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Mr. Dan Cardozo
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Dear Mr. Cardozo:

I enclose Thomas Reid Associates' comments on the California Department of Housing and Community Development June 30, 1998 Draft Environmental Impact Report for Chlorinated Polyvinyl Chloride (CPVC) Pipe Use for Potable Water Piping in Residential Buildings (SCH 970820040). My professional practice is preparation of EIRs and other environmental documents for state and local government and review of environmental documents prepared by others. My experience with CEQA dates to 1972 and my experience with the HCD plastic pipe approval process dates to 1980.

Our comments address major deficiencies in the EIR's definition of the proposed project, alternatives, and mitigation. Because the EIR relies heavily on NSF International standards as a substitute for the state's own investigations, we offer a thorough discussion of the NSF procedure and its limitations in application to the California CEQA process. We go on to discuss other inadequacies in the EIR treatment of water leaching and public health and in the environmental areas of solid waste, energy, fire, and socioeconomics.

The 1998 draft EIR appeared nearly a decade after an earlier, uncertified draft EIR. That older EIR and the technical studies that went into it identified several important gaps in technical knowledge, and since its publication in 1989, several additional health and environmental issues have emerged. In reviewing the 1998 draft EIR, it is disappointing that the state did not take advantage of the intervening years to procure information capable of resolving these issues. It is particularly disappointing that the state did not demand from industry information on CPVC formulation, leaching, and NSF test results that industry maintains unpublished, but which are essential to the state's capacity for independent review.

These comments are a criticism of the 1998 draft EIR; where possible we have indicated steps that HCD should take to more accurately and objectively convey information for public review. At present the draft EIR is a non-quantitative narrative based on selective information submitted by B.F.Goodrich and a cursory review of old studies that led HCD to dismiss potential impacts. This dismissal seems to be an internal HCD process – the public is not given enough information to be able to the see how the conclusions were reached and it is difficult for the public to be able to meaningfully comment on those conclusions.

When HCD concludes that all impacts are either insignificant or unsubstantiated, it misses a real opportunity to define controls and conditions of approval of CPVC that would allow California to mitigate and monitor the health, safety, and environmental impact of plastic pipe. Throughout the lengthy state approval process for plastic pipe there has been a steady evolution in our understanding of a range of issues, and we have seen real improvements in both metal and plastic plumbing systems: lead solder has been banned, DMF has been banned from solvents cements, low VOC adhesive rules are in place, and manufacturing processes for plastic resins have changed. We have seen polybutylene (PB) enter and depart the North American plumbing marketplace and leave no mark on California.

This evolutionary process is not complete. Real environmental issues still surround the adoption of CPVC plastic pipe, but the EIR ignores or belittles them. HCD has an opportunity and an obligation to address these issues; HCD has a responsibility to put California in a leadership position for worker and consumer safety. With the 1998 draft EIR, HCD has failed.

Sincerely,

Thomas S. Reid

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1. Introduction

A. Inappropriate Advocacy Tone

The HCD document is structured as a draft EIR but is deficient in terms of CEQA content and CEQA practice. While it is not uncommon for a lead agency to act as a project proponent, this EIR is unusual in its vigorous advocacy of plastic pipe. The EIR acknowledges that B.F. Goodrich, the primary CPVC resin supplier in North America, is the major source of information used by HCD in drafting the EIR. Unfortunately this extensive reliance on B.F.Goodrich prevents HCD from conducting the independent analysis required by CEQA. This reliance also prevents HCD from aggressively seeking out information which leads to alternative conclusions from the advocacy positions so clearly stated in the June draft EIR.

The June HCD document itself is well-written and clearly sets out HCD's policy objectives. It seems as if an editorial decision was made to eliminate contradictory information that might potentially detract from the clear policy statement. Except for the rather elaborate excursion into the perils of copper pipe, the draft EIR is remarkably lacking in analysis and documentation. Most of the statements regarding impact in the draft EIR are conclusory, lacking quantification and lacking substantiation. The abundant footnotes often point only to shallow or incomplete references, often provided by B.F.Goodrich.

A further matter of tone, apart from the advocacy, is the authors' apparent belief that the Lead Agency's proposed action does not warrant an EIR under CEQA. After all, the EIR is being prepared under order by the court (Superior Court of California, County of San Francisco, Judgment Granting Peremptory Writ of Mandate, Case Number 977657, March 13, 1997.) In many places, the authors seem incredulous and even offended that the CEQA process is being undertaken at all. For example, in explaining its inability to estimate future CPVC use, the EIR states,"other than in California CPVC pipe itself is simply an item of commerce which has never been independently regulated, other than through the Uniform Plumbing Code. (P. 2, emphasis added) Certainly the EIR sees the approval of CPVC for this specific application to be a logical step in a grand scheme: "In a sense then, the proposed Regulations to allow the use of CPVC pipe for potable water pipe in residential buildings are part of a much larger societal trend: The replacement of traditional, often natural materials produced at great environmental cost, with man-made products." (P. 3)

B. Inadequate Technical Information

The document is so dependent on B.F. Goodrich as a source of information that the EIR takes on the tone and flavor of a marketing piece. This is particularly troubling because B.F.Goodrich undoubtedly has information under its control (e.g. NSF) which the state could have used in preparing the EIR, but which B.F.Goodrich elected not to disclose and which HCD refrained from requesting.

The EIR presents no new information. It presents no studies, either conducted by the state or by industry. The EIR relies almost entirely on a vague recitation of the earlier, incomplete 1989 EIR, without re-presenting the substantive analysis of that earlier document. Because it offers only a summary of the older EIR, the current HCD document fails to explain the limitations of the older studies and presents a misleading account of the state of knowledge on plastic pipe. Given the time that has passed since the original draft EIR, it is hard to understand why HCD would not have undertaken at least some technical analysis of the wide range of pending issues concerning use of CPVC for potable water systems..

There are numerous potentially significant impacts associated with HCD's proposed action. These potential impacts have been identified during public scoping and in comment on the earlier draft EIR -- but the EIR either dismisses the issues with scant analysis or ignores the issues altogether. In many of these areas, the draft EIR faced a difficult task because information is incomplete. The EIR should have acknowledged the inadequacy of the decision making basis and attempted to obtain new information to acknowledge the uncertainties. Instead, the EIR merely comes to a conclusion that there is no evidence for potential adverse impact.

There are many examples of this. One is the EIR's dismissal of the recent awareness of potential carcinogenicity from Tetrahydrofuran (THF). Another example is the EIR's omission of any discussion of the adequacy of gloves to reduce worker exposure to solvents. This cavalier dismissal of problems with plastic pipe contrasts with the EIR's treatment of copper pipe. Without acknowledging our vastly longer history with copper piping, the EIR raises health and environmental impact questions about copper pipe in an effort to offset or counter balance the EIR's inadequate discussion of plastic pipe. Indeed, the EIR authors seem genuinely disappointed that lead is no longer associated with copper based plumbing, because lead's obvious toxicity simplifies the policy determination that the EIR is attempting to make.

The EIR seems to follow the following logic: 1) there are questions about CPVC pipe for which we don't have all the answers, but there is nothing obviously terrible about plastic pipe; 2) we can identify health questions about copper pipe as well; 3) the fact that questions have been raised about CPVC is not a reason to forbid its use in California. The problem with this logic is that it ignores the state's CEQA obligation to fully investigate the nature of the questions regarding CPVC pipe and to make a good faith, independent, and objective effort to answer those questions prior to the state proceeding to act.

The following technical discussion illustrates these particular failings. We present some new information gathered over the past few months. This includes preliminary laboratory work and recent publications. We also include technical analyses of several subject areas that the EIR ignores.

The EIR authors may view these comments as unnecessarily technical and may consider the issues raised as irrelevant to a decision which the Lead Agency seems to have already made. In fact, the issues raised here are essential to the state's decision. Approval of CPVC pipe for potable water in California will presumably lead to construction of new homes with CPVC plumbing. That plastic plumbing will be an essentially permanent component of the environment; if there are health, safety, or environmental impacts of that plastic plumbing, it is only common sense and responsible government to clearly identify problems and practical mitigation <u>in advance</u>. Given the scanty technical analysis in the 1998 draft EIR, the Lead Agency does not posses adequate information to proceed with the decision-making process.

The EIR attempts to rationalize this deficiency when it states: "To the extent there may be some unknown risks, the known benefits of a greater choice of building materials outweigh those risks." (P. v) This document clearly shows that the state has not made a good faith, objective effort to make known the "unknown" risks.

2. Incorrect Statements of Existing Code and Usage

The EIR includes several glaringly incorrect statements that affect the accuracy of the project description and the definition of alternatives. Incorrect statements regarding approval and use of CPVC in other states or for public water supply invalidate the EIR definition of both the existing environmental setting and the effect of the No Action/No Project alternative. The EIR addresses copper pipe both in the No Project and in other alternatives. Incorrect statements about the regulatory status of copper pipe invalidate EIR treatment of those alternatives.

A. Incorrect Statements of the Applicable Plumbing Code Sections Subject to Lead Agency Action

According to the Proposed Code Change in the EIR's appendix (p.5), the project under consideration by HCD is Section 604.1 of the UPC and the addition of two provisions related to the use of CPVC. The wording of these "two provisions" is not provided. The reader must go through the various codes and standards presented in the Appendix and determine exactly what would be adopted. It is not clear that this code adoption takes into account the full extent of all the appropriate standards that are referenced in the UPC.

Relevant sections of the 1995 code have been left out of the appendix such as: "**316.1.5 Solvent Cement Plastic Pipe Joints.** Plastic pipe and fittings designed to be joined by solvent cementing shall comply with appropriate IAPMO installation standards....CPVC and PVC pipe and fittings shall be cleaned and joined with listed primer(s) and solvent cements." Why was this very relevant section left out of the EIR appendix?

Further, the inclusion of the 1995 Plumbing Code (p.10) and the 1993 Installation Standard for CPVC Solvent Cemented Hot and Cold Water Distribution Systems (p.29) does not even take into account the most up to date 1997 UPC. The 1997 UPC will be shortly adopted as the 1998 California Plumbing Code (CPC). Since this project will be implemented using the 1998 CPC, this is the code that should have been cited in the appendix. There have been changes in the UPC since the 1995 CPC was adopted. For example, the Installation Standard for CPVC Solvent Cemented Hot and Cold Water Distribution Systems in the EIR appendix IAPMO IS 20-93 (p.29) has been updated as IS 20-96. IS 20-96 requires that primer be used whereas IS20-93 does not: "**316.1.1.3 Primer.** A listed primer in compliance with ASTM F 656-93 shall be used on all CPVC solvent cemented joints."

Why would the EIR refer to codes that will be outdated by the time the project comes before the Building Standards Commission for approval?

B. Misstatements Regarding Existing Use in California

The EIR claims that, "CPVC and its parent polymer PVC are approved for use in public water supply systems. Therefore, the existing environment of potable water piping in California includes CPVC in the supply systems ..." (EIR, p.20) While it is true that the UPC permits the use of CPVC pipe in public water supply systems, CPVC is in fact <u>not used</u> and therefore it can not be considered as part of the existing environment as the EIR states. The EIR authors assume that since CPVC is part of the existing environment that the impacts of adding additional CPVC are not as great, however this is simply not true.

CPVC is <u>not</u> used in public water supply distribution in California. The following California water districts were surveyed by telephone in August 1998: San Francisco Water Department (Bruce Hubley, Distribution Dept.), East Bay Municipal Water District (Pat Clinton, Distribution Dept.), Los Angeles Division of Water and Power (Kenneth Mak, Engineering Dept.), San Diego Water Utilities Department (Myrna Dayton, Engineering Dept.) and Coachella Valley Water District (Jim Zimmerman, Service Dept.). These districts cover the largest urban areas in California: San Francisco Bay Area, Los Angeles and San Diego and one southern central valley district. In addition, the chair of the California Chapter of the Water Distribution System, American Water Works Association, was interviewed about piping materials used in California in water distribution systems.

None of these five water districts use CPVC in their water distribution system, generally because PVC is less expensive. In addition, the chair of the California Chapter of the Water Distribution System, American Water Works Association, has never heard of CPVC being used in water distribution systems in California (Robert Clark, Capistrano Valley Water District).

Of these five districts, only the San Diego Water Utilities Department and the East Bay Municipal Water District use PVC in water distribution. Pat Clinton, Distribution Systems Engineering, EBMUD, (pers. comm., 8/20/98) estimated that in it's new installations, East Bay Municipal Water District (EBMUD) uses about 66%- 75% PVC, the remainder of the piping material is steel.

When PVC is used, it is typically <u>not glued</u> together, but it is mechanically joined by a push fitting with a rubber gasket or ductile iron fittings with no glue or solvents cements involved. Occasionally, small diameter -- 2 inches -- PVC pipe is solvent cemented, but the circumstances requiring only 2" diameter piping are infrequent, since fire protection fire flow requirements now require a minimum of 6" diameter pipes for adequate pressure.

The decision to use PVC pipe or steel in EBMUD takes into account size (pipe diameter) requirements, whether the installation site may have subsurface toxic contamination, slope of the site, landslide potential, crossing fault zones, and anywhere there would be high property damage if the pipe failed. PVC is used for 2" - 8" diameter installations; steel pipe is used in 6" - 12" diameter and greater. PVC will not be used if there is a potential of permeation from contaminants such as hydrocarbons from former gas station sites or pesticides from former agriculture sites. PVC is not used where the grades are steeper than 15% because only pipes materials with restrained joints are allowed. On steep slopes, steel welded pipes are used because they are restrained joints that will not burst under pressure. PVC pipe fittings will blow off under pressure. PVC will not be used in areas that cross fault zones because it can't take the shear stress from fault movements. When PVC fails it is a catastrophic event because it ruptures completely, whereas steel may just spring a leak that can be fixed by welding. Therefore any area that would suffer costly property damage due to a pipeline rupture (e.g. homes downslope of a pipeline), steel is used as a precautionary measure.

This finding from this survey is in sharp contrast to the EIR's assertion that CPVC pipe, as defined in the EIR for the purposes of the proposed action, is already part of the California environment because of its use in public water supply distribution. The "CPVC pipe" project under study in the EIR is solvent-cemented, small diameter CPVC. The pipe used in public water supply distribution is sometimes plastic, never CPVC, and practically never solvent-cemented. Because of this fundamental error, the EIR authors may have been led to incorrectly conclude that the absence of public health concerns over leaching from plastics from public water supply distribution in California meant that there were no legitimate analogous concerns for CPVC use in residential installations.

C. Misstatements Regarding standards for metal pipe

In an attempt to disparage metal pipes, the DEIR makes several misstatement about the standards for metal pipe. The DEIR states, "By way of contrast while there are established standards, tests, and certification for the health effects of CPVC pipe, at the time of writing this EIR there are no such requirements for metallic pipe and fittings. The Lead Agency is not aware of any assessment of the potential health risks presented by trace contaminants of copper in potable water pipe" (Footnote 9, p.7). This statement is incorrect because there are established standards for metal pipes. NSF 61 addresses metal pipes as well as ASTM and AWWA standards. In the same way, ANSI/NSF 61, Section 9 approves metal fittings.

The DEIR states, "...It is important to note that at the time of writing this EIR, independent testing and certification to established standards is not required for metallic pipe used for potable water systems in residential buildings" (Footnote 10, p.7). The DEIR also states, "By way of contrast metallic pipe used for potable water piping in residential buildings in California is not subjected to NSF or other independent testing for safety or suitability; instead it is self-certified by the manufacturer as meeting standard specifications, which relate to physical parameters of the pipe and fittings and do not include water contamination criteria or testing for safety" (Footnote 21, p.17). This statement is incorrect because the UPC requires that copper pipe used in water service meet ASTM standards which includes a testing and certification process.

The text of the EIR must be changed to reflect the UPC's requirement that copper pipe meet ASTM standards and omit all statements that metal pipe does not need to meet any standards for safety or suitability.

D. Misstatements Regarding Lead In Copper Plumbing Systems

Another systematic error affecting the EIR definition of the environmental setting and the No Action alternative is the lingering confusion over the extent of lead which will leach from a copper pipe system installed under current building codes. Lead solder was banned in 1986 in California; approved solder contains less than 0.02 percent lead. Copper pipe itself contains a negligible amount of lead (<10 ppm, CH2M Hill, Aug 1987, HCD-82, P. I-3). The EIR includes an unsubstantiated and speculative statement, "The extent to which high lead content products are still used despite the codes and labeling is open to question. <34> {Katz, E. 1998. Letter w/3 attachments. 3 pp. HCD } It is a certainty that the low lead solders and brass foundry products still contribute some lead to tap water. " (P. 33) and "This includes the concern raised by DHS <71> regarding the apparent continued use of lead-based solders by installers of copper pipe. " (P. 69) Reference to the Katz, DHS letter shows it to be based on a phrase in a 1989 report (Bellows) describing lead solder in the tool boxes of plumbers observed during a worker safety survey. That survey was conducted in 1988 outside of California, not long after the federal lead solder ban. The presence of the solder does not mean it was being used.

