Comments

On

Water Quality Impacts

Draft
Addendum
To
Final Mitigated Negative Declaration
Amending Section 604.1
of
California Plumbing Code
March 3, 2005

Prepared for

San Diego Baykeeper,
Santa Monica Baykeeper,
San Francisco Baykeeper,
Deltakeeper,
Russian Riverkeeper,
Orange County Coastkeeper

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April 25, 2005

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Water Quality Comments

The Project would increase the amount of chlorinated polyvinyl chloride ("CPVC") pipe and connectors used to construct or remodel homes. The use of CPVC in the potable water system of homes is currently limited by the California Plumbing Code ("CPC") to those units that have corrosion problems. CPC, Sec. 604.1. In 2004, CPVC was used in about 4% of residential construction or 33 housing units per day. The Project would allow the use of CPVC in up to 100% of new residential units and re-pipings of existing residences. This would increase the amount of organotin compounds, solvents, and other chemicals discharged to the waters of the State. The increase in the discharge of these chemicals would cause or contribute to violations of effluent limits and water quality standards, resulting in a significant water quality impact.

Section I discusses the framework for evaluating water quality impacts, explaining the source of chemicals, how they end up in waters, and why they cause significant water quality impacts. Section II applies these principles to organotin compounds. The analysis in Section II indicates that the increase in discharge of organotin compounds could cause or contribute to violations of wastewater treatment plant effluent limits and water quality objectives and criteria. Other chemicals also could be discharged during the flushing and routine use of CPVC-piped potable water systems that could also adversely impact water quality. Thus, an EIR should be prepared to evaluate the cumulative impacts of these and other chemicals on water quality, including impacts on aquatic organisms and humans who consume them.

I. WATER QUALITY FRAMEWORK

A. Contaminants In CPVC-Piped Potable Water Systems

CPVC is a type of rigid plastic pipe that is used in residential, commercial, and industrial applications. It is made by mixing a polymer resin with additives that include pigments, lubricants, and organotin stabilizers. Addendum,[1] p. 33. However, the Addendum does not identify any of these chemicals except organotin compounds and does not evaluate their potential impacts on water quality. The Project should not be approved until these chemicals are identified and their direct and indirect impacts are evaluated.

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[1] California Department of Housing and Community Development, Addendum to Adopted Mitigated Negative Declaration, March 3, 2005.

Sections of CPVC pipe are joined using fittings or connectors. The pipe is chemically fused to the connector using a process called "solvent welding" or "cementing." This process uses chemicals—cleaners, primers and cements—which are applied to the end of the pipe and the inside of the fitting socket. The principal chemicals in the primers and cleaners are methyl ethyl ketone, cyclohexanone, tetrahydrofuran, acetone, CPVC resin, and amorphous fumed silica.

B. Discharge Of Contaminants From Residential Water Uses

Some of these contaminants are leached out of the potable water systems and end up in surface and ground waters. The Project would increase the amount of contaminants discharged into waters of State in two ways: (1) flushing and (2) routine household water use.

1. Flushing Increases The Discharge Of Contaminants

The Addendum relies on a flushing measure adopted in the 2000 Mitigated Negative Declaration (2000 MND,[2] pp. 13-16) to mitigate water quality impacts. (Addendum, pp. 38, 40 (water quality impacts not significant if "flushing requirements" met).) This measure has been incorporated into the CPC and requires that CPVC pipe systems be flushed twice over a period of a least one week to wash out toxic chemicals after pipe installation and before home occupancy. (2000 MND, p. 2 and CPC, Sec. 301.0.1.) However, flushing converts a drinking water/public health problem into a water quality problem. The impacts of flushing are significant for the Project because up to 100% of newly piped residential units (1,134 per day by 2030) would flush contaminated wastewaters into the sewer system, compared to only 4% or 33 units per day under the 2000 MND.

Flushing creates water quality impacts by washing out some piping chemicals before home occupancy to lessen concentrations in drinking water. Chemicals that are flushed out of the piping are discharged into the sewer system, which routes them to wastewater treatment plants ("WTPs"). The WTPs remove some of the contaminants and discharge the balance into rivers, lakes, and coastal waters. Some of the treated effluent may be reused for irrigation, groundwater recharge, or wetland supply. Organotins are partitioned into sludges during treatment. The sludges are either incinerated and the tin emitted to the atmosphere, or disposed to land, thus potentially contaminating soils and

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[2] Department of Housing and Community Development, Negative Declaration with Mitigation Measures for the Limited Use of Chlorinated Polyvinyl Chloride (CPVC) Pipe for Potable Water Piping in Residential Buildings, September 21, 2000.

ground waters. Thus, chemicals that start out in the piping system end up in water bodies, in soils, or in ambient air.

Flushing would result in large amounts of contaminated water being discharged into receiving waters. These discharges would have the highest concentrations of CPVC contaminants and could thus result in significant water quality impacts. By 2030, 100% CPVC use in residential construction would result in the discharge of up to 1.1 million gallons per day of contaminated water from flushing alone,[3] plus household wastewaters from all previously CPVC piped houses.

2. Household Wastewaters Increase The Discharge Of Contaminants

After the initial flushing, some of the CPVC contaminants continue to leach out of the pipe, fittings, and joining compounds into water used in showers, clothes washers, toilets, dishwashers, baths, faucets, saunas, and garbage grinders, among others. The used waters, referred to as "residential wastewaters" or "household wastewaters" are discharged into the sewer, which routes them to WTPs, which discharge treated wastewaters and their residuals into the environment.

