.

The Life Cycle of PVC

The 'life cycle' of a product describes the stages that a material goes through from production to disposal. The general life cycle for PVC is shown in Figure 2.

PVC poses environmental and health threats throughout its life cycle, from the production of feedstock chemicals to the final disposal of PVC products. Though some PVC products can pose direct health risks to consumers, most of the hazards associated with PVC occur during production and disposal. An overview of the hazards associated with PVC production, use, and disposal is shown in Table 4.

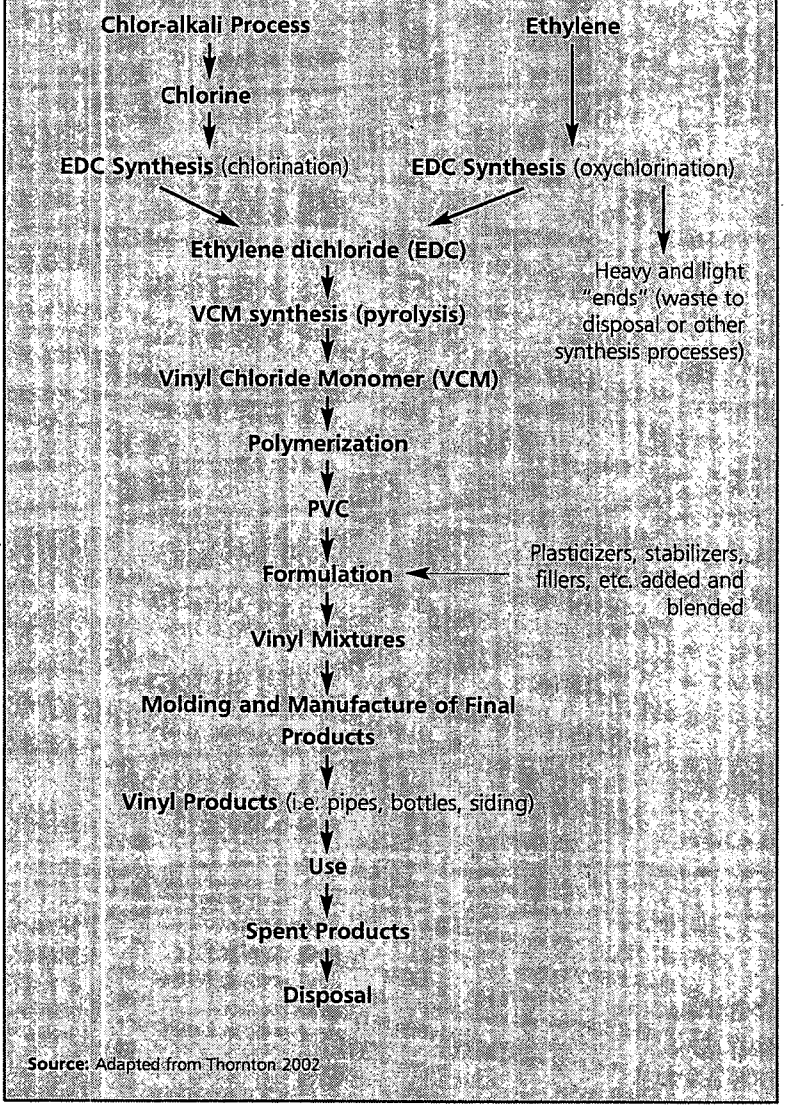
The major reason why PVC poses so many environmental and health threats throughout its life cycle is because it contains large amounts of chlorine (Thornton 2000). Chlorine is a highly reactive substance that readily combines with carbon molecules, the building block of life in people and animals. Carbon is the most important element in living things because it combines with oxygen, nitrogen and hydrogen to produce stable molecules such as DNA, proteins, hormones, sugars, starches and fats that are essential for life. Chlorine reacts readily with carbon, altering the original molecules and their functions (Thornton 2000).

The chlorine in PVC and its feedstocks (ethylene dichloride and vinyl chloride monomer) results in the generation of very large amounts of chlorine-containing

by-products during the manufacture of PVC and the burning of vinyl-containing products and waste. These chemicals include the extraordinarily hazardous chlorinated dioxins and furans, PCBs, hexachlorobenzene, hexachloroethane and hexachlorobutadiene (Papp 1996). Because of the chemical properties of chlorine, these by-products tend to be far more toxic, more persistent in the environment, and more likely to build up in the food supply and the bodies of people than otherwise similar chemicals that do not contain chlorine (Thornton 2000). PVC is the only major plastic that contains chlorine, so it is unique in the hazards it creates.

The chemicals used in the production of PVC (ethylene dichloride and vinyl chloride monomer) are also extremely hazardous. Vinyl chloride is a known human carcinogen that affects the central nervous system and damages the liver (Kielhorn 2000). Ethylene dichloride is a suspected human carcinogen that also affects the central nervous system and damages the liver (USEPA 2003a). Chlorine is a highly irritating gas that damages the upper respiratory system (USEPA 2003b). Hydrogen chloride is a corrosive gas that also affects the upper respiratory system (NAS 2004). These substances pose considerable threats to human health and the environment as a result of PVC production and processing.

Figure 2. The Life Cycle of PVC Plastic



Source: Adapted from Thornton 2002

PVC Production

PVC production begins with the conversion of salt to chlorine using huge amounts of electricity and the purification of ethylene from natural gas (See Figure 2). Chlorine and ethylene are then combined in a chemical reaction to form ethylene dichloride (EDC) in a process generally described as "feedstock production." EDC (considered a "feedstock" chemical) is converted in another chemical reaction to vinyl chloride monomer (VCM), the basic building block of PVC. Vinyl products are then produced in three additional steps. First, polymerization converts the single vinyl chloride monomer into a long chain of vinyl chloride molecules, the PVC polymer or resin. Second, through compounding (or formulation), additives are mixed in with the PVC resin to produce a vinyl formula with desired characteristics such as plasticity, color or resistance to degradation. The ability to change the properties of PVC (making it hard or making it soft or flexible) is what makes it possible to produce a wide range of PVC products. Third, during fabrication (or molding) the product is melted and then molded into its final shape such as a pipe, floor tile or window casing. A more

Table 4

Overview of Hazards Associated with PVC Production, Use and Disposal

Production

- Dioxin and mercury emissions and asbestos waste from chlorine production.
- Air emissions and wastewater releases from Ethylene Dichloride/Vinyl Chloride Monomer (VCM) production facilities.
- Dioxins and other organochlorines released as by-products of Ethylene Dichloride/Vinyl Chloride Monomer (VCM) production.
- Worker exposures to VCM.
- Incineration of production wastes.

Use

- Additives leach and otherwise migrate from PVC products (plasticizers/metal stabilizers).
- Accidental structure and vehicle fires release dioxins.

Disposal

Landfill

- Accidental landfill fires release dioxins.
- Additives, heavy metals and dioxins leach into groundwater.
- Gaseous emissions from additives.

Incineration

- Dioxins form when PVC is burned.
- Hydrochloric acid, toxic metals and dioxins are emitted to air.
- Ash, later stored in landfills, contains high levels of heavy metals and dioxins.

Recycling

- Diversity of additives prevents effective recycling of mixed PVC products and materials resulting in poor quality products (downcycling).
- Low recycling rates (currently <1%).
- Contaminates other plastics during recycling as well as other valuable commodities that are targeted for recycling.
- Does not reduce the overall demand for raw materials to make plastics (virgin resin) and has no effect on the amount of vinyl produced each year.

detailed description of the production and manufacturing process for PVC can been found in numerous references (Thornton 2002, Thornton 2000).

In 2000, there were 12 facilities in the U.S. that produced VCM (CEH 2000). Seven of these plants also produced PVC. As of 2003, there were 24 facilities operated by 12 companies that produced PVC resin in the U.S. (CEH 2003) and an estimated 2,332 PVC fabricating facilities (ARCC 2003). These PVC production facilities released 811,000 pounds of VCM and 670,000 pounds of EDC into the environment in 2002 (USEPA 2004). In addition, 6.5 million pounds of VCM and 2.5 million pounds of EDC were sent off-site to sewage treatment plants or waste treatment facilities (USEPA 2004). It should be noted that these are self-reported numbers that represent an absolute minimum. The actual releases are likely to be greater.

During production, most vinyl chloride releases are to the air since it is a volatile gas. A smaller amount of vinyl chloride monomer is released into groundwater or

into wastewater discharged to nearby rivers and streams. The wastes and emissions from production facilities are not limited to vinyl chloride. Dioxins are formed during the oxychlorination process, where chlorine is combined with ethylene gas (or ethylene, oxygen and hydrochloric acid) to form ethylene dichloride (EDC), the primary building block of the vinyl chloride monomer (Evers 1989). Dioxins are also formed when production wastes are incinerated. Incinerators, boilers and acid furnaces burn waste from the oxychlorination process (especially relevant are wastes such as "heavy ends" and distillation tars) and are responsible for the greatest proportion of dioxin releases during PVC production (Thornton 2002). Using data provided by the Vinyl Institute, the USEPA estimates that PVC-only production facilities were a documented source of dioxin in air emissions (see Table 6) (USEPA 2001).

Mercury is used in the oldest and most energy intensive process for producing chlorine (Thornton 2002). There are nine chlor-alkali facilities in the U.S. that still use mercury in their process, a 50-year-old technology (Steingraber 2004). Most of this mercury is reused at the plant, but there are still significant air emissions, waste water releases and waste sludge generated (Thornton 2000). Only about 10% of chlorine production in the U.S. still uses mercury, though very little of the mercury-produced chlorine goes to the production of ethylene dichloride or vinyl chloride monomer. The chlorine industry is the largest consumer of mercury in the country (Thornton 2000).

Mercury emissions at these plants are another environmental and public health concern (Steingraber 2004, USEPA 2003c) as mercury causes reproductive and neurological damage (NAS 2000). Mercury is a potent neurotoxin that accumulates primarily as methyl mercury, in aquatic food chains. The highest levels are found in large predatory fish, such as tuna and swordfish. Air emissions of mercury are transported through the atmosphere and eventually settle on land or surface water where natural bacterial processes transform some of the mercury into methyl mercury. Ingestion of mercury-contaminated fish is the primary route of exposure to methyl mercury. Neurodevelopmental toxicity can result from the exposure of pregnant women and young children to mercury, leading to learning disabilities in children (USEPA 2003c, NAS 2000).

Plants that manufacture ethylene dichloride and vinyl chloride monomer are a risk to workers and residents of surrounding areas. In the early 1970's, plants that manufactured vinyl chloride were found to be exposing workers to levels of the chemical high enough to put them at risk of developing a rare form of liver cancer—angiosarcoma. In 1974, the industry finally admitted that workers exposed to vinyl chloride did develop this rare form of liver cancer (Creech 1974). Residents of communities near vinyl chloride production plants are also affected by plant emissions. These plants discharge pollutants into nearby communities, contaminating drinking water and releasing dioxins into the air from on-site incinerators. Besides cancer, workers and residents alike are vulnerable to a range of ailments associated with vinyl chloride exposure, including damage to the liver, lungs, blood, nervous system, immune system, cardiovascular system, skin, bones and reproductive system (Kielhorn 2000, ATSDR 1997). More detailed analyses of the human health and environmental impact of PVC production processes can be found in numerous references (Steingraber 2004, USEPA 2002, Kielhorn 2000, ATSDR 1997).

Although the levels of vinyl chloride and ethylene dichloride released from these facilities are lower today than in the past, exposure to these substances is still a concern. There appears to be no safe level of exposure for these substances, especially vinyl chloride. Both of these substances are considered to be "genotoxic" meaning that they cause irreversible damage to DNA (Kielhorn 2000). A generally accepted scientific theory is that mutation in a single cell can result in cancer (Pitot 1991). Similarly, exposure to a genotoxic substance can lead to DNA damage. This means there is no safe level of exposure to these substances and any exposure increases the risk of developing cancer, a birth defect or a genetic disorder. Thus, lower emissions from vinyl chloride and ethylene dichloride facilities reduce, but do not eliminate, health and environmental risks.

The production and disposal of PVC poses dangers relevant to everyone, but often, particular groups of people are especially at risk. Plants that manufacture the ethylene dichloride and vinyl chloride monomer are often located in low-income areas or communities of color, as are incinerators that burn PVC waste and landfills that store PVC waste (Thornton 1997). These types of sites pose a threat. Community-based groups understand the threat these facilities pose to their communities. The urgency of their opposition to these facilities speaks to the intensity of the danger that they feel these facilities pose.

CASE STUDY

Mossville, Louisiana: PVC Production in the New "Cancer Alley"

In Calcasieu Parish, Louisiana, residents of Mossville, a small unincorporated community of about 1,500 African Americans, are confronting numerous toxic industries including four vinyl production facilities that include two major vinyl chloride manufacturers. Louisiana is home to more than half of the 12 vinyl chloride plants in the U.S., and Calcasieu Parish produces more vinyl than any other county in the country making it the unofficial PVC capitol of America. At the urging of Mossville residents, air monitoring conducted by the U.S. Environmental Protection Agency (USEPA) in June 1999 showed vinyl manufacturing facilities emitted concentrations of vinyl chloride, a potent human carcinogen, that were more than 120 times higher than the ambient air standard—making the air in Mossville unhealthy to breathe. PPG Industries and Condea Vista in Mossville leaked hundreds of thousands of pounds of ethylene dichloride, a feedstock for PVC, and contaminated the groundwater. As a result of this contamination and a lawsuit settlement with two companies, a significant portion of Mossville families have relocated. This has transformed a once highly populated neighborhood into a virtual ghost town. The Condea Vista facility has changed ownership, but has not improved. The portion of the facility now owned by Sasol Ltd. continues to be ranked in the top 10% of industrial companies that create the highest cancer risk from air and water pollution according to the USEPA 2002 Toxic Release Inventory. This data shows that in 2002 vinyl production facilities in Mossville generated 238,458,615 pounds of toxic waste that were dumped on the community or transferred to disposal facilities. Over 30 million pounds of this waste wound up in landfills and incinerators located in other communities.

In 1998, Mossville Environmental Action Now, Inc. (MEAN) appealed to the U.S. Agency for Toxic Substances and Disease Registry (ATSDR) to test residents for exposure to dioxin, a highly toxic compound that is a by-product of vinyl manufacturing and other industrial processes. In 1999, ATSDR reported dioxin test results showed the average Mossville resident has three times more dioxin in their blood than the average U.S. citizen. Furthermore, testing of breast milk from local mothers found elevated levels of dioxins as high as 30% above the national average. Cancer mortality rates for Calcasieu Parish are 1.6 times the national average and many women suffer from endometriosis, a condition linked to dioxin exposure.

The citizens of Mossville are determined in their search for justice. As descendants of African Americans who proudly settled the community in the late 1800's, they have inherited not only the land, but also the fighting spirit to survive and demand what is rightfully theirs. Working through MEAN, they have lobbied successfully for government action. Through use of a Bucket Brigade program, which allows residents to test their own air, they have caused industry to be fined as much as $300,000 when testing showed benzene levels 231 times greater than the state standard. In 2001, Sasol Ltd., a South African company with chemical and fuel operations in 20 countries, acquired Condea Vista. Working in solidarity with communities in South Africa, SasolWatch.com was created to expose the company's record of violations and toxic dumping on poor communities. MEAN is working with a local health care provider to develop necessary environmental health services for Mossville residents. The organization is educating the public about the dangers of PVC production, use and disposal. MEAN is also demanding significant pollution reduction, the clean-up of industrial contamination in the local estuary, and the just and fair relocation of consenting residents to a healthier environment (Sources: MEAN 2000, Ermler 2001, LBB 2004, SasolWatch 2004, Greenpeace 2004a, Greenpeace 2004b).

PVC Use

PVC plastic used in consumer products is not a pure material. By the time a product containing PVC reaches your home, a wide range of chemicals have been added in order to change its properties to meet a wide range of product needs. These additives include stabilizers, plasticizers and fillers that are mixed in with, but are not chemically bound to the PVC. A list of common additives found in PVC products is shown in Table 5.

The most important of these chemical additives are the plasticizers known as phthalates (pronounced 'thal - eights') and the metal stabilizers. Plasticizers are added

Table 5

Common Additives Found in PVC

Stabilizers
Lead • Cadmium • Antimony • Organotins • Zinc
Plasticizers
Diethylhexylphthalate (DEHP) • Diisononylphthalate (DINP) Diisodecylphthalate (DIDP)

Source: CEC 2000, DEPA 1995

to PVC to "soften" the plastic and make it pliable for certain applications. About 90% of all phthalates consumed in the U.S. (and about 98% in England) are used in PVC products (Thornton 2002, OECD 2004). These plasticizers can make up a large portion, in some cases up to 60% by weight, of the vinyl product (DTI 1995). Because these additives are not chemically bound to the PVC, they will leach out over time (Thornton 2002).

Studies have shown plasticizers such as diethylhexylphthalate (DEHP) and diisononylphthalate (DINP) have migrated out of PVC containers used to store food (CR 1998, DTI 1995); IV bags used to hold blood (Pearson 1993, Tickner 1999); toys (NET 1999, Stringer 1997); and numerous other products, exposing people to these toxic additives (DEPA 2001, Harmon 2001, HCWH 2002).

In some cases, these additives will evaporate or "off-gas" from PVC materials like flooring, wall covering or carpeting, contaminating indoor air (CARB 1999, Rudell 2000, Uhde 2001). A study by the California Air Resources Board measured forty target compounds off-gassing from PVC flooring. Phenol was found in the air off-gassing from all the vinyl sheets evaluated. Tetrahydofuran, cyclohexanone, toluene and n-tridecane were also found (CARB 1999). Another study found the degradation of plasticizers from PVC flooring was likely responsible for an increase in adult asthma as well as eye and skin symptoms in workers. The prevalence of these symptoms decreased when the PVC flooring was removed (Tuomainen 2003). A Swedish study estimated that 42,000 tons of phthalates are released from PVC products worldwide each year (DTI 1995). The familiar "new car" smell or the odor from a newly opened shower curtain represents the release of phthalates evaporating from a PVC product (Thornton 2000).

Components of PVC have also been found to leach from PVC pipes. Vinyl chloride has been found to leach from PVC pipes made prior to 1977 (Yaw 1999). PVC pipes made prior to this time had a high residue of vinyl chloride that failed to bond when the vinyl chloride monomer was polymerized into polyvinyl chloride. In a study of unplasticized PVC pipe, vinyl chloride was detected in water after 30 days at 2.5 parts per billion (ppb), a level that exceeds the USEPA drinking water standard of 1 ppb (Al-Malack 2000). Smaller pipe size, longer line length, and warm temperatures all increase the likelihood of vinyl chloride leaching from PVC pipes. Additional studies have found organotin stabilizers also leach from PVC pipes (Sadiki 1999, Sadiki 1996, Wu 1989, Forsyth 1997).

Phthalates have been shown to cause developmental and reproductive damage (NTP 2000), altered liver (Woodward 1990) and kidney function (Seth 1982) and have been linked to the development of respiratory problems in children (Jaakkola 1999, Oie 1997). More detailed information on the health and environmental impact of phthalates used in PVC products are available from many resources (ATSDR 1997, HCWH 2002, Rossi 2001).

Metal stabilizers are used in PVC to prevent degradation from heat during processing and from exposure to ultraviolet light during the useful life of a product (Pless 2002). They include lead, cadmium, zinc, antimony and the organotins (see Table 5). These metals will leach out of PVC products. Lead and cadmium were found to leach out of children's toys made with PVC (DiGangi 1997). Lead migrated out of PVC window blinds (CT 1996) and into water carried in PVC pipes (DTI 1995). Lead is a known cause of neurodevelopmental problems (USEPA 2004a). Cadmium causes cancer and kidney damage (USEPA 2003d).

Organotin stabilizers (tributyltin, tetrabutyltin, monooctyltin, dioctyltin) were introduced to replace toxic metal stabilizers like lead and cadmium, but they have also been found to leach from PVC products (Sadiki 1999, Harmon 2001). The organotins are also toxic. They affect the central nervous system, skin, liver, immune system and reproductive system (WHO 1980, Pless 2002). The diorganotins, such as dioctyltin, are potent developmental toxins (Ema 1995, Pless

2002) and potent teratogens (Noda 1993, Pless 2002). Tributyltin affects the nervous system, and has caused reproductive and developmental problems in animal studies (Boyer 1989, ATSDR 1992).

Antimony trioxide (ATO) is added to PVC used in flexible electrical cables and roofing foils (an alternative to roofing felt on flat roofs) to inhibit the formation and spread of flames during a fire (UBA 2001, DEPA 1999). For flame retardant applications, PVC accounted for 32% of the European market for antimony trioxide in 1998 (UBA 2001). The antimony, which is a synergist rather than a flame retardant, acts to enhance the flame retarding properties of chlorine in PVC. Antimony trioxide is a suspect human carcinogen when inhaled and is toxic to the lungs, heart, eyes and skin (UBA 2001, NAS 2000a). During fires and waste incineration, antimony dust and toxic antimony halides are released. Antimony also catalyzes the formation of dioxins and furans (UBA 2001).

Other flame retardants added to PVC include chlorinated paraffins, phosphate esters (organic phosphorus compounds some of which also contain chlorine or bromine) and aluminum trihydroxide (UBA 2001). These additives are used in high volumes but are also used in many other polymer applications in addition to PVC. Chlorinated paraffins and antimony are added as a flame retardant formulation for some PVC textile fibers that are resistant to soaking and weather (UBA 2001). Chlorinated paraffins are complex mixtures of short-chain and long-chain hydrocarbons containing up to 70% chlorine. Chlorinated paraffins cause liver and kidney toxicity in animals while the short-chain mixture is an animal carcinogen and possible human carcinogen (NAS 2000a). Chlorinated paraffins and phosphate esters in PVC also function as secondary plasticizers (UBA 2001).

The phosphate ester flame retardants used in PVC include tris (2-chloroethyl) phosphate, tris (chloropropyl) phosphate [TCCP], and tris (dichloropropyl) phosphate [TDCPP]. These compounds are added to PVC floor covering and are released as off-gassing occurs from the vinyl (Marklund 2003). TDCPP was widely used as a flame retardant in children's sleepwear until May 1977, when it was withdrawn from the market after published reports that it was mutagenic in bacteria (Sanders 1978). The use of TDCPP as a flame retardant may pose significant cancer risks and reproductive harm (testicular atrophy and decreased seminal vesicle secretions), according to a committee of top U.S. scientists (NAS 2000a). The German Federal Environmental Agency has recommended a reduction in the use of TCCP in favor of safer substitutes, since it has high environmental persistence with some evidence of carcinogenicity. (UBA 2001).

Structural and Vehicle Fires

Another hazard associated with the use of PVC products arises when PVC is burned in an accidental fire. Not only are many building materials made from PVC but it was once standard practice to use PVC to insulate wiring in buildings. In 1995, there were an estimated 574,000 structural fires and another 406,000 vehicle fires in the U.S. (USEPA 2001). When the PVC in buildings and vehicles burns, a variety of toxic substances are formed that pose major public health risks. The primary combustion products are hydrogen chloride gas, carbon dioxide and carbon monoxide (OFM 1997). Hydrogen chloride gas is a corrosive and highly toxic gas that can burn the skin and cause severe damage to the eyes and lungs. When hydrogen chloride comes in contact with the mucous lining of the lungs, it is converted into hydrochloric acid that can cause severe and permanent respiratory damage (IAFF 1995).

Accidental fires that burn PVC also generate phosgene gas, benzene, toluene, xylenes, dioxins, furans and other products of incomplete combustion (IAFF 1995). The poor combustion conditions that are typical of these fires are ideal for the formation of dioxins and furans (TNO 1996). Dioxins were found in the air, water, surface soil and nearby vegetation following the burning of a plastics recycling plant in Hamilton, Ontario (OMEE 1997). In the World Trade Center fires, dioxins and furans were identified as significant components of the smoke given off by the smoldering buildings (Landrigan 2004). In Germany, dioxin levels in indoor soot remaining after a house fire were found to be as high as 45,000 parts per trillion (ppt) TEQ—more than 300 times the German government's health standard (Fiedler 1993). After a fire at a plastics warehouse in Binghamton, NY, dioxin levels in soils were found to be more than 100 times higher than other areas of the community not impacted by the fire (Schecter 1996).

Firefighters and emergency responders are especially at risk from smoke and gases generated by fires burning PVC. Exposure to combustion gases from building fires has been linked to a high incidence of leukemia and laryngeal and colon cancers in firefighters at young ages (Wallace 1990) and to other adverse health problems including pulmonary hemorrhage and edema due to chemical pneumonitis (Schreiber 2003, Dyer 1976). This is one of the reasons why the International

Association of Fire Fighters supports the use of alternative building materials that do not pose as high a risk as PVC (Duffy 1998).

The toxic gases generated when PVC is burned in accidental fires have resulted in deaths and injuries, including workers exposed to toxic gases from burning electrical wires coated with PVC (Colardyn 1978); residents exposed to airborne toxics from a Hamilton, Ontario plastics recycling plant fire (Upshur 2001); and guests who died in the MGM Grand Hotel fire in Las Vegas (Buerk 1982). A summary of the public health hazards associated with accidental fires that burn PVC has been published elsewhere (Schreiber 2003).

PVC's use to insulate wiring has raised concerns not only for its use in buildings, but also in airplanes. The use of PVC insulation around wiring was once standard practice in airplanes. A typical airplane, for example, could contain more than 100 miles of PVC coated wiring (Ackerman 2003). Insulation of the wires is critical to air safety, but defects in the insulation can lead to short circuits and sparks that could potentially start a fire or spark an explosion. If PVC wiring overheats and starts to smolder, large amounts of smoke are generated and, if moisture is present, hydrochloric acid can be produced. Although there is no proof that PVC insulation has ever caused an airplane crash, concerns have been raised about older airplanes that still contain PVC-insulated wires. Use of PVC wiring is now prohibited on new planes since PVC insulation failed Federal Aviation Administration flammability tests (Ackerman 2003).

Accidental fires are unexpected, and thus difficult to regulate, but phasing out PVC could reduce the harm they cause. If PVC was not so widely used as a building material, accidental fires would not produce the toxic combustion products that are specifically caused by the burning of PVC. Both immediate and long-term impacts would be lessened: firefighters and victims alike would avoid exposure to the toxic gases and smoke caused by the fire, and the leftover ash would be largely free of these toxins as well.

CASE STUDY

Illiopolis, Illinois: PVC Plant Explodes

On April 23, 2004, a PVC plant operated by Formosa Plastics in Illiopolis, Illinois exploded. A towering plume of smoke containing dioxins, hydrochloric acid, vinyl chloride and vinyl acetate could be seen for miles around. The explosion caused both power and water to be cut off and over 900 people were evacuated from the community. People were stationed in makeshift shelters including the local shopping mall. The U.S. Chemical Safety and Hazard Investigation Board called the explosion the most serious the agency has investigated since it was founded in 1998. Four workers were killed instantly and one died shortly after being hospitalized.

Nearly three months after the disaster, the Illinois Environmental Protection Agency (IEPA) reported elevated levels of dioxin were found in the soil at 12 of 13 sites sampled. Some samples reached levels of 50 ppt—10 times higher than normal. Some areas tested were as far as 3 miles from the explosion. Residents are concerned about the constant health risks posed by these hazardous sites. More testing is planned. (Sources: Antonacci 2004, IEPA 2004, Steingraber 2004a).

CASE STUDY

Montreal, Canada: PVC Fire and Firefighter Exposure

A 1993 fire in St. Terese, Canada at a plastics plant called Plastibec, Ltd consumed more than 15 tons of PVC. The plant manufactured vinyl blinds and vinyl window frames. After burning for 18 hours and forcing 250 people from their homes, the smoldering structure continued to emit thick black smoke. In the end, the fire produced between 40-85 grams of dioxins and furans, equal to the amount released by the pulp and paper industry in an entire year. Of the 50 firefighters called out to the blaze, 6 were treated for smoke inhalation and more than 30 required medical treatment after being exposed to the fumes (Source: Greenpeace 1994).

THE DEADLY CONNECTION
PVC, Chlorine and Dioxin

MAJOR FINDINGS

- When burned, PVC plastic, which contains 57% chlorine when pure, forms dioxins, a highly toxic group of chemicals that build up in the food chain.
- The PVC content in the waste stream fed to incinerators has been linked to elevated levels of dioxins in stack air emissions and incinerator ash.
- PVC is the major contributor of chlorine to four combustion sources— municipal solid waste incinerators, backyard burn barrels, medical waste incinerators and secondary copper smelters—that account for a significant portion of dioxin air emissions. In the most recent USEPA Inventory of Sources of Dioxin in the United States, these four sources accounted for more than 80% of dioxin emissions to air (based on 1995 data).

The Formation of Dioxin

A major concern about PVC is the formation of dioxin during production and during disposal through incineration. The term 'dioxin' refers to a family of chemical compounds that are not intentionally made. They are generated as by-products during production and disposal of chlorinated compounds including PVC. There are many forms ("congeners") of dioxin, each with a different toxicity. The most toxic form is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), and is the standard against which the toxicity of all other forms of dioxin is measured. TCDD is a known human carcinogen according to the U.S. National Toxicology Program (USHHS 2002), World Health Organization (WHO 1997) and U.S. Environmental Protection Agency (USEPA) (USEPA 2000). Dioxin is fat-soluble, which means it will bioaccumulate in increasing concentrations as it moves up the food chain. Exposure to dioxins is associated with reproductive and developmental health problems, and has been shown to impair immune system response and interfere with normal hormone function (Birnbaum 2003).

The PVC-Dioxin Connection

The relationship between PVC and the formation of dioxins in incinerators is clear: PVC is a significant chlorine donor in the incineration process, spurring the formation of dioxins. The strongest evidence of this

comes from laboratory studies. The German EPA found that burning waste that includes PVC or other organochlorines produced dioxins, while burning waste without PVC did not (Theisen 1991). Two Danish studies found similar results (Vikelsoe 2000, Christmann 1989). In Japan, researchers found that adding 4% PVC to a mixture of PVC-free material increased dioxin emissions ten fold (Ishibashi 2000). When PVC was added to a mixture of newspapers or to chlorine-free paper and burned, dioxin emissions increased significantly with chlorine and PVC content (Yasuhara 2001). In a similar study, dioxin levels in fly ash were 200 to 1,200 times higher when PVC was added to a mixture of newspaper or chlorine-free plastics (Takasuga 2000). Several other studies found increased dioxin levels in fly ash or unburned residue were correlated with increased PVC levels in the waste stream burned (Kopponen 1992, Kolenda 1994, Wunderli 2000).

When elemental chlorine was added to a mixture of coal and salt, dioxin levels were 130 times higher than when the same mixture was burned without the chlorine (Mahle 1980). Adding PVC or chlorine gas to chloride-containing vegetable matter resulted in increased dioxin formation (Liberti 1983). In another study, as the level of organochlorines in a waste stream increased, so too did the amount of dioxins formed (Altwicker 1993). A study in Finland found that burning perchloroethylene in a laboratory produced more dioxins, chlorobenzenes and chlorophenols than burning sodium chloride (Halonen 1995).

There is also evidence from small-scale incinerators that support a relationship between burning organochlorine compounds like PVC and dioxin formation. The Danish EPA found that doubling the PVC content of an incinerator's waste feed increases dioxin emissions by 32% (DEPA 1995). Conversely, reducing the PVC feed results in a reduction in dioxin emissions. Researchers in Japan found that burning a mixture of PVC and polyethylene produced large amounts of dioxins (Tamade 2000, Yoneda 2000). A study conducted for the Dutch Environment Ministry found that PVC levels in the waste stream increased dioxin levels in the air emissions (Kanters 1996). Other studies in both the U.S. (Wagner 1993) and Europe (Christmann 1989, Vesterinen 1996, Halonen 1993, Hutari 1996, Manninen 1996, Hatanaka 2000) have found a positive correlation between PVC content in a waste stream and dioxin emissions.

An excellent review of the evidence linking chlorine content in the waste stream and dioxin emissions has been published (Costner 2001). This paper identified 47 studies involving laboratory and pilot scale combustion system/processes; 12 studies involving small-scale and other combustion systems/processes; and 31 studies involving full-scale combustors that are relevant to the relationship of chlorine content and dioxin emissions. The author found that reduced chlorine content was correlated with reduced dioxin formation in all three study groups and concluded that there is "a compelling body of evidence that dioxin formation in waste incinerators decreases when chlorine input is reduced."

The USEPA confirmed that PVC is a dioxin precursor in 1997 (USEPA 1997). They also acknowledged that, "several studies have identified strong correlations between chlorine content and CDD/CDF [dioxin/furan] emissions during combustion tests." As part of the Inventory of Sources of Dioxin developed by the USEPA, the agency acknowledged that a "review of experimental data clearly indicates an association between chlorine content of feed/fuels and ... synthesis of CDDs and CDFs" (USEPA 2001). However, the agency concluded that the results on whether a relationship between chlorine input and dioxin emissions exists were not "unequivocal" and left it at that.

Additional insight into the relationship between PVC and dioxin emissions can be found by examining the USEPA Inventory of Sources of Dioxin. Table 6 summarizes dioxin emissions from sources that include PVC. The table shows facilities that burn PVC are responsible for most of the dioxin sources identified. Eight quantified air sources and eight non-quantified air sources are identified that include PVC as a chlorine contributor in the waste stream. There are also quantified releases to water and land from sources that clearly contain PVC as a chlorine donor. In addition, quantified sources such as tire burning and asphalt mixing plants may contain PVC when household garbage is burned with tires, or when PVC is added as "filler" in producing asphalt. In fact, any process that burns household garbage—including gasification or pyrolysis (systems that burn waste in the absence of oxygen) — can be expected to generate dioxin emissions in large part due to the presence of PVC in the waste (BREDL 2002). The table also shows a number of other unquantified sources that may include PVC as a contributor to dioxin emissions. The data used to generate these estimates were collected in 1995 and represent the most recent data available on dioxin emissions in the U.S. (USEPA 2001).

The top four quantified sources alone—municipal solid waste incinerators, backyard barrel burning, medical

Table 6

Dioxin Emissions in the U.S. from Sources that Include PVC

Sources with Chlorine from PVC	Dioxin Releases (grams/year TEQ*)
Quantified Air Sources	
Municipal solid waste incinerators	1,250 [see note below]
Backyard barrel burning	628
Medical waste incinerators	488
Secondary copper smelters	271
Cement kilns burning hazardous waste	156
Cement kilns not burning hazardous waste	17.8
EDC/VCM production	11.2
Hazardous waste incineration	5.8
Non-Quantified Air Sources	
Landfill fires	
Landfill gas	
Accidental fires	
Scrap electrical wire recovery	
Secondary ferrous metal smelting	
Ferrous foundries	
Manufacturing chlorine and chlorine derivatives	
PVC manufacturing	
Other Possible Air Sources	
Sewage sludge	14.8
Asphalt mixing plants	7
Secondary lead smelters	1.72
Tire burning	0.11
Total Dioxin Releases to Air	**3,125**
Quantified Releases to Water	
Ethylene dichloride/vinyl chloride	0.43
Quantified Releases to Land	
Ethylene dichloride/vinyl chloride	0.73
Municipal waste water sludge	76.6

Sources and Notes: All data are from the USEPA Inventory of Sources of Dioxin (USEPA 2001) which reflects data generated in 1995, the most recent year for which data are available. Since the 2001 Inventory was published, dioxin air emissions from municipal waste incinerators have declined for two reasons related to a December 2000 compliance deadline for new federal regulations on toxic air emissions: (1) the closure of 25 waste combustion plants, nearly 20% of the total number, between 2000 and 2002 (Kaufman 2004); and (2) added air pollution controls that shifted much of the total amount of dioxin formed to incinerator ash, which requires land disposal. The USEPA now estimates that dioxin air emissions from large municipal waste incinerators are 12.0 grams of dioxin per year (TEQ) from 66 large incineration facilities in 24 states (USEPA 2002a). Dioxin air emissions from 39 small incinerators were estimated at 50 grams per year TEQ in 2000 and are projected to decline to 1.8 grams per year in response to a December 2005 compliance deadline for new federal toxic air emission regulations (ERG 2002). These more recent estimates have not yet been peer reviewed or published according to USEPA.

* TEQ = toxic equivalents; a measure of the total amount of all forms of dioxins, furans, and dioxin-like PCBs found in a sample.

waste incinerators and secondary copper smelters—account for 2,637 grams TEQ, which is equivalent to 84% of the annual total estimated dioxin emissions to air. Clearly, not all of these emissions are attributable to PVC. Dioxin can be generated when other chlorine donors are present. The fraction attributable to PVC is not known.

It is clear from this evidence that without PVC, there would be considerably less chlorine in the incinerator feed and hence less dioxins formed. This is not to say that chlorine content is the only factor determining dioxin production. It is not. Facility design, operating conditions and the presence of catalysts also matter, but numerous studies support the conclusion that without chlorine, dioxin cannot be formed and that PVC is the predominant source of chlorine in the waste stream (Costner 2001).

It is misleading to focus only on stack air emissions when assessing chlorine's contribution to dioxin formation. Fly ash, bottom ash and other residues contain dioxin as well. Two studies on municipal waste incinerators provide evidence that only from 0.0004 to 1% of total dioxins formed remain in the stack gases (Fabrellas 1999, Sakai 1997). Other research has shown that there is a positive correlation between dioxin concentrations in ash and the amount of PVC in the waste feed. In one study, when PVC was burned with wood, dioxin levels increased in the ash (Wilken 1994). In another study, higher dioxin concentrations were observed in ash residue from chlorinated plastics than in ash from chlorine-free paper, wood, cotton or wool (Theisen 1991). In general, as more PVC is added, dioxin levels rise.

Nonetheless, most studies focus on dioxin concentrations in stack gas as a means of assessing the relationship between chlorine and dioxin. The fact that many studies examining miniscule dioxin concentrations in this hard-to-measure source still find a positive correlation between chlorine and dioxin testifies to the strength of the relationship.

Despite this compelling body of evidence, the Chlorine Chemistry Council (CCC) has aggressively argued that there is no relationship between PVC content and dioxin emissions from incinerators. The industry's prime support for this claim is a study funded by the Vinyl Institute, a member of the CCC, conducted by an industry consultant and published by the American Society of Mechanical Engineers (ASME). This study examined data from 169 facilities and concluded that there was "little or no correlation between chlorine input and dioxin emissions from incinerators" (Rigo 1995). This study has been critiqued and its methodology shown to be invalid (Thornton 2002, Costner 2000, Costner 1997, Chien 2003). In addition, the conclusions of the ASME study were refuted at a workshop held by the USEPA in 1996 on Dioxin Formation Processes and Sources (Costner 2000).

Furthermore, a memo prepared prior to the release of the ASME study by the public relations firm Nichols-Desenhall Communications (under contract to the Vinyl Institute) calls into question the derivation and perhaps the integrity of the ASME study. This memo laid out a strategy to diffuse any connection between chlorine content/PVC and dioxin emissions made by the USEPA as part of their Dioxin Reassessment effort. The memo recommends the Vinyl Institute fund an "independent" scientific study to "debunk" the USEPA's claim about the positive relationship between PVC and dioxin emissions (Burnett 1994). This study turned out to be the one conducted under contract with the consulting firm of Rigo & Rigo Associates under the auspices of ASME. An internal Vinyl Institute memo described the role of the ASME, "The purpose of the ASME as the contractor is to provide unassailable objectivity to the study ..." (Goodman 1994). In this same memo, Rigo was described as "... willing to set his priorities to our needs, and he appears sympathetic to Plastics, Vinyl, PVC and Cl2 ..." Additional details on these memos have been described elsewhere (Thornton 2002).

PVC is the primary source of chlorine in the waste stream. Eliminating PVC would dramatically reduce the amount of chlorine being burned, and thereby limit dioxin formation. Given the abundant evidence implicating chlorine as an essential precursor to dioxin formation, it is important to reduce if not eliminate the levels of PVC in the waste stream. Banning PVC would be the most effective means of achieving this goal.

V DON'T BURN IT
The Hazards of Burning PVC Waste

MAJOR FINDINGS

- More than 100 municipal waste incinerators in the U.S. burn 500 to 600 million pounds of PVC each year, forming highly toxic dioxins and releasing toxic additives to the air and in ash disposed of on land.
- The largest PVC-burning states include Massachusetts, Connecticut, Maine—which all burn more than half of their waste—Florida, New York, Virginia, Pennsylvania, Maryland, Minnesota, Michigan, New Jersey, Indiana and Washington.
- The incineration of medical waste, which has the highest PVC content of any waste stream, is being steadily replaced by cleaner non-burn technologies.
- Open burning of solid waste, which contains PVC, is a major source of dioxin air emissions and dioxin-laden ash, as well as other dangerous pollutants.
- Backyard burning of PVC-containing household trash is not regulated at the federal level and is poorly regulated by the states—it is completely unrestricted in Michigan and Pennsylvania, partially restricted in 30 states and banned in 18.

When PVC is burned in municipal and medical waste incinerators, dioxins and other toxic gases are formed and heavy metals present in the waste are released into the air and residual ash. Dioxins are also released when residents in rural areas dispose of their trash by burning it in small furnaces or barrels behind their homes, and when PVC products or waste are burned in building, vehicle and landfill fires.

Municipal Waste Incinerators

Incineration, or high-temperature burning, is frequently used to dispose of municipal, hazardous and medical wastes. Because PVC is a widely used plastic (especially in medical applications), the waste burned in these incinerators inevitably contains PVC. As discussed earlier, the chlorine in PVC facilitates the formation of dioxins and other chlorinated organic compounds that are subsequently released to the environment (Costner 2001). Thus, incinerators are a major source of dioxins released to the air and land, and PVC is largely responsible for this situation.

Municipal waste or household trash incinerators are considered the largest source of dioxin emissions in air (USEPA 2001). The most recent inventory of dioxin sources in the U.S. estimated municipal and medical waste incinerators together account for 55% of all dioxin releases to air (40% and 15%, respectively) (USEPA 2001). Dioxin air emissions have since declined as

Table 7

States with the Heaviest Reliance on Municipal Waste Incineration

State	Percent Incinerated (After Recycling)	Number of Incinerators	Amount of PVC Incinerated (tons)
Maine	66.2%	4	5,448
Connecticut	55.4%	6	16,257
Massachusetts	54.6%	7	28,145
Minnesota	46.1%	15	14,432
Florida	37.1%	13	45,364
Hawaii	32.7%	1	3,454
Virginia	27.9%	5	18,806
New York	24.4%	10	37,517
Maryland	22.6%	3	12,486
Pennsylvania	22.6%	6	17,746
New Hampshire	22.2%	2	1,675
Remaining States*	Varies	32	49,075
Total	10.5%	104	250,405

Sources and Notes: Estimates derived from Kaufman (2004) for 2002. The amount of PVC incinerated by each state was calculated by: (1) assuming that the percent PVC content of municipal solid waste (0.62%) estimated by the USEPA (2003) is representative of the typical percentage of PVC in the waste stream; (2) assuming that post-consumer recycling of PVC in MSW is zero; (3) multiplying the average percent PVC in the waste (0.62%) by the total waste generated in that state according to Table 4 in Kaufman (2004); and (4) multiplying this value (the total PVC disposed in the state) by the percent of waste incinerated after recycling as shown in column 2 above. The percent of PVC incinerated after recycling was determined by dividing the total amount of waste incinerated in a state (provided in Table 4 of Kaufman 2004) by the total waste disposed of (after recycling).

* 19 states did not burn any MSW according to Kaufman 2004 and AL, AK, and MT did not report any data (see Appendix B).

incinerators have closed or added pollution controls to meet new standards (USEPA 2002a, ERG 2002). Now much of the dioxins formed from incinerators are released to the land through landfilling of incinerator ash.

Table 7 lists those states that rely heavily on incineration as a disposal option for municipal solid waste. Maine, Connecticut, and Massachusetts incinerate more than 50% of their municipal solid waste destined for disposal (not counting the amount of waste recycled). Minnesota has the largest number of municipal waste incinerators (15) followed by Florida (13) and New York (10). These states have been dependent on waste incineration since the late 1980's and early 1990's. This trend may have been motivated by zealous protection of abundant groundwater and surface water supplies; limited potential for new landfill capacity; subsidies for generating electricity from waste burning; and state policies which favor incineration over land disposal. A complete listing of the amount of PVC burned in each state is shown in Appendix B.

As shown in Table 7, an estimated 250,000 tons (500 million pounds) of PVC is burned in trash incinerators in the U.S. each year (Kaufman 2004). This estimate is even higher if you use the municipal solid waste data generated by the USEPA. Using the USEPA data for the year 2001, the amount of PVC burned is estimated to be about 600 million pounds (USEPA 2003). These values are consistent with other estimates (Thornton 2002). As discussed earlier, PVC waste contributes substantially to the chlorine content of the waste and to the formation of dioxins in trash incinerator emissions. Estimates of how much PVC waste contributes to the chlorine content in waste streams vary from 35 to 66% (CEC 2000, ECC 1994). Other minor chlorine sources include food waste and paper. Another source estimates that, on average, about 50 to 67% of the chlorine input in an incinerator can be attributed to PVC (Thornton 2002). However, as much as 80% of the organically bound chlorine, which is thought to be more conducive to dioxin formation than inorganic chlorine, is from PVC (Thornton 2000).

In addition to dioxins, PVC waste contributes to the formation of hydrochloric acid (HCl) in the flue gases of incinerators. This gas must be neutralized (primarily by lime) and removed by scrubbers. HCl damages the air pollution control equipment because it is so corrosive and requires additional maintenance. In addition, the metal stabilizers in PVC (lead and cadmium) do not break down during incineration but are released either as hazardous air emissions or remain in the ash and cinders (ECC 1994). Older PVC products that used cadmium as a metal stabilizer will contribute cadmium when burned (ECC 1994). Consequently, the more PVC in the waste stream the greater the operating cost of the incinerator due to: (1) the use of more agents to neutralize the acids and flue gases; (2) additional operating and repair costs; and (3) additional waste management costs to dispose of the residual ash (CEC 2000).

Waste incineration has been linked to a number of serious health problems in plant workers, as well as in surrounding communities. Many of these troubles implicate PVC as the root source of contamination. For instance, workers in incinerator plants have increased levels of chlorinated phenols and lead in their body tissues, which may result from PVC, as well as mercury and arsenic (Allsopp 2001). The USEPA has reported that metals emissions in incinerators rise when the chlorine content of the waste rises. In one study, metals were up to seven times higher when the chlorine content of the waste was increased from 0 to 8.3% (Carroll 1989). Elevated chlorine content levels also impair the efficiency of the scrubber (an air pollution control device) to remove metals from stack gases (Carroll 1989). Incinerator operators are not the only exposed group. Populations living near incinerators are particularly vulnerable to elevated levels of dioxins and heavy metals in tissue and blood, as well as to respiratory ailments and cancers (Allsopp 2001). Elevated levels of congenital abnormalities have also been observed in newborns in areas in the immediate vicinity of incineration plants (ten Tusscher 2000).

Even distant populations are at risk, as toxic air releases settle on crops and these crops are transported to other areas and/or eaten by livestock which, in turn, are consumed by people (Cohen 1998, Cohen 1995). A study by Barry Commoner and researchers at Queens College in New York found Inuit Native peoples living in the northern reaches of Canada, miles from any sources of dioxin, had high levels of dioxin in their bodies (Commoner 2000). These researchers also found dioxins released from incinerators and other dioxin sources hundreds of miles away in the U.S. and lower Canada were transported by wind currents to the far reaches of the globe.

A common argument in favor of incinerators is that they significantly reduce the weight and volume of waste going to landfills. While waste volume is reduced by about 45 to 50%, this statement only tells part of the story. The fly ash captured by the air pollution control equipment and the residual ash left in the burner must be disposed of in landfills and is often more toxic than the original raw waste. This is the result of burning metal-containing materials (including PVC), chlorine-containing PVC waste that generates dioxins, and other difficult to burn waste. This ash is stored in landfills, and often leaches into surrounding soil and water. Incineration may indeed reduce the volume of waste going to landfills, but in doing so, this practice shifts the waste burden to air releases and increases the toxicity of the waste that will eventually be landfilled in the form of ash. Incineration is not a solution to waste disposal, especially not for PVC-containing waste.

Medical Waste Incinerators

Incineration of medical waste involves the burning of solid waste generated primarily by hospitals and research facilities. PVC accounts for 5 to 15% of medical waste (DTI 1995, Hasselriis 1993, Marrack 1988, USOTA 1988). Medical products made of, or containing, PVC include surgical gloves, dialysis tubing, blister packs, inhalation masks, IV bags/tubing, mattress covers and blood bags. Even non-medical products containing PVC (e.g., office supplies) are often burned along with medical trash.

As the overall volume of waste generated by hospitals has increased over the past 50 years, so has the proportion of that waste containing PVC. In 1996, PVC accounted for 27% of all plastic used in durable and disposable medical products (Rossi 2000). This growth in the use and disposal of vinyl medical products has led to increased chlorine input to medical waste incinerators and thus greater dioxin formation. In 2001, the USEPA cited medical waste incinerators as the 3rd largest source of dioxin releases to the environment in the U.S (USEPA 2001).

In 1990, roughly 70% of U.S. hospitals used on-site incinerators (USOTA 1990). According to the USEPA, the number of medical waste incinerators operating in the U.S. dropped roughly in half from 1987 to 1995 (USEPA 2001). Similarly, the amount of medical waste burned in these incinerators dropped from an estimated 1.43 billion kilograms (kg) in 1987 to 0.77 billion kg in 1995. Today there are substantially fewer medical waste incinerators operating (USEPA 2004b). Some of this drop is due to new regulations that have gone into effect, which increased operating costs (USEPA 2000a). But the work of activist grassroots citizen organizations and national groups like Health Care Without Harm have played a major role in shutting down medical waste incinerators and encouraging the use of non-incineration treatment technologies (HCWH 2001, Lester 2003).

Hospital waste primarily consists of general solid waste (70%), medical waste (17%), patient waste (9%) and a small amount of hazardous waste (2%). Approximately 15% of this waste is considered to be infectious waste (HCWH 2001), which requires treatment to disinfect the waste but not necessarily incineration. Viable alternatives to incineration exist for the disposal of the

remaining 98% of medical waste that is non-pathological. Much of this waste is paper, cardboard, plastic, metals and general solid waste that does not need to be burned.

The most prominent alternative for treating hospital waste is autoclaving—a process that disinfects the biological waste component. Other treatment methods include microwaving, electro-thermal deactivation, gasification, chemical disinfection and thermal treatment (HCWH 2001). Yet even these alternatives do not address the underlying problem, the initial use and generation of PVC wastes. A better solution is to replace PVC products with non-chlorinated plastics.

Given the finding in recent studies that flexible PVC products used in hospitals (like dialysis tubing) leach toxic additives into patients' bodies (USFDA 2001, NTP 2000), the imperative to employ alternatives is stronger than ever. Additives mixed in with PVC to make it flexible or rigid are not chemically bound to the plastic and are thus prone to leach from the material. One such additive, a phthalate called 2-diethylhexyl phthalate (DEHP), has been found to leach from soft plastic, and has been documented to have a significant impact on the development of the male reproductive system and the production of normal sperm in young animals (Moore 2001). Also linked with DEHP exposure is respiratory distress, changes in kidney and liver function, ovarian dysfunction and decreased hormone production in females (Rossi 2001).

Open Burning

Perhaps the most under appreciated source of dioxin emissions is the open burning of household trash.

CASE STUDY

Detroit, Michigan: Henry Ford Hospital Medical Waste Incinerator

In February 2000, residents of a predominately African-American community in Detroit, Michigan succeeded in their efforts to shut down Henry Ford Hospital's medical waste incinerator. Since it began operating in 1980, the facility had been burning approximately 6 million pounds of waste annually. As of 1998, Henry Ford was the only hospital (of 25 surveyed) still burning medical waste in an on-site incinerator. Environmental justice was a primary concern: the Henry Ford Hospital System owns two other hospitals located in predominately white suburbs that send their waste to a commercial autoclave facility in Toledo, Ohio rather than burn it. This inconsistency fueled local activists.

The Henry Ford Hospital incinerator was a major, chronic polluter. For instance, the only emission controls in place were opacity limits, which do not involve emissions testing, but use a visual estimate of how 'opaque' a cloud of smoke emitted from the stack is. And even those limits had been violated on a number of occasions. Federal pollution controls on emissions of mercury, dioxins and heavy metals had not yet been implemented in Michigan, so the facility burned medical and other waste largely without regulation. The impact on public health was consequently severe. A five year long Michigan Department of Community Health study found the rate of children hospitalized for asthma in the zip codes immediately surrounding the incinerator to be three times that of neighboring Wayne County. Moreover, a report commissioned by the New York University Research Program focusing on Ambulatory Care Sensitive Conditions in Michigan from 1983 through 1994 found that in the four zip codes surrounding the incinerator, the average hospital admissions of children aged zero to four were four times the state average.

A coalition of more than a dozen organizations including Detroiters Working for Environmental Justice, Virginia Park Citizen's District Council, a local Sierra Club chapter, and the Sugar Law Center for Economic and Social Justice worked together for four years before successfully closing the incinerator in the spring of 2000. Strategies included civil disobedience, media attention and coalition building. Yard signs helped draw attention to the fight, and a constant barrage of phone calls and postcards to hospital officials ensured residents' concerns would not be ignored. Steady, targeted pressure on executives within Henry Ford Hospital System was a major factor in the eventual shutdown of the incinerator (Sources: Lott 2004, Holden 1999, Bates-Rudd 2000).

CASE STUDY

Oakland, California: IES Medical Waste Incinerator

On December 10, 2001, after a 4-year struggle, Integrated Environmental Systems (IES) was forced to shut down its commercial medical waste incinerator in Oakland, California. Even under "perfect" operating conditions, the incinerator was known to emit dioxins, mercury and other toxic pollutants. The facility was also notorious for all kinds of permit violations including excess emissions, broken monitors, odors, uncontrolled bypasses of the pollution control devices and worker safety violations.

The Coalition for Healthy Communities and Environmental Justice, consisting of Oakland residents and community, health, and environmental justice organizations, formed to bring an end to the IES incinerator. After having ignored emissions and permit violations for years, the Bay Area Air Quality Management District finally took action by declining to renew the facility's operating permit in 2001. When IES insisted on its intentions to keep burning millions of pounds of medical and non-medical waste every year, a powerful direct action was planned and executed by the Coalition. Community protesters blocked the entrance to the IES incinerator for eight hours nonviolently putting their bodies in front of trucks carrying waste.

Owing largely to the community's powerful voices and actions, IES sold its company to competitor Stericycle in December 2001 who is reportedly planning to tear down the incinerators and close the facility (Sources: Greenaction 2001, Greenaction 2001a).

CASE STUDY

Gila River Indian Reservation, Arizona: Stericycle Medical Waste Incinerator

Members of the Gila River Indian community near Chandler, Arizona organized as the Gila River Alliance for a Clean Environment and succeeded in forcing Stericycle to shut down a medical waste incinerator operating on tribal land in 2002. The incinerator had been burning medical and non-medical waste from several states for about 10 years, and was among the largest in the U.S. Waste from hospitals, medical and dental offices, mortuaries and research institutes was among the waste being burned. When Stericycle's lease for the facility came up for renegotiation, activists seized the opportunity to push for cleaner technologies like autoclaving. The renegotiated lease will allow only an autoclave on the site. With the closure of this facility, there are now no commercial medical waste incinerators in Arizona, Nevada, or California (Source: Greenaction 2002).

Open burning, also called uncontrolled burning or backyard burning, involves the burning of household trash by residents on their property. Burning typically occurs in a burn barrel, open fireplace or furnace, homemade burn box, wood stove, outdoor boiler or open pit (USEPA 2003e). Most backyard burning occurs in rural areas where there is no curbside trash pickup. According to government surveys, an estimated 20 million people in rural areas burn trash in their backyards (MDEQ 2003).

The smoke and vapors from the open burning of household trash contain many toxic chemicals that can affect people's health and the environment, including dioxins and furans; carbon monoxide; heavy metals such as mercury, lead, arsenic, and cyanide; volatile organic compounds (VOCs) such as benzene, styrene, and formaldehyde; particulates; polycyclic aromatic hydrocarbons (PAHs); and hexachlorobenzene (USEPA 2003f, MDEQ 2003). Exposure to these chemicals have been linked to adverse health problems including, but not limited to asthma, lung cancer, and other respiratory ailments, kidney and liver damage, and nervous system, reproductive and developmental disorders (USEPA 2003g). One study found emissions were highest for VOCs such as benzene and styrene, formaldehyde, hydrogen cyanide and hydrochloric acid, followed by polychlorinated biphenyls (PCBs) and arsenic (MDEQ 2003).

Among the toxic byproducts of backyard waste burning, dioxins and furans may pose the greatest public health threat. Dioxins are highly toxic even at low levels and have been linked to serious health problems in people that include cancer and adverse developmental and reproductive effects (USEPA

2003g, Birnbaum 2003). Dioxins are formed primarily because of low combustion temperatures, poor air distribution, and the presence of chlorine (USEPA 2003h). The majority of chlorine in household trash comes from PVC plastic. Because the emissions from open burning are released close to the ground, they are particularly dangerous to people and animals located nearby. There are also no pollution control devices on these burners.

The backyard burning of household trash also produces residual ash that contains toxic metals such as lead, chromium, mercury and arsenic, as well as PCBs and dioxins (USEPA 2003f, Lemieux 1998). The ash left over from the burning is often used by homeowners in gardens or placed in areas where children may play and come in contact with these toxic substances. In gardens, vegetables can absorb and accumulate the metals (USEPA 2003f).

Open burning was not initially identified by the USEPA as a source of dioxin (USEPA 1998). Now the agency has identified open burning as a major source of dioxins. The USEPA's most recent Inventory of Sources of Dioxin estimated open burning may account for as much as 628 grams TEQ dioxin, making it the second largest source of dioxin emissions in the U.S. (USEPA 2001). The USEPA found a single household burn barrel may release more toxic chemicals into the air than a municipal waste incinerator burning 200 tons of household trash a day that is equipped with state-of-the-art air pollution control devices (Lemieux 1998).

A key study used by the USEPA to estimate the amount of dioxins generated by open burning of household trash was published in 1998 by a New York researcher (Lemieux 1998). The author burned two sets of simulated household garbage in separate metal burn barrels in a controlled laboratory setting and measured emissions from each barrel. One barrel contained simulated waste from a household that did not recycle and the other contained waste remaining after "avid recycling." This study reported high emissions of volatile organic compounds (VOCs) including benzene, polynuclear aromatic hydrocarbons (PAHs), chlorinated benzenes and dioxins and furans. Surprisingly, higher levels of dioxins and furans were found in the emissions from the avid recycling household sample compared to the non-recycler.

CASE STUDY

Maine Bans Backyard Burning; Warns Public About PVC Hazards

Reducing dioxin emissions and protecting the health of Maine residents was a high priority when the Maine legislature voted to prohibit backyard trash burning in 2001. This new law and PVC educational outreach followed a citizen advocacy campaign led by the Natural Resources Council of Maine which focused on reducing the use and disposal of PVC because of its role as a dioxin-forming consumer product. A 1997 study found 10,000 backyard burn barrels across rural Maine and documented the high levels of dioxin emissions and exposures that resulted. The law also required the Maine Department of Environmental Protection (DEP) to educate people about dioxin-forming PVC products and their alternatives.

An educational bulletin, poster and flyer prepared and distributed by the Maine DEP contain clear and compelling messages about PVC.

> "We can make a difference by RETHINKING our purchasing habits to avoid putting PVC products in the waste stream."

> "You can help to reduce dioxin pollution from municipal trash incineration by: REPLACING #3 PVC Products with 'less polluting' natural materials OR safer plastic alternatives #1 PETE, #2 HDPE, #4 LDPE, #5 PP."

> "PVC plastics waste is a major source of our dioxin pollution in Maine. It is the only plastic that forms significant amounts of dioxin when burned and has very low recycling rates. It is even preferable to avoid burning PVC in municipal incinerators to reduce air pollutant levels and toxic ash disposal. Safe alternatives exist for virtually every use of PVC plastic."

Maine's educational materials also give clear consumer guidance on safer alternatives to typical uses of PVC plastic. The Maine DEP established the link between open burning and PVC as follows: "In addition to eliminating backyard trash burning, we need to reduce the toxic nature of our waste stream that goes to incineration because of the potential for serious health effects and contamination of our food supply" (Sources: MDEP 2001, MDEP 2001a, MDEP 1997).

A likely explanation for this difference may be the higher proportion of PVC plastic which is not recycled that ends up in the trash of the avid recycling household (4.5% versus 0.2%). According to the author of the study, "the higher proportion of PVC plastic in the avid recycler's waste stream could potentially increase the formation of chlorinated organic compounds." Other factors such as time, temperature history, mixing patterns, oxygen availability, as well as the mixture of carbon with chlorine in the presence of metal catalysts are also important factors in the formation of PCDDs (dioxins) and PCDFs (furans) (Lemieux, 2000).

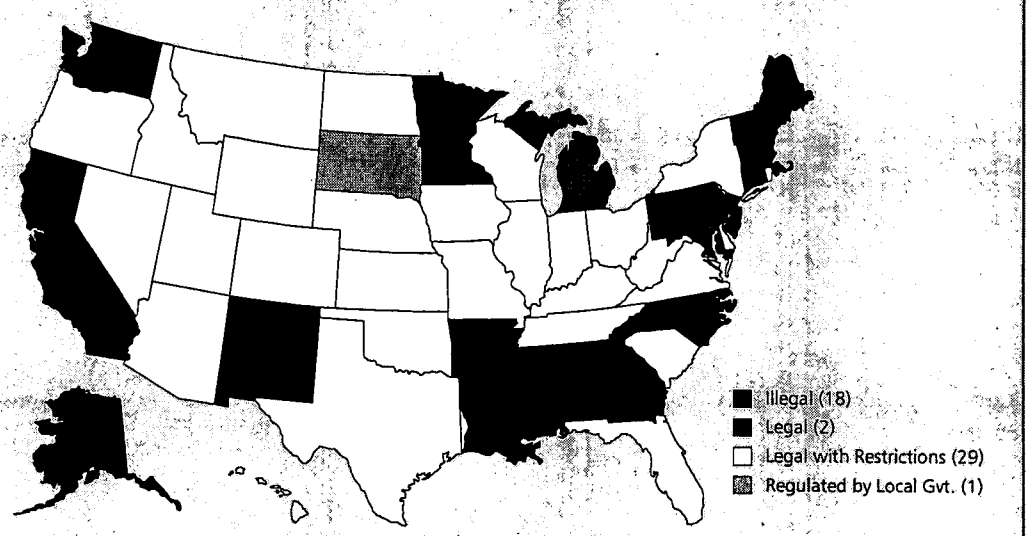
Initially, USEPA considered that PVC content in the waste might be a key determinant of dioxin emissions during open burning (Lemieix 1997, Gullett 1999). They conducted several experiments to evaluate the effect of PVC and chlorine input on dioxin emissions (Gullett 1999, Gullett 2000, Gullett 2001). The latest study concluded that the chlorine in the waste does appear to influence dioxin emissions, but only at high levels not typically found in household trash, and dioxin emissions were independent of the source of chlorine (Lemieux 2003).

A recent reanalysis of this same data found a very strong correlation between PVC and dioxin emissions in the USEPA burn barrel experiments (Neurath 2004). This study found that the percent chlorine, especially the percent PVC, were "the most important predictors of dioxin emissions"—not combustion variables such as carbon monoxide, temperature, or air input levels as claimed by the USEPA (Neurath 2004). Backyard burning is not like an incinerator where you can control these variables. By definition, uncontrolled burning is uncontrolled. What can be controlled is the type of waste, such as PVC, that is burned.

Open burning of household trash is thought to account for a considerable share of dioxin air emissions in many states including Maine (26%) (MDEP 2004) and New Hampshire (17%) (NHDES 2001). Some states including Massachusetts, Maine, Vermont, Connecticut, North Carolina, New Mexico, and Washington (USEPA 2003i), recognize the threat to public health and have adopted regulations completely banning open burning of household trash. Others, such as Alaska (AKDEC 2004) and California (CARB 2003), while allowing the burning of paper, cardboard and yard waste, have specifically banned the burning of plastic, rubber and other hazardous materials.

Figure 3 includes data originally developed by the New Hampshire Department of Environmental Services and updated in 2004. The figure shows open or backyard burning is illegal in 18 states, restricted in 29 states, completely unrestricted in two states (Michigan and Pennsylvania) and left to local government in one state

Figure 3. Current State Regulations on Backyard Burning of Household Waste in the U.S.



Source: Adapted from NHDES 2001

(South Dakota) (NHDES 2001, NHDES, 2003, NMED 2004, CARB, 2003a, MRSA 2004). Several states that have yet to enact proper legislation (e.g., Rhode Island, New York, Pennsylvania) have issued public health statements and developed pamphlets warning of the dangers associated with burning plastic, specifically the release of dioxins. The USEPA currently has no regulations that apply to open burning even though they estimate that it is one of the largest sources of dioxin in air (USEPA 2001). To assist in finding current regulations for each state, the USEPA has constructed a virtual map on their Website with links to each state's rules and regulations (USEPA 2003i).

Regulations on open burning typically vary between rural and urban/suburban areas. While generally prohibited in highly populated areas and municipalities, open burning is seldom stringently regulated in rural areas. One reason given for this has been that decisions on whether to restrict or ban open burning of household trash has been driven by citizen complaints (Lighthall 1998). Thus, those communities with enough people to generate a substantial number of complaints are the ones that enact or adopt policies to restrict or ban the open burning of household trash.

Every state has distinct laws though, and even within states, rules are far from uniform. Even in those states and areas where rules and regulations exist, enforcement is extremely difficult. This lack of coherence tends to stifle efforts to curb open burning in general and PVC burning in particular. Unless open burning can be curtailed or even adequately controlled, it is unrealistic to expect PVC will not be burned. PVC will continue to harm human and environmental health as long as open burning continues to be used to dispose of trash.

In addition to open burning of household trash, vehicle fires, structure fires, construction site burning and landfill fires all represent significant types of uncontrolled PVC combustion. Because PVC is so ubiquitous, the chance that it will be burned in intentional or accidental fires is high.

The cost of waste disposal has risen in recent years, and many rural residents are unable or unwilling to pay these increased costs. Otherwise laudable "pay-as-you-throw" (variable rate pricing) programs in communities across the nation aim to reduce waste, but in rural areas accustomed to paying a fixed rate regardless of the amount of waste they generate, such programs actually tend to trigger an increase in burning and illegal dumping. Rather than reduce the amount of waste generated, the more appealing option for some is illegal dumping and/or open burning. Moreover, proper disposal is often less convenient in rural areas. Burning trash may be a more appealing option than driving long distances to pay for and legally dispose of trash. State and local governments must address matters of affordability and convenience in these areas in order to help bring an end to open burning (MEDEP 1997). In the long term though, replacing PVC with safer alternatives is the only way to eliminate PVC from the waste stream.

VI NO PLACE LEFT
Problems with PVC in Landfills

MAJOR FINDINGS

- Dumping of PVC in landfills poses significant long-term environmental threats due to leaching of toxic additives into groundwater, dioxin-forming landfill fires and toxic emissions in landfill gases.
- Land disposal is the final fate of between 2 billion and 4 billion pounds of PVC that is discarded every year in some 1,800 municipal waste landfills.
- Many of the more than 1,900 landfills used for disposal of construction and demolition (C&D) debris are unlined and can not capture any contaminants that leak out of PVC building material waste.
- An average of 8,400 landfill fires are reported every year in the U.S., contributing further to PVC waste combustion and dioxin pollution.

Landfilling is the most common disposal option for PVC and thus is a significant part of the disposal stage of the PVC life cycle. The majority of PVC that is discarded as waste ends up in a landfill. However, landfills do not solve the PVC disposal dilemma. They eventually leak, routinely emit toxic gases and occasionally catch on fire. Landfills merely represent a temporary, polluting alternative to burning PVC and creating dioxins. As an interim strategy, land disposal of PVC is preferable to incineration, but it does not provide a long-term secure solution to PVC waste management.

Municipal Waste Landfills

In 2001, about 79% of U.S. municipal solid waste destined for disposal was landfilled (USEPA 2003). According to data made available by the USEPA, about 1.42 million tons of PVC was in U.S. municipal solid waste in 2001 (USEPA 2003). This represents less than one percent of the 163 million tons of municipal solid waste disposed of in landfills and incinerators. (This total does not include an additional 49 millions tons of municipal discards that were recycled or composted and contained negligible amounts of PVC).

The USEPA data establishes a low-end estimate of about 1.12 million tons of PVC (more than 2.2 billion pounds) that was dumped in landfills in 2001 (USEPA 2003). Using another source of data on municipal waste generation for 2002, the amount of PVC dumped

in landfills was estimated at 2.04 million tons, or more than 4 billion pounds (Kaufman 2004), nearly twice the USEPA amount. This latter estimate assumes the same percent PVC content in the municipal solid waste stream as reported by the USEPA.

The estimated number of active landfills in the U.S. that accept PVC for disposal in municipal solid waste varies. Citing 2002 data reported by 47 states, Kaufman lists a total of 1,767 municipal solid waste landfills (Kaufman 2004). USEPA concluded that 1,858 landfills received municipal solid waste in 2001 (USEPA 2004c). Yet another source estimates that there are 3,200 municipal solid waste landfills (EREF 2004).

Table 8 lists those states that rely heavily on landfilling as a disposal option for municipal solid waste in the U.S. California, Texas and Michigan landfill the most waste. Texas has the largest number of landfills (175), followed by California (161) and Florida (100). A total of 19 states including Texas, Ohio, and Illinois landfill 100% of their waste. A complete listing of the amount of PVC landfilled in each state is show in Appendix B.

Table 8

Estimated Amounts of PVC Discarded in Landfills According to States that Landfill the Most Municipal Solid Waste (MSW)

State	Number of Landfills	Amount of PVC Landfilled (tons)
California	161	328,260
Texas	175	176,896
New York	26	116,088
Ohio	44	100,509
Illinois	51	98,896
Michigan	52	96,241
Florida	100	76,817
Georgia	60	69,177
Pennsylvania	49	60,844
New Jersey	60	56,166
North Carolina	41	54,842
Indiana	35	52,986
Washington	21	49,128
Virginia	67	48,636
Maryland	20	42,722
Remaining States*	805	610,553
Total	1,767	2,038,761

Sources and Notes: Estimates derived from Kaufman (2004) for 2002. The amount of PVC landfilled by each state was calculated by (1) assuming that the percent PVC content of municipal solid waste (0.62%) estimated by the USEPA (2003) is representative of the typical percentage of PVC in the waste stream; (2) assuming that post-consumer recycling of PVC in MSW is zero; (3) multiplying the average percent PVC in the waste (0.62%) by the total waste generated in that state according to Table 4 in Kaufman (2004); and (4) multiplying this value (the total PVC disposed in the state) by the percent of waste landfilled after recycling as shown in column 2 above. The percent of PVC landfilled after recycling was determined by dividing the total amount of waste landfilled in a state (provided in Table 4 of Kaufman 2004) by the total waste disposed of (after recycling).

* AL, AK, and MT did not report any data (see Appendix B).

The amount of PVC waste going to landfills is expected to increase substantially over the next 20 years. A study in Europe found the amount of PVC waste generated in the 15 European Union countries will increase from 3.6 million tons per year in 2000 to 4.7 million tons in 2010 and to 6.4 million tons per year by 2020 (AEA 2000, ARGUS 2000). This is an increase of more than 75% over 20 years. This is because most PVC products were put into commercial use during the 1970's and their useful service life is ending. Components in cars, construction materials, and electrical, household and industrial goods typically last from 5 to 15 years (AEA 2000). Building materials such as pipes, flooring, and siding may last for decades before being replaced (AEA 2000). As production of these PVC materials has been on going for more than 30 years, the PVC waste that is entering the waste stream today is a reflection of the products put in use years ago. An estimated 300 billion pounds of this PVC will require disposal worldwide in the coming years (van der Naald 1998).

Construction and Demolition Waste Landfills

PVC is also found in construction and demolition (C&D) waste. C&D waste is generated from the construction, renovation, repair and demolition of structures such as residential and commercial buildings, roads, and bridges (ICF 1995). Franklin Associates

(under contract to the USEPA) estimated that 136 million tons of building-related C&D debris was generated in 1996 (FA 1998). This figure did not include road, bridge and land clearing debris. C&D waste consists mainly of wood products, asphalt, drywall and masonry waste with lesser quantities of metals, plastics including PVC, dirt, shingles, insulation, paper and cardboard (ICF 1995). The percentage of PVC in C&D waste is hard to estimate. One report specifically identified and estimated the percent of vinyl siding and PVC pipes in C&D waste to be 0.63% for the two materials combined (FA 1998). Other types of PVC plastic waste were not considered.

In 2002, forty-two states reported that 1,931 landfills were dedicated for disposal of C&D waste (Kaufman 2004). Many if not most of these landfills are unlined, offering groundwater supplies even less protection from contaminants that may leach from PVC and other C&D waste components.

The Hazards of Landfill Disposal of PVC

There are significant dangers associated with the dumping of PVC in landfills. Although there appears to be little degradation of the PVC polymer (ARGUS 2000, Mersiowski 1999), the additives present in PVC products are not chemically bound to the PVC and they will seep out into the environment over time (CEC 2000). These additives include plasticizers, stabilizers, pigments, fillers and other chemicals that are added to PVC depending on the final product's intended purpose (see Chapter 3). Many of these additives leach out in the disposal phase (Mersiowski 1999). This is especially true of flexible PVC products. In the case of the rigid PVC products, stabilizers are generally thought to be encapsulated in the matrix of the PVC polymer and thus migration is expected to be less than what occurs with the plasticizers (ARGUS 2000, AEA 2000, Mersiowski 1999).

In landfills, PVC (as well as all waste) is subject to different reactive conditions such as moisture, changing temperatures, the presence (or absence) of oxygen, and the activity of microorganisms (CEC 2000). These factors will interact with the waste at different stages of the aging process. Recent studies evaluating the behavior of PVC in landfills found that microorganisms and/or corrosive liquids common to landfill environments act to accelerate the release of additives in PVC products (Mersiowski 1999, Hjertberg 1995).

Cadmium, lead, organotins and phthalates (which account for over 90% of plasticizers) are commonly released from PVC waste in landfills (Mersiowski 1999, Hjertberg 1995). In studies evaluating the leaching of bisphenol A (BPA), an additive used in many plastics, PVC was found to release the highest concentrations of BPA (Yamamoto 1999). These additives will mix with water and other substances in the waste and generate "leachate" which will contaminate local groundwater in the vicinity of the landfill.

Leachate generated by waste in landfills has been detected in groundwater monitoring wells at numerous garbage landfills (Lee 1996). One study in California reported that 72% of 528 landfills had polluted the nearby groundwater (Lee 1996). The USEPA passed regulations in 1991 to control landfill leachate (USEPA 1991). These regulations have been criticized for relying on a "fundamentally flawed technological approach for MSW management that at best only postpones when significant environmental problems will occur as a result of the landfilled waste" (Lee 2003).

Estimates have been made of the amount of lead present in landfills that are attributable to lead additives in discarded PVC products. These estimates range from 1 to 28% (CEC 2000). In 1998, an estimated 51,000 tons of lead were used as stabilizers in plastic in Europe (CEC 2000) and an estimated 6 billion tons were used worldwide in 2000 (Tukker 2001). Much of this lead will end up in landfills and can be expected to be a significant source of lead being released into the environment (NCM 2003). The key question is how much of the lead will be mobilized and released into the environment and when. Although the mobility of lead is generally thought to be low, small amounts will slowly leak out. Over time, this could lead to substantial amounts of lead being released into the environment. One study in Europe reported that an estimated 8 kilotons of lead from PVC entered the waste stream and that 0.5 kilotons was released into the environment in 2000 (Tukker 2001). Given the longevity of PVC products, it can be expected that lead leaching from discarded PVC products in landfills will continue to be a health and environmental threat for many years to come.

The lack of adequate liners and/or leachate treatment in many old landfills (and even some new ones) ensures that these releases have an easy route into surrounding groundwater and soil. Many construction and demolition debris landfills are completely unlined. Most old landfills contain no liner or collection system to prevent leachate generated in the landfill from mixing with and

contaminating local groundwater. This leachate will seep down through the waste and eventually contaminate groundwater with hazardous and toxic chemicals (Lee 1994).

Even landfills equipped with the best liners and most up-to-date treatment methods cannot ensure long-term safety. In instances where liners or collection systems have been installed, leachate is still generated. When it reaches the bottom of the landfill, it is collected by a system of pipes and treated. The treated leachate is often sprayed back onto the waste and eventually collected again. If these pipes clog up, the leachate will accumulate in the landfill and create pressure on the liner. Eventually, this pressure will force the leachate out at the point of least resistance, usually the bottom of the landfill when the bottom liner fails.

These collection systems can be clogged by silt or mud, the growth of microorganisms in the pipes, or chemical reactions leading to the precipitation of minerals in the pipes. The pipes may also become weakened by chemical attack (acids, solvents, oxidizing agents or corrosion) and may be crushed by the tons of garbage piled on them (ERF 1989)

The liners used in landfills are generally made from high-density polyethylene (HDPE). These liners can be degraded by a number of household chemicals that can cause them to either lose strength, soften or become brittle and crack. Liners will also tear during installation or as a result of pressure from the weight of the waste. There may also be defects in the liners such as cracks, holes and faulty seams that allow leachate to pass through the liner (ERF 1992). One study found certain organic chemicals, such as chlorinated solvents, benzene, trichloroethylene (TCE) and vinyl chloride, can readily pass through an intact liner (i.e., a liner with no holes) in a short period of time (Haxo 1988). This finding has been confirmed in separate studies (Sakti 1991, Buss 1995, Lee 1996). Eventually, all landfills will leak whether they have a liner or not (ERF 1992, Bonaparte 1990, Lee 1992) and threaten the health of residents living nearby (ERF 1998). Landfills cannot guarantee safe, long-term disposal of PVC wastes and their by-products.

Landfill fires present another cause for concern. These fires generate a range of hazardous gases including carbon dioxide, carbon monoxide and hydrogen chloride. Dioxins and furan are also formed (USEPA 2001). Such fires are not uncommon. An average of 8,400 landfill fires are reported each year in the U.S. (FEMA 2002) and their ignition can be traced to a number of causes. Though over half of reported fires have no information available as to the initial cause, 40% of reported fires are classified as deliberate or suspicious, 20% are attributable to smoldering waste, and 5% ignite spontaneously. Highly flammable methane gas, released by landfilled waste as it decays is a primary factor in many cases.

PVC products disposed of in landfills contribute to the formation of dioxins and furans in the event of a fire. Four PVC products—pipes, rigid foils, floorings and cable wires—contribute about 40% of the chlorine content in landfills (Mersiowsky 1999). As previously discussed, the chlorine in PVC contributes to the formation of dioxins. Other factors that influence the amount of chlorinated dioxins and furans formed include fire temperature, and the availability of oxygen and catalysts (e.g., copper). Lower oxygen concentrations and lower temperatures (500-700° C) correspond with elevated dioxin formation (Moeller 1996). Both these conditions occur frequently at landfill fires.

Measured concentrations of dioxins and furans in the air of landfill fires are generally high and consistent with evidence gathered from test fires (Ruokojärvi 1995). As is the case with open burning, these air emissions are unfiltered and largely uncontrolled (see Chapter 3).