HCD's EIR is being written in 1998, and HCD and DHS presumably have access to current information regarding compliance with the lead solder ban in California. Does the Department of Health Services have evidence that the state code ban on lead solder is being routinely violated? Has this information been made public and what is program of enforcement is in place? If the state has no such evidence, then the EIR should exclude these statements. Inclusion of this sort of incorrect statement biases the EIR analysis of the No Project alternative and leads the reader to question the basis on which the draft EIR findings are made.

3. Incomplete Project Description

A. Overview

The project description in an EIR is the key to adequate analysis of environmental impacts of a proposed action. In this case the project description fails in several important regards. The EIR

1. Presents an incomplete description of the plastic pipe system subject to expanded use upon lead agency action.
2. Presents an incomplete and non-quantitative characterization of CPVC pipe formulation.
3. Fails to address contamination of CPVC resin.
4. Fails to discuss the undefined characteristics of low VOC cement.
5. Fails to identify reasonably foreseeable actions which contribute to cumulative impacts.
6. Presents an incomplete and speculative definition of which mitigating measures are incorporated in the proposed project and how those measures are to be implemented.
7. Makes erroneous assumptions about the definition of the No Project alternative.

These deficiencies are disappointing because the need for this information was identified during the public scoping process. Without this information the EIR cannot adequately identify potential environmental impacts, nor can the EIR begin to quantify the magnitude of potential impacts.

B. The CPVC Plastic Pipe System in Residential Installations

Most Current Uniform Plumbing Code (UPC) Not Used

In introducing the project description, the EIR addresses the proposed code change (P. 1) by referring to the key paragraph on page i of the code and the expanded texts of the relevant code in the technical appendix. Relevant sections of the 1995 code have been left out of the appendix such as: 316.1.5 "... CPVC and PVC pipe and fittings shall be cleaned and joined with listed primer(s) and solvent cements." Inclusion of the 1995 Plumbing Code (p.10) and the 1993 Installation Standard for CPVC Solvent Cemented Hot and Cold Water Distribution Systems (p.29) does not even take into account the most current 1997 UPC. The 1997 UPC will be shortly adopted as the 1998 California Plumbing Code (CPC). Since this project will be implemented using the 1998 California Plumbing Code, this is the code that should have been cited in the appendix. Changes since the 1995 CPC was adopted include IAPMO IS 20-96 explicitly requiring that primer be used. Even recognizing that California's code adoption cycle necessarily lags the action of IAPMO, the EIR's use of already out of date material affects the accuracy of its treatment of solvent cements. Many of HCD's conclusions about worker safety and consumer health rely on the belief that solvent usage for primers and cements is lower than in the 1980s when the work for the earlier EIR was done. The EIR should list in a table the code changes that will pertain to health, safety and environmental impacts.

Manufacturers

That the primary source of information relied on by the EIR authors is clear from the references and from the emphasis in analysis. Only B.F.Goodrich personnel are referenced in Chapter 11: Organizations And Persons Consulted, and the only industry citation in the EIR is to "B.F. Goodrich. 1997. Background Material for Consideration in Writing the EIR for CPVC Pipe in Residential Buildings in California. October 1997." (Footnotes 4, 52, and 53 or other footnotes referencing B.F. Goodrich documents). The EIR notes, " ... the Lead Agency has: ... considered ... information submitted by manufacturers of CPVC pipe, the plastics industry, ..." (P. 3), but the authors in fact have made no effort to identify manufacturers other than B.F.Goodrich that may make CPVC resin for the future California market. It is clearly insufficient to rely on B.F.Goodrich's dominance of the North American market. To do so is to fail to recognize the economic opportunities for plastic pipe manufacturers that will be created by the lead agency's action and to ignore the real potential for other manufacturers' products to be used in California. The EIR should list the half dozen or so major resin manufactures that may be seeking the California market place..

This omission sharply limits the applicability of the EIR's analysis and contributes to its editorial tone as a marketing document for B.F.Goodrich. By focusing only on B.F.Goodrich, HCD only requested information from B.F.Goodrich, and hence was not made aware of a broader range of environmental issues relevant to HCD's proposed project. These potential issues include the use of stabilizers other than organotins or manufacturing processes that may introduce chlorinated solvents or other contaminants. HCD brushes off the issue of other manufacturers by relying on the NSF approval process for products to be used in California. As discussed elsewhere this reliance is incomplete and unfounded, even as it applies to B.F.Goodrich products. When HCD fails to identify potential health issues for other manufacturers, HCD cannot analyze those issues in the EIR and it cannot show that all potential exposure is subject to testing by NSF, and hence has no basis for relying on NSF.

Range of CPVC Pipe Products

The EIR appears to focus on only a part of the range of products which would be permitted by the Lead Agency's proposed action. The draft EIR cites the UPC and its reference to CPVC "tubing". Reference to the list of manufacturers in the NSF certification document shows that there are flexible CPVC tubing products on the market. The EIR only describes rigid CPVC tubing as the basis of the potable water pipe system. Does the state intend to limit CPVC approval in California to only rigid CPVC?

Because slab-on-grade construction is common in California and contributes to most of the mass produced housing, the availability of a flexible, sub-floor installation material is economically important. Most copper piping installed in California is "soft copper" flexible tubing which can be routed around the structure with a minimum of joints. This is a labor saving feature that would be emulated in plastic and was one of the reasons why PB piping was recognized as having a market advantage over CPVC in the 1989 draft EIR.

In its dismissal of permeation risk, HCD states that there will only be CPVC in the structure and no CPVC in the ground. Does HCD believe that codes or good construction practice allow plastic pipe to be made with solvent joints and then be sealed beneath a concrete foundation slab? Does HCD exclude under-slab construction? If a flexible CPVC product is available it would be aimed at this market. However, the EIR neither identifies the availability of flexible CPVC nor does it describe the composition of flexible tubing or its potential for environmental impact.

Hot Water Temperature

The EIR misstates the operating environment of potable water piping in California. In discussing suitability for use the EIR states, "Hot water in residences is 110° by California Building Codes. CPVC is suitable for water temperatures over 200°." (P. 5) Most domestic hot water applications for clothes and dish washing demand higher temperatures. Hot water heaters are sold in California with temperature settings well in excess of 110 degrees Fahrenheit. In fact, the Uniform Plumbing Code Section 502.13 defines a water heater as an appliance with controls limiting water temperature to a maximum of 210 degrees Fahrenheit. The EIR should be based on a realistic temperature range based on actual usage in residences. HCD should determine whether temperature settings on water heaters are intentionally made lower for CPVC installations to take into account the inherently lower temperature capacity of the plastic pipe system. Does the manufacture or any pipe extruder or installer make this recommendation?

Determining and accurately portraying the temperatures which will be faced by expanded CPVC installation is an essential component of the project description. The temperature on the hot water side is relevant not only to issues of consumer product reliability, but also to issues of public health and safety. It is widely acknowledged, even in the EIR, that chemicals will leach more quickly when exposed to hotter extractant water. The EIR authors dismiss the role of hot water leaching, believing that only cold water is used for drinking and hence will be the only mode of exposure, "These extraction tests are performed at elevated temperatures, and so the actual concentrations of organotins in drinking water would be lower than suggested by these test data. " (P. 39) Comments on public health (see Dr. Martin Smith and Ms. Peggy Lopipero) show clearly that inhalation and skin exposure during bathing are important for both solvents and for organotins.

Potable Water Pipe Environment

The EIR is supposed to address the full project: the code change which would allow CPVC pipe for residential installation. The analysis in the EIR, however, is limited to pipe installation in the walls and floors of the structures themselves, and omits consideration of the run of plastic pipe from the water meter or any under-slab construction. This narrow focus is illustrated when the EIR talks of permeation, "The proposed building standards apply to potable water piping in the interiors of residential buildings. ... It is difficult to imagine a realistic scenario where the potable water pipe in the interior of a residential building would be subjected to prolonged contact with very high concentrations of harmful materials, such as gasoline, capable of permeating the pipe. (P. 61) The residential installation begins at the water meter, which is usually installed at the property line or between the curb and the sidewalk. This will afford some 30 to 50 feet of in-ground exposure. As discussed above, the slab-on-grade style of construction is popular in California (where there is no frost-line), this would result in an additional 50 to 150 feet of ground exposure. The draft EIR omits this important component of the project. HCD should determine what extent of future installations of CPVC would be under-slab.

C. Pipe Composition Manufacture

The discussion of public health in the EIR is presumably based on the EIR's definition of CPVC pipe resin formulation set forth in the project description. The information provided in the EIR is incomplete and non–quantitative. Correct and complete information could have been readily provided by reference to published industry sources or from B.F.Goodrich.

Part of the trouble stems from the EIR failing to draw a distinction between the primary polymer manufacturer and the pipe extruders. How many different products are offered by the resin manufacturer? B.F. Goodrich alone offers several different pipe resins, with different polymers and additives. What additional compounds may be added by the pipe extruders when the resin is formed into the marketable product? Do extruders add additional stabilizer or lubricants to pipe resin?

In several places, the EIR authors show a lack of familiarity with the manufacturing process. For example, the EIR states, "In addition, the chemicals Chloroform and Carbon Tetrachloride are formed during the manufacture of PVC and CPVC resins and have also been detected in water during leaching studies." (P. 22) This statement ignores the fact that chloroform and carbon tetrachloride were deliberate additives in the manufacturing process for the pipes analyzed in the referenced leaching studies. Later, the EIR attempts to narrow its discussion of leaching to organotins and to "Products formed from the reaction of chlorine during the production of CPVC resin. The chlorine reaction products are addressed in the next section, Disinfection By-Products. This includes the chemical chloroform, which is not only formed by reaction with chlorine, but also can be used in the manufacture of CPVC resin. The Lead Agency does not consider the exact origin of a trace impurity to be particularly relevant to the potential for significant impacts from its presence. " (P. 33) This statement ignores the significance of whether a substance in the drinking water is deliberately included in the pipe manufacture or is a contaminant of the pipe or is formed in the water later.

If HCD believes that the halocarbons are formed by the disinfection process, does HCD believe that they will be formed by reaction with normal chlorinated water. Does HCD know if the compound would be detected by NSF's extractant process. If a contaminant is in the pipe, NSF might find it. If it is formed in usage, NSF would not. Thus HCD cannot ignore the distinction.

As discussed below there are other contaminants which may be formed in the chlorination of PVC which are not addressed by EIR.

CPVC Resin Formulation

The draft EIR describes pipe-grade CPVC resin on pp. 5 and 25. Only a narrative is supplied -- there is no identification of the actual chemical substances used, or their quantity. The EIR merely identifies, "Organotin stabilizers ... The predominant pigment is titanium dioxide ... The lubricants are paraffins, which are derived from petroleum, and derivatives of stearic acid, which is obtained from plant and animal fats. " (P. 25) The only polymer mentioned is chlorinated PVC, there is no mention of polymer additives or polymer modification to improve resin characteristics.

Given the EIR's reliance on B.F.Goodrich as a source of information and given B.F.Goodrich's willingness to provide information (HCD-199 and HCD -227) it is remarkable that HCD did not at least include a full description of CPVC pipe resin as formulated by B.F.Goodrich. This information is not a trade secret. The NSF approval process relies on a standardized formulation of CPVC pipe, described below. B.F.Goodrich itself has provided formulation listing in patents which are readily available to the public (see Attachment B for examples of B.F.Goodrich CPVC patents: B.F. Goodrich CPVC patent No. 5,591,497; CPVC patent No. 5,194,471; and CPVC patent No. 4,377,459). The description of the "common art" of PVC is applied to the CPVC pipe formulations in great detail in No. 5,194,471 which describes a product quite more complex than the one contemplated by the EIR authors.

Because HCD does not list CPVC resin manufactures, it does not list different manufacturing methods that may affect the range of water contaminants. HCD notes that NSF seeks such formulation information, presumably because it is relevant to health issues, but HCD did not seek that information. Note that because of the use of a "range formula" discussed in comment Section 4, NSF may not receive anything more than a generic formulation from the manufacturers.

The issue of manufacturing is not academic. In the earlier leaching studies, high, unacceptable levels of chloroform and carbon tetrachloride were found. This contamination came from residual amounts of these chemicals that were used in the manufacturing process. Later changes in B.F. Goodrich PVC chlorination methods eliminated these material (Attachment B, Patent 4,377,459; 1983). This does not mean that other manufacturers do not use these. In one of its patents, B.F. Goodrich states that "CPVC can be made according to any commercial chlorination process or the like such as by a solution process, a fluidized bed process, a preferred water slurry process, a thermal process, or a liquid chlorine process. Inasmuch as chlorination processes for preparing CPVC resins are established and CPVC is readily available in the art, they will not be discussed in great detail herein." (Attachment B, Patent 5,194,471; 1993). HCD should inform the reader what this means for the proposed project.

Polymer Additives and Impact Modifiers

Polymer modification entails changing the nature of the CPVC resin by adding co-polymers or other polymers such as butadiene rubber. These polymer modifications are intended to add toughness or flexibility to brittle, stiff CPVC pipe. Is CPVC the only polymer present in pipe-grade resin? B.F.Goodrich mentions an "impact modifier" in its patents: "CPVC compositions, pipe, and a method of preparing a pipe are disclosed and comprise CPVC having 63% to 70% by weight chlorine and preferably 65% to about 69% chlorine; a high rubber impact modifier comprising a graft copolymer of a rubbery polydiene and one or preferably more than one hardening monomer selected from a group consisting of a vinyl aromatic monomer, a (meth)acrylate, and a (meth)acrylonitrile monomer including mixtures." and "13. An extruded chlorinated polyvinyl chloride pipe derived from a composition comprising chlorinated polyvinyl chloride having 65% to 69% by weight chlorine, a copolymer impact modifier comprising polybutadiene and having a Shore D hardness of from about 35 to less than about 64, chlorinated polyethylene, a stabilizer, an acrylic process aid and titanium dioxide" (see Attachment B: BF Goodrich CPVC patent No. 5,591,497)

One of B.F.Goodrich's premier products is called "Flow Guard Gold" which is touted for its greater impact resistance. Is there an additive to Flow Guard Gold to give it properties not available in resins from competing manufacturers? If CPVC resin is characterized as "hard", does B.F.Goodrich need to modify the polymer in the resin to produce a flexible or semi-rigid tube?

Thermal Stabilizers

As pointed out by the EIR, thermal stabilizers are necessary to prevent degradation of the CPVC resin during extrusion and use (P. 25). Thermal stabilizers are used for both CPVC and PVC; the greater temperature resistance of CPVC compared with PVC is offset by the need to use even higher temperatures during resin extrusion. The tendency for vinyl plastics to lose mechanical and color qualities in manufacturing has great economic importance to the industry. The subject matter of thermal stabilization for PVC and CPVC is very broad and well documented.

Non-tin Based Stabilizers

Organotin compounds are by no means the only materials used as thermal stabilizers. Other heavy metals including lead are used for vinyl plastics and apparently for vinyl tube used for potable water.

Lead is probably the earliest and chemically possibly one of the most effective stabilizers for vinyl. Lead-based stabilizers are widely used in flexible PVC and outside of the United States are used for potable water tubing, as observed by Glenn R. Atkinson, in *Polyvinyl Chloride Processing Stabilizers: Lead and Its Derivatives*, "Although the use of basic lead stabilizers in rigid PVC in the United States is somewhat limited, throughout the rest of the world, their use in these applications is quite common. The fact that the markets developed differently over the past 30 years was due primarily to differences in extraction standards developed for determining the leachability of lead stabilizers from PVC potable-water pipe. National Sanitation Foundation (NSF) Standard 14, the original extraction method, was a much more severe test than International Standards Organization Standard 3114, the method used throughout the rest of the world. Recently, the NSF methods were changed to reflect the actual use of the pipe. In a study funded by the Lead Industries Association, it was shown that lead-stabilized rigid-PVC pipe can be formulated adequately to meet the new NSF Standard 61 requirements. (Editor's note: There is currently no indication that the National Sanitation Foundation is considering or will consider approval use of lead-based stabilizers in PVC pipe.)" Chapter 20 in Jesse Edenbaum, ed. Plastics Additives and Modifiers Handbook, Chapman & Hall, New York. 1996 P. 334.

This text is relevant to two aspects of the EIR. First it provides HCD information on an alternative stabilizer, lead, that was not evaluated in the EIR. It shows that potable water products are manufactured with this stabilizer and should be included in the project description. NSF does not prohibit CPVC pipe made with lead-based stabilizers. If these products can pass NSF 61, then they would be permissible in California, and any amount of lead leaching from these classic products would need to be appraised cumulatively with other forms of potable water lead exposure.