The number of units using CPVC pipe could increase up to 852 units per day or 25-fold, based on 2004 data. Addendum, p. 19. If housing units increase in proportion to the California Department of Finance ("CDF") population projections, CPVC could be used in up to 1,234 units per day by 2030. The total number of residential units piped with CPVC by 2030, assuming 100% of new and re-piped units use CPVC from 2004 through 2030, would be 9.8 million units.[4] By 2030, up to 6.7 million gallons per day ("MGD") or 2.5 trillion gallons per year[5] of household wastewaters contaminated with chemicals leached from portable-water CPVC piping systems could be discharged into the waters of the State.

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[3] Flushing discharge in 2030 = (1,134 units/day)(3,800 L/unit)(0.26417 gal/L) = 1,138,361 gal/day. This amount could be flushed in a single day, or, alternatively, could be distributed over two or more separate days, depending upon how CPC Section 301.0.1 is implemented. However, if distributed over multiple days, it would combine with additional flushing water from new houses piped on those days, yielding the same total daily amount. The flushing amount (3,800 L) is based on the 1983 EA, Table IV-3 (SRI International, Environmental Review of Proposed Expanded Uses of Plastic Plumbing Pipe, March 1983).

[4] Assumes 852 units per day are piped with CPVC in 2004 and the number of such units increase in proportion to CDF population projections through 2030 or by about 11 units per day per year: Sum for n=0 to 26 of (852 + n11) = 26,865 per day for each year from 2004 to 2030.

[5] Amount of household wastewater discharged into sewer system: (26,865/day)(950 L/unit)(0.26417 gal/L) = 6,742,081 gal/day or 2,460,859,455 gal/yr.

C. Discharge Of Flushing And Household Wastewaters Could Result In Significant Water Quality Impacts

These discharges could result in significant water quality impacts by causing or contributing to violations of WTP effluent limits and water quality objectives and criteria. This could occur in two ways.

First, wastewater treatment plants have effluent limits calculated to protect the beneficial uses of receiving waters. Some wastewater treatment plants currently violate or are projected to violate effluent limits on contaminants that would be discharged by the Project, *e.g.*, tributyltin. An increase in the discharge of chemicals that currently violate or are projected to violate effluent limit(s) is a significant water quality impact.

Second, some wastewater treatment plants discharge treated effluent into receiving waters that are impaired because they violate water quality objectives and standards established to protect beneficial uses, *e.g.*, aquatic life, recreation, or fish consumption. An increase in the discharge of these chemicals contributes to existing impairment of water quality, causing a cumulatively significant water quality impact.

A number of chemicals have been reported in leachates from PVC and CPVC piped systems that could cause or contribute to violations of water quality objectives and criteria. These include organotin compounds,[6] methyl ethyl ketone, tetrahydrofuran, cyclohexanone, acetone, chloroform,[7] and vinyl chloride,[8] among others. In addition, polychlorinated dibenzo-p-dioxins ("PCDDs") and polychlorinated dibenzofurans ("PCDFs"), generically referred to as "dioxins," have been detected in extracts of CPVC extrudates.[9] The concentrations are generally elevated for the first several weeks and thereafter

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[6] Edward A. Boettner and others, Organic and Organotin Compounds Leached from PVC and CPVC Pipe, Report EPA-600/1-81-062, September 1981; D.S. Forsyth and B. Jay, Organotin Leachates in Drinking Water from Chlorinated Polyvinyl chloride) (CPVC) Pipe, Applied Organometallic Chemistry, v. 11, 1997, pp. 551-558.

[7] Sanitary Engineering and Environmental Health Research Laboratory (SEEHRL), University of California, Berkeley, Plastic Pipe Leaching Study, SEEHRL Report No. 87-11, November 1987; T.C. Wang and J.L. Bricker, 2-Butanone and Tetrahydrofuran Contamination in the Water Supply, Bulletin of Environmental Contamination and Toxicology, v. 23, 1979, pp. 620-623.

[8] M.H. Al-Malack, Effect of Water Quality Parameters on the Migration of Vinyl Chloride from Unplasticized PVC Pipes, Water, Air & Soil Pollution, v. 120, no. 1-2, 2000;

[9] Letter from Carl A. Mattia, Vice President, Environmental, Health and Safety Management Systems, The B.F. Goodrich Company, to Document Control Officer, Chemical Information Division Office of Toxic Substances, Re: Note in Accordance with TSCA Section 8(E), February 25, 1992.

decline. These chemicals are known to cause aquatic toxicity.[10] The cumulative aquatic impacts of all of these chemicals should be evaluated in an EIR. Further, additional leaching studies should be performed to determine the long term leaching behavior of wide range CPVC pipe products under field conditions.

II. ORGANOTIN COMPOUNDS

Organotin compounds are present in CPVC pipe, fittings, and primers. Addendum, p. 33. These chemicals leach into potable water and can be discharged into receiving waters, where they impair beneficial uses. The concentrations that leach from piping systems are initially high, up to 35[11] to 140 μg/L (McLellan 2002,[12] p. 33) and decrease to lower levels, 0.1 to 1 μg/L, after one to two weeks. These compounds appear to follow a bi-modal leaching model with two peaks, an initial peak from desorption of near surface material followed by internal diffusion through the polymer matrix and into the extracting medium.[13]

However, the available information is limited, particularly in regards to long-term leaching behavior under field conditions for a wide range of CPVC products. Because existing evidence indicates the potential for adverse water quality impacts, as discussed below, the HCD should sponsor studies to further investigate the long-term leaching behavior of CPVC pipe in the field, particularly in hot water applications, and use this information to prepare an EIR that comprehensively analyses water quality impacts.