Another concern with landfills is the generation of landfill gases. All municipal waste landfills generate gases that result from the degradation of materials in the waste (USEPA 1995). The most common landfill gas is methane that results from the degradation of biological matter in the waste stream. Other common landfill gases include vinyl chloride, benzene, toluene and dichloroethane (ATSDR 2001). These volatile gases result from the breakdown of waste components present in the landfill. When PVC degrades, plasticizers and other additives leach out, and some of these evaporate and contribute to the landfill gases (ARGUS 2000).

Older landfills made no attempt to vent or control these gases. As a result, there were many explosions in homes and buildings located near solid waste landfills caused by the migration of methane gas, a highly explosive substance (USEPA 1990, Lee 1994). More modern landfills attempt to capture these gases using a gas collection system. These systems consist of a series of wells installed throughout the landfill that are used to pull out the gas. A series of pipes connect the wells and carry the gas to either a flare where it is burned or to an energy recovery system where the gases are con-

verted into electricity (USEPA 1990). The flares can be a source of dioxins if chlorinated chemicals such as vinyl chloride are present in the landfill gases (USEPA 2001, Eden 1993).

Since 1996, large landfills have been required to have gas collection systems, which, the USEPA maintains, capture 75% of the gases (USEPA 2002b). However, there is no factual basis for this number. There are no studies that define the collection efficiency of these systems. Instead, this estimate is intended to reflect the best achievable efficiency while the systems are operating. The flaws in EPA's estimate are two fold. First, more of the gases are emitted both before the systems are installed and after they are removed from service, than during the time they are functional. Second, most landfills do not achieve best practices, especially because there is no way to measure emissions that might disclose poor efficiency, other than by detecting odor problems, which is just the manifestation of the worst fugitive emissions. A study that includes these factors found that there is no factual basis to conclude that, in practice and on a lifetime basis, more than 20% of the landfill gases generated are actually captured and either flared or used to recover energy (Anderson 2004a).

Landfills are also used to discard the residual ash generated when PVC products are incinerated. This ash contains dioxins and many heavy metals that will eventually cause many of the same leaching problems and threats to groundwater discussed earlier (USEPA 1994a, ERF 1990, Denison 1988). Clearly, landfills do not solve the disposal dilemma. They merely present a temporary, polluting alternative to burning PVC and creating dioxins. As an interim strategy, land disposal of PVC in a hazardous waste landfill may be preferable to incineration, but it poses its own environmental and public health threats and does not provide a long term secure solution to PVC waste management. Avoiding the generation of PVC-containing waste is the only sure way to prevent the problems associated with either landfill disposal or incineration of PVC waste.

VII RECYCLING MENACE
PVC Undermines Recycling Efforts

MAJOR FINDINGS

- Contrary to popular belief, recycling of PVC is negligible, with estimates ranging from 0.1% to 3% of post-consumer PVC waste being recycled.
- PVC is very difficult to recycle because the many additives used in PVC products make it impossible to retain the unique properties of the original formulation from a batch of mixed PVC products collected for recycling.
- PVC severely impacts the recycling of PET plastic bottles due to difficulty in separating these plastics when they are mixed together, and because of the contamination caused by the chlorine in PVC when they are processed together for recycling.
- The vinyl industry has inflated its PVC recycling rate by failing to account for all PVC waste generated and by redefining PVC waste incineration as recycling.
- PVC increases the toxic impacts of the recycling process for other discarded products such as nylon carpet, computers, automobiles and corrugated cardboard.

The ability to recycle used PVC products into new products is not feasible as a practical matter (Plinke 2000). While the vinyl industry has argued that PVC can be recycled (VI 2004a, PP 1999), in reality, a negligible amount of PVC is actually recycled. Estimates of how much post-consumer PVC (PVC that was used by a consumer for its intended purpose) is recycled vary from a high of about 3% (Plinke 2000, PP 1999) to a low of less than 1% (Denison 1997, Beck 1996). USEPA reports that less than 0.1% of PVC in post-consumer municipal solid waste was recycled in 2001, the most recent year for which data are available (USEPA 2003). As discussed below, at most 0.3% of PVC bottles were recycled in 2001 (Anderson 2004).

The primary reason for these poor recycling rates is the lack of uniformity in the composition of PVC products. Vinyl products are made using various formulations that are designed to achieve certain properties and create specific products. To achieve these features, additives such as lead, cadmium and phthalates that enhance properties such as durability and plasticity are mixed together with PVC. For example, vinyl siding and windows are made with lead to make them more durable, whereas infant chew toys contain phthalates to make them more soft and pliable. Table 9 shows what portion of the PVC is made up of these additives.

When these different formulations of PVC are mixed together, such as when they are collected as part of a recycling effort, they cannot be readily separated which

Table 9

Typical Composition of PVC Products and Materials

Application	Share of the Components (weight - %)				
	PVC Polymer	Plasticizer	Stabilizer	Filler	Others
Rigid PVC Applications					
Pipes	98	—	1-2	—	—
Window Profiles (lead stabilized)	85	—	3	4	8
Other profiles	90	—	3	6	1
Rigid film	95	—	—	—	5
Flexible (soft) PVC Applications					
Cable installation	42	23	2	33	—
Flooring (calander)	42	15	2	41	0
Flooring (paste, upper layer)	65	32	1	—	2
Flooring (paste, inside material)	35	25	1	40	—
Synthetic leather	53	40	1	5	1
Furniture films	75	10	2	5	8
Leisure articles	60	30	2	5	3

Source: Prognos 1994, Prognos 1999, Totsch 1990 as cited in Plinke, 2000.

is necessary to reprocess the PVC back into its original formulation and to retain the unique properties of the original formulation (Plinke 2000, Thornton 2000). This problem is further complicated because PVC formulations for the same materials have changed over time.

There are other problems with mixing PVC with other plastics. One difficulty is color. Recycled products must be separated by color, which in most cases is not practical (Plinke 2000). Another difficulty is that soft PVC cannot be used in rigid PVC applications, and rigid PVC cannot be used in soft PVC applications since the material has to be reformulated (i.e., new additives need to be added). Thus, when different formulations of PVC are mixed together, it becomes virtually impossible to create a formulation that can be used for any application that requires specific properties.

As a result, a lower quality PVC plastic is produced which cannot be used for the same purpose as the original product (Plinke 2000). Thus, PVC can never be truly recycled into the same quality material. It usually ends up being made into lower quality products with less stringent requirements such as speed bumps, parking bumpers, or park benches. The loss of quality in a material during recycling is called "downcycling." The downcycling of plastics is common because of the difficulties in separating out the components with different additives (Plinke 2000). PVC that is downcycled does not reduce the overall demand for the raw materials (virgin resin) used in making plastic, and has no effect on the amount of vinyl produced each year (Denison 1997).

In Europe, where PVC recycling has received greater attention, the vinyl industry has claimed greater progress in PVC recycling than is actually the case. Instead of measuring recycling progress against the total amount of PVC waste generated, the industry instead limited its recycling goals to the much smaller fraction of PVC waste that they deem to be economically "collectable" and "available." With this distortion the European industry claimed that they achieved their goal of recycling 25% of PVC waste window frames, pipes and fittings, and roofing membranes by 2003. In fact, actual PVC recycling rates were less than 5% for pipes and fittings, 6% for roofing waste and 16% for window frames (ENDS 2004).

The PVC industry's distortion of its recycling progress can't hide the facts. Throughout Europe, the total amount of PVC recycled in 2003 was 2% to 3%, matching only one-fifth of the industry's modest goal of recycling 10% to 15% of all PVC (not just what's collectable and available) by 2010 (ENDS 2003). These modest gains are being rapidly overshadowed by the projected 50% to 80% increase in PVC waste generation over the next twenty years (ENDS 2003, ENDS 2004).

Compare the 2% to 3% PVC recycling rate in Europe (which far outpaces the 0.1% to 3% U.S. PVC recycling rate) with the recycling rates for other commonly discarded products in the United States in 2001: auto batteries (94%), yard trimmings (57%), steel cans (50%), aluminum beer and soft drink cans (49%), paper and paperboard (45%), PET #1 plastic soft drink bottles (36%), tires (31%) and glass containers (21%) (USEPA 2004c).

To further cover its poor recycling record, the vinyl industry has taken to re-labeling PVC waste incineration as recycling. For example, the European Council of Vinyl Manufacturers describes trials of several new PVC "recycling" technologies. These include PVC waste incineration at a Dow Chemical plant in Leipzig, Germany to recover hydrochloric acid, and the chemical processing of waste PVC and mixed plastics to help fuel a steel plant in the Netherlands (ENDS 2003). They also included a proposed PVC waste gasification plant to make hydrochloric acid and a fuel gas, which was later abandoned by Solvay in France due to costs and technical problems (ENDS 2003). High temperature processing of PVC waste will form chlorinated dioxins and furans and other toxic byproducts and can only be properly classified as incineration or waste treatment, not recycling.

Impacts on the Recycling of Other Materials

The difficulty in separating PVC from other plastics, such as polyethylene terephthalate (PET) bottles or nylon carpet facing, makes it extremely difficult, if not impossible, to recycle those otherwise recyclable materials. PVC also increases the toxic impacts of recycling of other valuable commodities such as copper from wiring and cable used in electronics like computers, steel from the scrapped automobiles and corrugated cardboard containers sealed with PVC tape. These examples are summarized in Table 10 and discussed below.

Plastic Bottles

PVC severely impacts the recyclability of other plastics such as polyethylene terephthalate (PET or sometimes PETE). Bottles made of PET and high density polyeth-

Table 10

PVC Contaminates the Recycling of Many Materials and Products

Material and Product	PVC Use	PVC as Contaminant
Polyester from PET plastic (#1) bottles[1]	PVC and PET bottles are commingled in all bottle recycling efforts	Due to similar densities, it is difficult and expensive to separate PVC from PET; the presence of even a little PVC ruins PET recycling during processing.
Nylon facing from carpets[1]	Backing of carpet	PVC can't be readily separated from nylon; it contaminates it and results in "down-cycling."
Copper from wires and cables of electronics[2]	Plastic sheathing of wires and cables	The PVC on wires and cables with low copper content are burned at secondary copper smelters releasing dioxins and toxic additives and by-products.
Steel from automobiles[3]	Undercoating, wiring, interior and exterior trim, other plastics in autos	After shredding, most non-metal "fluff" is landfilled, but some PVC mixed with the steel is burned in electric arc furnaces.
Cardboard from boxes[4]	Tape and other binders used to seal boxes	After separation from corrugated cardboard, PVC plastic is burned at the paper mill.
Scrap wood from C&D[5]	Siding, pipes, window frames, flooring and other building materials	PVC scraps contaminate the waste wood extracted from C&D waste which is chipped to burn as a cheap fuel in "biomass" boilers.

Sources: 1 - Anderson 2004; 2 - SVTC 2004; 3 - CCC 2004; 4 - SCC 1988; and 5 - MDEP 2004a.

ylene (HDPE) make up 95% of all plastic bottles compared to only about 2.3% for PVC bottles (Anderson 2004). PET bottles (recycling code #1) are commonly used to contain water, soda, vegetable oil and many other products (Anderson 2004) and are highly recyclable. Lower quality recycled PET (which has greater tolerance for contaminants such as PVC) is often used to make a polyester fabric known as "fiberfill" that is used in coats, sleeping bags, pillows and carpeting. However, higher quality recycled PET (containing very little PVC) is increasingly being recycled directly back into bottles. It also has an economic benefit as it is sold for fiber at seven times the price of PET contaminated with PVC (Anderson 2004).

When PVC is mixed together with PET or other highly recyclable plastic, such as in the "all-bottle" recycling programs favored by the plastics industry, the few PVC bottles likely to be collected will be virtually indistinguishable from PET containers due to their similar appearance and density. Sophisticated separation technology that uses optical systems is available to identify and remove unwanted plastic bottles, such as PVC (USEPA 1993). However, the effectiveness of these systems is greatly reduced when the bottles are damaged or dirty. This makes accurate readings difficult to achieve and as a practical matter separation of PVC almost impossible (USEPA 1993, Anderson 2004).

If the PVC cannot be separated from the PET, it will severely effect the processing of the PET bottles into reusable plastic resin. This is because PET and PVC behave very differently when they are processed for recycling. PVC burns at a lower temperature than PET. It burns at the temperature that simply melts PET (Anderson 2004, EAF 1993). When this occurs, "black spots" get into the PET resin contaminating the batch and ruining or seriously downgrading the quality of recycled PET residue (Anderson 2004). According to one plastics recycler, "introducing one PVC bottle into the recycling process can contaminate 100,000 PET bottles" (Anderson 2004, EAF 1993). In addition, when PVC is melted, it generates hydrochloric acid, which will damage the processing equipment (OSWM 1993).

Despite these difficulties, the vinyl industry partially subsidized PVC bottle recycling in the mid-1990s (Anderson 2004). This effort failed miserably. At best, barely 2% of the bottles were recovered (Anderson 2004). Instead, truckloads of PVC plastic waste were landfilled (Denison 1997) leading the Association of Post-Consumer Plastic Recyclers (APR), a recycling industry trade group, to declare that vinyl products are "unrecyclable contaminants" in the recycling of PET and HDPE bottles (PMF 2003). APR later abandoned its efforts to establish viable markets to recycle PVC (RT 2001). A report on the recycling of PVC waste prepared for the European Union similarly concluded "mechanical recycling is not qualified to contribute significantly to the management of PVC post-consumer wastes in the next decades..." (Plinke 2000).

More recently, a report released by the GrassRoots Recycling Network (a group of community activists and recycling professionals advocating for zero waste and sustainable communities) concluded that PVC bottle recycling is negligible today and that at most 0.3% of PVC bottles were recycled in 2001 (Anderson 2004). The report provides details of how PVC recycling of bottles does not exist, cannot exist, and is not wanted even by the plastics recycling industry. The only solution is a total phase-out of PVC and a rejection of programs encouraging curbside pickup of PVC that ultimately cause more harm than good.

Electronics

An estimated 26% of the plastic used in electrical and electronic equipment is made of PVC (MCTC 1996). The cabling of computers and other electronics is currently a major application of PVC in electronics, although it can be found in the housings of older computers that may still enter the waste stream (SVTC 2004).

When these consumer products reach the end of their useful life, components can be recovered and reused. Recyclers strive to recover valuable metals, such as copper from the wiring of these electronics. This is done by mechanical removal of the plastic sheathing, but it is only economical when the copper content is high. Most PVC cables from consumer electronics do not contain enough copper and so are bundled and shipped to a secondary copper smelter. Once there, the PVC plastic is burned off from the copper, a known catalyst of dioxin formation. Thus, recovery of copper wire results in toxic emissions including dioxins and furans to air and ash (SVTC 2004, USEPA 2001).

Smelting can present dangers similar to incineration. A report on the recycling of computer parts raised concerns that the Noranda Smelter in Quebec, Canada, where much of the North American "electroscrap" is sent, is "producing dioxins due to the residual presence of PVC or other plastics in the scrap" (SVTC 2004). Noranda has denied that this facility presents a "pollution hazard." Secondary copper smelters, such as the one operated by Noranda, have been identified as one of the highest sources of dioxin emissions in the U.S. (USEPA 2001).

Automobiles

Cars currently produced in North America average about twenty-four pounds of PVC per vehicle, according to plastics manufacturers (APC 2004). When the hulks of old cars are shredded, some of the PVC plastic mixes with the scrap metal which is melted down to make recycled steel. The high temperature and possible metal catalysts trigger formation of dioxins and furans. The vinyl industry advocates burning the plastics-rich automotive shredder residue (ASR or "fluff") either with municipal solid waste or in a cement kiln (VI 2004b). This will further contribute to dioxin formation from the chlorine present in automotive vinyl materials and formation of toxic PVC by-products (Singhofen 1997, CCC 2004).

The main uses of PVC in automobiles include underbody coatings and sealants, wire harnesses, dash boards, door panels, arm and head rests, upholstery, heating and cooling ducts, floor mats, spray-on sound deadener, seat belt latches, seat covers, mud flaps, and exterior trim such as body side protection strips, weather strips and window sealing profiles (APC 2004, VI 2004c, CCC 2004). PVC is the second largest volume plastic for automotive use in North America (APC 2004).

Carpets

The disposal of carpets in municipal and construction and demolition waste adds PVC from carpet backing to the solid waste stream. Two progressive companies controlling just ten percent of the market have achieved a modest 22% recycling rate for PVC carpet backing. But mechanical separation used by companies such as Interface Fabrics leaves too much PVC contaminant in with the nylon. PVC burns at the same temperature that nylon begins to soften and destroys the separated nylon fibers (Anderson 2004). Another company that uses recycling (Collins & Aikman) must downcycle the entire carpet to a lower value carpet backing, losing the nylon fibers for reuse and requiring virgin materials for new carpet facing (Anderson 2004).

Truly closed loop recycling for carpets, in which the facing and the backing fibers are recycled back into their original uses, remains elusive (Anderson 2004). And the modest success earned by recycling of PVC carpet backing can't be readily translated to other uses of PVC. The carpet makers enjoy a large volume, steady supply of discards with a relatively standard formula of PVC, unlike the variable PVC mixtures used in so many other far-flung products that are difficult to collect and recycle for a high end use (Anderson 2004).

Old Corrugated Cardboard (OCC)

Another use of PVC is to make packing tape that binds corrugated cardboard boxes. After this cardboard is used, it is broken down and returned to a paper mill for recycling. Any tape or plastic binding used to seal the cardboard is removed and separated from the cardboard, and then burned in the mill's industrial boilers. When this tape or binding is made of PVC and burned, another source of dioxin is created (SCC 1988). The Smurfit-Stone Container cardboard recycling facility in Missoula, MT processes up to 525 tons of old corrugated cardboard (OCC) per day. This mill generates about 15 to 25 tons per day of "OCC rejects" that consist of plastic packing tape, plastic twine and other non-cardboard contaminants, some of which is made of PVC (WVE 2002). Dioxins and furans have been identified in the air emissions of pulp and paper mills (USEPA 2004d).

Scrap Wood

Pressures are increasing to burn more scrap wood for fuel and power in so-called "biomass" boilers that are a proven source of dioxin emissions (MDEP 2004). Yet it is increasingly likely that PVC siding, window frames, roofing foils and other vinyl building materials will become mixed with scrap wood recovered from construction and demolition debris. When chipped and burned, this PVC-contaminated wood scrap is likely to add to the amount of dioxins formed.

VIII DON'T BUY IT

Safer Alternatives to PVC are Available, Effective and Affordable

MAJOR FINDINGS

- PVC is the most environmentally harmful plastic; many other plastic resins can substitute more safely for PVC when natural materials are not available.
- Safer alternatives to PVC are widely available and effective for almost all major uses in building materials, medical products, packaging, office supplies, toys and consumer goods.
- PVC alternatives are affordable and already competitive in the market place.
- In many cases, the alternatives are only marginally more costly than PVC, and in some cases the costs of the alternative materials are comparable to PVC when measured over the useful life of the product.
- Phasing out PVC in favor of safer alternatives is economically achievable.
- A PVC phase-out will likely require the same total employment as PVC production (an estimated 9,000 jobs in VCM/PVC resin production, and 126,000 jobs in PVC fabrication) by making the same types of products from safer plastic resins.

Safer alternatives to the use of PVC plastic are widely available, effective and affordable. These alternatives pose fewer toxic chemical hazards than those associated with the manufacturing, use and disposal of PVC. In many cases, they completely avoid the formation of chlorinated by-products of combustion, e.g., dioxins, because they are chlorine-free; they also prevent the release of other harmful chemicals because they do not contain additives such as phthalates, lead, cadmium or tin, which are commonly found in PVC formulations.

Safer alternatives to PVC come in several forms including natural materials, as well as other synthetic plastics that are cleaner than PVC. For instance, instead of a vinyl shower curtain, a cloth shower curtain, wood clapboard siding or glass door easily does the job. For some people, the perceived aesthetic value of these natural materials further outweighs the comparative appearance of the PVC products. For others, the perceived convenience of lower maintenance tips the balance in favor of synthetic materials.

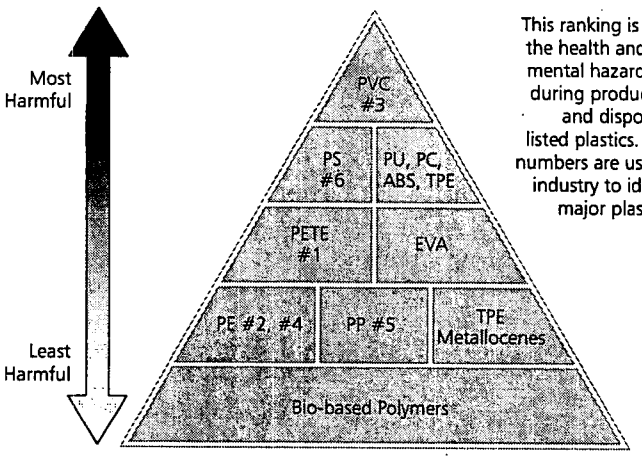
Even so, other cleaner plastics will do the same job as PVC without the high degree of toxic impacts throughout their life cycle. For example, a polyurethane-coated nylon shower curtain will repel water as well as one made of vinyl. The newly marketed polyethylene-based plastic siding avoids the toxic impacts associated with vinyl siding.

Many Other Plastic Resins are Safer Than PVC

Not all plastics or synthetic polymers are created equal. In a study of all major packaging materials conducted for the Council of State Governments in the U.S., PVC was found to be the most damaging of all plastics (Tellus 1992). A life cycle analysis conducted by the Danish EPA found that common plastics, such as polyethylene, polypropylene, polystyrene, PET and ethylene-propylene synthetic rubber, were all clearly preferable to PVC in terms of resource and energy consumption, accident risk and occupational and environmental hazards (Christiansen 1990).

This ranking of the major plastic resins from most harmful to least harmful is reflected in a revision of the Plastics Pyramid, originally developed by Greenpeace, shown in Figure 4 (DEPA 1995, van der Naald 1998, Tickner 1999a). The ranking qualitatively accounts for the toxic chemical hazards associated with the manufacture, use and disposal of plastics. Similar in concept to the federal government's Food Pyramid, the most harmful items at the narrow top of the pyramid should be avoided or used sparingly, while liberal advantage should be taken of the least harmful items listed at the broad base of the pyramid.

Figure 4. A Plastics Pyramid



This ranking is based on the health and environmental hazards created during production, use and disposal of the listed plastics. The code numbers are used by the industry to identify the major plastic resins.

A key to the plastics and some hazards associated with production, use and disposal

Level 1	PVC = Polyvinyl chloride	Chlorine, intermediates, many additives, byproducts
Level 2	PS = Polystyrene	Intermediates, fewer additives, some byproducts
	PU = Polyurethane	Some chlorine used, intermediates, waste byproducts
	ABS = AcrylonitrileButadieneStyrene	Hazardous intermediates, difficult to recycle
	PC = Polycarbonate	Some chlorine used, intermediates, toxic solvents, BPA
	TPE = Thermoplastic Elastomer	A copolymer or alloy of conventional plastic
Level 3	PETE = Polyethylene terephthalate	Some hazardous chemicals, high recycling rate
	EVA = Ethyl vinyl acetate	Chloride catalyst, some byproducts
Level 4	PE = Polyethylene	Fewer additives, some byproducts, high recycling rate
	PP = Polypropylene	Fewer additives, some byproducts
Level 5	Bio-based Polymers	Naturally based, e.g. starch, cellulose; compostable

Sources: DEPA 1993, van der Naald 1998, Tickner 1999a.

PVC clearly ranks as the most harmful plastic due to its high chlorine content, the toxic intermediate compounds used to produce PVC, the many toxic additives routinely added and its toxic by-products of combustion. PVC products, especially bottles and packaging, are sometimes labeled with the code number "3" (or the letter "V") based on a system used by the plastics industry to distinguish among the major plastic resins.

PVC V vinyl

The next level of the pyramid lists plastics that are still harmful but less so than PVC. These include polystyrene (PS), used for plastic cups and utensils and to make Styrofoam, and polycarbonate (PC), used to make compact discs and most reusable water bottles. PC releases a chemical known as bisphenol A (BPA) which is known to interfere with the functioning of the hormone system in lab animals and, as an endocrine disruptor, may pose a hazard to human health (Colborn, 1996). Acrylonitrile Butadiene Styrene (ABS) and polyurethane (PU) are also hazardous, but they are less toxic, persistent, and bioaccumulative than PVC.

The plastics in the middle of the ranking are even less hazardous than PVC and the other plastics higher on the pyramid. These include the polymer most often found in plastic beverage bottles, including bottled drinking water, known as polyethylene terephthalate (PET or PETE) (code # 1). Although hazardous chemicals are involved in the production of PET, it is recycled at a relatively high rate for plastics (19%) (USEPA 2003), especially in the eleven states that have

a returnable deposit on the sale of bottles of beer, wine, soda and other beverages.

Two high volume synthetic plastics are found near the base of the pyramid because they are far cleaner than PVC. These are polyethylene and polypropylene. Although these are both synthetic resins derived from nonrenewable fossil fuels, they are produced without toxic intermediates and far fewer additives or toxic by-products. Polyethylene, which ranks first in production among all resins, comes in two major versions: high density (HDPE or # 2), which is widely used in many applications, and low density (LDPE or # 4), which is commonly used in plastic bags. Both types are highly recyclable. Polypropylene (PP or # 5), often used for containers for products such as yogurt and prescription drugs, can readily be recycled but few recycling markets have been developed.

Even more environmentally preferable are the bio-based polymers, which are derived from natural renewable materials such as cornstarch or cellulose and which can be composted into beneficial organic matter to enrich soils rather than landfilled or incinerated. The Interface Fabrics company, among others, is pilot testing textile fibers made from bio-based polymers. An even higher standard would give preference to bio-based plastics developed from sustainable agricultural practices (e.g., without the use of pesticides and minimal fossil fuel inputs) that do not rely on genetically modified organisms or displace food products from serving the marketplace. Genetically engineered products should not be used in making bio-plastics.

Minimizing the disposal impacts of PVC favors the use of natural organic-based materials whenever practical because they biodegrade and represent a renewable resource. In many cases, however, a durable man-made plastic offers unique advantages to alternatives made of organic matter, minerals or metals.

Fortunately, as Figure 4 shows, many other synthetic plastic resins are widely available for product manufacturers to choose from to avoid the harmful impacts of PVC. And the emergence of bio-based plastics in the commercial marketplace gives an even greater boost to the success of sustainable production and environmentally preferable purchasing.

Safer Alternatives to PVC are Widely Available and Effective

PVC-free alternatives are already widely available for many applications. Several extensive reports have identified available and affordable alternatives to PVC (Ackerman 2003, Thornton 2002, Greenpeace 2001). Table 11 provides a few examples of available PVC-Free alternatives for several common PVC products. The sources reviewed below provide specific guidance on which vendors currently provide alternatives to specific products representing some of the most common uses of PVC. Several of these resources are searchable online databases of PVC-free products. The alternatives described can be currently found in the marketplace and are functionally equivalent, i.e., are as effective as a PVC product for the specified end use.

Building Materials

Effective alternatives are available now for most construction-related uses of PVC. Several databases, such as those offered by the Healthy Building Network (HBN 2004: http://www.healthybuilding.net/pvc/alternatives.html) and Greenpeace (Greenpeace 2004: http://archive.greenpeace.org/toxics/pvcdatabase), list these alternatives. A large number of construction projects, including the Sydney 2000 Olympic Stadium and the new EPA headquarters in Washington, DC have been constructed with little or no PVC (Greenpeace 2001, Greenpeace 2004b).

Medical Products

The Sustainable Hospitals Project is an excellent resource for healthy medical products, including PVC-free alternatives for gloves, bags and tubing. They operate a Website that includes extensive listings of products by category, by "hazard" or by manufacturer (SHP 2000: http://www.sustainablehospitals.org/cgi-bin/DB_Index.cgi).

Office Supplies

The Lowell Center for Sustainable Production has identified alternatives to the use of PVC in office supplies (SHP 2000: http://www.sustainablehospitals.org/cgi-bin/DB_Index.cgi). For example, instead of the common vinyl-coated three-ring binder, you can purchase an equivalent binder made of polypropylene with recycled content.

Packaging

The Grassroots Recycling Network has identified specific brand products that are currently packaged in PVC

Table 11

PVC-Free Alternatives to Common Materials

PVC Product	Available Alternatives	Affordability
Automobile Components	Polyolefins[1]	Competitive for most uses[1,2]
Blinds	Wood[3], Aluminum[3]	Varies
Bottles	High Density Polyethylene (HDPE)[4] polypropylene (PP) Polyethylene Terephthalate (PET)[4]	Slightly more expensive. Costs expected to go down with increased market share.
Flooring (Hard)	Bamboo[5], Ceramic Tile[5] Recycled Glass Tile[5]	Bamboo is comparable to vinyl.[5] Ceramic and recycled glass are more expensive.[5]
Flooring (Resilient)	Cork[6], Stratica[6], Linoleum[6]	Alternatives cost more up front but last nearly twice as long. Savings of 30-50% over 20 years.[6]
Gloves	Nitrile[7]	Cost competitive when purchased in large quantities.[7]
Medical Bags, Tubing, Etc.	Polyurethane[7,8], Silicon[7,8] Polypropylene[7,8], Polyethylene[7,8]	Prices vary but most hospitals are able to negotiate comparable rates through high volume purchasing.[8] Prices will fall as market increases.[8]
Pipes	High Density Polyethylene[5,6,9] Copper[6,9], Cast Iron[5,9] Vitrified Clay[5], Concrete[9]	Decreased labor cost for installation reduces importance of price.[6,9] Pipe selection rarely determined by material cost differences in this industry[6,9]
Roofing (For Flat Roofs)	TPO- Thermoplastic Polyolefin[5] EPDM- Ethylene Propylene Diene Monomer[5]	Comparable to similar vinyl roofing[5]
Siding	Wood[6], Fiber Cement[6], Aluminum[5]	Varies - High quality, longer lasting materials can cost less than PVC if you shop wisely.[6] Aluminum is more expensive but very durable and maintenance free.[5]
Wallpaper	Natural Fiber[6]	More expensive[5]
Windows	Wood[6], Aluminum[6]	Varies widely[6]

Sources and Notes: 1 - Greenpeace 2001; 2 - Singhofen 1997; 3 - Dickey 2002; 4 - GRRN -2004; 5 - CEC 2004; 6 - Ackerman 2003; 7 - Ruzickova 2004; 8- SHP 2000; 9 - Harvie 2002. **Note:** This table is not meant to be exhaustive, as there are endless uses of PVC. Rather, it is provided to offer a few concrete examples of available and affordable alternatives to PVC. In choosing alternative materials for this table, an effort was made to exclude those having significant environmental and/or health concerns of their own. This does not imply an endorsement by CHEJ or EHSC of any materials listed. We do believe, however, that the materials listed offer an improvement over PVC. For any material, there are advantages and disadvantages and we would encourage you to thoroughly research all purchasing decisions.

bottles (GRRN 2004a: To view their list online, go to http://www.grrn.org/pvc). The market share of PVC for containers has steadily declined to about 2% of all bottles sold (Anderson 2004). The mostly widely used PVC-free alternatives for plastic bottles are high density polyethylene (used for milk products and almost all personal and household care products) and PET (used for most beverages and vegetables oils, for example).

Toys and Other Consumer Products

Greenpeace has established a Website that provides information on PVC alternatives for more general con-

sumer items, including toys. This site includes a toy-company report card that rates companies on a scale of 1 to 5, from being completely PVC-free to refusing to change policies or provide information (Greenpeace 2003, Greenpeace 1997: http://archive.greenpeace.org/comms/pvctoys; a more recent 2003 version can be found at http://www.greenpeaceusa.org/features/details?item_id=526899). It is worth visiting each site as they both contain unique information. Greenpeace also has issued a report on worldwide PVC restrictions that includes a list of companies, by country, that have made a decision to phase out the use of PVC in their products (Greenpeace 2001: http://archive.greenpeace.org/toxics/reports/restrictions.pdf).

Automobiles

Many automobile makers are beginning to find and implement alternatives to PVC. General Motors, the world's largest auto manufacturer, was the first to make a public statement of its intention to stop using vinyl. GM planned to end the use of PVC in car interiors by 2004, cutting total PVC use by 30% (CCC 2004: http://www.cleancarcampaign.org/pvc_elvbackground.shtml). Also, other automakers, while remaining less public, have taken similar steps. Daimler Benz has not used PVC for interiors or undercoating in Mercedes autos since 1995 and Honda said they would gradually replace PVC in interiors by 2003 (Greenpeace 2001). Pontiac has found a unique way of applying polyolefin skin for full instrument panel design, instead of PVC. Likewise, Mitsubishi has substituted polyolefins in its instrument panels and door trimmings (Greenpeace 2001). According to the Clean Car Campaign—a national campaign coordinated by state, regional and national environmental organizations promoting a clean revolution in the motor vehicle industry—Volvo, Nissan, Toyota, and BMW are all using alternative materials to PVC in various applications and to varying degrees (Singhofen 1997). And according to the Greenpeace Review of Restrictions and PVC-Free Policies Worldwide, "Ford world-wide has set itself and its suppliers the ambitious target to eliminate applications of PVC by the 2006 model year" (Greenpeace 2001).

Appendix A to this report lists some common products available on the market that may contain PVC, including which products are bottled or packaged in PVC containers. Used with the resources reviewed above, consumers can easily leverage this knowledge to identify and replaced their purchases of PVC with safer alternatives. Also available is a list of specific products packaged with PVC (GRRN 2004a: http://www.grrn.org/pvc).

PVC Alternatives are Affordable

The following section on the affordability of replacing PVC with safer alternatives was derived primarily from the report "The Economics of Phasing Out PVC," written by Frank Ackerman and Rachel Massey of the Global Development and Environmental Institute, Tufts University, December 2003 (Ackerman 2003). This section was adapted from the above report with permission of the authors. The references used by the authors are cited in the original report which can be found in its entirety at www.ase.tufts.edu/gdae/Pubs/rp/Economics_of_PVC.pdf.

The serious health and environmental impacts caused by the production, use and disposal of PVC raise two important economic policy questions.

1) Are there affordable alternatives to replace most uses of PVC?
2) What would be the economic impact on society if PVC were phased out?

The Tufts University Global Development and Environment Institute addressed both of these questions in their recent report *The Economics of Phasing Out PVC* (Ackerman 2003). This report found that alternatives to PVC do exist and that PVC does not offer enormous economic advantages over other materials.

PVC-free alternatives are already competitive in the market place. The Tufts researchers found affordable alternatives available in every commercial and institutional PVC market they evaluated, including pipes, roofing materials, flooring, medical gloves, siding and windows (Ackerman 2003). Because PVC is found in so many products, the alternatives also widely differ depending on the product. The estimated costs of phasing out specific PVC products will likewise differ from one product market to the next. Many manufacturers and suppliers have been identified who currently sell cost-comparable alternatives to PVC used in medical bags and tubing, office supplies and building and construction materials.

The Tufts report concluded that a PVC phase-out is achievable and affordable and that it would not place a large burden on the economy. The study finds that the advantages of PVC are often overstated, that PVC is not substantially cheaper than many alternatives, and that alternatives providing equal or better performance are available for almost every use of PVC. In some cases, the costs of the alternative materials are already comparable to PVC when costs are measured over the

useful life of the product. In other cases, the alternatives are slightly more costly in today's market, though they are likely to come down in cost as their market share expands. There are "good reasons to expect the costs of alternatives to decline over time." The report also found that the continued use of PVC offers small short-term gains in some areas, and none at all in others.

The Costs of Replacing PVC: Three Studies

The Tufts report identified three detailed studies, all published in the mid-1990's, which estimated the costs of phasing out PVC. All three studies found PVC to be only modestly cheaper than the alternatives. The first study, conducted by the U.S.-Canada International Joint Commission (IJC) for the Great Lakes, examined the cost of phasing out PVC as part of its 1993 "Strategy for Virtual Elimination of Persistent Toxic Substances." This report was written for the IJC by a Canadian consulting firm, the Hickling Corporation, and updated in 1994. Charles River Associates (CRA), a U.S. consulting firm under contract to the Chlorine Institute, conducted the second study. This report, which was prepared in response to the IJC report, provided an economic analysis of the benefits of chlorine and related chemicals and included an analysis of PVC. The third study, conducted by Environment Canada in 1997, evaluated the options for replacing chlorine-based products and included a detailed look at the alternatives to PVC (Ackerman 20003a).

Each of these studies evaluated many specific uses of PVC and compared the prices of PVC products to their PVC-free alternatives. Environment Canada created two sets of price comparisons: a low cost case based on the least expensive available alternative and a high cost case based on higher-priced alternatives. Table 12 provides a summary of the estimated costs of replacing PVC made in each of these three studies. The table shows the cost increase that would result from switching to PVC-free alternatives, expressed in dollars per pound of PVC produced (updated to 2002 prices) for each study. Cost estimates are shown separately for pipes and for all other products since pipes represent about half of all PVC use. The pipe and non-pipe figures in Table 12 were averaged to obtain a rough estimate of the total cost of replacing PVC.

According to the Tufts report, this table shows that there was a remarkable degree of agreement between the Hickling and CRA studies. These studies found nearly identical average costs for replacing PVC—$1.07 to $1.15 per pound. The Environment Canada low estimate had an average cost of about half this much, due to its lower estimate for pipe costs. For the non-pipe uses of PVC, there also was fairly good agreement between CRA, Hickling and the Environment Canada low estimate ($0.87 to $1.10 per pound). The data shows that PVC is only modestly cheaper than the alternatives. The Environment Canada study, which included the full cost of installation, found alternative materials would cost just 6% more than vinyl, and building a PVC-free home would increase the cost of a home by just 0.4 percent—increasing the cost of a $150,000 home to $150,600 (CIS 1997, Thornton 2000).

Factors Favoring Phase-Out of PVC

According to the Tufts report, cost estimates such as those made by Environment Canada, based on current market prices, tend to overstate the economic benefits of PVC. Four reasons were given for this conclusion.

1) Life Cycle Costs Often Favor Alternatives.

Some of the alternatives have higher initial purchase prices than PVC products, but are actually less expensive over the useful life of the product. The total cost

Table 12

The Cost of Replacing PVC

US dollars per pound of PVC (2002 prices)

	CRA (industry)	Hickling (for IJC)	Environment Canada Low	Environment Canada High
Pipes	$1.43	$1.03	$0.15	$0.33
All other uses	$0.87	$1.10	$0.94	$3.84
Average	$1.15	$1.07	$0.55	$2.08

Average is the unweighted average of pipes and "all other uses."
Hickling data excludes windows.

Source: Ackerman 2003

over a product's life cycle is the cost that ultimately matters to the user. For example, the maintenance and repair costs for some building materials, such as flooring, can be the largest cost of a product's life cycle. In such cases, the lowest maintenance product is often the cheapest on a life cycle basis, regardless if it has the lowest purchase price. In this example, PVC or vinyl flooring is the cheapest option for commercial and institutional flooring on an initial cost basis, but among the most expensive options on a life cycle basis. When full life cycle costs are taken into account, PVC flooring loses out to alternatives that may have a higher initial price but last longer and are more easily maintained (Ackerman 2003).

The Impact of a PVC Phase-Out on Jobs

The Tufts report examined the impact that phasing out PVC would have on jobs. Using data provided by the Alliance for Responsible Use of Chlorine Chemistry (ARCC), they estimated that there are approximately 126,000 workers in PVC fabrication plants and approximately 170,000 workers at chlorine-producing and chlorine-using chemical plants in the U.S. However, most of the chlorine workers are in non-PVC related chlorine sectors such as paper mills, pesticides, and solvents. The Tufts researchers estimated that only about 9,000 of the 170,000 workers were employed in the production of vinyl chloride monomer (VCM) and PVC resin.

The Tufts report identified 12 operating VCM plants in the U.S. as of 2000, with a capacity to produce 17.4 billion pounds of VCM. According to the report, seven of the facilities that account for more than half the capacity were jointly located with PVC plants owned by the same company. The report also showed that as of mid-2003, ten companies produced 15.8 billion pounds of PVC resin at twenty locations in the U.S. Three other plants were idled by the recession with an additional capacity of 1.2 billion pounds.

The Tufts report suggested that replacing PVC with safer alternatives will change some of these jobs: from fabricating PVC products to fabricating the same products from other materials, most often other plastics; or from making vinyl chloride and PVC resin to making safer substitutes. However, the alternatives are likely to require about the same total employment as production of PVC. In some cases, the same workers who currently make PVC products will be employed making products from PVC alternatives (Sources: Ackerman 2003 and Ackerman 2003c).

2) Mass Production Reduces Costs.

Most products are cheaper when they are produced in large quantities. Costs typically drop as production volume increases. Currently, the advantages to mass production favor PVC, as many PVC products are produced in huge volumes. However, the production of the alternatives could likewise grow in volume in the future, making them less expensive and more competitive than they are at present. There are also learning curves that affect costs over time. As an industry gains experience with a production line, "bugs" are worked out, process improvements develop, and maintenance procedures and schedules are improved. All of these factors help to reduce costs.

3) PVC Products Endanger Their Users.

As previously discussed, the harmful effects of PVC are sometimes felt by the users of the products. For example, plasticizers in flexible PVC products such as children's toys can leach out of the product during use posing health hazards to users (see Chapter 3).

4) Environmental Protection Costs Are Routinely Less than Anticipated.

History has shown that the actual costs of compliance with environmental standards are often lower than the originally predicted costs. One of the best examples of this occurred in the PVC industry in 1974 when the Occupational Safety and Health Administration (OSHA) established a strict standard for workplace exposure to vinyl chloride, the raw material used to produce PVC. When this standard was proposed, the vinyl industry claimed that the costs of compliance would be in the "billions" and that the industry might shut down. Instead, actual costs were only a fraction of the original estimates primarily because the industry developed new

cost effective technologies to comply with the regulation. Other studies have confirmed this pattern of overestimating compliance costs (Ackerman 2003b).

In summary, the Tufts report concluded that a "PVC phase-out is achievable and affordable. The alternatives are increasingly well known and well developed, and in many cases are already cost-competitive with PVC. It is realistic and practical to build health and environmental considerations into materials choices for municipal infrastructure, commercial and residential buildings, medical supplies and consumer products. The cost impacts of substitution will be modest and will grow smaller over time" (Ackerman 2003).

IX TAKE ACTION
Preventing Harm from PVC Use and Disposal

RECOMMENDATIONS

- Policy makers at the local, state and federal level should enact and implement laws that steadily reduce the impacts of PVC disposal and lead to a complete phase-out of PVC use and waste incineration within ten years.
- A new materials policy that embraces aggressive source reduction of PVC should be adopted to steadily reduce the use of PVC over time.
- Federal and state waste management priorities should be changed to make incineration of PVC waste the least preferable disposal option.
- In the interim, any PVC waste generated should be diverted away from incineration to hazardous waste landfills.
- Consumers should take personal action to buy PVC-free alternatives and to remove PVC from their trash for management as household hazardous waste.
- Communities should continue to organize against PVC-related dioxin sources such as waste incinerators while working to promote safer alternatives.

Personal and political actions must be taken to prevent harm to human health and the environment from the use and disposal of PVC. If we don't burn PVC, the formation of dioxins and other toxic by-products of combustion will be prevented. If we can reduce the flow of PVC to landfills, leaching of toxic additives will be avoided. If we promote and purchase safer alternatives to PVC whenever they are available, then toxic pollution will be prevented throughout the PVC life cycle.

Making Choices: A New Materials Policy for PVC

When solid waste experts in the U.S. first established meaningful management goals about fifteen years ago, there was universal support for source reduction as the top priority (USEPA 1989). Table 13 shows the priorities established by the USEPA for the most environmentally sound strategies for managing solid waste. Source reduction is the top choice. It means taking action to avoid or prevent waste from being generated in the first place. In keeping with this philosophy, the first priority in managing PVC waste should be to avoid making it or using it in the first place.

We should adopt a universal policy and practice across the country to avoid the purchase or use of PVC whenever possible in order to prevent waste management problems before they start. We need to dramatically

Table 13

National Priorities for Solid Waste Management

Highest Priority	SOURCE REDUCTION	Includes Reuse
Middle Priority	RECYCLING	Includes Composting
Lowest Priority	DISPOSAL	Includes both Combustion and Land Disposal

Source: USEPA 2004d, USEPA 1989

and steadily reduce the amount of PVC waste produced through a source reduction strategy that targets PVC-containing products.

The second best option, if generating waste can't be avoided in the first place, is to reuse, recycle and compost the wastes. With PVC waste, this is not an option. Most PVC products cannot be reused or recycled, and definitely will not compost. What is the best option for PVC waste after source reduction and recycling? The answer lies in defining what ultimate disposal strategy is preferred once PVC waste has unavoidably been generated.

Federal solid waste policy fails to express a preference between waste disposal in incinerators or in landfills, treating each as equally usable options (See Table 13). Consistent with this lack of judgment, the USEPA has failed for over 12 years to finalize its reassessment of the health risks from exposure to dioxins. In addition, the USEPA has failed to take aggressive action to prevent dioxins and other toxic pollutant releases at their source, such as working to reduce PVC use and disposal.

Some states have chosen incineration as their top waste management option, favoring even dirty mass burn facilities over landfill disposal. For example, as shown in Table 14, under Maine state law, waste incineration is preferred over landfill disposal (MRSA 2004a). The State of Maine, in turn, burns the highest proportion of its waste (after recycling) of any state in the country (see Table 7 in Chapter 5).

By favoring waste incineration, such policies encourage the continuous formation of dioxins and other toxic air emissions, and the generation of toxic ash requiring land disposal. The burning of PVC in municipal solid waste releases dioxins and toxic additives. Land disposal, on the other hand, minimizes dioxin formation by avoiding intentional combustion, although some highly polluting landfill fires are unavoidable. Land disposal additives in PVC will leach and eventually contaminate groundwater. However, this is also true for incineration, since a large amount of dioxin and metal-laden incinerator ash also requires land disposal.

We believe that a new health-based materials policy is needed to reorder current federal and state priorities for waste management. Such a health-based policy should be designed so that the greatest effort is invested in the highest priority options as shown in Table 15. We propose a new set of priorities for PVC waste management that are based first and foremost on targeted source reduction steps that will prevent the creation of PVC waste in the first place. This strategy aims to aggressively and continuously replace the most hazardous uses of PVC with safer alternatives whenever available.

These source reduction steps include immediate action

Table 14

The State of Maine's Waste Management Policy Favors Incineration Over Landfill Disposal

Highest Priority	SOURCE REDUCTION	Includes reducing both the amount and toxicity of the waste
2nd Priority	REUSE	
3rd Priority	RECYCLING	
4th Priority	COMPOSTING	Of biodegradable waste
5th Priority	INCINERATION	And other waste processing which reduces waste volume
Lowest Priority	LAND DISPOSAL	

Source: MRSA 2004a

Table 15

Proposed Priorities for PVC Waste Management

Highest Priorities	Step # 1 - SOURCE REDUCTION	Ban disposable PVC bottles, containers and packaging.
	Step # 2 - SOURCE REDUCTION	End the use of lead and cadmium in all PVC products.
	Step # 3 - SOURCE REDUCTION	Phase out all disposable, non-durable uses of PVC.
	Step # 4 - SOURCE REDUCTION	End the use of PVC products containing phthalates.
	Step # 5 - SOURCE REDUCTION	Phase out PVC uses that are vulnerable to fire hazards, e.g., in building materials and cars.
2nd Highest Priority	EXTENDED PRODUCER RESPONSIBILITY	Require manufacturers to finance the "take-back" and safe management of PVC products at the end of their useful life.
3rd Priority	REUSE AND RECYCLING	Achieve the low potential to recycle bulk PVC waste into the same type products.
4th Priority	LAND DISPOSAL	In the interim, divert any unavoidable PVC waste away from incineration for disposal in hazardous waste landfills.
Last Option	INCINERATION	Ban open burning and incineration of any waste containing PVC

to end the use of PVC bottles and packaging. Other source reduction targets would include short-lived disposable PVC products and those that contain lead, cadmium and phthalates. Fire-vulnerable uses of PVC in buildings and vehicles should be replaced with safer alternatives. To avoid toxic by-products generated during structural fires, vinyl siding, roofing and window frames among other uses, should be replaced with safer alternatives.

This health-based materials policy would favor land disposal over incineration only temporarily and only for legacy waste from the stock of current PVC in use and any other unavoidable PVC waste. This waste would be managed by land disposal in a hazardous waste landfill.

A new materials policy for PVC defines incineration as the least favorable waste disposal option. We need to create effective systems to collect and divert PVC in the waste stream away from incineration. PVC should be actively managed as a serious problem waste akin to handling household hazardous waste (or other non-hazardous problem wastes like propane tanks or latex paint). This would mean educating consumers to identify PVC waste and separate it from the waste stream. As an interim practice, PVC should be diverted away from incineration for collection and transfer to a triple-lined "secure" hazardous waste landfill. With time, after PVC has been replaced with safer materials, the need to divert PVC to landfills would diminish.

Our vision for managing PVC waste is positive. We promote safer alternatives to PVC that are effective, affordable and available now. Alternatives that exist for most uses of PVC are able to do the job well at a cost that is comparable to PVC. Substituting safer materials for PVC is consistent with principles of clean, sustainable production (see Chapter 8).

To realize steady progress on the path to a PVC–Free Future, many personal and political actions by many people will be necessary.

Personal Steps

Taking personal responsibility for preventing harm from PVC is an important place to begin. Here are some key actions you can take as a consumer and contributor to generating household PVC waste.

1. Identify PVC Products.

Look for the "# 3" or the letter "V" inside the plastic recycling symbol (or sometimes beneath the recycling symbol) on the bottom of bottles and on clear plastic packaging such as blister packs. The # 3 and the letter V indicate that the plastic is made from PVC. Also, look for the words "PVC" or "vinyl" on the product (e.g., plastic pipe) or on its packaging. You will need to use other strategies to identify PVC products that are not labeled. Does the unlabeled soft plastic, such as the skin on a 3-ring office binder or a shower curtain, have that "new car smell" of chemicals? If so, it's probably vinyl and you're breathing phthalates, a PVC additive. Check the PVC product listing in Appendix A for likely suspects. You can also call the company and ask them whether they use PVC. If they do, ask them to switch. If they don't, thank them for being environmentally conscientious.

PVC V vinyl

2. Buy and Promote Safer Alternatives.

Search for and purchase non-PVC alternatives (see Chapter 8). Always avoid PVC bottles and plastic wrap (e.g., Saran Wrap). Consult Internet resources on PVC-free alternatives for office supplies, medical supplies, toys and building materials (see Chapter 8). Educate others about PVC hazards. Promote safer alternatives in your homes and business, with your friends and neighbors. If the best alternative is a plastic, look for the cleaner plastics, such as polyethylene (# 4 or # 2) or polypropylene (# 5) (See Figure 4).

3. Start Collecting PVC.

Don't toss PVC in the household trash, especially if your garbage is incinerated (see Table 7 to see if your state relies heavily on burning its waste). Put the PVC aside in an enclosed cardboard box and/or garbage bag away from the sun and possible ignition sources. See how much PVC you can salvage and segregate from the waste stream. Every bit of PVC diverted away from incineration will prevent some dioxin formation.

4. Ask the Manufacturer to Take it Back.

If you can identify who made the product containing PVC, bundle it up in a secure cardboard box and mail it back to the Chief Executive Officer of the product manufacturer (search the Internet for the address of the corporate headquarters and the CEO's name). Enclose a polite note asking that they take personal and corporate responsibility for safely managing this problem material at the end of its life. Tell them you won't buy any more of their products until they make the switch to PVC-free manufacturing. Warn them not to burn it. Ask them to dispose of it at a hazardous waste landfill or to securely store the PVC unless they can recycle it for high value uses. Ask for a written response.

5. Dispose of Your Collected PVC as You Would Household Hazardous Waste.

If you have too much PVC waste to mail back, ask that your community household hazardous waste collection program accept PVC plastic for secure hazardous waste land disposal, not for incineration. Explain the reasons why PVC is a serious problem waste. Encourage others to separate and divert PVC away from incineration.

Community Action: People, Voices and Communities

Being a PVC-free consumer is not enough. The real power needed to adopt a new health-based materials policy for PVC lies in the number of people involved. When friends and neighbors work together to organize their community to take action, major changes can occur. Grassroots action by community groups around the country has already stemmed the damage from PVC use and disposal. Medical waste incinerators are rapidly being replaced due to community-based campaigns that promote non-incineration alternatives (see case studies in Chapter 5). Few new municipal waste incinerators have been sited in the last ten years due to environmental health concerns and community opposition.

CASE STUDY

Intimate Brands Responds to 6,000 Consumers and Stops Using PVC

Greenpeace and the Center for Health, Environment and Justice (CHEJ) teamed up in 2001 to launch a consumer campaign against a major beauty supply company who distributed products packaged in PVC containers. The Victoria's Dirty Little Secret campaign successfully targeted Intimate Brands, the parent company of Victoria's Secret and Bath & Body Works, who agreed to phase-out PVC containers from their product line by the end of 2003 after receiving 6,000 faxes, phone calls, and postcards in one month.

Organizers launched the campaign at an Eco-Conference held annually on college campuses, distributed flyers and postcards, and posted an action alert allowing Website visitors to fax a letter or send a postcard directly to Intimate Brands. The company initially responded by sending defensive letters to the individuals that wrote to them. However, as more letters continued to come in, they took the demand more seriously. In February 2002, they met with representatives from CHEJ and Greenpeace and presented a plan to phase out the use of PVC bottles in both their Victoria's Secret and Bath & Body Work's line. PVC bottle production would stop by 2003 and by 2005 all PVC bottles would be out of circulation. The effectiveness of this campaign is a testimony to the positive changes that can be made when people come together and pressure companies to put safety first (Source: Lester 2003).

Community action has also repeatedly changed national waste policy from the grassroots up. Join with your friends and neighbors to make a difference. Join a local group or start a new one to take action against dioxin sources such as incinerators, backyard burning, landfills, biomass plants or building fires where PVC use and disposal release toxic chemicals into the environment. For referrals and how-to tips, contact the Center for Health, Environment and Justice (www.chej.org).

Organizing To Win Around Issues on PVC

Every day, people facing threats to their health and environment speak out about PVC problems. They look for proof that a landfill leaks, or seek to undertake a health study to link emissions from an incinerator to cancer, or find evidence that a polluting company has a bad environmental record. However, simply speaking the truth about landfills, incinerators, toxic products or previous violations won't stop the poisoning of our bodies and the environment.

The truth is only a start. In order for things to change, the truth has to be understood by a large group of people who then use this knowledge to fuel their efforts to win justice. The truth won't stop the poisoning, but mobilizing and organizing will.

According to Webster's dictionary, organizing is "uniting in a body or becoming systematically arranged." Organizing to protect our communities from environmental harm means pulling together a large enough, diverse enough, active enough group of people to convince corporations and the government that they have to stop making people sick with toxic chemicals.

Organizing is how we restore the balance between the rights of people to safe products and healthy communities, and the rights of corporations to profit. We will never have as much money as the corporate polluters. We will never be able to afford their Madison Avenue media campaigns or their twenty-four hour access to elected officials. But we can build our own power to overcome their influence. We can do this by organizing to demonstrate the strength of our numbers and the righteousness of our demands.

Successful organizing happens when a group of people find visible ways to use the truth to wake up the conscience of a larger group. In an era when politics is defined by scandals and sound bytes, organizing can remind the American people that political life is supposed to be about self-government, justice and the common good.

After years of doing it, we've come to the conclusion that organizing is more of an art than a science. At the same time, there are some basic rules for organizing that usually hold true. These rules aren't always applicable, but they are right often enough that you should consider them if you start to get organized around an environmental issue in your community.

Basic Organizing Rules

Power determines the outcome.

If two or more groups care about an issue, and one of them has a lot more power, that group will get what it wants, no matter what the facts are or who will be hurt.

Our power comes from people, while corporations and government's power comes from money.

Communities need to use strategies that depend on people's creativity, courage and caring. The corporations and government will use strategies that depend on things that can be paid for, like experts and lawyers.

Polluters and government agencies write the rules so they can win using experts and lawyers, which are their strength.

You can assume going in that if you play exactly according to the rules of their game, you will lose most of the time, whether you are at the slot machines in Atlantic City or the hearing process of your state environmental agency. Create your own rules instead.

To win, communities will have to work harder than polluters and government agencies do.

Polluters and agencies are doing what they do because they are paid to. They've done it before, and they know most of the facts before the fight even starts. You are opposing them because you believe your health and your community are at risk. This gives you an unmatched motivation for working harder than they do.

These rules may seem harsh and they are. And sometimes things turn out to be easier than these rules would lead you to expect. But when your community is at stake, it's important to start out vigilant, alert and ready to face the challenges ahead.

Experience has taught us that organizing isn't easy. Recognizing this should help you to be forgiving of each other and ourselves. We are trying to build a democratic society without adequate blueprints and models, so our trial-and-error method has to leave room for experimentation and mistakes. And recognizing how necessary organizing is should help you to be inclusive and persistent. There are no magic facts. There are no perfect heroes to give perfect speeches that will convince the polluters to stop polluting. There is only the dogged determination of people working together to protect their own health, their families' health and the health of their communities. This is why we organize. (See below for "Ten Simple Steps To Organizing.")

Mobilizing vs. Organizing

What is the difference between mobilizing and organizing? Take the 2004 protests in New York City around the Republican Convention. There was a large mobilization—demonstrations that brought out over 800,000 people—and various targeted actions. The main goal was to influence the results on Election Day and get people to understand the issues.

Mobilization is a thing that good organizers do. Mobilization is getting people together, moving people out. It's bringing people in to do an action. It's using everything including phone calls, personal visits and handing out fliers to bring a certain level of consciousness to the community. When trying to change policy and public opinion and purchasing choices, you need to use both organizing and mobilizing.

As a result of a mobilizing initiative, you will likely find people who will join your organization and build your organization's base. However, most people who are mobilized are not likely to join but their voice/presence in an activity increases your power for that moment. You are not likely to know how folks got to the mobilizing activity. Maybe they saw it listed on the internet at MoveOn.org or received an e-mail flyer, or a friend agreed to have dinner with them afterwards if they met at an event.

In organizing, leaders understand how people got there. For an organizer it would be important to have 100 people at a demonstration and to know exactly how those people got there. You know which leaders talked to people and can talk to them again, not just for this one event, but maybe for another campaign. Think about how to use mobilization opportunities to move your issues and to identify new members for your organization.

Ten Simple Steps To Organizing

1. Talk and Listen

If you are one, two or three individuals without an organization, you'll need to talk with other people in your community to build a group. If you are already part of an organization, then your next step is to talk to the people in your organization about initiating a campaign around a PVC issue in your community. Brainstorm a list of groups and individuals whose interests are most directly affected by PVC, then determine who you need to talk with first. Who are the people that are most directly affected? Who are the leaders in that neighborhood? What other organizations are involved in protecting the community's health? You can work out the answers to these questions in a brainstorming exercise at an early meeting of your group. Brainstorm a list of the groups of people whose self-interests are most directly affected, then figure out who has contacts with these groups or individuals.

2. Create and Distribute Fact Sheets

Create an attractive, easy-to-read and accurate fact sheet to educate the community about the problems and how these problems relate directly to their lives. A simple one-page fact sheet will serve the purpose.

3. Recruit Hundreds, One At A Time

Recruiting will help you build the relationships, resources and critical mass to act effectively for change. Reach out to a wide range of local groups to build the broadest possible coalition. It will be much more difficult for decision-makers to ignore your concerns if your campaign represents a wide cross-section of your community. All recruiting is a form of door knocking. If you are trying to organize a neighborhood, the doors line the streets. If you are trying to build a different kind of group or coalition, the doors may spread all over town and you may need appointments to open them. There are several ways to make knocking on doors easier. First come up with a 'rap'— "I am..." "We are..." "This is..." "We want..." "You can..." Also, consider circulating a petition. Not only will the petition help you get the names and addresses of community supporters and show community support to those in power, it also begins the process of getting the people you're talking with involved in the issue. Make sure to listen closely to the concerns of the people you are talking with and link the PVC problem to their interests and concerns.

4. Hold Meetings That Make People Want to Come Back and Bring Their Friends

People will come to a meeting if:

- They have made a commitment to come
- They have a role or responsibility in the meeting
- They have an immediate and specific self-interest in the work of the organization
- They have past, positive experiences with similar meetings

To have a successful meeting, your recruitment efforts must satisfy the first and third of these conditions. The second and fourth conditions will depend on how you run the meeting. There are several different kinds of meetings to suit different purposes.

House Meetings - This is the kind of meeting many groups hold when they are first forming. The meeting is held at a member's house and the style is informal. One of the biggest benefits of this kind of meeting is the greater comfort level among members.

Planning Meetings - Leaders or other key decision makers within the group get together to set their agenda, review the work that's been done and plan activities. Planning meetings should not be decision-making meetings, but rather they should establish the agenda and process by which decisions will be made at a general membership meeting or define a plan to carry out an activity that has already been decided upon by the membership.

General Membership Meetings - These meetings are important to ensure that all members of the organization share the responsibility for decision making and carrying out the activities of the organization. The time and location should always be chosen to accommodate the maximum number of people. The meeting should always start with an agenda and when possible, get the agenda out to people prior to the meeting in the form of a flier (this will also serve as a reminder for the meeting). Make sure you pass around a sign up sheet to collect names and addresses to contact people who attended in the future.

People will come to the next meeting if they enjoyed the first one, if it started and ended on time and wasn't a bore, if it produced concrete results, if it was lively and exciting, and if it delivered what was promised.

5. Set Goals

It is critically important to have long-term, intermediate and short-term goals to help members understand where they are going and the steps they have mastered along the way. Ask yourselves: What do we want? What is your bottom line? Do you want to pass a local or state law that bans PVC products where alternatives are available? This could be your long-term goal.

Next identify different strategies and tactics that will lead you to your goal such as getting your city or county council to pass a resolution to phase out all PVC products where alternatives are readily available. This could be your intermediate or short-term goal.

6. Identify Your Targets

Once you've identified what it is that you want, the next step is to identify who can give it to you. Pinpoint the actions and the people that have the power to help you reach your goal. The people who impede the achievement of your goal are often referred to as the targets of the campaign. This does not mean that they are evil or bad. It simply means that because they have the power to give you what you want, it makes sense to focus your attention and actions on them. The target of your campaign must always be a person or persons. You can't fight City Hall because City Hall is a building, but you can target the person with the power at City Hall to get them to act.

To help your group identify your targets, answer these three questions.

- Who is responsible for the situation you want to change?
- Who can make the changes you want to happen?
- How can you convince them to act on your issue?

7. Research Is An Essential Tool

Research is a tool, not an end product. You need to do research to gather enough information to achieve your goals, not to know absolutely everything there is to know. Research should tell you who has the power to give you what you want and should help you figure out what arguments your targets will probably use against you. Once you know this, you can create counter arguments. This report will give you some of the information you need, but you need to undertake the local research related to the problem that you want to address.

8. Take Direct Action

An action is any step you take to advance your group's goals. Petitions, letter-writing campaigns and educational meetings are all actions that advance your group's goals. A direct action is the most dramatic type of action, involving confrontation and demands. Direct action begins after your efforts at education, information sharing and persuasion are ignored. Use direct action when your group is ready to confront a decision-maker with its frustrations and to make specific demands. Direct actions move your organization outside the established rules for meetings and discussion. It takes your group into a forum in which you make the rules and where elected representatives and corporate executives are less sure of themselves and how to handle the situation. A direct action often provides the necessary pressure to force your target to act on your group's issue.

9. Target The Media

Who are the media decision-makers who need to be convinced that your story should be covered? What will it take to convince them? In most media outlets, the decision-makers are the editors, and the way you get to them is to spoon-feed them a story they can use without much work. It is important to develop a media strategy for your campaign that you can constantly refine and develop. But don't be fooled into believing that the media is the only way to get your story out. Keep creating your own media through fact sheets, cable access television programs, newsletters, call-ins to radio talk shows, letters to the editor, statements at public hearings, barbecues, rallies, auctions, concerts and videotapes.

10. Celebrate The Victories And Keep Applying Pressure

Savor the victories no matter how large or small. A meeting with the City Council is a small victory and a resolution to stop purchasing PVC is a larger victory. Celebrate all victories because it helps members to see that you are moving forward and are winning. No one wants to join a loser organization.

Policy Action

While personal steps are critically important, community action is a must. But neither are enough. The personal should also be political. Unless the system that unduly relies on hazardous materials like PVC is changed, then green consumerism and green behavior will remain a minor movement of the privileged few. Unless many community-based organizations join forces, large-scale systemic change will be slow in coming.

strictly prohibited everywhere as the country's major uncontrolled source of dioxin pollution. However, a statutory ban will not be effective without educating people about the hazards of PVC and simultaneously working aggressively to reduce the toxicity of the waste stream. People burn their waste to avoid real costs and inconvenience, and out of cultural habit and practice. People need to know the truth about PVC and waste burning in order to overcome their resistance to change.

2. Educate the Public About PVC Hazards. Conduct a well-funded public education campaign that targets PVC as a serious problem waste that especially threatens public health when burned, but also creates health and environmental risks when disposed of in a landfill. Use a hard-hitting approach that holds the chemical industry responsible for the impacts of open burning and for selling a material that releases toxic additives and by-products. Model the campaign along the same lines as the anti-tobacco industry ads that work to reduce teenage and adult smoking. The educational campaign should sell PVC-free solutions as it persuades people to halt the backyard burning of trash.

Table 16

A PVC-Free Policy Action Agenda

Accomplish Within Three Years

1. Ban all open waste burning.
2. Educate the public about PVC hazards.
3. Ban the incineration of PVC waste.
4. Collect PVC products separately from other waste.
5. In the interim, divert PVC away from incineration to hazardous waste landfills.

Accomplish Within Five Years

6. Establish our Right-to-Know about PVC.
7. Label all PVC products with warnings.
8. Give preference to PVC-free purchasing.
9. Ban use of PVC in bottles and disposable packaging.
10. Ban sale of PVC with lead or cadmium.

Accomplish Within Seven Years

11. Phase out other disposable PVC uses.
12. Phase out other high hazard PVC uses.
13. If safer alternatives are not yet available, extend the PVC phase-out deadlines for specific uses.
14. Fund Efforts to reduce the amount of PVC generated through fees on the PVC content of products.

Accomplish Within Ten Years

15. Phase out remaining durable PVC uses.
16. Decommission municipal waste incinerators in favor of zero waste plans.

Here are a number of action steps that government at the state, local and national levels must take to phase-out PVC in a timely and orderly manner. Actions that may be successful early on and that establish a foundation for future PVC reductions are listed first in order on the timeline below. These policy actions also give guidance to other decision makers in industry, commerce and institutions about policies that they should embrace to help prevent harm from PVC use. This PVC-free action agenda is summarized in Table 16.

Accomplish Within Three Years

1. Ban All Open Waste Burning. Backyard burning of household trash and other open burning should be

3. Ban the Incineration of PVC Waste. All forms of incineration of PVC waste should be phased out by a certain date. Designate PVC waste as hazardous waste. Develop educational programs and incentives to remove PVC from waste streams destined for incineration. Replace all medical waste incinerators with non-burn technologies for waste that needs to be disinfected and send the disinfected residue to a "secure" landfill. Develop a workable timeline to ban the incineration of PVC in municipal solid waste.

4. Collect PVC Products Separately from Other Wastes. Award grants and publicize new programs to support PVC waste separation and collection. Identify

CASE STUDY

PVC Identified as Household Hazardous Waste

In its Plan for the Statewide Collection of Household Hazardous Waste, the State of Maine identified PVC as a problem waste that should be separately collected and, if not recycled, then diverted away from incineration to landfill disposal. Although household hazardous waste remains exempt from regulation, collection programs are being expanded in Maine and elsewhere to encourage residents to turn in old hazardous products for safe management rather than tossing them in the trash. In addition to spent paint thinner, old pesticides, mercury products and other toxic household waste, the Plan targets PVC, latex paint and old propane tanks as problem wastes requiring special collection and management. Efforts are underway to establish a reliable means of funding the operational costs of household hazardous waste collection so that this plan can be fully implemented in Maine (Source: MDEP 2001b).

CASE STUDY

San Francisco Bay Area Adopts Dioxin-Free Purchasing Policies

The San Francisco Bay Area is leading the nation in preventing dioxin pollution by passing Dioxin Resolutions in Oakland and San Francisco and establishing dioxin-free purchasing requirements for local governments. The resolutions grew out of a grassroots campaign to shut down the last commercial medical waste incinerator in Oakland, one of the largest sources of dioxin in the Bay Area. A diverse coalition of environmental, environmental justice, health-impacted groups, labor representatives, and local government officials worked together to shut down the incinerator in 2001. In the process, they convinced local governments to pass dioxin resolutions and establish a Bay Area Government Task Force to implement resolutions that will:

- Promote dioxin pollution prevention practices;
- Use less toxic, non-chlorinated products and processes, such as chlorine-free paper and PVC-free plastics;
- Urge health care institutions to phase out PVC products;
- Work with other local governments to convene a Regional Task Force to identify sources of regional dioxin pollution and develop prevention strategies; and
- Pursue dioxin reduction practices that do not cause workers to become unemployed (Sources: Greenaction 2001a, CO 1999, CSF 1999).

PVC as a hazardous waste and add PVC waste products to existing programs that collect household hazardous waste, mercury products and other problem wastes for safer management.

5. In the Interim, Divert PVC Away from Incineration to Hazardous Waste Landfills. Clarify waste management priorities for PVC to establish preference for land disposal over incineration due to the formation of dioxin and other toxic by-products. Make the institutional arrangements needed to ensure that PVC waste is disposed of in "secure" triple-lined hazardous waste landfills and diverted away from incineration. Identify opportunities for operators of waste incinerators to remove more PVC waste from the floor of the incinerator prior to waste combustion.

Accomplish Within Five Years

6. Establish Our Right-To-Know About PVC. Require product manufacturers that sell products containing PVC to notify the state of the amount of PVC and the specific chemical name of additives used in individual products, identified by brand name, model and type of PVC use. This information should be made available on-line in a searchable database on PVC products that allows consumers and business people to identify PVC and its ingredients in consumer products and materials. This provides people with the knowledge they need to ask questions and make decisions about safer PVC-free alternatives.

7. Label All PVC Products with Warnings. A meaningful education and PVC diversion program will run head long into the current limits on identifying PVC in the

waste stream. By requiring all PVC products to be labeled, PVC can be more readily separated from other waste and diverted away from incineration. Warnings should encourage consumers to avoid burning PVC products. Labeling will also encourage product manufacturers to switch to safer non-PVC materials to avoid labeling requirements.

8. Give Preference to PVC-free Purchasing. A government procurement policy that establishes as a priority the purchasing of safer alternatives to PVC will harness institutional buying power. Changing the buying habits of various levels of government will help drive the market for PVC alternatives and begin to affect the practices of other institutions in the supply chain that supports government operations.

U.S. Companies Stop Using PVC in Products

Dozens of U.S. companies have stopped using PVC in their products. Some examples are as follows.

- General Motors announced it would phase out the use of PVC for auto interior panels by 2004, informing its suppliers to use alternatives for all new products (CCC 2004).
- Nine toy manufacturers, including International Playthings, Gerber and Brio are phasing out all the PVC in their products (Greenpeace 2003).
- Mattel, Inc., the world's largest toy manufacturer, is planning to phase in plant-based plastics to replace PVC in company products (Greenpeace 2001).
- NIKE, the shoe and sports equipment manufacturer, is phasing out PVC in its products (Greenpeace 2001).
- Helene Curtis eliminated PVC bottles for packaging Suave, and Intimate Brands, a major beauty supply company, is phasing out PVC containers by 2005 (Lester 2003).

9. Ban the Use of PVC in Bottles and Disposable Packaging. These two uses of PVC are the easiest and most compelling to ban outright in the near term. Both represent short-lived uses that become PVC waste soon after purchase. The PVC in bottles contaminates the recycling of the more plentiful and safer PET bottles (# 1 plastic) (see Chapter 7). The market in PVC bottles has already been declining steadily. The growing use of PVC for packaging, such as in clear plastic blister packs, adds disproportionately to the problem of PVC in municipal solid waste. Safer alternatives for both uses are readily available and already in the market place.

10. Ban the Sale of Any PVC Containing Lead and Cadmium. The continued use of these two highly toxic PVC additives presents a serious hazard that has long been recognized by progressive governments. Even the PVC industry has moved to replace some uses of lead and cadmium as stabilizers in their products. For example, the European vinyl industry has set a voluntary goal to phase out the sale of lead stabilizers by 2015 with a 15% reduction by 2005 and 50% by 2010 (ENDS 2004). However, by 2003 only a 5.3 % reduction in lead had been achieved (ENDS 2004). We think the global PVC industry needs to move away from lead much faster. By banning the sale of any new PVC product containing lead or cadmium, policy makers will be acting on strong public health science. Such a ban will further clean up PVC and raise questions about the other additives used in PVC and the hazards of the material itself.

Accomplish Within Seven Years

Priorities for Replacing Specific PVC Uses

1. PVC bottles and disposable packaging
2. PVC containing lead or cadmium
3. Other non-durable disposable PVC uses
4. Other higher hazard PVC uses
5. Other PVC used in durable goods

11. Phase Out Other Disposable Uses of PVC. Non-durable products made with PVC become waste in short order, steadily adding PVC to the municipal waste stream. Separating PVC from the waste stream after it is generated will never be 100% effective. Nor can these collected non-durable PVC products be readily recycled. Therefore, the next phase in directing reductions in PVC usage should focus on replacing the remaining non-durable disposable uses of PVC with safer alternatives whenever they are available, effective and affordable.

12. Phase Out Other High Hazard Uses of PVC. A further priority should target replacement of PVC uses that expose sensitive groups of people to toxic additives and other uses that are vulnerable to dioxin-forming fires. The continued use of vinyl in medical products

Health Care Institutions Move to Phase Out PVC

- Health Care Purchasing: Four top group purchasing organizations that buy supplies for more than 70% of U.S. health care facilities, such as Premier, Inc., established initiatives to reduce the purchasing of medical products containing PVC, mercury and the chemical plasticizer diethylhexyl phthalate (DEHP) (HCWH 2002a).
- Baxter International, Inc., one of the world's largest medical supply manufacturers, is phasing out PVC in its intravenous (IV) solutions containers (Baxter 1999).
- Abbott Laboratories has committed to move toward PVC- and DEHP-free alternatives (Abbott 2003).
- The thirty-seven members of the Maine Hospital Association agreed to continuously reduce the use and disposal of PVC plastic in hospitals as part of a statewide pollution prevention agreement (MHA 2001).

CASE STUDY

Model Policy Action Taken to Phase Out PBTs and PVC

In 2000, the Washington State Department of Ecology (Ecology) developed a groundbreaking strategy to phase out some of the deadliest toxic chemicals in Washington—persistent, bioaccumulative and toxic chemicals (PBTs). Ecology's program has a goal of reducing PBTs such as mercury, dioxin, PBDEs (toxic flame retardants) and PCBs by the year 2020.

Under Washington's PBT strategy, chemical action plans are developed for high priority chemicals. In 2003, Ecology developed a plan to reduce and phase out mercury and the legislature passed a bill to ban certain mercury consumer products. Right now, Ecology is working on a chemical action plan to reduce and eliminate toxic flame retardants (PBDEs), chemical cousins of PCBs that are rapidly rising in the environment, breast milk, orcas and other wildlife.

The Toxic Free Legacy Coalition, led by Washington Toxics Coalition, Washington Physicians for Social Responsibility, Healthy Building Network, WashPIRG, Breast Cancer Fund and People for Puget Sound, is working to ensure the meaningful implementation of legislation and Ecology's PBT strategy.

On a local level, the Toxic Free Legacy Coalition was successful in getting the City of Seattle to adopt a first in the nation purchasing policy to reduce and eliminate the purchasing of products that contain or generate PBTs, including PVC. The hazards of PVC continue to be central to the debate surrounding successful implementation of the Resolution (Source: WTC 2004).

represents a prime example of unnecessary exposure to the additives in PVC products. DEHP, a type of phthalate additive, leaches out of vinyl medical bags and tubing. An infant boy in neonatal intensive care may be exposed to enough phthalates from PVC to pose harm to his developing reproductive organs (Rossi 2001). Examples of PVC uses particularly vulnerable to dioxin-forming fires include automotive applications and building materials such as vinyl siding. High fire hazard uses of PVC should be replaced with safer alternatives.

13. If Safer Alternatives are Not Yet Available, Extend the Phase-Out Deadlines for Specific PVC Uses. A reasonable PVC phase-out policy would make allowance for those few cases where acceptable alternatives are not readily available. In such a case, a temporary exemption could be granted for a scheduled PVC phase-out deadline upon a satisfactory demonstration by a product manufacturer. Further criteria for granting interim relief should consider whether the specific use of PVC is essential to public health and safety or if the available alternative does not work effectively or is much more expensive.

14. Fund Efforts to Reduce the Amount of PVC Waste Generated Through Fees on the PVC Content of Products. Funding will be needed for public education, developing diversion and labeling programs, and to administer an orderly phase-out of PVC products. PVC products should be assessed fees to pay for these PVC reduction programs. That's the fairest approach. Fees should be collected at the product distribution level to avoid the administrative burden of retail fee collection.

Accomplish Within Ten Years

15. Phase Out Remaining Uses of Durable PVC Products. The remaining uses of PVC should be relatively lower hazard uses in longer-lived products that have less chance of accidental combustion or public exposure to toxic additives. These uses should be replaced with safer alternatives as the final priority for the orderly phase-out of PVC. By ending all uses of PVC, the toxic impacts across the life cycle from production to disposal will be prevented.

16. Decommission Municipal Waste Incinerators in Favor of 'Zero Waste' Plans. Within ten years, we should replace the inherently dirty and obsolete strategy of needlessly burning valuable resources disguised as discarded materials and products. Zero waste strategies involving much more aggressive source reduction (including product redesign), reuse, recycling and composting can reduce waste volumes even more than incineration, and without generating toxic by-products. As the contracts expire on the current inventory of more than 100 municipal solid waste incinerators, these plants should be safely decommissioned. Waste incineration should be relegated to the dustbin of history.

Conclusion

Within ten years, we can bring a virtual halt to the toxic life cycle of PVC. Through persistent organized action at all levels, discarding harm from PVC disposal will become a practice of the past. Safer alternatives will serve the same purposes filled by PVC now through the use of clean materials and the sustainable production of clean products. The health and environmental problems created by PVC can be solved through two profoundly simple actions—don't buy it, don't burn it!

APPENDIX A
Common Household Products and Packaging That May Contain PVC

Thousands of consumer products and packaging are made from PVC. The following is a general list of some common products that are typically made of PVC This list is meant to be a starting point for identifying what common products are packaged in or made from PVC. In creating this list, we recognize that companies are always changing their products, including the materials they use to package them. In some cases, you may find that a product listed is no longer made from PVC. If this happens, you may want to contact the company and congratulate them for being environmentally conscientious.

While this list may help get you started, not all containers and products are labeled. If you suspect that a product or its packaging is made of PVC, we suggest you contact the product manufacturer and ask them directly about the materials used in the product or its packaging. One way to be sure if the packaging of a product is made from PVC is to look for the number "3" or for the letter "V" inside the universal recycling symbol. This means that the product is made of PVC. Soft flexible plastic products that are made with PVC often have a distinct odor. What you smell is the plasticizer that was added to the PVC material to make it soft and flexible.

PVC V vinyl

In addition, a list of specific products identified by brand name that are packaged in PVC bottles, was generated by the Grassroots Recycling Network (GRRN 2004a). This list can be accessed on the GRRN web site at http://www.grrn.org/pvc.