Second, the text points out how NSF 61 incorporation of the "normalization factor" to reflect "at the tap" exposure amounts to a relaxation of extractant testing rigor. This adds another dimension of uncertainty to HCD's reliance on NSF, because HCD must independently determine that the NSF normalization factor is sufficiently protective of public health in actual usage in California and would result in potable water delivery in compliance with California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65).

Apparently some vinyl tubing manufacturers do not share HCD's phobia of lead. According to the European Council of Vinyl Manufacturer's website (www.pvc.org) question and answer page (Attachment E):

"**Q** Why is lead used as a stabilizer? Isn't lead a poisonous material?

"**A** Lead is an abundant, naturally-occurring metal and PVC products have been stabilized with lead compounds since the early 1930s. Lead is the most important stabilizer for rigid PVC applications...Among the principal applications using lead stabilizer systems are long-life products for the construction sector such as pressure pipes for potable water transportation..."

HCD needs to determine what other stabilizers including those with heavy metals other than tin may be used for vinyl potable water products. In order to adequately disclose the realistic range of CPVC products which may be used in California once HCD adopts its proposed plumbing code change, HCD needs to examine commercially available stabilizers used for both CPVC and PVC.

Commercial PVC data is relevant to CPVC because of the chemical similarity and the history of commercial application of PVC additives to CPVC manufacture. When defining the applicability to the EIR, it states, " ... this EIR may also be of relevance to possible future projects involving plumbing materials and the use of plastics, especially CPVC and its parent material, PVC. ... the Lead Agency expects the EIR may be of some use in the preliminary review and scoping of future projects which have potentially significant impacts related to the use of CPVC and PVC for other purposes." (P. 6) In attempting to broaden its assessment of leaching, the EIR refers to PVC public water supply piping and justifies that inclusion by referring to "CPVC pipe and pipe made from the parent polymer PVC " (P. 34) However, in the project description, the EIR seems to offer nothing more than a narrow, colloquial depiction of B.F.Goodrich CPVC products, ignoring other manufacturers and ignoring the broader, more competitive PVC industry.

The European defense of the use of lead based stabilizers and the absence of any U.S. prohibition on their use in potable water pipe means that HCD cannot ignore the possibility of lead as a deliberate pipe resin constituent. As discussed below under contamination, a screening-level laboratory test detected lead in an aqueous extraction of B.F.Goodrich CPVC pipe (Attachment Q).

Organotins

Even within the class of organotins, there appears to be numerous formulations available for use. These variations include different alkyl groups bonded to the tin atom, different numbers of alkyl groups, and different bonding schemes for the organotin sub-units. While these different model additives will probably leach similar organotin compounds, the overall molecular structure may significantly affect the rate of degradation and migration of organotins from the polymer matrix. Use of different thermal stabilizers formulations by different CPVC resin manufacturers may result in dramatically different organotin leaching rates into drinking water. Although there has been no systematic study of organotin leaching, the preliminary results from the most recent Sadiki study found that there appears to be variation between PVC pipe samples (Sadiki and Williams, "*A study on organotin levels in Canadian drinking water distributed through PVC pipes*", Health Canada). According to the results of PVC pipe sample extraction:

"Of theses [15] samples of PVC pipe, 12 contained monomethyl- and dimethlytin, 2 contained monobutyl- and dibutyltin and 1 contained a mixture of the four compounds with more butyl- than methyltins."

Lubricants

Lubricants used in the manufacture of CPVC are generally from the class of soaps or waxes. Because of their established effectiveness and low-cost, there appears to be little range of commercial substitution of products with a resultant greater potential public health impact. It should be noted that the residue of lubricants on the surface of the pipe contribute to the need to use a primer or cleaner prior to cementing a joint. Development of a "one-step" cement may be paralleled by changes in extrusion lubricants. B.F.Goodrich patent literature refers to lubricants which are acrylic.

Pigments

The EIR only mentions titanium dioxide as a pigment. As sold, CPVC for potable water use is colored with pigments other than titanium dioxide white. There must be other substances used as pigments, such as carbon black, iron oxide, or organic dyes. If the EIR authors have access to a listing of dyes or pigments, it should be included in the EIR for completeness. As it is, the selective and obviously incomplete listing of CPVC constituents demonstrates the inadequacy of the EIR project description.

Future Change

CPVC is an evolving product. Even over the course of the state of California EIR process, the manufacturing methods and formulation of CPVC for potable water use has changed. The HCD EIR acknowledges the likely changes in the future without identifying the nature of these changes and tbe possibility that new potential leachates or contaminants might result. While it is laudable to instruct NSF to be aware of future formulation changes, the EIR is inadequate without at least a preliminary consideration of the nature of these changes and as discussed elsewhere in these comments, the NSF process cannot ensure that significant impacts on public health will not occur. How does HCD expect to keep track of future changes? Does the state need to be able to continue monitoring future changes in the plastic pipe it plans to approve?

Based on patent literature, we expect changes in formulation for CPVC to occur due to different manufacturing processes (PVC chlorination), different additives (stabilizers, etc.), and polymer modification. To ensure the protection of public health and safety, the EIR should establish review procedures for the use of new formulations of CPVC .

D. Contamination of CPVC Resin or Pipe

As with any industrial product, CPVC resin is subject to contamination by unwanted chemical substances. The contamination can come from several sources: impurities in starting materials, or reacted or residual starting materials, and substances created during the manufacturing process or added in extruding resin to make pipe.

Trialkyltin

One class of deliberate additive is thermal stabilizers. The EIR claims that tributyl tin oxide (TBTO) is not added to CPVC resin. " TBTO is not added to CPVC. The organotins used as stabilizers in CPVC are far less toxic than TBTO. ...The highly toxic organotin TBTO is simply not present in CPVC. (P. 40) If the EIR had included a more thorough discussion of thermal stabilizers it would have shown the reader that the alkyl tins are breakdown products from the stabilizers and in these forms are not added to CPVC either. The EIR should also have included the literature reference to the relationship between alkylation number and value as a thermal stabilizer. This would have shown that the objective for an organotin stabilizer is to provide dialkyl or mono-alkyl tin in preference to tri-alkyl tin, combined in a larger molecule.

Whenever alkyl tins are found leached into water, it is because those molecular fragments have been released from the original formulation. Thus, it is not a matter of whether TBTO is deliberately added to CPVC, it is a matter of whether tri-alkyl tin is present as any constituent. The commercial manufacturing process for alkyl tins begins with a fully organic substituted tin – tetra alkyl tin – which is mixed with an inorganic reactant, usually chlorine, to lower the alkylation number. Thus in producing a mixture of mono- and di- alkyl tins, there will be incompletely reacted trialkyl tins left as a contaminant.

Because the EIR does not examine the actual thermal stabilizers in use for vinyl plastics, it is not surprising that it also does not seek to determine whether tri-alkyl compounds could be present. There is evidence that tri-alkyl compounds can appear in pipe resin and in water, albeit at far lower concentrations than for the mono-and di-alkyl forms. According to the Sadiki study on organotin leaching from PVC pipes, tri-methyl tin was observed leaching from PVC pipes at a level between 0.5 and 1.0 ng Sn/L (HCD-334, p.2396).

In a laboratory test conducted for Thomas Reid Associates, CPVC pipe turnings were extracted with water and with water with a chlorine residual maintained over a period of several days. The extraction was conducted by Anresco Lab (Attachment O) and the organotin measurements were made by West Coast Analytical Laboratory (Attachment Q). In all of the several pipe samples, tri-alkyl forms were found, whereas none were found in the blanks not exposed to CPVC pipe material. (See Attachment Q Report "A" pages 3 & 4 and Report "C" pages 3 & 4.)

There are very few laboratory studies of organotin leaching from vinyl pipe material. It is not easy to determine whether the studies actually looked for tri-alkyl as opposed to mono or dialkyl forms. For example Forsyth and Jay may not have been able to detect trialkyl tins. The only study stating that trialkyl tin compounds were studied was Boettner, 1982.

We do not know the actual magnitude of contamination, because there has been no systematic attempt to determine actual tri-alkyl tin presence in CPVC resin. Because it appears as a contaminant we would expect the presence of tri-alkyl tin contaminants to be highly variable. Ideally, we could look to NSF to see whether tri-alkyl tin contamination had been noted in the past, but unfortunately NSF conducts no organotin measurements and its tests of inorganic tin are naturally incapable of determining the nature of organotin compounds present in pipe leachates. The project description should discuss the potential of tri-alkyl tin contamination and present laboratory analysis of tri-alkyl tin presence in CPVC resin.

Residual Monomer

CPVC is made from PVC, a polymer of vinyl chloride. Because vinyl chloride monomer (VCM) is a known carcinogen and because earlier manufacturing of PVC and CPVC resin tests allowed substantial VCM residual in the finished product, NSF adopted a VCM leaching test as part of its standard protocol. Interestingly, residual vinyl chloride is still detected in the public water supply from pipes installed over a decade or more ago. This illustrates the capacity for vinyl plastic to leach substances over a very longtime. According to a US EPA letter regarding vinyl chloride contamination in the Kansas public water supply: "KDHE [Kansas Department of Health and Environment] believes they have collected enough samples from different areas of the distribution system to conclude that the vinyl chloride appears to be leaching from the oldest 70-80% of the distribution system, that is, the pipe that was installed in the late 60's and early 70's." (see Attachment D: Elizabeth Murtagh Yaw, USEPA, April 1, 1993 letter to Mr. Dave Eckstein, Uni-Bell PVC Pipe Association)

Butadiene, the monomer used to make butadiene rubber, is also a carcinogen. If butadiene rubber or other polymers are now used in "CPVC" pipe resin, does NSF test for these contaminants? Are there are formulations which may use styrene or acrylonitrile? If these or similar compounds may be used in the future, how can the state be assured that there will not be a leaching problem?

Post-Chlorination Products

Unlike most plastics, the polymer chain in CPVC is not made by the assembly of individual monomer sub units. The process whereby PVC is converted to CPVC entails aggressive chlorination of the PVC polymer. The post-chlorination replaces most of the hydrogen atoms on the PVC polymer chain with chlorine atoms. Other molecules present in the PVC resin starting material will also be subject to chlorination, and the conditions of post-chlorination may also degrade the PVC to some degree creating smaller, potentially mobile molecular fragments.

The issue of dioxin production from incineration of PVC waste has been raised by environmental groups in North America and in Europe. In particular the organization, Greenpeace has made dioxin pollution a focus of activity. The post-chlorination of PVC raises the possibility that dioxin and related chlorinated compounds may be created in the CPVC resin. One occupational health study in Germany detected dioxins in the air where CPVC resin was being extruded as plastic pipe (see Attachment A: Gesellschaft fur Arbeitsplatz- und Umweltanalytik, "*Orientational air studies for PCDF/D during extrusion of C-PVC.*" Nov. 22, 1991) Despite the sensitivity of the dioxin pollution issue, industry has published no follow-up. Rather, industry cited the particular CPVC extruder as an unusual case and asserted, without proof, that dioxin was not a relevant contaminant of CPVC.

A sample of CPVC pipe was subjected to dioxin testing for Thomas Reid Associates. The sample was obtained in San Francisco by Anresco Lab (Attachment O) and analyzed by Quanterra (Attachment P). This single analysis found octochlorodibenzofuran, one of the dioxin family of toxic substances. While no estimate was made of the capacity to leach dioxins from CPVC pipe, the extreme toxicity of dioxins and the logical pathway for their formation post-chlorination shows the need for the EIR to seriously investigate the potential for contamination.

The dioxin contamination issue is known to B.F.Goodrich and should have been communicated to HCD. HCD could also have discovered the issue by examining sources beyond B.F.Goodrich. The issue is relevant to the problem of multiple CPVC manufacturers using different processes with potentially different capacity to produce post-chlorination contaminants. It is also relevant to HCD's reliance on NSF to define the potential for public health impacts because NSF does not test CPVC pipe or CPVC pipe leachates for dioxins.

Heavy Metals

Other than tin added in organic form as a stabilizer, heavy metals are not a named ingredient in CPVC resin. In the aqueous extraction test conducted in 1998 for Thomas Reid Associates, lead was detected at significant levels in the extractant, but not in the blank. (Attachment Q, page 9-A). The method used to extract the pipe cleaned the outside to prevent external contamination and we conclude that some extractable form of lead must be present in the pipe. Perhaps this is an unidentified ingredient or a contaminant in the stabilizer. Has HCD reviewed any extraction test, such as those conducted by NSF, to determine if lead or other heavy metals other than tin are found? If so, what is the source of these substances? Does NSF ever fail any CPVC or PVC products for lead?

E. Incorrect Characterization of Solvent Cement.

The EIR places great emphasis on the putative change in solvent cement formulation in response to California air pollution regulations limiting VOC content. The EIR authors would have realized that this reliance is unfounded if they had investigated the nature of the VOC limitation and the history of so-called industry compliance.

The EIR reasoning is summed up by the statement, "The composition of the solvent cements and primers has been changed. The technology of solvent cements has advanced significantly in the past several years, and has reduced the concentration of volatile organic compounds (VOCs). This has been in response to the regulation of solvent cements and primers for the solvent welding of plastics by the California Air Resources Board (CARB) and Regional Air Quality Maintenance Districts (AQMDs). This reduction in VOC content of cements and primers applies to many adhesives and sealants, not simply those formulated and sold for use with CPVC pipe." (P. 45)

Currently available "Low VOC" Cements are no different than previous products tested

In fact, the technology of solvent cements has not advanced. The technology in use today and in the foreseeable future in California is the same as was used 20 years ago. To make a strong joint, the cement must partially dissolve both the pipe and the fitting so that the surfaces can be forcibly joined and "welded" together. Solvent cements permitted by code comprise plastic resin dissolved in a mixture organic solvents. The solvents are selected to provide and effective "bite" on the hard pipe surface over a wide range of ambient temperatures. The solvents are generally oxygen containing: ketones such as MEK, acetone, and cyclohexanone, or the cyclic ether, tetrahydrofuran. Formerly, dimethyl formamid (DMF) was used but due to toxicity concerns in the late 1980s, it was prohibited from solvent cements. The dissolved resin is meant to provide proper consistency for application and to fill voids at the edge of the joint, but it is clearly the solvent action on the pipe surface that provides the strength.

The EIR omits three key points of information. First, solvent cement and primer have always varied widely in the proportion of the various solvents used. The variation may be due to different manufacturer preferences in formulation and may be due to changing cost of materials. Second, the VOC limitations in effect have been adjusted upwards to allow industry to meet the limitations with existing products. Each of the major air quality management districts has set a timetable for VOC reduction that has been repeatedly delayed because industry cannot in fact make an acceptable product that meets the lower limits. Third, the ability of existing cement formulations to comply with the VOC restrictions is achieved because the California air districts have been adopting regulations which exempt acetone as a VOC.

The acetone exemption stems from EPA regulation 40 CFR 51.100 which finds acetone "negligibly photochemically reactive" and CARB Draft Proposed Determination Of Reasonably Available Control Technology And Best Available Retrofit Control Technology for Adhesives and Sealants (April 1998). This has been incorporated in some air district rules, e.g. South Coast Air Quality Management District rule 1168.

Thus, the so-called low VOC products are not appreciably different from ordinary solvent containing products. The "low VOC" is achieved by using a test method which still leaves solvent in the joint, and by using exempt acetone as needed to meet the limitation. Acetone has always been a component of these solvent products; the only "new technology" is adjusting the acetone content to meet air district rules.

When the EIR speaks of "technology-forcing requirements of CARB" (P. 50) it may be unaware of the history of the low VOC regulations and the fact that the initial two-step standard process envisioned to force the technology has stalled. For example, in the South Coast Air Quality Management District, initially, cements were to comply with a 450 gram/liter limit with a lower limit of 250 g/L to be attained in 1993. What has happened is that the initial limit was <u>raised</u> to 490 g/L to allow existing cements (with acetone added) to comply, the second step was raised to 270 g/L and the attainment for that lower limit has been repeatedly delayed from 1993 to 1998, and to 2003. Is HCD relying on the lower "technology-forcing" VOC limits in making its determination? If so, those products are not available and are not likely to be available for some time.

The matter of low VOC adhesives is important to the EIR, and the EIR should address the issue quantitatively. First, the EIR should list the primers and cements available in California, list their constituents, and show whether or not they comply with the VOC limitations. A list of ingredients from various sources is attached (See Attachment I). It shows substantial variation and implies that several of the products are unlikely to actually meet the more strict VOC limitations in the Bay Area and in the South Coast air districts. The comparison of cement and primer lists composition from the 1980s era of the leaching and worker exposure studies and from so-called low VOC products today. The range of variation is indistinguishable. In the 1980s, some products were all acetone or all MEK, cements used a large component of THF. The same is true today. Obviously, technology hasn't been forced yet.

Note that several "low VOC" primers are mostly non-exempt solvent and could not meet the 650 g/L air regulations. IS HCD relying on actual use of a low VOC product? Does HCD know whether compliance is verified?