A. Organotin Discharges Could Violate Effluent Limits

The concentrations of organotin compounds detected in PVC and CPVC leachates are similar to those measured in municipal effluents. Thus, PVC and CPVC plumbing systems have been identified as one of the major sources of organotin compounds in WTP discharges.

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[10] Karel Verschueren, Handbook of Environmental Data on Organic Chemicals, Van Nostrand Reinhold, New York, 3rd Ed., 1996. See also http://www.epa.gov/ecotox/.

[11] Edward A. Boettner and others, Organic and Organotin Compounds Leached from PVC and CPVC Pipe, U.S. EPA Report EPA-600/1-81-062, September 1981.

[12] Clifton J. McLellan, Director of Toxicology Services, NSF International, The Decrease of Tin Extraction from Chlorinated Polyvinyl and Polyvinyl Chloride Pipe, Fittings and Materials After Continuous Exposure to Potable Water, Organotin Environmental Programme - World Meeting, Japan, April 19, 2002.

[13] T.W. Downes, The Mechanism of Migration of Organotin Stabilizer from Polyvinyl Chloride into Contacting Media, Ph.D. Thesis, Rutgers University, New Jersey, 1972. See also Boettner et al. 1981.

High concentrations of organotin compounds have been widely reported in treated sewage effluents, including in California, *e.g.*, Hyperion, Oceanside, San Jose, San Diego, and Yuba County. One source that has been implicated for these high levels is leaching of organotin compounds from PVC and CPVC pipe because the majority of organotin compounds, 60% to 70%, is commercially used to stabilize the resins. Thus, the sewer system is an important source of organotin:

> Although the origin of organotin compounds in municipal wastewater is difficult to identify, a number of organotin applications may be addressed as potential sources. The principal commercial use of organotin lies in the stabilization of PVC. Principal sources of MBT and DBT compounds are thus the PVC processing industry, normal leaching and weathering of PVC pipes used for potable and wastewater, and from other PVC materials.

(Fent 1996a,[14] p. 46.) Canadian researchers similarly concluded:

> It is likely that new CPVC water distribution systems would contaminate the supplied water with organotins for some time after installation. PVC and CPVC plumbing installations may, therefore, be a significant source of the monobutyltin and dibutyltin found in municipal wastewater.

(Forsyth and Jay 1997, p. 556.) See also Tolosa et al. 1992.[15]

The Project would increase the discharge of organotin compounds, likely resulting in significant water quality impacts, *viz.* "[t]he ecotoxicological consequences of organotin-polluted wastewater and sludge should be regarded concerning both the discharge of wastewaters into aquatic systems and the use of digested sludge as a soil amendment. Adverse effects on the most sensitive aquatic biota (gastropods) in receiving waters were shown at the concentrations

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[14] Karl Fent, Ecotoxicology of Organotin Compounds, Critical Reviews in Toxicology, v. 26, n. 1, 1996, pp. 1-117.

[15] I. Tolosa and others, Occurrence and Fate of Tributyl- and Triphenyltin Compounds in Western Mediterranean Coastal Enclosures, Environmental Toxicology and Chemistry, v. 11, 1992, pp. 145-155.

found in [sewage] plant effluents." (Fent 1996b,[16] p. 151.) Some organotins are removed from effluents during the treatment process, depending on the type and efficiency of the process. However, the removed fraction is partitioned into the atmosphere or the sludges, which result in secondary environmental impacts that also should be evaluated.

Research conducted to date indicates that tributyltin ("TBT") is the most toxic of the organotin compounds that are likely to be present in CPVC leachates. Many WTPs in California currently have or will soon have effluents limits on TBT. Permits must contain limits that control all pollutants that "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality." 40 CFR 122.44(d)(1)(vi). Further, "[w]here a state has not established a water quality criterion for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or contributes to an excursion above a narrative criterion within an applicable State water quality standard, the permitting authority must established effluent limits." *Id.* The applicable water quality standards in California include those in the Ocean Plan, Basin Plans, Inland Surface Water Plan, and Bays and Estuaries Plan.

A Reasonable Potential Analysis ("RPA") must be conducted for every reissued wastewater discharge permit. Some of those completed to date have identified WTPs that have a reasonable potential to cause violations of ambient water quality standards for tributyltin. These include the WTPs that serve Los Angeles (Hyperion), San Diego County, Oceanside, Yolo County, Sonoma Valley County, and Contra Costa County, among others.

These facilities serve a significant fraction of California's population and are located in areas where a significant amount of the projected new housing would be built. If the Project is approved, 100% of this new housing could be piped with CPVC. Some of these WTPs have exceeded or have a reasonable potential to exceed their TBT effluent limits. The Project would increase TBT discharges from each of these facilities. This is a significant water quality impact because these WTPs currently have the potential to cause or contribute to exceedances of effluent limits.

The following sections evaluate the impact of the Project on the ability of some of these dischargers to meet their TBT limits. These analyses assume that

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[16] Karl Fent, Organotin Compounds in Municipal Wastewater and Sewage Sludge: Contamination, Fate in Treatment Process and Ecotoxicological Consequences, The Science of the Total Environment, v. 185, 1996, pp. 151-159.

the use of CPVC in the potable water system of residential units could increase the discharge of TBT into the sewer system by about 4,500 micrograms per house per day during flushing[17] and by about 40 micrograms per house per day during subsequent occupancy;[18] based on TRA[19] and National Sanitation Federation certification data for CPVC pipe, fittings, and other material. (McLellan 2002.)