Apparel:

Boots
Aprons
T-shirts with PVC prints (shiny)
Raincoats
Rain pants
Skirts
Lingerie
Shoes
Bags
Luggage
Bibs
Backpacks (PVC coating for waterproofing)
Watchbands
Diaper covers

Personal Care Items (packaging):

Shampoo
Hair gel
Lotion
Suntan lotion
Baby oil
Mouthwash
Face Wash
Aloe Vera Gel
Massage oil
Liquid soap

Household Items:
Cleaning product containers
Waterbeds
Shelving
Checkbook covers
Photo album sheets
Self-adhesive labels and stickers
Shower curtains
Imitation leather furniture
Mattress covers
Textiles
Toys
Clothes racks (covers metal to prevent rusting)
Pet care product containers
Strollers

Kitchen Items:
Drinking straws
Tablecloths
Beverage containers
Plastic utensils
Dishwasher, refrigerator and freezer racks
Dish drying racks (covers metal to prevent rusting)
Appliance casings
Food wrap
Food containers

Outdoor Items:
Pond liners
Tarps
Greenhouses
Children's swimming pools
Inflatable furniture
Outdoor furniture
Garden hoses
Balls

Automotive:
Upholstery
Dashboards
Door panels
Underbody coating
Car seats for children
Traffic cones
Wire coating
Auto-related product containers

Building Materials:
Pipes
Siding
Tiles
Wall coverings
Window frames
Door frames
Door gaskets
Gutters
Fencing
Plastic lumber
Shutters
Flooring
Wire/cable insulation
Molding
Cavity closure insulation

Medical Supplies:
Colostomy bags
Catheters
Blood bags
Bed liners
Tubing
Gloves
Mattress covers

Office Supplies:
Computer keyboards
Computer monitor housing
Cellular phones
Floppy disks
Binders
Clipboards
Paper clips
Tape
Mouse pads

Miscellaneous:
Credit cards
Slide holders
Landfill liners and leachate pipes

References to Appendix A

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APPENDIX B
Amount of PVC Generated, Incinerated and Landfilled in Each State

State	Total MSW Generated (tons)	Total Amount of PVC Disposed (tons)[1]	Amount of PVC Incinerated (tons)[2]	Amount of PVC Landfilled (tons)[2]
Alabama	*	*	*	*
Alaska	*	*	*	*
Arizona	6,012,359	37,277	0	37,277
Arkansas	3,838,217	23,797	545	23,252
California	54,429,851	337,465	9,205	328,260
Colorado	5,051,132	31,317	0	31,317
Connecticut	4,734,132	29,352	16,257	13,095
Delaware	1,069,042	6,628	0	6,628
Florida	19,706,584	122,181	45,364	76,817
Georgia	11,214,006	69,527	350	69,177
Hawaii	1,706,018	10,577	3,454	7,123
Idaho	1,090,000	6,758	0	6,758
Illinois	15,951,037	98,896	0	98,896
Indiana	9,542,378	59,163	6,177	52,986
Iowa	3,416,268	21,181	366	20,815
Kansas	4,698,338	29,130	0	29,130
Kentucky	5,465,608	33,887	16	33,871
Louisiana	4,952,900	30,708	0	30,708
Maine	1,327,164	8,228	5,448	2,780
Maryland	8,904,464	55,208	12,486	42,722
Massachusetts	8,307,387	51,506	28,145	23,361
Michigan	16,916,076	104,880	8,639	96,241
Minnesota	5,043,752	31,271	14,432	16,839
Mississippi	2,918,407	18,094	0	18,094
Missouri	7,256,744	44,992	207	44,785
Montana	*	*	*	*
Nebraska	2,395,100	14,849	0	14,849

State	Total MSW Generated (tons)	Total Amount of PVC Disposed (tons)[1]	Amount of PVC Incinerated (tons)[2]	Amount of PVC Landfilled (tons)[2]
Nevada	3,365,570	20,867	0	20,867
New Hampshire	1,214,777	7,532	1,675	5,857
New Jersey	10,606,326	65,759	9,593	56,166
New Mexico	2,095,052	12,989	0	12,989
New York	24,775,000	153,605	37,517	116,088
North Carolina	8,981,349	55,684	842	54,842
North Dakota	638,804	3,961	0	3,961
Ohio	16,211,198	100,509	0	100,509
Oklahoma	4,489,028	27,823	0	27,832
Oregon	4,074,945	25,265	2,434	22,831
Pennsylvania	12,675,854	78,590	17,746	60,844
Rhode Island	1,248,745	7,742	0	7,742
South Carolina	5,973,059	37,033	2,004	35,029
South Dakota	518,493	3,215	0	3,215
Tennessee	7,365,920	45,669	1,266	44,403
Texas	28,531,660	176,896	0	176,896
Utah	2,471,404	15,323	782	14,541
Vermont	611,617	3,792	498	3,294
Virginia	10,877,723	67,442	18,806	48,636
Washington	8,666,755	53,734	4,606	49,128
West Virginia	1,754,523	10,878	0	10,878
Wisconsin	5,592,862	34,676	1,545	33,131
Wyoming	693,783	3,301	0	3,301
Totals	**369,381,411**	**2,289,166**	**250,405**	**2,038,761**

Sources and Notes: Estimates derived from Kaufman (2004) for 2002. (1) The amount of PVC generated in each state is derived by multiplying the total Municipal Solid Waste (MSW) generated in that state by the percent of PVC (0.62%) estimated from USEPA (2003). We assumed the percent of PVC estimated from the USEPA data was representative of the PVC content in a typical municipal solid waste stream and that none of the PVC was recycled. (2) The amount of PVC incinerated (or landfilled) in each state was calculated by multiplying the total PVC disposed of in the state by the percent of waste incinerated (or landfilled) after recycling. The percent of PVC incinerated (or landfilled) after recycling was determined by dividing the total amount of waste incinerated (or landfilled) in a state (provided in Table 4 of Kaufman 2004) by the total waste disposed of (after recycling).

* These states did not participate in the survey conducted by Biocycle magazine (Kaufman 2004).

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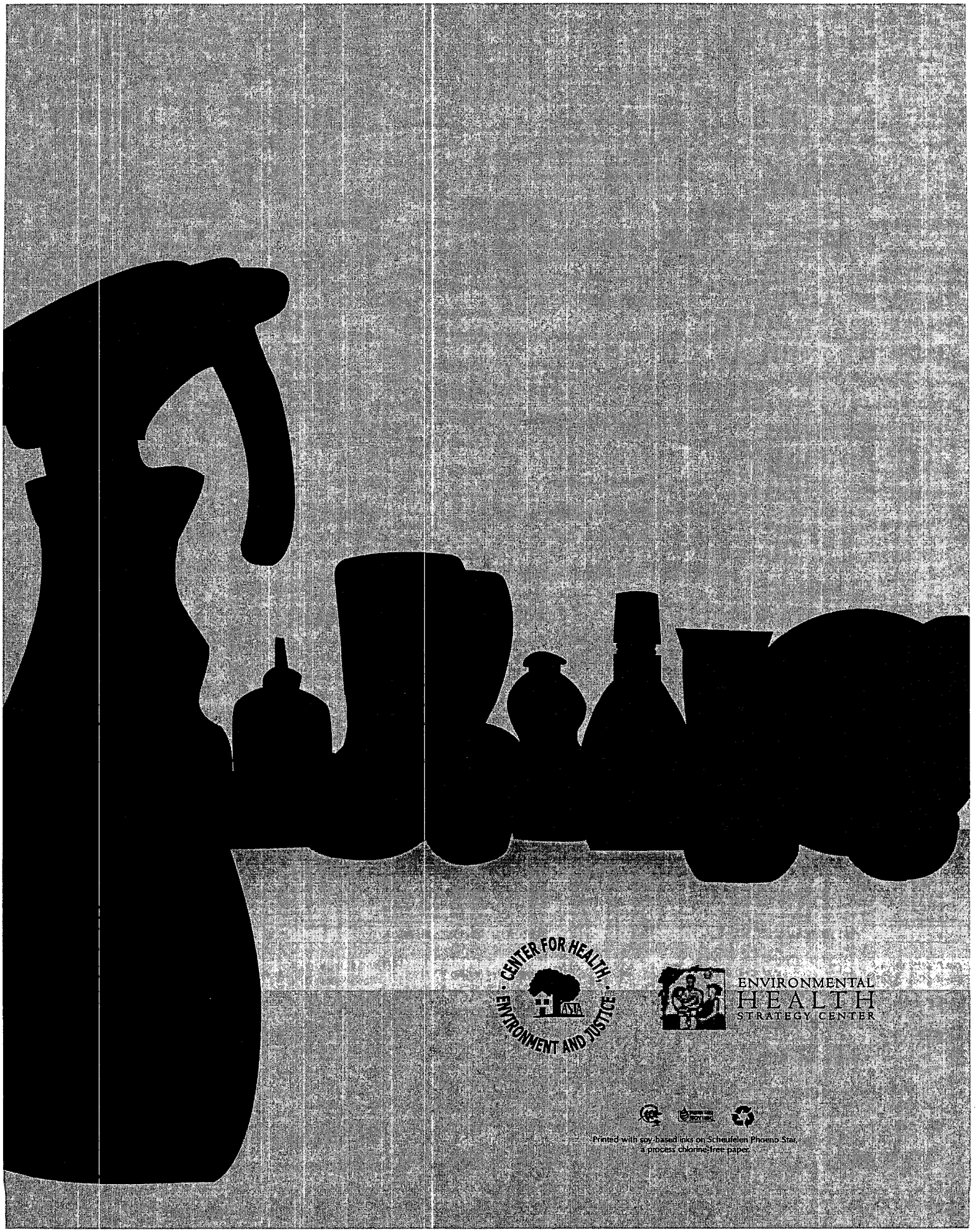

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Comments Submitted by
the California Pipe Trades Council
November 13, 1989

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I. SUMMARY OF COMMENTS

The deficiencies in the Draft Environmental Impact Report ("DEIR") issued by the Department of Housing and Community Development ("HCD") on the proposed expanded use of plastic plumbing pipe are of a magnitude and scope that are startling and unprecedented for a project of this significance. HCD is proposing to approve the use of plastic pipe to carrying drinking water and for drain-waste-vent ("DWV") in all residential, commercial and industrial buildings in California. Plastic pipe is currently prohibited for potable water use inside buildings, and DWV uses are highly restricted because of the fire danger presented by combustible piping.

Despite the fact that the proposed project would subject millions of Californians to toxic and cancer-causing chemicals leaching from plastic plumbing systems, the DEIR dismisses any concern with the use of plastic pipe in a simplistic and superficial report. It ignores the substantial evidence showing that the widespread use of plastic pipe would have serious impacts on drinking water quality, worker health and fire-safety, and devotes almost as much attention to metal pipes, which have been used safely for hundreds of years. Perhaps even more troubling is the DEIR's failure to consider at all a wide range of issues, including the mounting evidence of plastic pipe breaks and leaks, causing millions of dollars in damages and enormous heartache to homeowners across the nation. No objective reader could view this DEIR as a good faith attempt to study the public health and safety dangers of expanded plastic pipe use.

The California Environmental Quality Act ("CEQA") requires the preparation of an environmental impact report ("EIR") in order to fully inform the public and government decision-makers of the potential environmental and public health hazards associated with a proposed project. In this case, however, the DEIR reads like a report intended to advocate the use of plastic pipe, dismissing all evidence of public health and safety effects, often in conclusory fashion or by relying on Plastics Industry reports. This lack of objectivity and balanced analysis misleads the public and government decision-makers and subverts the fundamental policy objectives of CEQA.

This is not the first time a new building material has been proposed for approval based on Industry claims of safety. Asbestos was installed in schools and other buildings throughout the country as a fireproofing and insulation material based on claims by asbestos manufacturers that the material was safe. The tragic history of asbestos should not be repeated here -- the installation of plastic plumbing in California homes, offices and factories should not be allowed until a full and complete study of the potential health and safety effects of that action has been conducted.

In an effort to facilitate a thorough consideration of the potential impacts of plastic pipe use, the California Pipe Trades Council submits these comments on the DEIR. The sweeping deficiencies of the DEIR have required an extraordinary effort to identify both the inadequacies in the analysis presented, as well as a discussion of a number of profoundly important issues that are not considered at all by the DEIR. A separately bound document of appendices containing technical comments and reports as well as reference documents is also presented as comment on the DEIR.

A. <u>The DEIR's Project Description is Too Narrow</u>

The DEIR does not meet the standards for environmental review established by CEQA. It misleads the public and fails to consider significant environmental impacts from the expanded uses of plastic pipe due to an overly narrow definition of the project under consideration. An accurate and complete project description is the cornerstone of an adequate EIR. (*County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185 [139 Cal.Rptr. 396].)

On the basis of only a few samples of plastic pipe, the DEIR concludes that the entire range of generic pipe known as "CPVC" and "PB" are safe. The DEIR fails to consider:

- the ever-changing manufacturing and formulation processes of pipe, pipe fittings and the solvents, primers and glues used to join the pipe. These processes constantly introduce new chemicals, contaminants and other substances into the pipe and ultimately into the drinking water flowing through it. New

formulations will also expose plumbers to new substances that are toxic or with unknown health effects.

- the mechanical properties of plastic pipe, particularly as they affect the likelihood of mechanical failure. The DEIR implies that PB pipe will be the principal new type of pipe used for hot and cold drinking water applications when in fact PB pipe has suffered so many catastrophic mechanical failures that it has been banned IAPMO for all plumbing systems governed by the UPC. The potential for mechanical failure is a complex problem related to the nature of the pipe material as well as quality control in its manufacture. The implications of mechanical failure in terms of environmental hazard, property damage and economic cost to consumer are critical to an understanding of the full implications of expanded uses of plastic pipe.

- the impact of plastic pipe on non-residential construction. According to recent amendments to state law, the UPC provisions as proposed by HCD will apply to all occupancies. Therefore, the proposed action will permit plastic pipe in all residential, commercial, office and industrial buildings. However, the DEIR did not consider the drinking water, worker health or fire-safety impacts of plastic pipe installations in non-residential buildings.

B. The DEIR Underestimates Impacts on Drinking Water Contamination, Worker Health and Fire Safety

CEQA requires an EIR to contain a balanced, specific and detailed analysis of impacts. (*Whitman v. Board of Supervisors* (1979) 88 Cal.App.3d 397 [151 Cal.Rptr. 866].) In this case, the DEIR presents an incomplete, superficial and biased analysis that significantly understates the magnitude and scope of potential impacts.

1. Plastic Pipe and Joining Materials Will Leach Toxic and Cancer-Causing Chemicals into Drinking Water

The DEIR does not adequately analyze the effect on drinking water quality of plastic pipe because it relies almost exclusively on two narrow studies, one of which is a product of the Vinyl Institute ("Butter"). It ignores a number of earlier studies which provide a more complete context from which to interpret the Cooper and Vinyl Institute studies. A careful review of the Cooper and Butter reports shows that the DEIR did not even fully present those study results, but selected for discussion only those portions which appear to minimize the levels of chloroform in water in contact with CPVC pipe.

The DEIR fails to acknowledge the limitations of the Cooper and Butter studies, or discuss problems with the study protocols. The DEIR also fails to address the lack of consistency between the studies in evaluating the effects of residual chlorine in the water supply, or the fact that the labs did not test a representative sample of available pipe materials. In addition, the Vinyl Institute test of chloroform formation from CPVC pipe cement and showing low levels of chloroform, was performed on unusually cold water. The DEIR failed to report a much higher and consistent level of chloroform in a subsequent test run on 80 degree fahrenheit water containing no residual chlorine. The levels of chloroform leached into drinking water from PVC and CPVC pipe are in violation of Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986.

The DEIR erroneously suggests that private consensual groups like the International Association of Plumbing and Mechanical Officials ("IAPMO"), the National Sanitation Foundation ("NSF") and the American Society for Testing and Materials ("ASTM") will protect the quality of drinking water by regulating plastic pipe. The standards set forth by these organizations do not apply to the chemicals of concern from plastic pipe, solvents and cements. Compliance with these standards is not required and the enforcement of the standards is controlled by the industries the standards are intended to regulate.

The DEIR does not reveal or analyze the potentiating effects of methyl ethyl ketone ("MEK") on the cancer-causing power of chloroform, which is found in drinking water as a result of chlorination. It does not consider exposure by inhalation or through the skin.

The Draft EIR states that flushing newly-installed plastic pipe is adequate mitigation for chemical leaching. However, its proposed flushing procedure is from 1980 and does not take into account any of the information from leaching studies conducted in conjunction with the DEIR itself. Furthermore, a minimally effective flushing regime would require long periods of time and repetitions that are expensive and virtually impossible for plumbers, contractors, builders or building officials to carry out, monitor or inspect. To comply with CEQA, mitigation measures specified in an EIR must be feasible, effective and capable of being monitored for compliance. (Pub. Resources Code § 21081.6.)

The DEIR acknowledges that chemicals can permeate plastic pipe, but dismisses the danger from chemical permeation. However, there are 160,000 underground storage tanks in California containing hazardous materials, 90% store petroleum and at least 30,000 of those are leaking. Each month, 200 new contaminated sites are discovered. Leakage from automobiles alone can penetrate plastic pipe and contaminate drinking water. The DEIR must address the permeation threat posed by plastic pipe.

2. The DEIR Ignores Substantial Impacts from Plastic Pipe on Worker Health

The DEIR does not include the required worst case analysis of the danger to workers who install plastic pipe. It relies exclusively on a Department of Health Services ("DHS") study done for HCD that focused primarily on "average" rather than worst case exposure conditions. However, even this study found exposures to tetrahydrofuran ("THF") greater than those considered safe. The DEIR ignores the conclusion of the DHS study that overexposures will occur for plumbers working under worst case conditions, and downplays the significance of the actual risks workers will experience. The DEIR also fails to consider the effect of the limitations of the DHS sampling data on interpretation of the study results.

The DEIR relies on standards for exposure which are poorly documented and are too high by a factor of 10. The DEIR indicates that the health effects of long-term exposures to THF and MEK have not been well-studied, but ignores the evidence showing that these substances may cause cancer, and may increase the cancer-causing potential of chloroform by a factor of 30. In light

of this evidence, the high levels of THF associated with dermal exposure and enclosed working conditions should have led the DEIR to conclude that there were significant impacts associated with worker installation of plastic pipe.

The DEIR also fails to consider the impacts of increased plastics production on the health of manufacturing workers, particularly for the carcinogens acrylonitrile, butadiene and styrene, or the risk of upset at plastic and pipe manufacturing plants.

The DEIR selectively reports the results of the worker health studies, leaving out data which indicated that plumber exposure to cements would be excessive, and that animal and human studies of cement mixtures almost universally showed harmful effects. Likewise, the DEIR neglects to mention that these studies concluded that many of the provisions the DEIR itself suggests to protect workers from solvent and cement exposures were unworkable and unenforceable.

3. The DEIR Contains an Inadequate Analysis of Fire-Safety

Unlike metal, plastic burns, promoting fire spread and producing toxic smoke. These critical differences between metal and plastic have significant implications for buildings of all kinds. The DEIR does not adequately analyze these implications. The DEIR uses imprecise terminology where terminology has specific legal meaning, and is thus confusing and ambiguous as to whether the project will deviate from the UPC's restriction of plastic pipe to combustible construction. The DEIR fails to analyze the impacts of using plastic in all fire-rated buildings, including high-rise structures where fires are more likely to result in catastrophic loss of life.

The DEIR does not explain that additional approval by the State Fire Marshall will be required before plastic can be used in non-combustible, fire-rated buildings. It does not reveal that fire-stopping mechanisms in renovation or retrofit jobs have not been tested, and it underestimates the portion of residential construction requiring fire-resistive protections.

The mitigation measures proposed to reduce the fire hazard of plastic pipe suggest that performance standards and construction assemblies can be approved on an ad hoc basis by individual local building officials. Local building officials

do not have the expertise for this type of approval; the mitigation is also contrary to earlier recommendations by SRI that performance standards and construction methods must be regulated through the Uniform Building Code ("UBC") issued by the International Conference of Building Officials ("ICBO"). The current UBC contains no standards or approved construction methods for installation of plastic pipe in fire-resistive construction. No tested assemblies suitable for use with plastic pipe have been accepted by ICBO. The DEIR, as written, misleads the reader into believing that proven fire-resistive assemblies are readily available and have code approval.

C. The Draft EIR Fails to Consider Other Significant Environmental Issues

The Draft EIR is inadequate in its coverage of impacts on air quality, solid waste disposal and ecological effects of expanded plastic plumbing pipe in California. Since PB pipe applications are being disallowed by the International Association of Plumbing and Mechanical Officials ("IAPMO"), CPVC pipe would be the main type of pipe slated for expanded use by the proposed action. Expanded use of ABS DWV will aggravate air quality, water quality and noise impacts.

Air Quality: The solvent cements and primers used in manufacture and installation of CPVC contain organic solvents which contribute to photochemical oxidant formation, and the effects of increased emissions of these substances on air district rules and attainment of air quality standards must be included in an adequate EIR. Similarly, the EIR must address the impacts of the increased use of ozone-depleting substances.

Solid Waste Disposal: Most plastic materials are not biodegradable or degrade very slowly. Plastics already account for 25% of the volume of municipal solid wastes and solid waste disposal capacity is an increasing problem. Since plastic pipe is much and difficult more to recycle than copper pipe, the EIR must address the implications of an increased contribution to plastics in the waste stream.

Ecological Effects: The proposed project could result in the use of nearly 27 million pounds of ABS, 12 million pounds of CPVC and 1.5 million pounds of cement and primer statewide, each year. Yet the DEIR cavalierly dismisses

the potential impacts of such use on surface waters and ecological systems. The carcinogens (e.g., chloroform, styrene, and acrylonitrile) that can leach from these plastic pipe can produce harmful effects at very low concentrations and should not be dismissed as insignificant. Cumulatively, the amount of solvents entering sewage treatment systems may exceed the levels permitted by wastewater treatment authorities.

Noise: The lighter weight and rigid joints of ABS DWV systems transmit more water noise. The expanded use of ABS DWV in multiforming structures could adversely increase interior noise levels.

D. The DEIR Discussion of Economic Effects Is Inaccurate

The DEIR shows negligible cost savings with the use of PB pipe, which may not be relevant since PB pipe will be banned by the UPC because of its record of mechanical failures and will probably not be selected to replace copper should the code changes be approved. The economic analysis of pipe systems presented here shows that initial installation of PVC pipe in a dwelling is about $200 more than copper pipe; CPVC (which must be used for hot water) is about $900 more. Taking into account the 20-year service life of plastic pipe versus the 30+ year life of metal, as well as the costs of flushing, ventilation and inspection, the overall life-cycle cost of a CPVC system is over $3000 more than metal. The DEIR also falsely assumes that any cost savings in the plumbing system would be passed on to the consumer.

E. The DEIR Fails to Assess Significant Impacts, Cumulative Impacts, Irreversible Impacts, and Alternative Projects

The DEIR is required to identify potentially significant environmental impacts resulting from implementation of the proposed project. It fails to do so. The evidence the DEIR should have incorporated strongly indicates that leaching of chemicals into drinking water, worker exposure to solvent cements, increased fire hazards and air quality impacts are significant impacts. Impacts on solid waste disposal, water quality and noise in multi-family residences may be significant; however, the DEIR does not adequately address these issues.

Where significant effects have been identified, CEQA requires that the lead agency impose mitigation measures, or if infeasible, must make findings of

overriding considerations. In the case of plastic pipe, the suggested mitigation measures are infeasible, and with no economic advantage to plastic pipe, there are no possible findings of overriding consideration.

The DEIR does not analyze the cumulative impacts of the project. The DEIR avoids the implications of the use of 16.8 million pounds of plastics per year in new construction in California. The DEIR fails to discuss the cumulative effects of discharge into the environment of water passing through plastic water pipe systems. It does not analyze the incremental effect of adding pollutants to already polluted water and air.

The DEIR explicitly states that it will consider the effects of various chemicals to be additive only, and ignores synergistic and potentiation effects, particularly with regard to cancer promotion. It ignores the potential 30-fold increase in the carcinogenic effects of chloroform caused by simultaneous exposure to MEK. The DEIR does not mention the cumulative effect on public health risk of chloroform leached from CPVC combined with background levels in drinking water of 10 to 90 ppb. It ignores the effect of the project on petroleum supplies, a non-renewable resource.

The alternatives analysis in this DEIR is glaringly deficient. The alternatives are poorly defined, their application to real plumbing systems is unclear, and no real analysis is given of their impacts. In addition, the range of alternatives considered is artificially small. Other alternatives which should have been examined in detail in the EIR include the obvious "no use of PB pipe," and a ban on <u>all</u> plastic pipe (including the existing PVC and ABS applications).

The DEIR contains inadequate consideration of the significant irreversible changes brought about by the proposed action. These include the effects of carcinogens in drinking water, long-term health risks to plastics workers and plumbers, long-term fire safety risks to the public and the property damage and economic effects of mechanical failure of plastic plumbing.

The DEIR does not identify the environmentally superior alternative as required by CEQA. The DEIR states that ". . . the potential for harmful effects from copper leached from metal pipe into drinking water is virtually nonexistent for humans." (DEIR, p. 55.) In view of the fact that there is no health risk associated with metal pipe, (the risk of lead toxicity has been virtually eliminated

by current law) the DEIR should have concluded that the No Project Alternative -- no expanded use of plastic plumbing pipe -- is environmentally superior.

In view of the fact that all types of plastic pipe have been shown to be more expensive than metal pipe once life cycle cost and replacement cost are considered, there is no economic advantage to offset the increased risks associated with the expanded use of plastic pipe. If there is no economic advantage, then exposing the public and workers to any increased risk is completely unjustified.

II. DEIR MISLEADS THE PUBLIC AND FAILS TO ADEQUATELY CONSIDER POTENTIAL IMPACTS DUE TO AN INACCURATE AND OVERLY NARROW PROJECT DEFINITION

The definition of the project under review in an EIR is critically important since it informs the public and government decision-makers of the nature of the proposed activity and determines the scope and content of the analysis that follows. An inaccurate or incomplete project description undermines the public informational objectives of CEQA, and can lead to an underestimation of project impacts and an incorrect identification of alternatives and mitigation measures. In this case, the DEIR's description of the proposed activity is ambiguous, inaccurate and incomplete. This fundamentally flawed project definition misleads the public and official decision-makers regarding the true nature and scope of potential impacts, and results in an inadequate environmental assessment. The DEIR's narrow view of the project also results in a number of potentially significant impacts being excluded entirely from the analysis.

A. An Accurate and Complete Project Definition is the Sine Qua Non of a Legally Sufficient EIR

The significance of the DEIR's inadequate project definition is clear from the case law. The courts have declared that "[a]n accurate, stable and finite project description is the sine qua non of an informative and legally sufficient EIR." (*County of Inyo v. City of Los Angeles* (1977) 71 Cal.App. 3d 185, 193, [139 Cal.Rptr. 396, 401]; see also *City of Santee v. County of San Diego* (October 26, 1989, D007991) _____ Cal.App.3d _____ [89 C.D.O.S. 8002, 8006],

Rural Land Owners Association v. Lodi City Council (1983) 143 Cal.App.3d 1013, 1024-1025 [192 Cal.Rptr. 325,332-333] and *Santiago County Water District v. County of Orange* (1981) 118 Cal.App.3d 818, 829-830 [173 Cal.Rptr. 602, 608].)

The CEQA Guidelines also require that a project definition include: "the whole of the action, which has a potential for resulting in a physical change in the environment, directly or ultimately . . . ." (14 C.C.R. § 15037, subd. (a); See *City of Santee v. County of San Diego, supra*, 89 C.D.O.S. 8005 and *Rural Landowners Association v. Lodi City Council, supra*, 192 Cal.Rptr. 325, 332-333.)

The policy behind the requirement for a clear, accurate and complete project definition was cogently stated in *County of Inyo, supra*, 139 Cal.Rptr. 401: "A curtailed or distorted project description may stultify the objectives of the reporting process. Only through an accurate view of the project may affected outsiders and public decision-makers balance the proposal's benefit against its environmental cost, consider mitigation measures, assess the advantage of terminating the proposal (i.e., the 'no project' alternative) and weigh other alternatives in the balance." (See also *City of Santee v. County of San Diego, supra*, C.D.O.S. 8006.)

The project at issue in *County of Inyo* was a proposed increase in groundwater pumping from the Owens Valley aquifer for export to Los Angeles. (*County of Inyo, supra*, 139 Cal.Rptr. 402-403.) The City's EIR, however, initially described the project to include only the pumping of additional groundwater for use on City-owned lands in Inyo and Mono Counties, although later sections of the report considered the groundwater pumping as part of the City's larger water supply system. (*Id.*, pp. 399-400.).

The court concluded that the ambiguous project definition frustrated the public informational goals of CEQA and undermined the ability of the public and government agencies to present meaningful comments on the Draft EIR. The court found that "[t]he incessant shifts among different project descriptions . . . vitiate the City's EIR process as a vehicle for intelligent public participation." (*County of Inyo, supra*, 139 Cal.Rptr. 405.) The court added that "[a] curtailed, enigmatic or unstable project description draws a red herring across the path of public input." (*Ibid.*)

It important to note that the court invalidated the EIR even though it found that the uncertain project definition had not actually undermined the analysis of potential impacts, since the EIR had considered the broader project in evaluating environmental effects. The court concluded that "[t]he elasticity of the project concept does not vitally affect the 'impact' sections of the report." (*County of Inyo, supra*, 139 Cal.Rptr. 404.) Because the EIR had switched to a more expansive definition for purposes of the impact analysis, "the informative quality of the EIR's environmental forecasts is not affected by the ill-conceived, initial project description" (*ibid.*), but the court invalidated the EIR nonetheless because the statement of the project was incomplete.

An even clearer CEQA violation occurs where an inaccurate project definition affects the substantive environmental analysis. An example of such a violation occurred when the Owens Valley water controversy returned to the court four years later in *County of Inyo v. City of Los Angeles* (1981) 124 Cal.App.3d 1 [177 Cal.Rptr. 479]. In that case, the court found that the EIR had not defined the project to include surface water diversions, even though it was clear from the analysis that the increased export of groundwater would require some reliance on surface water for in-valley uses. (*Id.* at 177 Cal.Rptr. 482-483.) The court held that the exclusion of surface water diversions from the project description not only defeated the informational goals of CEQA, but also resulted in an inaccurate assessment of impacts and project alternatives. (*Id.* at 483 - 444.)

In *Santiago County Water District v. County of Orange, supra*, 118 Cal.App.3d 818 [173 Cal.Rptr. 602], the Court considered a challenge to an EIR on a proposed sand and gravel mining operation. Even though it was not disputed that additional water facilities would be required to serve the proposed mine, the project definition did not include construction of water facilities.

The *Santiago* court concluded that the inaccurate project definition rendered the EIR invalid since not all significant environmental effects had been considered. The court noted that "[t]he construction of additional water delivery facilities is undoubtedly one of the significant environmental effects of the project." (*Id.* at 173 Cal.Rptr. 608.) The court also concluded that the exclusion of the water facilities from the project description misled the public and government decision-makers regarding the full scope of the proposal: "Because of this omission, some important ramifications of the proposed project remained

hidden from view at the time the project was being discussed and approved. This frustrates one of the core goals of CEQA." (*Id.* at 173 Cal.Rptr. 602, 698.)

In *Rural Land Owners Association v. Lodi City Council, supra*, 192 Cal.Rptr. 325, the City considered a general plan amendment necessary to allow development on certain agricultural lands within the City's sphere of influence. However, the EIR described the project to include only the general plan amendment, and excluded the proposed annexation and development of the property as unrelated projects. (*Id.* at 192 Cal.Rptr. 330.)

The court held that the City's restricted project definition defeated CEQA's mandate for public disclosure and full consideration of project impacts. (*Rural Land Owners Association v. Lodi City Council, supra*, 143 Cal.App.3d 332-333 [192 Cal.Rptr. 330].) The court declared that "[r]esponsibility for a project cannot be avoided by limiting the title or description of the project." (*Id.* at 192 Cal.Rptr. 331.)

These cases demonstrate that an erroneous project description will render the EIR legally insufficient. In this case, the DEIR's project definition is clearly inaccurate and incomplete. For example, although the DEIR describes the proposed code change as approval of generic kinds of plastic pipe, the impact analysis considers the leaching dangers from only a narrow subset of the pipe and does not address varying pipe formulations. The DEIR's project description also excludes any consideration of the mechanical properties or failure history of plastic pipe. Most remarkably, the project definition excludes entire classes of occupancies that would be affected by the proposed code change and limits the analysis to residential structures.

The project definition is also ambiguous and misleading. For example, the DEIR defines the project to include authorization of plastic pipe in all fire-rated structures, even though the only code language cited restricts plastic pipe use to combustible construction. These deficiencies in the DEIR project definition will be discussed in more detail in the sections that follow.

B. DEIR Fails to Consider the Impacts Resulting from Variation in Plastic Pipe and Fastenings

The DEIR misrepresents the potential environmental and public health impacts of expanded use of plastic pipe and misleads the public and government decision-makers by reporting the impacts of only a narrow subset of plastic pipe, while at the same time defining the project as approval of plastic pipe as a generic, abstract quantity. Within the nominal designations of CPVC, PVC, PB, and ABS, there is wide latitude in composition which will determine how the pipe will affect the environment. The potential impacts of the pipe are dependent on the way in which the plastic resin is made, the way in which it is formed into pipe and fittings, and the way in which the pipe system is assembled.

1. DEIR Ignores the Substantial Evidence of Changing CPVC Formulations

The DEIR fails to address the impact of the diversity of CPVC chemistry. The 1983 ERD acknowledged the existence of different processes (e.g. use of swelling agents), but quickly dismissed the subject by stating that "B.F. Goodrich is the sole U.S. producer." (ERD, pp. III-7 - III-8.) The DEIR explores the subject no further. The DEIR relies heavily on a leaching test conducted by the University of California Sanitary Engineering and Environmental Health Research Laboratory ("SEEHRL"), reported by Cooper, et. al. 1987, yet the DEIR makes no effort to compare the type of CPVC tested by the Cooper study and the range of pipe that may be used in California upon HCD approval.

Chlorinated Polyvinyl Chloride is a generic name for one type of plastic; there are, however, important differences in the chemical composition of CPVC from different sources. CPVC pipe is extruded from resin made by several different manufacturers (both foreign and domestic) who use different manufacturing processes. The characteristics of resins made by different processes and different manufacturers will vary. Similarly, pipes made from these resins will also be of varying composition.

The current desire to minimize the cost of CPVC production will only increase as the market for plastic pipe expands, draws new manufacturers into the market, and heightens competition. In such a situation, cost competitiveness becomes essential and the willingness to incur added expenses diminishes. In the

absence of regulation, this would favor traditional and cheaper methods of CPVC manufacture over "cleaner," but more expensive, methods.

It is certainly true that B.F. Goodrich has struggled long in the United States to expand uses of CPVC and holds most of the modern domestic patents. Even if B.F. Goodrich were to retain its exclusive U.S. market, B.F. Goodrich itself is pursuing new manufacturing technologies. However, if the market for CPVC pipe expands, other manufacturers, with yet different methods, will become suppliers. By ignoring this economic reality, HCD has prepared an EIR that purports to assess CPVC, but in fact examines only one product of one manufacturer.

a. Patent Information Demonstrates That Varying CPVC Formulations Are Being Developed

In the competitive commodity chemical industry, little published information is available on formulation and manufacture of CPVC resins. Perhaps the best indication of the potential variability among different types of CPVC is information publicly disclosed in patents concerning CPVC manufacture. A 1985 patent survey conducted by B.F. Goodrich revealed that " at least 55 companies worldwide hold some 125 patents related to the production of CPVC."[1]

Such patents describe the processes and ingredients used in manufacture of the CPVC resin which is later extruded into pipe. This patent data can be used to gain a better understanding of the sources and extent of variation in CPVC pipe that could be installed in California. It is clear from this information that a variety of formulations are used in the manufacture of CPVC resin.

A 1983 patent assigned to B.F. Goodrich Co. states that "the major portion of CPVC is produced for use in the piping industry."[2] Another 1983 patent assigned to B.F. Goodrich states that "most commercially used CPVC is

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[1] Parker, RG and Martello, GA, "Chemical Modifications: Chlorinated PVC", Encyclopedia of PVC 2nd edition, Marcel Dekker, New York 1985, Chapter 11, page 620.

[2] U.S. Patent No. 4,377,459 to Parker, BF Goodrich Co., March 22, 1983; Column 8, lines 64-65.

produced by the chlorination of an aqueous suspension of PVC such as is described in U.S. Patent No. 2,996,489 . . . ."[3] U.S. Patent No. 2,996,489, also assigned to B.F. Goodrich, describes a process for the chlorination of PVC to produce CPVC. This process specifies the use of a chlorinated hydrocarbon as a swelling agent, with chloroform being "by far the most effective."[4] The wide-spread use of this method is substantiated in U.S. Patent No. 4,377,459 (issued in 1983) which states that the "most preferred (process for the chlorination of PVC) is a process carried out by suspending PVC in water, which PVC is swollen with a lower halogenated hydrocarbon swelling agent," usually chloroform.[5]

Another chlorinated compound, carbon tetrachloride (CCl_4), is important in the manufacture of CPVC resin. Carbon tetrachloride appears as either an additive or a contaminant in CPVC resin. "Much if not all of the CCl_4 is produced by chlorination of $CHCl_3$, one of the commonly used hydrochloromethylenes which are essential swelling agents. Typically, however, some CCl_4 is added to the chlorination reactor in a relatively small amount. . . ."[6]

The $CHCl_3$ and CCl_4 which are present in the resin are also present in pipe extruded from this resin. Analysis of pipe samples themselves can be used to determine residual concentration of chloroform and carbon tetrachloride in the pipe. Such an analysis of pipe samples is reported in "The Diffusion of Chloroform and Carbon Tetrachloride from Rigid PVC Pipe and Rigid CPVC Pipe into Water," by Donald G. Desrosiers and Paula C. Dunnigan, B.F. Goodrich Chemical Group, September 1982:

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[3] U.S. Patent No. 4,373,093 to Olson and Vielhaber, BF Goodrich Co., February 8, 1983; Column 1, lines 19-21.

[4] U.S. Patent No. 2,996,489, *op. cit., supra*; Column 5, line 65.

[5] U.S. Patent No. 4,377,459, *op. cit., supra*; Column 1, lines 17-21.

[6] U.S. Patent No. 4,147,859 to Davis and Boyer, BF Goodrich Co., April 3, 1979; Column 2, lines 1-6.

> PVC and CPVC resins were compounded, using typical pipe and fitting recipes, and then extruded into pipe specimens. The residual levels of $CHCl_3$ and CCl_4 in these various PVC and CPVC pipes were measured." (Emphasis added.)

The following residual concentrations were reported:

	Residual $CHCl_3$ (ppm)	Residual CCl_4 (ppm)
CPVC Pipe	43	18
CPVC Fittings	5.2	24

If these levels are indeed typical, the level of chloroform and carbon tetrachloride in CPVC pipe and fittings is of particular concern, given the carcinogenic potential of these compounds. In the past little attention was paid to ingredients of CPVC pipe, even though these ingredients are capable of leaching into drinking water. The patent which describes the process used to produce "most commercially used CPVC"[7] states that carbon tetrachloride is "an innocuous material easily removed from the polymer."[8]

Despite this statement, carbon tetrachloride is neither "innocuous" nor "easily removed from the polymer." It is also clear that neither carbon tetrachloride nor chloroform are easy to remove from CPVC resin:

> Since $CHCl_3$ and CCl_4 are swelling agents which, under suitable conditions may be diffused out of CPVC, it would not seem too difficult, given enough time, to rid the CPVC of even traces of the contaminants utilizing a stripping agent such as steam which does not react with either the resin or the contaminants. But it is. It is difficult, time-consuming, and uneconomical, to strip essentially all

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[7] U.S. Patent No. 4,373,093 to Olson and Vielhaber, BF Goodrich Co., February 8, 1983; Column 1, lines 19-21.

[8] U.S. Patent No. 2,996,489, *op. cit., supra;* Column 5, lines 54-55.

> $CHCl_3$ with live steam. It is even more difficult, and for practical purposes, impossible to strip essentially all the CCl_4 out of CPVC with live steam because the concentration of CCl_4 appears to level off at about 10 ppm, based on solid resin . . . .[9]

Another author has observed that

> . . . it is only with difficulty and expense that essentially all the swelling agent used in these processes can be removed from the CPVC product.[10]

The difficulty of this process results in the occurrence of chloroform and carbon tetrachloride as contaminants in the end-product, CPVC pipe. Methods designed to "strip" the contaminants from the resin are not completely successful: "despite additional, secondary steam stripping, commercially available CPVC typically contains well over 10 ppm each of $CHCl_3$ and CCl_4." (Emphasis added.)[11]

Patents issued to B.F. Goodrich describe methods for a) removal of carbon tetrachloride and chloroform contaminants from CPVC by methanol stripping[12], and b) production of CPVC which used fluorinated hydrocarbons rather than chloroform.[13] Thus, the capability to produce CPVC resin with lower concentrations of chloroform and carbon tetrachloride exists. The extent to which these methods are used, however, is unclear. These "cleaner" methods involve additional processing of resin and are thus more expensive than conventional methods. This additional expense results in a more costly end-product. CPVC manufacturers are very anxious to limit such additional expenses: ". . . it is essential that the cost of converting it (PVC) to CPVC be

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[9] U.S. Patent No. 4,147,859, *op. cit., supra;* Column 2, lines 40-51.

[10] U.S. Patent No. 4,377,459, *op. cit., supra;* Column 1, lines 34-37.

[11] U.S. Patent 4,147,859, *op. cit., supra;* Column 2, lines 31-34.

[12] U.S. Patent No. 4,147,859, *op. cit., supra.*

[13] U.S. Patent No. 4,350,798 to Parker, BF Goodrich, September 21, 1982.

minimized if the CPVC product is to be an affordable commodity."[14] This economic pressure will be significant since, as discussed below, CPVC is more expensive than its primary competitor, copper.

B.F. Goodrich found that the water-slurry process could be done without swelling agents and Parker and Martello claimed in 1985 that "use of swelling agents has now been discontinued in the United States."[15] But they also stress that diffusion limitation of the chlorinating species in water-slurry produces a polymer with a range of chlorine substitution -- more chlorine at the outside and less in the center of the granule. Because mechanical properties depend critically on chlorine content, a manufacturer using the water-slurry method must use rigorous process control <u>or</u> use a swelling agent. Again, without a specific requirement to the contrary, cost will play the dominant role in determining the manufacturing process used.

The mere availability of methods to manufacture cleaner pipe does not mean that cleaner pipe will be the only product available in California. Disclosure of these methods for reducing the level of contaminants in CPVC pipe entitles the holder of the patent to exclusive use of this method for the lifetime of the patent. Methods of CPVC production patented by B.F. Goodrich would not be available to other manufacturers of pipe. B.F. Goodrich may be understandably reluctant to license its patented process to competitors. In the absence of regulation, these competitors would be free to use cheaper, "dirtier" methods of producing CPVC. These products will in turn increase the economic pressure on B.F. Goodrich.

Thus, economic considerations and patent restrictions will act to limit the volume of CPVC pipe produced by methods which result in lower levels of contaminants. These factors suggest that within a few years after HCD approval most pipe purchased by California consumers will be produced by methods which result in the occurrence of significant residual levels of chloroform and carbon tetrachloride.

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[14] U.S. Patent No. 4,412,898 to Olson and Vielhaber, BF Goodrich Co., November 1, 1983; Column 1, lines 35-37.

[15] Parker and Martello, 1985, *op. cit., supra*, p. 621.

In addition to chloroform and carbon tetrachloride, there are other chlorinated compounds which can be components of CPVC pipe. Some potential contaminants are introduced during the production of PVC, which can later be chlorinated to produce CPVC. U.S. Patent No. 3,534,013 describes a process for manufacturing CPVC which uses as a starting material PVC which has been polymerized "in the presence of at least one specific modifier, i.e., a modifier selected from the group consisting of carbon tetrachloride, 1,1,1-trichloroethane, and 1,2,2-trichloroethane . . . ."[16] The same patent also mentions that trichloroethylene and tetrachloroethylene are "usually utilized as polymerization regulators of PVC." (*Id.*; column 2, lines 59-61.)

The chlorinated ethane compounds are of concern because of their toxicity and of the difficulty of removing them from pipe.[17] Further, these compounds have been demonstrated to leach from pipe into water. The *Diffusion of Organics from CPVC Pipe: Final Report*, James M. Montgomery, Consulting Engineers; September 1982 study conducted by Montgomery Engineers for B.F. Goodrich Co. detected tetrachloroethane, 1,1,2,2-tetrachloroethane and 1,1,2-trichloroethane (as well as carbon tetrachloride and chloroform) in water samples exposed to CPVC pipe. The McKesson Environmental Services study (Butter, 1986) "Effect on Water Quality of Leachable Substances from CPVC Pipe at an Elevated Temperature" found chloroform, carbon tetrachloride and methylene chloride in unchlorinated test water.

U.S. Patent 4,049,517 states that CPVC "is normally prepared by chlorinating VCR (PVC) which has been prepared by an aqueous suspension polymerization process . . . . In aqueous suspension polymerization processes . . . . solvents such as aromatic hydrocarbons, alone or mixtures thereof, such as benzene, toluene and mineral spirits are used as diluents for the catalysts."[18] Benzene is recognized as a carcinogenic chemical. Note that Montgomery Engineers found 0.4 ppb benzene, and McKesson found 0.9 to 1.8 ppb toluene in the CPVC tests.

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[16] U.S. Patent No. 3,534,013 to Wakabayashi, et al., Nippon Carbide, Japan, October 13, 1970; Column 1, lines 36-39.

[17] U.S. Patent No. 2,996,489, *op. cit., supra*; Column 5, lines 57-58.

[18] U.S. Patent No. 4,049,517 to Adachi and Oda, Tokuyama Sekisui, Japan, September 20,1977; Column 3, lines 31-44.

Another hazard is described in U.S. Patent No. 4,052,350: "The main thermal stabilizers which have been conventionally used for stabilizing chlorine-containing resins include inorganic acid salts, organic acid salts, organic tin compounds and the like and, particularly among these conventional stabilizers, lead salts and lead soaps are widely employed due to their excellent thermal resistance effects and low cost. Many of these stabilizers are toxic . . . ."[19] Metal contaminants can also arise unintentionally: ". . . trace contamination of (CPVC by) heavy metals . . . can easily result from hydrochloric acid attack on metal processing equipment."[20]

b. Varying CPVC Formulations Will Result in Dramatically Different Impacts on Drinking Water Quality

Samples of CPVC pipe of varying composition can exhibit striking differences in leaching behavior (i.e., different leachates, or different amounts of the same leachate). These differences are clearly demonstrated in results from the study conducted for B.F. Goodrich Co. by James M. Montgomery, Consulting Engineers.

Judging from B.F. Goodrich research and patent activity, the period from 1982 to 1985 probably saw a significant reduction of swelling agent use. Pipe made at the time of the Montgomery test and the Dunnigan report had higher levels of residual chloroform and other chlorinated organics. Pipe made later had less. Because the variation in manufacturing can explain the different results, the Montgomery data should be incorporated in the EIR.

In the Montgomery study, the leaching behavior of two different samples of CPVC pipe was examined. One pipe was produced by B.F. Goodrich ("BFG pipe") and the other by an unidentified manufacturer ("COM pipe"). For each of the two pipes, pipe assemblies were constructed, cured, and flushed. Each assembly was filled with tap water. The water was allowed to dwell in the assemblies for 14-days and then sampled and analyzed ("14-day samples"). The

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[19] U.S. Patent No. 4,052,350 to Shiohara, Kohara, and Miyoshi, Sekisui Kagaku, Japan, October 4, 1977; Column 1, lines 11-19.

[20] U.S. Patent No. 4,345,040 to Hall, BF Goodrich Co., August 17, 1982; Column 1, lines 65-67.

assemblies were again filled with water which was retained in the pipe for seven days ("+7-day samples"). Analysis of the samples show the extent of variability in leachates between the two samples of CPVC pipe. The COM pipe showed a) generally higher levels of leachates than the BFG pipe, and b) leachates that were not detected from the BFG pipe. Levels of some chlorinated compounds from each of the pipe types are shown below:

Average Concentration
(parts per billion)

	14-day Sample		+7-day Sample	
Leachate	BFG Pipe	COM Pipe	BFG Pipe	COM Pipe
Chloroform	45	52	17	23
Carbon Tetrachloride	7.4	13.5	2.3	9.3
Tetrachloroethane[21]	0.2	14.5	0.1	10.8
1,1,2,2-Tetrachloroethane	0	5.2	0	1.7
1,1,2-Trichloroethane	0	9.7	0	3.0

The levels of carbon tetrachloride are much higher in the samples from the COM pipe than in the samples from the BFG pipe. 1,1,2,2-tetrachloroethane and 1,1,2-trichloroethane were detected in samples from the COM pipe but not from BFG pipe.

These results clearly show the effect the variability in CPVC composition has on leaching from pipe into water. Both BFG pipe and COM pipe are available as "CPVC pipe." However, it is evident that both the number and level of leachates is greater from COM pipe than from BFG pipe. This difference could represent a significant difference in impact on public health. Further, this

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[21] Detected in control samples at 0.2-0.3 parts per billion
Source: Diffusion of Organics from CPVC Pipe: Final Report, James M. Montgomery, Consulting Engineers; September, 1982.

difference means that results of leaching tests on one type of CPVC pipe, as conducted by Cooper. are not necessarily representative of future public exposure.

This is confirmed by tests conducted by Acurex Corporation (Mountain View, CA) for Thomas Reid Associates in March and April of 1984. (See Acurex, appen. D.) Samples of a pipe believed to be manufactured by B.F. Goodrich and another pipe were tested by GC/ECD and GC/MS. Chloroform was found at 21 to 30 ppm, and carbon tetrachloride was found at 8 to 15 ppm.

2. DEIR Ignores the Substantial Evidence of Variation in the Additives Used in PB Formulations

Polybutylene pipe has had a limited commercial history, but aggressive market development efforts by Shell Chemical Co. have led to PB use as water service, water supply, or even domestic plumbing use. There are a variety of ways to polymerize 1-butene, but few make a polymer of sufficient chain length to be used for plastic pipe. The variability of manufacturing seen with CPVC has not emerged for PB.

For PB, the variability that affects potential public health impact comes from the slate of additive compounded with the raw polymer to produce pipe-grade resin. All commercial polyolefins (polyethylene, polypropylene, polybutylene, etc.) are susceptible to oxidative degradation where the carbon-carbon bonds in the polymer chain are broken and the polymer loses strength. The oxidation is a free radical[22] reaction which continues in a chain until the radical is trapped. In this way, an oxidizer can initiate substantial chemical change to the plastic. Because of the sensitivity of polybutylene to oxidative degradation, PB manufacturers have resorted to heavy doses of anti-oxidants.

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[22] A free radical is a molecular fragment with one or more unpaired electrons and is usually highly reactive, often attacking a chemical bond, but producing yet another unpaired electron.

Shell Chemical currently uses Irganox 1010, an antioxidant sold by Ciba-Geigy.[23] Irganox 1010 is one of a family of antioxidants sold to protect polyolefins from oxidation. Such chemicals function by trapping and stabilizing the free radical, intercepting the oxidant or stopping short the chain reaction in the polymer.

In the past few years there have been several prominent failures of the PB pipe. The reports cite mechanical failure and usually refer to the pipe showing a service life far less than the manufacturer claims. Apart from an understandable tendency of the manufacture to overstate durability, there may be several reasons for premature failure of PB pipe systems.

A major source of oxidant in domestic water supply is the residual chlorine. Preliminary lab studies showed extremely high chlorine demand from PB pipe; all of that demand will result in chemical reaction of the material in the PB pipe -- either by reaction with oxygen or by reaction with chlorine. The reaction of either polyolefin or antioxidant with chlorine will produce chlorinated compounds which are liberated into the water. Even the antioxidant oxygen reaction products may undergo further reaction with free chlorine once released from the pipe matrix.

Some indication of the significance of chlorine residual oxidation of PB comes from several recent patents where antioxidant formulations are examined to deal specifically with "chlorine resistant polybutene tube" and "corrosion inhibitors, for polybutene pipes carrying chlorinated water" (Mitsui Petrochemical, 1983 and 1984). It seems that industry is attempting to deal with premature mechanical failure of PB pipe due to unexpectedly high oxidation from residual chlorine in the water supply.

Unfortunately for California, none of these more resistant antioxidants have been subject to the HCD sponsored leaching study, nor were they even addressed in the EIR. Most of the new compounds are complex polyvalent free radical traps that function by reacting with a free radical and by stabilizing the

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[23] This was first disclosed by Shell Chemical, R.F. Schimbor in a letter to Myron Moskovitz, HCD, April 13, 1981. Irganox 1010 is used at 0.25%w in Shell's PB 4127, the grey pipe sold in the US for hot water.

unpaired electron. This class of chemicals can have subtle but significant effects in biological systems.

Even if better antioxidants are developed, it must be recognized that the principal mode of antioxidant function is by sacrificial reaction -- where the antioxidant reacts with the oxygen or chlorine instead of the plastic. Thus there is a significant potential for release of chlorinated antioxidant products into the drinking water.

3. DEIR Ignores the Substantial Evidence Potential Variation in Solvent Cement and Primer Formulation

While the SEEHRL (Cooper, 1987) study gives little information on cement composition, the very high solvent levels observed underscore the need to carefully appraise what the cement leaching potential may be.

a. Existing Cement Composition Varies

The Cooper study revealed nothing on cement composition. The failure to look for n-n-dimethylformamide (DMF) or to characterize contaminants is a deficiency in the Cooper study discussed below.

In the Department of Health Services ("DHS") worker health study, Bellows et al. spent much effort exploring for DMF in solvent cements. Several other solvents were of particular interest to Bellows: methyl ethyl ketone (MEK), tetrahydrofuran (THF), acetone (ACE) and cyclohexanone (CHX) and Bellows measured the amount of those solvents in 20 cement and primer samples, eight of these are specified for use with CPVC-PW. Bellows did not go on to consider the possible effect of future formulations.

The Bellows data are important to the public health assessment in the DEIR. First, they show the wide range of constituents among those cements sampled. Second, they imply the presence of unidentified substances present in the cement. Bellows' appendix E, reproduced here (Bellows, appen. E), lists the solvent analysis. The solvents reported by Bellows add up to less than 100%. For glues, about 5% of the cement is dissolved plastic to thicken the glue and fill voids in the joint. For primers and cleaners, essentially all of the material is

a volatile organic compound. In Bellows' appendix E, the balance unaccounted for in CPVC-PW products is typically more than 10%.

The McKesson study analysis of cement and primer revealed DMF and chlorinated organic contaminants. See discussion below.

The EIR should address the impact of variable cement composition. What are the substances comprising the remainder of the solvent cements? What is the potential public health effect of these substances leached into drinking water?

b. Effect of Recycling on Solvent Contamination

Recent hazardous waste legislation (Tanner) has set into motion a statewide effort to reduce the state's hazardous waste disposal problem. A central provision of the program is to encourage recycling. Solvents are particularly suited to recycling through distillation.

However, solvent recycling will result in bulk solvent on the market that is not as chemically pure as virgin material direct from the primary manufacturer. Contaminants would be introduced into recycled solvent by chemicals introduced by the previous user, mixed in intermediate storage, or from the recycler's own equipment. Since most volatile organics form azeotropes,[24] distillation would not remove small amounts of foreign substances. A solvent sold as MEK could contain chlorinated organics or benzene. (See the analysis of solvent cements conducted by McKesson Environmental Services where chlorinated organics were found as contaminants).

Recycled, chemically impure solvent is suitable for most applications (e.g. degreasing, surface coating). Recycled material would be attractive to a formulator of solvent cements because it would cost less. Recycled solvent

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[24] An azeotrope is liquid mixture of two or more substances that boils with a vapor composition equal to the composition of the liquid. This means that differences in boiling points of pure substances cannot be used to separate them when mixed. For example, a mixture of ethanol and water can be boiled to evaporate the alcohol, but alcohol and water form a 95:5 azeotrope so the composition of the vapor will never be more than 95% alcohol; the 5% water cannot be removed by distillation alone.

typically sells for 30% less than virgin technical grade solvent.[25] Solvent is a major material cost in the manufacture of primers and cements and savings from use of recycled material could significantly improve a manufacturer's profit margin.[26]

Since CPVC is readily soluble in a wide range of chemicals, the presence of small amounts of contaminants would not interfere with the mechanical effect of the cement. Indeed, the formulator would not know what contamination was present and the label could not reflect what was in the can.

c. Effect of Air Quality Regulations on Cement Formulations

The DEIR omits an analysis of the air quality impact of solvent cement use. The solvents are all precursor organic compounds, which react in the atmosphere to create ozone (smog). As discussed in section III.E.1 of this report, the total quantity of solvent emissions from cements and primers would have a significant adverse impact on California air quality.

As the goal of reducing ambient ozone seems less attainable, the state's major airsheds are searching for individually smaller, but cumulatively significant, sources of precursor organic compounds. Both the South Coast Air Quality Management District (SCAQMD) and the Bay Area Air Quality Management District (BAAQMD) have rules on the use of solvents in surface coatings,

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[25] Romic Chemical Corp. (East Palo Alto, CA) indicated typical prices for solvents in 55 gallon drum quantities: Acetone, $0.22/lb.; MEK, $0.29/lb.; THF, $1.05/lb; cyclohexanone, not avail. Tank truck quantities available at lower cost.

Virgin technical solvent available from Ashland Chemical in drums, in quantity: Acetone, $0.39/lb.; MEK $0.38/lb.; THF $1.52/lb.

[26] Cement for use with CPVC typically sells for $29.15/gallon and primer for $20.70/gallon with a 10% discount on large orders (Harrington Plastics, Fremont, California). At 50% THF @ 7.3 lb./gallon and the balance MEK, the savings to the manufacturer from the use of recycled solvent would be about $2.00 per gallon. For higher THF products (e.g. Product # 28 in Bellows' appendix E is 80% THF), the cost incentive may exceed 20% of the wholesale cost of the product.

including the use of solvents in adhesives. Solvent cements and primers used in plastic pipe fall under both districts' rules. The SCAQMD has begun to consider plastic cement solvent use specifically and is entertaining discussions with major cement manufacturers on the impact of the rule. (Pers. comm. with staff of SCAQMD, October 22, 1989.)

All of the common solvents are photochemically reactive. If the use of solvent cements expands with HCD's proposed action, the urban air districts will need to apply the same controls to cements as have been applied to other solvent based systems. In nearly all cases where the material is applied in the field and where environmental controls are impractical, the control takes the form of changing the formulation to less photochemically reactive solvents. Typically these are chlorinated solvents.

Evolving air quality regulations may soon force significant changes in the composition of solvent cements. The EIR should discover what alternative cement formulations are being considered and evaluate the potential for public health impacts from the constituents.

4. Summary

The changing composition of plastic pipe will expose the population to a changing chemical environment. The composition of a pipe determines the substances which may leach from the pipe. The DEIR has examined a few specific examples of pipe formulations in its reliance on the SEEHRL test reported by Cooper and the McKesson test reported by Butter. The DEIR makes no effort to extend the assessment of public risk beyond the narrow range of materials examined in the studies. Changing formulation will affect exposure from PB pipe systems as antioxidants and manufacturing methods change, and from CPVC systems as manufacturing, extrusion and solvent cements change. The differences among samples of CPVC pipe are of special concern. Chlorinated hydrocarbons are among the leachates from CPVC pipe which have the greatest potential for adverse health effects.

The DEIR dismisses the Montgomery results as irrelevant to the present HCD action. Failing to reconcile the different results obtained by Montgomery and Cooper, the DEIR wrongly concludes that the Montgomery tests were erroneous. An important reason that Montgomery and Cooper found different

results is that the two tests were studying different pipe samples. The pipe tested by Montgomery were probably made from resin produced by a swelling agent chlorination process, and the pipe tested by Cooper was not. Recall the differences noted by Montgomery between the BFG and the "COM" pipe -- likewise differences between the pipe tested by Montgomery and Cooper would produce different results.

Unfortunately, the DEIR does not recognize this discrepancy and it fails to adequately portray the potential exposure. There is no code in effect, nor mitigation measure recommended in the DEIR, which would prevent use of CPVC pipe made with carcinogenic compounds.

Unpredictable solvent cement composition has implications in two important area of environmental impact: drinking water and worker health. By failing to adequately characterize the solvent cement portion of the CPVC system, the EIR cannot adequately address these issues. Contaminants in cement will leach readily into drinking water and can introduce chemicals not considered in the DEIR. Contaminants would also pose a greater risk to the worker. It will be difficult for HCD to know what potential worker exposure will be in California without some method of testing the composition of solvent cements.

The DEIR's failure to consider effects from other formulas and manufacturing processes is a major oversight. It is clear that both CPVC and PB pipe systems will be subject to a wide range of variation in manufacture and assembly that could significantly affect public and worker health.

None of the codes pertaining to plastic pipe specifically address the concerns at issue in HCD's consideration of the public health impact of plastic pipe. Reliance on NSF is clearly not sufficient, since NSF test for virtually none of the substances identified as potentially harmful in the DEIR. In order for HCD to resolve the issues raised in the DEIR, HCD must consider health-directed manufacturing standards as a mitigating measure.

The EIR should be revised to show how HCD can assure that pipe formulations or joining systems containing harmful materials will not be used in California.

C. DEIR Fails to Consider Impacts Resulting From the Mechanical Failure of Plastic Pipe

The DEIR completely ignores mounting evidence that plastic pipe simply cannot perform the service for which it is intended on a long-term, reliable basis. In short, it breaks and leaks with unacceptable frequency. The ability of the pipe to carry water and waste reliably for many decades without breaking down is an environmental issue because the leakage of water and wastes into homes, under foundations, and in walls, ceilings and floors robs the people of California of a healthful and pleasing environment (Pub. Resources Code § 21000, subd. (b)), constitutes a health and safety hazard (Pub. Resources Code § 21000, subd. (d)), and deprives Californians of a decent home and satisfying living environment (Pub. Resources Code § 21000, subd. (g).)

The Department's omission of the pipe failure issue from the DEIR makes it impossible to assess all potentially significant impacts caused by the project. A consideration of the entire project must include plastic pipe failure, otherwise important impacts will be "hidden from view" and the goals of CEQA thwarted. (*Santiago County Water District v. County of Orange, supra*, 173 Cal.Rptr. 602, 698.)

1. Scope of the Mechanical Failure Problem

a. Plastic Pipe Failures Are Widespread

Wherever it has been installed, plastic pipe has failed at rates that make its continued use a health and safety hazard. The Council has been able to identify ABS DWV pipe failures in over 10% of housing units surveyed. (Thompson, appen. C, p. 2.) At HCD's September 26, 1989, hearing on the DEIR in Los Angeles, an attorney representing homeowners with ABS failure problems testified that he was personally aware of 5,000 residential units affected by ABS failures. (R.T. September, 26, 1989, hearing, p. 56.)

Among projects surveyed totalling 8,345 housing units, there have been 5,842 separate instances of failure affecting 944 units. (Thompson, appen. C, p. 2.) Failures include fractures at fittings caused by solvents or glues, leaks along the length of the pipe due to poor materials, and weeping of liquid through the

core of foam core ABS pipe. The failures have occurred in 10 counties throughout California where ABS pipe is in widespread use, including major population centers such as Los Angeles, Sacramento and Alameda. (Thompson, appen. C, p. 5.) It is also clear from the evidence that the problems of mechanical failure are not limited to one manufacturer, one extruder or even one kind of pipe.

The failure of PB residential potable water and water service[27] pipe is even more severe. The Council has been able to identify at least 3,496 housing units that have experienced failures in PB pipe systems. (Thompson, appen. C, p. 2.) The Council has also been able to identify 1,186 total PB instances of failure. (Thompson, appen. C, p. 2.) The failures have occurred in six California counties, including San Diego, Santa Clara, San Luis Obispo, Marin, Ventura and Kings counties. In San Diego County, the United States Navy replaced hundreds of PB water pipe with copper in homes constructed on a Naval facility after repeated failures of the PB systems. (See appen. EE.)

PB pipe has been used for residential potable water service primarily in San Diego and Santa Clara counties. In San Diego County, failure information is available on 650 units with PB plumbing systems. Of these, 198 have had failures of their PB systems. (Thompson, appen. C, p. 2.) In Santa Clara County, 3,300 units were surveyed for which failure information was available. (Thompson, appen. C, p. 3.) Five hundred of these units experienced failures in their plumbing systems. (Thompson, appen. C, p. 3.)

Several water distribution agencies using PB pipe to provide water service from water mains in the street to the consumer's water meter were surveyed. All have experienced high failure rates. The North Marin Water District suffered 600 failures out of 6000 installed PB service lines (Thompson, appen. C, p. 4); ten times the number expected with metal pipe. (Thompson, appen. C, p. 2.) The Morgan Hill Water Department has experienced 400 to 500 failures a year. (Thompson, appen. C, p. 4.) In total, Morgan Hill has had more individual failures than it has PB service lines; many of the lines have failed more than once. (Thompson, appen. C, p. 4.) The Camrosa Water District

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[27] Water service pipe refers to pipe running from water mains to the water meters of individual dwelling units or other structures.

installed 3,000 PB service lines, 200 have failed and a quarter of the total have cracks. (Thompson, appen. C, p. 3.)

The magnitude of the problem is illustrated by the flood of litigation by homeowners and contractors against resin manufacturers, pipe extruders, financial institutions and others over plastic pipe failures. A preliminary survey has identified over 75 separate lawsuits, most involving hundreds of homeowners and homes[28]. Many arise in Texas and California, but suits over plastic pipe have been filed in Arizona, Florida, Arkansas, Louisiana, Nevada, and North Carolina.

San Diego has seen a great deal of litigation, including an 80-unit low-cost housing development, Orchard Park (*Kirchoff v. U.S. Brass*, *Danskin v. Citizens Savings & Loan*, *Kringer v. Citizens Savings & Loan*, and *Ball v. Citizens Savings & Loan*), an 80 - 100 unit development (*Anderson v. Shell*), and a 183 unit condominium complex (*Hoffman Const. Co. v. Shell Oil*). The North Marin Water District, Camrosa Water District, and City of Morgan Hill have all sued pipe suppliers and manufacturers over PB failures. (*Camrosa Water District v. Mobil, Witco, et al.*, *Marin County Water District v. PE O'Hare, et al.*, *City of Morgan Hill v. Wesflex & Western Products.*)

Suits have been filed in Bakersfield (*Parkside Partners v. Centaur*), Fresno (*Quailwood Apartments v. Centaur*), Sacramento (*B&A Plumbing v. Centaur*), Kern County (*Gubisan v. Budget Homes*, and *Rancho deLano v. Fresno Distribution*) and San Jose (*Thomasello v. Shell & Celanese*), among others.

b. Plastic Pipe Failures Are Costly

Although many settlements are secret, the information that is available suggests that the cost of repairing failed systems and other forms of recovery in lawsuits is very high. An attorney who handles these cases estimated the exposure of defendants in the range of $30,000 to $40,000 per home. (Pers. Comm. with George Fleming, September 20, 1989.) San Antonio, Texas settled a suit over PB water service failures for $28 million. (Appen. G.) A lawsuit in Bakersfield against Parkside Partners concerning 242 units built with ABS DWV pipe resulted in damages of $2.1 million. (Thompson, appen. C, p. 6.)

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[28] The cases are listed by name in appendix F.

Complete replacement of PB systems with copper in San Diego county at Hillside Colony and in San Diego itself cost between $2,500 and $7,500 for each home. (Thompson, appen. C, p. 5.)

Camrosa County Water District and the City of Morgan Hill report higher costs for emergency repairs. Each incident averages $15,000 per line. (Thompson, appen. C, p. 6.)

c. Full Information on Failures is Not Available

What is known at present constitutes only a small portion of actual failures. There is no central clearinghouse for information on this subject, and there are several obstacles to the collection of complete information. Many failures are not reported to anyone but the local plumber who fixes leaks on a regular basis. There is no established process to gather information on individual failures of this kind.

Attorneys who specialized in litigation concerning plastic pipe are not entirely cooperative when asked for information concerning their cases, fearing adverse impacts on their settlement efforts. (Thompson, appen. C, p. 1.) Many of these attorneys have refused to provide any information or participate in surveys of the mechanical failure problem.

Finally, manufacturers, contractors and others who are responsible for the installation of plastic pipe have an interest in suppressing information about failures. These cases injure the reputations of contractors and reduce the value of affected properties. In at least two cases, contractors have threatened homeowners who sought to cooperate with investigations and surveys of failures aimed at establishing the extent of the problem. Both Jodine Downey and Rick Heistand of Simi Valley were told that their plastic pipe problems would not be fixed if they provided information to investigators. (Pers. comm. Dan Ritey, November 8, 1989.)

2. Causes of problem

a. Poor Quality Manufacturing and System Design

The source of the mechanical failure problem is different for the different piping systems. In some cases, the pipe system as specified is inherently flawed, in others, the material is not up to specification. The failed fittings and pipe identified in this survey all carried the appropriate IAPMO, NSF and ASTM stamps of approval.

PB has suffered greatly from mechanical failure because of a faulty pipe/fitting system. Past failures have been largely due to the failure of the fittings used to join the pipe segments. Fittings made from acetal copolymer are subject to attack by residual chlorine in the water.[29] As discussed earlier under PB formulation, problems with acetal fittings also pose a threat to PB pipe itself, and evidence of direct pipe failure is common.[30]

Until 1986, PB fittings were made from an acetal copolymer resin manufactured by the Celanese Corporation under the trade name of "Celcon." Celanese claimed the Celcon system had a service life of 50 years, comparable to that of copper. (Appen. H.) But Celanese, in 1969, was still trying to find a celcon resin that would last as long as 10 years and would not pit, crack, develop surface whiting, cratering, discoloration or leaks. (Appen. I.) Over the next decade, reports of corrosion problems were received from Celanese affiliates from around the world. (Appen. J.)[31]

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[29] Duval, DE. Review of the Celanese Corporation Technical Literature on Resistance of Celcon Acetal Copolymer to Chlorinated Water, LJ Broutman & Assoc. Chicago, IL. July 1, 1988. 13 pp. 43 ref. Duval summarizes information gathered for litigation on acetal fitting failures.

[30] The water service line failures in San Antonio and Marin County were failures of the pipe itself.

[31] Acetal resin manufacturers notified neither their customers nor retail consumers of the full limitations of their product. Shell Chemical Company "killed" stories intended as promotional pieces where plumbing leaks would reflect poorly on the product. (See appen. K.)

Celanese tested its fittings to the same standard as that used for polybutylene pipe, requiring it to withstand 500 PSI in 180 degree water with a confidence level of 85% or better. Nevertheless, Celcon's failure was dramatic. It could only withstand 20-40 PSI with less than 20% confidence. The Celanese solution was to recommend "back up positions be considered both from the technical and marketing points of view." (See appen. L.)

Additional problems arose from the "easy" installation using crimp rings to join the polybutylene pipe and Celcon fittings. "Easy" and "quick" installation required specialized tools that were not perfected after several generations. Worse, tolerance levels for the crimp ring diameter were set at 0.0015th of an inch. A larger diameter would result in leaks. A smaller diameter caused the fitting or the pipe to break. Field realities in plumbing installations preclude the use of such fine tolerances. (See appen. M.)

The Celcon fitting became the subject of so much litigation that Celanese Engineering Resins took action in 1985 to warn its plumbing customers of the "environmental limitations" in using Celcon. (Appen. N.) Celcon was withdrawn from "behind-the-wall" applications, from use in swimming pools, and, as was polybutylene, from use in recirculating hot water systems.

Representatives for the polybutylene pipe industry, as recently as 1989, insist the pipe itself does not fail. However, the North Marin Water District's experience of "prematurely deteriorated, decayed" pipe that had "become brittle due to oxidation in the ground" necessitating replacement after only 10 years of the claimed 50 year service life, is not unusual. (Appen. O.) Thousands of consumers in the United States had systems requiring repair. (Pers. comm. with Richard Rosenthal, attorney for homeowners, November 7, 1989.)

CPVC pipe has not exhibited the range of problems bedeviling PB. The pipe is inherently more resistant to attack by acids and by residual chlorine in the water supply. The chlorinated PVC resin is subject to degradation under heat, which poses a problem to extruders, but the normal exposure in use would not cause a problem to properly manufactured pipe.

Failures in CPVC installations are usually from poor joints. The solvent used to make the joint also softens the pipe at the joint. Applying pressure or

moving the pipe before the joint is fully cured causes permanent weakness and may lead to later breakage and leaks.

Future quality control will be a problem for CPVC. CPVC is a modification to PVC to improve strength and temperature resistance -- PVC is used for DWV and cold water PW, but cannot be used for hot water. Production of CPVC from PVC significantly increases cost of the resin. Cost cutting leading to poorer manufacturing methods, less complete or less homogenous chlorination and changing extrusion additives will increase the susceptibility to failure.

ABS pipe failure comes from chemical attack on the plastic and poor quality manufacturing. ABS is subject to attack by most organic solvents. Household chemicals (e.g drain cleaners, paint thinner) or very hot liquids rapidly attack ABS. The pipe either softens or is subject to surface stress and cracks abruptly from the induced stress.

Poor manufacturing results from an essentially unregulated use of regrind and recycle plastic. Cost competition in the ABS market forces local extruders to cut the average cost of resin by using second hand and off-specification material.

The extrusion process places the plastic under high temperature and mechanical shear. Many of the additives in the formulation are used to stabilize the plastic and aid in extrusion. However, after the plastic is put through several heating and extrusion cycles, there is significant cumulative damage to the polymer chain and mechanical properties are lost. Regrind waste from the extruder is not as good as virgin material.[32]

Further, much of the resin sold as ABS is not true ABS. Ideally, ABS is defined by a fairly specific ratio of the three constituent monomers: acrylonitrile, butadiene, and styrene. In ABS, the monomers are reacted to form a polymer with the various monomers linked together, giving the plastic uniform toughness.

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[32] Throne, JL. "Effect of Recycle on Properties and Profits: Algorithms." Advances in Polymer Technology v. 7 n. 1987, 4 pp. 347-360.

Because acrylonitrile, butadiene, and styrene are also used in other plastics separately, or in pairs, the recycle market offers an extruder a source of the same basic chemicals, but not actually reacted together to form true ABS. ABS pipe manufacturers purchase a resin suitable for extruding into pipe. If the resin contains the correct amount of the acrylonitrile, butadiene, and styrene subunits, it may pass as ABS, but the resin is only a mixture of the subunits, not an integrated chemical substance, and lacks the true mechanical properties ABS is supposed to possess.

Poor grade "ABS" resin is much more susceptible to organic chemical stress cracking because the different plastic particles in the mechanical mixture react differently to the chemical. Indeed even the solvent used for cementing the ABS together can introduce stress cracking at the joint leading to rapid failure.

b. Market Pressures and Recycling

The current market is well developed for ABS for DWV applications in California. The cost competition has already increased the use of recycled material in ABS pipe and this contributes to the problem of mechanical failure.

The problem with ABS will only increase as the pressure for recycling increases. State, federal and even local action to reduce the quantity of plastic in the waste stream will increase the amount of plastic available for recycle. Although a beneficial idea in principle, it is important that the recycled material find its way into the appropriate end product. It is difficult to exclude material that degrades ABS mechanical performance.

The same problem will develop with CPVC and possibly with PB. Already, the extruder can use regrind -- plastic waste from defective product -- to reprocess into pipe. Some filler can be added to the pipe resin to reduce cost.[33] However with more than a few percent of impurities, the material will loose strength. Both PB and CPVC are thermally compatible with other types of plastics -- basically, anything that melts in the same temperature range can be

[33] Calcium carbonate (chalk)/stearate can be added to CPVC. Shell adds 1.2% talc to pipe grade PB. RF Shimbor, Shell Chemical Co. letter to Myron Moskovitz, HCD. April 13, 1981.

mechanically blended. Much of the current patent literature deals with blends involving PB and other polyolefins, and CPVC and other vinyl or polyethylene polymers. With the proper colorant and a fresh dose of antioxidant or stabilizer, it is possible to use a substantial amount of regrind plastic and recycle to manufacture pipe resin.

The result is that the mechanical properties are degraded, particularly resistance to creep under heat, and that new chemicals are introduced into the pipe matrix. A "CPVC" resin mixture could incorporate PVC from a wide range of sources, and PVC scrap contains lead stabilizers and plasticizers. PB may be blended with other polyolefins containing antioxidants, flame retardants, and UV stabilizers not suitable for use in potable water systems. Both recycle streams will include contaminants other than the basic polymer family, such as residues of inks, coatings, adhesives, and impurities not removed in the recycling process.

The driving force for this is cost. The DEIR claims that CPVC installation costs about 20% less than metal for PW, and that PB cost about 35% less.[34] On the basis of that cost difference, the DEIR predicts that nearly all of the expanded use of plastic in California will be PB. Given IAPMO's recent prohibition on the use of PB, CPVC will most likely be the primary plastic contender.

Immediately upon HCD's action, there will be a vast market opportunity for CPVC manufacturers capable of beating the price of copper and CPVC sold by B.F. Goodrich. An unfavorable price/property balance for CPVC has been a major barrier to the chemical's growth.[35] More expensive than true commodity

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[34] However, the DEIR presents no analysis to support this statement with respect to CPVC. Indeed, the DEIR indicates that CPVC materials costs "are similar to those for copper." (DEIR, p. 12.) Moreover, the DEIR states in its section entitled "Economic Effects" that the use of plastics other than PB for PW use "would increase plumbing costs." (DEIR, p. 87.) As Dr. Dickens' analysis demonstrates, the use of CPVC in place of copper would substantially increase plumbing costs over current levels. (See *post*, section III.G.)

[35] B.F. Goodrich has expended a major effort to open the market for CPVC, persisting when all other domestic firms would not. Much of the published literature extolling the virtues of CPVC is written by B.F. Goodrich employees. The more reserved view is offered by RH (continued...)

plastics like PVC and polyethylene, and not as stable at high temperatures or as easy to mold as true engineering plastics, CPVC's big market opportunity is potable water applications. If HCD opens up this market, the cost factor will drive quality down and the mechanical failure problem will increase.

c. ASTM, NSF and IAPMO Cannot Protect the Public from Mechanical Failures

The UPC references plumbing material standards established by the ASTM. (UPC, ch. 2, table A, "Plumbing Materials Standards.") However, at present there is no independent governmental agency, private institution, or industry group that establishes or enforces effective standards governing plastic resin and pipe manufacturing and extruding

ASTM is a private organization established for "the development of standards on characteristics and performance of materials, [and] products . . . ." (1989 Annual Book of ASTM Standards section 8, volume 8.04 at iii, hereafter "1989 ASTM Standards," vol. 8.04 at iii") It establishes standards for the composition, size, strength and identity of some plastic plumbing pipe. Standards may be adopted, modified, or withdrawn at any time.

ASTM develops standards by a consensual process among interested parties, including manufacturers and governmental agencies. (1989 ASTM Standards, vol. 8.04 at iv.) Standards are usually written by the manufacturers

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[35](...continued)
Burgess (ICI, Ltd.):

> The softening point of PVC can be increased by chlorination of the product either in a solvent or as a suspension. Normally one grade of chlorinated PVC (CPVC) containing 63% chlorine is produced with a softening point of 120°C compared with 80°C for PVC itself. This grade is difficult to process and expensive so that if a lower softening point is acceptable blends of this product and PVC will be used in the proportions necessary to give the desired softening point. Products of this type have not been very successful commercially but are used for specialty markets such as hot water systems in mobile homes in the USA and for fibre manufacture in France. (R.H. Burgess. Manufacture and processing of PVC, MacMillan, New York, 1982, p. 99; emphasis added.)

of resins and pipe themselves. Each standard is reviewed in a five stage process. Proposed standards must be unanimously approved before they are adopted. (Pers. comm. with Elaine Christian, Assistant to the Director of ASTM, September 12, 1989.) Each participant exercises a full veto over the approval process and can disapprove any proposed standard for any reason.