Second, the EIR should evaluate how primers and cements will meet the stricter VOC limitations scheduled by California's major air districts. In addition to acetone, the air districts exempt certain chlorinated solvents from VOC roles. If industry was required to meet scheduled lower VOC limits, what additional exempt solvents may be added? Is HCD referring to existing "low VOC" formulations or is it anticipating some future alternative formulation? "...the Lead Agency finds that the potential significant effect of contributing to air quality degradation due to emissions of VOCs, will be less than significant if CPVC is approved for residential use. In summary, this is due to the changes in the technology of CPVC joining brought about by the technology-forcing requirements of the CARB." (P. 50)

Without this level of analysis, without any quantitative assessment of the chemicals involved, the EIR has no basis to make statements such as, "The Lead Agency will require, as part of the proposed Regulations, the use of low-VOC cements and primers statewide if it determines to approve the use of CPVC for potable water piping in residential buildings in California. This will greatly reduce the potential for worker exposure to solvents, compared to the situations which were previously studied by the Department of Health Services." (P. 48)

" This proposed measure is not, strictly speaking, a mitigation measure under CEQA, since the effects addressed are not significant adverse impacts." (P. 48) "(At the time this health risk assessment was conducted low-VOC cements had not been developed)" (P. 36)

One-step Cements are not Approved

The code subject to approval as the lead agency's proposed action requires the use of a primer before application of the solvent cement. This so-called two-step process increases the VOC emissions and increases the occupational exposure to solvents. Although the EIR stops short of acknowledging that the emissions from the primer-cement assembly affect either air quality or worker health, the authors wistfully cite the availability of a "one-step" cement to further reduce impact.

The EIR logic is, "In addition to the low-VOC materials now available, another of these technological advances is the development of solvent cements which do not require the use of primers (one-step cements). Neither of these advances in technology involves the use of solvents not used in the previous products. " (P. 46)

The one-step cement is not approved for CPVC use. The CPVC resin is denser and harder than PVC, the surface of the CPVC may also have a coating of lubricant or stabilizer left from the extrusion process which would interfere with solvent attack on the pipe surface. Pipe assembly instructions caution that the use of a primer or cleaner is necessary to remove grease or oil. The requirement for use of primer is made clear in the UPC Section 316.1.5: **"316.1.5 Solvent Cement Plastic Pipe Joints.** Plastic pipe and fittings designed to be joined by solvent cementing shall comply with appropriate IAPMO installation standards.... CPVC and PVC pipe and fittings shall be cleaned and joined with listed primer(s) and solvent cements."

HCD's proposed adoption of the UPC says not only that primer must be used (UPC Section 316.1.5), but makes clear that the primer must be colored differently from the cement (UPC Section 301.1.2.4.2). The color requirement here is different from the worker safety prohibition against clear, uncolored primer. The reason for the code contrasting color requirement is to allow a building inspector to inspect a joint and assure that a primer was in fact used, as required by code.

The rejection of the one-step cements now on the market is based on the difficulty of the cement adequately wetting and softening the pipe surface. Although the tone of the discussion in the EIR that these technical problems could be overcome politically, there will probably need to be further technical development before one step cements are available. A successful one-step cement may involve the addition of different, more aggressive solvents. What does HCD find is different about the composition of one-step cements now being tested and the current approved cements? None of the information submitted by B.F. Goodrich to HCD on the suitability of one-step cements ever mentions their solvent composition. Because one step cements are not approved, HCD has no basis to conclude that an approved one step cement will not use different solvents than are now found in the two-step, primer/cement process.

F. Failure to identify reasonably foreseeable actions which contribute to cumulative impacts.

The HCD EIR describes existing uses of CPVC pipe and related PVC pipe, but only to show that the propose approval for residential potable water use is not a radical change. HCD should acknowledge that potential for cumulative impacts such as from exposure to organotin leaching from vinyl piping. The recent work by Sadiki on public water supply shows small, but variable amounts of organotins from areas where PVC has been used for public water supply. HCD should acknowledge that new homes will be built in new subdivisions where there may be a greater tendency to use PVC for water supply. The potential leaching from the residential plumbing will be added on top of the leaching from the public piping system. Because one of the unresolved health issues for organotins is immune response suppression, the real possibility of an individual being exposed to low but inescapable organotin exposure should be acknowledged.

In the area of worker exposure, the EIR should define the potential for cumulative exposure to solvents from DWV, sprinkler and potable water. Exposure from potable water will not be the only source and the tolerance of an increment may be less when the background is already high from other activities.

4. Unwarranted Reliance on NSF 61 to Protect Public Health

A. Introduction

Accurate and complete assessment of public health issues is essential for informed public review of this project. As discussed elsewhere in these comments, the EIR uses an abbreviated, non-quantitative project description and relies on incomplete and often irrelevant older leaching studies. At various points in the EIR, the authors seem to realize the limitations of their analysis and turn to NSF International as a catchall security for all health risks -- both present and future.

There are three fatal problems with the EIR reliance on NSF: 1) the lead agency has not independently reviewed NSF's work; 2) the lead agency does not disclose the limitations of NSF's testing; and 3) the lead agency does not acknowledge NSF's stern warnings that no governmental entity shall rely on its standards. Indeed, the EIR authors seem to confuse NSF, a private non-governmental organization, with the regulatory authority of the U.S. EPA or the state of California.

In order to demonstrate these problems, we first define the NSF process, focusing on NSF 61 the standard which specifically addresses plumbing materials in contact with potable water. This discussion begins with NSF's disclaimer, gives the history of the creation and adoption of NSF 61 and relationship to NSF 14, ASTM standards, and the Uniform Plumbing Code (UPC), and includes the delegation from NSF to the plastics industry of the maintenance of plastic pipe formulation. This is followed by an analysis of the extent and limitations of NSF 61 with respect to the health issues such as organotins that the EIR attempts to address. This section closes with an appraisal of the EIR's treatment of NSF and its apparent reliance on NSF as mitigation for the proposed project.

B. NSF disclaimer of responsibility

How can the Lead Agency rely on NSF 61 to protect public health when NSF 61 contains strong disclaimers of responsibility, "NSF shall not be responsible to anyone for the use of or reliance on this standard by anyone." (NSF 61, p. v), and advising, "Final acceptance of a product for drinking water application is the responsibility of the appropriate federal, state, or local regulatory agent." (NSF 61, Footnote 1, p. 1). This creates a circular connection between regulations because the DEIR states that if CPVC is allowed in California that it must be an NSF listed product, but NSF 61 states that acceptance of the product is ultimately the responsibility of the state. In order for "final acceptance" to be the responsibility of the state, the state must have upon hand and available to the public all of the information on which that acceptance is based.

C. Summary of NSF testing and certification process

Because the Lead Agency relies on NSF and NSF Standard 61 for HCD's determination of significance, a brief description of the organization, standard and certification process is given below.

NSF 14, Plastics Piping System Components and Related Materials, which was first adopted in 1965, establishes minimum physical, performance, health effects, quality assurance, marking and record keeping requirements for plastic piping components and related materials. It includes requirements for plastic pipes to be used for potable water but it also addresses non-potable water uses of plastic pipe. Section 7 of NSF 14 addresses the requirements for potable water plastic piping system components. Any plastic piping product intended for potable water uses must conform with both NSF 14 and NSF 61. NSF 14 also requires that plastic piping conform with a recognized performance standard, which in the case of CPVC for hot and cold water distribution is ASTM D2846 (NSF 14). The UPC, requires that CPVC pipes for water service meet NSF 14 (UPC).

NSF 61 replaced the EPA Additives Advisory Program for drinking water system components. The first version of NSF 61 was adopted June 1988 by the NSF Board of Directors. It was prepared by the NSF Joint Committee on Drinking Water Additives and the NSF Council of Public Health Consultants (both of whose memberships are listed in Appendix H of NSF 61). NSF 61 was approved by ANSI in 1989 and is now referred to as ANSI/NSF 61 (NSF 61).

Tests Required for Certification

For certification of plumbing materials in contact with potable water, NSF conducts leaching or extraction tests. Thirty randomly selected samples of the product must undergo extraction testing. Exposure testing is required of pipe products based on the intended end-use, e.g. hot or cold water, the test requirements are based on the material specific analytes . A contaminant will require toxicity testing if it is an unregulated contaminant, e.g. not listed in the NSF 61 Appendix under the EPA National Primary Drinking Water Standards or Canadian Maximum Acceptable Concentrations Primary Drinking Water Standards. (NSF 61 Section 3 & 4)

NSF 61 requires the manufacturer to identify possible formulation-dependent analytes. Table 3.1 in NSF 61 lists the material specific analytes for each material type such as metal, concrete, plastic, elastomer and other materials. CPVC material specific analytes are: regulated metals, phenolics, tin, antimony, volatile organic chemicals and residual vinyl chlorine monomer (RVCM). The analysis of tin or antimony is only required if that metal is used in the stabilizer. The applicant must provide formulation information and method of manufacture and a list of known or suspected impurities/contaminants and their concentrations. Substances selected for testing should include the product as formulated, product constituents, total extractants and any chemicals contributed to water as a result of product use. A modification in the selection of substances for toxicity testing is allowed if it is well-supported by documented scientific judgement and rationale (NSF 61 Section 3).

Toxicity testing requirements for an additive are based on the anticipated human exposure to the additive and is calculated using estimates of the concentration(s) of the test substance at the tap. This normalization process is outlined in NSF 61 Appendix B Section 12.

Toxicity testing requirements are described for each of the following four ranges of normalized contaminant level: Level I (<10 ppb), Level II (≥ 10 and <50 ppb), Level III (≥ 50 and <1000 ppb), Level IV (≥ 1000 ppb). With each level more types of toxicity tests are required. The toxicity testing requirements are cumulative, so that a Level III exposure will also require all tests required in Levels I and II. A modification to the types of toxicity testing is allowed if well-supported by documented scientific judgement and rationale (NSF 61 Appendix A).

NSF Delegation to the Plastic Pipe Institute and Acceptance of the Range Formula

Apparently the certification of CPVC and PVC has been streamlined by increasing NSF reliance on an industry association, the Plastic Pipe Institute, a division of the Society of the Plastics Industry. This streamlined certification relationship is described in Otto S. Kauder, *Nontoxic Polyvinyl Chloride Processing Stabilizers*, Chapter 18 in Jesse Edenbaum, ed. Plastics Additives and Modifiers Handbook, Chapman & Hall, New York. 1996 P. 307. We include the discussion in full because the EIR itself does not disclose how NSF operates.

> "As part of the public water supply, pipe for potable water is under the aegis of the U.S. Environmental Protection Agency, which, however, has delegated to the NSF of Ann Arbor, Mich. (a private nonprofit organization), the authority to set standards and administer a seal of approval for products that meet these standards. The standards relate to the physical strength, integrity, and durability of the pipe and to the purity of the water delivered. The NSF, in turn, has delegated the authority over the physical characteristics of plastic pipe to the Plastic Pipe Institute (PPI), a division of the Society of the Plastics Industry. For many years, the NSF and PPI regulated the field of plastic pipe and its ingredients strictly by accepting each manufacturer's product--that is, each ingredient of a pipe "compound" and then the finished pipe made with these ingredients--upon submission of detailed information and samples and testing for compliance with standards for taste and odor, chemical migration, and physical properties. Thus multiple sources of supply of an ingredient, such as a resin, a stabilizer, or a pigment, required multiple acceptance procedures by the NSF and PPI.
>
> "As experience with the successful use of PVC stabilized with organotin and antimony mercaptide stabilizers accumulated, the NSF/PPI regulatory system was simplified in stages. First, the PPI agreed to permit conditional substitution of an "apparently chemically identical" ingredient for a fully accepted ingredient having passed 10,000 hours of hydrostatic testing at the point when testing of pipe containing an "apparently chemically identical" substitute ingredient passed 2000 hours. More recently, the NSF and PPI agreed to accept without further testing pipe compounds and finished pipe manufactured from a "range" formula owned by the PPI and accepted by the NSF. The range formula is, in effect, a generic recipe made with ingredients (resins, stabilizers, lubricants, pigments, etc.) taken from a list of ingredients previously accepted by the NSF and used in concentrations within the accepted range. One such range formula is as follows:

Ingredient	PHR *
PVC resin	100
Stabilizer	0.3 - 1.0
Calcium stearate	0.4 - 1.5
Paraffin wax	0.6 - 1.5
Polyethylene wax	0 - 0.3
Titanium dioxide	1.0 - 3.0
Calcium carbonate	0 - 5..0

Ingredient	PHR *
Process aid	0 - 2.0
Carbon black	0 - 0.2

* PHR is Parts per Hundred Resin, because the ingredients are added to the base of 100 weight units of resin, the total is somewhat greater than 100, thus PHR is similar to, but not the same as percent by weight.

HCD should determine whether such a "range formula" approach is being taken for all CPVC products likely to be certified by NSF and hence approved for use in California.

Calculation of Maximum Allowable Levels (MALs) for contaminants

For regulated contaminants the Maximum Allowable Level (MAL) shall not exceed ten percent of the EPA Maximum Contaminant Level (MCL) as cited in Appendix E of NSF 61 (NSF 61 Appendix A).

For unregulated contaminants, the MAL for a contaminant shall not exceed ten percent of the Maximum Drinking Water Level (MDWL). The MDWL is calculated depending on whether the contaminant is a carcinogen or noncarcinogen. A contaminant is considered a carcinogen if it meets EPA criteria as group A, B_1 , or B_2 (NSF 61 Appendix A).

The MDWL for a noncarcinogen contaminant is determined by taking the Highest No-Observable Adverse Effect Level (NOAEL) and applying safety factors and dosage/average intake conversions. For carcinogenic contaminants, the MDWL is calculated from a slope factor for human intake and the desired level of acceptable risk (NSF 61 Appendix A).

Certification Criteria Includes Approval Even If MAL Is Exceeded

The decision whether to certify a product that has unregulated contaminants at Level II or greater concentrations includes an option to certify the pipe product even if the exposure concentration is greater than the MAL (NSF 61 Appendix A, Fig. A2, A3, A4). What are the factors that allow approval of a product if the MAL is exceeded? NSF should disclose to the Lead Agency and the public if there have been any cases where a product has been approved even if a MAL has been exceeded and, if so, what was the justification for approval.

One way that NSF will certify a product which exceeds the MAL is by a time extrapolation where extractant levels are compared and NSF projects a complying end point. Has NSF conducted lab tests that would verify the long-term decay of extractant concentrations over time? If the procedures of NSF 61 have been ongoing for more than a decade, NSF should have information about long-term leaching.

Product Certification and Ongoing NSF Product Testing

After a product has been tested according to the protocols outlined in NSF 61, the "normalized" contaminant concentration is compared to the MAL established for the particular contaminants.

If the results are acceptable, NSF and the manufacturer enter into an contractual agreement and the product is certified and listed by NSF (NSF Web site, Drinking Water Additives, The NSF Certification Process).

The same need for disclosure also applies to ongoing NSF product testing. If the state is to rely on NSF, or other similar private company, the state should have an annual reporting of the actual performance of products subject to test: where high levels were measured, how many products failed, and what tests are being administered. This information will allow the state and the public of California to be informed and to be assured that public health is being adequately safeguarded.

D. NSF Confidentiality Requirement and Non-disclosure

Perhaps the most immediate obstacle to lead agency independent review of NSF is NSF's refusal/inability to disclose the data used to set standards and to determine compliance. The EIR needs to ask, what are the claims of the companies of why all of the above data must be kept confidential? The claim that the formula is a trade secret is not entirely valid because this information – at least in a semi-quantitative form -- is already available through patents, general industry knowledge and books. There is also a claim of ownership of the data. According to Ron Coiner, NSF in response to the question regarding why NSF was not able to supply the EPA with data that they had requested for the consideration of adding organotins to the Drinking Water Contaminant Candidate List:

> "...We have information that is confidential in nature. And in order for us to be able to provide that to EPA or to anyone, we have to get the permission of the people that own the data. NSF does not own the data. It's not ours to give out or distribute. And we are in the process of trying to get that authorization so that we can provide the requested information to EPA. (Ron Coiner Deposition, B.F.Goodrich vs. Village in the Lake in the Hills, March 24, 1998, p. 24-25)

Therefore, only NSF knows how a CPVC product is certified, not the public who use the products and must rely on a closed process to ensure that their health is being protected. Not even the EPA is allowed to see this data unless permission is granted by the companies. The EPA found this industry non-disclosure to be a significant barrier to EPA's ongoing work on drinking water contaminants. According to the EPA's announcement of the Drinking Water Contaminant Candidate List:

> "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 assess the toxicological data." (Federal Register: March 2, 1998 (Volume 63, Number 40), p.10282)

Since the DEIR is relying on NSF 61 to protect public health, the Lead Agency and the public should have access to this data.