1. Olivehurst

Olivehurst, located in Yuba County north of Sacramento, is proposing to upgrade its wastewater treatment plant to accommodate an increase in population, from 11,000 to about 45,000 within the next 10 to 15 years. New housing developments with up to 12,384 units are proposed. The Central Valley RWQCB concluded that discharges from Olivehurst had a reasonable potential of exceeding ambient criteria for tributyltin. Olivehurst WDR.[20] The Project would allow 100% of these new houses to use CPVC in the potable water system.

In 2004, the Central Valley RWQCB issued an amended discharge permit that set both mass and concentration effluent limits on TBT (Olivehurst WDR) and a cease and desist order (Olivehurst CDO[21]) that required compliance with the TBT effluent limits. The Board concluded: "[t]he Discharger currently cannot

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[17] TBT discharged during flushing of a CPVC-piped residential potable water system: (450 μg/L of total tin as dibutyltin)(290 μg TBT/233 μg DBT)(0.0035)(3,800 L/unit-day)(1-0.4) = 4,469 μg TBT/unit-day. The factors in this calculation are based on the following: (1) 450 μg/L is the total tin concentration reported as dibutyltin that is exceeded in 12% of the leachate samples after 1 day of leaching in NSF-61 certification tests. McLellan 2002, p. 35; (2) 0.0035 is the fraction of the total organic tin that is present as tributyltin based on the TRA leaching study; (3) 3,800 L is the volume of water flushed through a house prior to occupancy, based on the 1983 EA, Table IV-3; (4) 0.4 is the fraction of the TBT that is removed by the treatment plant, based on Y.K. Chau *et al.*, Occurrence of Butyltin Species in Sewage and Sludge in Canada, The Science of The Total Environment, v. 121, 1992, pp. 271-281.

[18] TBT discharged after occupancy of a CPVC-piped residence in routine household wastewaters: (0.1 μg/L)(950 L/unit-day)(1-0.6) = 38 μg TBT/unit-day. The factors in this calculation are based on the following: (1) 0.1 μg/L is the concentration of TBT measured in CPVC leachate, based on TRA 1998 and McLellan 2002. (2) 950 L/unit-day is the volume of water flushed through a house after occupancy, based on the 1983 EA, Table IV-3.

[19] West Coast Analytical, Results Reported to Thomas Reid & Associates, Leaching Study of Two Samples of CPVC, June 4, 1998.

[20] California Regional Water Quality Control Board, Central Valley Region, Waste Discharge Requirements for Olivehurst Public Utility District Wastewater Treatment Plant, Yuba County, Order No. R5-2004-0094, NPDES No. CA0077836, 2004.

[21] California Regional Water Quality Control Board, Central Valley Region, Order No. R5-2004-0095 Requiring the Olivehurst Public Utility District Wastewater Treatment Plant to Cease and Desist from Discharging Contrary to Requirements, 2004.

consistently comply with the Effluent Limitations for... tributyltin... Based on the above Findings, this discharge represents a threatened discharge of waste in violation of the Effluent Limitations for... tributyltin..." Olivehurst CDO, p. 4, Findings 4, 5.

The monthly average TBT effluent limits are 0.043 μg/L and 0.00065 lb/day for a design capacity of 2.1 MGD; 0.0011 lb/day for a design capacity of 3.0 MGD; and 0.0018 lb/day for a design capacity of 5.0 MGD. The Project could cause or contribute to exceedances of these limits by both flushing and routine discharges of household wastewaters.

The Project could contribute to continuing violations of these limits by allowing up to 100% of the new housing to use CPVC in the potable water system. The concentration of TBT in household wastewaters is about 0.1 μg/L (TRA 1998), higher than the effluent limit. Thus, small discharges of household wastewaters could contribute to exceedances of the 0.043 μg/L effluent limit.

The mass limits could be exceeded by flushing alone. The 0.00065 lb/day limit could be exceeded by flushing more than 66 CPVC-piped homes per day.[22] The 0.0011 lb/day limit could be exceeded by flushing more than 111 CPVC-piped homes per day. The 0.0018 lb/day limit could be exceeded by flushing more than 182 CPVC-piped homes per day. Because TBT is already present in Olivehurst's treated effluent, flushing fewer homes than calculated here could exceed the monthly effluent limits.

At buildout, household wastewaters from the 12,384 new homes could discharge up to 0.0011 lb/day[23] to the Olivehurst WTP. This could violate the 30-day average TBT effluent limit for design flows of 2.1 and 3.1 MGD and equals about 61% of the effluent limit at a design flow of 5.0 MGD. The impacts could be up to 47% greater (852/548) if re-pipings of existing homes were included. Addendum, p. 19.

Thus, flushing prior to occupancy and routine household discharges could cause or contribute to violations of Olivehurst's 30-day TBT effluent limits. These limits were established to protect the beneficial uses of receiving waters. Thus, this is a significant water quality impact.

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[22] The number of houses that can be flushed without violating effluent limits: effluent limit/ TBT per unit. For the 0.00065 lb/day limit: (0.00065 lb/day)/[(4,500 μg/unit)(10^{-6} g/μg)/(454 g/lb)] = 66 units.

[23] TBT discharge at buildout: (12,384 units)(40 μg/unit-day)(10^{-6} g/ug)/454 lb/g = 0.0011 lb TBT/day.