Compliance with ASTM standards is entirely voluntary for pipe and resin manufacturers. The standards may be less restrictive than is necessary under certain circumstances. (1989 ASTM Standards, vol. 8.04 at iv.) ASTM is solely a standard-developing organization; it has no testing capability.

Virtually every one of ASTM's hundreds of standard specifications for various types and forms of plastic pipe contain a warning that the standard does not address all of the safety problems associated with plastic pipe. The warning reads as follows:

> This standard may involve hazardous materials, operations and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitation prior to use.

ASTM directs users of the standards to develop their own health and safety practices or to follow governmental limitations, of which there none, since ASTM, the NSF and other private groups are the sole source of standards for plastic pipe. (See 1989 ASTM Standards, vol. 8.04.)

IAPMO inspects pipe production at factories listed under its auspices from one to four times per year, although pipe production is carried on year-round. Despite these inspections, widespread failures of ABS and PB pipe have occurred in the past few years. (See, *ante*, section II.C.) This pipe has all been stamped as meeting ASTM and IAPMO standards. The failures of PB pipe have been so catastrophic that IAPMO has removed it from the UPC for potable water applications.

In addition, listing with IAPMO is entirely voluntary. Many installers will not have sufficient information to look for the appropriate stamps, and

competition among producers could lead to the marketing of unlisted pipe that is less expensive than listed products. Pressures to keep prices down, combined with state authorization of expanded uses for plastic pipe, could increase the usage of unlisted (and untested) pipe.

The DEIR discussion is legally inadequate because it fails to investigate even issues raised in the text of the DEIR itself. The DEIR does not discuss the listing and inspection procedures of IAPMO and NSF, nor does it reveal the serious questions that have been raised about the adequacy of these purely private and voluntary procedures.

3. Importance of Considering Mechanical Failures in the EIR Process

Mechanical failure with plastic pipe systems produces direct environmental impacts from the failure itself, causes economic impacts through repair and replacement costs and property damage, and results in indirect impacts by forcing changes in pipe formulations. The DEIR does not address any of these direct impacts, economic impacts, or impacts on future pipe and fitting formulations.

a. Direct Environmental and Public Health and Safety Impacts

Failure of potable water systems is usually sudden because the system is under pressure and the pipe tends to burst when it fails. The break can happen at any place in the system, but is likely to affect the living area of the house.

Loss of property and aggravation are obvious impacts on the homeowner that create harm beyond economic damage. However, water in the living area creates an electrocution hazard. The electrical code requires ground fault circuit interrupters in all "wet areas" (i.e. bathrooms and out-of-doors), but wet floors in other living areas of a residence are not protected. Even when wet floors are the result of an accidental pipe break, a building inspector would declare a residential or commercial structure unsafe where water creates an electrical

hazard. A pipe failure can result in a direct hazard, or a forced evacuation from the damaged building.

Water line breaks under a slab foundation could damage the foundation and threaten the safety of the structure. Water in the soil from the pipe break would become contaminated by contact with the soil. Immersion of a broken potable water line in the ground creates a risk of back-siphon and system contamination when the water pressure drops (e.g. when the main is shut off for repair).

Failure of DWV systems poses the obvious risk of unsanitary conditions from raw sewage and vent gas. Protection of the public health is the motivating purpose for plumbing systems. When ABS-based DWV pipe breaks, the living space of a house is contaminated by sewage. In multifamily dwellings, the sewage could originate in another dwelling, introducing disease.

These significant impacts should be discussed in the EIR. Data are available on the extent of pipe failure. The economic analysis should reflect the cost of premature failure, and the environmental impact analysis should discuss the potential for failures leading to unsanitary and hazardous conditions.

b. Economic Effects

The economic analysis in the DEIR completely fails to consider the economic effect on consumers of mechanical failures of pipe. Particularly toward the end of its service life, plastic pipe is subject to "cracking, splitting, splits, stress fractures, pinholes and shear breaks." (DEIR, p. 88). Such failures can cause disastrous and costly water damage to structures as well as requiring costly replacement of the pipe system inside walls and under floors. Many homeowners' insurance policies exclude damage caused by plumbing failure due to normal wear and tear on the components. Pipe replacement costs are also far higher than initial installation cost because plumbers must work with enclosed structures rather than the open framework of a building under construction.

The failure of the DEIR to fully consider the mechanical failure of plastic pipe produces inaccuracies in its economic analysis. For example, HCD may determine, based on the inability of ABS and PB pipe to carry water and waste reliably, that these types of pipe should not be approved. In that case, the only

remaining piping materials under consideration are PVC and CPVC, both of which are substantially more expensive than metal. An economic analysis based on these assumptions would have to conclude that metal is cheaper than plastic. In contrast, the DEIR concludes that plastic is marginally cheaper than metal.

4. Study of PB Failure History Required to Support Departure from UPC Standards

a. IAPMO Has Voted to Ban PB Pipe Because of its History of Mechanical Failures

In September of 1988, IAPMO voted at its annual conference in Seattle, Washington to withdraw authorization for PB pipe and prohibit all use of the pipe in plumbing systems governed by the UPC. IAPMO's voting membership is limited to its Class A members, which include only government plumbing officials. These plumbing officials voted to ban the use of PB pipe after hearing extensive evidence on the history of PB mechanical failures

After the IAPMO vote in September 1988, the Plastics Industry submitted various code change proposals requesting that IAPMO reverse itself and reinstate approval of PB. These code change proposals were considered by IAPMO at its 1989 annual conference held in September in Sparks, Nevada. The conference delegates were presented with an IAPMO staff report summarizing the PB issue and recommending disapproval of the proposed code changes. The conference again considered the evidence and heard extensive debate on the mechanical deficiencies of PB plumbing pipe. (Reporter's Transcript ("R.T."), IAPMO Annual Conference, Sept 26, 1989, pp. 87-145.) Despite Plastics Industry arguments that mechanical problems with the pipe had been resolved, the plumbing officials responsible for publishing the UPC voted overwhelmingly to reject the code change proposals and reaffirm their decision to ban the use of PB pipe. (R.T., *supra*, p. 131.)

b. HCD Must Show PB Use is Necessary in California and Will Not Jeopardize Public Health and Safety

The State Housing Law requires HCD to adopt building standards which "impose substantially the same requirements as are contained in the most recent editions" of the uniform industry codes. (Health & Saf. Code § 17922.) In

submitting the proposed building standards to the State Building Standards Commission, HCD must also demonstrate that "national specifications, published standards, and model codes have been incorporated," or that such specifications, standards and codes do not "adequately address the goals" of the Department. (Health & Saf. Code § 18930, subd. (a)(7).) The California Building Standards Law also requires that state building standards be "consistent with state and nationally recognized standards for building construction in view of the use and occupancy of each structure to preserve and protect the public health and safety." (Health & Saf. Code § 18941.)

The courts have held that the "protection of public health and safety" was the "paramount policy" underlying the 1970 amendments to the State Housing Law requiring HCD to adopt building standards based on the uniform industry codes. (*Baum Electric Company v. City of Huntington Beach* (1973) 33 Cal.App. 3d 573, 581 [109 Cal.Rptr. 260, 266].) Thus, HCD is permitted to depart from the model codes only "[i]f [it] determines that a material, appliance, installation, device, arrangement or method of construction which is not permitted under the uniform codes is as safe as that permitted under the codes . . . ." (43 Ops.Cal.Atty.Gen. 27, 30 (1964).) HCD must also show that applying the uniform standards in California "would be unreasonable or unnecessary or ill advised." (63 Ops.Cal.Atty.Gen. 566, 578 (1980).)

IAPMO's overwhelming vote at both its 1988 and 1989 annual conferences to prohibit the use of PB makes it virtually certain that the 1991 UPC will not list PB as an authorized material. Given that the IAPMO action was specifically based on the economic loss and damage caused by the mechanical breakdown of the pipe, HCD's proposed blanket approval of PB pipe for potable water use in California must be supported by substantial evidence showing that the protections currently afforded California consumers will not be jeopardized by this action. The DEIR currently contains no discussion of the PB mechanical failure problem.

It is also clear that HCD must examine the PB mechanical failure problem (as well as the failure of ABS pipe) in the context of this EIR, even though the PB ban will not be effective until the 1991 edition of the UPC. CEQA requires that potential environmental impacts be considered at the earliest possible time. (14 C.C.R. § 15004, subd. (b).) It does not permit the lead agency to "piecemeal" a project and consider environmental effects in conjunction with

separate approvals. (*Bozung v. LAFCO* (1975) 13 Cal.3d 263 [118 Cal.Rptr. 249].) Considering the PB issue is particularly critical in the context of this review since the DEIR's environmental analysis assumes that PB will replace copper for potable water use in California. The use of a different plastic material, i.e., CPVC, could lead to dramatically different conclusions.

D. DEIR Fails to Consider Impacts Resulting from Plastic Pipe Installations in Non-Residential Structures

Despite the fact that the proposed code changes would permit plastic pipe use in commercial, office and industrial buildings, the DEIR only considers impacts from residential installations. This critical omission undermines the entire environmental analysis. It is impossible for the DEIR to accurately identify the nature and scope of the potential public health and safety threat from plastic pipe given that whole classes of affected occupancies have been left out of the analysis. The failure to consider impacts from plastic pipe use in non-residential buildings is particularly disturbing given that the DEIR itself acknowledges that impacts resulting from commercial, office and industrial applications could be more significant than in residential applications. (DEIR, appen. C, pp. C-227 - C-228.)

1. The California Building Standards Code Applies to All Occupancies

The DEIR restricts the scope of its analysis on the ground that "[HCD's] regulations do not affect the piping allowed in . . . commercial and industrial applications," since it has jurisdiction only over residential structures. (DEIR, p. 1.) This statement is incorrect; although HCD's enforcement jurisdiction is limited to residential dwellings, once its proposed code changes are approved by the State Buildings Standards Commission and codified in the California Building Standards Code, they apply to all occupancies in the state. The statement also ignores CEQA's well-settled requirement that an EIR must address the environmental effects of the whole project, even if portions of the project are beyond the jurisdiction of the lead agency.

A recent amendment to the California Building Standards Law[36] expressly provides that the building standards contained in the model codes, as referenced in the State Building Standards Code, "shall apply to all occupancies throughout the state . . . ." (Health & Saf. Code § 18941.5, subd. (a).)[37] The legislative history of this provision demonstrates that the express purpose of this amendment was to extend to commercial and industrial buildings state building standards adopted by state agencies with jurisdiction only over residential occupancies.

The amendment to Health and Safety Code section 18941.5 was enacted in the 1988 legislative session by SB 2871. (Sen. Bill No. 2871 (1988 Reg.Sess.) ch. 1302.) The first policy committee report on the bill included the following analysis, which was repeated in all subsequent Committee reports on the bill in both the Senate and the Assembly:

> SB 2871 would require all local agencies to adopt the most recent edition of the model codes as adopted by the state within 180 days from the date of publication by the State Building Standards Commission <u>and expands the application of these model codes from residential only, to all occupancies</u> . . . . [¶] [T]his measure is intended to bring uniformity to the application of building standards contained in the model codes to all types of occupancies, including

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[36] Effective January 1, 1988, the State Building Standards Law was renamed the California Building Standards Law. (Govt. Code § 18910.)

[37] Additionally, it should be noted that the UPC applies to all buildings -- residential, commercial and industrial (UPC § 103, subd. (m).) HCD is required to adopt building standards that are "substantially the same" as the uniform codes. (Health & Saf. Code § 17922, subd. (a).) An amendment restricting applicability of UPC requirements to residential structures would not comply with this requirement.

Even the ERD acknowledged, albeit in a somewhat ambiguous manner, that the proposed HCD amendments would affect non-residential occupancies based on the broader scope of the UPC provisions: "[HCD regulations affect] standards for commercial and other construction only indirectly through association (the UPC, for example, is intended to apply to commercial as well as residential construction)." (ERD, p. I-3, original parenthesis). The DEIR omits this reference and ignores any applicability of the proposed code changes to non-residential structures.

> residential, industrial and commercial buildings. Currently, there is confusion among contractors, builders and designers about which edition of the model codes apply to nonresidential buildings." (See Sen. Housing and Urban Affairs Com. Rep. on SB 2871, pp. 1 - 2 (1988 Reg. Sess.).)

The fact that state building standards are adopted based on programmatic authority, e.g., HCD adopts building standards based on its authority over housing, had created confusion and lack of uniformity in enforcement given that building codes are administered based on type of occupancies. The author of SB 2871 explained that his bill was intended to resolve this problem:

> These state programs, e.g., energy, handicap, seismic, etc. are the result of years of legislative initiatives to meet specific needs that were not addressed in 'model' codes. Model codes have always been written, not to address programs, but to aid design of <u>occupancies</u>, i.e., specific types of construction . . . . [¶] State amendments to model codes, therefore, were not addressed to specific occupancies, and as a result a patch-work of programs and occupancies developed, without clear authority and regulations for all occupancies . . . . [¶] An industrial building in Sacramento may not be required to meet any of the states programs, depending on the use of that building . . . . [¶] My Senate Bill 2871, the 'code uniformity' proposal simply says: let us apply the State Code, Title 24, to all occupancies. <u>Therefore, the commercial/industrial occupancies will comply with the state code and its amendments</u>. (Statement of Senator Milton Marks, Sen. Housing and Urban Affairs, April 5, 1988; second emphasis added.)

Thus, it is clear that the proposed code changes will apply to non-residential construction after approval by the State Building Standards Commission and inclusion in the California Building Standards Code. As lead agency, HCD is required to consider the impacts on plastic pipe use in commercial and industrial occupancies even though HCD does not have enforcement jurisdiction over these buildings and even though subsequent approvals are required.

HCD is required to submit the proposed code changes to the State Building Standards Commission for approval. (Health & Saf. Code § 18930.) The Commission may approve, reject or return proposed building standards to the adopting agency for amendment. (Health & Saf. Code § 18931.) In this case, the proposed building standards must also receive written approval of the State Fire Marshall. (Health & Saf. Code § 18930, subd. (a)(9); see discussion, *ante*, section III.D.1.(e).) Except under narrow circumstances, the building standards approved by the Commission must be adopted by local governments. (Health & Saf. Code §§ 17958, 17958.1 and 18941.5.)

In cases where a project must be carried out or approved by more than one agency, CEQA requires that a lead agency be designated to prepare the environmental documents for use by all responsible agencies. (14 C.C.R. § 15050.) The agency to act first must generally be designated the lead agency. (*Citizen Task Force on Sohio v. Board of Harbor Commissioners* (1979) 23 Cal. ed 812 [153 Cal.Rptr. 584].) In this case, HCD was designated the lead agency since, as the adopting agency, it will be the first to act on the code change proposal. All other agencies with subsequent approval power must participate as responsible agencies and must rely on HCD's environmental analysis. (Pub. Resources Code §§ 21980.3, 21080.4, 21104 and 21166.)

CEQA expressly requires that the lead agency consider the potential effects of the whole project, not just that portion of the project within its jurisdiction. (Pub. Resources Code § 21002.1, subd. (d).) The CEQA Guidelines explain that the term "project" means "the whole of the action" under consideration and "which may be subject to several discretionary approvals by governmental agencies. The term 'project' does not mean each separate governmental approval." (14 C.C.R. § 15378, subds. (a) and (c).) The courts have also held that an EIR must consider the environmental effects of the whole project, even if parts of the project are beyond the jurisdiction of the lead agency. (*City of Carmel-By-the-Sea v. Board of Supervisors* (1986) 183 Cal.App.3d 229, 241-247 [227 Cal.Rptr. 899, 907-911], *Bakman v. State Department of Transportation* (1979) 99 Cal.App. 3d 665 [160 Cal.Rptr. 583], *Bozung v. LAFCO* (1975) 13 Cal.3d 263, [118 Cal.Rptr. 249], *EDF v. Coastside County Water District* (1972) 27 Cal.App. 3d 695 [104 Cal.Rptr. 197].)

HCD is clearly required under CEQA to consider the effects of expanded plastic pipe applications in non-residential buildings, even though it is the action

of the State Building Standards Commission that will extend the proposed code changes to these buildings. As discussed below, these effects could be significant. A failure to consider the impacts from non-residential installations would require a separate environmental analysis prior to action by the State Building Standards Commission on the proposed code amendments. This is precisely the kind of "piece-mealing" of a project that CEQA was intended to avoid. (*Bozung v. Local Agency Formation Commission, supra*, 13 Cal.App.3d 283-284 [118 Cal.Rptr. 249].)

2. Environmental Effects in Residential and Non-Residential Structures would be Different

The DEIR itself recognizes that the impacts from plastic pipe installation in non-residential structures would be different and, in some respects, potentially more significant than the impacts identified with respect to residential installations. The DEIR's Technical Appendix on worker health consists of the DHS study of the potential health hazards for workers installing plastic plumbing. The study report acknowledged that its findings were limited to residential installations and specifically indicated that worker exposures in non-residential buildings were likely to be higher:

> This study had several limitations which should be considered when interpreting its results. The most fundamental of these limitations was that the scope of the study was limited to residential installations. Most plumbers do many types of installations during their careers at a mix of residential, commercial, and industrial sites. Commercial and industrial installation, typified by larger pipe sizes and extensive piping systems, are likely to produce higher exposures than occur in residential work. Conclusions about the possible hazards of installing residential plumbing do not directly apply to the hazards faced by these same workers at other sites." (DEIR, appen. C, pp. C-27 - 28, emphasis added.)

The conclusion of the DEIR's own Technical Appendix on worker health that worker exposures are likely to be higher in commercial and industrial installations is particularly significant given that the DHS study found exposure levels with residential installations in excess of established short term limits for some of the solvents at issue. (See discussion, *post*, section III.C.) Under these circumstances, CEQA would clearly require an examination of worker exposure

hazards in non-residential installations before plastic pipe could be authorized for such applications.

It is also likely that the DEIR's analysis of the leaching dangers of plastic pipe would produce different results in the case of non-residential occupancies. The DEIR indicates that, "[i]n determining the possible impacts of chemicals in pipe leaching into potable water, the time that the water remains in the pipe is . . . a critical variable." (DEIR, p. 29.) The second critical variable considered by the DEIR is the nature of water use in a residence, including the amount of water stored in the plumbing system, the amount used for drinking versus other uses, frequency of water replacement in plumbing lines and similar considerations. (*Ibid.*) These two critical determinants of the leaching danger would clearly differ in the case of non-residential occupancies.

The dwell time profile in an office or commercial building would be markedly different from the dwell times found in residential structures. These buildings are generally unoccupied after 5:00 P.M. and on weekends, resulting in significantly longer dwell periods than assumed in the DEIR. These buildings also include some systems, such as drinking fountains, that are used exclusively for drinking, sometimes with great intervals between usages. This again produces different assumptions from those applied in the DEIR.

The use of underground plastic piping to carry drinking water on industrial and commercial sites also raises a serious potential permeation hazard. There is extensive soil contamination throughout the state, and industrial and commercial developments are more likely to be located on contaminated sites than are residential developments. Although the Council disagrees with the DEIR's treatment of the permeation issue with respect to residential installations it is clear that a potentially significant permeation impact must be addressed with respect to industrial and commercial sites.

The DEIR's restricted project definition also distorts the DEIR's analysis of the fire danger. For example, the fuel loads present in residential construction are substantially less than those found in many of the other occupancies found in the UBC. In residential buildings, a ten pound square foot fuel load is much longer than assumed in the DEIR. In other occupancies, this fuel load can be four times that amount, i.e. 40 pounds per square foot or more.

The square footage of all buildings constructed per year in California, aside from residential buildings of not more than three stories in height, is very substantial and is also ignored in the DEIR's assessment of impacts. The effect of height on propagation of fire spread in tall buildings of residential or any other occupancy has been ignored in the DEIR. This stack effect can be considerable, and can spread fire from lower to upper stories of a building via the combustible piping. Finally, hospitals and other institutional buildings use as much or more plumbing as does a residential building. The effect on safety of the use of combustible piping on these institutional buildings has been ignored in the DEIR.

III. DEIR FAILS TO CONSIDER ADEQUATELY THE POTENTIAL IMPACTS OF EVEN THE NARROW PROJECT IT ADDRESSES

A. Drinking Water Contamination

The DEIR does not correctly identify the potential risk from drinking water contamination, even under its narrow project definition. This misrepresentation is compounded by an overstatement of the hazard from lead in drinking water under current law, resulting in a seriously flawed analysis of alternatives and mitigation.

1. DEIR Misrepresents Public Health Impacts by Relying Exclusively on the Cooper and Butter Studies

CEQA requires HCD to examine a reasonable worst case for environmental impact. (*Las Virgenes Homeowners v. Los Angeles* (1986) 177 Cal.App.3d 300 [223 Cal.Rptr. 18].) The two recent state sponsored studies, Cooper for water leaching and Bellows for worker health, add valuable information to the EIR process. For Cooper, a protocol was designed to help fill data gaps in certain areas of knowledge. However, Cooper could not answer questions beyond the specific focus of the study.

The effect of chlorinated water is a major issue not addressed by Cooper. Indeed, the possible significance of the role residual chlorine might play was only brought home by the high solvent levels observed by Cooper. Faced with the deficiency in the HCD testing program, the EIR authors went back to tests

performed by McKesson Environmental Services ("MES") laboratory for the Vinyl Institute (Butter, 1986).

The DEIR makes a significant error in its reliance on Cooper and Butter to the exclusion of a broad analysis. As stated before, the DEIR's complete failure to address the issue of plastic pipe formulation leads it to overlook a significant public health threat. Similarly, a narrow presentation of Cooper and Butter overlooks the limitations inherent in those studies.

Each study is simply a sample of the phenomena under investigation. Changes in any parameter of the tests would change results (the DEIR even notes this in explaining differences between Cooper and Butter). What the DEIR does not do is examine how sensitive the results of either study might be to variations in test conditions such as ambient temperature, number and quality of joints, composition of water, flush/dwell ratios and times, etc. Without an insightful analysis, the DEIR cannot adequately inform the public about how differing conditions in California could affect public health.

In essence, the DEIR reasons that if Cooper or Butter did not see it, it cannot happen. That is obviously wrong, because Cooper and Butter did not study everything. Rather than expend effort in analysis, the DEIR author takes the convenient way out. Instead, the DEIR should examine the few test results, including older tests, to establish a reasonable range of public health impacts. Perhaps the typical level of drinking water contamination would be as described, but under what conditions could levels be twice as great, or more? What would the worst case be? This approach is commonly done in environmental analyses such as air quality assessments and health risk assessments. It should be done here.

2. DEIR Fails to Consider Historical Data

a. Relevant Data on Leaching from Plastic Ignored

The DEIR does a great disservice to the decision making process by discarding data available to the ERD, gathered before 1983. The review of the earlier studies lead SRI to recommend further simulation testing. The recommendation was prompted by the need for certain pieces of information and improved experimental design, not by utter rejection of the earlier data.

Although some of the early studies have drawbacks[38], each one also contains useful information. However, if a past study implies a potentially significant health risk, the EIR must either explain precisely why the result is wrong and could never happen, or explain what measures HCD must take to prevent such conditions in California.

The early studies, such as Montgomery 1980 and 1982, show that high levels of chloroform and other chlorinated organic compounds can result in CPVC systems. The lower levels observed by Cooper can be attributed to any of the following: 1) changed manufacturing methods between 1982 and 1987, 2) different cements used, 3) longer dwell times in Montgomery, and 4) effect of chlorine in water.

The DEIR provides no basis to conclude that the levels seen in Montgomery could not be found in a PW system approved under HCD's proposed action. The DEIR selects only a part of the Butter study, ignoring the follow-up work that reported similar concentrations as found by Montgomery.[39] This is an example of selective reporting which leads to inaccurate conclusions. CEQA requires a balanced, complete inquiry. (14 C.C.R. § 15151.)

CEQA also requires that an EIR consider the significance of impacts under worst case conditions. In this case, the EIR must use the earlier studies as a means of establishing a higher range of potential exposures under worst case conditions. The significance of these exposure levels for public health must be examined.

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[38] For example, some studies used conditions more extreme than normal usage, had little guidance from prior efforts in analytical methodology (e.g solvent interference), or suffered from technical errors (e.g DEHP introduced by water supply connection tubing).

[39] McKesson's follow up study (Part 4) used "protocol water" (not chlorinated) and found chloroform from CPVC at levels up to 27 ppb in preoccupancy water. Such findings easily extrapolate to Montgomery's finding in the two week dwell.

b. DEIR Analysis of Metal Is Based on Studies of Now-Banned Lead-Based Solder

The DEIR's treatment of metal piping contrasts sharply with its treatment of plastic. In the plastic case, all old data are discarded; in the metal case, old studies are used exclusively. The Cooper study did not examine metal pipe. Butter studied copper pipe with 50/50 tin/lead solder. No current study with a defined protocol is available for no-lead solder; that is why the DEIR relies on old data.

Continuing reliance on metal plumbing is the No Action alternative, and is not part of the project. In fact, state law already restricts the amount of lead in solder to 0.2% (p. 58); what is already state law is not mitigation. The analysis in the DEIR on pages 35, 36, 42, 43 and Table 11 reflects conditions contrary to current state law. The discussion should be amended to clearly convey the extent of lead leachate from no-lead copper systems.

The comments here on lead are not meant to belittle the public health significance of lead in potable water. Indeed, the California Pipe Trades Council led the fight to ban lead solder in PW use. When the ERD was prepared, lead-based solder was allowed and the lengthy discussion had more relevance. While it is understandable that an EIR author is loath to discard text, the present treatment of lead in PW produces a significant bias in the document. The DEIR conveys a false impression that No Action--No Plastic means lead-based plumbing systems. That is not true.

With a correct presentation of the status of lead, the DEIR would show significantly less impact from metal pipe. The DEIR's recommended mitigation is current law and requires no further action on the part of HCD.

3. Sanitary Engineering and Environmental Health Research Laboratory Study (Cooper, 1987)

a. Problems with Protocol and Implementation of Study

The University of California Sanitary Engineering and Environmental Health Research Laboratory (SEEHRL) and Acurex, the analytical lab, operated under the HCD defined testing protocol. As seems inevitable, SEEHRL and

Acurex were forced to deviate from the defined protocol during the test. HCD and DHS discussed deviations from protocol but the DEIR does not. It would be valuable to have an organized presentation of the subject to allow the reader to better understand the limitations in the available data. The DEIR appendix A, Podoll's analysis of the Cooper work, should list deviations from the protocol and make it clear which test systems, analytical methods, and dates were affected.

In review of the Cooper study, the Council's consultants noted many problems. Given the magnitude of the challenge, the Council thought that the Cooper study was well done and provided useful information. However, the Council did expect SRI to conduct a thorough review of the Cooper work and base the DEIR discussion on a more sophisticated understanding of what Cooper was actually able to accomplish and what the significance of the Cooper results are to HCD's proposed action.

(1) Impaired Limit of Detection

The Cooper Study revealed large, persistent concentrations of organic solvents in the test water. The same solvents were found in the glues used to assemble the pipe. It had been anticipated that the solvents would pose an analytical problem to the lab -- the difficulty of detecting small quantities of some chemicals in the presence of large quantities of others. It seems that Cooper has done a far better job in dealing with solvent interferences than previous attempts by others, but the interferences persisted nonetheless and forced the testing lab, Acurex Corporation, to deviate from the original testing protocol. Cumulatively, the deviations reduce the resolving power of the test and make the DEIR's unquestioning reliance on the results even less appropriate.

In particular, what were the specific techniques used to reduce the adverse effects of high solvent levels? The report mentions sample dilution. What other methods were used (e.g. diversion of the solvent peak away from the detector)? The lab requested changes in protocol not to improve levels of detection for trace contaminants, but to reduce residual solvent loading on the instrument. How much did the presence of solvent residual reduce levels of detection for trace contaminants?

In all, the EIR should explain to the public what the resolving power of the test/analytical system was and compare the limits of detection (LOD) reported with health risk standards. For example, the LOD for chloroform exceeds the US EPA 10^{-6} cancer risk level. That means that water could contain chloroform at several times the appropriate risk level and the Cooper/Acurex test would not have detected it.

(2) Not All Leachates Identified

Contrary to the intent of the protocol, there was no substantive effort made to identify the Non-Priority Pollutants in either PB or CPVC test waters. This was understood to be a difficult part of the program, but is was equally clear that health concerns from plastic pipe were not limited to the few compounds listed by EPA as priority pollutants.

Acurex endeavored to sharply restrict the breadth of investigation required for non-priority pollutants, asking that HCD/DHS provide identification and standards in advance of the analysis and pay for additional characterization work. HCD staff resisted the change: "First, there is no way of identifying in advance what 'unknown' chemicals will be present in the pipe leachate. A major reason for the study is to allow a laboratory to identify compounds in the leachate. Second, the request for bids provided no time or money for such a secondary study." (Letter from Julie Castelli Nauman, Chief Deputy Director, HCD to Robert Cooper, Project Director, SEEHRL. May 27, 1987, appen. P.)

In the end, very little was done. Acurex reports a few "peaks," denoting chemicals coming off the column for both CPVC and PB, but does not identify them. The ostensible reason is that the peaks disappeared or were sporadic in appearance and would not be significant leachates. The Council is concerned that the analytical procedure may have masked the presence of the unknown substances.

The problem with solvent interference in CPVC systems clearly reduced the lab's ability to detect non-priority pollutant substances. But even with PB, the methods used may not have had optimum resolving power. The protocol specifies, "Identification of additional peaks ... shall be made when the chemical is present at a concentration equal to or greater than 10% of the nearest internal standard (of approximately 50 ug/l)." (HCD Protocol, January 1986. p.

4.) In careful review of the Acurex report, the Council notes extensive discussion of internal standards, but do not see verification that the standards were present at "approximately 50 ug/l," nor does the Council see a discussion of how the non-priority peaks were selected for study.

The likely presence of chemicals in leachate not reported by the lab is illustrated by an accident. When samples were left uncapped, some of the solvent evaporated before they were analyzed. "Two or three of the samples showed unknown peaks due to the concentrating of materials and other effects associated with the loss of solvent. These unknowns were not seen in any other day's samples, suggesting that they were an artifact associated with the day 45 acid analysis. Normally these materials would be well below the detection limit of the instrument." Cooper study, appen. K, p. 23, emphasis added.)

The EIR should present some sense of the magnitude of unidentified substances. What was the quantitative extent of material on the chromatogram that was not identified? Has SRI made an independent review of the Cooper/Acurex data to place confidence on the finding that no compounds other than the few noted in the DEIR could be in leachate from plastic pipe?

(3) Sample Mixup or Analysis Conducted Past Due Date

According to Acurex, several samples were mixed-up. The acid extracts for day 45 were combined inadvertently with the base neutral fractions for samples for day 50. During the re-analysis it was discovered that the acid extract had been left uncapped and the sample volume had changed." (Cooper study, appen. K, pp. 22-23.)

The HCD protocol requires the samples to be analyzed within 14 days. In several cases this was not done by the lab. Although not reported by Acurex, the date on the result summary shows that the samples for solvent cements were analyzed some 40 days late.

(4) Sample and Column Contamination

The ability of the lab to detect and identify small quantities of chemicals depends on freedom from contamination. Reports of occasional appearances of

chlorinated organics and phthalate esters are dismissed as contamination. Samples collected from PB pipe systems were apparently run on equipment impaired by high solvent left from runs on CPVC pipe systems. "Some of these [organic chemicals in PB pipe] appear to be attributed to laboratory contamination or carry-over in the analytical instrument from CPVC samples." (Cooper, appen. K, p. 15.) "An occasional problem was noted of carry over of ketone species (acetone, tetrahydrofuran, 2-butanone, [MEK] and cyclohexanone) into the control an PB samples." (for method 624, Cooper, appen. K p. 20.) " ... an occasional problem of ketone carryover was noted in control and PB samples in spite of efforts to avoid this by use of intermediate blanks and bake out procedures." (Cooper, appen. K, p. 25) "Two recurring laboratory contaminants were noted in the samples. These were the mono-2-ethylhexylester of hexandioic acid and hexadecanoic acid." (Cooper, appen. K, p. 21")

The prospect of solvent carryover is addressed in the HCD protocol. The protocol warns, "The contractor shall take appropriate steps such as disassembling and cleaning the purge and trap apparatus and running blank samples between the analyses of actual test samples to demonstrate that these substances have been reduced to background levels." (HCD, "Test Protocol Plastic Pipe Leaching Study," January 1986.) It is not clear that the contractor was able to so demonstrate.

(5) Inadequate Analysis of Cements

The HCD test protocol states that the joint compounds shall be analyzed. Cooper reports a partial analysis in its appendix J. The analysis is plagued by high levels of dominant solvents such that there is no resolving power for lower level constituents and contaminants. The first analysis effected a limit of detection of 500,000 ppb for priority pollutants -- any hazardous constituent present below this amount would not have been reported. The sample was run later with the major peaks diverted from the detector and the sample could be run without dilution. The limit of detection was improved, but the subsequent analysis was conducted on April 30, 1987, nearly six weeks after the first analysis. The sample was significantly past the required holding time requirement which reduces the recovery of trace contaminants.

In reviewing the HCD file on the Acurex analysis of cements, there is clear dissatisfaction on the part of HCD with the lab's performance, primarily because detection limits are so poor. The delayed analysis did not resolve the concerns raised by HCD or DHS staff.

In the study for the Vinyl Institute, McKesson Environmental Services was able to conduct a more insightful analysis of the solvent cements. (MES, 1986. Table 3, page III-18 to III-20.) Cooper apparently did not attempt to analyze the cements for DMF, a compound found earlier by MES and of public health interest. Cooper detected none of the chlorinated organic compounds found by MES.

Failure to carefully study the solvent cement and primer flaws the Cooper study. First, the analysis was required by the protocol. Second, considering that Cooper found that solvent leached rapidly into the water, it would warrant an effort to find out what was present or to be sure what was not present. A significant defect in project description discussed earlier is the failure to account for formula variability and contamination in solvent products. The point may be demonstrated by a comparison of the Cooper study, which found only low levels of chlorinated organics, with the McKesson elevated temperature study, which found high levels of chlorinated organics. McKesson did find chlorinated compounds in the cements; that may be a significant potential source of public health hazard. The EIR should address the question: Did the Cooper study fail to find chlorinated organics because the cement and primer used were relatively free from contamination?

(6) Duplicates Left Out of Average Values

The lab was routinely sent duplicate samples for backup analyses. The protocol called for analysis of the duplicates when required to resolve inconsistent results and a certain number were selected randomly for analysis as part of the quality control. It seems that the solvent concentrations reported in the main body of the Cooper report and used in the statistical analysis of leaching rates were based on averages that excluded the duplicate data when inclusion of the duplicate would have raised the average. Inclusion of duplicate data would increase the average for THF and slightly reduce the variance in the results.

(7) Reporting of Data Out of Linear Range

The analysis in the DEIR relies on leaching data from the preoccupancy period for its assessment of worker health and for projections of leaching kinetics. However, the solvent levels in the beginning of the simulation period were extremely high, and for some tests, were beyond the instrument's linear range of response. This is noted on Acurex's data sheet, "These values are approximations because they are out of the linear range of the instrumentation." (Cooper, appen. K, various tables, e.g., table 7.4). In the text, Acurex explains that the when a compound was out of linear range, the quantity was estimated by various means and the results reported to one significant figure. (Cooper, appen. K, p. 6.) The EIR should acknowledge the imprecision of the high solvent values and take these into account in statistical analysis of the results.

(8) Inadequate Statistical Analysis

One of the greatest disappointments in the SRI and Cooper work is the short shrift given statistical analysis of the data. Acurex provided a simplistic analysis of the test data. Acurex took widely scattered data -- a few points with a high variance -- and concluded ingenuously that the differences between two duplicate pipe units A/B and C/D were not statistically significant.

Robert Cooper, SEEHRL director, presumably had at his disposal capability to perform an insightful analysis of the data but chose not to do so. "The University [SEEHRL] will not be responsible for the analyses (including statistical) of the data generated by the contract laboratory. These latter functions will be taken care of by the consulting laboratory and others appointed by the State staff." (Memorandum from Robert C. Cooper to Marion B. Lentz, Sponsored Projects Office, Univ. Calif. Berkeley. November 12, 1986. Attachment D to SEEHRL contract with the State.) Hence, Cooper only reported average values for the solvents (Tables 7 to 10, and Figures 4 through 7).

The DEIR appendix A presents one semilogarithmic plot of one solvent for one type of pipe, but offers no further statistical analysis. Even that figure, (Figure 1) would be improved if the y-axis were labeled in actual concentration units instead of natural log units. The casual reader may not realize that "7.0" on the graph's y-axis corresponds to 1100 ppb.

The rate of solvent leaching is important in determining the public health impact of CPVC systems. The DEIR acknowledges, "The greatest uncertainty in plastic pipe leaching is estimation of the concentration-time profile of the CPVC cement solvents. The inherent variability in cement application procedures and the assumption of continued exponential decline of the concentration are the principal causes of these uncertainties." (DEIR, appen. A., p. A-10) Faced with this reality, SRI relies on "extrapolation of test data" to set concentration limits.

One concern is that the extrapolation is based on a simple extension of the semilog plot without an analysis of the variability inherent in the test data and the further variance from other factors (such as the cement application procedures cited by SRI). The DEIR does not disclose the method of the model used in the extrapolation. The graph in Figure 1 looks like an "eyeball" fit. Was curve fitting used? If so, the EIR should report the correlation coefficient and state whether data were lumped. Were analyses conducted for other solvents and for other pipe systems?

The textual discussion of the DEIR, appendix A, Annex A suggests that the curving semilog plot is due to the change in flushing procedure for the protocol, and that the decline in concentration over time changes because the preoccupancy flushing was 19 void volumes and the occupancy flushing was one void volume. In fact, the change in flushing contributes very little to the pattern, perhaps producing the slight upward blip in the graphs at day 16. The ultimate concentration in the pipe reflects the leaching rate and will be most directly influenced by dwell time. Unless the flushing were done over a long period of time, it is doubtful that it would do more than deplete the solvent at the surface of the pipe joint.

A more plausible explanation for the changing rate of decline is that the solvent is sequestered in different parts of the joint, some leaching more quickly, like cement exposed at the inside of the pipe, others more slowly, like cement inside the joint interface. The presence of solvent in slow leaching environment prolongs the potential exposure. (Appendix Q of these comments provides a quantitative presentation of this view.)

If SRI actually uses a curve fitting method, it would be appropriate to determine confidence intervals on the regression. At a minimum, the variable analyses presented by Acurex should be shown along with the mean and standard deviation. In scientific analysis, it is common for experimental data to be presented with error bars reflecting the 95% confidence interval for the data. What the confidence interval shows is the extent to which the average value is affected by the variation in sample analysis. If this is done for the Cooper data, the magnitude of solvent exposure projected from this one test is doubled.

Even that approach does not address the worry expressed in the DEIR over "cement application procedures" or other variables not addressed in the DEIR. The mention of "cement application procedures" may be a reference to the different results from the McKesson (Butter) study, addressed below. In its assessment of the Cooper results, the EIR should attempt to quantify the uncertainty in its estimates.

b. Chlorination Omitted from HCD Protocol

The HCD test protocol used by Cooper specified a high purity water system ("MilleQ" water). The alkalinity (pH) and hardness were controlled, but no residual chlorine was added to the water. The need for high purity water was clearly meant to achieve the lowest possible background level, keeping the standard deviation of the control values low, and thereby allowing the highest possible limit of detection for chemicals leaching from the pipe.[40]

At the time that the protocol was being specified, the primary interest was in the presence of chlorinated hydrocarbons in the CPVC pipe left from the manufacturing process; the potential role of residual chlorine in public water supplies was thought to be less important than chemicals leaching directly from the pipe. Lengthy discussions of the protocol with HCD staff failed to resolve the chlorination issue. The Council's representatives asked HCD to use chlorinated water in a test, but to assure that the water was otherwise pure, to provide a sensitive limit of detection above background levels. The plastics industry argued that the chlorination study added unnecessary cost and if done,

[40] For example, compare the difficulty with Butter in resolving chlorinated organics in a city supply water with a fluctuating background level. (See DEIR, appen. A, table 6, p. A-27.)

should use actual domestic water to show the high levels of trihalomethanes already present.

Recent evidence and the results of the Cooper study now suggest that there may be a significant role of residual chlorine in forming chlorinated hydrocarbons in both PB and CPVC pipe systems. Even the DEIR claims that chloroform would only be present as the product of reaction with residual chlorine. As discussed below, reliance on the earlier McKesson study for CPVC is misplaced, and McKesson did not test PB at all.

c. Cooper Test Not Representative

The Cooper tests on CPVC used four simulation systems, two from each of two brands of pipe and each brand with a different cement. As described, *ante*, section II.B., there is much potential variation in both pipe and cement. However, the Cooper study did not look behind the labels to determine how representative the materials were. The pipe resin in both samples was probably made by B.F. Goodrich. The solvent and primer came under different labels, but these are apparently only different "house brands" for material made by the same company.[41]

Given the concerns already raised over the potential for contamination as a result of manufacturing, the failure of Cooper or HCD to learn more of the history of the pipe and cements used in the test is a significant flaw in the scientific analysis used to justify the conclusion in the DEIR.

d. Selective Interpretation of Results

Some of the results of Cooper are removed before inclusion in the DEIR. Cooper[42] and Podoll of SRI analyzing Cooper[43] reported low levels of

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[41] The CPVC pipe came from Genova and from R & G Sloan, both use B.F. Goodrich resin. The cement and primer were labeled "Master Plumber" and "Ace Hardware", both made by PCI Industries. SEEHRL 1987, pp 2,3.

[42] Cooper, 1987, p. 15 and appen. K, Acurex Final Report, August 31, 1987. David R. Taylor.

chloroform and trichloroethane or trichloroethene in water from the CPVC systems. Neither is mentioned in the DEIR list of leachates from Cooper, and the DEIR is so bold as to say "Chloroform was not found [in the Cooper test]." (DEIR, p. 40.)

4. McKesson Environmental Services Study (Butter, 1986)

The DEIR attempts to bypass the lack of information on chlorine effects by relying on the McKesson Environmental Services (MES) study done for the Vinyl Institute (Butter, 1986). This is inappropriate. The information should be presented in the DEIR, but the EIR authors seem not to have made an independent appraisal of the data as required by CEQA. Further, the Butter study is the only information used in the DEIR to address an important public health issue.

a. Inappropriate to Rely on Vinyl Institute Sponsored Study

The study was sponsored by the Vinyl Institute, with Alan J. Olsen of B.F. Goodrich as a principal administrator. B.F. Goodrich is the principal domestic manufacturer of CPVC pipe and is a real party in interest in the HCD action, if not the formal "applicant." CEQA requires the lead agency to exercise independent judgment in using information, particularly when provided by the applicant. Certainly HCD recognized the need for testing conducted for the state independent of the parties to the action (Plastics Industry and Pipe Trades). HCD expended a significant effort soliciting and directing the efforts of a testing laboratory. It is essential that the public have the same confidence in the EIR.

b. Problems with Protocol

The EIR should carefully assess the deficiencies in the Butter study. As described below, the deficiencies severely limit the advisability of HCD's reliance on the Butter study for assessment of the chlorination issue. Given the significance of the issue, HCD failure to add chlorination to the Cooper study renders the conclusions in the DEIR invalid.

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[43](...continued)

[43] Dr. Thomas Podoll, "Water Quality Review Update" Technical Studies, appen. A, p. A-25.

(1) MES "Chlorinated" Water Not Reported

The most significant problem with the study as prepared by McKesson is the selection of chlorinated water for the CPVC test. The Vinyl Institute originally asked MES to study copper pipe in parallel with the tests of plastic overseen by HCD. (Butter, 1986, p. I-1.) MES proceeded with tests on copper (using 50-50 tin-lead solder) and used three different test waters:

- Domestic Water. Raw water from the Sacramento Municipal System, trucked from Sacramento to MES in Dublin and chlorinated on-site at MES. The raw water is naturally low in hardness (24 mg/l as $CaCO_3$).

- HCD Protocol Water. Local (Dublin) water passed through reverse osmosis and the MilleQ ion exchange system then hardness (100 mg/l as $CaCO_3$) and pH (8) adjusted. No chlorine.

- Softened Water. Protocol water of specified hardness was passed through a conventional water softener and chlorinated to 1.0 ppm residual chlorine.

(Butter, 1986, p. II-11.)

The rigorous attention to test waters for copper pipe was presumably directed at an effort to see the levels of metal scavenged by soft waters with a reduced pH (acid) from residual chlorine.

When the first HCD plastic pipe leaching test was aborted due to laboratory error[44], the Vinyl Institute asked MES to undertake a study of CPVC. The waters selected for study were:

- Domestic Water. Dublin municipal (chlorinated) water. Not modified by lab; connected directly, with a pressure controlling valve.

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[44] Versar Laboratories, selected by HCD to perform the leaching test, was terminated in 1986.

- HCD Protocol Water. As for metal system, above.

(Butter, 1986, p. III-25.)

Contrary to the test of copper pipe, MES added no chlorine to any of the CPVC test waters. For the "domestic water," MES claims that "[t]he chlorine level was checked each day water was used." (Butter, 1986, p. III-25.) However, these chlorine levels are not reported. The level of residual chlorine actually introduced into the system is a critical experimental variable, yet it is unknown. The DEIR cannot rely on an alleged test of CPVC with chlorinated water if it is not known how much chlorine was present.

The water called "Dublin municipal" by MES is supplied by the Dublin San Ramon Services District (DSRSD). The water is obtained by DSRSD from Alameda County Flood Control and Water Conservation District, Zone 7. Zone 7 chlorinates raw water from the California Aqueduct or from Del Valle Reservoir, but the chlorine levels have fallen by the time DSRSD receives the water for distribution, and the DSRSD usually supplements chlorination to 0.5 ppm. The high chlorine demand from surface water supplies causes DSRSD to perform further chlorination at reservoirs because the residual chlorine level falls during distribution. (Pers. comm. with John Mauck, Water Supervisor, DSRSD, November 1, 1989.)

Although MES did not report residual chlorine levels, it is likely that residual chlorine introduced into the CPVC pipe assembly was well below 0.5 ppm, less than half of the level MES was asked to maintain for the chlorinated soft protocol water used in the test on copper pipe. MES used a different chlorinator for the Sacramento municipal water in the metal tests. MES did not report the level of chlorine desired, but the chlorinator malfunctioned during the test sending total chlorine as high as 3.0 ppm. (Butter, 1986, p. II-17, and part II, figure 4.) It seems certain that MES did not use chlorine levels that high on the CPVC pipe.

The different treatment of plastic and metal show a bias in experimental design. Aside from calling into question the reliability of the study, the differences are significant for the DEIR's conclusions. It appears that the low levels of chloroform reported by Butter may be due in part to the low levels of

residual chlorine in the test water. Yet the DEIR adopts the Butter value for preoccupancy chloroform without taking into account the problem of representativeness of the residual chlorine level. If residual chlorine had been greater, would not the reaction with solvent be more rapid, leading to higher chloroform concentrations in the water?

(2) High Background Levels of Halogenated Organics Obscure Test Results

The municipal water from DSRSD has high background levels of halogenated organics which obscure the test results. The high chlorine demand from the surface water supplied by DSRSD which depletes residual chlorine is also responsible for producing halogenated organics in the water. Total trihalomethanes (THM) often reach 100 ppb, particularly in early winter. (Pers. Comm. with John Mauck, DSRSD, November 1, 1989.) Surely this condition would have been well known to MES staff.

Unfortunately, the high and fluctuating levels of THM confound the analysis of leaching and secondary THM formation in the pipe system. With background levels ranging from 6 to 53 ppb chloroform over the course of the study (Butter, 1986, table 14-1, p. III-64), the lab's ability to resolve the contribution from the plastic pipe system is severely reduced.

Butter acknowledged this limitation (with emphasis added):

> Trihalomethane concentrations found in the discharge from the municipal water tube assemblies during the usage period correlate well with concentrations in the municipal input water, and a contribution from the pipe assemblies cannot be established. (Butter, 1986, p. III-1.)

> The concentration of the three [THM] vary within the precision of the analyses and any contribution from the CPVC pipe cannot be discerned. (Butter, 1986, p. III-57.)

> . . . the effect of the piping system on the concentration of trihalomethanes in a chlorinated water supply is not significant in relation to the

concentration in the inlet water based on the expected precision of the method at that concentration. (Butter, 1986, p. III-82.)

In these statements, Butter is warning the reader that the background levels were so high that MES really couldn't be sure if they found anything. In deciding to rely on the MES study, SRI should conduct an analysis of the effect of high background levels on the limit of detection. The HCD protocol makes reference to the "Guidelines for Data Acquisition and Data Quality Evaluation in Environmental Chemistry"[45] which show how a high standard deviation in the field blank or control sharply increases the limit of detection and reduces test resolving power. yd

Even pipe contributions smaller than background can have a significant public health impact. First, any addition to the cancer risk is an adverse impact. Second, the concerted efforts of government and water distributors to reduce THM in drinking water is offset by increases from a new source. Third, THM can be reduced system-wide, but the chloroform in a plastic PW system is added just before use and is no longer susceptible to system-wide treatment.

The obscuring effect of using a high THM municipal water demonstrates further bias in experimental design. When the Vinyl Institute studied copper, special soft municipal water was trucked in from Sacramento, and a special soft, chlorinated pure water was prepared from HCD Protocol water. Experimental conditions were ideal for leaching and detecting metals from copper. However, when the Vinyl Institute studied CPVC, different municipal water was used, and no chlorinated high purity water was used. Experimental conditions were adverse for leaching and detecting chloroform from CPVC.

(3) CPVC Test Run with Very Cold Water

According to the DEIR hypothesis, chloroform appeared in Butter because solvents, particularly MEK, leached from the joints and reacted with the residual chlorine in the municipal water. The DEIR failed to mention that the MES test

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[45] ACS Committee on Environmental Improvement, "Guidelines for Data Acquisition and Data Quality Evaluation in Environmental Chemistry", Anal. Chem. 52:14 pp. 2242-2249. Dec. 1980.

was run with unusually cold water which resulted in a smaller than normal amount of leaching and reaction.

MES began the CPVC study in early winter. The "mini assemblies" and the full scale simulation were housed in an unheated building. During the winter months, the temperature of the MES experimental setup was typically 45°F. Thus the entire CPVC leaching study done by MES was conducted in a virtual icebox -- significantly reducing chemical mobility and reactivity, and leading to a dramatic underestimate of the potential for chloroform in CPVC piping.

The chloroform concentration depends on the rate of formation. The key factors determining the rate of formation are diffusion and dissolution (solvent leaching) and reaction with chlorine. The rates of all of these physical chemical phenomenon are temperature dependant. Actual rate dependance varies according to the reaction, but reactions typically are accelerated exponentially by increasing temperature.[46] The chemistry governing this phenomenon is not exotic, yet the DEIR never attempts to consider the effect of temperature on the applicability of the McKesson results.

Surely hot water in a PW system will increase reaction rates, and the effect of longer dwell at higher temperature should be addressed by the EIR. Circulating hot water systems will keep the solvent-chlorine system at an elevated temperature, 120°F or more. However, even in a conventional hot water supply

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[46] The rate relationship is defined by the Arrhenius equation and requires knowledge of the activation energy.

$$k = k' e^{-E_{act}/RT}$$

Where k is the new rate, k′ is the rate constant, E_{act} is the activation energy (cal/mole), R is the gas constant, T is absolute temperature, and e is the base of natural logarithms.

Although E_{act} for the dark, aqueous chlorination reaction is not known, the typical value of E_{act} is 13,000 cal/mole and leads to an approximate doubling of reaction rate with a 10° rise in temperature (Linus Pauling, General Chemistry, 2nd. ed., WH Freeman, San Francisco 1958. Page 409). The temperature difference from 45°F to 80°F is equivalent to 20°C. At typical E_{act}, one would predict a fourfold increase in solvent chlorination rate. Were pipe to be maintained at 120°F, the reaction would be 18 times greater than at 45°F.

system, current energy conservation requirements call for insulation that can keep water warm above ambient for an hour.

Cold water supply will usually be warmer than the 45°F average for MES pipe leaching study. Pipes in interior walls will be warmed by building heat in winter, and pipes in crawl spaces or in exterior walls will be warmed by sun and exterior air temperatures during summer. It would be common in the warm season to have standing water in the cold supply reach 80°F or more.

c. Errors in Interpretation

Despite the significant limitations, there is useful information in Butter that could contribute to the DEIR's analysis. Unfortunately, the DEIR omits reference to results from Butter that demonstrate a higher leaching potential than do the results from Cooper.

d. MES Elevated Temperature Test Not Reported

MES acknowledged the problem with running the CPVC simulation in the cold. In response, MES tested a "mini" assembly of CPVC. The report, part IV of Butter, is included here as appendix R. The mini assembly is a ten foot length of pipe with five fittings and 12 joints in all. Unlike the simulation test assemblies which were built by a master journeyman plumber (Butter, 1986, p. III-6.), the mini assembly was built by laboratory staff. MES used only the unchlorinated HCD protocol water for the reexamination and the straight "chlorinated" municipal water was not used. (Butter, 1986. Page IV-15.) The assembly was flushed and filled the same as in the full simulation, but kept at 80 °F during the test.

The results displayed in Part IV of Butter show much more rapid leaching. Day 1-2 showed chloroform at 27 ppb and THF at 160,000 ppb. Chloroform appeared in every sample out to day 43. On day 50, the last day of the mini test, THF was found at 6800 ppb and MEK at 190 ppb. (Butter, 1986, part IV, table 2, pp. IV-13,14.)

Butter explained these results as follows:

> Higher levels of extractables were found in water from assemblies at 80°F than was found in water from assemblies at ambient temperatures. This is not surprising in view of the 35°F differential between the two studies. That difference translates to 6-7 x increased reaction rates. Thus the data generated presents the worst possible case for CPVC at the elevated temperatures. (Butter, 1986, p. IV-1.)

Butter also mentioned the following considerations that tempered the interpretation: 1) the ratio of joints-to-length was greater than in the HCD protocol, 2) the cementing of the joints was less perfect, exposing substantially more cement area, and 3) sampling of a limited internal volume could lead to a non-homogeneous sample.

Although the additional joints and sloppy work would increase leaching, such conditions could easily occur in actual construction. The last ten feet of pipe reaching the water tap has the largest number of fittings per foot of pipe, and, overuse of glue is common in unskilled labor. After all, the mini assembly was built by McKesson Environmental Services technicians, not by people completely unfamiliar with the plastic pipe materials.[47]

Note the high and consistent presence of chloroform in <u>unchlorinated</u> water. The DEIR attempts to explain all chloroform as the product of solvent reaction with residual chlorine. In the mini test system, with no residual chlorine, the chloroform observed must have come from some other source. The EIR must reconsider its hypothesis for chloroform formation. The EIR should consider the levels MES observed in the elevated temperature as relevant to the establishment of a worst case condition.

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[47] The "and a lick to stick" approach is common in unskilled labor assembling plastic pipe. Plastic joints can be imperfect for several reasons. In particular, failure to cut square and debur pipe leads to incomplete insertion and a poor joint. Solvent cements are not meant to fill voids and only work well in an "interference" fitting. However, when a plastic joint leaks, it cannot be remade, as with metal, it must be entirely cut out. Depending on the stage of assembly, this can be an extreme nuisance. Hence, the inexperienced plastic worker will often use a great excess of glue in an attempt to avoid the inconvenience of failures.

e. MES Cement Analysis Not Reported

The McKesson study presents an analysis of the solvent cements and primers used in the test system. The detail of the analysis is not published, but it seems from the results that MES was able to achieve a level of resolution Acurex could not achieve. It would make sense for the EIR to publish information from Butter to make up for the deficiency in the results from Cooper.

The solvent cement data are reproduced here as appendix S. The analysis gives the major constituents in rough percentages and shows the minor constituents or contaminants found. Among the minor constituents area N-N-dimethylformamide (DMF), and chlorinated organics.

The DMF was found leached into the water in the pipe. DMF is a health concern, and its presence in cements was brought out by the worker health studies. (Bellows, 1989.) Since the SEEHRL study did not analyze for DMF, the EIR should refer to the MES study.

The chlorinated organics imply contamination of the solvent, as would be expected from use of recycled material. None of the manufacturing processes for the oxygenated solvents (THF is an ether, MEK, ACE, CHX are ketones) would involve methylene chloride, trichloroethane, or freon, yet those chemicals were found in the cement. MES was having serious problems with limit of detection and dirty blanks for methylene chloride, but levels of methylene chloride were observed above control values in the test water. In the Appendix to the DEIR, Podall noted that "Methylene chloride, a minor constituent of the cement, was detected on day 1 at about 10 ppb and fell to about 2 ppb by day 75." (DEIR, appen. A, p. A-25). But the main body of the DEIR doesn't list methylene chloride as a potential leachate from cement in table 9, page 40, and does not include an analysis of the potential health effects of methylene chloride, a carcinogen and neurotoxin. The EIR should alert the public to the possibility of chlorinated compounds being introduced directly into the water from contaminants in the cement.

5. Effect of Chlorination

a. Other Studies Should Not Be Dismissed

The following laboratory test results are dismissed by the DEIR:

1. United States Testing Company, Inc. "Extraction of Polybutylene Pipe with Chlorinated Water." (December 8, 1986.)

2. James Montgomery Consulting Engineers, Inc. "Diffusion of Organics from Polybutylene Pipe." (September 9, 1987.)

Both studies used a chlorinated test water to extract organic material from polybutylene pipe samples. In each case, the PB pipe showed a high affinity for the residual chlorine and correspondingly high levels of chloroform were observed.

The tests were not intended as simulations of actual domestic usage. The extraction took place in a glass jar with short lengths of PB pipe immersed in hot water. The tests used long extraction periods for the PB and provided continual replacement of chlorine as it was consumed by reaction with the PB pipe. However, the conditions are relevant to appraisal of domestic health hazard and the results are significant. PB is meant to be used with hot water and the contact times used in the Montgomery Engineers study for chlorination 2, 4, and 6 hours are not unrealistically long.

If conditions are extrapolated to shorter extraction times and chlorine is not replenished, the tests still imply adequate contact time for nearly complete reaction of organics in the PB to form chlorinated organics in drinking water. Furthermore, the slower leaching under normal usage conditions will act to prolong the period of exposure.

The results of chlorinated test water in PB systems has implications to the CPVC system as well. Based on lab studies in glass, the chlorination of organics is slow under normal drinking water pH. The presence of the pipe, however, may provide conditions to accelerate the reaction. The presence of very high, persistent solvent levels in the CPVC system suggests that there may be a far greater potential for residual chlorine in the domestic water supply to form

chloroform by reaction with solvents. Typical residual chlorine levels are 500 to 1000 ppb chlorine. Even partial reaction with solvents would deplete the chlorine rapidly and has the potential to produce chloroform levels well above 100 ppb.

b. DEIR Fails to Consider Effect of Residual Chlorine on Chloroform Production

The problem of reaction with residual chlorine will be significant. While formation of trihalomethanes from chlorine in drinking water is recognized as a public health problem, the far greater threat of water-borne infection prevents reducing or abandoning chlorine as the preferred method of water treatment. In recent years, giardia has emerged as a formidable water-borne infection in the U.S. and EPA requirements for water supply to meet bacterial count standards will unfortunately require higher doses of chlorine in some water systems. Most affected are systems with long pipe runs from plant to consumer, such as Los Angeles, where the need to maintain bacteriostatic residuals at the periphery of the system will result in higher levels of residual in the central area.

Pipe affinity for chlorine will reduce chlorine residual in the potable water system, reducing public health protection and possibly increasing the incidence of pipe borne pathogens. The DEIR ignores the significant problem of bacterial or other pathogenic colonies established in plumbing. The initial smooth surface of plastic pipe erodes in use and offers a substrate for microorganism growth.

6. The DEIR Fails to Consider that Producers and Installers of Plastic Pipe Will Violate Proposition 65

Proposition 65, also known as the Safe Drinking Water and Toxic Enforcement Act of 1986 (Health & Saf. Code § 25249.5 et seq.) prohibits any "person in the course of doing business" from knowingly discharging or releasing a chemical known to the state to cause cancer or reproductive toxicity into water. (Health & Saf. Code § 25249.5.) Chloroform, a chemical found to leach into drinking water from plastic pipe (particularly CPVC and PVC) in the DEIR, is a chemical known to the state to cause cancer. (22 C.C.R. § 12000, subds. (b) and (c).) Chloroform was placed on the list of carcinogenic chemicals on

October 1, 1987, more than twenty months ago. The discharge of chloroform into water from plastic pipe is, therefore, a violation of Proposition 65.

Chloroform leaches from plastic pipe during the first two days after installation at the level of 27 ppb, which is equivalent to 27 micrograms per liter of water. (Butter, 1986, part IV, table 2, pp. IV-13, 14.) Assuming, as do the DEIR and the Proposition 65 regulations, that an average person ingests 2 liters of water per day, the exposure would be 54 micrograms per day. (DEIR, p. 46; 22 C.C.R. § 12721, subd. (d)(2)(A).) This exceeds by six times the exposure limit of 9 micrograms per day established by Proposition 65 and attendant regulations. (Health & Saf. Code § 25249.10, subd. (c), 22 C.C.R. § 12711, subd. (a)(2).) It exceeds by more than four times the exposure level established by the state for drinking water of 6 ppb. (22 C.C.R. §12711, subd. (a)(3); CDHS, Applied Action Levels for Chlorine, 1988.)

Since the chloroform leached from plastic pipe exceeds legal levels, it is considered a significant amount of contamination and is barred by Proposition 65. (Health & Saf. Code § 25249.9, subds. (b)(1) and (2).) Resin and pipe manufacturers and plastic pipe installers would be enjoined from making and installing the pipe and could be liable for civil penalties of $2500 per day for each violation. (Health & Saf. Code § 25249.7, subds. (a) and (b).)

Chloroform leaches from plastic pipe directly and indirectly. As the result of manufacturing processes, it may be present in the pipe itself and dissolve directly into the water. (See, *ante*, section III.A.6.b.) In addition, it is created from the interaction of MEK from pipe solvents with residual chlorine already in the water for disinfection. (DEIR, p. 40.) Either of these sources would constitute a "discharge or release into water" because it is a "direct or indirect transfer" of chloroform to consumers by a manufacturer or installer. (22 C.C.R. § 12202, subd. (e)(4); Health & Saf. Code § 15149.11, subd. (a).) Since the chloroform leaches into potable water systems, it is contaminating drinking water. (Health & Saf. Code § 25249.5.)

The DEIR completely ignores Proposition 65 and the effect of its provisions on the proposed expanded uses of plastic pipe. This omission is important because Proposition 65 could make many of the expanded uses illegal

due to leaching of chloroform and other chemicals in excess of established limits.[48]

7. ASTM, NSF and IAPMO Cannot Protect the Public from the Health Dangers of Plastic Pipe

The DEIR is misleading in suggesting that private agencies will assure the safety of plastic pipe. The DEIR ignores questions raised in the ERD about whether "voluntary standards organizations, such as the National Sanitation Foundation, [can] catch the majority of errors in manufacturing pipe and related materials." (ERD, p. II-22.)

NSF only tests for some metals and for vinyl chloride monomer. NSF does not test for chemicals of concern from the plastic pipe or from CPVC pipe cements. NSF does not address the range of chemical public health hazards addressed in the DEIR. It does not test for Substances such as tetrahydrofuran (THF), methylethylketone (MEK), cyclohexanone, acetone, chloroform or degradation products from the antioxidants. NSF cannot even determine the full range of substances it could test for because NSF is not informed by the plastics industry of the proprietary formulation of plastic pipe.

The NSF sampling procedure and NSF seal does not protect the public from harmful substances in pipe. NSF tests only a small sample of pipe that has already been distributed in the market place. If the NSF test reveals an excessive level of chemicals (ie. vinyl chloride) a warning is issued to the manufacturer to meet the standard, but the "defective" pipe is not removed from the market. Only repeated exceedance of maximum permissible levels result in an NSF seal being withdrawn.

If the use of PVC, CPVC, and ABS pipe were more widespread, a great proportion of the pipe sold would not carry the NSF seal anyway because the non-NSF-approved pipe is cheaper, and would be installed by many contractors for this reason.

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[48] The DEIR also fails to consider that IARC considers exposure to carcinogens at any level unsafe.

Other testing organizations such as ASTM, referred to in the UPC do not test for chemicals leached into drinking water. Most importantly, ASTM does not issue standards related to the issues of water quality, worker safety, or smoke toxicity.

Many ASTM standards for plastic pipe reference additional standards developed and adopted by the NSF. Compliance with NSF standards is not required by the ASTM standards. Every ASTM standard references NSF Standard 14 in a note to the materials section of the standard. The note reads, in pertinent part,

> [name of subject pipe] intended for use in the transport of potable water should be evaluated and certified as safe for this purpose by a testing agency acceptable to the local health authority. The evaluation should be in accordance with requirements for chemical extraction, taste, and odor, that are no less restrictive than those included in National Sanitation Foundation Standard 14. . . . (Emphasis supplied.) (See, for instance, ASTM Standards F441 - 88 and F442 - 88.)

NSF standard 14 requires monitoring of pipe for chemical extraction parameters once a year for 11 substances, not including MEK, THF, acetone, chloroform, DMF, or cyclohexanone. It does not require monitoring for additional substances and establishes no levels at which such substances would be considered dangerous. (1989 NSF standard 14 § 7.0, p. 7.) The standard leaves quality assurance testing to the manufacturer itself. (1989 NSF standard 14 § 9.0, p. 10.) The conditions of extraction for standard 14 are less rigorous than may be experienced in actual use. Before the pipe is extracted, cut lengths are put through the wash cycle of a laboratory dishwasher with detergent in deionized water. It would be difficult for HCD to require a flushing protocol as effective in precleaning pipe.

NSF has also developed another standard related to drinking water, standard 61, entitled "Drinking Water System Components - Health Effects." This standard requires that pipe be tested according to prescribed protocols for indirect additives to drinking water from the pipe. However, those companies choosing to list their plastic plumbing pipe and fittings under standard 14 do not

have to comply with the requirements, of standard 61 and will not be required to do so until the end of 1990. (Pers. comm. with Jim Pascal, National Sanitation Foundation, October 17, 1989.) Standard 61 has never been used to test the safety of plastic pipe for use in potable water applications. The only products listed by NSF as meeting standard 61 requirements are sand and gravel used as process media for water treatment. (NSF, NSF Listings, Drinking Water Additives - Health Effects, May 31, 1989, pp. 11, 12.)

Even if NSF Standard 61 were ever to be applied to plastic pipe, it could not assure the safety of the pipe.[49] Standard 61 is intended for voluntary use only. (1988 NSF Standard 61, p. v.) NSF disclaims responsibility for use of the standard by others and states that "[p]rovisions for safety have not been included in this standard because governmental agencies or other national standards-setting organizations provide safety requirements." (1988 NSF Standard 61, p. vii.)

Finally, Standard 61 is fatally flawed because it leaves to the manufacturers and agencies the task of determining just how much contaminant may leak into drinking water from plastic pipe and joining materials without endangering the health and safety of consumers. In effect, even if Standard 61 applied to the plastic pipe proposed for use in drinking water systems, it contains no standards on the most crucial issue of all -- at what level these pollutants are dangerous.

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[49] Appendix A of standard 62 describes Toxicological Review and Evaluation Procedures of indirect additives to water from plastic pipe and joining and sealing materials (among other sources). More or less extensive testing strategies are outlined depending on the potential human exposure level. (Standard 61, p. A-4 - A-7.) Significantly, Standard 61 does not specify precisely what levels of indirect additives are unacceptable in drinking water. Methods to be used by the manufacturers or agencies to determine the maximum level of exposure that is safe for humans are contained in Standard 61, but the levels of allowable exposure themselves, the core of any effective system of regulation, are not specified. Plastic pipe is not even required to comply with the maximum exposure levels already established by the Environmental Protection Agency for a very few pollutants. (NSF standard 61, p. A-7 and appen. F. Appendix F lists EPA exposure limits, but that appendix is explicitly not made a part of the standard.)

The DEIR is also in error when it claims that the UPC requires NSF listing. Nothing in the UPC requires NSF listing for plastic pipe or joining materials. Indeed, the only standards such pipe must meet are established by IAPMO and ASTM.

a. Safety Standards Are Not Enforced

Manufacturers wishing to place the NSF stamp on their products must obtain an listing with the Foundation. The companies pay for such listings. Listed pipe is tested three times a year. If it fails the appropriate tests, it is subject to violation procedures, which, in extreme cases, could include a recall.

The NSF sampling procedure and NSF seal does not protect the public from harmful substances in pipe. NSF tests only a small sample of pipe that has already been distributed in the market place.

There is evidence that NSF has refused to delist substandard products because of the financial support form listed products. The Foundation was sued by a pipe manufacturer in 1985 after it failed to halt sales of much cheaper ABS pipe by a competitor. The pipe was made from scrap plastic, rather than the materials required by NSF and ASTM standards.

Although NSF delisted the competitor, it failed to publicize that fact and, indeed, misrepresented the status of the manufacturer to inquiring customers. In addition, NSF failed to stop the continued manufacture, sale and installation of the substandard pipe although it carried the NSF stamp of approval. (Supply House Times, October 1985, appen. T, pp. 19, 20.)

In 1987, NSF itself admitted that it could not assure compliance with its standards in a timely manner and could not recover unsafe pipe after it was sold or installed. In February 1987, NSF learned that thousands of pounds of PVC pipe produced by a North Carolina manufacturer during several months in late 1986 and early 1987 contained amounts of residual vinyl chloride monomer (RVCM) in excess of NSF standards. NSF did not learn of the violation until almost two months after the pipe was manufactured and did not issue a recall of the pipe until two months after that, on March 24, 1987.

This situation is particularly serious since pipe with RVCM leaches dangerously high levels of vinyl chloride, a known cancer-causing agent, into the water that flows through it. The delay by NSF in discovering the violation and its slow response was compounded by the fact the NSF could recover only 10% to 20% of the dangerous pipe. (Pers. comm. with Tom Gable, NSF, on June 18, 1987.) As a result, between 80% and 90% of the dangerous PVC potable water and drain-waste-vent pipe was sold and installed in the homes of unsuspecting consumers, who to this day are probably being exposed unacceptably high doses of vinyl chloride. (See June 2, 1987, letter, from Judith Kuhn; May 12, 1987, letter, Kuhn to Gable; May 29, 1987, letter Gable to Kuhn; March 24, 1987, recall notice from NSF, appen. V.)

No private group with such a record can be trusted to protect the health and welfare of Californians. Nevertheless, the DEIR proposes to place full responsibility for the safety of plastic pipe sold in California on the shoulders of NSF. This plan is unacceptable and in derogation of the duty of HCD to protect the safety of our citizens.

8. Analysis of the Potential Impacts of Permeation

The DEIR dramatically understates the significance of the permeation hazard of plastic pipe.[50] The analysis understates the risk by: (1) Failing to accurately assess the permeation potential of CPVC; (2) Ignoring the acknowledged permeation risk of PB; and (3) Failing to assess the extent of contaminated soils in the state.

a. DEIR Fails to Correctly Assess the Permeation Risk of CPVC Water Pipe

The DEIR identifies two factors affecting permeation: (1) " . . . whether the pipe is rigid or flexible;" and (2) "the activity (or availability) of the chemical surrounding the pipe." (DEIR, p. 38.) While the general concept of "rigidity" conveys a sense of the denseness of the matrix, it does not accurately convey the

[50] Permeation refers to the phenomenon where substances outside of pipe are able to penetrate the pipe and appear in the water inside.

resistance to diffusion by different chemical species. After all, unglazed terra cotta is rigid but permeable to liquids.

The 1985 Berens report dominates the DEIR's analysis of CPVC pipe. In that study, a theoretical estimation is made for relatively low levels of chemical diffusing through a rigid matrix. However, there is no factor for chemical or solvent-solute interaction between the diffusing chemical and the pipe matrix.

The DEIR only notes that the resistance of CPVC to permeation would be reduced if solvent concentrations were sufficiently high to soften the pipe. However, that position does not adequately reflect the peculiar solubility of CPVC in chlorinated organics. Even small amounts of C_1 or C_2 chlorinated organics are absorbed into CPVC and alter the polymer matrix. That is why such compounds are used as "swelling agents" in the manufacture of CPVC pipe.

The DEIR dismisses the potential for low molecular weight halogenated organic permeation to CPVC. The EIR must examine the susceptibility of CPVC pipe to chloroform, trichloroethene, and methylene bromide.

b. DEIR Ignores the Acknowledged Permeation Risk of PB

The DEIR finds that PB is more susceptible to permeation, because it is a "rubbery plastic." For this reason, the DEIR concludes that:

> [T]here is a clear risk of using plastic pipe service lines, particularly those made of PB, in the vicinity of underground gasoline storage tanks, dump sites, and other areas where high organic chemical contamination of the soil is possible. (DEIR, p. 39; emphasis added.)

The Council concurs that permeability of PB is such that there would be significant cumulative exposure in contaminated soils.[51] Permeation in polyolefins has been extensively studied in assessments of polyolefin suitability for packaging

[51] The DEIR discussion of chemical sorption on soil raises an important complicating factor, although this issue is not resolved in the DEIR.

and gas piping; the role of monomer type, polymer density, and crystallinity produce effects more relevant to permeation than rubberiness. In any event, it is clear that PB is permeable to aromatics such as benzene (a carcinogen).

Although the DEIR finds a "clear risk" of permeation from PB use in contaminated soils, it does not propose <u>any</u> mitigation to address the hazard. HCD must consider measures to regulate plastic pipe use in contaminated soils. In order to develop such regulations, the EIR should list chemicals that pose permeation threats -- chemicals that are capable of permeating PB, and that are in industrial or domestic use and hence may be in the pipe environment.

For each chemical listed, the EIR should determine the external matrix concentration which would produce specified interior levels with a lengthy dwell. The potential for soil sorption effects should be noted, but the inert matrix values should be reported. In view of the permeation hazard of CPVC overlooked by the DEIR, the list should include chemicals capable of permeating CPVC as well.

Such a table would allow HCD to make a more reasoned assessment of the extent of potential permeation. At a minimum, this information would show that PB is unsuited in soils contaminated by gasoline, and that CPVC is unsuited in soils heavily contaminated by halogenated organics. It would also show that either pipe could be permeated by methyl bromide, the fumigant used in residential pest control.

This information would enable HCD to consider appropriate mitigation measures to address the permeation hazard as required by CEQA. For example, should existing DHS regulations governing the use of plastic pipe in public water distribution systems where there may be a danger of contaminated soils be extended to plastic pie from the meter to the residence? (See 22 C.C.R. § 64622.) If plastic pipe is restricted from areas contaminated by gasoline or other chemicals, how would HCD ensure that the area not become contaminated <u>after</u> the pipe is installed? Should plastic pipe be prohibited from use in areas of high contamination risk? Should plastic pipe be prohibited from use on commercial sites? Industrial sites? Former commercial agricultural lands? The EIR must also consider prohibiting underground use of plastic pipe as an environmental superior alternative.

c. DEIR Fails to Assess the Extent of Contaminated Soils in the State

The DEIR understates the risk of permeation by ignoring the extensive soil contamination in California. The State Water Resources Control Board has identified 160,000 underground tanks in California storing hazardous materials. (Golden State Report, "Tanks a Lot," October 1989, p. 20.) Ninety percent of these tanks are storing petroleum, and at least 30,000 are leaking. (*Ibid.*) Another 200 new contaminated sites are identified each month. (*Ibid.*; emphasis added.) These leaking storage tanks can be found beneath every type of commercial, industrial and residential building, including private homes. (*Ibid.*)

Leaking fuel can travel long distances floating on the ground water or as vapor through permeable backfill in utility trenches. Furthermore, storage tanks are not the only source of potential contamination. Leakage from vehicles, illegally dumped waste, or spillage from industrial processes can introduce contamination where it could not be predicted.

The DEIR also dramatically understates the permeation risk by failing to consider plastic pipe use on commercial and industrial sites. These sites are much more likely to face soil contamination problems and may also have much longer service lines from the meter to the structure. The DEIR should examine the extent of soil contamination on such sites, and HCD must consider prohibiting the use of underground plastic pipe in non-residential applications.

With respect to residential applications, the DEIR fails to consider the permeation hazard posed by residential development on former agricultural lands. Many commonly used agricultural chemicals are present in the soil and could present permeation dangers if underground plastic pipe is used. In view of the extent of agricultural land conversion in California and the heavy use of chemicals by commercial growers, this is a potentially significant hazard not addressed by the DEIR.

Proposed development projects between July 1987 and April 1989 in the ten Central Valley counties alone would convert 87,000 acres of former cropland to residential and other urban uses. (American Farmland Trust, "Risks, Challenges and Opportunities -- Agricultural, Resources and Growth in a Changing Central Valley," 1989, p. 18.) It is estimated that 500,000 acres of

farmland in the Central Valley may be converted to residential subdivisions, offices and factories in the next ten year period. (*Ibid.*) The State Department of Conservation reports that agricultural land conversion in the Central Valley may be even greater, possibly 100,000 acres per year. (Pers. comm. with Kim Trott, Department of Conservation, November 3, 1989.)

9. The DEIR Understates the Health Risks Associated with the Chemicals that Leach into Drinking Water from Plastic Pipe Cements[52]

Organic chemicals such as MEK, THF, and DMF, as well as the principal trihalomethane - chloroform, leach from plastic pipe and the primers, solvents and cements used to join the pipe into the drinking water flowing through it. Chloroform alone is a known human carcinogen and what is known about the other substances raises serious questions about the safety of chronic human exposure to them singly or in concert.

a. Problems with DEIR Selection of Standards Governing Acceptable Levels

The DEIR attempts to establish standards by which to judge the potential health impacts of chemicals leaching from plastic pipe. Unfortunately, in the absence of adequate toxicological data, the DEIR asserts without foundation that risk is unlikely. Consistently, the technical discussion in the DEIR is followed by a conclusion not supported by the technical facts.

In the discussion of carcinogenesis, the DEIR states "in the absence of information to the contrary, all such effects (ie. of various chemicals together) have been treated (where quantifiable) as if they were additive. This methodology ignores synergistic effects, potentiation effects, and the now known effects of certain chemicals as cancer promoters, turning on promotor genes which cause other genes to produce uncontrolled cell growth.

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[52] This discussion is based on the report by Dr. Martyn Smith and Ms. Catherine Wright attached as appendix A. Please see that report for a more detailed discussion of these issues and for specific references to the scientific literature.

In the discussion of maximum contaminant levels (MCL's) on p. 49, the DEIR states that MCL's have been developed for 26 compounds and that 83 more compounds will have such levels designated by the end of 1989. The DEIR does not mention whether any additional compounds of concern in the plastic pipe EIR are among the 83 compounds to be newly designated.

b. Drinking Water Consumers Will Be Exposed to Dangerous Chemicals Through Skin Absorption and Inhalation

Ignoring its own technical appendix, the DEIR assumes that potable water consumers will be exposed to toxic chemicals only from drinking the contaminated water. This is clearly incorrect. (Smith, appen. A, pp. 5, 6.)

A recent study shows that the drinking of water may not even be the primary route of consumer exposure. The dose of dangerous chemicals from skin absorption of chemicals may equal more than half of the dose received from drinking. (Smith, appen. A, p. 6.)