Non-Disclosure Limits the Public's Ability to Review the Draft EIR

Because the EIR does not present factual information on NSF standard setting and product testing, the public has no opportunity for meaningful comment on the appropriateness of NSF 61 to protect public health from potential leaching from CPVC pipe. None of the data listed above is provided in the DEIR nor is it available to the public from NSF. The only thing available for the public to review is the NSF 61 standard and referenced EPA risk assessment, which is only the methodology. One cannot ascertain whether the MALs set by following NSF 61 Appendix A are based on appropriate toxicological studies because these studies are confidential.

There are other problems with NSF 61 and the NSF certification and testing process that have not been be addressed by DEIR.

MALs for unregulated contaminants

Until recently, the MALs developed for unregulated contaminants were considered confidential since the companies paid for the toxicity tests to establish these MALs and NSF did not own the data. Unregulated contaminants of concern include organotins, THF, MEK, cyclohexanone, acetone. This year, NSF has disclosed the MALs for organotins only due to the consideration of organotins in the EPA Contaminant Candidate List process. Only now have the MALs been disclosed for THF, MEK, cyclohexanone and acetone and this only as a result of this DEIR process. Ron Coiner, Manager of the Plastics, Plumbing and Mechanical Programs at NSF International, when asked whether the action levels for unregulated contaminants are considered confidential stated:

> "...some of the information that may be used in developing those acceptance criteria can be of a confidential nature. And currently, we do not publish the acceptance criteria for the unregulated contaminants in standard 61. So that the end result is that they're typically handled by staff internally here at NSF as confidential." (Ron Coiner Deposition, BF Goodrich vs. Village in the Lake in the Hills, March 24, 1998, p. 74, Attachment K)

In addition to material-specific analytes, NSF toxicologists may require additional testing of substances based on formulation information provided by companies. NSF relies on the companies' formulation information being accurate instead of running a broad scan for all possible substances. There are three main ways to determine pipe ingredients: require companies to provide formulation information and possible impurities/contaminants and their concentrations, an unannounced inspection of manufacturing plant and sampling the resin that is being produced to see whether it agrees with formulation information, and run a broad scan for all possible substances (a GC/MS scan is an example of a broad scan). NSF 61 requires the first two for CPVC products, but not the last. According to Table 3.1 Material Specific Analytes, a GC/MS is required of some materials such as PEX, Isoprene and Portland Cement, but not of other materials like PVC and CPVC. The problem is that some contaminants or impurities may be missed if a broad scan is not performed.

The formulation information is may be insufficient to determine potential contaminants. Based on the standard formula process described above, NSF may not actually have access to real formulation data. The formula may be provided in general, categorical terms without information about the specific constituents. Without that information, NSF may not have knowledge of product specific contaminants such as tri-alkyl tins and residual monomer.

Application of more rigorous testing is not impractical, and apparently is conducted by other health standard organizations. The United Kingdom (UK) has standards that require a broad scan of possible contaminants. In the UK, testing and approval of potable water products are divided into two sections: products designed for use in buildings (domestic, commercial, industrial) and products designed for use in water collection, treatment and distribution (the public side).

The UK testing requirements for CPVC pipes for potable water are contained in BS 6920, "Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water." For the public side, the actual testing requirements are based upon product formulation and a GC-MS general scan for unsuspected organic leachates, together with specific analysis for any ingredients or manufacturing by-products which may have a toxicological impact. (BS 6920)

E. The "Normalization" Process

NSF laboratory testing measures the concentrations of contaminants in extractant water. NSF applies a "normalization" factor to determine "at-the-tap" exposures which is multiplied times the laboratory result before comparison with maximum allowable levels of the contaminant. The normalization factor is always less than one and thus reduces the amount of contaminant reported and makes it easier for the pipe to pass the MAL. The normalization factor is essentially a "fudge factor" and apparently adoption of the normalization factor makes it easier for products to pass NSF extraction testing (see discussion of lead-based stabilizers, above).

NSF's procedure is found in NSF 61, Appendix B Section 12. The concept behind normalization is logical: laboratory tests have a greater surface to volume ratio and a greater dwell time for extraction then would be found under customary usage in actual applications. The normalization method developed by NSF is fairly complex and is based on a series of assumptions of the extraction environment of actual installations in contact with potable water. Much of the development of normalization factors pertains to public water supply piping and storage tanks where clearly the very large volume of water and relatively rapid flow rate would produce lower effective leaching than would be measured in the laboratory.

For residential installations, the assumptions behind the normalization factors may not be sufficiently conservative. The section of Table B.15 addressing residential pipes is based on 280 feet of ½ inch nominal [inside] diameter pipe with a static volume of 2.86 gallons, and a residential water usage of 180 gallons per day, with a 16 hour active flow rate of 120 gallons. NSF calculates a 0.76 multiplier normalization factor for static concentration and an additional 0.024 multiplier for flowing concentration, resulting in a combined a factor of 0.0182. In application, if NSF set a limit for long-term exposure of 20 ppm, NSF would pass a pipe sample that produced a laboratory extractant concentration of 1,000 ppm -- 54 times the limit.

NSF has also developed a normalization factor for residential fittings -- appliances, faucets and the like dispensing potable water. Because NSF assumes that fittings represent only six percent of the residential system total, the static volume of the fittings is only six percent and thus the normalization factor for fittings is the residential pipe factor times an additional 0.06 multiplier. Again, in application, if NSF set a limit for long-term exposure of 20 ppm, NSF would pass a fitting sample that produced a laboratory extractant concentration of 18,000 ppm -- 914 times the actual limit.

The ongoing concerns for lead in drinking water is focusing on brass used for fittings. The EIR cites some of the current public health discussion of lead in its assessment of copper piping, without distinguishing the lead contribution from the fitting from any contribution from the pipe. Brass is limited to 8 percent lead content, but retains lead as an important component for ease of machining. The brass fittings are ANSI/NSF 61 certified and are presumably subjected to NSF extraction tests. With nearly a thousand-to-one fudge factor on test results, it is easy to see how high lead levels, and lead levels well in excess of Proposition 65, can be measured in the field from code-complying fixtures.

The same concern applies to plastic pipe in the residence. Depending on the pattern of actual use, much of the potable water ingested could have a higher dwell time then is accounted by NSF's assumption of 120 gallons flow in the day. A glass of water, filled coffee pot, reconstituted juice all take a fraction of a gallon and when drawn from the tap the water consumed may have a higher contaminant concentration then afforded by NSF's normalization factor.

F. No NSF 61 Direct Testing Method for Organotins

NSF does not conduct any tests for organotins – either of pipe resin or of water extractions. How can HCD conclude that NSF is a reliable source for testing of organotins? The way that NSF certifies plastic pipe for organotins is by an indirect measurement: NSF measures the inorganic form of tin and then correcting for the molecular weight to estimate the organotin species. NSF does not state how it actually converts inorganic tin extraction results to determine compliance with the MAL. Has HCD examined this calculation and found it appropriate? The problem with this method is that it cannot determine the actual amount of organotins or which organotin species is present. Thus NSF testing cannot be a basis for the EIR's assertion that no trialkyl tin species are present in plastic pipe.

As described in Section 3 of these comments, trialkyl tin was found in a laboratory test of CPVC pipe. The samples subjected to organotin analysis were also subjected to inorganic tin analysis. The field blank (plain water not exposed to CPVC pipe but handled and transported from San Francisco to the laboratory with the extract samples) had detectable inorganic tin, but no detectable organic tin (Attachment Q). For HCD to make use of NSF data, it needs to determine whether NSF subtracts the inorganic tin found in a blank from the inorganic tin in the extract when NSF calculates possible organic tin.

G. Relying on a third party for implementation of a standard

Normally when relying on third party for implementation of a standard there are assurances that the third party will take responsibility for the standard. Although the DEIR concludes that leaching is not a significant impact requiring no mitigation, it reaches this conclusion based on the reliance of NSF. Technically, reliance on NSF 61 is not a mitigation, however, it is necessary to support the Lead Agency's assertion of nonsignificance. Normally when relying on third parties, such as a responsible agency, for regulations or standards there are assurances that the third party will take responsibility for the mitigation. For example when a project has an air quality impact, most air quality mitigation would be responsibility of the regional air quality district. There is assurance that this mitigation will be implemented because it is in the jurisdiction of another agency.

The Lead Agency's reliance on NSF 61 to ensure the protection of public health and therefore NSF International as the third party implementor is problematic. As noted above, NSF 61 contains strong disclaimers of responsibility, "NSF shall not be responsible to anyone for the use of or reliance on this standard by anyone." NSF 61, p. v, and advising, "Final acceptance of a product for drinking water application is the responsibility of the appropriate federal, state, or local regulatory agent." (NSF 61, Footnote 1, p. 1). Without a party willing to take responsibility that the standard will be implemented, and without open access to NSF's information, testing procedures and standard setting, the lead agency that must certify in the EIR that the project avoids significant impacts to the environment cannot exercise its independent judgement and has no factual basis to support its determination.

Delegation of public health protection to NSF, a non-governmental organization supported by private industry is problematical. How can a CEQA determination of non-significance be made based on implementation of standards by a non-governmental organization that cannot be held publicly accountable. EPA awarded the development of NSF 61 to a consortium led by NSF to develop voluntary third-party consensus standards. But what type of oversight is the EPA allowed in the implementation of NSF 61? NSF even keeps information from the EPA confidential, as was noted above in the case where the EPA requested information from NSF in conjunction with the Drinking Water Contaminant Candidate List process. As discussed above, the EPA requested the toxicological data that supported the action levels set for organotins, however NSF could not provide the information due to confidentiality agreements.

The NSF Task Force groups that look at the toxicological data on various contaminants are heavily represented by industry. For example, NSF organized a Tetrahydrofuran (THF) Task Group in response to the National Toxicology Program's study on THF. According to the minutes from the meeting, there was broad representation from the industry (including B.F.Goodrich, Oatey, etc.); only one representative from the EPA was present and there did not appear to be any representatives of consumers or workers. This task group was meeting to discuss whether the MAL set for THF should be changed based on the NTP's THF study. The conclusions were that the industry would perform further toxicological testing before any action was taken. (NSF Tetrahydrofuran Task Group, Meeting Minutes, July 10, 1997)

H. EIR use of NSF in lieu of real mitigation

The EIR relies on NSF 61 to address potential leaching impacts from CPVC pipe which is inappropriate given the inability of HCD to claim independent review of NSF 61 and when the critical information necessary for an independent judgement is confidential, and given the problems with the NSF 61 process.

The Lead Agency claims it independently reviewed NSF standards and found them to be conservative and protective of public health. The DEIR states that:

"The Lead Agency considers it to be reasonable and prudent to apply the standards of safety and suitability for use relied upon in the regulation of public drinking water systems to the potable water systems of residential buildings. The National Sanitary Foundation (NSF) certification is generally considered to provide sufficient protection of public health from contaminants in drinking water arising from materials in contact with potable water." (p.17)

"The Lead Agency has also independently reviewed the NSF Standards for Drinking Water System Components Health Effects (NSF 61) <23> and finds them to provide a reasonable assurance of safety." (p.18) emphasis added

"The Lead Agency considers NSF testing and certification to established, human health conservative standards to provide a reasonable assurance of safety." (p.18)

"In the absence of MCLs, the Lead Agency has relied on the MAL determined by NSF using the formal risk-assessment methodology developed in the USEPA-sponsored program to assure safety of products which contact drinking water." (p.21)

"Under the proposed building standards, only CPVC pipe, fittings, and cements which are tested and certified by an independent entity, NSF, would be allowed to be used for potable water piping in residential buildings in California as is the case in other states and the model code. The Lead Agency considers NSF testing and certification to established standards of suitability for intended use (NSF 14) to provide a reasonable assurance that these materials are suitable for their intended use." (p.29-30)

The information relied upon by the Lead Agency [in it's determination that contamination of drinking water by leachates from CPVC does not result in a significant impact] includes the following:

....If the Lead Agency determines to approve the use of CPVC for potable water piping in residential buildings, only materials certified by NSF (NSF 61) will be allowed. NSF certification is now required for any material used in public drinking water treatment and distribution systems, and expanding this requirement to residential potable water piping will provide consistency of protection from the drinking water source to the customer's tap. As discussed in Chapter 3 of this EIR, NSF certification is relied upon by other public agencies in other situations pertaining to drinking water safety. Based on review of the NSF Standards and testing, the Lead Agency considers NSF testing and certification to existing standards to provide a reasonable and conservative presumption and assurance of safety. The standards which NSF tests against are based on a conservative human health risk assessment process." (p.37) emphasis added

I. HCD Lack of Independent Review

The EIR has not provided evidence that the Lead Agency "independently reviewed" NSF 61. In the following quote there is reference to a document that does not prove independent review of NSF 61:

"The Lead Agency has also independently reviewed the NSF Standards for Drinking Water System Components Health Effects (NSF 61) <23> and finds them to provide a reasonable assurance of safety." (p.18)

Footnote 23 is the Underwriters Laboratories 1997 document entitled: "*Drinking Water System Components, Component Materials, and Treatment Additives Directory*." How does reference to this document offer proof that the Lead Agency "independently reviewed" NSF 61?

Further reference to the Lead Agency's review of NSF:

"Based on review of the NSF Standards and testing, the Lead Agency considers NSF testing and certification to existing standards to provide a reasonable and conservative presumption and assurance of safety. The standards which NSF tests against are based on a conservative human health risk assessment process" (p.37).

This reference does not provide any additional evidence of independent review. What exactly did the Lead Agency review to come to this conclusion? Did the Lead Agency only review NSF 61 and the related EPA risk assessment? What testing did the Lead Agency review?

The determination that leaching from CPVC products is not a significant impact cannot be made by HCD without reviewing the data that is considered confidential by NSF due to proprietary restrictions. The following lists some of the information that the Lead Agency would need to review to be able rely on NSF 61 protecting public health from potential leaching impacts from CPVC products.

1. A list of resin manufacturers.
2. The formulations used by each of these manufacturers.
3. For manufacturers using the range formula, what are the individual sources of additives such as stabilizers, lubricants, and pigments that are being used.
4. What outside, non-NSF approvals do those additives have.
5. What do extruders add to the pipe in addition into what is provided by the resin manufacturer.
6. For each CPVC product, what formula-based analytes did NSF determine needed to be tested.
7. What test criterion, meaning the MAL and the "at the tap" normalization factor is applied for any tests.
8. Testing history of CPVC products showing amount of analytes in the extractant or the percent of MAL. This would show the number of occasions when the MAL was exceeded and the general trend for variance in products.
9. For tests where the MAL was exceeded, what long-term extrapolation did NSF conduct to allow the product to be certified.

10. The underlying toxicity studies and data supporting the NSF standards.

Note that the EIR reliance on leaching studies conducted in the 1980s is a major deficiency. If HCD had attempted to access NSF's ongoing certification program, HCD could have substantially augmented its factual database.

Formulation information was not reviewed

The Lead Agency should have reviewed the formulation information submitted by companies wanting their product certified as complying with NSF 61. However, this information is considered confidential by NSF. Since this is a key to determining which substances are tested, the Lead Agency and the public does not know which substances are found in CPVC products and in what amounts. Since the types of tests required for a product are formulation dependent, the public will also not know what types of tests were required for a particular product.

Toxicity studies to establish MALs for unregulated contaminants are not reviewed

The toxicity studies that are used to establish the MALs for unregulated contaminants are considered confidential by NSF since they don't own the data. Therefore the Lead Agency and the public does not have access to this critical information. Full disclosure of the NSF procedure determining MAL is necessary for the state of California to place reliance on NSF. The MAL procedure entails NSF consideration of technical information from manufacturers and public health information. The public needs to see the range of information that NSF considers and how NSF uses that information. NSF's use of agency staff in its technical advisory committees is appropriate, but not a surrogate for public review and public involvement. If the MAL procedure is not public, neither the public nor the state of California will know whether information is complete and up-to-date.

The lack of review is reflected by the EIR's confusion in its reference to NSF's contamination level criteria. Where the EIR states, "In the absence of MCLs, the Lead Agency has relied on the MAL determined by NSF using the formal risk-assessment methodology developed in the USEPA-sponsored program to assure safety of products which contact drinking water." (p.21) it goes on to show two standards, one for short-term exposures (the STEL) and another for long-term exposures (the MDWL). The EIR does not actually discuss the relationship of these two standards to the MAL and the EIR does not establish whether these two standards or the MAL are intended as NSF test criteria or as drinking water criteria.

Attached to NSF 61 is Appendix E, Rationale Document for Additives Toxicology Review and Evaluation Procedures. Section 5.3, Unregulated Contaminants states that the "MAL for unregulated contaminants will not exceed 10 percent of MDWL". The EIR should clarify what standards HCD believes are being applied by NSF for organotins. What is HCD's assumption about the cumulative exposure to organotins and how does that effect the relevant choice of standard? In NSF's "Rationale .." It states that for carcinogens, the MDWL is calculated using 10^{-5} risk factor; HCD should examine how this relates to the state's statutory obligations under Proposition 65.