2. Oceanside

The City of Oceanside owns and operates two WTPs that discharge up to 21 MGD of treated effluent to the Pacific Ocean. Oceanside's discharge permit contains a 30-day TBT effluent mass limit of 0.016 lb/day and a 30-day effluent concentration limit of 0.012 μg/L. In June 2003, the City reported a 30-day average TBT concentration of 0.18 μg/L, which exceeded the effluent limit by 33%. The City also reported a 30-day mass emission rate of 0.020 lb/day, which exceeded the effluent mass limit by 20%. The San Diego RWQCB issued a tentative order assessing penalties against the City for these violations. (Oceanside Order.[24])

The Project would increase the amount of TBT discharged by the Oceanside WTP. The population of Oceanside is projected to grow from 167,082 in 2003 to 283,600 in 2025.[25] Assuming 2.795 persons per household,[26] 41,688 new housing units would be constructed in the service area of the Oceanside WTP through 2025. Assuming 100% of the new units plus repipes use CPVC, by 2025 they could increase the discharge of TBT from the Oceanside WTP by up to 0.0054 lb/day.[27] This discharge alone is 34% of the 30-day effluent limit of 0.016 lb/day and, combined with TBT from other sources, would be cumulatively significant. If the 2003 discharge of 0.02 lb/day were to occur again, TBT discharges from CPVC-piped homes would increase the reported violation in 2003 by 27%. Thus, the use of CPVC in new and repiped homes in the service area of the Oceanside WTP has a reasonable potential of causing or contributing to a violation of Oceanside's TBT effluent limit. This is a significant water quality impact.

3. Los Angeles (Hyperion)

The Hyperion Wastewater Treatment Plant treats most of the wastewater generated in Los Angeles County, including that from the City of Los Angeles, several nearby cities, and unincorporated areas in the metro region. Hyperion

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[24] California Regional Water Quality Control Board, San Diego Region, Tentative Order No. R9-2004-0006 Administrative Assessment of Civil Liability for Mandatory Minimum Penalties Against the City of Oceanside, Oceanside Ocean Outfall, Violation of Order No. 2000-11, NPDES No. CA0107433 Waste Discharge Requirements for the City of Oceanside, San Luis Rey and La Salina Wastewater Treatment Plants Discharge to the Pacific Ocean via the Oceanside Ocean Outfall, 2004.

[25] http://www.fairus.org/Research/Research.cfm?ID=963&c=9

[26] http://www.dof.ca.gov/HTML/DEMOGRAP/repndat.htm

[27] Increase in TBT discharged to Oceanside WTP (852 units/578 new units)(41,688 units) (40 μg/unit-day)(10^{-6} g/μg)/(454 g/lb) = 0.0054 lb/day.

currently discharges about 315 MGD of wastewater to the Pacific Ocean through two outfalls. The major outfall (#2) discharges to the Pacific Ocean within Santa Monica Bay. Hyperion also periodically discharges through a second outfall (#1). This plant serves one of the fastest growing areas in California.

The Los Angeles RWQCB concluded that tributyltin, when discharged through each outfall, had a reasonable potential to exceed Ocean Plan objectives on tributyltin (Hyperion 2004,[28] p. F-24) and established water quality based effluent limits for both outfalls. The Fact Sheet concluded that "[t]here is one constituent (tributyltin) that exhibits reasonable potential to exceed an Ocean Plan objective" and recommended limits for TBT of 20 μg/L for outfall #1 and 120 μg/L and 0.42 lb/day for outfall #2, based on the Ocean Plan human health TBT objective.

The Project would increase the amount of TBT discharged by the Hyperion WTP due to flushing and routine household wastewater discharges into the sewer system. These discharges are significant because Hyperion currently has a reasonable potential of exceeding its TBT limits.

The population of Los Angeles County is projected to grow from 9,871,506 in 2003[29] to 11,236,734 in 2030.[30] Assuming 3.117 persons per household,[31] 437,994 new housing units would be constructed in the service area of the Hyperion WTP through 2030. Assuming 100% of the new units plus repipes use CPVC, they could increase TBT in Hyperion's effluent by up to 0.057 lb/day.[32] This discharge alone is 14% of the 30-day effluent limit of 0.42 lb/day and, combined with TBT from other sources, would be cumulatively significant because TBT has a reasonable potential to violate the TBT Ocean Plan objective. This is a significant water quality impact.

4. Bay Area Dischargers

The San Francisco Bay RWQCB has concluded that a number of dischargers under its jurisdiction have either violated or have a reasonable

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[28] California Regional Water Quality Control Board, Los Angeles Region, and U.S. EPA, Fact Sheet, Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit for the City of Los Angeles (Hyperion Treatment Plant), September 21, 2004.

[29] http://quickfacts.census.gov/qfd/states/06/06037.html

[30] http://www.dof.ca.gov/HTML/DEMOGRAP/repndat.htm

[31] http://www.dof.ca.gov/HTML/DEMOGRAP/repndat.htm

[32] Increase in TBT discharged to Hyperion WTP (852 units/578 new units)(437,994 units)(40 μg/unit-day)(10^{-6} g/ug)/454 g/lb) = 0.057 lb/day.

potential to violate TBT effluent limits. These all occur in service areas that are projected to experience large increases in population and hence new residential construction. The Project would allow the potable water system in up to 100% of these new homes to be piped with CPVC. This would increase the amount of TBT discharged into WTPs that have violated or have a reasonable potential to violate TBT effluent limits set to protect receiving water quality. Therefore, each of these instances identified below constitutes a significant water quality impact.

The Sonoma Valley County Sanitation District, which discharges about 2.6 MGD of wastewater into shallow waters of San Pablo Bay, has a reasonable potential of violating its TBT effluent limits. The Board established an interim 30-day TBT limit of 0.013 μg/L and final monthly and daily average TBT limits of 0.007 and 0.018 μg/L, respectively. (Sonoma WDR.[33]) Three samples out of 43 exceeded the final monthly limit, and one exceeded the interim limit. (Sonoma Infeasibility Study, 2002.[34])

The District's service area consists primarily of residential homes, retail businesses, agricultural land, and vineyards. The population in Sonoma County is expected to grow from 236,363 in 2004 to 357,649 in 2030. This would require 47,322 new housing units, each of which could be piped with CPVC and each of which could discharge household wastewater contaminated with TBT. These new homes could contribute TBT to Sonoma Valley's effluent, causing or contributing to violations of its TBT effluent limits, which are lower than the concentration of TBT that has been measured in CPVC leachate, 0.1 μg/L. (TRA 1998.)