Consumers also inhale toxic chemicals that evaporate from contaminated water. The enclosure of the bathroom can trap dangerous chemicals in the air at high levels during a shower. (Smith, appen. A., p. 6.) Inhalation of these chemicals exposes children to the same amount of chemical as is contained in 1.1 liters of the water, women the amount in 3.7 liters, and men the amount in 2.5 liters of the water. (Smith, appen. A, p. 6.)

Because the DEIR assumes exposure to only 2 liters of water a day from drinking, it does not consider additional exposure to contaminants from skin absorption and inhalation. The Department cannot assess the true health risk posed by the contaminants added to drinking water by plastic pipe unless it acknowledges and measures all routes of exposure.

c. The DEIR Fails to Consider the Combined Effect of Chemicals Leaching from Plastic Pipe

Despite the significant evidence to the contrary, the DEIR assumes that the danger posed by the combination of chemicals from plastic pipe will be simple sum of the danger posed by each individually. The DEIR ignores the evidence that the carcinogenic effects of these leachates is multiplied when they are found together.

Most notably, the worker health study reveals that MEK potentiates the cancer causing effects of chloroform. Dr. Martyn Smith estimates that this potentiation can be as much as 30 times, increasing the cancer risk to humans far beyond acceptable levels. (Smith, appen. A, p. 16.) In addition, the worker health study mentions peripheral neuropathy caused by the combined exposure of MEK and THF. MEK and acetone, plastic pipe leachates, cause polyneuropathy when found together. (Smith, appen. A, p. 12.)

Nor are small doses of carcinogenic material necessarily safe. In combination with equally small doses of other carcinogens, they can cause cancer even at low levels. The synergistic effects of the leachates are described in more detail in section III.B.7. of these comments and in the comments of Dr. Smith. (See appen. A., pp. 15, 16.)

Before exposing Californians to a chemical that could worsen a contaminated environment by increasing the damage done by chemicals already in their bodies, the Department must carefully and fully consider the environmental effects of such action. It has instead attempted to ignore this significant environmental impact, in violation of CEQA.

d. The DEIR Ignores the Evidence that MEK and THF Cause Chronic Health Effects

Relying on a lack of chronic toxicity data on MEK and THF, the DEIR concludes that they pose no health risks. This reasoning is seriously flawed. Indeed, what is known about these substances suggests that they are dangerous and potentially carcinogenic.

Subchronic toxicity studies of THF showed serious effects requiring further study of the chronic effects of this substance. (Smith, appen. A, pp. 7, 8.) THF damages chromosomes, and may be a cause of cancer. THF has caused toxic hepatitis in plumbers. (Smith, appen. A, p. 8.) The DEIR has no basis for its assumption that THF is safe.

As discussed, MEK potentiates the carcinogenic effects of other common contaminants. It causes irritation and central nervous system depression. Chronic irritation is associated with skin cancer. Subchronic toxicity studies of MEK show that it causes liver damage. It, like THF, causes chromosome aberrations. (Smith, appen. A, p. 8.) It would be highly irresponsible to introduce MEK into the drinking water thousands of California homeowners without more information concerning its potential health effects.

e. The DEIR Does Not Assess the Health Impacts of Irganox 1010

Irganox 1010 is an antioxidant used in large quantities in plastic pipe. Several structurally similar antioxidants are rodent carcinogens. The toxicity of these substances must be addressed in the DEIR. (Smith, appen. A, pp. 6, 7.) Tests for FDA approval of Irganox 1010 are not strictly relevant. The chemicals present in the water will be the breakdown products of Irganox 1010 and the products of its reaction with chlorine. Note that the DEIR makes reference to no test of PB with chlorinated water -- none was done.

f. The DEIR Fails to Use the More Conservative Standard in Assessing the Health Impacts of MEK

The discussion of MEK is also suspect because SRI chose to use a more lenient Health Advisory ("HA") standard of 1800 ppb rather than the more conservative EPA standard of 170 ppb, claiming that the SRI standard is based on a more recent study. From the two studies cited, there is no clear reason why one standard is preferable other than SRI's claim that the later (higher standard) study had "good laboratory practices." (DEIR, p. 51.) However, neither study examined oral MEK intake and neither gives a good basis for the DEIR's conclusion of no risk.

Since the EPA itself has not relaxed the standard, why should the "SRI" standard be used to evaluate risk? In particular, the SRI standard seems to have been chosen so that levels measured in the pipe the at than 60 days occupancy are below the standard, where they would be considerably above the EPA standard. HCD is required to assess potential health effects under the most health-protective regulatory standard.

10. The DEIR's Suggested Mitigation would not be Effective and Fails to Comply with CEQA

a. Proposed Flushing Would Not Provide Effective Protection

Flushing is suggested as an approach to the problem of ridding the pipe system of contamination, but the flushing recommended by the DEIR as mitigation would not address the full spectrum of the threat.

The 1989 DEIR suggests the same flushing procedure first proposed in 1980, before any environmental analysis had been conducted. The hypothesis then was that any leaching would be short term and that a short term (e.g. 2 week) flushing regime would suffice. However, when the Cooper study was completed, the persistence of solvents was generally acknowledged by the study team as a bit of a surprise. (Pers. comm., presentation in meeting at DHS, December 17, 1987.) Despite this persistence, despite the potential interaction with residual chlorine (not studied), despite MEK potentiation of THM (not studied), and despite the probable levels of contaminants from other formulations and assembly methods (not studied), the DEIR merely repeats the same short term flushing protocol as mitigation.

The simulation study had a "pre-occupancy" phase which was intended to allow initial leaching to reduce contaminant levels without having to "count" the results in the public health analysis, although the DEIR does report the pre-occupancy data, as it should. The pre-occupancy period was not designed to test a flushing protocol. To the extent it may bear upon a flushing protocol, the fact that high solvent levels remained after the pre-occupancy phase demonstrates the ineffectiveness of such protocol. The DEIR establishes no maximum acceptable level for contaminants remaining after flushing, nor does it

present evidence that a greater volume or a greater elapsed time would be required.

b. Proposed Mitigation would not be Feasible or Enforceable

The DEIR presents flushing as mitigation without proposing that any language be added to the UPC or the State Plumbing Code to implement the recommendation. A state informational bulletin would not suffice, since the requirement is not incorporated into the code used as a reference by installers. It is also hard to imagine how criteria for adequate flushing could be developed, given the immense technical difficulties in testing water for minute amounts of organic chemicals. Without testing, it would also be impossible to ensure that the flushing procedure was being implement properly or was effective.

Even if the requirement were codified and a realistic protocol were developed, it would not ensure implementation. Contractors and builders will resist the expensive and time-consuming procedure suggested. Flushing requires repetitive actions to be carried out after the plumber has finished his work. It would be difficult to assign responsibility for flushing to someone other than the plumbing subcontractor, yet requiring the plumbing subcontractor to perform flushing would force him to return daily to the job site.

Building Codes specify materials and methods of construction that are practical to enforce through inspection. Plumbing is inspected before the sheet rock goes up and markings, straps, joints, etc. are in plain view. Even the use of non-lead solder can be observed by the color of the solder outside of the joint. By contrast, how is a building inspector to know whether the entire plumbing system has been flushed?

CEQA requires that a mitigation program adopted as condition of the project be accompanied by a reporting or monitoring program to ensure compliance during implementation. (Pub. Resources Code § 21081.6.) The proposed flushing mitigation would not comply with this requirement.

B. Worker Health

1. DEIR Analysis of Worker Health Risks Fails to Comply with CEQA

To fulfill the requirements of CEQA, the DEIR must identify a reasonable "worst case" exposure level and determine if that exposure level would create a significant effect. The CEQA Guidelines require that "[t]he EIR . . . focus on the significant effects on the environment. The significant effects should be discussed with emphasis in proportion to their severity and probability of occurrence." (14 C.C.R. § 15143.)

If the worst case analysis produces a significant effect, the DEIR must then propose mitigation measures to reduce the impacts to insignificance. Conversely, if no impacts are found to result from the worst case analysis, no significant impacts exist and no mitigation is required. However, if the proposed mitigation measures cannot fully mitigate the impacts, the DEIR must clearly state the severity of the resultant risks.

The DEIR's worker health analysis is based upon data collected in the DHS worker health study completed earlier this year and on the 1983 ERD. However, the DEIR departs significantly from both reports in its overall tone, and omits many significant points. In constructing its analysis of the impacts resulting from plastic pipe installation, the DEIR has focused on average impacts and ignored significant impacts resulting from a reasonable worst case analysis. This approach leads the DEIR to faulty conclusions not supported by the referenced technical documents.

The DHS report was professionally well presented, acknowledging that limitations existed during the study which must be considered when evaluating the study results. The previous SRI study addressed some of the technical problems in proposing mitigation measures. Both the DHS study and the ERD recognize that overexposures will occur under worst case installation conditions.

The DEIR, however, fails to acknowledge the limitations of the DHS data which focused on average exposure levels. Furthermore, after arriving at a substantially weaker conclusion by not examining worst case conditions, the DEIR does not establish a basis for mitigation measures. Without a strong

rationale, the resulting mitigation measures are technically inadequate and far too general to reduce the hazards associated with the installation of plastic plumbing pipe.

To be useful in the public review process, the DEIR must adequately portray the risks involved with installation of CPVC, PB, and ABS pipe. The DEIR should weigh the inadequacies of existing data on exposure levels and health effects. A closer examination of this data will show that the potential impacts associated with installation of plastic plumbing pipe are underestimated significantly in the current DEIR.

A legally sufficient analysis must address the following topics:

- Are the risks associated with the worst case exposure conditions significant?
- How do the limitations of the DHS sampling data affect the resultant overexposure probability estimations?
- How do the limitations of the DHS sampling data affect the regression analysis?
- What is the significance to worker health of the high levels of dermal absorption found in the DHS study?
- How feasible, effective and enforceable are the mitigating measures which the DEIR suggests; do the measures decrease the hazards of plastic pipe installation?

2. The DEIR Fails to Consider the Risks Associated with Worst Case Exposures

Conditions which contribute to high exposure levels and occur under many circumstances are identified in the DHS report and mentioned in the DEIR. The DEIR, however, does not indicate the severity of the risks present during these worst case exposure conditions. The DEIR must both clearly identify these conditions and the consequent risks to present a complete picture of the

hazards involved. This section will discuss what factors lead to worst case conditions, how they are particularly applicable to CPVC-pw installations, and how their significant risks should be explained in the DEIR.

Typical CPVC-PW installation (the focus of the DEIR) includes many factors which lead to worst case conditions more often than in other types of pipe installations. These factors are listed below.

- Installation is simple and fast, therefore enabling many joints to be cemented in a short time.

- Installation involves the use of primers and cleaners as well as cement, therefore causing higher solvent exposures to workers.

- Installation is typically completed later in construction, therefore it is being conducted in more enclosed areas.

- Installation for remodeling jobs occurs more frequently, further increasing the amount of work conducted in enclosed areas.

- Installation is often concurrent with DWV installation using PVC or ABS pipe, exposing many workers to solvents from both pipes.

Similar conditions are also discussed in the ERD (p. IV. C-10) and included in the DEIR (p. 61) under Chemical Exposures in Plumbing for New Construction;

> At times, however, plumbers must work in enclosed spaces. For buildings with basements, plumbers may not begin work until the subflooring has been installed the first floor; in such cases, they have to work close to the underside of the flooring (in industrial construction, or in large commercial buildings of poured concrete, they always have to work close to the flooring, regardless of the story). Second, even in partially framed buildings, the plumbers work from time to time in small spaces where air exchange is minimal. In addition, plumbing requires close attention to detail--particularly in making good joints. Thus, plumbers installing plastic or copper pipe

> will sometimes work with their eyes (and thus their noses) close to the pipe to verify the soundness of joints; that posture increases the potential for inhaling vapors from pipe solvents.

Additional conditions which lead to high airborne and dermal exposures for prefabricaton work are discussed in the ERD:

> On a site where plastic is used, the journeyman or advanced apprentice usually doing the actual installation would have relatively intimate and constant contact with the cement throughout the day. This exposure would result not only from the vapor exposure as he cemented the joints, but also from the residual cement on his hands (or gloves) and clothing. A large job with the aforementioned time and cost pressures would accentuate this behavior, and it would not be uncommon for a plumber to end the day with his coveralls coated with the cement. (ERD, p. IV.C-10.)

The DEIR also observes that "[t]he exposures of the workers doing the prefabrication (on site or in the shop) may be substantial." (DEIR, p. 61.)

Because of the variety of work conditions described in the ERD which can lead to high exposure levels, the Council had recommended that testing exposures under such conditions should be a central objective of the DHS study. The DHS study protocol recognized that sites where large amounts of solvents are present in air with limited dispersion and high volatilization capability would produce higher exposures. These conditions exist when:

- Many joints are being cemented in a short period.
- Heavy skin contact occurs through bad application practices.
- Spills occur.
- Several workers are present in a limited space.
- Work is conducted in enclosed (little air movement) areas.

- At high temperatures.

Despite this recognition, the protocol did not focus the study effort on data gathering under these conditions. The Council criticized the study protocol on the ground that the proposed testing would not produce information on exposure levels experienced by workers encountering worst case conditions. (See letter to Julie Nauman, August 30, 1988. appen. V.)

As was predicted, the sampling information produced by the DHS study was extremely limited in worst case data. Due to the common CPVC work practices discussed above, one would expect to encounter combinations of worst case conditions more frequently at CPVC potable water sites than at other sites tested. Unfortunately, only two of the sites monitored (sites 14 and 17) contained more than one of the worst case conditions (enclosed area/heavy skin contact/high temperature). No site was observed where all of the contributing conditions occurred at the same time. The study also failed to examine exposures at commercial and industrial sites, despite acknowledging that exposures at such sites would be higher.

Although the DHS study states that the researchers were unable to locate worst case sites, DHS failed to test a number of sites with multiple worst case conditions that were specifically identified and available. (See letter from Sally Mitchell, November 6, 1989, appen. W.) The failure to test these sites prevented presentation of a truly random survey.

Given the limited sampling data, the DHS report could only estimate the risks to typical workers during an <u>average</u> work day (for the conditions monitored in the study). The severity of the risks present during worst case conditions were not discussed quantitatively. However, as the DHS study itself recognizes, <u>overexposure will occur for plumbers working in worst case conditions</u>:

> The workers with the highest exposures <u>did</u> experience overexposures; for them, overexposure was a reality, not a probabilistic event. Other workers with similar working conditions are likely to have similar exposures . . . ." (See Memorandum from Linda Rudolph, Chief Occupational Health Surveillance and Evaluation Program, DHS to Julie Nauman, responding to comments on draft Worker Health

> Study, p. 4.) "[W]orkers who spend extended periods in highly-enclosed areas may experience frequent overexposures. Two workers did, in fact, have repeated overexposures while working for several hours in a crawl space. Because the amount of work in highly-enclosed areas may be over-represented or under-represented in this study (sites with enclosed areas were specifically sought for monitoring, but few were located), the calculated exceedance probabilities may not apply to the industry as a whole. (DEIR, appen. C, p. C-30.)

In its analysis of chemical exposures, the DEIR acknowledges that the probability (a 25% chance) of exceeding exposure limits in enclosed spaces is high:

> [S]hort-term exposures have been found to approach or exceed the short-term limits (STELs) for tetrahydrofuran (THF) and methyl ethyl ketone (MEK), especially during work in enclosed areas. The estimated probabilities of such a short-term exceedance of the STELs for THF and MEK were 0.04 or less <u>except in enclosed spaces where the probability was as high as **0.25**</u>. (DEIR, p. 67, emphasis added.)

Despite this recognition, the DEIR ignores the significance of the risks presented by exposures in enclosed spaces. The quoted 0.25 probability refers to the probability of overexposure during any random 15 minute period. A short-term probability of 0.25 equals a 99.99 probability for an exceedance of the short-term exposure limit at least once during an 8-hour day.[53] Therefore, as stated in the DHS study, workers with the highest exposures <u>will</u> experience overexposures. However, by disregarding the worst case risks, the DEIR does not adequately portray the severity of the hazards involved with installation of plastic pipe.

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[53] An 8-hour day contains (32) 15-minute periods. Each 15 minute period has a 25% chance for over exposure and conversely a 1-0.25 = 0.75 or 75% chance of going through 32 periods with no over exposure is $0.75^{32} = 0.0001$. Hence, the chance of one or more over exposures in (32) 15-minute periods is 0.9999.

3. The DEIR Fails to Determine How the Limited DHS Sampling Data Affects the Overexposure Probability Estimators

A caveat appears throughout the DHS study regarding the effect of the limited sampling survey on the report findings. The DEIR, however, does not mention the limitations on the data anywhere in its analysis of this issue. The DEIR should not quote the statistics reported by the DHS study without also repeating the limitations on that data described in the DHS report. Since no sites contributed data influenced by all of the worst case conditions and very few study sites contained combinations of the conditions, the data reported in the DEIR may underestimate overexposure probabilities. This caveat should be explicitly and clearly stated to inform the reader of possible unobserved and unaccounted-for exposures, and the implications of the possible underestimation should be fully analyzed in the EIR.

One key finding of the DHS report is the calculated probabilities for overexposure. These probabilities reflect the percentage of time when exposures exceed exposure limits. Any high exposures monitored and their associated frequencies highly influence the resulting probabilities. Implicit in the calculated probabilities (for the average worker) is the assumption that the distribution of working conditions over the study period is identical to that of a hypothetical worker day.

The probabilities presented in the DHS study apply only to the working conditions monitored and cannot be reliably extrapolated to other conditions. If the distribution of time spent over a working day is different (i.e. all time is spent in highly enclosed areas), the probabilities based on the study-wide distribution will underestimate the frequency of overexposure for the 8-hour working day. This could easily occur if, as noted in the DHS study, one worker may drill holes all day while another lays pipe and cements joints continuously. (DEIR, appen. C, p. C-15.) Thus, if more worse case sites would have been included within the sampling survey, more frequent overexposures might have occurred and subsequently higher probabilities might have resulted.

As discussed, the DHS sampling survey was limited in "worst case" sites. The study surveyed only residential installations and only two of the sites monitored contained more than one of the worst case conditions. No site was observed where all of the contributing conditions occurred at the same time and

no non-residential sites were included. These limitations were emphasized in the DHS study report:

> Commercial and industrial installation, typified by larger pipe sizes and extensive piping systems, are likely to produce higher exposures than occur in residential work. Conclusions about the possible hazards of installing residential plumbing do not directly apply to the hazards faced by these same workers at other sites. . . . Certain combination of working conditions could, in principle, sometimes occur together to produce "worst case" exposures higher than those found in this study. For example, the data presented above suggest that those might occur at a site with: no air movement, several workers in the same work space, many joints glued for a given period, heavy skin contact with primers and cements, and perhaps high ambient temperatures and a few spills of the products. Two of the sites monitored (sites 14 and 17) had several of these factors, but not all of them. Sites with all the factors listed above could have higher exposures. (DEIR, appen. C, pp. C-27 - 28.)

The main text of the DEIR does not discuss these limitations. The DEIR references the exceedance probabilities in the DHS study without discussing the implications of the under-represented sites. These implications should be clearly stated.

4. The DEIR Fails to Consider How the Limited DHS Sampling Data Affects the Regression Analysis

A regression analysis determines which individual factors in a study are significantly related to the study focus (high exposure levels). The resultant correlations presumably indicate how working conditions affect exposure and thus show which work conditions should be avoided or controlled by effective mitigation measures. In addition, this analysis indicates which combinations of conditions could lead to the highest, and therefore more significant, exposures. These results are important because they implicate possible, realistic exposure levels not directly observed within the limited the scope of the DHS study. The DEIR has not correctly interpreted the results of DHS's regression analysis.

The study's regression analysis compares high exposure levels over all sites monitored to:

(1) Composition of bulk products.

(2) Number of joints cemented per period.

(3) Air flow rate.

(4) Temperature

The DHS regression analysis found that significant associations existed between THF exposures and factors 3 and 4 for CPVC-potable water installation. Negative associations were found for both factors. Factors 1 and 3 were significantly associated with THF exposures for all installation types together. A negative association was again found correlating air flow rate and exposure levels. A positive rate was shown between the composition of the bulk products and exposure levels.

The association between factors 1 and 3 seem plausible, however, the negative association for temperature (increasing temperature was associated with decreasing exposure) for CPVC installations is counter-intuitive. One would expect an increase in temperature to cause higher exposures due to the volatility of the solvents (a more plausible physical relationship).

For the regression to be statistically correct, all combinations of conditions must be monitored. However, the study sampling was limited; not all combinations of significant variables were monitored. For example, no high temperature conditions were sampled in the enclosed areas. This limitation was explained in the DHS report:

> The observed association between job factors and exposure levels cannot reliably be used to predict exposure levels expected under conditions not monitored in this study, particularly because several of the job factors were interrelated, decreasing the reliability of the resulting statistics. For example the highest exposures, which dominated the exposure distribution, were collected in just two crawl spaces. Both had ventilation, and both were partially

> underground and quite cool. Thus, if the overall exposure model controlled imperfectly for air flow rate (which is unlikely), then a misleading apparent (negative) association could appear between temperature and exposure level." (DEIR, appen. C, p. C-29.)

Before any study can determine precise associations, adequate data for each condition must be accumulated. Since no high temperature conditions were sampled in enclosed areas, the regression analysis was based on inadequate data. Although these limitations on the sampling survey were addressed in the DHS report, they are not reported in the DEIR.

The limited data on high temperature sites is of particular importance in California where high ambient temperatures often exist. Even though no significant association was found for temperature in this data set, a significant association may exist under different sampling conditions. This point was acknowledged in the DHS study:

> These data do not preclude the possibility that high ambient temperatures produce somewhat elevated exposures; rather they indicate that <u>in this data set</u> the temperature effect (if any) is minor compared to the effects of ventilation and bulk composition. (DEIR, appen. C, p. C-29.)

Thus, high temperature may lead to additional overexposures. This association should be analyzed in the EIR.

5. The DEIR Fails to Consider the Significance of Dermal Absorption

In the DHS study, end-of-shift urine samples were taken to determine the effects of high dermal exposure on workers. The urine levels found during the study ranged from below the detection limit up to 6700 ug/l with a mean of 452 ug/l. Since no Biological Exposure Limit has been established, the authors converted the values to estimated air exposure levels. These were based on correlations between urine levels for light and heavy dermal absorption and measured air exposures. The resulting estimated airborne

exposures ranged from 165 ppm to 850 ppm (well over the 8-hr TLV of 200 ppm).

While this procedure incorporates considerable uncertainty, the DEIR does not consider the potential health impacts of these high exposure levels. The DEIR simply observes without further discussion:

> [T]he total biological uptake, as measured in urine analysis, was substantially above the urinary concentrations that airborne exposure alone would have produced; uptake through the skin appears to have been responsible for the excess. The actual high values are not reported. These values cannot be lightly dismissed, however, because they so far exceed the established full-shift exposure limit for THF (up to 3.7 fold). (DEIR, pp. 67 - 68, emphasis added.)

The high air exposure levels (more than 4 times the TLV) are sufficiently high enough to warrant concern. The lack of toxicity data at these levels should not preclude the EIR from issuing a stronger statement of the potential detrimental health effects associated with dermal absorption of solvents.

In light of the uncertainties regarding chronic health effects, the high levels of THF associated with dermal exposure, the overexposures occurring in enclosed areas and the limitations of the DHS study regarding a worst case analysis, it is clear that the study and the DEIR underestimate the risks associated with the installation of plastic plumbing pipe. The large increase in total biological uptake due to high dermal exposures are not even mentioned in the Worker Safety and Health summary on pages 70 - 72 of the DEIR.

6. DEIR Fails to Consider Significant Evidence of Potential Health Effects to Workers Installing Plastic Pipe[54]

a. Chronic Exposure to MEK and THF May Cause Significant Health Effects

What is known about MEK and THF suggests that the chronic exposure suffered by those who install plastic pipe daily for many years may cause cancer. As is summarized above in the discussion of water quality, a study this year showed that repeated exposure of rats and mice to THF caused narcosis, degeneration of the adrenal cortex, and changes in the uterus of female mice. (Smith, appen. A, pp. 7 - 8.) THF has also been shown to be toxic to rat livers. (Smith, appen. A, p. 7.) Although the DEIR itself cites evidence that THF causes structural and numerical chromosome aberrations, potentially causing cancer, this information is ignored, and the DEIR concludes that there is no evidence of possible health effects. (DEIR, p. 56.) On the basis of this information, the National Toxicology Program is pursuing THF chronic toxicity/carcinogenicity studies to determine the magnitude of cancer risk from THF. (Smith, appen. A, p. 7.)

Finally, the literature reveals two case histories of plumbers who suffered toxic hepatitis from exposure to plastic pipe glue containing THF. (Smith, appen. A, p. 8.) The available evidence clearly suggests chronic health effects from THF. This information is of particular concern since the worker health study found higher installer exposure to THF than any other substance.

Similarly, the DEIR concludes that exposure to MEK poses no occupational danger to plumbers. Yet the evidence that does exist suggests otherwise. As is discussed above, MEK causes irritation, central nervous system depression, chromosomal aberrations and liver damage. (Smith, appen. A, p. 8.) MEK may also potentiate the carcinogenic effects of other solvents and chloroform. (See discussion below.) MEK can cause quite

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[54] This discussion is based on the report of Dr. Martyn Smith and Ms. Catherine Wright, attached as appendix A. Please see the report for a more detailed discussion of these issues and for specific references to the scientific literature.

severe effects with unknown long-term implications. (Gibson statement, appen. X.)

This information creates doubts about the quality and safety of water from plastic pipe, and even greater concern to installers, who may drink large amounts of water soon after installation, and who absorb and inhale the solvent cements chemicals.

b. Installers Will Be Exposed to Potentially Dangerous Combinations of Solvents and Other Contaminants

These comments have already pointed out the danger in assuming, as does the DEIR, that the interactive effect of solvent cements and other contaminants is only additive. (See *ante*, section III.A.) Studies show that the solvents in combination may cause illness where each individually would not, and that the leachates are more dangerous when considered with other contaminants in the water and the general environment. (Smith, appen. A, pp. 12 - 17.)

The DEIR states that "no chronic effects have been attributed to" MEK and THF. (DEIR, p. 56.) Yet the worker health study acknowledges "a few case reports of chronic MEK exposure, in combination with chronic exposure to other solvents such as THF or toluene, causing peripheral neuropathy." (DEIR, appen. C, p. C-69.)

The DEIR fails to discuss evidence of polyneuropathy in shoe factory workers exposed to MEK, acetone and toluene, two of which are plastic pipe leachates. (Smith, appen. A, p. 13.) It fails to note peripheral neuropathy caused by combined exposure to MEK and THF discussed in the worker health study. (Smith, appen. A, p. 13.)

Not only does the DEIR ignore the effects of the leachates acting together, it ignores the effect of the leachates in combination with contaminants already in the water and the environment. Most notably, the DEIR does not confront the fact that MEK makes chloroform, a carcinogen, even more dangerous, perhaps by as much as 30-fold. (Smith, appen. A, pp. 14 - 17.)

The DEIR finds that chloroform leaches into water from plastic pipe at the rate of 6 ppb. Chloroform is also found in drinking water at background levels of between 10 and 90 ppb and it leaches from plastic pipe. This level of chloroform alone creates a cancer risk of one in a hundred thousand. Increasing this risk 30 times establishes a risk level that is unacceptable under current public health standards. (Smith, appen. A, p. 16.) MEK makes other common substances such as acetone, ethanol and rubbing alcohol, more carcinogenic. (Smith, appen. A, p. 16.)

Finally, what is now known about cancer suggests that adding even a small amount of a carcinogen to the environment may cause cancer in humans already exposed to a number of other carcinogens at low doses. (Smith, appen. A, pp. 15 - 16.) "A 'non-carcinogenic' dose of a known carcinogen (in animal experiments) does still bear a risk that will become manifest if other carcinogens are applied to the same organ." (Smith, appen. A, p. 16.) The failure to discuss this risk is a failure to analyze the cumulative impacts of the project.

c. Short-Term Exposures Are Significant

The DEIR attempts to dismiss short-term over-exposures to solvent chemicals. These exposures are important, however, because they can have long-term, chronic effects on pipe installers.

For instance, a short term exposure of 15 minutes or less may actually expose bodily tissues to toxic solvents for 5 hours while they are distributed throughout the body. (Smith, appen. A, p. 10.) It cannot be assumed that exposure ends when the source outside the body is removed.

In addition, the irritation of eyes, nose and throat reported in the studies and by the plumbers surveyed in the worker health study can cause serious health problems[55]. Chronic irritation experienced during a career of

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[55] Plumbers at a San Francisco apartment building of over 200 units also reported significant evidence of plumber irritation such as dizziness and headache. (Mitchell letter, November 6, 1989, appen. W.)

exposure to these chemicals may indicate carcinogenic effects. (Smith, appen. A, p. 11.)

Overexposure to toxics is a significant environmental effect of the proposed project and must be discussed as such in the DEIR. Failure to do so violates CEQA.

d. Leachates May Be Dangerous at Much Lower Levels than was Previously Assumed

The DEIR relies in some instances on the assurance that exposures to MEK, THF, chloroform and other chemicals is below the threshold limit values (TLV's) established by the American Conference of Governmental Industrial Hygienists. (Smith, appen. A, pp. 11-12.) However, MEK produces irritation at half the TLV level, and a substantial percentage of the plumbers in the worker health study reported irritation as well.

This information is consistent with the recent work of Dr. S.A. Roach, who has completed a comprehensive examination of the studies supporting TLV levels. His results are sobering; in four out of five studies, 100% of those exposed to TLV levels or below were adversely affected. Dr. Roach recommends that average exposures should be kept to below one-tenth of the TLV's. (See Roach letter to Nauman, October 24, 1989, appen. Y.)

HCD's proposed building standards must protect the health and safety of Californians. The standards may not expose workers to toxic chemicals that may cause illness. Since the evidence suggests that TLVs are not sufficiently health protective, the EIR must examine exposure dangers below TLV levels.

e. The DEIR Ignores Increased Toxic Exposures of Workers in Plastic Manufacture

Although it concedes that the proposed project will result in millions of additional tons of plastic consumption, the DEIR makes no mention of the effect of more production on manufacturing workers. Acrylonitrile, butadiene and styrene are rodent carcinogens and vinyl chloride is a human carcinogen. (Smith, appen. A, p. 19.) Solvent cement and primer

manufacture will expose plant workers to solvent hazards as described for plumbing workers.

There is no analysis of the risk of upset at plastics plants, although a recent explosion at the Phillips Petroleum plastics plant in Texas killed over 20 workers. (San Francisco Chronicle, October 24, 1989 at A3, appen. Z.)

The DEIR must assess all significant impacts, including the effect on workers in plastics manufacture, pipe manufacture and solvent cement manufacture.

7. The DEIR Suppresses Critical Portions of the Fowler Report on Worker Health

Although the technical report prepared by Douglas Fowler forms the organizational and textual basis for the DEIR's discussion of worker health issues, portions of the Fowler report that do not support the conclusions of the DEIR are missing from the draft.

The discussion of new construction in the DEIR is almost word for word from the Fowler report (DEIR, p. 61), but the last three sentences of the report's discussion are missing from the DEIR. The sentences read as follows:

> On those sites where plastic is used, plumbers may have relatively intimate and constant contact with the cement throughout the day. This exposure results not only from the vapor exposure as they cement the joints, but also from the residual cement on their hands (or gloves) and clothing. Plumbers may end the day with their coveralls coated with cement. (Fowler Report, p. C-5.)

While the information in the very last sentence is repeated in the DEIR and the report, the information concerning close contact and exposure from inhalation and skin contact is missing. The removal of these lines from the DEIR is critical since they suggest that plumber exposure to cements will be very high.

The DEIR discussion entitled "Installing Copper" does not contain a sentence found in the report which states that "Since the recent banning of lead solder in potable water systems, lead exposure has been dramatically reduced." (Fowler Report, p. C-6.) This fact about the installation of copper plumbing systems that is highlighted in the report and later mischaracterized in the DEIR as "mitigation."

The report introduces the worker health study by citing portions of the ERD which establish the need for such a study and then noting that "the survey [worker health study] included at least limited attempts to provide all of the information sought in our 1983 ERD." (Fowler Report, p. C-8; emphasis supplied.) The Fowler report thus acknowledges the limitations on the worker health study that are never addressed in the DEIR.

The DEIR also omits large portions of the discussion in the Fowler report entitled "Toxicity of Cement Mixtures in Humans and Animals." The Fowler report noted that a detailed review of animal studies found that "[s]cores for the adhesives indicated slight or slight to moderate damage, respectively." (Fowler Report, p. 7.) The DEIR includes only a two sentence paragraph concluding that cements present no significant health hazard. (DEIR, p. 69.)

The most notable omissions from the DEIR are contained in the Fowler report in the section on mitigation measures entitled "Potential for Exposure Reduction." (Fowler Report, pp. C-18 - C-21.) While the DEIR includes the mitigation measures themselves almost word for word, important limitations on the measures which cast doubt on their feasibility are discussed in detail in the Fowler report, but are omitted from the DEIR. (DEIR, pp. 72 - 74.)

For instance, on the issue of ventilation, the report states:

> Field observations and conversations with knowledgeable construction personnel indicate that provision of portable local exhaust ventilation systems is frequently thought necessary by plumbers, but that (especially in the commercial or large tract residential work) they frequently either do not ask for this protection or are refused by representatives of some general

> contractors. The reasons for such reluctance to make this request, or for the refusals, are the pressures of time and cost on these closely scheduled jobs and the skepticism of the plumbers regarding the practicality of these controls. (Fowler Report, p. C-19.)

Given the unwillingness of the plumbers to ask for, and the contractors to provide, ventilation, the feasibility and practicality of the ventilation mitigation is in doubt. Such a mitigation measure would not comply with CEQA standards. Yet this information is omitted from the DEIR, denying the public and policy makers of information necessary to make an intelligent decision regarding the proposed project.

The DEIR also fails to disclose information contained in the Fowler report that throws doubt on the feasibility of the mitigation requiring the use of gloves during installation of plastic pipe. The Fowler report states as follows:

> It is not clear that plumbers would readily use such gloves, even if they were available. Plumbing requires that a reasonable sense of touch be maintained for the installation of piping, especially in finished work, where some of the work may be done "blind" inside cabinets and the like. (Fowler Report, p. C-19.)

The interference gloves present to good plumbing practice make their use highly unlikely. This proposed mitigation does not meet CEQA standards.

Project alternatives are a form of mitigation. (*Citizens for Quality Growth v. City of Mount Shasta* (1988) 198 Cal.App.3d 433, 443-445, [243 Cal.Rptr. 727, 732-734.]) The DEIR suggests an alternative that would require all plastic pipe be joined with threaded, rather than glued, fittings. (DEIR, p. 103.) Yet text contained in the Fowler report but removed from the DEIR shows that this project alternative is not a reasonable one.

> Threaded fittings -- already available for connections to galvanized steel piping -- would also be a possible ultimate solution. However, given observed work practices, <u>it is probable that the</u>

> excessive time required to make threaded connections in the field would eliminate an advantage of the plastic pipe over competing systems and would not be acceptable to contractors. (Fowler Report, p. C-19.)

Without this information, the reader cannot assess the viability of one of the project alternatives discussed in the DEIR.

8. The Mitigation Measures Suggested by the DEIR Will Not Be Feasible, Effective or Enforceable

The consideration of appropriate mitigation measures is an essential part of the CEQA process:

> CEQA establishes a duty for public agencies to avoid or minimize environmental damage where feasible. . . . A public agency should not approve a project as proposed if there are feasible alternatives or mitigation measures available that would substantially lessen any significant effects that the project would have on the environment. In deciding whether changes in a project are feasible, an agency may consider specific economic, environmental, legal, social, and technological factors. (14 C.C.R. § 15021.)

The DEIR describes several possible mitigation measures but does not indicate whether any of the mitigation measures are required to protect worker health. In addition, many of the mitigation recommendations included in the DHS study have been dropped without explanation. Finally, there is little or no discussion of whether the measures would be feasible or enforceable. This discussion does not provide HCD with any basis to determine what mitigation measures must be required in conjunction with its action on the project. The question of whether HCD can feasibly reduce exposure below hazardous levels remains unanswered.

The DHS study's recommendations focused on preventing the overexposures associated with worst case conditions.

> To prevent such overexposures, the following recommendations should be implemented consistently throughout the construction industry. (DEIR, appen. C, p. 35.)

Although the DEIR incorporates some of these recommendations, no clear rationale for the measures suggested is established since the DEIR never fully acknowledges or investigates the risks associated with worst case conditions.

The first DHS recommendation urged contractors to avoid work in enclosed areas. This recommendation was left out of the DEIR with no explanation. Although the recommendation would appear prudent, given that air flow rate was the strongest and most prevalent factor affecting exposure levels, this measure is not practical. Work in enclosed spaces is unavoidable in the construction industry. The DHS study itself acknowledged that "CPVC-pw installation is usually done later in the overall construction process . . . so the buildings tend to be more enclosed." Installing CPVC-pw pipe earlier in construction would increase the chance of pipe damage.

A recommendation to avoid work in enclosed spaces does not represent feasible or effective mitigation. A worker refusing to work in an enclosed space because of exposure to plastic pipe glues could be immediately fired. A worker may legally refuse to work only where an unsafe condition presents "an imminent risk of death or serious bodily injury." (*Whirlpool Corp. v. Marshall* (1980) 100 S.Ct. 883, 888-890.)

The DEIR included a weakened version of the DHS's recommendation for ventilation. This mitigation measure is much too general to provide the specific guidance needed to reduce the hazards present under worst case conditions. Under what circumstances would ventilation be mandatory? What technical specifications for ventilation would be required? What agency would establish these requirements and specifications? Would Cal/OSHA have sufficient funding to increase its regulatory responsibility.

The DEIR's reliance on Cal/OSHA inspections to ensure compliance with the suggested mitigation demonstrates a lack of familiarity with occupational health and safety regulation. Cal/OSHA's "Policy & Procedure Manual" establishes the following "Inspection Priorities": (1) Imminent hazards and/or fatality; (2) Serious injury; (3) Scheduled health inspections.

(Cal/OSHA "Policy & Procedure Manual," appen. AA, p. 1.) In addition, Cal/OSHA's Deputy Chief for Field Services, Hamilton Fairburn, indicated that Cal/OSHA devotes 90% of its inspection efforts to complaints and accidents, with only a small portion of time directed to scheduled inspections. (Pers. comm with Hamilton Fairburn, Deputy Chief of Field Services, Cal/OSHA, October 20, 1989.) He also observed that it is especially difficult to conduct scheduled inspections in the construction industry because of the number of projects around the state, and because of the short time period a particular contractor is on-site. Mr. Fairburn observed tat there are so many construction contractors in the state that with Cal/OSHA's current level of staffing, it would take "30 years" to inspect each of them just once.

The third DHS recommendation urged contractors to "establish and enforce work practices that minimize skin contact," prohibit "cleaning hands with primers, and wiping excess cement from joints," and provide and require the wearing of protective gloves for those who cannot follow these practices. (DEIR, appen. C, p. C-35.) The DEIR suggests limiting applicator and dauber sizes and making protective gloves "available" on work sites. (DEIR, pp. 73, 74.)

Making contractors responsible for establishing protective measures would provide no assurance that workers would be protected. The powerful economic interest of contractors to avoid protective measures which add costs and time to the job make it unlikely that such measures would be implemented. HCD cannot rely on industry self-enforcement to protect workers. Nevertheless, the DEIR does not recommend any changes to Health & Safety Code provisions, Cal/OSHA regulations or enforcement responsibility. It simply suggests that "reminding employers of their responsibility will be sufficient." (DEIR, p. 74.) The ERD acknowledged that no gloves exist which offer protection from all of the hazards associated with plastic pipe installation:

> In the case of requiring the use of gloves, it is not clear that there is any one glove material that might be relied upon for protection against the variety of solvents found in the cements in common use. Table IV-43 shows results of a recent laboratory investigation of the permeability of some of the solvents of interest though common glove materials. From that table, it can

> be concluded that the material that are most protective against DMF (neoprene and natural rubber) are poorly protective against THF and MEK. Similarly, the material most suitable for MEK and THF is polyvinyl alcohol (PVA), which is not suitable for DMF. Further PVA tends to disintegrate in water, making it useless for construction work. (ERD, p. IV.C-49.)

This statement is consistent with data issued by glove manufacturers which demonstrate that no glove currently available would provide protection from THF. (See appen. BB.) This is particularly disturbing here, given that high exposures to THF were one of the key findings of the DHS study.

The feasibility of this measure is also questionable, given the burden the neoprene gloves would pose for a workers' manual dexterity and comfort. This point is also examined in the ERD:

> Finally, it is not clear that plumbers would actually use such impermeable gloves, even if they were available. Plumbing requires a reasonable sense of touch for the installation of piping, especially in finishing work, where some of the work may be done "blind" inside cabinets and the like. (ERD, p. IV.C-49.)

The limitation on dauber size is also not a practical suggestion. The installation of larger pipe, particularly in commercial and office buildings requires the use of large daubers. The DEIR neither discusses the practicality of the suggestions nor recommends any action to implement the proposal.

The four measures recommended by the DHS study required contractors to provide emergency portable eyewash stations to protect employees from the hazards of splashes of plastic pipe primers and cements or of hot flux. The serious eye damage from these chemicals could be reduced with immediate flushing at the stations. No mention of this hazard or the mitigation measure was included in the DEIR.

Several other mitigation measures suggested by the DEIR involve education and training of to inform plumbers of risks and equipment and techniques to help reduce exposures and increase safety in the use of plastic

plumbing pipe. These are good ideas in theory, however, implementation of education and training programs involves time, effort, and money for plumbing contractors, plastic pipe and supply distributors, primer and cement manufacturers, and HCD. How will the education program be setup and coordinated between all of these groups? Who will fund the program? Are all plumbers currently required to pass the state licensing exam? Are plumbing contractors required? Should HCD propose changes in the sate licensing examination to the Contractors Examination Board? What will motivate contractors to provide health and safety training for their employees? Will such training be required? Who will enforce the training requirement? None of these issues are discussed, and no actions to implement the proposal are recommended.

The DEIR also overlooks the short careers of many workers. The DHS study stated that "[w]orkers' experience in the pipe trades ranged from 3 months to 41 years. . . . workers installing CPVC-fire had the least experience (mean 1.7 years). Only eight (10%) reported receiving specific health and safety training, which usually focused on worker safety . . . . Only two workers (3%) said they had been informed about the potential hazards of the substances in plastic pipe primers and cements." (DEIR, appen. C, p. C-14.) With a transient work force, how can contractors be expected to educate their employees on a consistent basis? This issue is not addressed.

In light of current conditions, it is unlikely that the industry will adopt additional measures to protect worker safety from a new hazard. As observed in the DHS report, the construction industry is presently unable to protect the safety of its worker against the obvious dangers associated with ladder and chainsaw use; how can it be expected to guard against the more subtle dangers of chemical exposure? The DEIR does not present sufficient information for HCD to make required findings regarding appropriate mitigation measures.

C. The Discussion of Fire Safety is Inadequate and Fails to Comply with CEQA

1. The Description of the Proposed Code Change and the Code Change Process is Ambiguous, Incomplete and Inaccurate

a. The DEIR's Consideration of Plastic Pipe Use in Fire-Rated Buildings Conflicts with the Proposed Code Language Contained in Table 1

The DEIR's description of the proposed code changes is ambiguous and inconsistent. The DEIR describes the project as adoption of UPC provisions governing the use of plastic pipe, as codified in the 1982 edition of the Code. (DEIR, p. 1.) The specific UPC sections proposed for adoption are set forth in Table 1, and expressly limit the use of plastic pipe DWV uses to "structures where combustible construction is allowed." (DEIR, pp. 5 - 7.)

The DEIR, however, adds the following footnote to the combustible construction limitation: "HCD is proposing to allow ABS, PVC and CPVC DWV piping in fire-resistive construction." (DEIR, p. 5, fn. 2.) On the previous page, the DEIR states that HCD is proposing to allow the use of ABS and PVC DWV pipe "in fire-resistive construction in fire-rated buildings." (DEIR, p. 4.) No further explanation is offered.[56]

The DEIR's casual use of terminology is the source of the confusion. "Combustible," "fire-resistive" and "fire-rated" are terms of art used in UBC provisions establishing building standards and requirements for fire-safety. The UBC establishes fire-resistive requirements for both combustible and noncombustible construction. (See UBC, Table 17-A, included in appen. DD.) Since the UPC language proposed for adoption would permit the use of plastic pipe in fire-resistive construction in combustible buildings, DEIR

[56] Additional uncertainty is created by the fact that the DEIR text mentions only PVC and ABS as being proposed for DWV use in fire-rated structures even though Table 2 includes CPVC as a proposed DWV use in fire-rated structures.

footnote 2 can only mean that HCD is proposing to allow the use of plastic plumbing systems in fire-resistive construction in noncombustible buildings.[57]

The UPC has never authorized the use of plastic pipe in noncombustible, fire-rated structures. Prior to 1982, the UPC restricted the use of PVC and ABS DWV pipe "to residential construction, not more than two (2) stories in height." (UPC, §§ 401, subd. (a) and 503, subd. (a)(1) (1979 ed.).) With the issuance of the 1982 edition of the Code, this language was revised to limit plastic pipe to "combustible construction." (UPC § 401, subd. (a)(2) and § 503 subd. (a)(2) (1982 ed.).) This language has remained the same in all subsequent editions of the UPC and is the language proposed for adoption by HCD.

The ambiguity in the DEIR's description of the proposed code change raises a number of significant issues which must be addressed in the Final EIR. First, the legal effect of the proposed code adoption is unclear given the conflict between the expanded use of plastic pipe apparently proposed by HCD, and the expanded use authorized by the actual code language reflected in Table 1. Although the DEIR indicates that HCD is proposing the use of plastic pipe in fire-rated, noncombustible buildings, no code language to implement that proposal has been set forth as a part of this project. Indeed, the only code language circulated for public review would expressly prohibit the use of plastic pipe in noncombustible fire-resistive construction.[58]

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[57] Under the UBC, combustible construction refers to Type III, Type IV and Type V structures, which are buildings of 3 stories or less with a combustible structural framework allowed. (See UBC, table 17-A, appen. DD.) An additional story is allowed if the building is fully sprinklered. (UBC § 507.) Noncombustible or fire-rated buildings are Type I and Type II structures, which are multi-story and high rise buildings with a noncombustible structural framework. (UBC, table 17-A.) Type I buildings can be of unlimited height and area; Type II buildings, if fire-rated, can be up to 12 stories in height and can have in excess of 240,000 square feet per floor. (UBC, table nos. 5-C and 5-D.)

[58] Although the DEIR contains no code language to implement a proposal to permit plastic pipe in noncombustible construction, further mystery is created by the DEIR's Figure 2, which describes "Decisions Leading To Expanded Use of Plastic Plumbing Pipe." (DEIR, p. 10.) This Figure includes a box entitled "Amendments

(continued...)

The lack of clarity in the description of the proposed project regarding plastic pipe use in fire-rated construction also violates CEQA's mandate for full disclosure and meaningful public participation. The DEIR's ambiguous footnote and incorrect use of terminology, particularly in an area as complex and arcane as this, is certain to mislead and confuse both the general public and government decision-makers regarding the nature and scope of the changes proposed with respect to fire-safety requirements. CEQA has been characterized as an "environmental full disclosure" statute, intended to apprise the public and agency decision-makers of all environmental effects associated with a proposed project. (14 C.C.R. § 15151.) This is important not only to ensure accountability, but also to enable meaningful participation by interested parties in the environmental review process. (Pub. Resources Code § 21003, subd. (b).) The uncertain project description also violates the requirement of the California Building Standards Law that HCD demonstrate that the proposed building standards are "not unnecessarily ambiguous or vague, in whole or in part." (Health & Saf. Code § 18930, subd. (a)(6).)

In this case, the State Building Standards Commission and the State Fire Marshall have direct approval authority and other public officials (e.g., uniform code bodies, local building officials) have a direct interest in the

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[58](...continued)
Permitting Additional Uses Not in UPC." The Key to the Figure describes this action as "Already Completed."

This reference to amendments permitting uses beyond the UPC which are "already completed" is completely inexplicable. Could it somehow be a reference to amendments to implement the expanded use of plastic pipe in fire-rated construction? If so, what does it mean to say these amendments are "already completed"?

Since the lack of explanation for this reference precluded any meaningful comment, the Council asked HCD's CEQA Project Coordinator, Mike McMillan, for an explanation from either the Department or SRI regarding the significance of this statement in Figure 2. Mr. McMillan was also at a loss to explain what was meant by this reference and indicated that he would request an explanation from SRI. Despite repeated requests from the Council, no explanation was forthcoming.

proposed code changes. Since the conflict between the HCD proposal and the code language set forth in the DEIR is never reconciled, these public decision-makers may not be aware of the magnitude of the proposed change. The failure to set forth code language to implement the proposed use of plastic pipe in noncombustible construction also denies both the public and government decision-makers of their right to comment on the proposed project. (Pub. Resources Code § 21003, subd. (b).)

The DEIR's discussion of the potential fire hazard fails to distinguish between plastic pipe use in fire-resistive construction in combustible buildings and the unprecedented expansion of plastic pipe use to all noncombustible, fire-rated structures.[59] Under the UBC, multi-story and high rise fire-rated buildings must meet much more extensive and stringent requirements to ensure fire safety. (See UBC, table 17-A, appen. DD, and chs. 18, 19 and 43.)[60] In addition to a non-combustible structural framework, these buildings must have a non-combustible load-bearing internal construction that resists the spread of fire, gases and smoke from floor to floor and between adjacent offices or residential units.

This internal fire protection is provided by a combination of highly technical floor, ceiling, wall and chase partitions. (UBC, Table No. 17-A.) These fire-resistive assemblies must contain a fire in one location for a minimum of one or two hours depending on whether the containment is from one story to another or within a story. It is the intent of the UBC to achieve this degree of containment in order to afford the occupants of multi-story and high-rise buildings adequate time to escape and to create a manageable and more easily controlled fire.

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[59] Expanded plastic pipe use in fire-resistive construction in combustible structures also presents a significant fire danger. The discussion in the following sections on the inadequacy of the DEIR's analysis of the fire hazard and proposed mitigation measures applies to the proposed use of plastic pipe in both combustible and noncombustible construction.

[60] Multi-story buildings are structures two stories or more, but less than 75 feet to the floor of the upper most occupied story; high rise buildings are structures over 75 feet (UBC, § 1807.)

Plastic pipe is not currently allowed anywhere in the UBC's extensive provisions regulating construction techniques and materials in fire-rated buildings and fire-resistive assemblies. The use of combustible plumbing systems that traverse and penetrate the protective floors and partitions within a fire-rated building can severely affect the integrity of the fire-resistive assemblies and can undermine the safety afforded by such assemblies. Unlike noncombustible metal pipes, plastic plumbing systems have been shown to act as a fuse, linking the entire building into one common fire disaster. It is for this reason that the UBC does not currently permit the use of plastic plumbing systems in fire-resistive construction.

The DEIR also fails to consider HCD's limited discretion to adopt less restrictive standards than are established in the UPC. (See, *ante*, section II.D.3.b.) It is precisely because of concerns about fire-safety that IAPMO decided to restrict plastic DWV uses to wood-frame, combustible construction. This intention was recently reaffirmed at IAPMO's 60th Annual Education and Business Conference on Uniform Plumbing Code Changes held in Sparks, Nevada on September 26, 1989. Because the term "combustible construction" is not specifically defined in the UPC, the limitation on the use of plastic pipe had led to some confusion in enforcement. In order to address the problem, the President of IAPMO appointed an Ad-Hoc Committee on Combustible Construction. (Pers. comm. with Ed Wachter, Executive Director, IAPMO.)

The Ad-Hoc Committee voted unanimously to recommend that IAPMO add the following definition to the UPC: "Combustible Construction -- For the purpose of this code, combustible construction is a structure in which any member of its structural framework will ignite and burn at a temperature of 1392° F. or less." (Proposed Code Revisions, Item 2, IAPMO Annual Conference, Sept. 26, 1989.) This definition includes only wood-frame buildings of three stories or less and confirms IAPMO's intent to limit the use of plastic DWV pipe to these structures.[61]

The Plastic Pipe and Fittings Association (PPFA) and other Plastics Industry representatives opposed adoption of the definition at the conference

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[61] The 1392° F threshold is the UBC point at which non-combustible is defined under UBC Standard 4-1. (UBC, § 415.)

and argued that IAPMO ought to remove its restriction on the use of plastic pipe in noncombustible, fire-resistive construction. (R.T., IAPMO Annual Conference, pp. 4-9.) The full IAPMO voting membership, which includes only government plumbing officials, rejected the Plastics Industry arguments and voted overwhelmingly to adopt the definition of combustible construction and retain the UPC prohibition on the use of plastic pipe in noncombustible, fire-rated structures. (R.T., IAPMO Annual Conference, p. 14.)

A proposal to allow the installation of combustible DWV piping in all multi-story and high-rise buildings is unprecedented and raises profound issues of public safety. As discussed in section II.D.3.b. with regard to the proposed authorization of PB, HCD has limited discretion to adopt less restrictive standards than the UPC. HCD must show that the uniform standards would be "unreasonable, unnecessary or ill-advised" if applied in California, and that performance tests or other evidence demonstrate that the public health and safety would be equally protected under the proposed standards. In this case, the DEIR does not identify any unique conditions indicating that the UPC restrictions would be unreasonable in California. As will be discussed, the DEIR also fails to support its conclusion that the use of combustible piping will not compromise public safety with any performance tests or comparable evidence.

b. DEIR Understates the Amount of Fire-Rated Residential Construction Affected by the Proposed Code Change

The DEIR misstates the scope of fire-rated residential construction subject to the proposed code change. The DEIR states that "[t]he only residential buildings that are fire-rated, however, are structures having three or more stories and structures of any height whose occupants might not be able to rescue themselves in the event of a fire (e.g., schools, hospitals, and nursing homes). Therefore, fire-rated buildings account for only a very small portion of total new residential construction." (DEIR, p. 12.) This statement is incorrect and reveals that the authors of the DEIR do not understand UBC standards establishing fire-resistive requirements.

The 1988 UBC requires one-hour fire-resistive construction for all dwelling unit separations (walls or floors) regardless of the required fire

rating of the rest of the building. (UBC, § 1202, subd. (b).) The section 1202 provisions requiring one-hour fire-resistive walls and floors apply to all buildings with two or more dwelling units. Any plumbing system installed in the walls or floors of these dwellings are subject to the same mitigation requirements as for a full, one-hour fire-rated building.

The DEIR also indicates an anticipated 90,000 multi-family dwelling units out of a 250,000 total dwelling units estimated for 1988. Thus, almost 40% of the total estimated dwelling units constructed in 1988 would be multi-family units and would not represent a "very small portion of total residential construction" as suggested by the DEIR. Under the 1988 UBC, all of these units will contain fire resistive construction. In those cases where plastic pipe is installed in such buildings, the mitigation measures necessary to protect public health and safety will be required.

c. The DEIR Fails to Consider the Use of Plastic Pipe in Non-Residential Construction

As discussed in section III.D.1.c., the proposed code changes would apply to all occupancies, including commercial, office and industrial buildings. The DEIR, however, addresses only residential buildings and does not address the public safety impacts of this significant expansion of combustible piping into all fire-rated structures.

The square footage of all buildings constructed per year in California, aside from residential buildings of not more than three stories in height, is very substantial and is ignored in the impact assessment made by the DEIR. In addition, hospitals and other institutional buildings generally contain more plumbing than a residential building. The effect on safety of the use of combustible piping on these institutional buildings has been ignored in the DEIR.

The proposed expanded use of plastic pipe would increase the fire hazard to the public because the fuel loads present in residential construction are substantially less than those found in many of the other occupancies governed by the UBC. In residential buildings, a ten pound per square foot fuel load is assumed. In other occupancies, this fuel load can be four times that amount, i.e. 40 pounds per square foot or more. The effect

of the height on propagation of fire spread in tall buildings of residential or any other occupancy has also been ignored in the DEIR. This stack effect can be considerable, and can spread fire from lower to upper stories of a building via the combustible piping.

d. DEIR Fails to Consider Fire-Safety Impacts from Plastic Pipe Use in Remodeling and Renovation

After describing current plumbing material use, the DEIR states: "Remodeling and renovation may pose exceptions to these guidelines." (DEIR, p. 11.) The only additional discussion of this point occurs on page 13, where the DEIR assumes that "[r]enovations are likely to use the original plumbing materials in replacing part or all of the plumbing systems." The potential fire-safety impacts associated with plastic pipe use in renovation work are not addressed.

There has been virtually no testing of fire-safety mitigation systems that can be used as a retrofit in existing buildings where combustible piping is proposed to replace metallic piping systems. Fire tests conducted on conventional combustible framed buildings, with standard cutouts in the plates for plumbing installation, demonstrate that combustible piping reduce the one-hour fire resistance of the wall by half, to an average 30 minute fire endurance. (See ERD, pp. IV.D-15.)

The special mitigation requirements for plastic pipe use in renovation work are also ignored by the DEIR. The traditional methods for replacing existing plumbing systems in a renovation cannot be used with plastic pipe. It is impossible with such work to ensure that the mitigation procedures are properly followed, particularly at the floor line or plate line in combustible construction.

In order to maintain fire safety with such in such circumstances combustible piping should not be allowed in walls and floors to replace existing metallic piping without special mitigation. This mitigation must include submission of complete details of the method of installation for approval by the building and fire officials as both capable of achieving the required fire-rating and proper installation, and capable of inspection. Because of the complex nature of the retrofitting or replacement of existing

piping, any such work would also require special inspection under the provisions of UBC section 306.

The DEIR also underestimates the potential scope of plastic pipe use in renovation work. For example, in cases where an existing plumbing system has failed or otherwise requires replacement, that system is rarely, if ever, replaced with a steel system. It is very likely that the proposed code changes would result in the use of plastic plumbing systems in such cases.

e. The DEIR Fails to Consider the Requirement for State Fire Marshal Approval

The DEIR fails to consider the approval authority of the State Fire Marshall in conjunction with the proposed code changes. The function of the Office of the State Fire Marshall is to promote and develop methods for protecting life and property against fire and panic. (Health & Saf. Code § 13100.1.) Toward that end, the State Fire Marshall is required to prepare and adopt building standards to promote fire-safety in construction with regard to various categories of structures. (See Health & Saf. Code §§ 13108 [state-owned buildings and institutions], § 13143 [jails, hospitals, nurseries, schools, theaters and auditoriums], § 13143.6 [semi-custodial care facilities] and § 1321.1 [high-rise structures].)

In 1981, the Legislature amended the State Housing Law to substitute the State Fire Marshall for HCD as the entity responsible for developing building standards governing fire-safety in the occupancies subject to the State Housing Law (hotels, motels, lodging houses, apartment houses, swellings, buildings, and accessory structures). State Fire Marshall authority over building standards governing fire-resistive construction in these occupancies is now found in two sections of the State Housing Law. (See Health & Saf. Code § 17920.7 and § 17921, subd. (b).) This transfer of authority was based on the increased concern of the Legislature with the entire area of residential fire safety.

The California Building Standards Law also expressly requires that any building standards submitted to the State Building Standards Commission by any adopting agency that involve fire and panic safety must have the "written approval of the State Fire Marshall." (Health & Saf. Code § 18930, subd.

(a)(9).) Despite this explicit requirement, the DEIR does not mention the approval authority of the State Fire Marshall and the Figure 2 list of decisions required before the expanded use of plastic pipe does not list the State Fire Marshall as an "actor" in the process. (DEIR, p. 10.)

The submission of building standards permitting the use of combustible piping within, and penetrating through, fire-resistive construction would clearly affect fire-safety and require the written approval of the State Fire Marshall pursuant to Health and Safety Code section 18930. The elaborate performance standards and construction methods suggested by the DEIR as necessary to mitigate the fire hazard are evidence of the fire-safety implications of the proposed building standards. The State Fire Marshall is the only state official with the expertise and authority to evaluate such fire-safety mitigation.

The DEIR also blatantly misrepresents the consistent position of the State Fire Marshall through out this proceeding. The DEIR claims that the State Fire Marshall's 1980 and 1987 reports found that the use of plastic pipe would have "negligible" effects on fire spread, intensity, and toxicity. (DEIR, appen. D, p. D-8.). This statement is the exact opposite of what the State Fire Marshall concluded.

The State Fire Marshall's 1980 report concluded that use of combustible piping in fire-rated construction presented potentially significant hazards and should not be allowed without additional study. The report concluded that "additional in-depth fire testing is necessary to: (a) ensure that plastic pipe will not contribute to unusual fire spread; and (b) that the toxicity generated by the combustion of plastic pipe will not extend beyond the area of initial exposure in quantities sufficient to prove hazardous." (State Fire Marshall, "Fire Hazards of Plastic Pipe," May 1, 1980, p. 1.) The DEIR's mischaracterization of the State Fire Marshall's position is remarkable given that the 1980 State Fire Marshall Report was one of the key bases for HCD's decision to prepare an EIR on the plastic pipe proposal.

The DEIR also misrepresents the 1987 State Fire Marshall report. First, this report was limited to a consideration of the smoke toxicity danger to fire-fighters from two kinds of plastic pipe used in fire sprinkler systems;

it did not consider issues of fire spread or intensity. (State Fire Marshall, "The Potential Toxic Hazards Relating to the Use of Plastic Pipe for Automatic Fire Sprinkler Systems," April, 1987, p. 1.) Second, the report found that laboratory tests showed that burning plastic pipe presented a significant hazard (*Id.*, pp. 32-37), however, the report concluded that the hazard could be managed in real world applications, provided a number of specific mitigation measures were required. (*Id.*, pp. 42-44.)

The State Fire Marshall's 1987 report on plastic sprinkler systems reinforces the arguments that follow regarding the inadequacies of the DEIR's mitigation recommendations. The State Fire Marshall's report strongly emphasizes that the smoke toxicity hazard from plastic sprinkler pipe can <u>only</u> be avoided through careful implementation of appropriate mitigation measures. The report concluded that approved and listed installation systems were essential. (State Fire Marshall Report, supra, p. 43.) The report also stated that careful adherence to the specifications of the approved systems was required, and noted that the listed systems strictly limit the type of occupancies and the types of construction where plastic pipe may be used. (*Ibid.*) The report also indicated that installation of the sprinkler systems required "approval of local building and fire departments to insure proper and safe installation." (*Ibid.*)

The State Fire Marshall's 1987 report reveals the inadequacies of the DEIR's fire-safety mitigation proposal:

> A common theme running through all of the research, testing and investigation done relative to the use of plastic for sprinkler pipe is the necessity for protection. All of the mitigating factors related to its use can only be considered effective if the pipe is installed behind appropriate barriers. Because the research findings [regarding the dangers of plastic pipe] are unequivocal in their conclusions, the use of PB and CPVC is <u>totally unacceptable</u> in any configuration in which the pipe is exposed." (State Fire Marshall Report, *supra*, p. 43; emphasis added.)

HCD must condition its adoption on State Fire Marshall approval of the proposed building standards as they affect the use of plastic pipe in fire-resistive construction.

2. The Proposed Mitigation Fails to Comply with CEQA and Would not Protect the Public from the Fire-Safety Hazards of Plastic Pipe

The DEIR expressly finds that the installation of plastic plumbing systems under the proposed code changes would create a significant fire danger. The DEIR Technical Appendix on fire safety finds that "[p]lastic plumbing systems are more of a fire hazard than their metal counterparts particularly at penetrations through fire-rated barriers." (DEIR, appen. D, p. D-7.) The DEIR text concludes: "[I]n fire-rated walls, plastic plumbing pipe cannot be installed in the same manner as metal pipe without lowering the fire rating." (DEIR, p. 77.)

In order to mitigate the fire hazard created by plastic plumbing systems, the DEIR suggests two mitigation measures. The first mitigation proposal provides:

> HCD could issue a special Information Bulletin to ensure that local jurisdictions are aware of the ramifications of using plastic plumbing pipe. This bulletin could inform building inspectors that fire ratings can be maintained by the proper use of fire-stopping materials and techniques that comply with existing fire codes and performance standards. (DEIR, p. 80.)

The second mitigation proposal provides:

> [I]n a special Information Bulletin on plastic plumbing pipe, HCD could emphasize that additional care is required in the inspection of buildings with plastic plumbing pipe to ensure that code requirements are met through proper installation. (DEIR, p. 81.)

The DEIR's suggested mitigation measures are in direct conflict with the findings of the ERD, which expressly rejected these measures as ineffective. These mitigation measures are also proposed without reference to the development of fire-safety standards and requirements in the UBC and violate CEQA's requirement that proposed mitigation be capable of implementation and enforcement.

a. The Mitigation Measures Proposed by the DEIR Must be Approved and Certified by ICBO and Codified in the UBC

It is important to emphasize that there has been general agreement by all parties as to the mitigation measures required to address the fire danger created by the use of combustible plumbing systems. All participants to this proceeding have agreed that, prior to the expanded use of plastic pipe, it was necessary to have both performance standards and construction methods which demonstrated that plastic systems would not compromise the protection afforded by fire-resistive assemblies. It had also been generally agreed that such performance standards and construction methods must be approved and certified by the ICBO.

The DEIR departs from these accepted principles by suggesting, for the first time, that performance standards and construction assemblies can be approved on an ad-hoc basis by individual local building officials. The DEIR proposal reveals a profound misunderstanding of the building standard development process in general and the combustible piping standards and requirements in particular.

Local building officials do not have either the technical expertise or the resources to evaluate performance standards and construction methods for the use of combustible piping in or through fire-resistive assemblies. This is a highly complex area that has been under study by technical subcommittees of the ICBO for several years. The lengthy review of these issues by ICBO demonstrates that the DEIR's recommendation to allow certification of standards and assemblies by local building officials is both impractical and premature. The absence of ICBO approved standards and construction assemblies would not only lead to inconsistent requirements around the state, it would provide no guarantee that nationally recognized standards would be applied. The fire dangers presented by plastic pipe demand such guarantees.

The DEIR's mitigation recommendations are in direct conflict with the conclusions of the ERD, which contained a much more detailed examination of the fire safety issue and which is incorporated by reference in the DEIR. The ERD clearly stated that performance standards and construction

methods necessary to make plastic pipe safe in fire-resistive construction cannot be left to local approval. The ERD observed:

> Traditionally, technically complex or controversial changes in building materials or methods of construction have not been left to the individual building official to grapple with because the individual official typically does not have the resources or training to resolve the issue. Moreover, it has long been recognized that such a fragmented approach to issues concerning human safety and protection of property is not in the interest of society. (ERD, p. IV.D-3.)

The ERD went on to observe that adequate protection of the public health and safety could only be assured through the established review procedures of the existing code bodies:

> It is one of the fundamental purposes of, for example, the International Conference of Building Officials (ICBO) to investigate the merits of new construction or material proposals and to develop and adopt into code the appropriate UBC provisions to specify safe construction methods and installation conditions. Changes to the Uniform Building Code, produced by ICBO, are processed each year. The changes to the code are carefully reviewed in public hearings by professional experts in the field of building construction and fire and life safety. (ERD, p. IV.D-3.)

The ERD expressly concluded that "[f]ollowing such a review procedure in the case of proposed expanded use of plastic pipe is essential for the following reasons:"

> "(1) Special and as yet undeveloped or unproven construction measures involving additional cost and care are needed to satisfy code performance standards (primarily for fire-resistive construction).

"(2) Significant amounts of combustible material are at issue, notably in the case of ABS DWS piping, and there is a potential health hazard from smoke generation, particularly from PVC and CPVC.

"(3) Code enforcement is likely to be a significant problem with plastic pipes, and the resources for enforcement must be carefully weighed in developing code provisions.

"(4) The Uniform Building Code (1982 Edition) is deficient in specific provisions, standards or recommendations for installation of plastic pipe in fire-resistive construction.[62] The Uniform Plumbing Code (1982 Edition) does not address the issue at all."

Each of the reasons cited by the ERD for making ICBO adoption of standards and construction methods a prerequisite to HCD approval of expanded plastic pipe use remains true today. However, the ERD's careful analysis is completely ignored by the DEIR.

b. The UBC Contains None of the Mitigation Measures Recommended by the DEIR

The current UBC (1988 edition) is as deficient in specific provisions, standards or recommendations for installation of plastic pipe in fire-resistive construction as was the 1982 edition of the UBC considered in the ERD. The proposed amendments to the State Plumbing Code as described by the DEIR would allow the use of plastic in fire-resistive construction without any of the approved standards or construction methods the DEIR claims are required to ensure the safety of plastic pipe use in fire-resistive construction.

Unlike the ERD, which emphasized the need to coordinate approval of the expanded use of plastic pipe with the approval and certification of

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[62] "The UBC (1982) defines 'fire-resistive construction' as follows: 'Fire-resistive construction is construction to resist the spread of fire, details of which are specified in this code.'" (ERD, p. IV. D-4; original emphasis.) With this footnote, the ERD further emphasized the need to rely on the UBC, which is the only source for detailed standards governing fire-resistive construction.

fire-safety mitigation measures in the UBC review process, the DEIR proposes mitigation as if the UBC did not exist. None of the mitigation measures recommended by the DEIR has been incorporated into the UBC in the period since publication of the ERD. The DEIR also disregards the fact that ICBO is currently engaged in a review of some of the measures discussed in the DEIR.

At its 66th Annual Code Development Conference in September 1988, ICBO approved for the first time a number of performance standards for the penetration of fire-resistive assemblies by combustible piping. However, these standards do not cover the special installation and inspection procedures which the ERD indicated were critical to maintaining the integrity of the fire-resistive assemblies. Furthermore, these performance standards are subject to the ICBO annual code change cycle and may be revised or withdrawn completely before final approval. Even if not altered, these changes would not be codified until the 1991 edition of the UBC, which after state and local adoption would not be effective until sometime in 1992.

More importantly, the critical installation methods necessary to ensure fire-safety have not yet received even preliminary acceptance from ICBO. The PPFA manual cited in the DEIR is a Plastics Industry document that has been submitted to the National Evaluation Service for review. The assemblies described in that document have not received any acceptance or certification from ICBO.

It is not at all clear that the devices described in the PPFA manual will receive ICBO acceptance. Indeed, the 1985 manual referenced in the DEIR contains numerous assemblies that do not restrict the annular space of the penetration to 1/8 inch, which the Fire & Life Safety Committee of ICBO considered essential to maintain the fire-rating with plastic systems. (Design Guide to the 1988 Uniform Building Code, 1988 supplement, pp. 35-37.) The installation methods proposed by the Plastics Industry are a long way from acceptance by ICBO.[63]

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[63] The Council is advised that there have been subsequent editions of the PPFA manual, although these documents are not available for public review. If the Final EIR references any later editions of the PPFA manual or any other material to support its

(continued...)

If plastic pipe were authorized by the State Plumbing Code, no approved assemblies currently exist that could be practically installed. Although Underwriters Laboratories lists a few assemblies using plastic pipe, even the Plastics Industry acknowledges that these systems "are not practical from a pricing standpoint." (HCD Task Force Meeting, Tape #5, Comments of Joe Zicherman, representing Society of the Plastics Industry.) It is precisely for this reason that the Plastics Industry is attempting to obtain acceptance of the less expensive assemblies described in the PPFA manual. However, at this point no such assemblies have received even preliminary acceptance from ICBO.

Thus, the three steps described in the ERD as essential to the safe use of plastic pipe in fire-resistive construction (UBC standards, UBC approved construction methods and ICBO Evaluation Reports for accepted assemblies) remain absent but are assumed to exist by the DEIR. This is a glaring error in the fire-safety analysis that could have serious ramifications should the proposed code changes be approved. Even if some of the required mitigation measures should be developed in the future, the DEIR overlooks the fact that many local jurisdictions may attempt to approve plastic pipe through local amendments upon certification of the Final EIR. At that point, none of the mitigation measures required to protect the public from the fire dangers of plastic pipe would be in place.

c. The Mitigation Measures Proposed by the DEIR Require Application of the UBC Special Inspection Process

Even if combustible piping installation methods are accepted by ICBO and the related standards and code provisions are incorporated in the 1991 UBC, the DEIR itself acknowledges that plastic pipe use in fire-resistive construction raises special enforcement issues. In discussing its proposed mitigation measures, the DEIR observes:

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[63](...continued)
view that approved construction methods are available, CEQA requires that such material be made available for public review and comment. (14 C.C.R. § 15150, subd. (b).)

> The effectiveness of most fire stop systems is sensitive to workmanship; consequently, additional care is required in installation and inspection to ensure the prescribed protection is achieved. Furthermore, economic pressures and competition generally drive performance to the minimum allowable level, requiring vigilance to ensure that the acceptable level of fire safety is maintained.
>
> Therefore, in a special Information Bulletin on plastic plumbing pipe, HCD could emphasize that additional care is required in the inspection of buildings with plastic plumbing pipe to ensure that code requirements are met through proper installation. (DEIR, p. 80.)

The ERD emphasized the need for extreme care in inspecting the installation of fire-resistive assemblies containing plastic pipe to ensure that the combustible piping would not compromise fire safety. The ERD observed that because "considerable care and attention are required to fire-stop the penetration for plastic plumbing systems sufficiently to maintain the fire rating," it is important to consider "the question of nullifying the protective countermeasures by sloppy workmanship or intentional circumvention of the code." (ERD, pp. IV.D-8 and D-26.). The ERD went on to explain:

> "'Resistance to fire propagation is no better than the most poorly constructed seal or sleeve. A forgotten cementing job around the outside of a conduit penetrating a wall, or an inadequate fire stop between floors in a pipe chase can negate the value of good design. Note that good fire stops and seals are more important in plastic systems than metal. With poor seals, heat and flame will be forced to flow around the pipe due to the positive pressure on the fire side.
>
> "'This could quickly melt or burn the plastic conduit or pipe, exposing a much larger opening for flame penetration and transport of smoke and toxic gas. Even with steel pipe in rated construction, fire penetration has occurred. The chance for fire penetration, and the hazard resulting from such a failure, is greater for plastic pipe.

"'In view of the more stringent design and inspection requirements that are needed to achieve an equivalent level of fire safety, the difference in cost of plastic, compared to metal, systems may be less than some believe.'" (ERD, pp. IV.D-26-D-27, quoting from Smith, E.E., 1973, "Fire Hazards of Plastic Pipe, Conduit, and Insulated Wire.")

These concerns remain valid today. Indeed, in light of the evidence showing that plastic pipe will not offer a savings in cost over metal pipe (see, *post*, section III.G.), there be even greater economic pressure to cut corners and avoid the cost of special mitigation measures required with plastic pipe use than estimated by the DEIR. Yet, the DEIR simply suggests that HCD could issue an Information Bulletin informing building officials that additional care is required with the installation of plastic pipe.

An Information Bulletin would not constitute sufficient mitigation given the need for extreme diligence required in the installation of plastic systems emphasized in both the DEIR and the ERD. The recommendation also demonstrates a lack of familiarity with the building inspection process. For example, a Building Inspector typically examines construction after framing and after close-up. Where the mitigation measures are installed after framing, but before close-up, the Building Inspector would not be in a position to examine the fire-resistive assemblies that would be installed behind sheetrock at the time of the final inspection.

Under such circumstances, departure from the unusual inspection process is required. A Building Inspector must arrange to be present to examine the fire-resistive mitigation assemblies present behind the covering of the framing before that covering is installed. The Building Inspector must also examine the installation after cover-up to ensure that the mitigation methods required at the penetrations of the surface covering are installed properly.

The UBC has in place a "special inspection" process intended for use in cases where unusual inspection needs are present. Section 306 lists types of construction work requiring special inspection and includes a catch-all for any work involving unusual hazards or conditions. In this case, the DEIR itself demonstrates the critical importance of proper installation. It is also clear that inspection of the installation of fire-resistive mitigation devices

during the phases of construction would require substantial time as well as departure from the customary inspection routine. Under these circumstances, it is clear that protection of the public health and safety demands that plastic pipe installation in fire-resistive construction be added to the types of construction requiring special inspection under UBC section 306, and that HCD make invocation of the special inspection process a condition of approval.

d. The Mitigation Measures Proposed by the DEIR Must be Referenced in the State Plumbing Code

Even assuming the UBC is someday amended to include both performance standards and accepted construction methods for the use of plastic pipe in fire-resistive construction, another point overlooked by the DEIR is the lack of coordination between the UPC and the UBC. The proposed project is to amend the State Plumbing Code by adopting the 1982 amendments to the UPC. The UPC does not regulate fire-resistive construction. Even the Plastics Industry in its oral comments on the DEIR in Los Angeles noted that "[t]here's a discrepancy between the Plumbing Code and the Building Code in this area." (R.T., September 26, 1989, hearing, Los Angeles, p. 45.)

The problem is that even if the 1991 or later editions of the UBC specified performance standards and specific installation methods, the UPC and the State Plumbing Code would not require that such standards and installation requirements be satisfied. The DEIR does not recommend that any such standards or methods be specified in the State Plumbing Code or reference the appropriate standards in the UBC. As a result, plastic pipe will be authorized for use without any fire protection mitigation measures being legally required.

The failure to coordinate the provisions of the UPC with UBC requirements also creates a serious enforcement problem. This issue was discussed at the recent IAPMO conference in conjunction with consideration of a proposed amendment to the UPC requiring that plumbing installed within or penetrating fire-resistive construction be tested against nationally

recognized standards and be listed by approving agencies as suitable for the purpose. (R.T., IAPMO Annual Conference, pp. 29-30.)[64]

Several speakers observed that the proposed amendment would create enforcement problems since the technical expertise and responsibility for inspecting the construction of fire-resistive assemblies rests with the Building Inspector, not the Plumbing Inspector. One plumbing official described the practical difficulty in implementing such a provision:

> When I go out and do -- and I do the plumbing inspections in my jurisdiction most of the time --when I go out and do a top-out inspection, I may never see the rest of that building again. I think most of you in code enforcement would agree with that, that sometimes, as inspectors, that is the last time we see it.[65] [¶] Now, this code change would then give us the responsibility of making sure that penetration has been done properly. I see this as being unenforceable from a plumbing inspector's position. It's actually a building inspector that is going to have to go back and make sure that the penetration assembly itself -- not the pipe -- as a plumbing inspector, I am going to check the pipe. I am going to make sure it's right, but that actual assembly is going to be checked by somebody else. (R.T., IAPMO Annual Conference, pp. 27-28.)

The same enforcement problem would be created by an amendment to the State Plumbing Code allowing the use of plastic pipe in fire-resistive construction. Plumbing Inspectors do not have the expertise, responsibility or practical ability in the course of the usual plumbing inspection routine to ensure proper installation and penetration of fire-resistive assemblies. The required fire-safety mitigation would be entirely unenforceable and ineffective

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[64] The proposed amendment was rejected. (R.T., IAPMO Annual Conference, p. 40.)

[65] "Top-out" refers to the stage of plumbing installation after framing of the building and initial "rough-in" plumbing work and includes drilling, layout and all plumbing installations above the first floor. This stage is followed by the finishing work which includes plumbing of all fixtures and final installations after sheetrocking and cover-up.

unless HCD includes language in the proposed code change requiring special inspection by the appropriately qualified officials.

3. Summary of Fire-Safety Analysis

The DEIR's description of the proposed code changes and code change process with respect to fire-safety is ambiguous, inconsistent and misleading. The DEIR indicates that plastic pipe use is proposed in noncombustible fire-rated construction, even though the only code language proposed would prohibit plastic pipe use in such structures. The DEIR also fails to identify the approval authority of the State Fire Marshall with respect to the proposed standards. The DEIR's analysis of the fire-safety impacts is also incomplete, failing to consider non-residential installations and renovation work.