NSF explicitly warns all potential users of NSF certification that any reliance on NSF must only be made based upon the independent judgment of the user. It may be convenient for the state to rely on the NSF process both for determining MAL's and for testing products in the marketplace, but that reliance cannot constitute blind delegation of the state's responsibility to independently determine that the public health has been adequately protected. If the state is to use NSF or any other similarly constituted private organization, the state needs to be able to show the public how the standards have been derived, how those standards relate to state law, and the state, at least, needs to be able to take public comment on those standards.

5. Ineffective Mitigation

One of the greatest deficiencies of EIR is its failure to objectively address mitigation. The potential mitigation measures have been the subject of discussion since the earliest days of EIR and throughout the legislative process which established interim use of CPVC. The EIR's refusal to aknowledge this past endeavor is baffling.

A. Denial of the Need for Mitigation

Perhaps EIR authors are concerned that acknowledging the possible benefit of, or need for, mitigation somehow would detract from the mandate to permit CPVC and the clarity of the policy statements in the document. This tone is set by the mitigation hesitatingly specified in the EIR: "C. Mitigation Measures Proposed to Minimize the Significant Effects:
This EIR finds that the proposed building standards will not result in any significant environmental effects. Therefore mitigation is not an issue. However, simply because the impacts are below the thresholds of significance does not mean that further reduction of impacts is not a desirable goal. The Lead Agency has incorporated measures (though not required as mitigation) to even further reduce the potential for impacts. These provisions in the proposed Regulations include:

- Requiring the flushing of all potable water systems in residential buildings, regardless of the material used. This will help to reduce the exposure of persons to leachates from pipe and joining materials such as fluxes and solvents, as well as dirt and debris which may contaminate the pipe and fittings.
- Allowing only the use of low-VOC primers and cements. This will provide for statewide application of standards developed by the ARB for application to regions with critical air quality problems. It will also reduce workplace levels of the same solvent vapors." (P. 104) Earlier, on page 50 the EIR includes one step cements in the general category of desirable changes, but omits them here.

This distinction begs the real question: what controls and conditions need to be in place to reduce adverse safety or environmental effects? Whether these controls and conditions come from industry or from HCD or from some third party, they need to be a part of the project future or else HCD's finding of no significant impact is without foundation. These comments demonstrate that significant impacts will result from product approval in the absence of mitigation. As discussed, the draft EIR's contrary conclusion is not supported by any facts or analysis.

Mitigation falls into the general categories of:

1. Product content (pipe and cements) as it affects potential for leaching into the water supply for the environment.
2. Product content (cements) as it effects worker safety.
3. Product content (cements) as it effects air quality.
4. Workplace installation: ventilation, gloves, etc.
5. Post-installation flushing.

The EIR only discusses controls over product content for either worker or consumer safety in the context of NSF. As described in the preceding section, HCD has not independently reviewed NSF and is unreasonably relying on NSF to mitigate product content risks. As part of the proposed project HCD should establish a formal monitoring requirement of NSF or of what ever other entity provides testing and certification for products used in California. The full range of disclosure needed for the EIR is described previously.

B. Workplace Measures

Workplace installation controls are vital components of worker safety. In the previous, 1989 EIR, there is a substantial discussion of the need for ventilation, gloves, worker training and other factors to reduce solvent exposure. None of this is present in the 1998 draft EIR. A simple reference to product labeling is completely insufficient to show whether these measures are being applied and are effective when applied.

The EIR does not even acknowledge the results of efforts to mitigate CPVC impacts in a brief trial of CPVC in California. In 1995, the California legislature established a procedure for a two-year approval of CPVC. The approval incorporated some of the recommendations of the earlier CDHS into state law, Health and Safety Code Section 17921.9 "CPVC plastic piping; alternative material; safe work practices." The specific provisions for worker safety are:

> "(2) Cleaners shall be renamed as primers, include strong warnings on the hazards of using primers as cleaners, and include dyes to discourage use as cleaners. (3) Applicators and daubers shall be limited to small sizes. (4) Enclosed spaces shall be ventilated with portable fans when installing CPVC pipe. (5) Protective impermeable gloves shall be utilized when installing CPVC pipe." California Health and Safety Code Section 17921.9

As logical as these measure may sound, they may be impractical to implement and enforce. HCD should determine to what extent these measures were done during the period that law was in effect.

The EIR's complete silence on the issue of glove permeation considering that the issue was raised during scoping and the EIR's principal author observed a demonstration of solvent permeation of gloves conducted at the plumbers local Training Center in San Jose. During that demonstration gloves rated for use with solvents passed vapor from CPVC primer and cement through the glove in less than 20 minutes after exposure. The winter temperature at the Training Center was cool, permeation is more rapid in warmer weather.

The ERD prepared in 1983 for the state EIR lists gloves and permeation potential for different chemicals. There it is shown that THF is highly aggressive at permeating most glove material and that the material capable of resisting THF is attacked by other more common solvents and aqueous liquids. A series of glove permeation tests was conducted by TRI/Environmental using the only glove actually rated to resist THF (Attachment R). When exposed to PVC or CPVC solvent cement and primer, the resistant glove did not last the eight-hour test where THF was present.

The matter of glove permeation is serious, because the worker so exposed does not feel glue or liquid; only the vapor passes through, but passes through at high concentrations and continuously after exposure. This form of contact enhances skin absorption. The EIR can point to the requirement for gloves on the label on a can of solvent cement, but it must disclose to the EIR reader whether that control will be effective. This is another indication of the EIR's lack of objective review.

The same problem holds for ventilation. There should be some standard that is easily observed in the field that will provide adequate ventilation under most reasonable conditions. It is not sufficient to observe a requirement for ventilation on the label on a can of solvent cement. The EIR should show what kind of ventilation is necessary to reduce solvent exposure to acceptable levels.

C. Flushing for Consumer Protection

The EIR does suggest that flushing after installation would be valuable for both metal and plastic. Is the flushing under discussion intended to be the same protocol described in the 1989 draft EIR? Or is intended to include only the code reference to section 609.9 disinfection of potable water system? In either case EIR should show how this short-term flushing would eliminate the longer-term leaching problems.

The EIR did not even address the minimal requirements once a part of California law. When CPVC pipe was allowed in Riverside and San Bernardino counties, the California state law, Health and Safety Code Section 17921.9 "CPVC plastic piping; alternative material; safe work practices." required that CPVC systems be flushed before occupancy:

> "(e) All of the following flushing procedures shall be adhered to when installing CPVC pipe in California after the effective date that adds this section [Oct 12 1995]: (1) When plumbing is completed and ready for pressure testing, each cold water and hot water tap shall be flushed starting with the fixture (basin, sink, tub, or shower) closest to the water meter and continuing with each successive fixture, moving toward the end of the system. Flushing shall be continued for at least one minute or longer until water appears clear at each fixture. This step may be omitted if a jurisdiction requires the building inspector to inspect each water system.
>
> "(2) The system shall be kept filled with water for at least one week and then flushed in accordance with the procedures set forth in paragraph (1). The system shall be kept filled with water and not drained.
>
> "(3) Before the premises are occupied, the hot water heater shall be turned on and the system shall be flushed once more. Commencing with the fixture closest to the hot water heater, the hot tap shall be turned be permitted to run until hot water is obtained. The time required to get hot water in a specific tap shall be determined and the cold water tap at the same location shall be turned on for the same period of time. This procedure shall be repeated in succession toward the end of the system." California Health and Safety Code Section 17921.9

Why are these not addressed? Is it because of EIR authors think that a discussion of flushing would lead to reader to believe the impact of solvent, organotin, or other leachates might be significant? Does HCD believe that these measures are unnecessary in California? Does HCD believe that these measures are a matter of ordinary practice and are routinely carried out already?

D. Any Measures for Protection of Health, Safety and the Environment Need to Be Implemented and Monitored

Even if the EIR the wishes to avoid this stigma of required mitigation, it is extremely important for the EIR to sum up in one place what requirements will control the impact of CPVC plastic pipe and which of these requirements are specifically being proposed in the draft EIR to be placed on the approval by HCD. These requirements need to be stated clearly and quantitatively and there needs to be a relationship between the requirement and the environmental mitigation which would be accomplished. The EIR should state who would be responsible for implementing and monitoring the requirements.

The realm of mitigation should include public health, worker safety, and any feature of environmental impact where HCD has postulated some feature of CPVC which reduces or eliminates impact otherwise alleged.

HCD should assess how mitigating measures or any controls or requirements that limit the impact of CPVC would actually be carried out. The overarching need to monitor the product being used in California and to monitor NSF would fall to HCD. For some measures such as the use of gloves or ventilation, workplace inspection would be required. For other measures the local building inspector would be involved.

HCD should address the practicality of these measures. In the EIR, HCD vacillates on the subject of workers following label procedures or other requirements. Sometimes, HCD asserts that these good practices must be done whether they are done in fact in the field, and that HCD predicated its findings of no significance on an assumed compliance. And other times HCD acknowledges, or in the case of copper and lead-based solder, asserts that are not followed.

What counts are the impacts that will result from HCD's proposed action. HCD needs to list the labeling requirements or other regulations that must be followed and then identify potential barriers to their implementation. Without implementation these labeling requirements will not reduce worker safety, public health, or environmental impact.

6. Public Health

Plumbing for potable water is an essential public health issue. The primary focus has always been on the potential for chemical constituents of the CPVC plumbing system to leach into the water and to pose a health risk to the consumer. This section of comments begins with an overview of the technical studies referenced by the EIR which reveals a real paucity of information. The EIR discussion of leaching is so non-quantitative that it is difficult for the public to see the basis of the conclusions of no impact; the author assumes that a lack of information is a clean bill of health.

This section follows the discussion of leaching with the related issue of permeation. Finally fire safety while not a central theme with CPVC is also addressed as a public health matter.

A. Status of Technical Studies

Several areas of technical analysis are incomplete because there is not sufficient technical study of the underlying phenomena. The most significant lack is understanding of the long-term leaching behavior of CPVC pipe with respect to organotin and solvents, and the effects of chlorine residual in potable water.

The draft EIR is inconsistent in its presentation of technical studies. On the one hand, the EIR claims that there has been new information since the 1989 draft EIR, on the other hand the EIR relies entirely on the relatively scant information base which was available over a decade ago. Speaking of the 1989 EIR, the authors state,"much of the information is still the most current available and, therefore, the Lead Agency has used this earlier work." (P. ix) The authors then go on to claim, "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." Examination of the information referenced in the 1998 draft EIR shows that the state has done little to advance technical understanding of the issues since the work it has done previously.

Long-Term Leaching Behavior Undefined

The EIR claims, "There have been numerous studies and analysis of the effects of plumbing materials on water quality" (P. 68), but the document only cites two studies which bear on leaching from CPVC pipe in a simulated usage situation, with leaching observed over longer than a two-week period. The two studies are referred to as the Cooper study conducted for the Department of Housing and Community Development in 1987 by the University of California at Berkeley, Sanitary Engineering Laboratory, and the Butter study conducted for the Vinyl Institute by Foremost-McKesson in 1986. The Vinyl Institute work was largely directed by B.F.Goodrich.

All of the other citations offered by the draft EIR are not in fact technical leaching studies, but are secondary analyses and do not present information independent from either the Cooper or the Butter studies.

The EIR cites a study by CH2M-Hill "*Metal v. Plastic Pipe: A Comparative Health Risk Assessment on Drinking Water Quality*. 1987. Prepared by CH2MHILL for the Lead Agency)" (HCD-82, P. 65). If the authors had inspected the document they would've seen on the cover that the CH2M-Hill report was prepared for the Vinyl Institute and in the summary that it is based solely on the Foremost-McKesson work done earlier for the Vinyl Institute in 1986.

Other, earlier laboratory studies were only preliminary investigations into leaching. The J. M. Montgomery study in 1982; *Diffusion of Organics from CPVC Pipe*, J.M. Montgomery, Consulting Engineers, Inc., Pasadena, California, September, 1982., did, in fact find phthlate in the leachate, but this was later determined to be contamination from phthlate plasticizer in laboratory tubing used to connect the test cells. It is inexplicable that the authors of the EIR would have failed to observe that distinction if the document itself had been inspected. The J. M. Montgomery study raised the issue of CPVC contamination by chloroform and other chlorinated solvents used at that time in its manufacturer. By the time that the Cooper and Butter studies were conducted, B.F.Goodrich had altered its manufacturing method to substantially eliminate the need for chlorinated solvents as "swelling agents". Thus the Cooper and Butter studies only show leaching potential from CPVC resin manufactured without swelling agents. The earlier J. M. Montgomery study must be used to show potential chloroform leaching levels from CPVC pipe made from an alternative manufacturing method. As mentioned in comments Section 3 and as illustrated by B.F. Goodrich patent 5,591,497 (Attachment B), alternative methods are still considered currently available.

It is important to note that one of the key public health and drinking water safety issues in the current, 1998 EIR is the leaching potential for organotin compounds deliberately introduced into the CPVC resin as additives. None of the leaching studies referenced in the 1998 draft EIR tested for organotin leaching from CPVC. Therefore there is absolutely zero technical information on organotin leaching presented in the draft EIR.

Even the studies cited have significant limitations (see analysis below). The primary technical focus of the Cooper and Butter studies was solvents leaching from solvent welded joints during the early stages of occupancy. The Cooper study led to HCD proposing pre-occupancy flushing as a mitigating measure for solvents in drinking water. Neither the Cooper nor Butter studies indicate the long-term leaching behavior of organotin compounds embedded in the CPVC pipe matrix.

The only studies which bear on organotin leaching are recent research efforts undertaken in Canada (Forsyth and Jay, HCD-136, and Sadiki, et al, "*Pilot Study on the Contamination of Drinking Water By Organotin Compounds from PVC Materials*," 1996). Even here, the draft EIR attempts to minimize the significance of the issue without seeing whether those studies are in fact adequate as a basis for California decision-making.

What is perhaps most startling is the authors' reliance on NSF testing programs without disclosing any of the results of NSF tests. Presumably NSF has in fact been conducting leaching tests as part of its certification quality control process. These tests would have been conducted in the intervening decade since Cooper and Butter. While there are technical limitations with NSF testing protocol (see analysis below), the EIR should have, at minimum, shown the full range of NSF leaching test results on the CPVC products which would be marketed and used in California once HCD's proposed approval is granted. Where is the data that already exists?

Implied Reliability of Other Regulatory Procedures

An objective assessment of available technical studies would have shown HCD that many of the important questions to be addressed in the EIR could not be answered with available information. The EIR dismisses this deficiency by repeated references to other putative regulatory processes where other presumably "informed" decision-makers allowed the use of CPVC pipe. Most notably, the EIR's constant citation of "all of the other 49 states" which use CPVC, does not describe what scientific, objective, public regulatory process was used in any of those 49 states to approve CPVC. If those other states had in fact conducted independent reviews of CPVC, HCD could examine the technical record so developed, and incorporate it into HCD's own technical analysis as required by California law. The EIR does observe, "... other than in California CPVC pipe ... has never been independently regulated, other than through the Uniform Plumbing Code." (P. 2) In that light, the EIR should remove statements that imply that use elsewhere is evidence of

CPVC acceptability in California.

The other significant area of implied reliability is the EIR's reference to the approval of CPVC for public water supply distribution in California. Unaware that CPVC is not actually used for public water supply in California, the EIR states, "The public water supply systems which connect to and deliver water to residential buildings are regulated by public health agencies and the State Public Utilities Commission. This system has, in the instance of CPVC, resulted in different standards and materials for these potable water piping applications, even though the public drinking water flows directly from one to the other. " (P. 16) "Both CPVC and PVC piping systems are assembled using primers and solvent cements. The same solvents are used in primers and cements for both materials. These solvent cements and primers are also approved for use in public drinking water systems in California. The approval process for these materials includes provisions to assure protection of human health, safety and the environment." (P. 98) It is significant that the first statement occurs immediately under the heading "Regulatory Background and Independent Testing" which shows that HCD is lumping regulatory approval by another agency and independent testing as equivalent in value to its analysis.

This is clearly wrong: only by disclosing factual information and HCD's own independent analysis can HCD fulfill the requirements of CEQA. Vague and unsubstantiated references to other approvals have no meaning. If HCD thinks other regulatory approvals are relevant, then the EIR should include the results of specific documented tests, studies, or other analyses which the other agencies used to assure protection of human health, safety and the environment.

Available Studies Identified Work Needed, but Undone

Looking back at the studies that are available, each one acknowledged its limitations and usually included recommendations for further work. The EIR relies on the body of available work without determining whether the preliminary results are either applicable or definitive for the analysis the EIR is required to do. It may be a common trait of researchers to recommend further research, but the researchers' own warning to the reader should not be ignored by HCD. The lead agency should evaluate the original studies and show where subsequent work was done to remedy the deficiencies.

The EIR authors rely on the CH2M-Hill report, possibly under the erroneous belief that the work was done for the state of California, rather than for the Vinyl Institute. The EIR cites part of the summary from CH2M-Hill, but does not make reference to some of the more important parts of the work.