The San Jose/Santa Clara WTP, one of the largest in California, treats wastewater from over 1.5 million people who live and work in a 300 square mile area encompassing San Jose, Santa Clara, Milpitas, Campbell, Cupertino, Los Gatos, Saratoga, and Monte Sereno.[35] This facility discharges through Artesian Slough into South San Francisco Bay.

The current permit does not limit TBT because the effluent concentration of 0.004 ug/L is lower than the water quality criterion of 0.01 ug/L.[36] However,

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[33] Waste Discharge Requirements for Sonoma Valley County Sanitation District, Sonoma, Sonoma, County, Order No. R2-2002-0046, March 20, 2002.

[34] Sonoma Valley County Sanitation District's Infeasibility Study, January 29, 2002.

[35] http://www.sanjoseca.gov/esd/wpcp.htm

[36] California Regional Water Quality Control Board, San Francisco Bay Region, Waste Discharge Requirements for Cities of San Jose and Santa Clara Water Pollution Control Plant, Santa Clara County, Order No. R2 2003-0085, NPDES Permit No. CA0037842, September 17, 2003.

a "serious violation" of TBT effluent limits occurred in the past (SJ/SC WDR[37]), and the Board assessed a mandatory penalty. (SJ/SC Penalty.[38]) TBT monitoring is on-going.

The population of Santa Clara County is projected to increase from 1,731,422 in 2004 to 2,152,963 in 2030. Assuming 2.9 persons per household, this amounts to 145,359 new residential units. The Project would allow the potable water system of these new units to be piped with CPVC. This could result in a large increase in TBT discharges from flushing and household wastewaters into the San Jose/Santa Clara's WTP, causing or contributing to future violations of its TBT effluent limit.

The Central Contra Costa Sanitary District ("CCSD") serves a population of about 421,000 in central Contra Costa County. The current permitted dry weather flow is 45 MGD, which is discharged into Suisun Bay,[39] a critical habitat for threatened salmonid species. The Board concluded that this facility had a reasonable potential to cause or contribute to exceedances of water quality objectives and criteria for TBT and established a maximum daily interim limit of 0.06 ug/L. (CCCD Permit,[40] pp. 12, 19.) The use of CPVC in new and repiped homes in the service area of the Oceanside WTP would increase the discharge of TBT into this facility and thus has a reasonable potential of causing or contributing to a violation of CCSD's TBT effluent limit. This is a significant water quality impact.

B. The Project Could Adversely Impact Aquatic Organisms

1. Ecotoxicology Of Organotin Compounds

Organotin compounds are extremely toxic to aquatic life causing well-documented "deleterious impacts in aquatic ecosystems." (Fent 1996a). The early developmental stages of aquatic organisms are particularly sensitive to

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[37] California Regional Water Quality Control Board, San Francisco Bay Region, Order No. 98-052 NPDES No. CA0037842, 1998.

[38] California Regional Water Quality Control Board, San Francisco Bay Region, Complaint No. 01-086, Mandatory Minimum Penalty in the Matter of Cities of San Jose and Santa Clara, Santa Clara County.

[39] http://www.centralsan.org/aboutcentralsan/whoweare.html

[40] California Regional Water Quality Control Board, San Francisco Bay Region, Waste Discharge Requirements for Central Contra Costa Sanitary District, Martinez, Contra Costa County, Order No. 01-068, NPDES No. CA0037648, June 20, 2001.

organotin compounds.[41] These compounds are endocrine disruptors, causing, for example, imposex, *i.e.* a pseudo-hermaphroditic condition in female gastropods (snails) caused by TBT and manifested by the development of a false penis.[42] Endocrine effects have been observed at levels of about 1 ng/L TBT (0.001 μg /L).[43]

Organotin compounds also cause adverse reproductive and developmental effects, they have caused widespread deformities in oyster shells, and they cause a wide range of adverse impacts in fish,[44] among many others. Chronic toxicity of TBT is high. The German Federal Environmental Agency (Umweltbundesamt) uses a 90-day no observed effect concentration ("NOEC") for TBT of 10 ng/L. Studies with rainbow trout showed NOECs of 2-4 μg /L after 28 days. (Rüdel 2003,[45] p. 185.) The effects of TBT on plankton and oysters have been observed at ng/L concentrations.[46] These reported effects concentrations are typically much lower than the levels found in most sewage effluents. (Fent 1996b, Sec. 2.1.) California concluded in 1988 that "TBT is one of the most toxic chemicals to aquatic life routinely detected in California waters." (SWRCB 1988,[47] p. xi.)

Organotins are also highly bioconcentrated, meaning very low concentrations in the water can accumulate to very high concentrations in organisms that live in the water, thus ultimately posing a public health hazard for consumers (of fish, oysters, etc). Bacteria can concentrate up to 120 mg Sn/kg

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[41] R. Eisler, Tin Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review, Contaminant Hazard Reviews, Biological Report 85 (1.15), January 1989.

[42] See, e.g., Y. Shimasaki, T. Kitano , Y. Oshima, S. Inoue, N. Imada, and T. Honjo, Tributyltin Causes Masculinization in Fish, Environmental Toxicology and Chemistry, v. 22, n. 1, 2003, pp. 141-4.