With respect to mitigation measures, the DEIR's recommendations would not be feasible, effective or enforceable. In order to implement the mitigation measures suggested by the DEIR, the following actions must take place:

(1) ICBO final adoption of standards and performance requirements governing the use of plastic pipe in fire-resistive construction.

(2) Codification of standards and performance requirements governing the use of plastic pipe in fire-resistive construction in the UBC.

(3) State Fire Marshall adoption of standards and performance requirements governing the use of plastic pipe in fire-resistive construction consistent with the provisions of the UBC.

(4) State Building Standards Commission approval of code changes submitted by the State Fire Marshall and codification of such changes in the California Building Standards Code.

(5) ICBO approval and listing of installation methods for the use of plastic pipe in fire-resistive construction.

(6) State Fire Marshall approval and listing of installation methods for the use of plastic pipe in fire-resistive construction or acceptance of ICBO approved assemblies.

(7) Amendments to UPC and State Plumbing Code referencing the appropriate UBC and California Building Standards Code requirements regarding the use of plastic pipe in fire-resistive construction.

D. The Discussion of Smoke Toxicity Is Inadequate and Fails to Comply With CEQA

The DEIR dismisses the danger from smoke produced by burning plastic pipe as an insignificant hazard. It ignores the fact that smoke from burning plastic releases numerous highly toxic and carcinogenic substances into the air. For instance, burning PVC releases dioxins and furans. When these substances are inhaled by occupants and fire fighters, they can cause severe injury. (Smith, appen. A, p. 17.)

The DEIR does not address or analyze the long term health-effects of exposure to hydrogen chloride, which is produced when PVC burns. Hydrogen chloride burns the respiratory tract, causing long term respiratory damage. Carcinogens inhaled or absorbed from burning pipe will also produce long-term health risks. An adequate DEIR must discuss these issues. (Smith, appen. A, p. 18.)

The DEIR does not address or analyze the very real possibility that, under current construction methods, an individual in a room adjacent to a burning room could be exposed solely to smoke from plastic pipe. The fire test conducted by the Warnock Hersey International laboratory proved smoke from plastic pipe can pour from a burning room through openings in the wall created by burning pipe into an adjacent room that is not itself burning. Injury and death from plastic conduit smoke alone was very great in the

Beverly Hills Supper Club fire. The smoke caused injuries long before the building itself went up in flames. (Wallace, 1981, p.208.) In some parts of buildings, such as basements and utility shafts the pipe is not hidden behind a wall of any kind, but is fully exposed. Under these conditions the only smoke exposure is the highly toxic plastic pipe smoke.

The DEIR completely fails to mention the Warnock Hersey test although it is discussed in the ERD. (ERD, p. IV.D-15.) The test considered the installation of plastic pipe under typical construction practices. Although the DEIR suggests special construction methods for plastic pipe, as is explained above, none of these methods are currently approved and available. The possibility of injury or death from inhalation of only plastic pipe smoke remains a risk. It should be analyzed in the DEIR.

The DEIR claims that since HCD has jurisdiction over only a small portion of the flammable substances in modern buildings, limits on plastic pipe would have no effect. If every agency adopted such a policy there would be no regulation of admittedly dangerous substances such as smoke from plastic plumbing pipe. Indeed, CEQA requires that the agency lessen the adverse environmental impacts over which it has control. (*Citizens for Quality Growth v. City of Mount Shasta* (1988) 198 Cal.App.3d 433 [243 Cal.Rptr. 868].)

E. Other Potential Impacts not Considered

1. DEIR Fails to Consider Potential Impacts on Air Quality

The Initial Study identified air quality as an area of potentially significant impacts. The DEIR, however, discusses this issue only in the context of the general impact of increased pipe manufacturing in the state and dismisses any possible impact by stating that the plastic manufacturing plants would have to comply with emissions controls. (DEIR p. 96.) This rather limited discussion fails to comply with CEQA and ignores evidence of a potentially significant effect of the project.

a. Cement Solvents are a Significant Source of Reactive Organic Gas Air Pollutant Emissions

The DEIR failure to adequately characterize the project leads to a failure to consider air quality impacts. Generally, the DEIR gives little consideration to the solvent cement and primer component of the CPVC piping system, yet these materials contain organic solvents which are precursors to the formation of photochemical oxidant or ozone (smog). The DEIR is misled by its economic analysis to assume that essentially all potable water piping will be PB rather than the more costly CPVC. However, because of poor reliability in PB systems, the use of PB will be prohibited in the 1991 UPC. Thus, CPVC may become the only "plastic pipe" available for California. Even if PB were to remain available, the EIR should at least examine the sole use of CPVC as a worst case air pollution impact from plastic pipe.

Increased plastic pipe use will increase solvent use. CPVC-pw pipe will require solvent cement and primer rich in THF, typically 70%, with MEK, Cyclohexanone, Acetone, and other volatile solvents making up the remainder. ABS for DWV uses similar solvents, but without the more costly THF. (Bellows, et. al. 1989, appen. E.) All of these volatile organics are photochemically reactive. In urban air basins, the organic vapors from solvent use in the field and from cement manufacture will contribute to ambient ozone levels.

Using the ERD's fitting data for a typical single family house and published cement and primer use data, the amount of primer and cement is 0.17 gallons for PW, and 0.80 gallons for DWV. (ERD, 1983, tables II-2 and II-3; Chasis, DA, Plastic Piping Systems, 2nd ed. Industrial Press New York 1988. Table 3-4.) Considering the solvent composition and the presence of non-volatile material in cements, the weight of reactive organic is 2.4 lb. per dwelling for PW and 10.3 lb.per dwelling for DWV.

The DEIR estimated use changes reflect dominance of PB over CPVC.[66] The amount of plastic can be estimated from the DEIR's

[66] "PB and, to a limited extent CPVC, would replace copper for water supply." (DEIR, p. 13.)

assumptions for the amount of new construction and the amount of fire-rated construction, and the amount of plastic pipe use in each category. In all, the DEIR estimated new construction at 259,000 single family equivalents. Assuming expanded plastic PW in 90% of these and expanded plastic DWV in fire-rated units, total annual solvent use would be 549,000 pounds for PW and 921,700 pounds for DWV.

This increased solvent use would have a significant adverse impact on air quality. Obviously, not all of the solvents are emitted directly to the air, but cumulative emissions from manufacture, open containers at the job site, curing joints, and vapor evolution from water containing leached solvents, would ultimately bring most of the material into the air.

This volume of solvent is a 0.22% increase in South Coast stationary source emissions for reactive organic gasses. This increase is significant. The current stationary source inventory for reactive organic gasses in the South Coast air basin is 590.54 tons/day (1985). Assuming that a third of new construction took place in the South Coast basin, and correcting for the work week and summer construction season, the expanded use of plastic pipe amounts to an increase of 1.27 tons per day of reactive organic gasses. For an industrial project, such emissions would require New Source Review and application of stringent controls.

The South Coast Air Quality Management District and the Bay Area Air Quality Management District have rules limiting solvent use. SCAQMD rule 1168 (adopted April 7, 1989) sets a current limit of 650 g/l (5.4 lb./gal) of solvent in cement for plastic pipe, to fall to 250 g/l (2.4 lb./gal.) by January 1, 1991. The BAAQMD plans to extend its rule 8-4 to plastic cements in the next year. Current products on the market as analyzed by HCD in the DEIR do not comply with this rule. The EIR should evaluate the potential air quality impact of increased solvent use and explain the effect of the proposed HCD action on air district rules and effect on attainment of air quality standards.

b. Manufacturing Process

A wide range of chemicals can be used in the manufacture of CPVC pipe. Some of these are chlorinated or fluorinated compounds that are

considered ozone depleting substances.[67] Solvent cement manufacturers faced with new rules on limits to precursor organics (see below) may switch to compounds which are not considered precursors,[68] but which are ozone depleting substances. The DEIR must perform a full evaluation of the potential impact. Merely concluding that pipe would be manufactured out-of-state is not an adequate assessment for a truly global pollutant.

The ERD noted that most pipe resin is made out-of-state and that a few extruders are in state. The DEIR gives only a vague discussion of pollution from manufacturing. While the amount of plastic used in California may be a small percent of the amount used nationwide, there will be significant increases in pipe extrusion and solvent cement manufacture in the state. At the minimum, the EIR should estimate the magnitude of increases in the state and investigate the kind and approximate magnitude of environmental pollution associated with expanded manufacturing.

Several of the manufacturers are having a difficult time meeting the increasingly strict emissions controls. Reliance on "pollution control permits" (DEIR, p. 96) is not sufficient mitigation for HCD action.

2. DEIR Fails to Consider Potential Impacts on Solid Waste Disposal

In 1987 the public discarded about 22 billion pounds of plastic material and by the year 2000 that amount is expected to reach 38 billion pounds, accounting for 10% by weight and nearly 25% by volume of municipal solid wastes. (Chemical & Engineering News, January 30, 1989.) Disposal of plastics presents a significant problem. Most plastic materials are not biodegradable or degrade very slowly in the dark, anaerobic environment of

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[67] For example, U.S. Patent 4,373,093, issued to Olson, et. al. (B.F. Goodrich) cites the use of chlorofluorocarbons in the manufacture of CPVC.

[68] BAAQMD Rule 8-1-208: Organic Compound, Non-Precursor: Methylene chloride, 1,1,1 trichloroethane, 1,1,2 trichlorotrifluoroethane (CFC-113), trichlorofluoromethane (CFC-11), dichlorodifluoromethane (CFC-12), dichlorotetrafluoroethane (CFC-114) and chloropentafluoroethane (CFC-115).

a landfill, take up valuable space and can leach toxic chemicals when disposed of in landfills.

Plastic pipe would enter the waste stream from renovation of buildings with new plumbing systems, from demolition and from disposal of scrap material left over from construction projects. If plastic pipe became widely used, it could compose a substantial amount of the plastic material disposed of at landfills.

Recycling plastics for reuse could present a solution to the disposal problem but development of the framework necessary for recycling including, collection, sorting, reclamation and reuse, is still being developed and is not a commonly available technology. Some of the most basic problems still being solved include the development of efficient collection systems, the difficulty in removing debris and impurities from used plastic as heat degrades the integrity of plastic, the difficulty in sorting different types of plastics prior to recycling and the contamination of recyclable plastic with biodegradable plastic which makes the end product weaker and unmarketable. Valid markets for the end product must be developed.

By contrast, copper pipe is readily recycled. The material is easily extracted from demolition debris and a well established market for copper scrap already exists. Reprocessing copper eliminates most foreign material so the recycled metal is indistinguishable from virgin material in making new pipe.

Wide spread use of plastic pipe could aggravate existing solid waste disposal problems or create new problems. The EIR should address issues relating to the disposal of used pipe with particular emphasis on the impacts of landfilling plastic pipe and the feasibility of wide spread recycling. The eventual disposal of large quantities of plastic pipe has potentially significant impacts on solid waste programs throughout the state which must be addressed in this EIR.

The recycling issue is critical to HCD consideration. There is no facile mitigation available to push the issue beyond concern. On one hand, increased use of plastics such as the pipe resins that are formulated to resist biodegradation will have an adverse impact on the environment. On the

other hand, increased pressures to recycle plastics will exacerbate the problem of chemical and mechanical quality control of the pipe itself, and increased potential for chemical leaching and mechanical failure will have an adverse impact on the environment.

3. DEIR Fails to Consider Ecological Effects

Since the DEIR dismisses the public health impact of chemical leached into drinking water, it is not surprising that the DEIR also brushes off any environmental effect from leaching. The discussion is not adequate. (DEIR, p. 95.) The annual volume of pipe and solvent is immense: nearly 27 million pounds of ABS, 12 million pounds of CPVC, and 1.5 million pounds of cement and primer. The cumulative quantity of leachate may well be significant, particularly when concentrated in a few urban areas.

The quantity of chloroform initially leaching in water will exceed the state Proposition 65 threshold for discharge into drinking water. ABS leaches styrene and acrylonitrile, both carcinogens, and both of concern at very low levels. High levels of the cement solvents are found in potable water pipe and would be present in the DWV system at even greater levels.[69] The water from the potable water and DWV piping would be discharged into the municipal sewer. The solvents in the cements are the same as are used in industry. Most wastewater treatment agencies have restrictions on the discharge of solvents into the sewer. For example, without an industrial discharge permit, a business in Los Angeles would be prohibited from discharging wastewater if it contained the levels of solvent reported by Cooper for CPVC.

The EIR should evaluate reliance on flushing as a public health measure in the light of the possible restrictions on wastewater discharge. The solvents are obviously present in the pipe, flushing merely makes them someone else's problem. The EIR should address what restrictions would be

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[69] More cement and primer is used for the DWV system because of the larger diameter pipes. In the typical single family home described in the ERD, DWV uses 4.7 times the solvent product as does the PW system. The solvent in the DWV would enter the sewer or leave as vapor through the vent. The concentration of solvents in waste water leaving the house would be several times higher than the levels observed by Cooper or Butter in the potable water studies.

placed on a home builder or plumbing contractor working on a large housing project that was required to flush the piping systems of many units during a building inspection. Note that Butter found total solvents in day 1-2 at 181,430 ppb; the cumulative quantities of solvents would be significant.

4. DEIR Fails to Analyze Potential for Noise Impacts

The DEIR discussion of noise (p. 96) shows no effort to analyze the potential for noise from plastic piping systems. Accounts are termed "anecdotal" and apparently, "no empirical data . . . could be found." A review of titles in the bibliography does not suggest any references that discuss noise inside structures or from pipe systems. The DEIR does not even attempt to identify which system -- potable water or DWV -- is the subject of the anecdotes, although the reader may infer from the comment about fire-rated buildings that it is the DWV system.

The EIR could at least relate some anecdotes. If it did, the reader would learn that most of the concern surrounds the significant reduction in sound attenuation from the light-weight, rigid plastic pipe system. As the DEIR shows in table 3 (p. 14), the weight of a cast iron DWV system is 1,775 pounds, compared with 300 pounds for ABS. Mass is well known as the most effective sound attenuation factor; the plastic system with roughly one-sixth the mass absorbs less acoustical energy than iron. Similarly, sound travels well through rigid material. In no-hub cast iron, the neoprene rubber sleeve connector has an internal rubber ring that fits between the sections of iron pipe -- metal does not touch metal -- so that the transmission of acoustical energy along the pipe system is broken at every joint. In ABS, the pipe system is solvent welded into one continuous piece. The plastic system transmits acoustical energy better than the iron system.

The DEIR gives no estimates or measurements of sound levels from either potable water or DWV systems. Nonetheless, the DEIR concludes without any analysis at all that "noise levels would not reach significant levels." Without determining the noise level and without stating a standard of significance, how can the DEIR come to this conclusion?

The standard that should be applied is noise limits for the inside of residences. Extensive noise study from the early 1960's onward has led to

the current community noise standards in common use today. For example, the USEPA reported that "[interior sound] levels of 40 dB(A) have been known to awaken approximately 25% of the sleeping population, while levels of 45 dB(A) appear to keep approximately 20% of the population from falling asleep immediately. These considerations have led to the adoption of 40 dB(A) as a criterion level for sleep interference effects." (Bolt, Beranek and Newman, Noise From Construction Equipment and Operations, Building Equipment, and Home Appliances. USEPA NTID300.1, December 31, 1971, p. 67.)

Noise measurements should be easy to take for the DWV system. A 1971 EPA study reported flush toilet noise and discussed piping systems. Flush toilet noise peaked at 77 dB(A) in some models with others as low as 62 dB(A). (Bolt, Beranek and Newman, 1971. *op. cit., supra*, pp. 50 - 53.) How much of this energy is transmitted through pipe mounting into an adjacent unit in a multifamily building? How much acoustic energy could be generated by a surge of wastewater falling in a plastic DWV system?

Noise in a multifamily building is a significant source of stress and impairs the quality of the environment. It may be necessary for the EIR to pose the more explicit question drawn from anecdote: Will a light sleeper be awakened by a neighbor flushing a toilet? Will sound levels in plastic DWV reach 40 dB(A) in the sleeping areas of multifamily residences? If so, then the impact would be significant, and the EIR should consider mitigation such as requiring acoustic insulation around DWV when it passes along a sleeping area.

F. The DEIR Analysis of the Effect of the Proposed Project on Housing Costs Is Internally Inconsistent, Inaccurate and Incomplete[70]

The treatment of economic impacts in the DEIR is inadequate to inform the public and policy makers of the economic ramifications of the

[70] This section is based on a study prepared by Dr. William T. Dickens, included as appendix B. Please see that study for a detailed discussion of the economic issues and appropriate citations.

propose project. Although the DEIR describes the alleged savings associated with the use of PB pipe, PB pipe has been banned by IAPMO and would most likely not be the material replacing copper in California. Moreover, the DEIR fails to calculate the costs of the types of pipe that would serve as the attentive material, CPVC and PVC. The DEIR also notes several additional costs of plastic pipe, but does not take them into account in its comparative cost calculations. The analysis also contains numerous inconsistencies and inaccuracies.

1. PVC and CPVC Are Significantly More Costly than Copper

Those forms of plastic most likely to be used in residential construction will be more expensive than copper. An analysis based on a plumbing system described in the ERD (Tables II-2 and II-3) using standard estimating procedures (Means, 1988) shows that the cost of materials and installation of a PVC potable water system would be $228.55 more than a copper system[71]. A CPVC potable water system would cost $904.87 more than a copper system. (See Dickens, appen. B, p. 2, table 1.) There is simply no economic advantage to plastic pipe.

2. The DEIR Ignores Several Additional Costs of Plastic

a. Plastic Costs More Than Metal to Replace

The DEIR assumes for its analysis that plastic systems last 20 years and metal 30 years. (DEIR, p. 88.) However, this differential is not taken into account in the DEIR's analysis of the comparative cost of plastic and metal. In addition, the facts do not support a service life for metal of only 30 years. Copper pipe can last from 30 to 200 years, and cast iron even longer. (Dickens, appen. B, p. 2.) The population weighted mean life of copper is 64 years for water from five water districts covering 60% of California's population. (Dickens, appen. B, p. 3.)

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[71] Although PVC is not proposed for potable water systems, the economic analysis in the DEIR contains ambiguous language suggesting that the DEIR considered the cost of a PVC system. (DEIR, p. 87.) In the interest of completeness a PVC system economic analysis is included here.

Assuming a service life of plastic at 20 years and a service life of metal at a conservative 50 years, the present value of the cost of replacing a plastic system is at least $1,558.00 more than the present value of the cost of replacing a metal system. Assuming a lower discount rate, metal is $3,083.00 cheaper to replace, at present value, than plastic. (Dickens, appen. B, p. 4, table 2.) This is a cost to be borne by the homeowner, not the builder.

b. Plastic Is More Expensive to Repair Than Metal

Due to differing service lives, plastic is, by conservative estimate, $167.51 more expensive to repair than copper at present value. (Dickens, appen. B, p. 5, table 3.)

c. The DEIR Does Not Take the Cost of Flushing into Account to Determine the True Costs of Plastic

Labor will be required to flush the plastic pipe system as recommended in the DEIR. However, the DEIR does not take this cost into account in its economic analysis. If labor for only two trips to the project site for flushing is included, an additional cost per building of $192.00 will be added to the total cost of the plastic plumbing pipe system. (Dickens, appen. B, pp. 6,7.)

d. The Cost of Ventilation Must Be Included in the Analysis

The DEIR does not estimate the cost of the ventilation it recommends. A survey of existing ventilation methods suggests that a system sufficient to satisfy the DEIR's recommendation would add as much as $100.00 to the cost of installing a plastic system. (Dickens, appen. B, p. 7.)

e. The Cost of Special Inspections and Fire-Stopping Mechanisms Must Be Accounted For

In order to control fire in buildings plumbed with plastic systems, special fire-stopping mechanisms must be placed in fire walls where plastic pipe penetrates. Special inspections will be required while construction proceeds since the evidence of installation of such mechanisms will not be visible after construction is complete. These inspections will cost a minimum

of $150.00 for each unit in a multi-story building. (Dickens, appen. B, p. 7.) This is a conservative estimate of the increased cost for fire safety mitigation, since it does not include the cost of the fire-stopping systems themselves or the increase costs of the special installation methods required for such systems.

f. Including All Costs and Mitigations, Plastic Pipe Will Cost Between $2,400 and $3,000 More Than Metal Pipe

The following table provides a conservative summary of the total savings associated with the use of metal over plastic plumbing pipe.

Increased Costs of PVC and CPVC over Metal

	PVC	CPVC
Installation Labor & Materials	$ 228.55	$ 904.87
Replacement (Present value)	1558.00	1558.00
Repair (Present value)	167.51	167.51
Flushing	192.00	192.00
Ventilation	100.00	100.00
Special Inspection	150.00	150.00
Total Increased Cost	$2396.06	$3072.38

Using less conservative assumptions, the increased cost of plastic could amount to almost $4,000.00 in present value. (Dickens, appen. B, p. 10.)

3. Other Economic Assumptions in the DEIR Are Incorrect

The economic analysis of the DEIR is flawed in a number of other ways, as well. For instance, the DEIR assumes that any savings in plumbing costs will be reflected in housing prices. This assumption cannot be supported.

Since the amount of housing is limited, the price of a house is not determined by its cost, but by the demand for housing. (Dickens, appen. B, p. 8.) In other words, housing prices depend on what people will pay and not on what it costs to build. The same is true for rents. (*Ibid.*)

The DEIR suggests that corrosion control costs could be saved if plastic were installed. California does not have particularly corrosive water, and corrosion treatment is done by the water department, not the homeowner[72]. In any case, corrosion control for metal pipe could not be suspended since water distribution systems, metal systems in homes, and the couplings for some plastic systems continue to consist of metal pipe. (Dickens, appen. B, p. 9.) There will be no savings resulting from decreased corrosion control.

There is no support cited in the DEIR for the proposition that fewer variances for plastic would be required if the proposed project were implemented, and a survey of local jurisdictions has uncovered none. Indeed, requests for variances to use plastic pipe appear to be rare or nonexistent. (Dickens, appen. B, p. 9.)

4. The Economic Analysis in the DEIR Is Inconsistent and Incapable of Confirmation

The DEIR does not provide any factual support for its estimate of plumbing costs of $580 for materials and $580 for labor. The estimate represents a decrease in materials costs and an increase in labor costs from the estimates cited in the ERD, but the DEIR does not explain the variation. (See ERD, p. IV.F-1 - 9.) The tables cited in support of the

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[72] The DEIR is in error when it ascribes savings to a municipal water system to individual homeowners. (Dickens, appen. B, p. 9.)

estimate (ERD Tables II-2 and II-3) contain no information concerning the cost of a PVC potable water supply system although the estimates appear to include such a system.

Neither the DEIR nor the ERD (which is incorporated by reference) explain why a mark-up of 15% for overhead and profit is included or the source of the percentage chosen. The DEIR assumes reduced material costs of $95 and reduced labor costs of $58 with the use of PB potable water pipe. Since PB pipe is not likely to be used for potable water service, given IAPMO's recent ban, these figures are of little relevance. In any case, they vary inexplicably with the amounts cited in the ERD; the alleged material savings is greater in the ERD and the labor savings less. The source for these figures is not cited or explained.

The DEIR is confusing and inconsistent on the issue of whether or not plastic pipe would be cheaper than copper. On one hand it states that, except for PB (now banned), the use of other plastics would "increase plumbing costs." (DEIR, p. 87.) Later the document states that the substitution of one plastic for another would not affect replacement costs for a plumbing system. This cannot be true if all plastic systems except PB systems would be more costly.

The DEIR states that the replacement cost of a plastic system will be cheaper than the replacement cost of a metal and plastic system. (DEIR, p. 88.) This conclusion is also not consistent with the earlier conclusion that, except for PB systems, the use of plastic will increase plumbing costs.

The DEIR and ERD are contradictory on the expected service life of plastic and copper plumbing systems. At one point a 20 year service life for plastic systems and a 30 year service life for copper is referenced. (DEIR, p. 88.) On the very same page, it is assumed that both plastic and copper have a 20 year service life. The DEIR cites no source for these assumptions and, as discussed, they are wrong.

Much of the material in the economic analysis of both the DEIR and the ERD is unsupported in the text itself, and no analysis or confirmation can be performed on the assertions made. For instance, the DEIR places dollar figures on the cost savings for replacement of a plastic plumbing

system in single family and multifamily units. (DEIR, p. 88; ERD, p. IV.F-3.) These figures are not the same in both documents and the DEIR does not explain the variation. Neither document cites to a single source to justify the alleged savings figures.

Similarly, the DEIR does not document the basis for alleged cost savings cited for multiple-family dwelling units, for corrosion treatment, or for life-cycle cost savings. (DEIR, pp. 87 - 89.)

The failure of the DEIR to support many of the factual assumptions made during its economic analysis deprives the public of its ability to assess the environmental impacts of the proposed project. "A conclusory statement 'unsupported by empirical or experimental data, scientific authorities, or explanatory information of any kind' not only fails to crystallize issues [citation omitted] but 'affords no basis for a comparison of the problems involved with the proposed project and the difficulties involved in the alternatives.'" (*People v. County of Kern* (1974) 39 Cal.App.3d 830, 841-842 [115 Cal.Rptr. 67, 75, quoting *Sylva v. Lynn* 482 F.2d 1282, 1285 (1st Cir. 1973)].)

The conclusory statements in the DEIR concerning the costs of metal and plastic piping systems, the costs of corrosion control, the savings of some systems over others, the service lives of various systems, and other, unsupported factual material do not meet the requirements of CEQA.

IV. OTHER CEQA VIOLATIONS

A. DEIR Fails to Identify Significant Effects

1. CEQA Requires that an EIR Identify Potential Impacts that are Considered Significant

The DEIR fails to indicate whether any of the impacts it discusses are considered potentially significant, even though the analysis with respect to several issues would seem to compel such a conclusion. The DEIR may be under the mistaken impression that if it concludes that no significant effects would occur after the implementation of mitigation measures or changes and

modifications in the project, then it need not identify significant impacts. This view is contrary to the plain language of CEQA and the Guidelines.

The fundamental purpose of an EIR is to identify the significant effects of a proposed project. It is this determination that imposes an obligation on the lead agency to require mitigation measures or changes in the project to mitigate or avoid the identified effects. The identification of significant effects also creates an obligation under CEQA to make certain mandatory findings, <u>including findings that appropriate mitigation measures or changes have been required to lessen the significant effects</u>.

CEQA expressly provides that "[t]he purpose of an environmental impact report is to identify the significant effects of a project on the environment, to identify alternatives to the project, and to indicate the manner in which those significant effects can be mitigated or avoided." (Pub. Resources Code § 21002.1, subd. (a).) The California Resources Agency "Discussion" following CEQA Guidelines section 15064 emphasizes this point:

> The determination of significance is one of the key decisions in the CEQA process. This decision leads to the preparation of either a Negative Declaration or an EIR which involves the additional requirements to investigate the significant effects, to propose mitigation measures and alternatives, to respond to public comments, and to make findings on the feasibility of changing the project to reduce or avoid significant effects. ("Discussion" following 14 C.C.R. § 15064.)

CEQA Guideline section 15064 explains the legal obligations of the lead agency and responsible agencies when the EIR identifies one or more significant effects:

> Determining whether a project may have a significant effect plays a critical role in the CEQA process . . . [¶] When a final EIR identifies one or more significant effects, the lead agency and each responsible agency shall make a finding under Section 15091 for each significant effect and may need to make a statement of overriding considerations under Section 15093 for the project. (14 C.C.R. § 15064.)

Under section 15091, a public agency is prohibited from approving a project when the EIR identifies one or more significant effects unless the agency makes findings based on substantial evidence that changes or alterations to avoid or substantially lessen the identified effects have been required, that such changes are within the jurisdiction of another agency, or that specific factors make mitigation measures or alternatives infeasible. (14 C.C.R. § 15091.) Where a public agency proposes to approve a project with significant effects that have been identified in the EIR but not substantially mitigated, it must adopt findings of overriding considerations supporting its decision. (14 C.C.R. § 15093.)

The failure to clearly identify significant effects also violates the informational objectives of CEQA. CEQA states that "[t]he purpose of an [EIR] is to provide public agencies and the public in general with detailed information about the effect which a proposed project is likely to have on the environment; to list ways in which the significant effects of such a project might be minimized; and to indicate alternatives to such a project." (Pub. Resources Code § 21061; see also § 21002.1.) It also defeats CEQA's policy of meaningful public input on appropriate mitigation measures or other changes and modifications in the project to avoid the identified effects.

2. DEIR does not Identify any Impacts as Significant, Despite an Analysis that Would Clearly Compel Such a Conclusion

The DEIR does not identify a single significant effect of the expanded use of plastic pipe, despite the obvious finding of its own analysis that significant impacts would occur without appropriate mitigation. The failure to identify significant effects violates the CEQA provisions discussed above and conceals from the public and government decision-makers information essential to evaluate the proposed project.

Probably the most glaring example of this deficiency in the DEIR occurs in its discussion of fire-safety. As discussed in section III.D.1., the DEIR finds unequivocally that the expanded plastic pipe use proposed by HCD would create a fire hazard, endangering the public health and safety. The DEIR concludes that "in fire-rated walls, plastic plumbing pipe cannot

be installed in the same manner as metal pipe without lowering the fire rating." (DEIR, p. 77.)

The DEIR's conclusions on fire-safety clearly constitute a finding of significant effect. An unambiguous statement of this finding is required by CEQA in order to alert the lead agency and responsible agencies of the importance of effective mitigation or changes in the project to lessen or avoid the significant effect. It also puts the public decision-makers on notice of the requirement to adopt appropriate findings as required by the CEQA Guidelines before acting on the project.

The DEIR's failure to state its finding that plastic pipe use would create a significant fire danger without the suggested special mitigation measures also misleads the public and undermines informed participation. A reader may be misled to believe that the special methods for plastic pipe installation in fire-resistive construction are a part of this project, rather than separate measures the imposition of which is critical to the protection of the public health and safety. The disclosure of this fact is especially important here since, as demonstrated in section III.D.1.e., these mitigation measures are not within HCD's jurisdiction to approve or require.

In a similar fashion, the DEIR's analysis of worker health indicates that without the elaborate worker protection methods suggested, a significant health impact on workers installing plastic pipe would result. As discussed in section III.C.8., the DHS worker health study found exposures in excess of established exposure levels. CEQA itself indicates that a finding of significant effect is required if a project "will cause substantial adverse effects on human beings, either directly or indirectly." (Pub. Resources Code § 21083.) The CEQA Guidelines also indicate that the creation of "a potential public health hazard" should also be considered a significant effect." (14 C.C.R. appen. G, subd. (v).)

With respect to drinking water contamination, the DEIR finds that a worker drinking preoccupancy water would be exposed to a cancer risk of 1 in 1 million. (DEIR, p. 52, fn. 6.) As the DEIR states, this is the level typically considered by regulators to represent a significant risk level. (DEIR, p. 57.) Nevertheless, the DEIR does not indicate any findings of significant impacts with respect to drinking water quality.

B. The DEIR Does Not Identify Feasible Mitigation Measures

As is described in detail above, HCD must develop feasible mitigation measures to decrease or avoid all of the significant impacts it identifies. In order to approve the project, it must make findings based on substantial evidence that mitigations have been required. (14 C.C.R. § 15091.)

In adopting mitigation measures, the Department is also required to adopt a reporting and monitoring program that will insure that the mitigation measures are actually implemented. (Pub. Resources Code § 81081.6.) The monitoring program must be supported by substantial evidence on the record. (14 C.C.R. § 15091, subd. (b).) The DEIR contains no evidence upon which to base the necessary findings for the monitoring and enforcement of mitigation measures.

As has been discussed throughout these comments, the DEIR does not contain feasible or enforceable mitigation measures. For example, flushing to reduce leaching of dangerous chemicals will not be reliably accomplished, and the flushing protocol does not reflect recent information concerning leaching. No amendments to the plumbing code or other actions are proposed to implement and enforce the proposal are set forth. The same is true with worker health. (See, *ante*, section III.C.10) and fire-safety (see, *ante*, section III.D.2.)

The mitigation discussion of the DEIR does not comply with CEQA, and provides no basis for a monitoring or implementation program.

C. The DEIR Discussion of Cumulative and Long-Term Effects Fails to Comply with CEQA

1. The Overall Impact of Expanded Uses of Plastic Pipe Must Be Considered With the Effects of Other Activities

The DEIR must contain a discussion of the cumulative impacts of the proposed project considered with other related activities. (14 C.C.R. § 15130.) "'Cumulative impacts' refers to two or more individual effects

which, when considered together, are considerable or which compound or increase other environmental impacts." (14 C.C.R. § 15355.)

"[I]t is vitally important that an EIR avoid minimizing the cumulative impacts. Rather, it must reflect a conscientious effort to provide public agencies and the general public with adequate and relevant detailed information about them." (*San Franciscans for Reasonable Growth v. San Francisco* (1984) 151 Cal.App.3d 61, 80 [198 Cal.Rptr. 634].) As in the rest of the EIR, conclusory statements do not constitute an adequate cumulative impact analysis. (*Whitman v. Board of Supervisors* (1979) 88 Cal.App.3d 397 [151 Cal.Rptr. 866].)

Cumulative impacts arise from two sources: the sum total of the many individual effects attributable to the project itself (14 C.C.R. § 15355 subd. (a)), and the impact of the project when considered in the context of other developments. (14 C.C.R. § 15355, subd. (b).) A project's environmental impact may not itself be significant, but it may become significant in light of the cumulative impacts of other past, present or foreseeable projects.

The cumulative and long-term impact analysis in the DEIR does not meet this standard. The discussion in the DEIR of the cumulative and long-term effects of increased use of plastic pipe consists of one page in a 350 page document. It repeats and misstates material from other parts of the report, but adds virtually nothing to the substance of the text. It denies the existence of cumulative impacts that do exist and misrepresents the facts concerning those impacts.

2. The DEIR Does Not Accurately Assess the Aggregate Effects of Expanded Uses of Plastic Pipe

In its assessment of cumulative impacts, the DEIR fails to acknowledge the full impact of the project when it states that the interactions among the leachates from plastic pipe, fittings and solvents would have only additive effects. (DEIR, p. 99.) This statement is false. The DEIR itself indicates only that additive effects were assumed for the purposes of analysis, not that other synergistic effects among leachates do not exist. (DEIR, p. 47.)

The comments of Dr. Martyn Smith, attached as appendix A, show that the assumption of only additive effects is incorrect, and that certain combinations of leachates have been proven to have potentiating effects on human cancer. For instance, a 1984 study suggests that MEK potentiates the carcinogenic properties of chloroform 30-fold. (Smith, appen. A, p. 16.) This is a significant health effect caused by the cumulative impacts of MEK and chloroform in plastic pipe leachates and chlorinated drinking water.

The DEIR underestimates the effect of MEK in water by as many as 30 times. An EIR that significantly underestimates cumulative impacts is in violation of CEQA and must be redrafted. (*San Franciscans for Reasonable Growth v. San Francisco* (1984) 151 Cal.App.3d 61 [198 Cal.Rptr. 634] (underestimation of square footage of other building projects by two or three times requires new cumulative impact analysis).)

In addition, the DEIR's position is contrary to evidence showing interactive effects of MEK and THF, both of which are found in solvent cements used to join CPVC pipe.[73] The worker health study and other scientific evidence document peripheral neuropathy and polyneuropathy in humans caused by exposure to both of these solvents. (See, *ante*, section III.C.8.a.) The DEIR does not acknowledge or explain the cumulative effects on human health of the solvents used in plastic plumbing systems.

3. The DEIR Fails to Discuss the Project in a Wider Environmental Context

In reviewing the cumulative impacts of the project and factors outside the project, the agency must look both at the environmental context in which the project will be implemented and other related projects that may magnify the total environmental damage. (Whitman v. Board of Supervisors (1979) 88 Cal.App.3d 397, 408 [151 Cal.Rptr. 502, 515]; Citizens to Preserve Ojai v. Board of Supervisors (1985) 176 Cal.App.3d 421, 431 [222 Cal.App.3d 247].) The DEIR does neither.

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[73] With the banning of PB, the greatly increased use of CPVC is likely.

a. The DEIR Does Not Discuss the Cumulative Impact of the Project on an Already Polluted Environment

While the DEIR notes that the chloroform leached from pre-occupancy water in the Cooper study reaches the AAL, it does not discuss this exposure in conjunction with the fact that most drinking water contains chloroform at background levels between 10 and 90 ppb.[74] (See *ante*, section III.C.8.a.) The DEIR also fails to consider the possibility that MEK could increase the cancer-causing effects of chloroform already in water to very dangerous levels.

Cancer can be caused by a combination of known carcinogens, even if individually they are present at low levels. The total exposure of workers and drinking water consumers to the carcinogens in plastic pipe and joining compounds as well as other common household exposures could increase the risk of cancer beyond the risk encountered through exposure to any one of the substances. (See, *ante*, section III.C.8.a.) The cumulative exposure to the toxic chemicals associated with plastic pipe when considered in light of other past, present and foreseeable exposures is undoubtedly significant. The Department must complete an analysis of these cumulative impacts in order to assure that the DEIR complies with standards required by CEQA.

The DEIR also states that water quality in California is poor. (DEIR, p. 44.) The DEIR also finds that carcinogenic and potentially carcinogenic leachates will enter the water from plastic pipe, but does not state that the cumulative impact of these chemicals on polluted water will make pure water an even more distant goal.[75]

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[74] The sole mention of this issue in the DEIR is a speculative one. (" . . . if other sources of these chemicals contaminate the water supply . . . .") (DEIR, p. 99.) Since it is clear that consumers will be exposed to other sources of chloroform, this fact must be discussed. It is not sufficient to speculate where specific and useful information is available.

[75] Of course, consistent with the tone of the entire DEIR, it uses serious environmental problems as an excuse to add to dismiss the incremental degradation as minor. For instance, the DEIR concludes that, although plastic pipe emits toxic smoke when burned, the smoke would be only a small portion of the total smoke in a fire. (DEIR, p. 81.) Noting that water quality in California is

(continued...)

In its discussion of fire safety, the DEIR notes that the smoke from fires in houses and other occupancies is highly toxic. (DEIR, p. 86.) It concedes that plastic pipe will add to the amount of already toxic smoke, but does not state, as it should, that the additional smoke from plastic pipe will aggravate an already significant and dangerous environmental impact.

The DEIR must acknowledge these cumulative impacts and assess whether or not they can be mitigated or whether the benefits are greater than the environmental costs. (14 C.C.R. § 15043.)

b. The DEIR Does Not Consider the Proposed Project With Other Projects

There is no indication in the DEIR that HCD has made or caused to be made any systematic survey of other projects that could magnify the already severe impacts of the proposed project. For instance, an increased use of plastics as a building material, alluded to in the discussion, might adversely affect the health of construction workers by exposing them to ever-greater amounts of plastic and joining materials from wall coverings, electrical conduits and other sources. This cumulative effect is not mentioned or analyzed in the DEIR.

There has apparently been no search of building code changes in the past ten years to determine if other plastic building materials are being or have been approved during that period.
Without such an analysis, it will be impossible to assess whether the incremental increase in plastics caused by use of plastic pipe is part of a much larger trend with even more significant environmental effects.

The DEIR ignores the cumulative effect of increased manufacturing and fabrication of plastic pipe and its resins on air and water quality and

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[75](...continued)
poor, the DEIR reasons that the slight additional decrease in water quality caused by plastic pipe will not effect the situation. (DEIR, p. 44.) This logic will, in the long run, "overwhelm the natural environment." (*Las Virgenes Homeowners Federation, Inc. v. County of Los Angeles* (1986) 177 Cal.App.3d 300, 306 [223 Cal.Rptr. 18, 23].)

worker health. Greater production will certainly increase factory emissions into water and air. Hazardous wastes from manufacture will increase. The DEIR must investigate and quantify air, water and soil pollution by the plastics industry and present a discussion of the subject so that the public and the Department will have a complete assessment of the impacts of this project and the cumulative impacts of this project and other related projects.

Because the DEIR ignores impacts on manufacturing, it contains no discussion of the cumulative impacts on employees of the plastics industry resulting from increased production of resins, pipe, fittings and solvents.

4. The DEIR Misstates the Long-term Effects of Exposure to Plastic Pipe

Since the Department is proposing an amendment to state policy and regulation concerning the uses of plastic pipe in California, the DEIR must include a discussion of the long-term effects of the project under scrutiny. (14 C.C.R. § 15126, subd. (e) and § 15127.)

As these comments have shown, the DEIR is wrong in its bald statement that ". . . although toxicological data are not complete, repeated exposure would probably not accumulate to serious, long-term health risks." (DEIR, p. 99.) Based on information contained in the appendices and other sources, the true state of knowledge at this time is that THF and MEK may well have chronic health effects on humans. There is a lack of information, but what is known suggests that these substances have long-term carcinogenic effects. Recent studies suggest that THF is toxic to the liver, that MEK and THF produce chromosomal aberrations which may cause cancer, and that the irritative effects of MEK may have long-term effects. (See, *ante*, section III.C.8.a.)

In light of this information, the DEIR should conclude that long-term exposure to these substances could accumulate to serious, chronic health effects. Because of such potentially serious long-term effects, the DEIR must consider whether the use of plastic pipe is justified despite the lack of economic or other benefits. (14 C.C.R. § 15093, subd. (b); *Towards*

Responsibility in Planning v. City Council (1988) 200 Cal.App.3d 671 [246 Cal.Rptr. 317].)

D. The Identification of Alternatives in the DEIR Does Not Aid Informed Decision-Making

1. Under CEQA, the Discussion of Alternative Projects is the Linchpin of the EIR

The DEIR admits, but subsequently ignores that the proposed expanded uses of plastic pipe have substantial environmental impacts. These include a significant degradation of already degraded water quality, worker overexposure to dangerous solvents and chloroform, and increased flammability of building materials. In light of the significant environmental impact of the project, a full discussion of project alternatives as required by CEQA is the "linchpin" of the DEIR. (*Monroe County Conservation Council, Inc. v. Volpe* (2d Cir. 1972) 472 F.2d 693, 697-698.)

An EIR must contain a "detailed statement" setting forth the "alternatives to the proposed project." (Pub. Resources Code § 21100, subd. (d).) The discussion of alternatives must be sufficiently detailed to "foster informed decision-making and informed public participation." (14 C.C.R. § 15126, subd. (d)(5).) "Conclusory comments in support of environmental conclusions are generally inappropriate." (*Laurel Heights Improvement Association v. Regents* (1988) 47 Cal.3d 376 [253 Cal.Rptr. 426, 438].)

Where, as here, the agency approving the project is the same as the agency proposing the project, the discussion and analysis of alternatives in the EIR must be specific enough to explain the reasoning process of the agency to the public. (*Laurel Heights Improvement Association v. Regents, supra*, 253 Cal.Rptr. at 440; *Citizens for Quality Growth v. Mount Shasta* (1988) 198 Cal.App.3d 436, 441 [243 Cal.Rptr. 727, 730].)

2. The DEIR Merely Identifies, but Does Not Discuss, Alternative Projects

The DEIR does not take the consideration of alternatives seriously. As a result, it does not comply with CEQA standards for consideration of alternatives to the proposed plumbing code amendments.

The perfunctory nature of the alternatives analysis in the DEIR is obvious from the extremely brief treatment of so important an aspect of the environmental review. Three general alternatives are identified, the second with several overlapping sub-alternatives. The entire treatment is little more than two pages in a DEIR (with appendices) of over 350 pages. (DEIR, pp. 103 -105; *Laurel Heights Improvement Association v. Regents* (1988) 47 Cal.3d 376 [253 Cal.Rptr. 426, 438]. EIR alternatives analysis of one and one-half pages in 250 page document violates CEQA.)

3. No Project Alternative

The first alternative identified in the DEIR is the "no project" alternative. It contains no more discussion than did this alternative in *Laurel Heights*, stating the "obvious conclusion" that the impacts identified in the DEIR would not occur. (*Laurel Heights Improvement Association v. Regents, supra*, 253 Cal.Rptr. at 438.) There is no discussion or analysis of this alternative. For instance, the fire safety implications of the no project alternative are not even mentioned. The economic effects are neither mentioned nor discussed. The DEIR does not mention or discuss widespread mechanical failures of plastic pipe. Indeed, the DEIR does not even outline in any detail exactly what the no project alternative would entail for uses of metal and plastic pipe.

a. Modified Projects

The second set of alternatives is five modifications on the proposed project which narrow its scope. The fifth modification is merely a combination of the third and fourth. None of these alternatives is discussed in more than a single paragraph. The DEIR fails to analyze how the mechanical failures of plastic pipe affect these modifications.

The first modification is too unclear to allow for intelligent public comment as required by CEQA. It would "permit the use of only PB for hot and cold water supply, inside and outside all buildings." (DEIR, p. 103.) It is not clear whether this is an awkward way of saying that all proposed CPVC uses would be abandoned, or that CPVC use would still be proposed for drain-waste-vent applications. If the latter is implied, then the short discussion of this alternative is partially irrelevant since plumbers would continue to be exposed to dangerous solvent cements.

If this is a "no CPVC" alternative, it should be stated as such and subjected to the level of discussion and analysis required by CEQA. For instance, in *Laurel Heights*, the court disapproved an alternative site analysis that merely identified where the sites were and stated that they were too small. There was no discussion of how large the alternative sites were, the possibility of expanding existing sites, or purchasing or leasing other sites away from residential neighborhoods.

A discussion of a "no CPVC" alternative in the required detail would, at a very minimum, demand some analysis of its impact on water quality and fire safety. The DEIR erroneously concludes that all other impacts would be the same as the proposed project, although the body of the document states that CPVC is more expensive than PB and copper, so this alternative would allow the use of less expensive plumbing materials.

In light of the removal of PB pipe from the UPC by IAPMO, the DEIR inexplicably fails to propose, discuss and analyze a "no PB" alternative. Since the Department and the State Building Standards Commission are prohibited from approving building standards that are not as safe as those found in the UPC (see, *ante*, section II.3.b.), the implementation of this alternative is clearly within the reasonable range of alternatives which must be analyzed. Yet it is not mentioned in the draft.

Any discussion of the "no PB" alternative must include an analysis of the public health, worker health, fire safety and economic implications of such a project. These must be weighed against the environmental impacts of the proposed project itself and the other suggested alternatives.

Another alternative identified but not discussed or analyzed in the DEIR suggests that plastic installations be limited to threaded and not glued fittings. There is no assessment of the feasibility of this alternative - can these types of plastic pipe be joined in threaded fittings? The DEIR does not discuss the implications for fire safety of this alternative. There is no analysis of the economic impact of using threaded instead of glued joints. There is simply no information provided about this alternative that allows the public to assess it in any meaningful way.

The DEIR also suggests that PB and CPVC pipe be used only outside buildings. The DEIR does not mention the impact of such a project on water quality. It does not address the economic feasibility of the alternative.

The fourth modification is unclear. It could refer to a project that limits DWV outside and in fire-rated construction to CPVC pipe, or one which limits CPVC pipe use to DWV outside and in fire-rated construction. Until the meaning of the alternative is clarified, the public cannot comment on it with any precision. In any case, the alternative is only identified, but is not discussed or analyzed. It does not address the water quality impacts of such a project, or its economic feasibility.

The last modification is a combination of the preceding two and suffers from the same analytic flaws. There is no discussion or analysis of water quality or worker health issues, nor any effort to weigh the environmental advantage of the alternative against the other alternatives.

b. No Plastic Alternative

The DEIR proposes a final alternative which would ban all plastic pipe in California. This alternative is not subject to sufficient discussion to allow a reasonable assessment of its environmental advantages. For instance, the DEIR states that a "no plastic" alternative would decrease permeation of pipe and that leachates would change. However, the leachates referred to are not listed nor are their toxic properties compared. It is impossible from this discussion to determine whether or not plastic or metal leachates are to be preferred.

The truncated discussion of the alternative states that the positive or negative impacts on industry would probably be greater than the proposed project, but the positive or negative impacts are not listed. Without such information, it is impossible to assess this alternative. The DEIR presents no discussion of the economic impact of the "no plastic" alternative.

4. The DEIR Does Not Identify "No Project" as the Environmentally Superior Alternative

The entire alternatives discussion completely ignores the purpose of the requirement that alternatives be presented in the first place. There is no discussion of the "comparative merits of the alternatives" as required by CEQA. (14 C.C.R. § 15126, subd. (d).) The alternatives discussion in the DEIR does not identify the environmentally superior alternative, does not explain why the alternatives were rejected in favor of the proposed project, and does not identify a superior alternative from among all but the "no action" alternative. All of these analyses are required by CEQA and are missing here. (14 C.C.R. § 15126, subds. (d)(1) and (2).)

On the basis of the comments presented in this document, there can be no doubt that the "no project" alternative is the environmentally superior project. Although the entire spectrum of negative environmental impacts of plastic pipe, from manufacture to sale to installation, cannot be repeated here, without expanded uses of plastic plumbing pipe, the mechanical failure, water quality, worker health, and fire safety problems associated with this product would disappear. Cast iron, galvanized steel and copper pipe pose no danger to water quality. (DEIR, p. 55.) They are environmentally superior to plastics, and even the DEIR concludes they are no more expensive.

The limited discussion of project alternatives in the DEIR is completely inadequate to meet the minimal standards for such discussion in CEQA. "To facilitate CEQA's informational role, the EIR must contain facts and analysis, not just the agency's bare conclusions or opinions." (*Laurel Heights Improvement Association v. Regents* (1988) 47 Cal.3d 376 [253 Cal.Rptr. 426, 439], citing, among others, *Concerned Citizens of Costa Mesa, Inc. v. 32nd Dist. Agricultural Assn.* (1986) 42 Cal.3d 929, 935 [231 Cal.Rptr. 748].) The alternatives posed in the DEIR must be completely analyzed and explained

and circulated for public review after the ambiguities and uncertainties have been clarified.

E. The DEIR Fails to Consider All Significant Irreversible Environmental Changes Resulting from Expanded Uses of Plastic Pipe

CEQA requires the EIR to include a detailed statement concerning "[a]ny significant irreversible environmental changes which would be involved in the proposed project should it be implemented." (Pub. Resources Code § 21100, subd. (e).) The DEIR barely acknowledges this requirement with a scant half page discussion of the irreversible changes the proposed project would cause. The DEIR discussion contradicts the ERD section on the same topic and no explanation is offered.

The expanded uses of plastic will have at least four major irreversible impacts. The project will discharge carcinogens and other dangerous chemicals into drinking water of unknown types in unknown quantities. It will expose plumbers to daily doses of known carcinogens and other chemicals that may be cancer-causing. It will introduce into fire-rated and non fire-rated construction a new flammable material to replace a material that is not flammable. Finally it will replace a strong, stable, long-lasting pipe material with weaker, more fragile plastic in construction where replacement is virtually impossible without destructive renovations of considerable cost and inconvenience to building owners.

The DEIR dismisses the irreversible changes in drinking water quality in a few lines. It does not recognize the real implication of the facts buried in the document, appendices and supporting studies which raise serious questions concerning the leaching of chemicals, some known, most not, into already polluted drinking water. As these comments have shown, an inadequate project description has led the Department to ignore large areas of impact. New materials and new manufacturing processes have changed the formulation of pipe and the contaminants found with pipe just during the period the DEIR has been in production.

If DMF is phased out, what will replace it? What will be the irreversible effects on water quality and ultimately the health of Californians

from these new chemicals? Is there any way to know what new materials are being used or what new manufacturing processes installed before the pollutants they produce are consumed by the general population? None of these issues are discussed in this section of the DEIR.

Those impacts that are addressed are underestimated. For instance, the DEIR must discuss the irreversible environmental changes resulting from the introduction of THF and MEK into drinking water over tens and hundreds of years.

The DEIR discussion of the irreversible impacts of plastic pipe on worker health is also completely inadequate. The Department's own study shows that plastic pipe solvents will expose plumbers to unsafe levels of THF. These comments highlight the fact that the established levels of safety themselves are inadequate, and that present information concerning the known chemicals suggests chronic health effects. What are the irreversible changes inherent in exposing California's plumbers to greater amounts of carcinogens? The DEIR must discuss this question in detail.

In striking contrast to the non-discussion of irreversible impacts on worker health contained in the DEIR, the ERD discusses the fact that increased deaths from cancer are certainly an irreversible long-term impact from the use of plastic pipe and its primers, solvents and glues. (ERD, p. V-12.) There is no explanation of the very different conclusions on this point found in the DEIR and ERD.

The reader is left confused and uncertain about the true irreversible effects of the proposed project. The DEIR says there are no impacts at all. The ERD indicates that more deaths will result. At the very least, this inconsistency must be explained. To comply with the spirit and letter of CEQA, however, the DEIR must honestly and openly discuss each and every irreversible impact, including increased deaths from cancer.

Although the ERD suggests increased mortality from the smoke toxicity of plastic pipe, the DEIR dismisses the irreversible impacts of flammable plastic pipe. (ERD, p. V-12; DEIR, p. 101.) Certainly the exchange of an inflammable for a flammable material will be irreversible. If the project is implemented a portion of building construction not now vulnerable to fire

will burn. Homes and buildings plumbed with plastic will then be more flammable as a whole. This effect of the project is irreversible.

Neither the ERD or DEIR discuss the irreversible impact of installing failure-prone plastic instead of metals that last much longer. Tens of thousands of homes will contain plumbing systems that break and leak far sooner and more frequently than metal. It will not be possible to replace all of these systems for economic, logistic and practical reasons. The wide usage of plastic pipe would, alone, make removal or use of other materials unlikely. (14 C.C.R. § 15126, subd. (f).) In some cases, where plumbing is placed in concrete slabs, replacement is simply not possible. The installation of plastic in these locations is irreversible. Yet this fact is neither mentioned nor discussed in the DEIR.

The advantages of a serious assessment of the irreversible effects of increased uses of plastic are revealed in the history of the plumbing code change now under review and other building materials that have, after the fact, been found to be dangerous.

Had the code changes now proposed gone into effect as planned in 1981, thousands of California homes would have been plumbed with polybutylene pipe. PB piping systems used in limited areas of California and widely in Texas has and continues to fail, ruining homes, reducing property values, and costing thousands of dollars for partial or complete replacements. The delay caused by careful environmental review has saved California from being used as a vast testing ground for unsound materials. The irreversible damage done elsewhere has been avoided. More damage and the costs of repair can also be avoided if the DEIR contains a hard and honest look at plastic pipe and the changes it will cause.

The cost of reversing a mistake is much higher than avoiding one in the first place. Hundreds of millions of dollars have been spent removing asbestos from homes, offices, schools and other buildings because its impact on human health was not adequately assessed before it became a ubiquitous building material. The impact on human health is irreversible. The cost of removal is unavoidable, although much asbestos will probably never be removed. Its ill-considered use will plague us for hundreds of years.

In light of recent experience with PB pipe and asbestos, the Department must complete an assessment of the irreversible environmental impact of installing even greater amounts of plastic pipe in homes and buildings.

One of the basic irreversible changes the DEIR should consider is the use of nonrenewable resources. (14 C.C.R. § 15126, subd. (f).) Plastic is a petroleum by-product. Petroleum is a non-renewable resource. Unlike metals, plastic is not recyclable. The DEIR does not mention these facts or assess whether the current use of petroleum for this purpose is justified, as required by CEQA. The DEIR must study how much petroleum will be used in the coming years, what alternative uses might be, how long known resources will last, and the relative advantages and disadvantages of present versus postponed use of this resource.

In its present state, the DEIR treatment of significant irreversible changes in the environment resulting from increased uses of plastic pipe does not comply with CEQA.

V. CONCLUSION

The analysis presented in these comments clearly demonstrates that the proposed code changes would cause significant adverse effects on public health and safety. The DEIR substantially underestimates potential impacts due to a number of omissions and deficiencies in the analysis of drinking water contamination, worker health and fire-safety. Moreover, the DEIR fails to consider at all a broad range of potentially significant impacts due to an inaccurate and overly narrow project definition.

The economic analysis presented by Dr. Dickens also proves that the code changes would substantially increase plumbing costs. The DEIR completely misinterprets the economic impact of the proposal by failing to take into account a number of significant additional costs associated with the use of plastic pipe. The DEIR also dramatically understates the true cost of switching to plastic plumbing by assuming the use of PB instead of copper. As discussed, PB has been banned by IAPMO and will most likely not be the material substituted for copper. As demonstrated in Dr. Dickens'

analysis, the use of any other plastic material would significantly increase plumbing costs over the cost of metal pipe.

Under these circumstances, HCD would be unable to justify the proposed code changes under the standard required by the California Building Standards Law. Health and Safety Code section 18930 requires HCD to demonstrate, inter alia, that "[t]he public interest requires the adoption of the building standards" and that "[t]he cost to the public is reasonable based on the overall benefit to be derived from the building standards." (Health & Saf. Code § 18930, subds. (a)(3) and (5).) In view of the significant adverse impacts and increase costs associated with the expanded use of plastic pipe, it is clear that HCD will not be able to meet this standard and will be required to withdraw the proposed code changes.

Comments of

California Pipe Trades Council
California Firefighters Association
California Legislative Conference of the Plumbing, Heating and Piping Industry
Mechanical Contractors Association of Northern California
Richard Cuffe, Greg Baker, Ron Morgan and Sam Gill

on the

DRAFT
ENVIRONMENTAL IMPACT REPORT
FOR
CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE
USE FOR POTABLE WATER PIPING IN RESIDENTIAL BUILDINGS

August 29, 1998

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Comments of

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I. INTRODUCTION

Given the generally-recognized deficiencies of the 1989 Plastic Pipe Draft EIR, we did not think a more deficient environmental assessment of these issues was possible. We were wrong. At least the independent consultants engaged by HCD in 1989 took the issues seriously and attempted to conduct a substantive analysis. The present Draft EIR does neither. It consists of a series of conclusory assertions that dismiss any possible concern or question regarding CPVC pipe.

The concerns and questions regarding the human health and environmental impacts associated with CPVC are not just dismissed without analysis, they are swept away with broad statements touting the wonderful qualities of this material. The Draft EIR reads like an extended marketing brochure for CPVC, which perhaps is not surprising since much of it is based on information supplied by the Marketing Division of B.F.Goodrich Speciality Chemicals, which stands to make millions of dollars if the project is approved.

The intense pressure revealed in the internal documents to secure CPVC approval before the end of the present Administration required that the CEQA process be completed "quickly and efficiently." This fast track did not allow for any meaningful assessment of the serious health and environmental issues associated with CPVC installation and use. The resulting product is a quintessential example of a "grudging, pro forma" environmental review that fails to meet the most basic CEQA requirements.[1]

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[1] It is important to emphasize that while the technical comments included in exhibits A – D support the analysis of the legal deficiencies in the document discussed in this letter, they are submitted as independent comments on the Draft EIR and require a separate response. While we have found it helpful to occasionally reference points made in the technical comments, the relevant technical comments should be consulted for a detailed discussion and analysis of the substantive point. A response to the general summary of the technical discussion that appears in this letter would not suffice as a response to the specific, detailed points made in the technical analysis. CEQA requires a "good faith, reasoned analysis in response" to specific environmental issues raised in the comments. (14 C.C.R. § 15088(b); *see also Environmental Protection Information Center v. Johnson* (1985) 170 Cal.App.3d 604, 628 [216 Cal.Rptr. 502], "conclusory responses unsupported by empirical information, scientific authorities or explanatory information have been held to be insufficient to satisfy the requirement of a meaningful, reasoned response.")

As discussed in detail below and in the technical comments, the Draft EIR's evaluation of the project fails to meet the minimum standards of CEQA. The Draft EIR's analysis of potential impacts is completely devoid of any quantification, empirical analysis or factual examination of any kind. The document does not provide substantial evidence to support its findings regarding potential environmental effects.

The Draft EIR's unprecedented failure to undertake any substantive analysis of impacts has required the extraordinary effort to identify and analyze project impacts reflected in the attached technical comments. Exhibit A includes the technical comments prepared by Thomas Reid Associates. These comments focus on the problems in the Draft EIR's definition of the project, and also address a number of project impacts not considered by the Draft EIR. Tom Reid has over 25 years of experience in preparing EIRs for public agencies and for project applicants. He also has 18 years of experience studying the chemistry of plastic plumbing products, and evaluating the human health and environmental effects associated with such materials.

Exhibit B contains the comments of Dr. Martyn T. Smith and Ms. Peggy Lopipero. Dr. Smith is a Professor of Toxicology in the School of Public Health at the University of California, Berkeley. He is the Head of the Division of Environmental Health Sciences at U.C. Berkeley. Dr. Smith is particularly familiar with this project, having prepared comments on HCD's 1989 Plastic Pipe Draft EIR. Ms. Lopipero has almost ten years of experience as a consultant specializing in toxicology and epidemiology, working for the State of California and other clients. Dr. Smith and Ms. Lopipero address the full range of toxicological issues raised by the project.

Exhibit C includes the technical comments of James D. Bellows. Mr. Bellows is a Certified Industrial Hygienist and Certified Safety Professional. He is exceptionally well-qualified to address the worker health and safety issues associated with the project, having served as the lead author of the 1989 Department of Health Services ("DHS") CPVC worker exposure study relied upon by the Draft EIR. Mr. Bellows presents a detailed analysis of the significant worker health impacts that would result from project approval.

Exhibit D contains the comments and analysis of the air quality issues prepared by Dr. Phyllis Fox. Dr. Fox has 25 years of experience preparing or reviewing air quality analyses for EIRs. Dr. Fox presents a detailed calculation of the VOC emissions that will result from project approval.

These comments demonstrate that the project as currently proposed would cause significant adverse impacts on human health and the environment. The Draft EIR presents no factual analysis, scientific assessment or other substantial evidence that would support a contrary conclusion.

II. DRAFT EIR FAILS TO COMPLY WITH THE FUNDAMENTAL INFORMATIONAL AND PUBLIC DISCLOSURE REQUIREMENTS OF CEQA

A. Legal Standards

"CEQA's fundamental goal [is] fostering informed decision-making." (*Laurel Heights Improvement Association v. Regents of the University of California ["Laurel Heights I"]* (1988) 47 Cal.3d 376, 402 [253 Cal.Rptr.426].) "The purpose of CEQA is not to generate paper, but to compel government at all levels to make decisions with environmental consequences in mind." (*Bozung v. LAFCO* (1975) 13 Cal.3d 263, 283 [118 Cal.Rptr. 249].) The EIR is "the heart of CEQA" (*County of Inyo v. Yorty* (1973) 32 Cal.App.3d 795, 810 [108 Cal.Rptr. 377]), and "serves as the informational tool to facilitate informed decision-making." (*Dusek v. Anaheim Redevelopment Agency* (1985) 173 Cal.App.3d 1029, 1037 [219 Cal.Rptr. 346].)

"A legally adequate EIR 'must contain sufficient detail to help ensure the integrity of the process of decision-making by precluding stubborn problems or serious criticism from being swept under the rug.'" (*Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 733 [270 Cal.Rptr. 650].) The EIR serves "to demonstrate to an apprehensive citizenry that the [agency] has analyzed and considered the ecological implications of its action." (*No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68, 86 [118 Cal.Rptr. 34].) "Thus, the EIR 'protects not only the environment, but also informed self-government.'" (*Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 564 [276 Cal.Rptr. 410]; citation omitted.)

B. Application of Legal Standards to Draft EIR

The combined deficiencies in the Draft EIR result in a document that fails to meet the most basic informational and public disclosure requirements of CEQA. As explained in detail in each of the sections that follow and in the attached technical exhibits, the Draft EIR does not reflect an independent

assessment of the project, fails to disclose the analytical and technical basis for its conclusions, fails to include an accurate or complete project description, wholly fails to address a number of project impacts and inadequately addresses others. The document is so profoundly defective, it constitutes little more than a "*post hoc* rationalization" designed to secure project approval "quickly and efficiently."

Rather than "fostering informed decision-making," the Draft EIR misleads the public and the decision-maker regarding both the true nature of the project and the true scope and severity of potential environmental and public health effects. The unprecedented lack of disclosure in the document effectively sweeps under the rug the complicated issues raised by the project. The absence of analysis in the Draft EIR has also improperly shifted to the public the burden of identifying and analyzing the serious environmental and public and worker health issues associated with the proposed project. The Draft EIR does not serve " to demonstrate to an apprehensive citizenry that the [agency] has analyzed and considered the ecological implications of its action." (*No Oil, Inc. v. City of Los Angeles, supra,* 13 Cal.3d at p. 86.)

III. DRAFT EIR IS NOTHING MORE THAN A "*POST-HOC* RATIONALIZATION" OF A DECISION ALREADY MADE

The Department's reluctant compliance with CEQA under compulsion of a court order, and its determination to approve the project before the end of the present Administration, have undermined the integrity of the environmental review process. The review process has been put on a fast track, and has been denied the resources and expertise necessary to produce a meaningful and substantive analysis of the issues. It has resulted in an assessment that is not genuine or objective, and that has given short shrift to the serious public health and environmental issues associated with the installation and use of CPVC potable water pipe. The Draft EIR reflects little more than a *post hoc* rationalization of the Department's prior determinations regarding the environmental and public health issues raised by the project.

A. Legal Standards

The courts have emphasized that the integrity of the environmental review process depends upon a genuine, objective and complete assessment of a project's potential environmental effects *before* the agency has decided to approve a project. (*Laurel Heights I, supra,* 47 Cal.3d p. 394, *Mira Monte*

Homeowners Assn. v. County of Ventura (1985) 165 Cal.App.3d 357, 366 [212 Cal.Rptr. 127], *County of Inyo v. City of Los Angeles* (1984) 160 Cal.App.3d 1178, 1185 [207 Cal.Rptr. 425].) The Supreme Court explained the policy rationale for this requirement in *Laurel Heights*:

> "A fundamental purpose of an EIR is to provide decision makers with information they can use in deciding *whether* to approve a proposed project, not to inform them of the environmental effects of projects that they have already approved. If post-approval environmental review were allowed, EIR's would likely become nothing more than *post hoc* rationalizations to support action already taken. We have expressly condemned this use of EIR's. [citation omitted]." (*Laurel Heights I*, 47 Cal.3d at p. 394; original emphasis.)

The courts have given particular consideration to "how a public agency must approach the environmental planning and approval process the second time around when its original actions have been declared violative of CEQA." (*San Franciscans for Reasonable Growth v. City and County of San Francisco* (1989) 209 Cal.App.3d 1502, 1522-1523 [258 Cal.Rptr. 267].) In *Laurel Heights*, for example, the Supreme Court put the lead agency on notice that its prior approval of the project would not excuse anything less than full and complete compliance with CEQA requirements:

> "The [lead agency] must begin anew the analytic process required under CEQA. We will not accept *post hoc* rationalizations for actions already taken, particularly in light of the fact that those activities were begun in violation of CEQA, even if done so in good faith. To do so would tarnish the integrity of the decision making process required by CEQA . . . ." (*Laurel Heights I, supra,* 47 Cal.3d at p. 425.)

The courts will not countenance a "grudging and pro forma compliance" with environmental review requirements. (*San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 742 [32 Cal.Rptr. 704].) The "assessment of environmental impacts . . . must be genuine [and] open to the public, premised upon a full and meaningful disclosure of the scope, purposes, and effect of a project." (*County of Inyo v. City of Los Angeles, supra,* 160 Cal.App.3d 1178, 1185; *see also Mira Monte Homeowners Assn. v. County of Ventura, supra* 165 Cal.App.3d at p. 366.)

"[A] *post hoc* rationalization of a decision already made" defeats the fundamental informational and public disclosure objectives of CEQA. (*Laurel Heights I, supra,* 47 Cal.3d 376, 395.) "Only by requiring the [lead agency] to fully comply with the letter of the law can a subversion of the important public purposes of CEQA be avoided . . . ." (*People v. County of Kern* (1974) 39 Cal.App.3d 830, 842 [115 Cal.Rptr. 67]; *Mira Monte Homeowners Assn. v. County of Ventura, supra* 165 Cal.App.3d at p. 366, *San Franciscans for Reasonable Growth v. City and County of San Francisco* (1984) 151 Cal.App.3d 61, 71-72 [198 Cal.Rptr. 634].)

B. Application of Legal Standards to Draft EIR

1. HCD's Prior Decision to Approve CPVC Pipe

In this case, the Draft EIR was prepared *after* the Department had concluded that the use of CPVC pipe did not present any legitimate environmental or public health concerns, and *after* HCD had already decided to approve the project. Prior to commencing its environmental assessment, HCD and the Administration were on record repeatedly denying that approval of CPVC pipe would present a potential for any significant environmental effects. Indeed, three years ago, HCD approved the same project considered in the Draft EIR without conducting any environmental review. At that time, HCD expressly rejected claims that it was required to first prepare an EIR before approving the project, and stated its view that CPVC use did not present any risk to the environment or public health. The present EIR was prepared only after the court overturned the Department's 1995 project approval for failure to comply with CEQA, and after the Administration's efforts to secure approval of CPVC through the Legislature were unsuccessful.

On October 26, 1995, the Department approved proposed regulations authorizing the identical use of CPVC it now considers in the Draft EIR. A coalition of labor organizations, environmental groups and plumbing and mechanical contractor associations objected to the proposed approval of CPVC on the ground that HCD had failed to address the serious public health and environmental issues associated with CPVC potable water pipe. The coalition submitted extensive comments detailing the significant drinking water contamination, worker health and safety, air quality and other environmental and health issues associated with installation and use of CPVC pipe. The Copper Development Association ("CDA") and other interested parties also submitted comments raising similar concerns. The

coalition, CDA and others argued that HCD was required to conduct an environmental assessment pursuant to CEQA *before* proposing approval of CPVC pipe.

The Department rejected these arguments and expressly stated in its Final Statement of Reasons filed under the Administrative Procedure Act ("APA") that "*[i]t is the DHCD's position that adoption of the proposed regulation [approving CPVC] would not have a significant effect on the environment . . . .*" (Appen. 1; p. 20; emphasis added.) The Department's APA statement went on to list the reasons for HCD's conclusion that the CPVC approval would not have any significant environmental effects, none of which included an assessment of the potential for such effects conducted pursuant to CEQA. (*Ibid.*)

The Department submitted the proposed regulations approving CPVC to the California Building Standards Commission ("CBSC") for adoption as required by the California Building Standards Law. (Health & Saf. Code §§ 18901, *et seq.*) HCD representatives testified before the CBSC that the approval of CPVC potable water pipe would not have significant environmental effects. In adopting HCD's proposed regulations, the CBSC specifically relied upon the Department's analysis with regard to the need for CEQA compliance in approving CPVC pipe. (Appen. 2, p. 7.)

A coalition of labor, environmental and contractor groups challenged the HCD/CBSC approval in court for failure to comply with CEQA. The court found that an amendment to the California Plumbing Code allowing the use of CPVC pipe constituted discretionary action subject to CEQA, and that such action could result in potentially significant environmental effects. (*Cuffe, et al. v. California Building Standards Commission and California Department of Housing and Community Development* (Sup. Ct. San Francisco County, 1997, No. 977657) Order granting writ of mandate filed Jan. 21, 1997, appen. 3.) On this basis, the court invalidated the CPVC approval and ordered HCD and the CBSC to take no further action to approve CPVC without complying with CEQA. (*Cuffe, et al. v. California Building Standards Commission and California Department of Housing and Community Development, supra,* judgment granting peremptory writ of mandate filed April 9, 1997, appen. 4.)[2]

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[2] The Draft EIR attempts to limit the significance of the *Cuffe* holding by asserting that "the courts have required [HCD] to comply with CEQA only in reconsidering [HCD's previous prohibition] with regard to the use of CPVC in California." (Draft EIR, p. 9.) The Draft EIR

Following the court decision, HCD and the Administration backed a legislative effort to circumvent the court-ordered environmental review. The Department supported Assembly Bill 942 (Miller), which was introduced one month after the *Cuffe* decision, and would have allowed CPVC potable water pipe for use in California without any CEQA compliance. The bill failed to receive sufficient votes and died in the Assembly Appropriations Committee on May 21, 1997.

2. Internal Decisions Not to Retain Technical Expertise and to Rely on Information From B.F. Goodrich

With all attempts to avoid environmental review unsuccessful, the Department and the Administration reluctantly accepted that an EIR would be required in order to approve CPVC. This reluctance is clearly reflected in the internal strategy decisions regarding the EIR's preparation, and is barely disguised in the Draft EIR itself. The Draft EIR repeatedly questions the need for an environmental assessment noting that, in other states CPVC "is simply an item of commerce," and indicating that such use "might ordinarily establish a reasonable presumption that CPVC can be used safely." (Draft EIR, pp. 2 and 19.) Despite this ordinary presumption, HCD "elected" to evaluate potential impacts because of "a history of controversy" with CPVC. (Draft EIR, p. 19.) [3]

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goes on to suggest that future changes in California Plumbing Code ("CPC") provisions would not be subject to CEQA. (*Ibid.*) These assertions are not supported by any language in the actual *Cuffe* ruling. Indeed, the court *rejected* HCD's arguments that CEQA does not apply to changes in building standards. The court also specifically found that the approval of CPVC was a discretionary decision not only because it represented a reversal of prior policy, but also because it constituted a substantive amendment to the CPC. (*Cuffe, et al. v. California Building Standards Commission and California Department of Housing and Community Development, supra,* order granting writ of mandate filed Jan. 21, 1997.) The Draft EIR's interpretation is also inconsistent with the official position taken by the Department's Division of Codes and Standards, which has notified at least one plumbing material manufacturer that HCD's authorization of his product in the CPC would require both UPC approval *and* an EIR prepared pursuant to CEQA. (Appen. 5.)

[3] This statement is disingenuous at best. HCD has not "elected" to prepare this EIR; it is being prepared under court order. The court ordered its preparation not because of "a history of controversy," but because of substantial evidence of significant environmental and public health issues raised by the project.

The overall tone for this effort was set at the highest levels of the Administration. Governor Wilson called the prohibition on CPVC potable water pipe a "tragedy," and expressed the Administration's view that "[t]here is not a good case that can be made against [CPVC pipe]." (Delson, *Wilson Rips Ban on Plastic Pipes*, Riverside Press-Enterprise (Dec. 25, 1997).) The Press-Enterprise report also noted that "Wilson earlier tried to order statewide legalization of plastic pipe through administrative channels, but a court rejected that policy, pending completion of an environmental impact report." (*Ibid.*)

At the outset of the planning process for the CPVC environmental review, the Business, Transportation and Housing Agency ("BTH") informed HCD in no uncertain terms that its job was to secure approval for CPVC before the end of the Wilson Administration. (Appen. 6.) HCD appeared to understand its assignment, reporting to BTH that "[o]ur goal is to have CPVC pipe approved for residential interior use by December 1998." (Appen. 7.)

The Department's attempt to avoid CEQA review over the last several years, however, left very little time to both conduct a meaningful assessment of the complex public and worker health and environmental issues associated with CPVC, and also approve the pipe before the Wilson Administration leaves office. The record shows that the ambitious timeline established for CEQA review and project approval quickly came into conflict with the substantive requirements of a genuine environmental assessment. As established by internal BTH and HCD memoranda, at every turn priority was given to the timeline over a meaningful review process.

An internal BTH memorandum reporting on an early planning meeting between BTH and HCD indicated that the HCD Director had raised concerns about BTH's involvement in the management of the environmental review. (Appen. 6.) In response, however, BTH made clear that it would not tolerate any delays in the environmental review process that might jeopardize the timeline for project approval. The BTH representative at the meeting asked the HCD Director, "if he were totally left alone, what would his timeline be?" (*Ibid.*) According to the BTH memorandum, the HCD Director indicated that it would take "a month to meet and put a plan together, and he went on and on." The BTH representative "stopped him finally and said that such a 'plan' would be unacceptable." (*Ibid.*)

As reported in another internal BTH memorandum, a follow up meeting between the BTH representative and the HCD Director was held to ensure that HCD understood that its mission was to ensure CPVC approval by December, 1998. The BTH representative reports that he "just had a come to Jesus meeting with [the HCD Director]." (Appen. 6.) The memorandum reports that the HCD Director indicated that he had been specifically told by BTH "that he [HCD Director] was individually and personally on the line to manage and make this thing work. That his job, reputation and [expletive] would be ground into nothingness if he failed . . . . [HDC Director] also apologized if he misunderstood his role, and is ready and willing to cooperate to make plastic pipe for residential use a reality." (*Ibid.*)

This initial exchange between BTH and HCD laid the ground rules for the review process. If one month to identify the analytical requirements and plan for the preparation of a complex environmental assessment was "unacceptable," then clearly no element of the analysis would be allowed to interfere with the timeline for approval. From that point forward, the record demonstrates that all decisions regarding the preparation of the EIR were driven by the determination to complete the CEQA review "quickly and efficiently." (Appen. 8.)

The emphasize on timely approval over analytical requirements is nowhere more evident than in the key decision regarding who would prepare the EIR. HCD does not have a staff with the technical qualifications to consider the drinking water, industrial hygiene, air quality, fire safety, and other highly specialized issues involved in this project. This lack of expertise is not unexpected since these issues are outside of HCD's normal regulatory and jurisdictional responsibility.

In HCD's last attempt to prepare an environmental assessment of CPVC potable water pipe and other plastic pipe uses, the Department recognized the need to hire an independent consulting firm with the necessary expertise to evaluate the technical issues involved in this project. In the 1989 proceeding, HCD contracted with the Stanford Research Institute ("SRI") to prepare the EIR. SRI had in-house expertise in a number of the relevant disciplines, and also subcontracted for additional technical expertise to consider the industrial hygiene, fire safety and other specialized subjects. (Draft EIR, Plastic Plumbing Pipe, August 1989, "1989 Draft EIR," p. 117.) The costs of the independent consultant were paid for by the Society of the Plastics Industry, representing the industrial interests that were the proponent of the project. (Appen. 9.)

In the present proceeding, the record shows that BTH and HCD began meeting with representatives of the B.F.Goodrich Company as early as June 1997. (Appen. 10.) The purpose of these meetings was to formulate a strategy for certification of a Final EIR and approval of CPVC by December 1998. (Appen. 11.) B.F.Goodrich is the major domestic producer of CPVC pipe resins and would be the major beneficiary of HCD's approval of CPVC pipe. B.F.Goodrich stands to make millions of dollars from expanded pipe sales in the California market. (Delson, *Pipe Wars*, Riverside Press Enterprise, Oct. 6, 1997.)[4]

In these discussions, HCD again recognized its lack of technical competence to evaluate the environmental and public and worker health issues associated with the project. The record reveals, however, that BTH and HCD were concerned that engaging an independent consultant would delay the process and jeopardize approval of the project within the ambitious timeline that had been established. (Appen. 8.) BTH and HCD even considered having the EIR prepared by another state agency, and discussed the matter with Caltrans. Caltrans representatives indicated, however, that while Caltrans has experience with CEQA procedures and had the "expertise to *manage*" the preparation of an EIR, it did "not have in-house expertise to deal with the [public] health" issues raised by the CPVC project. (Appen. 12.)