CH2M-Hill includes a section assessing the limitations of the Butter (McKesson) study it reviews. On page VII-33, it notes that the metal and plastic studies were conducted using different water systems and with different water types. It noted that trihalomethane data were statistically discounted due to the study methodology and, by inference, the results do not bear on levels of trihalomethanes that are of public health significance. Note that Butter did not measure organotin.

As is evident, even the consultants to the Vinyl Institute were aware of the preliminary nature of leaching studies. The critique is important to one of the fundamental jobs that the EIR must accomplish: objective and full disclosure. Throughout the EIR, the authors have extracted negative results from the few studies available and have concluded that these non-findings are sufficient evidence to conclude no potential for public health impact.

The limitations of the studies relied on in the 1989 EIR were described in detail in the comments submitted on that draft EIR. No final response has been made to those comments and HCD should explain why the limitations identified there are not still relevant. Limitations that were identified included:

Sanitary Engineering and Environmental Health Research Laboratory Study (Cooper, 1987)

- a. Problems with Protocol and Implementation of Study
  - (1) Impaired Limit of Detection
  - (2) Not All Leachates Identified
  - (3) Sample Mixup or Analysis Conducted Past Due Date
  - (4) Sample and Column Contamination
  - (5) Inadequate Analysis of Cements
  - (6) Duplicates Left Out of Average Values
  - (7) Reporting of Data Out of Linear Range
  - (8) Inadequate Statistical Analysis
- b. Chlorination Omitted from HCD Protocol
- c. Cooper Test Not Representative
- d. Selective Interpretation of Results

McKesson Environmental Services Study (Butter, 1986)

- a. Inappropriate to Rely on Vinyl Institute Sponsored Study
- b. Problems with Protocol
  - (1) MES "Chlorinated" Water Not Reported
  - (2) High Background Levels of Halogenated Organics Obscure Test Results
  - (3) CPVC Test Run with Very Cold Water
- c. Errors in Interpretation
- d. MES Elevated Temperature Test Not Reported
- e. MES Cement Analysis Not Reported

The criticisms of the failure to investigate the relationship of chlorinated potable water and leaching are particularly significant. The widespread use and subsequent failure of PB piping probably was due to unaccounted attack by chlorine residual. While CPVC may be less susceptible to attach, chlorine residual will promote tin leaching and may react to produce other leachates. In the lab testing done in 1998 for Thomas Reid Associates, the CPVC pipe had a continual chlorine demand not shared by the blank. What was the chlorine reacting with?

Need for Objective Comparison of Studies

In order to demonstrate an objective review of available studies, the EIR should present in table or matrix with a side-by-side comparison of the leaching studies. This comparison should identify:

- The study principal investigator,
- the study year,
- who commissioned the study,
- what pipe material was studied,
- was the pipe material itself subjected to independent analysis of its chemical constituents,
- was the pipe material approved for use with potable water,
- were solvent cemented joints included for plastic, or for metal, were soldered joints used and was no lead solder used,
- what kind of leaching conditions prevailed (chlorination, pH, temperature, flushing interval, dwell time),
- how long the study was conducted (duration of simulation),
- what chemical analytes were studied (solvents, inorganic metals, residual monomer, chlorinated organics, organotins), and
- what were the practical limits of detection under the study conditions.
- The comparison should list any limitations acknowledged in the study report itself and
- it should present the state's objective assessment of how representative the study is to answering the fundamental questions in the EIR: what is a reasonable, but health-protective projection of long-term, cumulative, non-voluntary exposure.

When the state undertakes this necessary exercise, it will clearly disclose to the public that the studies available are few, old (many did not evaluate current plumbing products such as no lead solder and impact modified CPVC), and short-term – none beyond 75 days. Tests of chlorinated potable water and tests for organotins are conspicuously missing.

B. Potable Water Leaching

Given the limitations of the database used for the EIR is hard to see how HCD could reach its conclusions. The general theme is that studies found that substances leach, the leaching declines over time, and so concentrations must go to insignificant levels even though the studies themselves were not conducted so is to show this.

The EIR cannot readily dismiss the long-term and cumulative exposure to solvents, organotins and possible chlorinated organics which may leach from the pipe.
@@@
The EIR's concern for lead in drinking water is well founded. Elimination of lead based solders followed a general social effort to eliminate lead as an environmental contaminant: leaded gasoline, lead-based paint pigment, lead in pottery glazed cookware, and lead pipes. The EIR acknowledges brass as a source of lead, but refuses to separate brass fixtures from a metal pipe distribution system. The typical statement, "It is a certainty that the low lead solders and brass foundry products still contribute some lead to tap water. (P. 33) shows this co-mingling of concepts. While there is evidence that brass foundry products contribute lead to tap water, the EIR should acknowledge that brass foundry products may legally contain up to 8 percent lead and have extensive surfaces in contact with tap water whereas lead solder may legally contain no more than 0.02 percent lead and the solder line in a joint is a far smaller contact area. Does the EIR have any basis for the preceding statement? Is there an estimate of the proportion of lead contributed by solder compared with the proportion contributed by a brass fitting?

This comment is not academic. What the EIR apparently fails to recognize is that residences plumbed with CPVC will be fitted with fixtures made of brass. By lumping lead from brass with the invented lead from solder, EIR significantly miss-states a public health problem.

C. Permeation

Another area where the EIR gives short shrift to the potential public health impacts is in the area of permeation. The EIR assumes that CPVC pipe is sufficiently dense that permeation of organic materials from the outside of the pipe to the inside the pipe will be insignificant. The assumption of reduced diffusion seems reasonable based on a consideration of the increased chlorine content resulting from post-chlorination of PVC resin. However the concern for permeation continues to increase as the extent of contaminated groundwater becomes more widely known. The concern extends to new threats such as MBTE oxygenate a used in gasoline. It is significant to note of that the public water supply conveyors consider contaminated ground to be a counter indication for use of PVC pipe. Refer to the discussion in Section 2 of these comments. Note that the PVC pipe used for water supply is much thicker wall than the small diameter CPVC pipe proposed for residential use and would be far more resistant to permeation..

As was pointed out in comments on the inadequate project description, the project under consideration will lead to installation of CPVC in soil from the meter to the structure and under the slab in common residential construction. EIR should include specific test data on CPVC that will reflect the potential for permeation and as important, the potential for shortened pipe system lifetime due to exposure of the plastic pipe to potentially aggressive organic compounds.

D. Fire

The EIR treatment of fire and fire safety belies a lack of research. The treatment offered is nothing more than speculation as to the actual dangers attendant to residential structure fires.

Toxic Smoke

The major cause of death in residential structure fires is due to the incapacitation of occupants which prevents their escape before the fire has reached them. Smoke, with its toxic gas constituents, travels from room to room, within walls, and through ventilating systems reaching victims far before the direct heat of the fire. Carbon monoxide, hydrogen cyanide, hydrogen chloride, and phosgene all contribute to rapid incapacitation of fire victims.

The EIR discusses the generation of toxic gases during combustion of CPVC, but omits any mention of phosgene. Chemically, phosgene is carbon monoxide with two chlorine atoms attached. It is more toxic than carbon monoxide and was used in World War I as a poison gas. The EIR correctly notes the absence of nitrogen in the CPVC formulation, hence predicting the absence of cyanide, but incorrectly concludes that only carbon monoxide is a toxic concern for smoke.

Some 20 years ago the issue of phosgene as a component of toxic smoke from PVC fires was investigated. Articles such as, Dyer, R. F., and V. H. Esch, 1976, Journal of the American Medical Association, Vol. 235, No. 4, pages 393-397, "Polyvinyl Chloride Toxicity In Fires.

Hydrogen Chloride Toxicity In Fire Fighters" found that " However a wide variety of other toxic gases such as phosgene (75445), benzene (71432), toluene (108883), xylene (1330207), naphthalene (91203), and vinyl-chloride (75014) are present." But concluded that " The toxic effects of these gases are small when compared to the toxicity of hydrogen-chloride. The synergistic effects of these gases is unknown. Similarly, Bjerre a 1984, "Health Hazard Assessment of Phosgene Formation in Gases of Combustion of Poly Vinyl Chloride Using a Simplified Method of Mathematical Modeling", Annals of Occupational Hygiene 28 (1). 1984. 49-60. Found that, "Under extreme conditions with respect to composition, temperature and cooling rate of the combustion gases, dangerous concentrations of phosgene may have been reached within a fraction of a minute.", but also concluded that the rate of phosgene formation for PVC combustion was slow without catalysis.

It is surprising that the issue has not been revisited for CPVC. In PVC there is essentially at least one hydrogen for every carbon and for every chlorine so that the thermodynamically favored reaction of chlorine with hydrogen with the formation of hydrogen chloride is going to dominate the less favored reaction of chlorine with carbon. In pipe-grade CPVC, the chlorine content is much greater and the ratio of hydrogen to chlorine is far less than the stoichiometric one-to-one of PVC. The EIR recognizes this, " This is due to the chemistry of CPVC, specifically the fact that the polymer contains such a high percentage of chlorine that there is little for atmospheric oxygen to react with in a fire." (P. 55) With oxygen from air, heat from neighboring burning material, and carbon from soot or char as a catalyst, phosgene formation may be more significant.

HCD should query industry as to whether it has conducted such tests of CPVC itself. Has HCD inspected laboratory tests or field studies of CPVC in a fire? Although CPVC is less flammable than PVC, CPVC may have an even greater potential for toxic smoke generation than PVC.

Fire Propagation

The statement of the fire safety problem in EIR is clear, "It has been suggested that this could result in a faster rate of fire spread, if CPVC pipe passing through a wall were to melt or slump due to a fire on one side of the wall and leave an opening.(P. 53) Unfortunately EIR never gets around to answering the question. Does HCD have laboratory tests of CPVC potable water pipe performance in fire rated walls?

The draft EIR addresses fire propagation with speculation. The statement, "the metals used for potable water pipe are excellent conductors of heat and can contribute to the spread of fires through barriers." (P. 91) is unsubstantiated. The circumstances in which copper with water in it would be exposed to heat of sufficient intensity that it would breach a fire rated wall by conduction of heat along the pipe would probably have long ago caused a CPVC pipe to melt away from the wall and breach the fire ratings by allowing heat and flames to pass through. Does HCD have a comparison between CPVC and copper during a fire test? The reference cited to Parker addresses DWV not potable water. Because DWV is normally empty it will heat faster and the vertical vents would probably transfer heat differently than smaller diameter horizontal potable water pipe. This line of reasoning is another example of EIR's double standard of proof for metal and plastic.

7. Economic and Social Effects

The EIR refers to HCD's "goals of providing Californians with safe, affordable, and decent housing." (P. 71) These goals are laudable and widely shared, but the EIR appears to be using affordability of housing built with plastic pipe as a contributing motivation for approval of the project. The EIR claims the virtue of affordability and consumer choice for plastic pipe in construction but does not present quantitative, objective analysis to show to what extent this may be true.

Throughout the document, the authors make it clear that they favor the use of CPVC pipe, generally considering it preferable to copper. The promotional tone of the EIR reflects this favoritism and the document cumulates in a casual and almost colloquial statement of overriding considerations. The EIR states; " Even if new information comes to light in the future which might indicate some minor impacts of CPVC, it is now thought that the environmental, economic, and social advantages of approving CPVC would very likely override any newly discovered adverse attributes of CPVC." (P. 111)

What do the EIR preparers consider to be "minor impacts of CPVC"? Are potential leaching, air quality impacts from solvent use, worker health and safety impacts considered minor? The EIR should identify what "minor" verses "substantial" impacts are. The reader can surely see the difficulty HCD had with sifting through data and quantifying effect, but the implication of HCD performing some sort of balancing between "impacts" and "advantages" requires more quantification. In the socioeconomics section, HCD should show exactly how much or how little the proposed CPVC code change would benefit housing.

A. No Significant Difference in Cost

HCD's EIR perpetuates the myth that CPVC plastic pipe is a boon to affordable housing. The origin of this myth may be simply B.F. Goodrich marketing promotion, or it may be the common perception that anything plastic must be cheaper than anything metal. Considering the resources available to the Department of Housing and Community Development, it is surprising that the EIR does not contain real data on cost developed by HCD.

Instead, the EIR relies on a report comparing CPVC and copper (Kennedy and Jenks, 1995, HCD-251) to conclude that CPVC would have a lower installed cost than copper (DEIR, p. 105). Kennedy and Jenks does not provide the basis for its cost estimates and it appears that HCD has not attempted to obtain the actual bases for this analysis or to conduct its own independent review.

Does HCD's conclusion reflect the additional costs associated with the installation of CPVC pipe apparently not included in Kennedy and Jenks. According to Dickens (Appendix B of comments submitted by the California Pipe Trades Council on the 1989 plastic pipe EIR, Nov. 13, 1989, see Attachment F), there are additional costs associated with plastic pipe that must be factored into any economic analysis comparing copper and CPVC pipe:

Labor will be required to flush the plastic pipe system as recommended in the DEIR. However, the Kennedy and Jenks analysis 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, p. 6-7). This is a conservative estimate since labor costs have increased since this analysis was prepared in 1989.

The DEIR does not estimate the cost of the ventilation required when gluing CPVC pipes together. A survey of existing ventilation methods suggests that a system sufficient to satisfy the DEIR's recommendation would add as much as $100 to the cost of installing a plastic system. (Dickens, p. 9.)

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 for each unit in a multi-story building (Dickens, p.9.). This amount also applies to single family units and probably has increased since 1989. This is also a conservative estimate of the increased cost for fire safety mitigation, since it does <u>not</u> include the cost of the fire-stopping systems themselves or the increase costs of the special installation methods required for such systems.

Currently, the costs of CPVC are not significantly lower than copper. Dickens presented an analysis comparing the material costs of the copper and CPVC (Attachment F, Dickens, Appendix A, p.15-16), which showed CPVC to be more expensive than copper at that time. The cost of CPVC resin has dropped; the cost of copper fluctuates with a world market and both CPVC and copper are going to be at a cost disadvantage to the definitely cheaper polybutylene (PB) or PEX pipe. This analysis was updated using 1997 costs of copper and CPVC (see Attachment G). The updated analysis shows that there is only a $57.00 material savings by using CPVC.

If the EIR is going to present a favorable discussion of CPVC over copper piping based on affordability, then it must present a table showing a cost comparison for installing the two different materials. The cost comparison must incorporate (and clearly specify) all proper installation procedures for each material from beginning to end (including inspections, fire blocking material, etc.).

True life-cycle cost will depend on the installed life of the plumbing system. In the EIR, the claimed estimated life span of CPVC is not based on any supportable data. The DEIR states that: "CPVC has an estimated service life of 75 years, although this is only an estimate since CPVC has only been in use for about half of that time." (DEIR, p.105). What is the source of this estimated service life? Is it just someone's assumption or is it based on field studies or laboratory simulated aging studies? Does any pipe manufacturer, such as B.F.Goodrich or the extruders using B.F.Goodrich resin, offer a 75-year warranty for the product? Does B.F.Goodrich publish information on the conditions that may shorten pipe life? Simply put, if there is no data to support the 75 year estimate, a more conservative figure should be used. The EIR must substantiate its 75-year life span projection.

B. Construction Cost Savings Do Not Mean Savings to the Consumer

Even if CPVC were significantly cheaper than copper, this would not produce "affordable" housing for California citizens. The EIR states that allowing CPVC will further the goal of providing affordable housing, but the EIR does not show how reducing the cost of plumbing materials and installation actually effects cost of a house when it is sold. According to Dickens:

> "When any amount of a good can be produced at a fixed cost that cost will determine the goods price. However, when the quantity of a good that can be produced is limited, the price will be determined by the demand for the good. The cost of producing it will be irrelevant to the selling price. It seems reasonable to assume that in many urban areas in California all land within normal commuting distance of the central city has been developed and the quantity of housing available to those who wish to work in the central city is essentially fixed. In such an environment the price of housing, even the price of a new house constructed on an old lot, will be unaffected by the cost of building the new housing. Rather, any reduction in construction costs will simply increase the value of land. Only in rural areas or in urban fringe areas (where housing costs are relatively low) is it likely that the cost of building new housing will affect the price of housing.
>
> The same should be true for rent. In fully developed urban areas (where rents are highest) rent is probably unaffected by the cost of constructing new rental housing and is determined only by the demand for housing. Again, savings on construction costs will only increase the value of land" (Dickens, p. 9-10).

If there are any cost savings with CPVC pipe, they will benefit the contractor or home builder and not the consumer. Indeed the consumer will have very little choice over what plumbing materials are installed in anything other than custom homes. Another myth is that putting plastic pipe in the marketplace will add to consumer choice. According to the DEIR: "Allowing consumers to choose pipe with the longest life span in their home's location is consistent with the general public policy goal of providing California families with safe, decent, and affordable housing (DEIR, p.106). This statement is totally misleading because consumers do not get the choice of what plumbing material is used when a house is newly constructed. The contractors/developers get the choice of what building materials to use. EIR text referring to housing affordability because of use of CPVC piping should be removed from the EIR.