[43] P.E. Gibbs and G.W. Bryan, TBT-induced Imposex in Neogastropod Snails: Masculinization to Mass Extinction. In: S.J. de Mora (Ed.), Tributyltin: Case Study of An Environmental Contaminant, Cambridge University Press, Cambridge, 1996, pp. 212-236.

[44] T. Braunbeck, D.E. Hinton, and B. Streit (Eds.), Effects of Organotin Compounds in Fish: from the Molecular to the Population Level, Fish Ecotoxicology, 1998, pp. 259-302.

[45] Heinz Rüdel, Case Study: Bioavailability of Tin and Tin Compounds, Ecotoxicology and Environmental Safety, v. 56, 2003, pp. 180-189.

[46] C. Alzieu, Biological Effects of Tributyltin on Marine Organisms. In: S.J. de Mora (Ed.), Tributyltin: Case Study of An Environmental Contaminant, Cambridge University Press, Cambridge, 1996, pp. 167-211.

[47] State Water Resources Control Board (SWRCB), Tributyltin, A California Water Quality Assessment, December 1988.

dry matter, which corresponds to a bioconcentration factor of >7,000.[48] For phytoplankton, bioconcentration factors of 5,500 to 30,000 have been reported; mollusks show bioconcentration factors of up to 16,000. In fish, bioconcentration factors vary among species and depending on the type of tissue; the highest bioconcentration factors of up to 52,000 are found in liver tissue.[48] The compounds have been found in the tissue of marine mammals and implicated in the decline of sea otters in California.[49] High concentrations of TBT have also been reported in transplanted bivalves in California's Mussel Watch Program.[50]

The Addendum relies on the analysis in the 2000 MND. However, the 2000 MND did not evaluate the impact of organotin compounds, or any other compounds, on aquatic organisms or those who consume them, presumably because the scope of the 2000 project was very limited and resulted in only 4% CPVC use in 2004. However, the Project allows up to 100% CPVC use in some of the fastest growing areas in the State where organotin levels in receiving waters exceed levels know to cause adverse impacts to aquatic organisms. Thus, increased discharges of these compounds from this Project will contribute to an existing water quality impairment. This is a significant impact.

The following comments focus on TBT. However, it is important to note that other forms of organotin are also toxic. The Human and Ecological Risk Assessment Division of the California Department of Toxic Substances Control ("DTSC"), for example, recommends that TBT equivalents be analyzed, similar to the approach used for dioxins, i.e., that other forms of organotin be converted into TBT equivalents based on relative toxicity. The DTSC recommends an equivalency factor for dibutyltin of 0.01, i.e., the dibutyltin concentration is

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[48] See, *e.g.*, C. Alzieu, Biological Effects of Tributyltin on Marine Organisms, In: De Mora, S.J. (ed.), Tributyltin: Case Study of an Environmental Contaminant, Cambridge, University Press, 1996, pp. 167-211; K. Fent, Ecotoxicology of Organotin Compounds, Critical Reviews in Toxicology, v. 26, 1996, pp. 1-117; W. Kalbfus, A. Zellner, and E. Stanner, Gewässergefährdung durch Organozinnhaltige Antifouling-Anstriche, Umweltbundesamt Berlin, UBA-Texte 44-91, 1991; all in: Arbeitsgemeinschaft für die Reinhaltung der Elbe, Herkunft und Verteilung von Organozinnverbindungen in der Elbe und Elbenebenflüssen, 1999.

[49] http://www.defenders.org/wildlife/new/marine/otters/ca/disease.html

[50] See, e.g., San Francisco Estuary Project, State of the Estuary. A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, June 1992, Table 22; 2001 Regional Monitoring Program, Bivalve Tissue Results at http://www.sfei.org/rmp/2001/RMP_2001_bivalve.pdf and Tomales Bay Water Quality Status and Trends Report (reporting over 100 ppm TBT in oyster tissue) at http://www.bml.ucdavis.edu/peeir/manuscripts/Smith.Tomales.Bay.Water.Qual.Status.&.Trends.%20Rpt.pdf.

multiplied by 0.01 to convert it to TBT equivalents. (DTSC 2003.[51]) This approach should be used in future evaluations of water quality impacts.

2. Organotin Concentrations In Receiving Waters And Sediments Exceed Safe Levels

a. Tributyltin ("TBT")

In 1988, the SWRCB conducted an in depth review of TBT, which included water and sediments, concluding: "TBT is a serious and widespread contaminant of marine and fresh water habitats in California." The study documented widespread occurrence of TBT in marine and freshwater habitats across the state. Ninety percent of the samples exceeded the SWRCB criteria, including 61% of non-marina samples. (SWRCB 1988.) (See also testing of river and marina waters[52] and coastal waters[53] reported elsewhere.) Widespread impairment of water bodies from organotins remain, even though one of the causes of this impairment, the use of TBT in anti-fouling boat paints, has been banned for smaller vessels.

The U.S. Geological Survey recently concluded that "there is potential for long-term chronic effects of TBT in San Francisco Bay," based on a study of sediments and clam tissues.[54] (See also studies of Monterey Bay,[55] the Santa Ana watershed,[56] Los Angeles watersheds,[57,58] and North Coast watershed.[59])

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[51] California Department of Toxic Substances Control, Human and Ecological Risk Division (HERD), HERD Ecological Risk Assessment (ERA) Note, HERD ERA Note Number 3, Calculation of an action level/preliminary cleanup goal for dibutyltin (DBT) in surface, ground, and sediment interstitial water for protection of saltwater aquatic life, September 2, 2003.

[52] Peter M. Stang and Edward D. Goldberg, Butyltins in California River and Lake Marina Waters, Applied Organometallic Chemistry, v. 3, 1989, pp. 183-187.