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[4] The B.F.Goodrich company has been afforded unusual access and special treatment throughout HCD's recent consideration of CPVC pipe. On August 26, 1995, Governor Wilson met with Wayne O. Smith, President and Chief Operating Officer of B.F. Goodrich Specialty Chemicals, in Columbus, Ohio, during Governor Wilson's presidential campaign. (Appen. 13.) In his meeting with Governor Wilson, Mr. Smith cited the state's failure to approve CPVC drinking water pipe "as an example of a regulatory barrier in California that has closed a market for one of our products . . . ." (*Ibid.*) On September 1, 1995, Mr. Smith followed up the August meeting with a letter to Governor Wilson intended to provide "a few more details" on the CPVC issue. (*Ibid.*) Mr. Smith asked the Governor to "look into this regulatory block," and asked that HCD approve CPVC "by edict." (*Ibid.*) One month later, Governor Wilson directed HCD to approve CPVC pipe immediately without completing the environmental review required by state law. (Appen. 14.) On October 26, 1995, HCD proposed emergency regulations approving CPVC. (Appen. 15.) B.F. Goodrich met with Governor Wilson again on December 12, 1997 to discuss CPVC approval, just two weeks before the Governor was quoted calling the failure to approve CPVC "a tragedy." (Appen. 16.) In addition, HCD is not requiring that B.F. Goodrich provide funding to prepare the EIR on CPVC. This is unlike the practice HCD has followed in the past when it required the plastic pipe manufacturers to fund the EIR work, and apparently unlike HCD's intended future practice, since it has notified a plastic plumbing manufacturer seeking code approval that his company would have to fund an EIR. (Appen. 5.)

The internal documents reveal that the solution ultimately proposed was to have the B.F.Goodrich Company provide the technical support and analysis, and have the document "managed" in-house at HCD. This approach was recommended "given the short time line" and "the willingness and ability of the industry to support the effort with timely responses to our needs." (Appen. 17.)

Concerned about the "litigation risk" of relying on information submitted by the project proponent, and without in-house technical expertise to independently review such information, BTH sought advice from the General Counsel of the California Resources Agency, the State's chief legal authority on CEQA. (Appen. 8.) The Resources Agency General Counsel advised against the approach proposed by BTH/HCD, and recommended HCD retain an independent consultant to prepare the EIR. (*Ibid.*) BTH and HCD rejected the advice, citing the potential delays involved in hiring an independent consultant:

> "During the meeting, you indicated that it was not desirable to have a project proponent, or its consultant, perform the environmental analysis. I can certainly understand that it may appear to be somewhat of a conflict of interest and would, therefore, raise some political questions. These considerations can, and will be, an important factor in our decisions. They must, however, be weighed against whether proceeding in that manner presents a *real* litigation risk . . . [¶] This is an issue of some importance, since neither HCD nor CBSC really has staff on board to manage the preparation of a complicated EIR. While I fully endorse your idea to retain a specialist consultant to oversee the project and to ensue (sic) the state's independent review of the draft environmental documents, each additional consultant will require a certain level of expense and personnel time. Minimally, there will be costs and delays involved, if nothing else, in the preparation of bid documents and contracts, the establishment of accounting systems to accept funds from the applicant, the payment of contract expenses, and the preparation of final audits. As a practical matter, it will also be much more difficult to ask the project applicant for reimbursement of state costs than to simply ask them to find the appropriate consultants and ensure that quality materials are provided and merely cover the state's billings for the consultant retained to assist in independent review of the prepared materials as you have recommended . . . . [¶] *Since the goal is to*

accomplish this CEQA review quickly and efficiently, I am reluctant to reject this alternative out-of-hand unless it presents an unwarranted litigation risk." (Appen. 8; first emphasis in original, second emphasis added.)

BTH/HCD decided subsequently that even the alternative approach of seeking funding from B.F.Goodrich to retain an independent consultant to review the materials prepared by the project proponent presented too great a risk to the timeline for approval. No industry funding was ever secured and no independent consultant was retained. Instead, the Department of Food and Agriculture ("DFA") loaned to HCD a career civil service employee with experience in CEQA procedures to manage the EIR preparation relying on materials supplied by B.F.Goodrich. This DFA employee became the principal author of the Draft EIR.

While the DFA employee certainly has experience in managing preparation of CEQA documents, it is clear that he was not loaned to HCD because of any technical expertise in plastic pipe chemistry, drinking water contamination, worker health and industrial hygiene, air quality, fire safety or any of the other technical subject areas involved in the CPVC environmental assessment. Indeed, the record reflects that HCD never even requested a copy of the DFA employee's resume or any other evidence of his substantive training or experience, and no such evidence was ever provided. A copy of the resume secured from DFA reveals no training or experience in any of the technical areas involved in this project. (Appen. 18.) [5]

The reliance on B.F.Goodrich in the preparation of the Draft EIR is clearly revealed in the internal documents. For example, HCD decided that retaining technical consultants would not be necessary because of "the willingness and ability of industry to provide support." (Appen. 17.) In addition, HCD indicated that it "will draw on resources of industry" in preparing the Draft EIR, and that "[s]upport [d]ocuments [are] to come from industry." (Appen. 11, 17.)

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[5] Repeated requests for a copy of the DFA employee's resume were finally answered by letter dated May 13, 1998, indicating that arrangments for the DFA employee's work on the Draft EIR were made by BTH. (Appen. 19.) BTH also failed to provide copies of the resume in response to public records request. The resume was finally obtained through a direct request to DFA.

Accordingly, on August 26, 1997, the DFA employee, now working at HCD, prepared a memorandum to B.F.Goodrich requesting an extensive set of technical information, data and analysis covering virtually every subject to be addressed in the Draft EIR. (Appen. 20.) B.F.Goodrich replied by indicating that it had assigned the task to a "Goodrich team," which would prepare the requested materials. (Appen. 21.)

3. Objections Raised by the Public and Public Officials Regarding HCD's Failure to Engage Independent Technical Consultants and Failure to Seek Industry Funding for EIR Preparation

The record reveals key strategy decisions by HCD to: 1) have a DFG employee manage preparation of a Draft EIR based on materials provided by B.F.Goodrich; and 2) not engage an independent technical consultant to review and analyze the Goodrich submittals. These decisions prompted concerns by the organizations and public officials that have long sought an independent examination of the public health and environmental issues associated with plastic pipe use. This interest in a truly independent and objective review was heightened in this proceeding by the fact that HCD had previously approved this same project with no environmental review, and was on record asserting that the use of CPVC presented no significant environmental or public health issues.

The record contains several letters to HCD from interested organizations and members of the Legislature raising questions about the way HCD was approaching the environmental review process. The letter from Senator Hilda Solis was typical:

> "I do not understand why the normal EIR process in not being followed in this instance. I am not (sic) concerned whether it is appropriate to use taxpayer funds for this purpose. I am also concerned that the failure to hire a team of consultants with the appropriate technical expertise will result in a deficient, legally inadequate EIR. Consequently, I would appreciate the following information. What is the cost of the staff time that will be used to prepare the CPVC EIR? How does HCD intend to provide adequate technical expertise? Why are outside technical experts not being retained? [¶] What is the justification for using taxpayer dollars for this project? What is the justification for not requiring CPVC manufacturers to pay the full cost, including reimbursement of staff

time, for this EIR? Why is this EIR being paid for by public funds when the last effort was paid by the Plastics Industry?" (Appen. 22.)

Despite concerns expressed by an array of interested parties and public officials, HCD refused to reconsider its approach and did not engage an independent consultant or seek industry funding. As discussed in detail in Section IV, *infra*, HCD also failed to abide by requests from the interested public that it ensure a meaningful assessment of the technical issues by state experts. The record demonstrates that no substantive review by state technical staff outside of HCD ever took place.

4. Result is a Grudging and Pro Forma Compliance Designed to Secure Project Approval "Quickly and Efficiently."

The record in this case clearly reveals a "grudging and pro forma compliance" by a Lead Agency that had prejudged the issues. The record demonstrates that the environmental review process was designed to achieve project approval "quickly and efficiently," rather than to thoroughly and objectively evaluate the potential environmental and public health dangers of CPVC pipe. The result is a document that fails to present an objective or genuine assessment, and that constitutes little more than a *post hoc* rationalization of determinations and decisions already made by HCD.

IV. DRAFT EIR DOES NOT REFLECT AN INDEPENDENT REVIEW AND ANALYSIS BY THE LEAD AGENCY

The Draft EIR fails to comply with CEQA's requirement that the document reflect the Lead Agency's *independent* review and analysis of potential environmental effects. (Pub. Resources Code § 21082.1(c).) As demonstrated below, HCD did not utilize technical staff qualified to independently assess the issues, and it improperly relied on third-party assurances with respect to drinking water impacts without even attempting an independent review.

A. Legal Standards

CEQA requires that the lead agency independently review and analyze the issues identified in the Draft EIR. (Pub. Resources Code § 21082.1(c)(1).) It also requires that the Draft EIR reflect the lead agency's independent judgment. (§ 21082.1(c)(2).) The CEQA Guidelines specify further that a

lead agency must subject information submitted by others to the lead agency's own review and analysis before using that information in the Draft EIR. (14 Cal. Code Regs. (C.C.R.) § 15084(e).)

In order to fulfill CEQA's mandate for an independent review and analysis of potential environmental effects, the lead agency obviously must have the technical capability to conduct such review and analysis. The CEQA Guidelines expressly require that the EIR reflect an interdisciplinary approach and consideration of qualitative as well as quantitative factors that is conducted by competent individuals in the relevant disciplines. (14 C.C.R. § 15142.) Accordingly, the courts have required that agencies possess the appropriate expertise or seek expert assistance when analyzing issues or making determinations under CEQA that demand specialized knowledge.

In *Sundstrom v. Mendocino County* (1988) 202 Cal.App.3d 296 [248 Cal.Rptr. 352], the court rejected a mitigated negative declaration on the ground that the County's planning staff did not have the expertise necessary to determine that a potentially significant effect would not occur. In particular, the *Sundstrom* court rejected the planning staff's dismissal of potential vegetative changes resulting from the project, explaining:

> "What will be the effect of this uninterrupted soil humidity on an ecosystem adapted to seasonal drought? CEQA exists to compel local agencies to address questions like this. As the implementing guidelines recognize, CEQA's objective of preserving "high quality ecological systems" demands "an interdisciplinary approach which will ensure the integrated use of the natural and social sciences and the consideration of qualitative as well as quantitative factors." (Guidelines § 15142; Pub. Resources Code § 21000, subd. (b).) Some degree of interdisciplinary consultation may be necessary in an initial study as well as in preparation of an EIR. *Without seeking the opinion of, say, a qualified botanist or ecologist, the Planning Commission staff was not in a position to dismiss the possibility of potentially adverse vegetative change.* (*Id.* at p. 312; emphasis added.)

The courts have also held that agencies may rely on staff analysis and opinion when making CEQA determinations only where the staff is qualified to conduct the analysis or render the opinion. In *Greenebaum v. City of Los Angeles* (1984) 153 Cal.App.3d 391, 413 [200 Cal.Rptr. 237], for example, the court affirmed the adequacy of an EIR in the face of conflicting evidence over the proposal's compliance with the City's General Plan only after finding that

the lead agency's independent review conducted by qualified experts. Appellants had submitted expert testimony that the project was not consistent with the General Plan, while the City planning department concluded otherwise. The court found that the planning department staff "qualify as experts since this type of analysis is their business." (*Id.* at p. 413.)

Similarly, in *Stanislaus Audubon Soc'y v. County of Stanislaus* (1995) 33 Cal.App.4th 144, 153 [39 Cal.Rptr.2d 54], the court rejected the defendant's contention that the planning department was not qualified to render an opinion regarding a project's potential growth-inducing impacts. The court found that the planning department's determination "should be given sufficient weight since its staff members are professionals in the field." (*Id.* at p. 153 [39 Cal.Rptr.2d at 60-61].) The court also found that it was not unreasonable to presume that the department which was "relied upon by the County to study and evaluate development proposals, in light of its prior experience in the area, has *expertise upon the subject*, is *qualified to assess the data presented* and to render opinions thereon." (*Id.* at 155; emphasis added.)

B. Application of Legal Standards to Draft EIR

In this case, the Draft EIR fails to meet the independent review requirements of CEQA for two reasons. First, HCD did not retain independent consultants, did not have the in-house expertise to independently review and analyze the technical issues associated with the proposed project, and did not involve state experts in the substantive review. Second, even assuming HCD possessed the required technical expertise on the drinking water issue, it improperly relied upon third-party assurances to find no significant impacts from CPVC leaching without independently evaluating the basis for such assurances. Both of these issues were brought to HCD's attention well in advance of the Draft EIR's circulation -- in scoping comments submitted by the California Pipe Trades Council, and in extensive correspondence submitted by the Council and other interested parties.

1. HCD Does Not Have the Expertise to Independently Assess the Technical Issues and Did Not Involve State Experts in the Substantive Review

There is no dispute that the proposed approval of CPVC pipe to carry potable water raises highly technical issues involving several disciplines and

specialized fields, including, at a minimum, chemistry, toxicology, industrial hygiene, drinking water quality, air quality and fire safety and smoke toxicity. It is equally clear that HCD's statutory responsibilities for state housing programs and policies do not require staff with technical capabilities in these areas. (*See* Health & Saf. §§ 50400, *et seq.*)

As discussed in detail in Section III, *supra*, HCD recognized, both in the 1989 proceeding and in the current proceeding, that its independent review and analysis of the technical issues raised by the project would require technical expertise outside the Department. Unlike the 1989 review, however, in this proceeding HCD decided not to seek industry funding for an independent consultant to prepare the EIR, or for technical consultants to assist the Department in conducting its independent analysis of the issues. Instead, the Draft EIR was prepared by a DFG employee relying on technical information and assessments provided primarily by the B.F.Goodrich Company. As noted in Section III, the DFG employee does not have technical expertise in the various disciplines involved in this environmental assessment. Of course, no one person could be expected to possess this range of expertise.

Without the assistance of an independent consultant or an in-house technical staff, a number of interested organizations and public officials sought HCD's commitment to involve state experts outside of HCD in the environmental review process. These parties also sought assurances that the review by state technical experts would be genuine and substantive, and not merely "informal consultation" through telephone calls designed to create an appearance of an independent technical analysis. HCD was asked to agree that state technical experts would review the underlying source documents, including the comments submitted by the public during the 1989 EIR proceeding, review any materials submitted or prepared by B.F.Goodrich, and prepare, or assist in preparing, the technical sections of the Draft EIR and the responses to comments on the technical issues in the Final EIR.

These concerns were raised by labor and environmental group representatives at Mr. Mallory's confirmation hearings. For example, California Pipe Trades Council representatives asked if HCD would: 1) identify the state experts who would be involved in preparing the EIR; 2) indicate how their time would be funded in the current state budget; 3) indicate whether the state experts would be allowed to review the underlying, original technical documents; and 4) indicate whether the state experts would

review and respond to the comments submitted on the Draft EIR. These witnesses explained:

> "[W]e think outside independent consultants are the best way to ensure an objective and careful analysis, but we think the Department is committed to doing this as an in-house process . . . . Typically, the way the EIR process is conducted, especially in a highly technical area like this one, is that the applicant funds the technical studies, which are typically prepared by outside technical consultants. That's the process the Department followed in 1989. This time they are not following that process and we are just seeking assurances that there will be a genuine and careful review of this by state experts." (Senate Rules Committee, Confirmation of Richard Mallory (Jan. 12, 1998), test. of Daniel L. Cardozo; *see also* test. of Gary Patton on behalf of the Planning and Conservation League.)

Mr. Mallory testified at the January 12, 1998 Senate Rules Committee hearing that the technical review and preparation of the Draft EIR would be done "principally by the one person," referring to the DFG employee. (Senate Rules Committee, Confirmation of Richard Mallory, *supra,* test of Richard E. Mallory.) In response to questioning from Senate Rules Committee members regarding HCD's specific plans regarding the use of state experts, Mr. Mallory indicated that the Department would consult with other state staff as it deemed necessary, but he refused to commit to the substantive involvement of state experts proposed by the interested parties. (*Ibid.*)

It is clear that HCD's reluctance to commit to genuine participation by state experts was motivated once again by a determination to stay on schedule and not jeopardize the approval timeline set for the project. It is also clear that sound reasons existed for this concern. The involvement of state personnel outside of HCD in a substantive review of the complex issues raised by this project obviously would have required substantial staff time to review the voluminous studies and data generated during the 1989 proceeding, as well as the extensive documents submitted by B.F.Goodrich in the present proceeding. The lack of funding for such staff time in the budgets of other agencies and departments, and the logistical problems inherent in adding substantive work to already full workloads, clearly could have led to delays in the ambitious BTH/HCD timeline.

Although not surprising given the determination to complete the environmental review "quickly and efficiently," HCD's resistance to public

calls for substantive involvement of state experts is ironic since the Department now must rely on review by outside state experts to support any claim that the Draft EIR reflects the Lead Agency's independent judgment. Since HCD did not hire an independent consultant and did not have in-house expertise, analysis by outside state experts would be essential to any claim that the Draft EIR reflects an independent assessment. The record clearly reveals, however, that no substantive review and analysis by state technical experts ever took place.

Almost ten months after the CDF employee arrived at HCD to begin preparing the Draft EIR, HCD acknowledged that no substantive analysis by state experts outside of HCD had taken place:

> "To date, *all substantive work on the EIR* has been done by Robin Reynolds [the CDF employee] *using his own professional expertise and judgment* with support assistance from Norm Sorenson and Rachel Harris. This work involved numerous informal consultations with public agencies and others. However, the only formal consultation Robin has had with persons outside of the Department has been with Ron Coleman of the Office of the State Fire Marshall. Mr. Coleman was sent a portion of draft text concerning smoke toxicity for review and comment. To date, no response has been received." (Appen. 25; emphasis added.)

HCD also explained that it did not believe that the involvement of state technical experts was necessary because of the research and study that has been done on these issues:

> "As you correctly pointed out in your letter, the subject matter of the DEIR does raise a number of *highly technical issues*. Nonetheless, considerable research has been done on these issues both as part of the previous draft environmental impact report and otherwise. Because of this wealth of information, *Robin has not yet found it necessary to formally solicit the assistance of other state agency personnel.*" (Appen. 25; emphasis added.)

HCD's response misses the point. The research presented in the 1989 Draft EIR was roundly criticized by a number of highly qualified experts. This criticism was directed at all components of the research, from methodology to analytical conclusions. The Department cannot now resolve the disputes over the 1989 technical analysis without the assistance of

technical experts to evaluate the issues. In addition, as discussed more fully in Section V, *infra*, it is particularly important that HCD conduct an independent analysis of the technical disagreements and *disclose the details of that analysis* in the Draft EIR since it never responded to the extensive technical comments submitted on 1989 Draft EIR.

Furthermore, the studies and research other than the 1989 EIR materials relied upon in the new Draft EIR were provided primarily by B.F.Goodrich as a part of the several thousand pages of material the CPVC resin manufacturer supplied for preparation of the Draft EIR. It is particularly inappropriate for HCD to rely on technical studies and research submitted by the party that is essentially the applicant in this action, without an independent analysis of the substantive issues by technically competent individuals. As discussed in Section III, the Draft EIR's lead author does not possess technical expertise in the issues raised by this project.

HCD also may not retroactively transform its "informal consultations" into substantive technical review by state experts. It is important to emphasize that HCD's admission that the CDF employee was responsible for all substantive analysis was made two months before the Draft EIR was sent to the printer for publication. At this point in production of the document, the substantive technical analysis must have been virtually complete, with only the drafting of text remaining.

The record also reflects a complete absence of substantive review by state technical experts. With the exception of the two brief letters from the Hazard Evaluation System and Information Service ("HESIS"), the record does not contain *a single* written report, assessment, evaluation or communication of any kind from any state personnel outside of HCD regarding the issues under review in the Draft EIR. HCD also expressly acknowledged that no state personnel outside of the Department were involved in developing or reviewing the critical thresholds of significance which guide the Draft EIR's evaluation and significance determinations with regard to health impacts from drinking water contamination and worker chemical exposures. (Appen. 23.)

It is also apparent that the key state personnel identified by HCD as participating in informal consultations did not conduct any substantive review or analysis of the CPVC issues, usually by their own admission. At a March 9, 1998 "scoping" meeting, the first of two sessions that HCD agreed

to conduct involving the state technical staff working on the Draft EIR, the only non-HCD staff present were David Morry of the Office of Environmental Health Hazard Assessment ("OEHHA") and Robert Burns of the California Department of Health Services (DHS) Office of Drinking Water.

At the March 9, 1998 meeting, Mr. Morry made a brief presentation regarding OEHHA's recommended Public Health Goal level for copper in drinking water. (Appen. 24.) Mr. Morry noted, however, that he was unfamiliar with the contaminants associated with CPVC, and indicated that it was important that HCD prepare a health risk assessment for any contaminants that could leach into drinking water from CPVC pipe. (*Ibid.*) Mr. Morry indicated that a health risk assessment was particularly important for organotins, which he learned for the first time at the meeting were of concern with CPVC. (*Ibid.*) Mr. Morry had not been informed by HCD that organotins were one of the contaminants of concern with CPVC pipe. Mr. Burns did not make any presentation at the March 9, 1998 meeting. (*Ibid.*)

In follow-up conversations between representatives of the California Pipe Trades Council and Messrs. Morry and Burns, both of the state agency representatives indicated that they were not familiar with the technical issues and debate regarding CPVC potable water pipe. (Appen. 24.) Both Mr. Morry and Mr. Burns also indicated that they were *not* working with HCD on the CPVC Draft EIR, nor had either of them been asked by HCD to assist in the technical review of CPVC pipe. (*Ibid.*) HCD subsequently confirmed that Messrs. Morry and Burns were *not* technical experts being consulted by the Department in preparing the Draft EIR. (Appen. 25.)

At the second "scoping" session on the technical issues held on May 1, 1998, the only non-HCD staff present were Robert Burns and Peter Kurtz. As indicated above, HCD acknowledged that Mr. Burns was not involved in any technical analysis of the CPVC issues. Mr. Kurtz is a long-time staff member of the Department of Food and Agriculture's Pest Detection/Emergency Projects section of the Division of Plant Industry.

Mr. Kurtz indicated at the May 1, 1998 meeting that he viewed his role as acting as a resource to help the Draft EIR author understand any toxicological information. He acknowledged that he was not with an agency that had any programmatic authority over the issues involved with this project. Mr. Kurtz indicated that his review had been limited to some of the leaching issues. Mr. Reynolds also indicated at the meeting that HCD was

relying primarily on HESIS with regard to the worker health issues. Mr. Kurtz stated that he only reviewed the information provided to him by Mr. Reynolds. (Appen. 26.)

The record demonstrates that Mr. Kurtz did not present any *written* report, analysis or evaluation to HCD on any issue. Moreover, it is clear from the record that Mr. Kurtz could not have provided any informed input to HCD with regard to the toxicological issues associated with CPVC drinking water leaching. As discussed in detail below, HCD never received from NSF the toxicological studies and data that were used to establish the NSF standards applied by the Draft EIR. A meaningful analysis of the toxicological issues would have been impossible without consideration of the toxicity information on which the Draft EIR's significance determination rests. It is also clear that the information provided to Mr. Kurtz by HCD was far from complete. For example, Mr. Kurtz indicated that he was not given a copy of the public comments on the 1989 Draft EIR, which include a substantial technical analysis of the CPVC toxicity issues. (Appen. 26.)

Finally, as indicated, the only written recommendation submitted to HCD by state staff outside the Department on any issue considered in the Draft EIR is contained in the two HESIS letters. The HESIS letters and recommendation are discussed in Section III, *infra*, under the discussion of worker health impacts. Remarkably, the Draft EIR's determinations with regard to worker health impacts are *contrary* to the only formal recommendation submitted to HCD by state staff.

2. HCD Improperly Relied on Third-Party Assurances in Finding No Significant Impact on Drinking Water Without Conducting Any Independent Review

a) HCD was required to independently review and analyze the adequacy of NSF standards and testing

Even assuming the Lead Agency possessed the expertise to independently analyze the technical issues and render judgments regarding the significance of potential drinking water impacts, it failed to exercise its independent judgment. To support its finding of no significant impact on drinking water safety, the Draft EIR relies on the levels of contamination accepted by NSF, and on the NSF process for testing and certification of CPVC pipe. The record conclusively demonstrates, however, that HCD never

independently evaluated the levels of contamination accepted by NSF to determine their safety, never reviewed the actual levels of leachate found in NSF testing and never reviewed the results of the NSF testing with regard to the CPVC pipe it is considering in this project. HCD's reliance on a private entity for the fundamental health risk determination without any independent review of that determination violates CEQA's requirement that the Draft EIR reflect the Lead Agency's independent judgment.

It important to clarify the Draft EIR's apparent misunderstanding of the legal point being made here. The Draft EIR repeatedly notes that other agencies in other regulatory settings require that NSF-listed products be used, as HCD proposes to do in this regulatory approval.[6] We agree that in amending the California Plumbing Code ("CPC"), HCD could require an NSF listing for CPVC pipe under the authority of the State Housing Law and the State Building Standards Law. However, HCD's authority to require NSF, IAPMO, ASTM or other materials standards under other statutes does not alter its obligation under *CEQA* to conduct an independent review and analysis of potentially significant effects when preparing an EIR.[7]

Nor can the fact that other agencies apply NSF standards substitute for an independent analysis of the adequacy of NSF standards and testing. If HCD's claim is that other agencies in other regulatory proceedings have conducted a technical review and analysis which demonstrates the effectiveness of NSF standards and testing to protect public health and avoid drinking water contamination, then it must evaluate that technical review

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[6] The Draft EIR asserts without any citation to authority or documentation of any kind, that "all of the other 49 states which allow the use of CPVC for potable water systems in residential building rely on NSF testing and certification for the pipe, fittings, cements, and primers for both safety (NSF 61) and suitability for the intended use (NSF1 14)." (Draft EIR, p. 18.) This assertion contains two errors: first, as explained in detail in Section VI, *infra,* 49 other states do not allow CPVC pipe; and second, not even NSF claims that 49 states require compliance with its standards. According to NSF, "twenty-nine U.S. states have current regulations or legislation requiring compliance of water contact materials to ANSI/NSF 61." (Appen. 30a.) The author's zeal has once again put him ahead of the facts.

[7] Even apart from CEQA, a determination of the level of public drinking water contamination that would be allowed by the regulatory approval of a plumbing product coming in contact with that water constitutes an exercise of the police power that cannot be delegated to a non-governmental entity. (63 Ops.Cal.Atty.Gen. 566 (1980).) HCD's reliance on NSF's current and future standards would be constitutionally permissible only if HCD independently evaluated the adequacy of such standards to protect California drinking water consumers. (*Id.*, at pp. 580-582.)

and analysis and present it in the Draft EIR that is circulated for public review. If other agencies have not conducted this review of NSF standards and testing, then the references to other agencies appear entirely irrelevant to this environmental review.

NSF itself emphasizes the importance of independent judgment and regulatory action by any public agency relying on its standards, and it expressly disclaims responsibility or liability to "*anyone*" relying on its standards or testing:

> "NSF International (NSF), in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of NSF represent its professional judgment. *NSF shall not be responsible to anyone for the use of or reliance upon this standard by anyone.* NSF shall not incur any obligations or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this standard. [¶] Participation in NSF's standards development activities by a regulatory agency (Federal, state, local) shall not be construed as the agency's endorsement of NSF, its policies, or any of its standards. [¶] NSF standards provide basic criteria to promote and protect public health. *Provisions for safety have not been included in this standard because governmental agencies or other national standards-setting organizations provide safety requirements.*" (NSF 61 – 1997a, Drinking Water System Components – Health Effects, p. iii.)

The Draft EIR relies on standards established in a non-public, confidential process, by a non-governmental body without conducting any independent assessment of the basis for those standards, or their adequacy in protecting public health. The non-governmental body in turn disclaims any responsibility or liability to the public or public regulatory agencies relying on such standards. CEQA's requirement for the exercise of independent judgment by the lead agency, and the constitutional bar against the delegation of police powers to non-governmental bodies, are both intended to prevent just this kind of avoidance of public accountability.

We raised this issue with HCD in advance of the Draft EIR's preparation. Concerned that HCD would simply defer to NSF rather than conduct a genuine assessment of the levels of chemical leaching from CPVC pipe and the potential health effects associated with such levels, our scoping

comments discussed the need for an independent review of NSF's standards. We emphasized that HCD would be required to conduct an *independent* evaluation of the adequacy of the NSF standards and testing before it could rely on the NSF process to support a finding of no significant impact:

> "[T]he Department has a legal responsibility to protect the public health and safety that cannot be delegated to private organizations under well settled principles of constitutional law. Any reliance on private standards in state regulations would require the exercise of the Department's independent assessment of the adequacy of the standard, and protection against future changes in the standard by a private organization." (California Pipe Trades Council, Comments on Scope of CPVC EIR (Sep. 25, 1997), p. 12.)

The Council's comments also indicated that the Draft EIR would be required to "conduct a careful evaluation of any such standards referenced by the regulatory standard," and that such evaluation must include "the ability of the standard to resolve effects which are potentially significant." (*Ibid.*)

b) The Draft EIR relies on NSF standards and testing without conducting an independent review and analysis of such standards and testing

As we feared, the Draft EIR's finding of no significant impact on drinking water rests almost entirely on the NSF standards and testing methodology. The Draft EIR states clearly that HCD is relying on NSF certification as "a reasonable assurance" of no significant effects on drinking water. (Draft EIR, p. 8.) It also states that "the Lead Agency has relied on the MAL [maximum acceptable level] determined by NSF" in assessing the significance of contaminant leaching for substances without state or federally-adopted maximum contaminant levels ("MCL"). (Draft EIR, p. 21.) These substances include all of the leachate from CPVC solvents and pipes other than what the Draft EIR describes as "disinfection by-products." In addition, HCD relies on NSF testing and certification of CPVC pipe to ensure compliance with both NSF standards for solvent and pipe leachate, *and* the MCLs established under federal and state law for the trihalomethanes, including chloroform, (the Draft EIR's "disinfection by-products") which leach from CPVC pipe. (Draft EIR, p. 41.)

Aware of the Council's scoping comments, the Draft EIR declares: "[HCD] independently reviewed the NSF Standards for Drinking Water System Components Health Effects (NSF 61) and finds them to provide a reasonable assurance of safety." (Draft EIR, p. 18.) This statement reflects not only a misunderstanding of CEQA's independent judgment requirement, but a fundamental misunderstanding of the science of health risk assessment. Rather than providing reassurance of an independent review, it further calls into question HCD's conclusions with regarding to potential drinking water impacts.

The NSF 61 Standard referenced by the Draft EIR sets forth the health risk assessment methodology applied by NSF in setting allowable levels of contaminants in drinking water. While examination of that methodology is an important starting point in HCD's evaluation of the NSF action level determinations, a review of the methodology alone is not sufficient to determine the adequacy of those levels in protecting public health.[8] NSF's analytical method could produce a wide range of action level determinations depending on the specific toxicity data and assumptions used in applying that method to the analysis of particular contaminants. A review of the underlying toxicity studies and data considered by NSF in applying the NSF 61 methodology is essential to any meaningful review of the adequacy of the NSF determinations regarding allowable levels of contamination.[9]

Other public agencies required to make independent determinations regarding the risks of drinking water contamination recognize that any reliance on NSF action levels necessitates a review of the underlying data. For example, the Draft EIR repeatedly refers to the NSF risk assessment methodology as being developed in a "USEPA [United States Environmental Protection Agency]-sponsored program." (Draft EIR, 21.) However, not even EPA will rely on NSF's application of the EPA-approved methodology without an independent review of the underlying toxicological data. EPA's position on this issue was clearly stated in its on-going consideration of organotins as

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[8] It appears that the Draft EIR author did not even review the most recent methodology applied by NSF. The Draft EIR references NSF 61 1995 (Draft EIR, p. 19), while NSF currently applies NSF 61 1997b. In any event, as explained, review of the methodology alone is insufficient.

[9] A more detailed explanation of the significance of underlying toxicological data and assumptions in applying a health risk assessment methodology is further explained in the comments of Dr. Smith and Ms. Lopipero, attached as exhibit B.)

a priority contaminant for regulation under the Federal Safe Drinking Water Act ("SDWA").

Pursuant to the SDWA, EPA has established a Drinking Water Contaminant Candidate List ("CCL") identifying priority contaminants for drinking water research and monitoring, and which also serves to identify contaminants for drinking water regulation. (62 Fed.Reg. 193 (Oct. 6, 1997).) After careful review and analysis, EPA adopted a final list of 50 chemical contaminants out of an original list of 391 contaminants considered. (63 Fed.Reg. 40 (March 2, 1998).) Organotins were listed by EPA as a contaminant of special concern. (62 Fed.Reg. 193 (Oct. 6, 1997), p. 52211 and 63 Fed.Reg. 40 (March 2, 1998), p. 10276.)

After the draft CCL was published on October 6, 1997, EPA received four comment letters arguing that organotins should be deleted from the list; three letters were submitted by industrial manufacturers of organotin stabilizers for CPVC pipe manufacture, and one letter was submitted by NSF. (63 Fed.Reg. 40 (March 2, 1998), p. 10282.) NSF submitted detailed comments describing its health risk assessment process and testing and certification program with respect to organotins, and emphasizing reliance on NSF by other public agencies. (Appen. 27.) On these grounds, NSF argued that EPA should delete organotins from from the CCL because NSF's program assured protection of the public health. (*Ibid.*)

EPA rejected NSF's arguments and listed organotins on the final CCL:

> "The Agency is aware of the NSF certification program, and has noted that many States require the use of NSF-certified material in the construction of new buildings. The Agency agrees with the NDWAC Working Group recommendation that *an assessment of the toxicological data underlying the action levels established by the NSF needs to be made* along with assessment of other available information on organotins, before these compounds can be disregarded as of concern. The Agency requested this information from the NSF, and learned that due to confidentiality agreement, NSF cannot disclose this information, therefore we have not yet been able to asses the toxicological data. [¶] [extended discussion of concerns regarding organotin leaching from CPVC pipe] [¶] In view of these concerns, the Agency believes that organotins, including mono- and diorganotins, should remain on the CCL until the Agency can perform *its own in-depth evaluation of the occurrence and toxicological data* of the

contaminants of this class." (63 Fed.Reg. 40 (March 2, 1998), p. 10282; emphasis added.)

The HCD has acknowledged that it did not consider the underlying toxicological data and toxicity information on which the NSF action levels are based. As noted above, the Draft EIR itself stated that the author's review was limited to NSF 61, which sets forth the methodology applied to establish action levels, but does not disclose the specific toxicity studies and data on which the determinations are based. (Draft EIR, p. 18.) In addition, we specifically requested from HCD copies of the underlying toxicity studies and data relied upon by NSF and considered by HCD in preparing the Draft EIR, as well as copies of any reviews of this information by state experts or others. The request included:

> "A copy of all underlying toxicological studies and data considered by NSF in conducting health risk assessments to establish each of the NSF Maximum Allowable Levels, Maximum Drinking Water Levels, Short Term Exposure Levels or any other NSF action level relied upon or cited in the Draft EIR for each of the drinking water contaminant considered in the Draft EIR. This request is only for the toxicological studies and data utilized in the NSF health risk assessment process that were provided to HCD and considered by the Lead Agency in preparing the CPVC Draft EIR. [¶] A copy of any and all reports memoranda, notes, evaluations, analyses or other discussion of the toxicological studies and data described in Paragraph 1, prepared by a state agency, department or office other than HCD, or prepared by B.F.Goodrich, NSF or any other party, and that were provided to HCD and considered by the Lead Agency in preparing the CPVC Draft EIR." (Appen. 23.)

HCD responded to this request by stating that it had none of the information requested. (Appen. 23.)

In the same way that it relied on NSF's allowable contaminant levels, HCD relied on NSF's testing and certification program without conducting any independent review of the underlying performance test data or the "normalization" calculations made by NSF to estimate actual exposure levels that are used in reporting test results. The Draft EIR concludes that NSF testing program will ensure that the public is protected based on only the general description of methodology set forth in NSF 61. Once again, the Lead Agency acknowledged that it did not review the key underlying data.

We requested from the Department:

> "A copy of any and all test reports, data or other information provided to HCD and considered by the Lead Agency in preparing the CPVC Draft EIR, showing the levels or concentrations of leachate from CPVC pipe and fittings found by NSF through its NSF61 testing and certification program with respect to organotins, acetone, cyclohexanone, methyl ethyl ketone, tetrahydrofuran, chloroform, other trihalomethanes, or any other drinking water contaminant considered in the Draft EIR; [¶] A copy of any and all reports, data or other information provided to HCD and considered by the Lead Agency in preparing the CPVC Draft EIR, showing the calculations performed by NSF to estimate "at-the-tap" levels of exposure by "normalizing" contaminant levels determined in the laboratory with respect to organotins, acetone, cyclohexanone, methyl ethyl ketone, tetrahydrofuran, chloroform, other trihalomethanes, or any other drinking water contaminant considered in the Draft EIR." (Appen. 23.)

HCD responded to this request by stating that it had none of the information requested. (Appen. 23.) HCD simply could not independently assess the adequacy of the NSF standards and testing program in protecting public health without reviewing the underlying toxicity and testing data. This issue is discussed in detail in the attached technical comments.

c) Expert opinion indicates that NSF standards and testing are not adequate to ensure protection of public health

It is also clear that Draft EIR's failure to review the underlying basis for the NSF standards and the adequacy of NSF's testing and certification program, are not merely technical legal defects. As discussed in detail in the attached technical comments, the NSF standards, testing and certification process are not adequate to ensure protection of the public health.[10]

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[10] See the attached technical comments and Section VII, *infra*, regarding the deficiencies in the Draft EIR's discussion of impacts, for a more detailed discussion of the deficiencies in NSF standards and testing and the relationship of these deficiencies to the analysis of specific impacts.

For example, Dr. Smith and Ms. Lopipero determine, based on an exhaustive review of the published literature, that several of the NSF allowable levels of contamination are much too high to adequately protect human health. Unless HCD presents an analysis of the toxicity studies and data that support the NSF action levels, it simply has no factual or analytical basis for rejecting the conclusions of the Smith and Lopipero analysis. No contrary analysis is presented in the EIR.

Thomas Reid Associates also discuss in detail the deficiencies in the NSF testing and certification program. For example, NSF accepts the manufacturer's representation regarding product formulas and does not independently test the material as is done in some foreign countries. NSF also allows manufacturers to submit a generic "range formula" that allows for the substitution of types and amounts of constituent materials within the generic formula without disclosure even to NSF. The NSF "normalization calculation" to estimate "at-the-tap" exposures significantly *underestimates* exposures for residential plumbing installations. NSF also expressly retains the discretion in applying NSF 61 to certify products *even where the exposure concentration is in excess of the established MAL for the contaminant.* This entire NSF testing and certification process is confidential between NSF and the product manufacturers. Each of these issues and additional deficiencies in the NSF testing and certification program are discussed in detail in exhibit A.

Under these circumstances, without an independent review of the actual product formula data, the results of the normalization calculations, the actual performance test results and information on the number of products certified even after failing the testing process, and without on-going disclosure of this data and information to the public and state regulators, HCD simply has no basis to conclude that the NSF process will protect drinking water consumers, either currently or in the future. The Draft EIR contains no substantial evidence supporting such a conclusion.

Finally, it is important to emphasize that an independent review and analysis is critical since NSF is a private entity and is not accountable to the public. The Draft EIR quotes NSF describing itself as "a trusted neutral agency" (Draft EIR, p. 17), but the fact remains that NSF's operations are almost entirely funded by manufacturers of plumbing products listed and tested by NSF. The NSF standards for unregulated contaminants are also established largely on the basis of toxicity information and studies provided

by and owned by the manufacturers of the regulated products. (*See* exhibit A.)

It is also evident from the record that NSF's standards-setting and testing process are dominated by the industrial participants that have an economic stake in the results of the process. [11] For example, the NSF THF task force examining the NSF action level for THF in light of the National Toxicology Program ("NTP") study finding THF to be an animal and potential human carcinogen, includes almost entirely representatives of the THF industry and B.F.Goodrich. (Attachments to the Comments of Thomas Reid Associates ("Reid Associates"), att. L.) The Task Force meeting minutes show that one EPA staff member has been present, but did not actively participate in the proceedings. (*Ibid.*) The Task Force has had no representation from the workers and drinking water consumers that are exposed to the potential carcinogen. (*Ibid.*) In addition, as discussed in exhibit A, NSF has delegated critical components of the certification of plastic pipe to the Plastics Industry itself.

It is also clear that NSF is sensitive to the economic effect of its standards and testing process on product manufacturers, and is extremely cooperative with its industrial customers. For example, the NSF staff assured the industry representatives that a decision on the acceptable exposure level ("MAL") for THF would be made only after the industry and regulatory communities have reached a *consensus* recommendation. (Reid Attachments, att. L; emphasis added.) NSF also reassured the manufacturers that if a change is made "for THF or any other *high impact* MAL, ample opportunity for reformation and requalification of affected products will be made." (*Ibid*; emphasis added.) In addition, the NSF Manager of Plastics, Plumbing and Mechanical Programs testified on behalf of B.F.Goodrich in the Goodrich lawsuit against a small Illinois town that prohibited CPVC pipe. [CITE] He was even featured in a promotional video on behalf a B.F.Goodrich CPVC potable water pipe product that was produced by the B.F.Goodrich Marketing Division. [CITE]

The point is not to suggest any ethical impropriety in the NSF process, but rather to emphasize that NSF is not a public agency. NSF's orientation

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[11] This concern that third-party standards setting organizations place the economic interests of their industrial clients above the public interest is a long-standing one. The particular problems with NSF, ASTM, ANSI and similar organizations were the subject of extensive testimony in congressional oversight hearings as early as the 1970s. (Appen.28.)

is perfectly understandable given its purposes and functions. It is necessarily accountable to the manufacturing and industrial customers it serves through its listing process, but it is not accountable to the general public.

V. DRAFT EIR FAILS TO DISCLOSE THE ANALYTIC AND TECHNICAL BASIS SUPPORTING ITS CONCLUSIONS

The fundamental purpose of an EIR is to disclose the facts and analysis supporting its conclusions regarding a project's potential impacts. This disclosure enables the public and decision-maker to make an independent judgment regarding the environmental consequences of project approval. The present EIR not only wholly fails to provide any specific facts or analysis regarding project impacts, its discussion actually masks the genuine issues raised by the project and misleads the public and decision-maker as to the environmental ramifications of the project.

A. Legal Standards

The EIR must present "a sufficient degree of analysis to provide decision-makers with information which enables them to make a decision which intelligently takes into account environmental consequences." (14 C.C.R. § 15151.) The level of detail and analysis in the EIR must be "sufficient to enable those who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project." (*Laurel Heights I, supra,* 47 Cal.3d 376, 404-405.)

"The EIR must contain facts and analysis, not just the bare conclusions of a public agency." (*Santiago Water District v. County of Orange* (1981) 118 Cal.App.3d 818, 831 [173 Cal.Rptr. 602].) The environmental assessment "must reflect the analytic route the agency traveled from evidence to action." (*Kings County Farm Bureau v. City of Hanford, supra,* 221 Cal.App.3d at p. 733.) In particular, any conclusion that a potential effect will not be significant must be supported by a rigorous scientific analysis and concrete substantial evidence. (*Ibid.*)

The courts have also held that agency judgment and opinion cannot substitute for facts and analysis. (*Santiago Water District v. County of Orange, supra,* 118 Cal.App.3d at p. 831.) "An agency's opinion *concerning matters within its expertise* is of obvious value, but the public and decision-makers, for whom the EIR is prepared, should also have before them the basis for that opinion so as to enable them to make an independent reasoned

judgment." (*Ibid.*; emphasis added.) Thus, the EIR must disclose the specific facts and technical analysis that supports the Lead Agency's opinion regarding the significance of the project's potential environmental effects. (*Ibid.*) This disclosure is even more critical where the Lead Agency is exercising its judgment regarding matters *outside* the Lead Agency's expertise.

Finally, CEQA requires that the specific facts and technical analysis supporting the Lead Agency's conclusions and opinions be disclosed *in the EIR*. The Lead Agency reliance on facts and technical analyses that appear in documents or studies outside of the EIR cannot substitute for an analysis presented in the document circulated for public review. The EIR itself "must reflect the analytic route the agency traveled from evidence to action." (*Kings County Farm Bureau v. City of Hanford, supra,* 221 Cal.App.3d at p. ___.)

Like an EIS prepared under NEPA, an EIR must be "an essentially self-contained instrument, [which should] be capable of being understood by the reader without the need for undue cross-reference." (*Baltimore Gas & Electric Co. v. Natural Resources Defense Council* (1983) 462 U.S. 87, 99-101, fns. 12, 13 [103 S.Ct. 2246].) The presentation of the technical data and information in the EIR must be "sufficient to permit full assessment of significant environmental impacts by reviewing agencies and members of the public." (14 C.C.R. § 15147.) In addition, the *complete* details of the technical analysis and data supporting the findings of the EIR must be presented in an appendix to the main body. (*Ibid.*)

While CEQA permits an EIR to incorporate by reference all or portions of other publicly-available documents, the Guidelines make clear that this procedure is appropriate only for documents providing general background, but not for materials that "contribute directly to the analysis of the problem at hand." (Guidelines § 15150(f).) The Discussion following Guidelines section 15150 explains that the section is intended to provide guidance for incorporating documents "in a manner consistent with the *public involvement and full disclosure* functions of CEQA." (emphasis added.)

B. Application of Legal Standards to Draft EIR

The Draft EIR is devoid of substantive analysis and consists of little more than a series of conclusory assertions and unsupported opinions. This absence of analysis is not surprising, indeed it was inevitable, given the factors discussed in the previous sections of these comments. HCD had

already officially decided that the project did not present a potential for any significant effects, and that the court-ordered environmental review should be conducted "quickly and efficiently." These decisions in turn led to the fateful decision not to engage independent technical experts or to substantively involve state experts in the review. HCD's strategy precluded any opportunity for a genuine analysis of the technical issues raised by the project.

The approach taken throughout the Draft EIR is to list a set of information, studies or prior research that the author claims to have "reviewed," "considered" or "analyzed." [12] The author then concludes, based on his review and consideration of the listed material, that the project will not cause any potentially significant effects. The author frequently also relies on HCD's "reasonable and prudent" judgment or opinion in resolving various issues. What is missing from the presentation, however, is a description of the "analytic route" that leads the author from the cited source material to his conclusion that no impact will occur. (*See Kings County Farm Bureau v. City of Hanford, supra,* 221 Cal.App.3d at p. 733.) The author also fails to describe the analytical basis that supports HCD's exercise of judgment regarding the issues. (*Santiago Water District v. County of Orange, supra,* 118 Cal.App.3d at p. 831.)

Without disclosure of the critical analytical details, the public is denied an opportunity to meaningfully consider and comment on the Draft EIR's conclusions. As explained below, the Draft EIR's failure to support its findings with detailed analysis or specific factual explanation is a particularly serious violation of CEQA under the circumstances of this environmental review.

The Draft EIR's approach reflects, in part, HCD's view that the research and analysis done in conjunction with the 1989 Draft EIR was adequate, and that no additional research or analysis is necessary to evaluate the current project. For example, HCD based its failure to ask for an analysis of the technical issues by state experts on the "wealth of information" and "considerable research" produced in "the previous draft environmental impact report" proceeding. (Appen. 29.) The Draft EIR also acknowledges that:

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[12] Indeed, the Draft EIR begins by describing in broad, general terms a list of information that it has "analyzed and considered" in the "EIR process." (Draft EIR, pp. ii-iii.)

"much of the information [in the 1989 Draft EIR] is still the most current available and, therefore, the Lead Agency has used this earlier work. The Lead Agency has not undertaken additional research since there is now adequate information available on which to base an informed decision regarding the potential for significant impacts from the proposed use of CPVC." (Draft EIR, p. viii.)

Accordingly, the Draft EIR relies heavily on the 1989 Draft EIR and the materials prepared for the 1989 environmental review to support its conclusions with regard to the current project. While it is certainly appropriate for HCD to utilize relevant research and analysis from the earlier EIR proceeding in conducting the current review, CEQA requires that the research and analysis supporting the Lead Agency's conclusions be presented *in the Draft EIR that is circulated for public review*. It is obvious, however, that considerable time would have been required to apply the 1989 research and analysis in this EIR proceeding. HCD apparently was not willing to "begin anew the analytic process," since it would have jeopardized the Department's ambitious timeline for certifying a Final EIR. (*Laurel Heights I, supra,* 47 Cal.3d at p. 425.)

Thus, instead of incorporating the prior research into the present evaluation, the current Draft EIR simply cites the 1989 Draft EIR and associated studies to support its conclusions, without describing the details of the prior research and analysis, or their relationship to the current project evaluation. This approach deprives the public of an ability "to understand and to consider meaningfully the issues raised by the proposed project." (*Laurel Heights I, supra,* 47 Cal.3d 376, 404-405.) The effect of the Draft EIR's reliance on the previous EIR is particularly pernicious in this case given the extensive criticism of the research and analysis presented in the 1989 Draft EIR.

The serious deficiencies in the previous environmental evaluation are reflected in scope and unanimity of the public comments on the document. HCD received several hundred pages of comments from organizations and individuals representing a wide range of interests in the plastic pipe debate.[13]

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[13] The Draft EIR indicates that the public comments on the 1989 Draft EIR are a part of the record of this EIR proceeding. The complete set of public comments submitted on the 1989 Plastic Pipe Draft EIR are hereby incorporated and made a part of these comments.

The parties filing comments included labor organizations, environmental and consumer groups, business associations, state and local public agencies and officials, members of the state Legislature and individual concerned citizens. The comments reflected a remarkable consensus that the Draft EIR was profoundly flawed.

Even DHS, which had assisted HCD in the EIR process by preparing the worker exposure study, strongly criticized the Draft EIR's evaluation of worker health impacts. DHS commented that the Draft EIR "understates the magnitude of chemical exposures that occur during plastic pipe installation, and underrates the potential health impacts of those exposures." (Appen. 30.) DHS also questioned the efficacy of the mitigation plan presented in the draft EIR to address worker chemical exposures. (*Ibid.*)

The Department's own Legal Affairs Office also concluded that the environmental analysis presented in the draft EIR failed to comply with CEQA.[14] (Appen. 32.) The Legal Affairs Office determined that "additional information is required to comply with the California Environmental Quality Act (CEQA)." (*Ibid.*)

In light of the consensus regarding the 1989 Draft EIR's deficiencies, additional funding was needed to conduct the analysis required by CEQA (Appen. 9.) The Society of the Plastics Industry, however, refused to provide such funding. (*Ibid.*) On August 9, 1994, Lewis R. Freeman, Jr., Vice President for Government Affairs for the Society of the Plastics Industry, wrote to HCD and directed the Department to suspend all work on the plastic pipe EIR immediately, until directed otherwise by the Society of the Plastics Industry. (*Ibid.*) As a result, HCD never responded to the public comments and the issues raised in those comments remain unresolved.

Despite the serious deficiencies in the 1989 environmental review and the extensive criticism of that review, the Draft EIR simply cites to the record of the 1989 proceeding to support its conclusions *without presenting the details of the 1989 analysis and without responding to the public comments on that analysis*. This strategy enables HCD to effectively avoid addressing the

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[14] Given the extensive criticism of the draft EIR, the Department referred the document and public comments to the Attorney General for review. (Appen. 31.) In 1992, the Attorney General submitted a lengthy opinion letter to the Department concluding that the Draft EIR was legally inadequate and that substantial additional work and evaluation of the proposed project would be required to complete an EIR in compliance with CEQA. (Appen. 31.)

serious issues raised in the 1989 proceeding in the course of the current approval. This is a particularly egregious example of "stubborn problems [and] serious criticism being . . . swept under the rug." (*Kings County Farm Bureau v. City of Hanford, supra,* 221 Cal.App.3d at p. 733.)[15]

The discussion of potential impacts of solvent leaching on drinking water contamination is a good example of the Draft EIR's approach. The Draft EIR relies on studies and analyses presented during the 1989 Draft EIR proceeding to support its conclusion that the project will not result in a potentially significant impact:

> "The Lead Agency has reviewed the studies and analysis which were used and included in the previous Draft EIR. The Lead Agency has also reviewed the comments and criticism of this earlier work . . . [¶] The Lead Agency does not find any reason to conclude that contamination of drinking water by leachates from CPVC would be a significant impact on the environment that would result from the proposed project. While the comments received on the Draft EIR and criticism submitted subsequently suggest there may be a basis for disagreement over the details of the past studies, there is no substantial evidence to prove a significant impact." (Draft EIR, pp. 36-37.)

This cursory and conclusory discussion discloses none of the details of the leaching analysis and drinking water contamination evaluation presented in the 1989 Draft EIR. It reveals nothing about the numerous leaching studies that have been prepared on CPVC leaching, the specific rate and duration of leaching with regard to the individual chemical contaminant, the levels of leaching before and after flushing, the implementation and enforcement of the proposed flushing requirement, the estimated exposures

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[15] The brief two or three sentence descriptions that follow the studies listed under "Summaries of Selected Studies and Reviews of Drinking Water Contamination by Pipe and Pipe System Components, and Worker Health and Safety" in the Draft EIR do not correct the problem. These brief descriptions do little more than indicate that a study was prepared and its subject matter; they offer few if any details regarding the substance of the study or its relationship to the analysis at hand. (*See* attached technical comments for further discussion of the inadequacy of the study descriptions.) In at least one case, the description avoids the critical point. In describing the Cooper leaching study, the Draft EIR notes that the test protocol was established with input from a number of interested parties. (Draft EIR, p. 65.) The Draft EIR fails to address, or even acknowledge, however, the substantial comments submitted in 1989 regarding the improper *deviations* from that protocol.

to drinking water consumers, the toxicity data on these contaminants and so on.

The Draft EIR also fails to disclose the substantial controversy and debate regarding the fundamental adequacy of the drinking water contamination analysis in the 1989 Draft EIR. The comments on the 1989 Draft EIR took issue with the adequacy and accuracy of the leaching studies upon which the Draft EIR now relies, the effectiveness of the flushing protocol proposed in the 1989 report, the standards applied to evaluate acceptable levels, the estimates of exposures, the assessment of the toxicity data and virtually all other elements of the analysis. These comments included analyses prepared by technical experts which concluded that CPVC approval *presented a potential for significant effects on drinking water contamination*. (*See* California Pipe Trades Council, Comments on Plastic Pipe Draft EIR, Nov. 13, 1989.) For the Draft EIR to reduce several-hundred pages of substantive comments, including expert comments finding a potential for significant effects, to "disagreement over the *details* of past studies" is disingenuous at best, and at worst an attempt to mislead the public as to the serious issues associated with chemical leaching from CPVC pipe.

The Draft EIR is replete with this kind of conclusory statement unsupported by any empirical analysis or factual explanation, which is contrary to CEQA requirements. (*People v. County of Kern, supra*, 39 Cal.App.3d at p. 841-842.) Another example with respect to drinking water contamination is typical:

> "A review of the previous studies of the contamination of potable water by piping materials demonstrates that all pipe materials, including the metallic pipe now commonly in use in California, can and do result in detectable contamination of water. In some studies, where *extreme* conditions are examined, the levels of contamination have exceeded existing health-based standards. The greatest reported exceedence of drinking water standards is for copper pipe systems . . . While these levels of these contaminants would be unacceptable, it is *unlikely* that consumers would *often* encounter contamination at these *extreme* levels." (Draft EIR, p. 63; emphasis added.)

Which studies found contamination levels above health-based standards? What levels were found? What were the conditions under which the studies were undertaken? What is the likelihood that these conditions

would exist under real world conditions? How did the Draft EIR make that determination? What does it mean to say that it is "unlikely" consumers would "often" experience "extreme" contamination levels? Reliance on such undefined phrases and unexplained terms results in conclusory assertions that do not provide the public and decision-maker with meaningful information regarding the project or its potential effects. (*Whitman v. Board of Supervisors* (1979) 88 Cal.App.3d 397, 411 [151 Cal.Rptr. 866].)

The potential for synergistic and additive effects from combined exposure to CPVC solvent chemicals was a major issue of debate in the 1989 EIR proceeding. Comments were submitted by a respected toxicologist describing the potential for synergistic and additive effects and referring to the then-existing studies and emerging data on the topic. (Dr. Martyn Smith, Comments on 1989 Plastic Pipe Draft EIR, Nov. 13, 1989.) Additional expert comments submitted with this letter describe the post-1989 studies and data regarding the synergistic and additive effects of the CPVC solvent chemicals. (*See* ex. B.)

The Draft EIR's *entire* discussion of this issue is as follows:

> "Multiple, simultaneous exposures to different materials can have effects which are greater than, less than, or different from effects observed from exposures to the same materials separately. In the cases of the solvents used in CPVC primers and cements, there is no evidence to suggest synergistic effects between the four solvents. There is one report of possible adverse interaction following overexposure to one of the solvents used to joint CPVC, THF and a general anesthetic. This is among the information reviewed by DHS during preparation of this EIR. (*See* the summary of the 1989 DHS report, "Plastic Pipe Installation: Potential Hazards to Workers" at the end of this chapter.) [¶] The effects of exposure would not be expected to be additive over time since none of the solvents is known to bio-accumulate." (Draft EIR, p. 38.)

This is a textbook example of the kind of conclusory, unsupported statement regarding potential impacts that the courts have rejected. The Draft EIR's finding of no significant effect rests on the one sentence assertion that "there is no evidence to suggest synergistic effects." This statement is especially outrageous given that HCD's own environmental review record in this case, a record the author claims to have "reviewed and analyzed," contains expert testimony supported by references to the published literature

indicating a potential for synergistic effects. If the author disagrees with this testimony and the supporting studies, he must explain that disagreement *in the Draft EIR.*

The Draft EIR contains numerous additional examples of conclusions regarding the potential effects of the project that are unsupported by any detailed analysis or factual explanation. The defects in the Draft EIR's discussion of specific impacts are addressed in our comments on the impact analysis in Section VII, *infra.* The attached technical comments also discuss other examples of assertions, claims, assumptions and conclusions made or drawn by the Draft EIR without documentation, citation to a source or factual explanation of any kind.[16]

The Draft EIR's failure to disclose the details of its analysis and its reliance on the author's "review and consideration" of materials outside of the EIR constitute particularly serious violations of CEQA for two reasons. First, the Lead Agency does not possess in-house expertise and did not engage consultants qualified to review the technical issues. As explained in detail above, HCD does not have programmatic jurisdiction or in-house expertise with regard to the drinking water safety, worker health, air quality, fire safety, toxicology or other technical subjects at issue in this proceeding. In addition, HCD did not engage independent consultants or involve state experts in the substantive evaluation of the highly technical issues considered in the Draft EIR.

Second, the materials relied upon outside of the EIR are suspect, consisting of documents from the discredited and abbreviated 1989 EIR proceeding, or documents submitted by B.F. Goodrich, the effective applicant in this proceeding. The Draft EIR Bibliography of materials reveals that, even with respect to the copper issues, HCD relied almost entirely on information submitted by B.F.Goodrich, a chief economic competitor of the copper industry with respect to potable water piping. Under these circumstances, it is critical to the integrity of the environmental review

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[16] The undocumented statements and conclusions in the Draft EIR are so extensive, we have reprinted numerous examples in appendix 33. We assume that most of these statements and conclusions are based on the "voluminous materials" submitted by the B.F.Goodrich marketing and government relations departments, as indicated by the HCD Draft EIR Bibliography. While HCD may have been reluctant to identify the source of this material, CEQA requires that the public be informed of the basis for Draft EIR's assessment.

process that the analytical details supporting the Draft EIR's conclusions be disclosed.

VI. INADEQUATE PROJECT DESCRIPTION

The definition of the project under review in an EIR is critically important since it informs the public and government decision-makers of the nature of the proposed activity and determines the scope and content of the analysis that follows. As discussed below and explained in detail in the technical comments attached in exhibit A, the Draft EIR's definition of the project is profoundly flawed. In addition to being factually incorrect and incomplete, the serious deficiencies in the project description are another indication of the lack of technical expertise in the preparation of the document, and the failure of B.FGoodrich to provide HCD with complete information on its product and the nature of the project. The inadequate and incomplete project description undermines the entire analysis of the project.

A. Legal Standards

The courts have declared that "[a]n accurate, stable and finite project description is the *sine qua non* of an informative and legally sufficient EIR." *(County of Inyo v. City of Los Angeles* (1977) 71 Cal.App. 3d 185, 193 [139 Cal.Rptr. 396]; *see also City of Santee v. County of San Diego* (1989) 214 Cal.App.3d 1438 [263 Cal.Rptr. 340]; *Rural Land Owners Association v. Lodi City Council* (1983) 143 Cal.App.3d 1013, 1024-1025 [192 Cal.Rptr. 325]; and *Santiago County Water District v. County of Orange, supra,* 118 Cal.App.3d at pp. 829-830.)

The CEQA Guidelines also require that a project definition include "the whole of the action, which has a potential for resulting in a physical change in the environment, directly or ultimately . . . ." (14 C.C.R. § 15037, subd. (a); *see also City of Santee v. County of San Diego, supra,* 214 Cal.App.3d at pp. 1450-1455; and *Rural Landowners Association v. Lodi City Council, supra,* 143 Cal.App.3d at p. 1025.)

The policy behind the requirement for a clear, accurate and complete project definition was cogently stated in *County of Inyo v. City of Los Angeles, supra,* 71 Cal.App.3d at p. 193:

> "A curtailed or distorted project description may stultify the objectives of the reporting process. Only through an accurate view of the project

may affected outsiders and public decision-makers balance the proposal's benefit against its environmental cost, consider mitigation measures, assess the advantage of terminating the proposal (i.e., the 'no project' alternative) and weigh other alternatives in the balance." (*See also City of Santee v. County of San Diego, supra*, 214 Cal.App.3d at pp. 1450-1455.)

Another court noted that a failure to include all components of a project in the project description defeats CEQA's mandate for full public disclosure and consideration of potential impacts: "Because of this omission, some important ramifications of the proposed project remained hidden from view at the time the project was being discussed and approved. This frustrates one of the core goals of CEQA." (*Santiago County Water District v. County of Orange, supra,* 118 Cal.App.3d at p. 830.)

B. Application of Legal Standards to Draft EIR

The importance of an accurate project description in this case and the deficiencies in the project description presented in the Initial Study were discussed at length in our scoping comments filed in response to the Department's Notice of Preparation:

> "The Department's Initial Study of the proposed project presents a vague and incomplete description of the project. The project definition omits important elements of the proposed approval. We fear that this inadequate project description will lead the Department into the same problems in the environmental analysis that plagued the 1989 EIR. It is imperative that a clear and accurate definition of the full scope of the project be developed at the outset. Some of the relevant considerations in preparing an adequate project description are set forth below." (California Pipe Trades Council, Comments on Scope of CPVC EIR, Sep. 25, 1997, p. 3.)

Our scoping comments discussed in detail the legally-required elements of a complete and accurate project description for this project. These elements included a complete and accurate description of the regulatory action, including the specific regulatory language proposed for adoption, CPVC installation and use in non-residential occupancies, the complete plumbing system authorized for use and variations in manufacturing formulas. (California Pipe Trades Council, Comments on Scope of CPVC EIR, Sep. 25, 1997, pp. 2-7.)

Despite our effort to describe in advance the details of an adequate project definition in order to avoid the defective project description that plagued the 1989 assessment, the Draft EIR includes an inaccurate, misleading and curtailed project description. The significant errors and deficiencies in the Draft EIR's technical definition of the project are discussed at length in exhibit A. This deficient project description undermines the analysis of impacts and fails adequately to advise the public and decision-makers of the nature and scope of the project.

1. The Draft EIR Incorrectly Describes the Proposed Code Adoption

The inaccuracies in the Draft EIR's project definition begin with an incorrect description of the building standard being proposed for adoption. The Draft EIR's apparent confusion regarding the regulatory action under consideration not only undermines the analysis of specific impacts, but calls into question the fundamental accuracy and integrity of the environmental review.

The Draft EIR asserts that CPVC is currently authorized "from the service connection up to the walls of residential or other buildings [and] for buried potable water piping on residential properties outside of the perimeters of the building walls." (Draft EIR, p. 20.) It claims that the current project would authorize CPVC pipe within "the interiors of all residential buildings." (*Ibid.*) Similarly, the Draft EIR describes the project as approval of CPVC pipe use "in the interior potable water systems of residential buildings." (*Id.*, p. vii.) The Draft EIR does not cite any building standard, regulation, statute or other authority for these statements.

The Draft EIR also states that "[t]he project which this EIR considers is to adopt section 604.1 of the Uniform Plumbing Code (UPC) with no changes. In previous adoptions, the sentence 'CPVC pipe and tubing may be used for hot and cold water distribution within a building' had been deleted." (Draft EIR, p. i.) The Draft EIR then quotes UPC section 604.1:

> "604.1 Water pipe and fittings shall be of brass, copper, cast iron, galvanized malleable iron, galvanized wrought iron, galvanized steel, or other approved materials. Asbestos-cement, CPVC, PE, or PVC water pipe manufactured to recognized standards may be used for cold water distribution systems outside a building. <u>CPVC water pipe and</u>

tubing may be used for hot and cold water distribution systems within a building. All materials used in the water supply system, except valves and similar devices shall be of a like material, except where otherwise approved by the Administrative Authority." (Draft EIR, p. i; original emphasis.)

The Draft EIR apparently is confused about the California amendments to UPC section 604.1 that are incorporated into the current CPC. It also appears to misunderstand both HCD's building standards jurisdiction, and the water system components governed by section 604.1.

The provisions of the CPC apply to all components of the plumbing system "in or on any building or structure *or outdoors on any premises or property*." (24 C.C.R., Part 5, § 101.4.1.) The provisions of CPC Chapter 6 that have been adopted by HCD expressly cover the plumbing system from the water meter or other point of service connection to the water supply system owned by the private or public water utility. (*See* 24 C.C.R., Part 5, §§ 604.1, 610.1, 610.8.) The California Public Utilities Commission or DHS jurisdiction over the private or public water distribution system ends at the customer's water meter or other service connection. (California Public Utilities Commission, General Order 103 § I(3)(f) (May 7, 1993).

The water service connection is typically at the street or property boundary, with a service pipe and other system components extending to the building. The length of the building service piping depends on building setbacks and lot configuration. For nearly twenty years, HCD has recognized its jurisdiction over this component of water service systems by adopting amendments to section 604.1 that delete *both* references to CPVC in section 604.1, including the reference to CPVC use in the service piping "outside a building." (24 C.C.R., Part 5, § 604.1.) Thus, the Draft EIR's description of the current and proposed provisions of section 604.1 is incorrect. CPVC pipe is *not* authorized "from the service connection up to the walls of residential or other buildings [and] for buried potable water piping on residential properties outside of the perimeters of the building walls" as asserted in the Draft EIR. (24 CCR, Part 5, § 604.1.) *That is a use that would be authorized by the project under consideration in the Draft EIR.*

The Lead Agency's present confusion about its jurisdictional authority and the scope of the project approval is inexplicable given its repeated action

over nearly 20 years to adopt[17] amendments to section 604.1 to delete CPVC use in service piping outside a building. The Draft EIR's error is also difficult to explain given the author's repeated claims that he has reviewed the 1989 Draft EIR in preparing this document. The 1989 Draft EIR left no doubt that the proposed code change included authorizing "[CPVC] for use *in exterior* and interior hot and cold water supply." (1989 Plastic Pipe Draft EIR, p. 4.) The 1989 Draft EIR also correctly quoted section 604.1 (formerly § 1004) showing *both* references to CPVC underlined and proposed for approval by HCD. (*Id.*, p. 7.)

The Draft EIR's Appendix creates even more uncertainty for a reader trying to understand the proposed code change. The Appendix begins by repeating the Draft EIR's inaccurate statement of CPC section 604.1, suggesting that CPVC is currently allowed for building service piping and that HCD proposes to add only interior use. (Draft EIR Appendix, p. 5.) Under a section entitled "Permitted Materials," however, the Appendix reprints the CPC section 604.1 approved by HCD in 1995 that *authorized* CPVC potable water pipe for interior and exterior use, but that was overturned by the court in January 1997. (*Id.*, p. 26.) The Draft EIR not only fails to advise the reader that this authorization was rescinded, it states that the "[a]mendent to Section 604.1[was] effective on a permanent basis November 30, 1995." (*Ibid.*)

As discussed in detail in exhibit A, the Draft EIR's incorrect assumption as to the scope of the proposed project results in a failure to consider the full range and scope of potential impacts with regard to drinking water leaching, worker safety, air quality, permeation and other issues. In addition, the incorrect, contradictory and confusing project description misleads the public regarding the nature of the project and its potential effects.

2. The Draft EIR Incorrectly Describes the Current Authorization for CPVC

The Draft EIR presents a distorted picture of the scope and context of the proposed project approval by presenting an inaccurate description of the current authorization and use of CPVC in California and elsewhere. This misleading picture begins inside the front cover of the document. The Draft

[17] And later propose adoption to the CBSC pursuant to Health and Safety Code section 18949.5.

EIR includes a map showing 14 counties shaded and listing 40 cities and stating: "Counties where CPVC *is permitted for use* are highlighted in map. In addition, the following cities have notified the Lead Agency that they *permit the use* of CPVC." (Draft EIR, inside of front cover; emphasis added.)

The Legislature granted authority to local jurisdictions that acted to permit CPVC pipe between the October 15, 1995 effective date of the bill and January 1, 1996, to allow the use of CPVC pipe until January 1, 1998, at which time the authority expired. (Health & Saf. Code § 17921.9.) Consequently, CPVC potable water pipe is not "permitted for use" anywhere in California, with the exception of the City of East Highland.

Later the Draft EIR notes that the legislative authority to allow use of CPVC "expired by its own terms at the end of 1997." (Draft EIR, p. viii.) However, the members of the public reviewing the EIR may not recognize that this brief reference makes irrelevant the Draft EIR's earlier express reference and accompanying map purporting to show jurisdictions that allow CPVC. At a minimum, the description of project scope is internally inconsistent and confusing.

Moreover, the Draft EIR's later reference to this issue adds to the misleading nature of the project definition by implying that a number of the jurisdictions listed in the first reference proceeded to adopt permanent approval of CPVC after expiration of the legislative authority. The Draft EIR states that "*some jurisdictions* commenced procedures to permanently allow CPVC pipe in new construction and for re-piping where copper piping had failed." (Draft EIR, p. viii.) As far as we are aware, only the City of East Highland adopted permanent regulations approving CPVC. If HCD is aware of others, they should be listed with appropriate documentation of the permanent adoption. If HCD is not aware of others, it is difficult to understand the purpose of the statement in the Draft EIR except as an effort to create a misleading impression with regard to the extent of current authority. The statement should be clarified.

The Draft EIR also states, more than once, that CPVC potable water pipe is allowed "in all other 49 states." (Draft EIR, p. vii.) This statement implies that there can be no legitimate basis for California's singular refusal to approve a material allowed everywhere else in the country. It is also clear that the Draft EIR's assumption about authorization and use in other jurisdictions was a significant factor in the Draft EIR's assessment of impacts from this project. The Draft EIR expressly states that existing uses in other

jurisdictions "is a *major factor* in the consideration of the proposed building standards expanding the use of CPVC." (Draft EIR, p. 19; emphasis added.) In addition to being based on an incorrect assumption about current uses, the statement is disturbing in what it reveals about the bias and lack of independent judgment in the preparation of this Draft EIR. [18]

In claiming approval for CPVC in all other 49 states, the Draft EIR simply parrots a line that has become a mantra of the Marketing Division of B.F.Goodrich Specialty Chemicals. What is revealing, however, is that this claim has been rebutted on more than one occasion with evidence presented to HCD in this and in prior proceedings, including the 1995/96 emergency approval of CPVC.[19] The fact that the Draft EIR repeats the Goodrich assertion without referring to evidence in its own record, indicates either that the Draft EIR author is not familiar with the record, or that he simply incorporated the Goodrich materials without any attempt at an independent review.

The Draft EIR's claim also reveals a lack of understanding of alternative legal frameworks for building code adoption, even though this is one of the few issues involved in this project that does fall within HCD programmatic responsibility. In many states, a minimum building code is adopted at the state level, but local jurisdictions are permitted to adopt more stringent standards without a requirement for state-code conformity. This is the code adoption framework previously applied in California prior to legislative reforms initiated in the 1970s.

In states following the minimum building code approach, a statement that the "state" allows CPVC is misleading since any number of local jurisdictions within that state could still prohibit CPVC. In the state of Illinois, for example, the state code allows CPVC, but the City of Chicago and

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[18] As discussed below, the statement reflects HCD's misunderstanding of its legal obligations under CEQA. The authorization or use of CPVC in other jurisdictions is irrelevant unless an analysis of the potential environmental impacts of such authorization and use, or subsequent studies and tests of the leaching, worker health and other impacts of installation and use, have been conducted. The Draft EIR must present and discuss this information in its present analysis if CPVC authorization and use elsewhere are to be considered properly in the present CEQA analysis.

[19] The record of the 1995/96 CPVC emergency adoption proposed by HCD and adopted by the CBSC is hereby incorporated by reference in support of these comments, if not already considered a part of the record of this proceeding.

many smaller jurisdictions within the state *prohibit* CPVC. B.F.Goodrich is well-aware of this regulatory scheme since it has sued one of these small jurisdictions in federal court for prohibiting CPVC potable water pipe. (*See B.F.Goodrich Company v. Lake in the Hills, Illinois, and David Sellek, Building Commissioner for Lake in the Hills*, 1996, (N.D.Ill., No. 96 C 50346).) The Draft EIR's author must also be aware of this lawsuit since he relies principally on one declaration submitted by Goodrich in that litigation to support several of his key findings. Repeating this misleading statement despite that awareness is further evidence of the bias, or at least a lack of care, in the presentation.

The village of Lake in the Hills prohibited CPVC pipe based on concerns about the potential public health and safety impacts of the pipe that are similar to the concerns that have been raised in this proceeding. (*See B.F.Goodrich Company v. Lake in the Hills, Illinois, and David Sellek, Building Commissioner for Lake in the Hills, supra,* Defendants' Memorandum in Support of Their Motion to Dismiss Plaintiff's Complaint, Nov. 8, 1996.) It is unclear why Goodrich selected this small village in Illinois to sue since large states and cities have prohibited CPVC on the same grounds. In any event, the lawsuit is unlikely to succeed given the well-settled law granting local governments broad authority under the police power to regulate in the interest of the public health, safety and welfare.

In those states that require state code conformity, California, New York and Arkansas each prohibit CPVC potable water pipe based on concerns about the public health and safety impacts associated with the pipe. (Appen. 34.) When the individual local jurisdictions in the minimum code states are added to these states, almost 25 percent of the United States population resides in jurisdictions that *prohibit* CPVC potable water pipe. This is a far cry from the Draft EIR's unsupported assertion that all other 49 states allow CPVC.

It is also important to note that this discussion refers only to authorization for use, not actual use. The record of this proceeding indicates that even where CPVC is authorized, actual use for potable water pipe is limited. For example, the DHS worker exposure study (Bellows) includes a lengthy discussion of the difficulty the study team had in locating CPVC potable water installation sites anywhere in the country, even with the assistance of Goodrich. The report notes that most CPVC pipe production was for interior sprinkler pipe. The Draft EIR makes no effort to determine what proportion of the total CPVC pipe production cited is for potable water

versus sprinkler uses. The DHS study team ultimately was required to travel to Atlanta, Georgia to test worker exposures.

3. The Draft EIR Incorrectly Describes CPVC and PVC Use in California Public Water Systems

The Draft EIR misrepresents CPVC potable water applications in California. Throughout the document, the author claims that CPVC is used in public water distributions systems. (Draft EIR, pp. vii-viii.) The Draft EIR repeatedly asserts that CPVC is already present in the existing environment up to the walls of residential structures and other buildings. (Draft EIR, p. 20.)

These assertions are never accompanied by citation to any informational source or documentation of any kind. Since no agency or utility operating a public water system is cited to support these statements, we assume they are based on claims made by B.F.Goodrich in its voluminous submittals to the Department. The claims obviously suggest to the reader that since CPVC is used throughout the public system, a prohibition on CPVC use *inside* residential dwellings is arbitrary and irrational.

The Draft EIR's impression that CPVC is used throughout the public water distribution system clearly influenced the assessment of impacts from this project. It indicates that existing use of CPVC "is a major factor in the consideration of the proposed building standards expanding the use of CPVC." (Draft EIR, p. 19.) Indeed, the Draft EIR goes so far as to state that the use of CPVC in public distribution systems "might ordinarily establish a reasonable presumption that CPVC can be used safely . . . in[side] residential buildings . . . ." (*Ibid.*) The Draft EIR's view demonstrates a fundamental misunderstanding of the analytical and evidentiary requirements necessary to make CEQA findings regarding project impacts.

Any "presumption" of no significant effect would have to follow an analysis meeting the substantive requirements of CEQA. That analysis would have to demonstrate that the CPVC use in public systems presented the same issues as interior use, that the potential leaching, worker health, air quality and other issues raised by interior use had been studied in conjunction with the pipe's approval for use in public systems and that such studies showed that potential impacts would be below a level of significance. If this type of analysis was done with respect to the existing uses of CPVC cited by the Draft EIR, the details of the analysis should be discussed in the

Draft EIR. If the analysis was not done, then these repeated references to CPVC authorization elsewhere are simply irrelevant to the present environmental review.

As explained in detail in the attached technical comments, CPVC pipe is *not* used in public water supply distributions systems in California. (*See* ex. A.) This fact could have been easily confirmed by a few phone calls to public water system operators. Of course, this finding is not surprising given the qualities of CPVC pipe and the nature of water distribution systems. CPVC pipe is expensive relative to other piping material available for use in water distribution systems, and is specifically engineered to withstand hot water temperatures. Public water distribution systems do not carry water at elevated temperatures. The Draft EIR's claims would have seemed counterintuitive to anyone familiar with the basic facts regarding CPVC pipe and public water systems.

The Draft EIR's findings regarding solvent cement impacts were also clearly based on assumptions regarding use of solvent cements with PVC in public water systems. The Draft EIR asserts that when PVC pipe is used in public water systems "the same solvents are used in the cements and primers for [CPVC and PVC]" when in contact with drinking water. (Draft EIR, p. 20.) The Draft EIR also claims:

> "The solvents in the primers and cements used for CPVC and PVC *in public drinking water systems* are the same solvents which would be used to join CPVC in residential buildings. These materials therefore *are already part of the existing environment* and are now in contact with the drinking water of the State." (Draft EIR, pp. 33-34; emphasis added.)[20]

No citation or support for these assertion and claims is offered.

As discussed in the attached technical comments (*see* ex. A), the PVC pipe utilized in public water systems is not solvent-joined. The larger diameter PVC pipe sizes used in public water systems are mechanically

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[20] The first sentence in this quote, and the first part of the second sentence, appear only in the electronic version of the Draft EIR. The text was apparently inadvertently dropped from the printed version. We have not attempted to determine whether other such discrepancies exist between the electronic and printed versions of the Draft EIR circulated for public review.

joined. Solvent cementing is typically not applied. The Draft EIR's incorrect factual assumption again undermines its determinations regarding solvent cement impacts. These facts, again, could have been verified by contacting the operators of public water systems.

4. The Draft EIR Fails to Include CPVC Installation and Use in Non-Residential Occupancies

In comments on the 1989 Draft EIR, and prior to issuance of the NOP on the current Draft EIR, we raised with HCD the importance of including non-residential occupancies in the environmental assessment. HCD took the position in 1989 and again in this proceeding, that it was not required to consider CPVC use in non-residential occupancies. Accordingly, the NOP issued for the Draft EIR described the project is limited to the installation and use of CPVC in residential occupancies.

In commenting on the scope of the project described in the NOP, we again emphasized the importance of considering non-residential installations in order to satisfy both the legal and technical requirements of an adequate assessment. Our scoping comments included references to comments from the 1989 EIR proceeding discussing the potential impacts from non-residential installations. In response to our scoping comments, the Draft EIR abandons HCD's prior position that no consideration of non-residential occupancies is required. Unfortunately, however, the Draft EIR still fails to analyze the impacts of CPVC use in other occupancies as required by CEQA.

The California Supreme Court has held that the initial EIR on a project must analyze the impacts of future expansion or other action if: 1) it is a reasonably foreseeable consequence of the initial project; and 2) the future expansion or action would likely change the scope or nature of the initial project or its environmental effects. (*Laurel Heights I, supra,* 47 Cal.3d at p. 396.)

In this case, future action to expand the use of CPVC to non-residential occupancies is a reasonably foreseeable consequence of the present project.[21]

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[21] It should be noted that unless the proposed building standard is amended to indicate that it applies only to residential occupancies, it may *automatically* apply to all occupancies. The Draft EIR acknowledges that the Attorney General has determined that building standards apply to all occupancies unless "a standard specifically states that it only applies to a particular occupancy." (Draft EIR Appendix, p. 6, citing 74 Ops.Cal.Atty.Gen. 1 (1991).) The Draft EIR goes on to observe that the California Building Standards Code utilizes a matrix

The Draft EIR itself acknowledges the likelihood that HCD's approval of this project will result in future actions to allow CPVC in non-residential occupancies:

> "If CPVC is allowed for the interior distribution of potable water in residential buildings, it is possible that other public agencies which propose Regulations for other types of construction may also expand the allowed uses of CPVC pipe." (Draft EIR, p.vii.)
>
> "The approval of CPVC by the Lead Agency may induce other agencies to allow CPVC pipe in other occupancies." (Draft EIR, p. 4.)
>
> "CPVC would likely be allowed [by other agencies with jurisdiction over other occupancies]." (Draft EIR, p. 101.)

The Draft EIR even goes so far as to indicate that a *purpose* of this EIR is to assist other agencies in taking action to expand CPVC approval in non-residential occupancies:

> "One of the intended uses of this EIR is to assist other public agencies with authority over other occupancies in considering approval of CPVC for potable water piping . . . . If other agencies later choose to consider the use of CPVC, the Lead Agency anticipates that this EIR will prove useful if and when those agencies evaluate their actions under CEQA." (Draft EIR, p. 5.)
>
> "[I]t is reasonable to assume that [this EIR may be used] . . . [t]o assist agencies with authority over building standards for structures other than residential buildings in considering approval of CPVC for potable water piping." (Draft EIR, p. 11.)

HCD's recognition of the likelihood of future expansion of the project is clearly supported by recent history. In late 1995, HCD proposed, and the CBSC adopted, emergency regulations approving CPVC plumbing systems in residential occupancies. Immediately following the Commission's adoption of HCD's proposed CPVC regulations, the Office of Statewide Health Planning

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adoption table approach. (*Ibid.*) It doesn't explain how that fact relates to the Attorney General's analysis, however, since the CBSC utilized a matrix adoption table at the time of the 1991 Attorney General's opinion. The Draft EIR should clarify this issue.

and Development ("OSHPD") proposed regulations authorizing CPVC plumbing systems in the occupancies subject to both OSHPD 1 and OSHPD 2 jurisdiction. (*See Monograph of Code Change Submittals for 1996, Suggested Revisions to the California Building Standards Code*, February 1996, California Building Standards Commission, p. 178.) These occupancies include general acute-care hospitals, acute psychiatric hospitals, skilled nursing facilities and intermediate care facilities. (California Building Standards Code, §101.8.1.) The CBSC suspended its consideration of the proposed OSHPD CPVC regulations only after the HCD/CBSC approval of CPVC in residential occupancies was overturned by the courts for failure to comply with CEQA.

It is virtually certain that OSHPD will resubmit its proposed CPVC regulations to the Commission should the Department certify a Final EIR and propose regulations approving CPVC plumbing systems in HCD occupancies. In addition, the former CBSC Executive Director indicated following the HCD and OSHPD proposals in 1995 and 1996 that he expected proposals for the lifting of CPVC restrictions in all other occupancies subject to state building standards jurisdiction following an HCD approval. (*See* California Building Standards Code, §101.8.1.)

Although HCD now recognizes the likelihood that other agencies will expand authorization for CPVC use to other occupancies as a result of this project approval, the Draft EIR concludes that "[b]ecause these other agencies operate independently of the Lead Agency, it may not be appropriate to consider such expansion as a part of HCD's proposed project." (Draft EIR, p. 5.) For this reason, "[u]se of CPVC in other occupancies is considered in the EIR as one of the alternatives and under cumulative impacts, but is not a part of the proposed project." (Draft EIR, p. vii.)

The Draft EIR has misinterpreted the Supreme Court's holding in *Laurel Heights*. The Draft EIR's obligation to evaluate the impacts from future action to expand CPVC use is not dependent on whether HCD has jurisdiction or control over the future action, but rather whether such action "is a reasonably foreseeable *consequence* of the initial project." (*Laurel Heights I, supra,* 47 Cal.3d 393, 396; emphasis added.) The Draft EIR acknowledges that it is, and therefore the effects of the future expansion must be addressed whether or not the future action is subject to HCD approval. This is particularly true in this case, where HCD acknowledges it is authorized to *recommend* CPVC approval in all occupancies to the CBSC,

and where the CBSC has building standards adoption authority over such occupancies. (*See* Draft EIR, p. 9.)

The Draft EIR is also incorrect in assuming that it may consider the future expansion as an alternative to the initial project. The *Laurel Heights* decision makes clear that the policy underlying the requirement to consider reasonably foreseeable future expansion is to ensure that the potential effects of future actions are considered *together* with the impacts of the initial project. The purpose of the requirement is to ensure that the decision-maker and the public understand the full scope of potential impacts that may result from the initial project approval. (*Laurel Heights I, supra,* 47 Cal.3d at pp. 394-396.) In any event, as discussed in Section IV, *infra*, the Draft EIR's discussion of project alternatives does *not* analyze the impacts of non-residential CPVC installations.

Finally, the Draft EIR's indication that it would analyze CPVC use in non-residential occupancies under its cumulative impacts discussion may have satisfied *Laurel Heights* had such an analysis been conducted. As discussed in Section VII, *infra*, however, no analysis of CPVC use in other occupancies appears in the Draft EIR's cumulative impacts section.

The Draft EIR's failure to consider the potential impacts from CPVC installation in non-residential occupancies is a major defect in the environmental review. There is no question that such future expansion would "change the scope or nature of the initial project or its environmental effects." (*Laurel Heights I, supra,* 47 Cal.3d at p. 396.) As discussed in detail in the attached technical comments, the potential cumulative effects on drinking water, worker health and air quality from CPVC installation in non-residential occupancies are significant. (*See* attached technical exhibits.)

5. The Draft EIR Fails to Include the Complete Plumbing System Proposed for Authorization

In our scoping comments we observed that the NOP and Initial Study refered only to approval of CPVC *pipe*. The pipe, however, is only one component of an integrated plumbing system. The Draft EIR disregards these comments and repeats the defects of the NOP and Initial Study, giving scant attention to the full scope of the CPVC plumbing system HCD proposes to authorize. This issue is discussed in more detail in the attached technical comments. (*See* ex. A.)

The installation and use of CPVC pipe requires special fittings or adhesives to join the CPVC pipe segments, as well as to join the pipe to metallic connections and fixtures. CPVC pipe also requires special insulation materials, hanging systems and construction methods to address abrasion and noise, and to protect the pipe from elevated temperatures and extreme cold. CPVC pipe also requires special fire stopping systems. These other components of the CPVC plumbing system are essential to the installation and use of CPVC pipe and are an integral part of the project under consideration. The Draft EIR's failure to address all components of the CPVC plumbing system presents a misleading picture of the full scope of potential impacts.

An examination of the complete plumbing system proposed for approval is particularly relevant to the HCD's ability to define and mitigate potential impacts. Past failures with CPVC as well as with other plastic pipes have resulted in part from an incompatibility between materials supplied by different manufacturers. For example, CPVC may fail when exposed to certain insulation or fire-stop materials. The best known example is the widespread failure of polybutylene (PB) pipe due to problems with a particular brand of fitting used with the PB plumbing system.

Because CPVC is a new product, HCD also must anticipate reasonably foreseeable changes in CPVC plastic piping systems. For example, the majority of new construction in California is slab-on-grade, where flexible tubing is laid below a poured concrete slab. Rigid CPVC is not suited to this mode of installation, and widespread CPVC use in the California marketplace may require a flexible CPVC pipe. Will rigid CPVC be bent using heat for this application? Will a new flexible CPVC tubing be introduced into the marketplace? What is the scope of the CPVC pipe product proposed for approval? These issues are ignored in the Draft EIR, despite detailed scoping comments raising these questions that were presented in advance of the Draft EIR's presentation.

6. The Draft EIR Fails to Include Variations in Manufacturing Formulas for CPVC Pipe

In our scoping comments, we pointed out that the 1989 Draft EIR, as well as the current NOP and Initial Study, define the project merely as approval of "CPVC" pipe. The Draft EIR, again, largely disregards our scoping comments and repeats the defects in the NOP and Initial Study. These deficiencies in the project definition and their affect in distorting the

Draft EIR's impact analysis are discussed in great detail in the attached technical comments. (*See* ex. A.)

"CPVC" is a generic term for plastic produced by chlorinating polyvinyl chloride (PVC), and there can be significant differences in the chemical composition of the material resulting from varying manufacturing methods. The CPVC resin, the pipe itself, the solvent cements, and other system components contain potentially harmful chemicals that are introduced during the manufacturing and extrusion process. The differences in manufacturing and extrusion methods result in differing chemical compositions and create a potential for a wide variation in health and environmental effects.

In the technology previously used by B.F.Goodrich and other manufacturers of CPVC, chlorination was done inexpensively in aqueous solution with the addition of a chlorinated solvent swelling agent to effect penetration of PVC granules by the chlorine in solution. The swelling agent was trapped in the resin and later leached into water in the pipe. Some of the agents, such as chloroform, are carcinogenic and present significant health risks even at low concentrations.

While a newer manufacturing method patented by B.F. Goodrich eliminates the carcinogenic swelling agents, there is no guarantee that the cheaper, older method of manufacture will not be used for pipe resin marketed in California. California has always seen low cost Pacific Rim imports enter the construction materials market. Cost pressures and patent restrictions increase the likelihood of "dirtier" methods of producing CPVC. This could result in significant residual levels of chloroform and carbon tetrachloride exposure in the future that have not be found testing current resins produced by B.F.Goodrich.

CPVC resin is extruded into pipe and plumbing system components by companies different than the companies that manufacture the CPVC resins. Because the extrusion process occurs at high temperatures and under high mechanical stress, chemical additives are necessary. The EIR must define the full range of manufacturing options for thermal stabilizers and CPVC formulations that may be applied to manufacture the products subject to approval.

The same need for comprehensive definition applies to cements, fittings and other components of the piping system being proposed for approval. An adequate environmental assessment must address current

variations in solvent cement and primer formulations, and must also evaluate the potential impacts from reasonably foreseeable future changes in these formulations.

Despite the broad product approval proposed by the current project, the Draft EIR considers the potential impacts of only a single specific, and relatively "clean," manufacturing method. As discussed in detail in Council's comments on the 1989 draft EIR, this analytical approach dramatically understates the scope of potential health impacts, and misleads the public and the decision-maker regarding the consequences of project approval. (*See* California Pipe Trades Council, Comments on 1989 Plastic Pipe Draft EIR, *supra,* pp. 14-29.) As discussed in detail in exhibit A, the current EIR repeats the same errors.

7. The Draft EIR Fails to Present a Balanced And Objective Project Description

The gratuitous asides extolling the virtues of CPVC throughout the document demonstrate the lack of balance and objectivity in the evaluation, and fail to present the public and the decision-maker with a clear and nuetral statement of the project. The distorted project description misleads the public and decision-maker as to the genuine human health and environmental issues raised by the project.

In some cases, the bias in the presentation reaches the point of absurdity. For example, the Draft EIR cannot present even a list of "existing uses of CPVC" without editorializing. Thus, instead of a list of "potable water applications," we get a list entitled "*Safe, pure drinking water for hot-and cold*-potable water applications." (Draft EIR Appendix, p. 57; emphasis added.) Instead of a list of "industrial applications," we get a list entitled "*Reliable Process Systems for corrosive* industrial environments." (*Ibid.*; emphasis added.) This document has all the earmarks of a Goodrich marketing piece, but, as is the case throughout the EIR, its source is not identified.

While on the one hand HCD claims insufficient knowledge or jurisdiction to evaluate the possible impacts of CPVC use in non-residential occupancies, if feels confident enough to conclude that "it would seem that CPVC would likely be allowed." (Draft EIR, p. 101.)

The lack of balance and objectivity is shown throughout every aspect of the Draft EIR's presentation and discussion of the issues. The document also creates an obvious double standard in its treatment of copper versus CPVC. The biases in the evaluation are identified and discussed in detail in the technical comments attached in exhibits A – D. The Draft EIR's approach fails to satisfy CEQA requirements for an objective and full disclosure.

VII. INADEQUATE ANALYSIS OF POTENTIAL IMPACTS

As discussed in detail below and in the technical comments, the Draft EIR's discussion of project impacts fails to meet the minimum standards of CEQA. Some project impacts are not discusses *at all*, while others are treated in cursory fashion. Even the issues that should be at the heart of this environmental review, worker heath and safety, drinking water contamination and air quality, are treated in a brief and conclusory discussion. The Draft EIR's impact analysis is completely devoid of any quantification, empirical analysis or any factual examination of any kind. Thus, an EIR examining the effects of exposure to chemicals in drinking water and in the workplace never once discloses the levels of exposure that the public or workers would experience!

Even though the burden of the environmental analysis is placed on the lead agency and not the public, and even though the agency cannot "hide behind its own failure to gather relevant data," the Draft EIR's unprecedented failure to undertake any substantive analysis of impacts has required the extraordinary effort to identify and analyze project impacts reflected in the attached technical exhibits. The sparseness of record presented by the Draft EIR enlarges the scope of issues that must be examined in a recirculated EIR that responds to the issues identified in these comments. (*Sundstrom v. Mendocino County, supra,* 202 Cal.App.3d 296, 361.)

A. Legal Standards

The EIR prepared by the Lead Agency must include a detailed statement setting forth all significant effects of the proposed project. (Pub. Resources Code § 21100(b)(1).) Its purpose is "to provide the public and governmental decision-makers . . . . with *detailed information* of the project's likely effect on the environment; to describe ways of minimizing significant effects; to point out alternatives to the project." (*County of Inyo v. City of Los Angeles, supra,* 71 Cal.App.3d at p. 192; emphasis added.)

CEQA requires that the "environmental impact report *shall* include a detailed statement setting forth *all* of the following: (1) *All* significant effects on the environment of the proposed project . . . ." (Pub. Resources Code § 21100(b)(1); emphasis added.) Additionally, the agency is required to make findings "with respect to each significant effect" that are based on substantial evidence in the record. (Pub. Resources Code §§ 21081(a), 21081.5.)

Failure to disclose a significant impact in the EIR would deprive "the public, who relied on the EIR's representations, of meaningful participation . . . ." (*Mira Monte Homeowners v. San Buenaventura, supra,* 165 Cal.App.3d at p. 365.) The EIR must disclose to the public and to decision-makers whether an impact is significant, so that the public may have an opportunity to review and comment on the severity of the impact and the adequacy of mitigation measures. "In reviewing an EIR a paramount consideration is the right of the public to be informed in such a way that it can intelligently weigh the environmental consequences of any contemplated action and have an appropriate voice in the formulation of any decision." (*Karlson v. City of Camarillo* (1980) 100 Cal.App.3d 789, 804 [161 Cal.Rptr. 260].)

CEQA "contemplates serious and not superficial or pro forma consideration of the potential environmental consequences of a project." (*Leonoff v. Monterey County Bd. of Supervisors* (1990) 222 Cal.App.3d 1337, 1347-48 [272 Cal.Rptr 372].) "Conclusory comments in support of environmental conclusions are generally inappropriate." (*Laurel Heights I, supra*, 47 Cal.3d at p. 404; *see also Seattle Audubon Society v. Moseley* (W.D. Wash. 1992) 798 F.Supp. 1473, 1479, quoting *Silva v. Lynn* (1st Cir. 1973) 482 F.2d 1282, 1285.) "To facilitate CEQA's informational role, the EIR must contain facts and analysis, not just the agency's bare conclusions or opinions." (*Laurel Heights I, supra,* 47 Cal.3d at p. 404, quoting *Concerned Citizens of Costa Mesa v. 32nd Agricultural Ass'n* (1986) 42 Cal.3d 929, 935 [231 Cal.Rptr. 748]; *see also Robertson v. Methow Valley Citizens Council* (1989) 490 U.S. 332, 349 [109 S.Ct. 1835]; Adler *v. Lewis* (9th Cir. 1992) 675 F.2d 1085, 1096.)

Preparing an EIR requires research and information gathering. Lead Agencies must thoroughly investigate potential project impacts. (*Seattle Audubon, supra*, 798 F.Supp. at p. 1479-1482.) The burden of this environmental investigation is placed on the government rather than the public. (*Sundstrom v. Mendocino County, supra,* 202 Cal.App.3d 296, 311.) "The agency should not be allowed to hide behind its own failure to gather

relevant data." (*Ibid.*; *see also* p. 361 (sparseness of record suggests existence of significant issues.) The agency "must use its best efforts to find out and disclose all that it reasonably can." (14 C.C.R. § 15144.)

The process of analyzing a project's impacts must be an interactive one between the public and the lead agencies. The process "must be open to the public, premised upon a full and meaningful disclosure of the scope, purposes, and effect of a consistently described project, with flexibility to respond to unforeseen insights that emerge from the process." (*County of Inyo v. City of Los Angeles, supra,* 160 Cal.App.3d at p. 1185.)

B. Application of Legal Standards to Draft EIR

1. Worker Health and Safety

The Draft EIR's treatment of worker health impacts is arguably the most disturbing aspect of the entire document. As discussed in detail in the attached technical analyses, the evidence clearly demonstrates that the project will result in significant impacts on worker health and safety unless effective mitigation measures are imposed. Despite this evidence, the Draft EIR finds *no* impact on workers without *any* worker safety mitigation.

The Draft EIR's finding of no impact is based on a list of considerations briefly discussed, but is not supported by any scientific or factual analysis. Moreover, as discussed below and in the technical exhibits, the considerations cited by the Draft EIR as the basis for its determination are factually incorrect. In addition to being inaccurate, one of the factors considered by the Draft EIR is not an appropriate consideration under CEQA. As shown in the attached technical comments, an empirical analysis of the evidence, including mathematical calculations utilizing the same data relied upon by the Draft EIR, demonstrates that the project would result in serious violations of workplace chemical exposure standards that must be considered significant under CEQA.

The Draft EIR's discussion of the worker health issues also conflicts with the conclusions of the 1989 Draft EIR and 1990 Administrative Final EIR as well as the recommendations of the state experts HCD claims to be relying on for the worker health analysis. In the 1989 proceeding, HCD more clearly acknowledged the chemical exposure risk to workers from the project. (1989 Plastic Pipe Draft EIR, p. 72; Administrative Final EIR, p. 79.) It also required a set of specific mitigation measures that the EIR concluded were

"essential" to protect workers from adverse impacts resulting from solvent exposures. (*Id.*, 1989 Draft EIR, pp. 72-74; 1990 Administrative Final EIR, pp. 79-81.)

Even though the 1989/90 environmental documents treated the worker health impacts much more seriously than the current Draft EIR, the DHS Office of Environmental Health Hazard Assessment[22] found the evaluation inadequate. DHS concluded that the 1989/90 environmental documents had not disclosed the full dimension of the exposure risk to workers identified in the 1989 Bellows report. (Appen. 30.) DHS also concluded that the mitigation measures proposed to implement the recommendations of the Bellows report would not guarantee adequate protection unless they were made more rigorous and specific, and unless specific implementation steps were identified. (*Ibid.*) In this proceeding, the DHS letter updating the earlier analysis concludes that the previous DHS recommendations remain valid. (Draft EIR Appendix, p. 80.)[23]

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[22] As a result of subsequent administrative reorganization, the Office of Environmental Health Hazard Assessment is now called HESIS.

[23] In requesting DHS review of the worker health issues, HCD did not provide DHS a copy of the 1997 NTP study showing carcinogenic activity with regard to THF, the CPVC solvent chemical with the highest worker exposures. The Draft EIR indicates that this study was "not otherwise available to the Lead Agency." (Draft EIR, p. 67.) This is a remarkable and revealing statement. The NTP THF study is well-known in the industrial and regulatory communities. NSF has established a task force in response to the NTP study that has been meeting for some time to reevaluate exposure levels for THF. B.F.Goodrich and the CPVC cement manufacturers are represented on this task force. The carcinogenic potential of THF is probably the single most important development since the 1989 Draft EIR and has significant implications for the worker health analysis as discussed in the technical comments. The fact that the study was not brought to HCD's attention by B.F.Goodrich, and was not provided as a part of the voluminous materials submitted by Goodrich for preparation of the EIR, raises serious questions about the objectivity and balance in the information relied on by HCD. Moreover, the fact that HCD did not independently identify or obtain the study reinforces the view that no independent research and analysis were conducted. A simple phone call to NTP is required to obtain the study. Finally, the overall bias in the preparation is revealed by a letter from the author of the Draft EIR to the HCD Director noting that the California Pipe Trades Council had provided the NTP study to DHS for consideration during its review. The letter indicates that DHS was provided "with what they *apparently* felt was significant new unpublished information" regarding THF. (Appen.35; emphasis.) The Council's industrial hygiene consultant, Mr. Bellows, provided the NTP study to DHS because, in his professional judgment, it is of critical significance in evaluating the worker health impacts of the project. We believe any objective participant in this review would agree that it is significant new information.

The outside independent consulting team that prepared the 1989 Draft EIR included professional industrial hygiene consultants. DHS staff also includes certified industrial hygienists. Even though HCD does not have any professional industrial hygienists or other staff with industrial hygiene experience preparing the current Draft EIR, HCD now concludes that the mitigation measures identified as "essential" to protect workers in the 1989/90 environmental documents and in the DHS recommendations are not necessary at all.

As discussed below and in the technical exhibits, the Draft EIR's conclusions are not supported by any facts or scientific analysis, are based on significance thresholds that are contrary to established industrial hygiene practice and assume incorrect and invalid factual assumptions. The detailed technical analysis presented in the exhibits demonstrate that when current project circumstances are considered, the impacts on worker health are even more significant, and the corresponding need for effective mitigation even more important, than was determined in the previous reports.

A key assumption of the Draft EIR is that it need not consider worker chemical exposures that result from work practices or conditions that are inconsistent with safe use recommendations on product labels and product Material Data Safety Sheets ("MSDS"). Thus, the Draft EIR establishes as a threshold of significance: "Regularly exceeding established workplace [exposure] standards *by persons following material labels and Material Data Safety Sheets*, documented in worker health and safety studies, for example the 1980 and 1989 California Department of Health Services reports." (Draft EIR, pp. 42-43; emphasis added.) The Draft EIR also expressly states that it will not consider any chemical exposure "to constitute a significant adverse impact" if the exposure results from "failure to follow instructions for safe use." (Draft EIR, p. 47.)

There are two problems with the Draft EIR's premise. First, as explained in detail in the technical comments, the Draft EIR's reliance on product labels and product MSDSs in assessing risk is contrary to standard professional industrial hygiene practice, conflicts with HCD's own approach to this issue in the previous environmental review and is inconsistent with the recommendations of the DHS health experts. Product labels cannot reasonably be relied upon to produce any specific safe work practices because of the generic and general nature of the precautions listed, the impracticality and lack of enforcement of the labeling requirements, the lack of worker

control over relevant workplace conditions and other factors discussed more fully in exhibits A and B.[24]

Second, even assuming that effective implementation of the safe work recommendations listed on product labels would avoid worker overexposures, the record conclusively demonstrates that such safe work recommendations are not effectively implemented in practice. The technical exhibits explain in detail the reasons why these labeling requirements do not translate into safe work practices, and why the same non-implementation of the safe work recommendations on product labels would be expected with the present project approval. Moreover, the only study of actual CPVC installation practices in the record of this proceeding demonstrates that project approval will result in worker overexposures despite the precautions listed on the CPVC primer and cement labels.

The Draft EIR does not deny that workers will experience exposures under real world conditions, nor does it argue that the product use recommendations are more likely to be implemented today than at the time of the Bellows study. It simply declares that HCD will not consider impacts resulting from work practices that are inconsistent with product label recommendations. This approach is contrary to express CEQA requirements.

An EIR must focus on potentially significant effects in accordance with "their severity *and probability of occurrence*." (14 C.C.R. § 15143, emphasis added.) The Lead Agency must investigate the likelihood of future environmental consequences of the project approval, and must address all "anticipated" environmental effects. (*Laurel Heights I, supra,* 47 Cal.3d at pp. 398-399.) The Lead Agency may avoid addressing a potential impact only if that impact "is clearly insignificant *and unlikely to occur*." (*Ibid.*; emphasis added.) The Draft EIR may terminate consideration of an impact if it finds, "after a thorough investigation," that the impact "is too speculative

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[24] The author of the Draft EIR should also be aware of the questionable effectiveness of the product safe use instructions. Mr. Reynolds was presented with a demonstration of the failure of supposedly impermeable gloves within twenty minutes of contact with CPVC cements and primers. The fact that this information is not referenced at all in the Draft EIR is another example of the lack of balance and selective presentation of information regarding the potential impacts of the project. A videotape of the glove demonstration and a second videotape of a recent CPVC installation in Livermore under AB151 authority are submitted in a separately bound appendix and show the lack of effectiveness of product labels in ensuring a safe work environment.

for evaluation." (14 C.C.R. § 14145.) The Lead Agency "must use its best efforts to find out and disclose all that it reasonably can." (C.C.R. § 15144.)

There are sound policy reasons for CEQA's requirement that the Lead Agency consider all reasonably anticipated effects of the project. In this case, for example, the Draft EIR's approach leaves the anticipated worker chemical overexposures unaddressed, even though the Draft EIR itself suggests that effective mitigation measures may be available to protect workers. If the Draft EIR believes that effective application of the product label recommendations would avoid worker overexposures, it should identify the specific measures that are necessary to avoid excessive exposures, and analyze why those measures are not being effectively implemented.

For example, are the recommendations too general? Are they impractical under actual work conditions? Would additional worker education and training help? Are contractors aware of their responsibilities to provide a safe workplace? Is there a lack of enforcement of these requirements? Does Cal/OSHA have adequate resources to enforce safe work practices at residential constructions sites? Should local building officials be given enforcement responsibility?

On the basis of this analysis, the Lead Agency could then develop appropriate mitigation measures to ensure effective implementation of the work practices and conditions that the Draft EIR itself indicates are necessary to protect workers. This is essentially what was intended by the mitigation measures that were under consideration by HCD and DHS in the 1989/90 environmental proceeding . The current EIR's approach simply "sweeps the problem under the rug," and ignores impacts that the record demonstrates will result from the project approval. CEQA does not permit the Lead Agency to disregard a reasonably anticipated impact of the proposed project.

The Draft EIR lists two other key factors leading to its conclusion of no worker impacts. The first is a claim that since the 1989 Bellows study, dyes have been added to CPVC primers and new instructions have been added to the primer and cement labels. (Draft EIR, p. 46.) No citation to material labels, reports, studies, or support of any kind is offered for these assertions. As discussed in detail in attached technical comments, neither claim is true. An examination of primer composition at the time of the Bellows study and currently shows no changes regarding the use of dyes. (*See* ex. C .) In addition, an actual comparison of the material labels in use at the time of the

Bellows study and current labels demonstrates that no substantive changes have been made to the contents of material labels. (*Ibid.*) The two leading CPVC primer and cement manufacturers confirmed that no substantive changes had been made to labeling during this time period. (Appen. 36.)

The second factor relied on by the Draft EIR is the introduction of low-VOC primers and cements, which the Lead Agency proposes to mandate as a part of the project approval. (Draft EIR, p. 48.)[25] The Draft EIR finds the development of low-VOC products particularly significant, claiming that their use "will greatly reduce the potential for worker exposure to solvents, compared to the situations which were previous studied by the Department of Health Services." (Draft EIR, p. 48.) No analysis, factual explanation, study, report or other source of information is cited for this key conclusion of the Draft EIR.

As explained in detail in the attached technical comments, the Draft EIR's assumption that low-VOC primer and cement products will reduce worker exposures is incorrect. The conclusion appears to be based on nothing more than a simplistic assumption that if VOCs are reduced, worker exposures must be reduced. The Lead Agency, however, misunderstands both CPVC primer and cement formulation and the exposure modeling of the 1989 Bellows study.

An actual review of primer and cement formulations demonstrates that the total amount of solvent chemicals has not changed.[26] The manufacturers have merely recombined the quantities of the constituent solvents. In fact, the manufacturers have been unsuccessful in reformulating the products to substantially reduce VOCs, and the South Coast Air Quality Management District has had to increase its VOC limit and extend its time period for compliance in order to match current product performance

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[25] As discussed, however, the Draft EIR never discloses the specific cement requirement it indicates will be imposed as a part of the project approval.

[26] It is clear that the Lead Agency did not have any actual information regarding the formulation or solvent content of the low-VOC primers and cements it concludes will reduce worker chemical exposures. We specifically requested all information in the possession of the Lead Agency to support its claim that "the percentage content of solvents in the formulations have decreased" and "that the solvent primers were no longer generally in use." (Draft EIR Appendix, p. 80; and appen. 23.) HCD responded that it had no information on record. (Appen. 23.)

parameters. The technical issues associated with CPVC solvent cement and primer formulations are discussed in detail in exhibit A.

Thus, rather than the dramatic advances in solvent technology in response to regulatory standards as suggested by the Draft EIR, regulatory standards have been lowered to meet technological limitations. The small reductions in VOCs have been achieved largely by marginal increases in the amount of acetone in the formulation, which is not a regulated VOC. As discussed under air quality, *infra*, however, the VOC emissions from CPVC cementing remain substantial.

Perhaps because of the lack of industrial hygiene expertise in the preparation of the Draft EIR, HCD did not realize that it could have tested empirically its theory that chemical exposures would be reduced by the use of low-VOC cements. As explained in exhibit C:

> "The 1989 DHS (Bellows) study was specifically designed to help policy makers evaluate exposure scenarios other than those actually monitored. The study report presents data and an exposure model ideally suited to estimating the exposures that can be expected under modified conditions, *such as with alternative primers and cements.*" (ex. C, p. 18; emphasis added.)

The technical analysis in exhibit C presents the detailed calculations applying the exposure model utilized in the 1989 DHS study, but substituting the low-VOC primer and cement formulations cited by the Draft EIR. Those calculations show that the reformulated primers and cements relied upon by the Draft EIR would result in *higher* combined exposures than were observed in the 1989 DHS study. These results are a function primarily of the substantial increase in MEK in the low-VOC formulations. Thus, the use of low-VOC cements would *increase* the combined exposures that would be expected from the project.

The detailed analysis presented in the attached technical comments demonstrates that worker chemical exposures will regularly exceed established workplace standards: 1) based on the CPVC installation practices that can be reasonably anticipated to occur as a result of the project approval; 2) assuming use of the same CPVC low-VOC primers and cements considered by the Draft EIR; and 3) documented by application of the exposure model applied in the 1989 DHS study relied on by the Draft EIR. This is a significant impact of the project under the Draft EIR' s own

significance threshold,[27] and under well-established CEQA standards. (14 C.C.R. § 15065(d) and Guidelines Appendix G(v).)[28]

2. Drinking Water Contamination

The Draft EIR concludes that no significant impact on drinking water quality will occur as a result of the proposed project. Like the conclusions with respect to all other potential impacts, the Draft EIR reached this conclusion by listing a set of factors considered, but with no actual analysis of the issues. The Draft EIR's conclusion is based on three factors: 1) NSF testing and certification; 2) use of low-VOC cements and primers; and 3) requirements for flushing. (Draft EIR, pp. 38-39.)

As discussed elsewhere in this letter and in the attached technical comments, these factors listed by the Draft EIR do not support a conclusion that no significant impacts on drinking water will occur. As demonstrated in the technical comments, NSF standards, testing and certification will not ensure an absence of significant impacts. A number of the NSF standards are too high to adequately protect health, and the deficiencies, limitations and discretion involved in the NSF testing and certification process prevent that process from guaranteeing that unacceptable leaching will not occur.

Moreover, even assuming that a contrary view of the adequacy of NSF standards, testing and certification could be supported, the Draft EIR has not presented any contrary evidence or analysis. Indeed, the record demonstrates that HCD does not even have in its possession the facts necessary to reach a different conclusion. HCD acknowledged never receiving the toxicological data and studies supporting the NSF standards, any NSF CPVC leaching test reports, data or other information regarding compliance with health-protective standards, or any NSF reports or data regarding its "normalization" calculations for CPVC leachate. In the absence of this data,

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[27] When corrected to include consideration of reasonably anticipated impacts as required by CEQA.

[28] The declaration submitted by B.F.Goodrich in the Lake in the Hills litigation and relied upon by the Draft EIR is not inconsistent with this conclusion. First, the Goodrich witness acknowledged that adverse health effects were possible where safe use recommendations were not followed. (*See* ex. C, p. 38.) As discussed, the Lead Agency analyzing impacts under CEQA cannot disregard impacts where it is reasonably anticipated that such impacts will occur. Second, the Goodrich consultant also acknowledged that "serious health effects" are associated at levels of exposure that the record in this case indicates will occur. (*Ibid.*)

it is impossible for HCD to exercise its independent judgment regarding the adequacy of NSF standards, testing and certification in protecting against potential adverse effects on drinking water from the proposed project.

The Draft EIR also asserts that low-VOC cements and primers "will result in . . . less leaching." (Draft EIR, p. 38.) No data, test results, formulation information or other source or support of any kind is offered for this key assumption in the Draft EIR's finding regarding the absence of leaching impacts. As already discussed, HCD acknowledged having no actual chemical formulation data on the low-VOC cements. (Appen. 23.) Any conclusions regarding changes in leaching characteristics obviously would be impossible with such information. Furthermore, as discussed above and in the technical comments, the low-VOC cements and primers have not reduced the total chemical content of the previous cement and primer formulations; the manufacturers have merely shifted the balance of the individual solvent chemicals. Since total chemical solvent content has not changed, *no reduction* in total solvent leaching would be expected.

The third factor relied upon by the Draft EIR is a new flushing requirement that would be required as a part of the project approval. The Draft EIR indicates that drinking water contamination "can be greatly reduced" by flushing, and that flushing "will mitigate the minimal impacts from leaching." (Draft EIR, p. 42.) The Draft EIR presents no studies, data or analysis to support these claims. The Draft EIR never identifies the levels of leaching before flushing or after flushing," or does it indicate how the flushing requirement would address the leaching that has been identified after the initial installation. The absence of any information in the Draft EIR regarding the *actual levels* of leaching expected from project approval is a major defect in the discussion of the project and violates the fundamental public information and disclosure objectives of CEQA.

More important, the Draft EIR never even sets forth the actual flushing protocol that would be required as a part of the project approval or describes in any manner the flushing requirement that is being proposed. This failure to describe the flushing requirements cited by the Draft EIR as a basis for its conclusion precludes meaningful comment on the environmental analysis. It also precludes reliance on the flushing requirement as a basis for finding no significant impact on drinking water.[29]

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[29] The only "flushing" provision described in the Draft EIR is the UPC § 609.9 disinfection requirement, which the EIR indicates is *not* sufficient. (Draft EIR Appendix, p. 38.) The

The 1989 Draft EIR also required a flushing protocol for CPVC potable water systems that was described in detail in that document. The 1989 flushing protocol required that the system flushed according to specified procedures a minimum of one day following the completion of the system, one week following the initial flushing and again before the premises are occupied. (1989 Plastic Pipe Draft EIR, p. 75.) Is the flushing protocol now being required the same or similar to the flushing protocol required by HCD in 1989? If so, then the Draft EIR must respond to the comments that addressed the proposed flushing protocol in the 1989 Draft EIR.

The comments on the 1989 Draft EIR identified a number of problems with the flushing protocol that must be evaluated in the present project. These problems included the questions about the feasibility and enforceability of the flushing requirement given that plumbing contractors leave the site after completion of the system and plumbing inspectors also do not return to the site after final certification of system installation in accordance with code requirements. Local building departments also do not have the staff or funding to assume new enforcement responsibilities.

The limited CPVC installations allowed by AB 151 proved that the concerns raised in the 1989 comments regarding the enforceability of the flushing requirement were valid.[30] AB 151 included a system flushing requirement that was identical to the flushing protocol required by HCD in the 1989 Draft EIR. (*See* Health & Saf. Code § 17921.9.) A survey conducted of building officials in jurisdictions that had approved CPVC pursuant to AB 151 found that only 2 of the 37 building officials surveyed had enforced the AB 151 flushing requirement. (Appen. 37.)

If HCD is now requiring some different flushing protocol, it must explain why it has decided to depart from the flushing requirement it

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National Plumbing Code flushing requirement that the Draft EIR indicates it *is* requiring is never described.

[30] In our scoping comments, we suggested that HCD take advantage of actual, real-world installations of CPVC occurring under the temporary AB 151 authority in order to evaluate workplace conditions, worker exposures, mitigation opportunities and the like. HCD failed to do so and the Draft EIR does not discuss these issues. As demonstrated by the report presented in appendix 37, the information is extremely relevant to the issues under consideration in the EIR.

previously had found necessary. It must also present the full details of the proposed flushing protocol in order to allow the public an opportunity to comment on the details of the flushing requirement as was done in 1989, and in order to provide adequate information for an assessment of the project approval by the decision-maker.

3. Air Quality

The Draft EIR completely fails to analyze the impact of the project on air quality. As a result, the Draft EIR does not recognize that the project will have a significant impact on air quality. As discussed in the comments of Dr. Phyllis Fox attached as exhibit D, the proposed approval of CPVC pipe will increase emissions of reactive organic gases, which are precursors to ozone. These reactive organic gases are emitted from the solvent cements that are used to join pieces of CPVC pipe.[31]

The increased emissions of reactive organic gases exceed significance standards in many air quality management districts in California, including the South Coast Air Quality Management District, which has the worst ozone pollution in the United States. (SCAQMD *CEQA Air Quality Handbook*, (1993), p. 3-1.) This is a significant impact that must be analyzed and mitigated if feasible.

a) Information required in the draft EIR

The Draft EIR must assess the impacts of the increase in ROG emissions from the solvent cements used to join CPVC pipe as a result of the proposed project. Such information includes estimates of the ROG emissions from plumbing a single dwelling with CPVC pipe and estimates of the number of dwellings that will be plumbed with CPVC pipe in each air basin. The Draft EIR has not provided any of this information. Therefore, the attached letter from Dr. Phyllis Fox sets forth such information, together with analysis.

Regulation of air quality is a complex matter, involving federal, state and local regulatory agencies. There are numerous regulatory programs with

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[31] As noted in the letter from Dr. Fox, various regulatory agencies use terms such as reactive organic gases (ROG), reactive organic contaminants (ROC), precursor organic contaminants (POC) and volatile organic compounds (VOC). Dr. Fox's letter explains the relationship between these terms. This letter generally uses "ROG."

different goals and purposes. There is a well-established legal framework for analyzing a project that is located at a single site.

However, this proposed project will impact every county and every air basin in California. These air basins have different standards of "significance" and have different levels of air quality.[32] The impacts in each basin could therefore be different. An air basin with few housing starts and good air quality may not suffer the same impacts as an air basin with thousands of housing starts and poor air quality. Therefore, the Draft EIR must analyze the impacts of the project in each air basin.

(1) Exceedance of significance standards

Regulation of air quality is so complex that many air quality management districts in California have adopted handbooks or guidance material for the use of other agencies that must analyze the impact of a project on air quality. This material often sets forth a standard by which the impact of a project may be measured to determine whether the impact is significant. These standards take into account the size of the project and the quality of the air in the basin.

For example, the South Coast Air Quality Management District has adopted a *CEQA Air Quality Handbook*. That *Handbook* establishes a significance threshold for reactive organic contaminants of 55 pounds per day. (South Coast Air Quality Management District, *CEQA Air Quality Handbook* (1993), p. 6-2.) The estimates by Dr. Fox of increased ROG emissions from approval of CPVC pipe in the South Coast Air Basin are that, even if only 25% of new homes are plumbed with CPVC pipe, such emissions will increase by an average of 420 pounds per day in the year 2010. This far exceeds the SCAQMD's significance standard of 55 pounds per day.

Similarly, the Bay Area Air Quality Management District has adopted a handbook called *BAAQMD CEQA Guidelines* (1996). That handbook establishes a threshold of significance for ROG of 80 pounds per day. Dr. Fox estimates that even if only 25% of homes are plumbed with CPVC pipe, the increase in ROG emissions in the Bay Area Air Quality Management District

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[32] The Draft EIR's discussion of Environmental Setting fails to mention at all air quality factors relevant to its examination of air quality impacts; e.g., existing attainment, non-attainment, etc.

will be an average of 158 pounds per day in the year 2010. Again, this far exceeds the level of significance.

Dr. Fox sets forth information showing that whether CPVC is used in 25% or 100% of new homes, the ROG emissions from the solvent cements will exceed the significance thresholds set forth by the SCAQMD, the BAAQMD, the Antelope Valley APCD, the El Dorado County APCD, the Mojave Desert AQMD, the Placer County APCD, the San Diego County APCD, the San Joaquin Valley Unified AQMD, and the San Luis Obispo County AQMD. Depending on the percentage of homes plumbed with CPVC pipe, and depending on the maximum or average number of homes plumbed, significance standards will also be exceeded in the Sacramento Metropolitan AQMD, the Santa Barbara County APCD, the Ventura County APCD, the Butte County APCD, the Kern County APCD, the Monterey Bay Unified APCD, the Northern Sierra AQMD and the Yolo-Solano AQMD.

These are significant impacts that were not discussed or identified in the Draft EIR. None of this information was provided in the Draft EIR. The information is important to the air quality management districts, to the public, and to the decision-makers at HCD. Without this information the Draft EIR is legally inadequate.

(2) Inconsistency with regional plans

In addition, the Draft EIR has failed to discuss whether the proposed project is consistent with regional air quality management plans. CEQA requires that an EIR "shall" discuss "any inconsistencies" between the proposed project and "regional plans. (Such regional plans include, but are not limited to, the applicable Air Quality Management Plan (or State Implementation Plan once adopted) . . . ." (14 C.C.R. § 15125(b).)

Each air quality management district is required by the California Clean Air Act to adopt a plan to attain air quality standards. The plans must contain measures by which each district will achieve and maintain state ambient air quality standards for ozone, and other air pollutants. (Health & Safety Code § 40910.) Each plan must be designed to achieve a reduction in districtwide emissions of 5 percent or more per year for each "non-attainment" pollutant or its precursors.

Most air districts in California fail to meet the state ambient air quality standards for ozone and its precursors, and are "nonattainment" for

these pollutants. (17 C.C.R. § 60201.)[33] Therefore, they are required to have air quality attainment plans, pursuant to Health & Safety Code section 40910.

As discussed in the letter from Dr. Phyllis Fox, the air quality attainment plans often include an inventory of existing and projected sources of emissions. (Health & Safety Code § 40913(a)(1) references such inventories.) That inventory is used to develop measures for achieving the state ambient air quality standards. As Dr. Fox discusses, most air districts have not included ROG emissions from CPVC pipe solvent cements in their inventories. This is proper because use of CPVC pipe as proposed by HCD has not previously been authorized for use in residential occupancies, except under very limited circumstances.

However, this leads to the conclusion that approval of CPVC pipe will cause air districts to have greater difficulty achieving and maintaining the state ambient air quality standards. Thirteen California air basins, including the San Francisco Bay Area Air Basin, the South Coast Air Basin, the San Diego Air Basin, the South Central Coast Air Basin, the Sacramento Valley Air Basin, and the San Joaquin Valley Air Basin do not achieve the state ambient air quality standards for ozone. (17 C.C.R. § 600201.) These air basins include most of the population of California.

The Draft EIR must discuss the project's inconsistency with the air quality attainment plans of the air basins that fail to meet the state ambient air quality standards for ozone. It must discuss whether the project will cause a delay in the ability of those districts to meet ambient air quality requirements.

Further, the Draft EIR must consider whether the project will affect air basins that are now meeting the state ambient air quality standard for ozone. If the project will significantly reduce air quality in those air basins, then that is a significant impact that must be identified, discussed and mitigated, if feasible.

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[33] Only the North Coast Air Basin, the Northeast Plateau Air Basin, the Lake County Air Basin and the Lake Tahoe Air Basin are in attainment for ozone. (17 C.C.R. § 60201.)

(3) Inconsistency with state plan

Further, the Draft EIR must consider whether the project is consistent with the California State Implementation Plan. (14 C.C.R. § 15125(b).) The State Implementation Plan ("SIP") is required by the federal Clean Air Act. Like the local air quality attainment plans, the SIP is required to contain measures that will bring each air district in California into compliance with the federal air quality standards. The SIP addresses both maintaining air quality, where standards have already been met ("attainment" areas), and achieving air quality, where the standards have not been met ("non-attainment" areas). (42 U.S.C. § 7410.)

Only parts of the California SIP have been approved. (40 C.F.R. § 52.223, *et seq.* and § 52.270, *et seq.*) Large portions of California are "nonattainment" for the federal ozone standard. (40 C.F.R. § 81.305.) This means that approval of CPVC pipe will make it more difficult for the California SIP to be approved for ozone and will make it more difficult for air basins to comply with the portions of the SIP that have been approved. The Draft EIR must provide information about the SIP and analyze the consistency of the project and the SIP, as required by the CEQA Guidelines.

The Draft EIR should use the information about emissions that is provided in the letter from Dr. Fox to determine whether approval of the project would cause or contribute to a violation of the ambient air quality standards that have been established by CARB. It may be necessary to perform modeling to make that determination. Modeling protocol have been established by air districts and by the California Air Pollution Control Officers Association. The Draft EIR should use the appropriate modeling protocol. If approval of the project would cause or contribute to a violation of ambient air quality standards, then that would be a significant impact that must be mitigated, if feasible.

b) Inappropriate reliance on CARB draft proposal

Instead of obtaining and analyzing information regarding the potential impacts of ROG emissions from solvent cements on air quality, the Draft EIR simply assumes the impacts are not significant.

The Draft EIR relies on a California Air Resources Board draft proposal to determine the reasonable available control technology (RACT) and best available retrofit control technology (BARCT) for controlling emissions of volatile organic compounds from the commercial and industrial application of solvent-based adhesives and sealants. As the CARB proposal notes, the RACT/BARCT determination would apply only to existing sources of VOC emissions. (Draft Proposal, April 30, 1998, p. 1.) The draft proposal would prohibit the sale or application of adhesives and sealants that do not meet the requirements of the proposal. The Draft EIR further states that the "impacts of solvent cements on air quality have been addressed at the statewide programmatic level by the CARB . . . ." (DEIR, p. 49.)

The Draft EIR states, without providing any basis for the statement, that the proposed rule is likely to be adopted prior to HCD's certifying the final EIR. (DEIR, p. 49.) The Draft EIR states that HCD will require compliance with the final CARB decision on a statewide basis. The Draft EIR then concludes that HCD considers that application of the CARB proposal ("when finished") to CPVC joining materials will assure that approving the use of CPVC pipe will not significantly contribute to photochemical smog, eliminating the need for extensive analysis.

The Draft EIR cites the sentence in CEQA Guidelines section 15064(i) that provides: "If an air emission meets the existing standard for a particular pollutant, the Lead Agency may presume that the emission of the pollutant will not be a significant effect on the environment." (DEIR, p. 101.) Relying on the CARB proposal and this sentence in the Guidelines, the Draft EIR concludes that the project will not have a significant impact on air quality.

The conclusions in the Draft EIR are not supported by substantial evidence in the record, and the legal analysis is incomplete, leading to an unsupported conclusion that the impacts of the project are not significant.

First, using solvent cements that comply with the CARB proposal still causes a significant impact on air quality. The analysis by Dr. Fox assumes such compliance. As demonstrated above, there is no basis for concluding that compliance with the proposal will reduce the project impacts to a non-significant level.

Second, the CARB proposal is a draft proposal. There is no information as to the schedule for adopting a final determination. There is no provision in CEQA or in the Guidelines that would permit a lead agency to

rely on a draft proposal to determine that an impact is not significant. The CEQA Guideline cited in the Draft EIR applies only to an "existing standard," not to a draft proposal.

Third, there is no evidence that the CARB proposal considered the impact of the project that is proposed by HCD to greatly expand the use of CPVC pipe. Although the Draft EIR claims that the "impacts of solvent cements on air quality have been addressed at the statewide programmatic level by the CARB . . . . ," there is no support for this statement in the Draft EIR. Because the proposed use of CPVC pipe is not authorized, it is likely that CARB did not consider its impacts on air quality at all. The CARB proposal applies to a broad array of adhesives and sealants. There is no evidence that CARB focused on a proposed future use of CPVC cements.

Fourth, there is no evidence that a RACT/BARCT determination is a "standard" for an air pollutant, within the meaning of CEQA Guideline section 15064(i). The California Air Resources Board adopts ambient air quality standards for criteria air pollutants. These standards are published in a "Table of Standards" (17 C.C.R. § 70200.) For example, the standard for ozone is that the ozone concentration in the ambient air must not exceed 0.09 ppm over a one-hour period. (*Id.*) These are likely to be the air pollution standards that are referenced in the CEQA Guidelines.

Fifth, the BACT/BARCT determination would apply only to existing sources of air pollutants. The approval of CPVC pipe will apply to new sources.

Sixth, the CEQA Guideline was not fully quoted in the Draft EIR. The remainder of that section states: "If other information is presented suggesting that the emission or discharge may cause a significant effect, the Lead Agency shall evaluate the effect and decide whether it may be significant." Here, there is a wealth of other information, as set forth in the letter from Dr. Fox, showing that emissions caused by the project will have a significant impact on air quality. Simply complying with a RACT/BARCT determination is not enough to eliminate a significant air quality impact.

There is simply no excuse for the failure of the Draft EIR to gather and present information regarding the impact of the project on air quality. As the information presented by Dr. Fox amply demonstrates, the project will have a significant impact. This impact must be discussed, analyzed and mitigated, if feasible.

4. Proposition 65 Impacts

Proposition 65, also known as the Safe Drinking Water and Toxic Enforcement Act of 1986 (Health & Saf. Code § 25249.5 *et seq.*) prohibits any "person in the course of doing business" from knowingly discharging or releasing a chemical known to the state to cause cancer or reproductive toxicity into a source of drinking water. (Health & Saf. Code § 25249.5.) The California Supreme Court has determined that water coming out of the tap from plumbing fixtures is a "source of drinking water" for purposes of Proposition 65. (*People* ex rel. *Lungren v. Superior Court* (1996) 14 Cal.4th 294, 298, fn. 2 [58 Cal.Rptr.2d 855].) Chloroform, a chemical found by the Draft EIR to leach into drinking water from CPVC, is a chemical known to the state to cause cancer. (22 C.C.R. § 12000, subds. (b) and (c).) Chloroform was placed on the list of carcinogenic chemicals on October 1, 1987, more than eleven years ago.

As explained elsewhere in these comments, chloroform leaches from CPVC directly and indirectly. As the result of manufacturing processes, it may be present in the pipe itself and dissolve directly into the water. In addition, it is created from the interaction of MEK from pipe solvents with residual chlorine already in the water for disinfection. Either of these sources would constitute a "discharge or release into water" because it is a "direct or indirect transfer" of chloroform to consumers by a manufacturer or installer. (22 C.C.R. § 12202, subd. (e)(4); Health & Saf. Code § 15149.11, subd. (a).) Since the chloroform leaches into potable water systems, it is contaminating drinking water. (Health & Saf. Code § 25249.5.)

Chloroform leaches from plastic pipe during the first two days after installation at the level of 27 ppb, which is equivalent to 27 micrograms per liter of water. (Butter, 1986, part IV, table 2, pp. IV-13, 14.) Assuming, as do the Draft EIR and the Proposition 65 regulations, that an average person ingests 2 liters of water per day, the exposure would be 54 micrograms per day. This exceeds by six times the exposure limit of 9 micrograms per day established by Proposition 65 and attendant regulations. (Health & Saf. Code § 25249.10, subd. (c), 22 C.C.R. § 12711, subd. (a)(2).) It exceeds by more than four times the exposure level established by the state for drinking water of 6 ppb. (22 C.C.R. § 12711, subd. (a)(3).)

The Draft EIR completely ignores Proposition 65 and the affect of its provisions on the proposed approval of CPVC. This omission is important

because Proposition 65 could make many of the expanded uses illegal due to leaching of chloroform and other chemicals in excess of established limits.

5. Manufacturing Sector Impacts

The Draft EIR fails to address at all the environmental and worker health impacts associated with the increased manufacturing of CPVC resins, CPVC pipe and fittings, and CPVC solvent cements and primers. The Draft EIR indicates that these impacts are not considered because CPVC is not manufactured in California and the impacts occur out-of-state. (Draft EIR, pp. 50-51.) No documentation or source is cited for the claim that CPVC is not manufactured in California.

There are at least three problems with the Draft EIR's rationale for excluding consideration of manufacturing sector impacts. First, a quick review of NSF-listed manufacturers reveals several California-based manufacturers of CPVC fittings and other CPVC system components and CPVC cements and CPVC primers. (NSF Listings, Plastics and Plumbing System Components, February 19, 1997.)

Second, the exclusion is inconsistent with the Lead Agency's previous determination regarding the required scope of the environmental review of plastic plumbing systems in preparing the 1989 Draft EIR, which did consider potential impacts from changes in the manufacturing sector. (1989 Plastic Pipe Draft EIR, pp. 95-96.) At a minimum, HCD should explain the basis for changing its determination of the scope of the project.

Third, the Draft EIR fails to cite any authority for its claim that out-of-state impacts need not be considered in a Draft EIR. We know of no support in the statute or case law that suggests that out-of-state impacts resulting from an in-state project need not be addressed. HCD has acknowledged its authority to adopt mitigation measures that assuming the Draft EIR's assumption of lower chemical content were true, could reduce the severity of manufacturing sector impacts, such as requiring use of products based on type of formulation (e.g., low-VOC cements). The Draft EIR's position is contrary to the fundamental requirement that CEQA be interpreted so "as to afford the fullest possible protection of the environment." (*Friends of Mammoth v. Board of Supervisors* (1972) 8 Cal.3d 247, 259 [104 Cal.Rptr. 761].)

As demonstrated in the attached technical comments, CPVC manufacturing may cause significant environmental effects, including the release of dioxins into the air and water. CPVC manufacture can also result in significant worker exposures to toxic and carcinogenic chemicals. The Vinyl Chloride industry in particular has a very disturbing record of manufacturers knowingly exposing workers to serious and life-threatening workplace conditions. (Appen. 38.)

The Draft EIR's complete failure to address the impacts of increased CPVC and related product manufacturing in response to the project approval is contrary to CEQA requirements.

6. Mechanical Failure, Fire Safety, Permeation, and Other Impacts

The technical comments attached in exhibit A, discuss in detail the Draft EIR's failure to adequately address project impacts on mechanical failure, fire safety, permeation and in other areas. Those comments demonstrate that the Draft EIR's deficiencies in addressing these issues result in a document that fails to meet CEQA standards. These deficiencies in HCD's consideration of the project must be corrected in order to support any findings of no significant effect.

VIII. INADEQUATE ASSESSMENT OF CUMULATIVE IMPACTS

A. Legal Standards

"Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time." (14 CCR § 15355(b).) Because of this potential additive effect, "'[t]he full environmental impact of a proposed . . . action cannot be gauged in a vacuum.'" (*Whitman v. Board of Supervisors of Ventura County* (1979) 88 Cal.App.3d 397, 408 [151 Cal.Rptr. 866] (quoting *Akers v. Resor* (W.D. Tenn. 1978) 443 F.Supp. 1355, 1360).) For these reasons, CEQA requires that an EIR discuss a project's potential cumulative impacts when combined with past, present, and reasonably anticipated future projects. (Pub. Resources Code § 21083(b), 14 C.C.R. §§ 15130(b), 15355(b).)

A cumulative impact analysis must contain the following elements:

1) Either:

   a) A list of past, present, and reasonably anticipated future projects producing related or cumulative impacts, including those projects outside the control of the agency, or

   b) A summary of projections contained in an adopted general plan or related planning document which is designed to evaluate regional or areawide conditions. . . ;

2) A summary of the expected environmental effects to be produced by those projects with specific reference to additional information stating where that information is available; and

3) A reasonable analysis of the cumulative impacts of the relevant projects. An EIR shall examine reasonable options for mitigating or avoiding any significant cumulative effects of a proposed project. (14 C.C.R. § 15130(b).)

CEQA's cumulative impact analysis requirement must be interpreted to afford the fullest possible protection to the environment. (*Citizens to Preserve the Ojai v. Board of Supervisors* (1985) 176 Cal.App.3d 421, 431-32, [222 Cal.Rptr. 247]; *Kings County Farm Bureau v. City of Hanford, supra,* 221 Cal.App.3d at p. 720.) Accordingly, the courts have vigorously enforced the obligation to consider cumulative impacts. As the court stated in *Citizens to Preserve the Ojai v. County of Ventura, supra,* 176 Cal.App.3d at p. 431, quoting *San Franciscans for Reasonable Growth v. City and County of San Francisco* (1984) 151 Cal.App.3d 61, 79 [198 Cal.Rptr. 634]:

> "[I]t is vitally important that an EIR avoid minimizing the cumulative impacts. Rather, it must reflect a conscientious effort to provide public agencies and the general public with adequate and relevant detailed information about them.' [Citation.] A cumulative impact analysis which understates information concerning the severity and significance of cumulative impacts impedes meaningful public discussion and skews the decisionmaker's perspective concerning the environmental consequences of a project, the necessity for mitigation measures, and the appropriateness of project approval. [Citation.] An inadequate cumulative impact analysis does not demonstrate to an apprehensive citizenry that the

governmental decisionmaker has in fact fully analyzed and considered the environmental consequences of its action."

A lead agency must find that a project will have a significant effect on the environment if "[t]he possible effects of a project are individually limited but cumulatively considerable." (Pub. Res. Code § 21083(b); *see also* 14 C.C.R. § 15065(c).) The fact that a particular project's incremental impact is not significant, or is relatively small when compared to the greater overall problem, does not mean the project does not have significant cumulative impacts. This theory was rejected in *Kings County* because it would "allow[] the approval of projects which, when taken in isolation, appear insignificant, but when viewed together, appear startling." (*Kings County Farm Bureau v. City of Hanford, supra,* 221 Cal.App.3d at p. 720-21.) The proper standard for a cumulative impacts analysis is whether the impacts are "collectively significant." (*Id.* at p. 721, citing 14 C.C.R. § 15355.)

Nor does uncertainly about a project's potential cumulative impacts excuse the lead agency from analyzing those impacts. (*Terminal Plaza Corp. v. City and County of San Francisco* (1986) 177 Cal.App.3d 892, 904-905 [223 Cal.Rptr. 379].) As previously discussed, an agency must use its best efforts to discover and disclose all information reasonably possible. (14 CCR § 15144.) Even if the lead agency finds that there are no significant cumulative impacts, the EIR must explain the basis for that conclusion. (*Terminal Plaza, supra,* 177 Cal.App.3d at pp. 904-905.)

B. Application of Legal Standards to Draft EIR

The Draft EIR's brief chapter on cumulative impacts falls far short of the CEQA standards discussed above. It presents no quantification, analysis or factual explanation of any kind to support its conclusions with regard to the two cumulative effects considered: drinking water leaching and air contaminant emissions. Moreover, it does not even identify cumulative impacts on worker health as an issue, and does not discuss potential worker safety cumulative effects *at all.*

1. Failure to Consider Cumulative Impacts on Worker Safety

The Draft EIR's failure to consider cumulative impacts on workers is a major oversight of the document and is clearly contrary to CEQA requirements. The Lead Agency has identified worker chemical exposure as

one of the key areas of potential project impact for consideration in the environmental review. The Draft EIR itself acknowledges that workers will experience chemical exposure above workplace standards *from the project alone.* As discussed above, when properly analyzed, these exposures are a significant impact of the project that is currently unmitigated by the project proposal. Under these circumstances, the Draft EIR's failure to consider cumulative effects is particularly serious since such consideration may have resulted in a different estimate of the total impact on workers.

Furthermore, an analysis of the total potential for worker chemical exposures indicates that such exposures would be cumulatively significant. As demonstrated in the technical comments, cumulative worker exposure is significant when exposures during concurrent system installation, non-residential installation and long-term cumulative exposures are considered along with exposures from the project. The failure to consider this issue is a critical defect in HCD's evaluation and undermines the integrity of its conclusions regarding worker safety.

2. Inadequate Consideration of Cumulative Impacts on Drinking Water Contamination

The Draft EIR dismisses any potential for cumulative effects on drinking water contamination based entirely on its "assumption" that NSF standards will protect drinking water consumers. (Draft EIR, p. 100.) No facts or data regarding background contaminant concentrations, project contaminant concentrations, multiple pathway exposure potential, long-term exposure potential or expected total combined chemical exposure is provided. The Lead Agency's unsupported assumptions do not constitute substantial evidence.

As discussed elsewhere in these comments and in the attached technical comments, NSF standards neither provide adequate health protection, nor has HCD independently evaluated such standards to support its assumption that they are adequately health protective, and no such evaluation is presented in the Draft EIR. Moreover, as discussed in the attached technical comments, when background levels of contamination and long-term exposures are considered, the project presents a potential for significant cumulative effects on drinking water contamination.

The Draft EIR specifically finds no cumulative impact on drinking water quality from CPVC use in non-residential occupancies. The Lead Agency's entire "evaluation" of this issue is as follows:

> "Should other agencies with jurisdiction over other occupancies later determine to approve the use of CPVC for potable water piping, *it does not appear logical* that there will be any additional cumulatively significant impacts related to leachates in drinking water. It is the nature of the pipe and fittings in contact with the water, not the nature of the structure which houses the pipe, which is relevant. (Draft EIR, p. 101; emphasis added.)

A phrase like "it does not appear logical" is a textbook example of the kind of subjective, unsupported and conclusory statement that the courts have cited in overturning EIRs. Furthermore, the only factor referenced by the Draft EIR is misleading, inconsistent with other statements in the Draft EIR, and raises more questions than it answers. While "the structure" may not affect leaching characteristics, it would affect the nature of the piping system that is installed (e.g., size of pipe, number of fittings, in-soil distance from meter, etc.) and the use of that system (e.g., dwell times) that the Draft EIR acknowledges are relevant to leaching impacts. Indeed, many of these factors when considered with respect to non-residential installations would be expected to *increase* leaching.

As discussed elsewhere, the Draft EIR admits that expansion of the project to non-residential occupancies is "reasonably foreseeable." The potential cumulative effects of such expansion must be addressed in the EIR. (*Laurel Heights I, supra,* 47 Cal.3d at p. 433.)

3. Inadequate Consideration of Cumulative Impacts on Air Quality

As with the discussion of direct project impacts, the Draft EIR presents no analysis of cumulative air quality effects. Instead, the Draft EIR's four-sentence presentation concludes that no analysis of cumulative air quality impacts is required. It bases this conclusion on CEQA Guidelines section 15064(i), which states: "If an air emission meets the existing standard for a particular pollutant, the Lead Agency may presume that the emission of the pollutant will not be a significant effect on the environment." (Draft EIR, p. 101.)

The Draft EIR's assumption that it is not required to analyze cumulative air quality impacts is incorrect for two reasons. First, as explained above, a finding that direct project impacts are not significant does not excuse the Lead Agency from considering potential *cumulative* impacts. The very purpose of the cumulative impact requirement is to determine whether a project's impacts are "cumulatively considerable" even though they may be "individually limited." (Pub. Resources Code § 21083(b); *see also* 14 C.C.R. § 15065(c).)

Second, as discussed above and in Dr. Fox's comments, the VOC emissions from the proposed project approval will *exceed* significance thresholds that have been established by several Air Quality Management Districts for such emissions. Given the significance of the VOC emissions from the project alone, the cumulative impact analysis is even more critical in order to apprise the public and decision-maker of the full scope of the project's potential environmental effects. As demonstrated in Dr. Fox's comments, the potential cumulative air quality impacts of the proposed project are significant.

IX. INADEQUATE ASSESSMENT OF ALTERNATIVES

A. Legal Standards

"The core of an EIR is the mitigation and alternatives sections." (*Citizens of Goleta Valley v. Board of Supervisors* ("*Goleta II*") (1990) 52 Cal.3d 553, 564.) A major function of an EIR is to "ensure that *all reasonable alternatives* to proposed projects are thoroughly assessed." (*Id.* at p. 565-566, quoting *Wildlife Alive v. Chickering* (1976) 18 Cal.3d 190, 197 [132 Cal.Rptr. 377] (emphasis added by court); *accord Laurel Heights I,* 47 Cal.3d at p. 400.)

The burden of identifying and evaluating alternatives rests with the agency, not the public. (*Laurel Heights I, supra,* 47 Cal.3d at pp. 405-406; *Goleta II,* 52 Cal.3d 553, 568.) An EIR must discuss alternatives in sufficient detail to meet the EIR's information purposes. (*Laurel Heights I,* 47 Cal.3d 376, 406.) This is also governed by a rule of reason: "Absolute perfection is not required; what is required is the production of information sufficient to permit a reasonable choice of alternatives so far as environmental aspects are concerned. . . ." (*Id.* at p. 407, quoting *Residents Ad Hoc Stadium Committee v. Board of Trustees* (1979) 89 Cal.App.3d 274, 287-288 [253 Cal.Rptr. 426].)

B. Application of Legal Standards to Draft EIR

The Draft EIR's discussions of alternatives follows the pattern of the rest of the document; it is cursory, conclusory and completely lacking in any references to supporting facts or documentation. The consideration of alternatives fails to comply with the requirement that the discussion present sufficient detail to meet CEQA's informational objectives. (*Laurel Heights I, supra,* 47 Cal.3d at p. 406.)

The discussion of CPVC use in non-residential occupancies is indicative of the lack of analysis. The Draft EIR asserts that "[b]ased on the conclusion that there would be no significant impacts if CPVC is approved for residential occupancies, *it appears unlikely* that there would be significant impacts associated with CPVC use in other occupancies." (Draft EIR, p. 110; emphasis added.) The courts repeatedly have cited this sort of unsupported conclusory statement as a basis for invalidating EIRs.

As discussed in the technical comments attached, the use of CPVC in non-residential occupancies presents a potential for direct and cumulatively significant effects that are never addressed by the Draft EIR. As discussed elsewhere, non-residential CPVC use is a reasonably foreseeable consequence of the project approval that was acknowledged by the Draft EIR and must be addressed by the Lead Agency.

x. SOCIOECONOMICS

Despite the Draft EIR's claim that it is relying on the 1989 Plastic Pipe Draft EIR and associated documents, it reaches conclusions in its chapter on economic and social effects that are in direct conflict with the factual determinations of the earlier report. No explanation for the Lead Agency's contradictory findings is offered.

In 1989, HCD determined that a CPVC or other plastic potable water system would have a service life of 20 years. (1989 Plastic Pipe Draft EIR, p. 88.) In the current Draft EIR, HCD estimates a service life for a CPVC system of *75 years*. (Draft EIR. P. 105.) The Draft EIR should explain how the Lead Agency's new analysis supports a 55-year increase in service life over what it estimated in 1989. Has there been a substantial change in the CPVC formulation or manufacturing method that is not disclosed in the Draft EIR? Is B.F.Goodrich now offering a 75-year warranty on its CPVC Flow Guard Gold product?

In 1989, HCD determined that a substitution of CPVC for copper in a residential potable water system "would *increase* plumbing costs." (1989 Plastic Pipe Draft EIR, p. 87; emphasis added.) In the current Draft EIR, HCD concludes that a substitution of CPVC for copper would *decrease* plumbing costs by between $1,175 - $1,000 per residential installation. (Draft EIR, p. 105.) The Draft EIR should explain the factors that supported the 1989 estimate and how these factors have changed to produce the substantially different conclusion in the new Draft EIR.

As is the case throughout the Draft EIR, the document touches on an issue that generated significant comments in the 1989 EIR proceeding without addressing the issues raised in those comments *or even acknowledging that the issues were raised.* For example, extensive comments on the economic issues were submitted in the 1989 proceeding by Dr. William T. Dickens, Professor of Economics at the University of California, Berkeley. Dr. Dickens' comments demonstrated that the Draft EIR had failed to account for a number of additional costs associated with plastic plumbing systems in preparing its cost comparison of plastic and metal plumbing systems. No response to these comments was ever presented, and they are ignored by the Draft EIR. Dr. Dickens' comments are included as an attachment to the comments of Thomas Reid Associates and are offered as additional comment on the economic analysis presented in the Draft EIR.[34]

The Draft EIR also repeats an error that was addressed in Dr. Dickens' 1989 comments. The Draft EIR suggests that reduced costs of plumbing installations would reduce housing prices and further an objective of the project. (Draft EIR, pp. 106–107.) As Dr. Dickens indicated, under standard economic theory, any plumbing system cost savings would not be passed on to home buyers or renters. Since the supply of housing is limited, price is not determined by the cost of construction, but by the demand for housing. In other words, the price of a house depends on what people will pay for it and not on what it cost to build. (*See also* California Pipe Trades Council, Comments on 1989 Plastic Pipe Draft EIR, November 13, 1989.)

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[34] The cost estimates in the Dickens report are stated in 1989 dollars and are also based on the outdated 1983 Environmental Review Document's estimate of a typical plumbing system; however, the fundamental conceptual analysis regarding system component costs that have not been taken into account remains applicable to the current Draft EIR. Dr. Dickens' comments also addressed the plastic materials other than CPVC that were under review in the 1989 Draft EIR.

The socioeconomic issues are addressed further in the attached technical exhibits.

XI. A NEW DRAFT EIR MUST BE RECIRCULATED FOR PUBLIC REVIEW

A. Legal Standards

CEQA requires recirculation of an EIR whenever "significant new information" is added to a report or where there are "substantial changes" to the initial draft. (Pub. Resources Code § 21092.1.) In this case, the revisions to the EIR that are necessary to comply with CEQA will require that "significant new information" be added to the EIR. We believe a new EIR must be recirculated for public comment.

The Supreme Court has recently clarified the standards for determining when the information added to an EIR is "significant." The Court held that recirculation is required when the information added to an EIR discloses:

> (1) a new substantial environmental impact resulting from the project or from a new mitigation measure proposed to be implemented [citations omitted]; (2) a substantial increase in the severity of an environmental impact unless mitigation measures are adopted that reduce the impact to a level of insignificance [citations omitted]; (3) a feasible project alternative or mitigation measure that clearly would lessen the environmental impacts of the project, but which the project's proponents decline to adopt [citations omitted]; or (4) that the draft EIR was so fundamentally and basically inadequate and conclusory in nature that public comment on the draft was in effect meaningless [citations omitted]. (*Laurel Heights Improvement Assn'n v. Regents of the University of California* (1993) 6 Cal.4th 1112, 1130 [26 Cal.Rptr.2d 231] ("*Laurel Heights II*").)

The courts have held that the failure to recirculate an EIR turns the process of environmental evaluation into a "useless ritual" which could jeopardize "responsible decision-making." (*Sutter Sensible Planning v. Sutter County Board,* (1981) 122 Cal.App.3d 813 [176 Cal.Rptr. 342].) Both the opportunity to comment and the preparation of written responses to those comments are crucial parts of the EIR process.

The *Sutter* court held that the failure to include all significant information in the original document denied the public the "opportunity to test, assess, and evaluate the data and make an informed judgment as to the validity of the conclusions to be drawn therefrom." (*Sutter Sensible Planning v. Sutter County Board, supra,* 122 Cal.App.3d p. 822.)

Recirculation of the EIR is also required in order to assure that responses will be prepared by the lead agency to all comments. "The policy of citizen input which underlies the act supports the requirement that the responsible public officials set forth in detail the reasons why the economic and social value of the project, in their opinion, overcomes the significant environmental objections raised by the public." (*People v. County of Kern, supra,* 39 Cal.App.3d 830.) The responses to comments play a vital role in insuring the integrity of the process by precluding stubborn problems or serious criticism from being swept under the rug. (*Ibid.*)

Responses to comments play such an important role in the environmental evaluation that the CEQA Guidelines spell out the agency's duty to avoid pro forma responses:

> "In particular, the major environmental issues raised when the lead Agency's position is at variance with recommendations and objections raised in the comments must be addressed in detail giving reasons why specific comments and suggestions were not accepted. There must be good faith, reasoned analysis in response. Conclusory statements unsupported by factual information will not suffice." (14 C.C.R. § 15088, subd.(b).)

CEQA is much more than simply a presentation to the public of the lead agency's environmental analysis. Public comments and responses to comments are equally essential ingredients of a valid EIR. As one court observed:

> "CEQA compels an interactive process of assessment of environmental impacts and responsive project modification which must be genuine. It must be open to the public, premised upon a full and meaningful disclosure of the scope, purpose and effect of a consistently described project, with flexibility to respond to unforeseen insights that emerge from the process."" (*County of Inyo v. City of Los Angeles, supra,* 160 Cal.App.3d at p. 1185.)

B. Application of Legal Standards to Draft EIR

These comments have identified a number of significant environmental impacts that were not discussed at all in the Draft EIR or that were meaningfully considered, including direct and cumulative impacts on drinking water contamination, worker health and safety, air quality, Proposition 65, mechanical failure, fire safety and permeation. In addition, the grudging, pro forma consideration of an action previously approved by the Lead Agency, the failure to conduct an independent analysis and evaluation, the failure to disclose or explain the analytical basis for the Draft EIR's conclusions, the fundamentally inaccurate and incomplete project definition and the inadequate and incomplete assessment of potential impacts preclude meaningful public comment.

The combined deficiencies in the Draft EIR reflect a document "so fundamentally and basically inadequate and conclusory in nature that public comment on the draft was in effect meaningless." (*Laurel Heights II, supra,* 6 Cal.4th at p. 1130.) The complete omission of any analytical details or factual explanation for the critical conclusions regarding the potential public health and environmental impacts of the project denied the public an "opportunity to test, assess, and evaluate the data and make an informed judgment as to the validity of the conclusions to be drawn therefrom." (*Sutter Sensible Planning v. Sutter County Board, supra,* 122 Cal.App.3d at p. 822.) Under these circumstances, recirculation is required under the *Laurel Heights II* test.

XII. NO LEGAL BASIS FOR EMERGENCY ACTION

HCD proposes adoption of building standards approving CPVC potable water use on an emergency basis. As discussed below, the basis cited for the emergency approval clearly fails to meet the legal requirements for emergency adoption.

A. Legal Standard

An emergency building standard is a building standard proposed for publication in the California Building Standards Code pursuant to Government Code section 11346.1. (Health & Saf. Code § 18913.) Section 11346.1 authorizes adoption of an emergency regulation only upon a finding that the regulation "is necessary for the immediate preservation of the public peace, health and safety or general welfare . . . ." (Gov. Code § 11345.1, subd.

(b).) This finding must be accompanied by a written statement that describes the *specific facts* showing the need for immediate action. (*Ibid.*)

The authority to adopt emergency regulations is an exception to the normal requirement that all regulatory actions take place after reasonable notice, meaningful opportunity for public review and testimony, right to petition for reconsideration and other statutory and constitutional due process requirements. The exception is a narrow one, allowing emergency adoption only where immediate state action is necessary to protect against a public crisis. (*Poschman v.Dumke* (1973) 31 Cal.App.3d 932, 941-942 [107 Cal.Rptr. 596.].)

In order to prevent state agencies from abusing the emergency adoption authority and circumventing requirements for public review and consideration, the courts will review the evidence relied upon by the agency to ensure that a genuine emergency exists. (*Poschman v. Dumke, supra*, 31 Cal.App.3d at p. 941.) The courts have not hesitated to strike down emergency regulations where the adopting agency has not presented sufficient evidence to substantiate claims that immediate action is necessary to preserve the public health, safety or general welfare. (*Poschman v. Dumke, supra,* 31 Cal.App.3d 932; *California Medical Association v. Brian* (1973) 30 Cal.App.3d 637 [106 Cal.Rptr. 555]; *California Association of Nursing Homes, et al. v. Williams* (1970) 4 Cal.App.3d 800 [84 Cal.Rptr. 590].)

B. Application of Legal Standards to the Proposed Emergency Adoption

HCD approved CPVC pipe in 1995 on an emergency basis claiming that immediate authority to use CPVC was necessary to address a purported emergency in the cities of Colton and East Highland where copper pitting purportedly required replacement of plumbing systems in relatively new subdivisions. The 1995 approval and subsequent permanent adoption was overturned by the court.

HCD now claims that emergency approval of CPVC is required because of the level of copper discharges in the South San Francisco Bay. The Draft EIR's explanation of the basis for the proposed emergency adoption is as follows:

"Because of [copper discharges] in the South [San Francisco] Bay, and potentially elsewhere in the State, the Lead Agency intends to recommend that the use of CPVC pipe for potable water piping in residential building be incorporated into the California Building Codes[35] on an emergency basis, as soon as the Final EIR is Certified." (Draft EIR, p. xi.)

The unexplained assertion that copper discharges may "potentially" enter waters "elsewhere in the State" is so obviously deficient as a basis for emergency action under the legal standards set forth above that it will not be considered further in this letter. The Draft EIR also fails to present specific facts demonstrating the need for emergency action to address copper discharges into the South Bay from public wastewater facilities. The copper discharges from these plants not only fail to present a public emergency, *they are in compliance with existing discharge permit limits* as reflected in current NPDES permits. (*See* San Francisco RWQCB, NPDES Permit for South Bay Discharges.)

The Draft EIR's claims regarding the South Bay copper emergency are simply general assertions without any supporting facts or evidence. The law requires a description of the specific facts that establish an immediate threat to the public health and safety. The assertions in the Draft EIR are no more than "statements of the motivation" for the proposed action and "declarations of policy." (*Poschman v. Dumke, supra*, 31 Cal.App.3d at p. 942.) They do not, however, present the kind of "specific facts" demonstrating a "crisis situation" that the courts have required as a basis for emergency action. (*Ibid.*) Moreover, even assuming the Draft EIR could show a pubic health crisis in the South Bay, it has offered no justification for emergency *statewide* action.

This is a project approval in search of an emergency. The public health crisis in 1995 was copper pitting in various southern California locations, now it is South Bay water quality. While HCD may wish to avoid the public review and testimony required for a non-emergency regulatory adoption, particularly given the profound problems with the proposed regulation discussed above, the exception is a narrow one and allows emergency

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[35] We assume the author intended to refer to the California Building *Standards* Code ("CBSC"), which includes as Part 5 the California Plumbing Code, since the proposed building standards proposed by the HCD would *not* be incorporated into the California Building Code, which is Part 2 of the CBSC.

adoption only where a genuine emergency exists. (*Poschman v. Dumke, supra*, 31 Cal.App.3d at p. 941.)

XIII. CONCLUSION

As demonstrated in these comments, the Draft EIR is profoundly inadequate and fails to meet the minimum requirements of CEQA. The document does not provide substantial evidence to support its findings or project approval, on an emergency or any other basis. A new Draft EIR that at least discloses the serious human health and environmental questions associated with the project must be circulated for public review. A court's observation with respect to another EIR seems particularly appropriate:

> "This document resembles an EIR as mist resembles a Colorado cloudburst." (*City of Coronado v. California Coastal Zone Conservation Commission* (1977) 69 Cal.App.3d 570, 583 [138 Cal.Rptr. 241].)