[53] M. Stallard, V. Hodge and E.D. Goldberg, TBT in California Coastal Waters: Monitoring and Assessment, Environmental Monitoring and Assessment, v. 9, 1987, pp. 195-220.

[54] Wilfred E. Pereira, Frances D. Hostettler, and Terry L. Wade, Butyltin Contamination in Sediments and Lipid Tissues of the Asian Clam, *Potamocorbula amurensis*, near Mare Island Naval Shipyard, San Francisco Bay, U.S. Geological Survey, Toxic Substances Hydrology Program, Proceedings of the Technical Meeting, Charleston, South Carolina, March 8-12, 1999, Water-Resources Investigations Report 99-4018A, Volume 2 of 3 – Contamination of Hydrologic Systems and Related Ecosystems.

[55] Water Quality Protection Program for Monterey Bay National Marine Sanctuary, Action Plan III: Marinas and Boating, May 1996.

[56] B. Phillips *et al.*, Sediment Chemistry, Toxicity, and Benthic Community Conditions in Selected Water Bodies of the Santa Ana Region, SWRCB, Bay Protection and Toxic Cleanup Program, August 1998.

Residential wastewaters are discharged into treatment plants that discharge into these waters. Thus, the Project could increase TBT concentrations in water bodies that are currently impaired.

Sediment toxicity is a significant concern because organotin compounds accumulate in the sediments and pore waters, affecting benthic organisms. (Fent 1996a; Unger et. al;[60] Hoch 2001.[61]) Juvenile salmon, listed under the federal Endangered Species Act, commonly feed on epibenthic organisms, which are among the more sensitive to TBT exposure. Researchers at the National Marine Fisheries Services ("NMFS") recently established a sediment threshold of 120 ng/g (120 ppb) dry weight for TBT to protect salmonid invertebrate prey from severe acute effects of TBT. They noted: "at this sediment concentration some sublethal effects on benthic invertebrates, especially mollusks, are expected. If the intent was to protect all benthic species against sublethal effects, a sediment value approximately ten times (or more) lower would be more appropriate." (Meador et al. 2002,[62] p. 548.)

Sediment TBT data from the Bay Protection and Toxic Cleanup Program ("BPTCP")[63] indicate that about 15% out of 555 sediment samples equal or exceed 120 ppb. Additional testing is required to determine if this threshold is exceeded in critical habitat for listed salmonid species. However, based on the BPTCP testing, it is likely that this threshold is exceeded in some critical habitat areas. Thus, increased discharges of TBT from the Project could cause or contribute to adverse impacts to endangered salmonid species and their prey organisms.

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[57] B. Anderson et al., Sediment Chemistry, Toxicity, and Benthic Community Conditions in Selected Water Bodies of the Los Angeles Region, SWRCB, Bay Protection and Toxic Cleanup Program, 1998.

[58] U.S. Army Corps of Engineers, Los Angeles Regional Dredged Material Management Plan Feasibility Study, Baseline Conditions (F3) Report Technical Appendix, August 2004.

[59] North Coast RWQCB, Chemical and Biological Measures of Sediment Quality and Tissue Bioaccumulation in the North Coast Region, Final Report, October 1998.

[60] M.A. Unger, W.C. Macintyre, and R.J. Huggett, Sorption Behavior of Tributyltin on Estuarine and Freshwater Sediments, Environmental Toxicology and Chemistry, v. 7, 1988, pp. 907-915.

[61] M. Hoch, Organotin Compounds in the Environment - an Overview, Applied Geochemistry, v. 16, 2001, pp. 719-743.

[62] James P. Meador, Tracy K. Collier and John E. Stein, Determination of a Tissue and Sediment Threshold for Tributyltin to Protect Prey Species of Juvenile Salmonids Listed under the US Endangered Species Act, Aquatic Conservation: Marine and Freshwater Ecosystems, v. 12, 2002, pp. 539-551.

[63] http://gis.ca.gov/catalog/BrowseRecord.epl?id=1781

b. Unknown Toxicity

Numerous water bodies throughout the state are listed under Clean Water Action Section 303(d) as impaired by "unknown toxicity" or "toxicity" or "sediment toxicity." These include: most of the water bodies in Region 5 (Central Valley), *e.g.*, the Delta, the Sacramento River and San Joaquin River and Region 4 (Los Angeles) as well as some water bodies in Regions 6 (Lahontan), 8 (Santa Ana), and 9 (San Diego). The statewide 303(d) list is posted on the SWRCB's website.[64] Section 303(d) water bodies do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology.

Organotin compounds and other chemicals discharged by the Project cause aquatic and sediment toxicity and thus would contribute to these known impairments. The Project would increase the discharge of organotin compounds and other toxic chemicals into some of these Section 303(d) water bodies, contributing to ongoing violations of the narrative toxicity standard in Basin Plans throughout the State.

Although not explicitly evaluated in these comments due to time constraints, the Project would also result in the discharge of elevated concentrations of methyl ethyl ketone, cyclohexanone, tetrahydrofuran and acetone, among others, especially during the initial flush. These chemicals are known to cause aquatic toxicity. Further, dioxins have been detected in the extracts of CPVC extrudates. The HCD should sponsor studies to further investigate the leaching behavior of CPVC piping systems and aquatic toxicity of the resulting leachates. This information should be used to evaluate the cumulative water quality impacts of all of these chemicals combined in an EIR. The synergistic impacts of these chemicals should be considered.

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[64] http://www.swrcb.ca.gov/tmdl/docs/2002cwa303d_listof_wqls072003.pdf