C. Mechanical Failure and the Consumer

Arguably mechanical failure of potable water plumbing systems would lead to direct impacts on the physical environment, but we choose to discuss it under the heading of socioeconomics because it is a component related to consumer issues.

At several places in the EIR, great emphasis is placed on problems with copper corrosion where aggressive water is used for potable water. Replacement of copper by plastic is the sole approach contemplated by the EIR. The EIR should also include, however, a broader range of options to reduce copper corrosion. The relevance of this should be obvious because even with adoption of the proposed code change, there will be literally millions of homes with copper plumbing already throughout the state. Whatever legitimate consumer or environmental problems are associated with copper, they will not disappear with HCD's action.

For this reason the EIR needs to take a broader look at the issues of corrosion that it identified. Rather than simply pointing to copper corrosion as one of HCD's motivations for the project, the EIR should identify alternatives including water treatment and the costs associated with them. The EIR should address the potential community wide impact on funding for water treatment for newer homes being built with plastic versus older homes built with metal. HCD obviously views plastic pipe as a quick fix for aggressive water, but what about existing structures?

CPVC has been around for a long time as a plastic, but the aggressive development of CPVC piping for industrial and residential use began in the 1980s with B.F.Goodrich's establishment in the marketplace. The EIR authors seem to think that CPVC has an extensive track record, but present very little information on the actual extent of long-term installations. Citation of a few demonstration homes plumbed many years ago is hardly relevant. Citation of the "other 49 states" doesn't really show the basis for comparison of the extent of consumer testing of CPVC compared with far more broadly used metal. B.F.Goodrich should be a source of this information, but HCD will need to objectively review anything provided to be able to discern fact from marketing.

This information is relevant because the dramatically different extent of the installed base of copper and CPVC affects all of the statistics that HCD quotes in the EIR. Any listing of worker injuries is statistically meaningless without showing the extent of the population generating the statistic.

HCD needs to present information on failures of CPVC systems – either based on actual failures in the field or known limitations to CPVC. The EIR dwells at great length on copper corrosion (e.g. pp. 89 – 91), but never presents information about CPVC. B.F.Goodrich, HCD's primary source of information, could have provided an objective description of CPVC limitations, special installation requirements, and known problems in the field. HCD could have presented this information side-by-side in EIR, and the public at least would have seen that there is a significant potential for failure due to incompatible materials, incorrect installation, and exposure to high temperatures. B.F.Goodrich's installation guide for its product includes some of these known limitations (Attachment C).

CPVC's parent material PVC is not suited to hot water service because it loses strength at elevated temperatures. The process of post-chlorination of PVC to produce CPVC pipe progressively raises the softening temperature and brings the resin into the range of thermal performance suitable for hot water service in residential installations. The EIR should disclose that CPVC pipe is operating at the extreme high end of its rated temperature range and that this leaves no margin of safety for even momentary heat exposure such as from a malfunctioning water heater or from a homeowner attempting to thaw a frozen pipe. Some of the installation restrictions seek to limit the potential for damage, but these only underscore the fact that the hot water connection is the weak link in a CPVC system.

The EIR should note that CPVC will be subject to less reliability when installed in cold weather. Cold weather can affect the CPVC assembly because the solvent cements must be used in a narrow temperature range — well above freezing. The solvent cement manufacturers warn against cementing pipes below 40^0 F and there are low temperatures cements manufactured presumably with a different mix of solvents. If the joint is too cold it will not set properly, the joint may be mechanically deformed before it sets, and the solvent will eat deeper into the pipe and produce a weaker joint. If solvent cement freezes, the consistency will change and subsequent use may produce weak joints.

There is a long list of incompatible materials, materials whose chemical composition is capable of attacking CPVC resin and altering its mechanical performance either through softening or through swelling and subsequent stress cracking. The EIR should disclose that long term exposure of a CPVC plumbing system to potentially incompatible materials will result in failure. There is very little experience with a solvent welded thermoplastic piping system in a home that operates under pressure. The thermal resistance and mechanical strength of CPVC depend critically on its mass of incorporated chlorine and is sensitive to the effect of absorbing any foreign substance. Chemically, CPVC is resistant to aqueous acids or alkalies, but is highly susceptible to attack by organic solvents and oils. If exposed to these materials, the pipe system will weaken and fail. The joints are most susceptible because the connection is only formed by the mingled pipe surfaces softened by the solvent.

B.F.Goodrich acknowledges a short list of obviously incompatible materials (Attachment C), but there are undoubtedly more. Home construction relies on sealants, adhesives, surface coatings, insulating foams, plastic fixtures, etc. Substances not normally thought of as solvents will attack CPVC such as vinyl plasticizers used to make flexible PVC products. If in contact with CPVC piping, the PVC plasticizers could migrate into the CPVC and weaken the pipe. The exposure could occur from vinyl-coated pipe hangers or from contact with other materials. Other oils or adhesives such as the binder on fiberglass insulation and water vapor barriers may slowly degrade CPVC.

Interestingly, HCD has access the information on incompatibility and failure from environmental exposure of CPVC to chemicals. On page 62, the EIR discusses permeation and mentions the failure of several homes in Florida where CPVC pipe was exposed to a termiticide. HCD reassures the reader without evidence that the termiticide could not have permeated the pipe and that the only problem was that the pipe failed. HCD's careful consideration of the limitations stated by B.F. Goodrich (Attachment C) is needed. Does HCD have information of sources of chemical damage to CPVC not included in the list in Attachment C?

The problem in Florida is associated with several commonly used termiticides, notably chlorpyrifos (Dursban), but may also be related to exposure to the petroleum based carrier as well as to the active ingredient. The same chemicals are registered for use throughout the United States and the same slab on grade construction is used extensively in California.

HCD should list which chemicals are known to be incompatible with CPVC

a) What chemicals are considered incompatible with CPVC plastic pipe?
b) What kind of effects can these incompatible chemicals have on CPVC?
c) Are any of these chemicals found in common household materials?
d) What kind of remediation can be done when the pipe system is found in contact with incompatible materials or to have been exposed? Should the homeowner wait for failure or would damage stop when the incompatible material is removed?

e) What measures will HCD implement to make sure that this problem is minimized?

8. Solid Waste

The EIR makes several assumptions about future recycling of CPVC piping from the waste stream that are not supported by factual information. The DEIR must provide supporting information for the conclusion of no significant impact by providing background information on plastic recycling from the waste stream. Specifically, the EIR must provide information on the following issues:

a) The DEIR must estimate the potential waste stream created by allowing CPVC in California by projecting the amount of material that would eventually be added to the waste stream (in pounds per day or tons per year). This issue cannot be cast aside as speculative simply because the estimated useful life of CPVC is "more than half a century".

b) The EIR states that because PVC is currently recycled, CPVC will also be recycled. The EIR should provide information regarding the amount and type of current PVC recycling. How is it separated from the waste stream (source separated or extracted from a mixed waste stream)? Are recyclers spread throughout the state or is the plastic shipped to few regional recyclers?

c) What is the market for recycled PVC? Can recycled PVC compete with virgin PVC resin and is the recycled PVC market artificially supported by industry or government sponsored recycling programs? Would the recycled market be the same for CPVC resin?

d) According to the Lead Agency, CPVC has been in use everywhere else in the world except for California. If this is the case, there must be some information regarding the market and recycling methods of CPVC. What portion of CPVC is recycled from the waste stream in other states (or countries) that currently allow its use? How does the price of recycled CPVC compare to the price of virgin CPVC (which will be the ultimate factor driving the recycling of CPVC)? What kinds of products are made out of the recycled CPVC (other than those already listed in the EIR).

e) The DEIR should examine the effect on CPVC use on recycling of demolition debris and interference with AB 939 waste reduction goals.

f) What effect will recycling CPVC have on the constituents of plastic pipe? Will recycled resin be usable for pipe? Will the properties of thermal stabilizers and the high extrusion temperatures needed for CPVC result in CPVC mixed with PVC making it difficult to recycle PVC itself? HCD should refer to industry literature for this.

In preparing the DEIR, it appears that the authors overlooked information regarding plastic recycling contained in two of the sources listed in the EIR's bibliography. In reviewing these sources published by the California Integrated Waste Management Board (CIWMB), several pieces of information regarding the current state of plastics recycling came to light:

- The U.S. EPA estimates that 19.3 million tons of plastic waste were generated in the U.S. in 1993. Of that amount, only 0.7 million tons were diverted from disposal, only 3.5 percent of the amount generated. In California, the plastic waste diversion rate was 2.9 percent in 1990 (Integrated Waste Management Board, 1996, HCD-109, p.1). The plastics recycling industry is relatively immature compared to other materials such as glass, paper and aluminum which are recycled at rate of 22 percent, 34 percent and 26 percent respectively.

- While there has been some success with recycling plastic materials such as PET and HDPE, there has been less success with PVC. According to the California Integrated Waste Management Board:

  "Markets for recycled PET are currently the largest and most developed. However, the vast quantities of HDPE used in consumer products will support increasingly large markets for HDPE. Other common resins - such as polystyrene, LDPE, polypropylene, and PVC - continue to face collection, separation, and contamination problems that curtail the development of markets" (Integrated Waste Management Board, 1992, HCD-107, p.52).

- Postconsumer plastic recycling, however, still is experiencing significant growing pains because of several barriers:

  - ☐ Expensive technologies are necessary to clean and separate the different plastic wastes. Although increasing progress is being made in separation and reprocessing technologies, most solutions are costly.

  - ☐ Labor costs are high because many plastics must be manually separated.

  - ☐ The market for recycled resins is limited by seasonal fluctuations that lead to an unstable supply, sharp fluctuations in prices for virgin resins, volatile foreign markets, and uneven quality of collected plastic waste because there are no widely accepted standards.

  - ☐ "Transportation costs generally are high for plastics due to their low weight and high volume. The amount that any given container can haul is limited without first incurring the cost of compressing and baling" (Integrated Waste Management Board, 1992, HCD-107, p. 2).

While the information contained in these two references does not necessarily indicate the state of plastics recycling "more than half a century" from now when the DEIR predicts CPVC will begin to enter the waste steam in appreciable quantities, it does indicate the current state of plastics recycling and the difficulties that must be overcome before a strong and comprehensive plastics recycling industry exists. These two documents do not necessarily support the EIR's conclusion of no significant impact because CPVC piping will be recycled.

First the EIR must tell the public how much CPVC waste is expected to enter the waste stream, then the EIR must discuss the practicality of recovery of most of the CPVC in the waste stream through recycling before a conclusion of no impact can be supported.

If California's 1990 plastic waste diversion rate was 2.9 percent, that means that roughly 97% of plastic wastes generated were disposed of in landfills. The widespread use of a material that is difficult to recycle and will most likely be landfilled is not consistent with the goals of AB 939 which directs cities and counties to reduce the waste stream to landfills by 50% by the year 2000. AB 939 also presents a waste management hierarchy which places source reduction above recycling. Since copper piping is a proven product for potable water systems and there exists a proven market for recycled copper piping, HCD must address the CPVC piping and its consistency with the waste management goals established by AB 939.

9. The Effects of Leaching on the Physical Environment

The potential impacts of water leaching on the physical environment are not addressed in the DEIR. Cumulatively, solvents, organotins, or other substances leaching from CPVC pipe will pass into the wastewater and reach the environment.

While the DEIR addresses in detail the leaching impacts of copper piping on the physical environment, it completely ignores the leaching impacts of CPVC piping. There is no discussion of the potential of leachates from CPVC to impact the physical environment. At a minimum the following issues should be addressed for each of the potential contaminants leached from CPVC:

- the amounts of the leached contaminants should be estimated;
- the potential toxicity of the contaminants on the aquatic environment;
- the sensitivity of receiving environments, such as rivers, bays, estuaries and the ocean (any water bodies where sewage treatment plants discharge);
- Any water quality standards relevant to these contaminants should be discussed;
- the estimated amount of contaminant discharge should be compared to existing standards;
- Relevant studies that address the impacts of these contaminants on the physical environment should be presented;

The following impacts should be addressed as stated above.

Organotin leaching impact on environment has not been addressed. The potential for organotins leaching into the water discharge system into the sensitive marine habitats, such as the South Bay, has not been addressed. The DEIR claims that CPVC is required to reduce impacts of copper leaching on the South Bay, but does not address the impact of exchanging one leachate for another.

1. The potential impact of dibutyltin and monobutyltin on marine organisms has been completely ignored.
2. There has been no attempt to estimate the amount of loading of organotins into sensitive environments such as the South Bay. The DEIR goes into great detail regarding the amount of loading of copper pipe leachates on the South Bay but does not even attempt to address organotin loading.

Consider that each household constructed with CPVC pipe will include approximately one pound of organotin compounds in the pipe matrix. This organotin material will become a permanent part of the aquatic environment – that is to say it as the potential to leach small but steady amounts of organotin into the water system. Even assuming the low levels of organotin posture late in EIR, the cumulative leaching could be substantial. The EIR should contain at least an estimate of this quantitative impact. Does the high chlorine residual of the disinfection process result in greater organotin leaching? What is the effect of this amount of tin on the aquatic environment of the South Bay?

Potential dioxin impacts on the environment have not been addressed in the DEIR. Dioxins or more specifically dibenzofurans were found in pipe tested (see attachment P). Although this test does not demonstrate leachability in raises an issue that should be addressed in EIR. Additionally the potential of chlorinated vinyl in pipe manufacture or in the waste stream may also be a source of dioxins (see attachment A).

As with the organotin case above, there has been no attempt to estimate the amount of loading of dioxins into sensitive environments such as the South Bay. This is particularly important since the U.S. EPA is expected to reverse the Water Resources Control Board's decision not to list dioxin as a high priority pollutant for the San Francisco Bay under the Clean Water Act (See Attachment H: Inside Cal/EPA, July 10, 1998, p.8).

10. Energy, Manufacturing and the Environment

The EIR addresses energy on pp. 50-51 with the observation that CPVC is made from LPG gas and salt. This over simplification misses some of the energy and environmental costs associated with the production of CPVC resin and its extrusion into pipe products. Chlorine makes up the majority of CPVC by weight as it is manufactured by the chlor-alkali process from electrolysis of concentrated brine. Production of the brine through electrolysis itself and processing chlorine are all highly energy intensive. For completeness in its discussion of LPG energy impacts, the EIR should note the electrical and other energy requirements of the chlor-alkali side of the product. Further energy is required to produce PVC monomer, to complete the chlorination process and later to manufacture the pipe directly. The EIR analysis only addresses the energy content of a petrochemical raw material and not the total energy cost of the product.

The EIR briefly addresses the waste and environmental impact of CPVC manufacture (P. 52). Probably the most significant environmental impact comes from the earlier stages of chlorine and PVC monomer manufacture. These impacts have been the subject of substantial environmental concern from public interest groups and have been associated with some of the most significant incidence of toxic contamination in the U.S. While these precursor impacts are broadly disseminated and perhaps the CPVC component of PVC manufacture is small, for completeness, EIR should acknowledge these life-cycle environmental effects.

Further in the discussion of energy, EIR notes, "In order to achieve a reasonable level of energy efficiency, many residences have plastic insulation installed on copper pipes." (P. 52) Is it HCD's interpretation of the California energy conservation regulations that CPVC pipes used for hot water will not need to be insulated? Are all available insulation materials compatible with CPVC?

Thomas S. Reid, Professional Experience

General Expertise

Thomas S. Reid has directed his firm and participated in much of its technical work since its inception in 1972. He has managed the performance of work on over 400 environmental impact assessments and other technical studies. Many of these studies involved industrial, energy, or waste management projects that had significant issues regarding air pollution, air toxics, water quality, public health, public safety, or risk of upset.

Mr. Reid is well versed in the physical aspects of environmental analysis and conservation planning. He has expertise in the areas of air and water chemistry, noise assessment, engineering aspects of projects and computer modeling in impact assessment. Applied skills include aerial photo interpretation, geographic information systems (GIS), CAD-assisted mapping, data processing and interpretation, and statistics. His work in air quality modeling, monitoring and impact assessment has special expertise for fugitive dust, fine particulate, crystalline silica and asbestos.

Education:

B.S. Chemistry, Yale University, New Haven, CT, 1969.
Graduate study in Biology, Stanford University, Stanford, CA, 1969-1973.
National Science Foundation Graduate Fellowship, 1969-1972.

Membership:

Association of Environmental Professionals, 1974
American Chemical Society, 1976
Air and Waste Management Association, 1986

Professional experience in assessment of Industrial, Energy and Waste Management Projects

- Oil Transshipment and Refining
- LNG Transshipment/regasification
- Oil and Gas Pipelines
- Petroleum Extraction and Enhanced Recovery
- Underground Natural Gas Storage
- High-voltage Transmission Lines
- Water Supply Systems
- Processing and Warehousing Facilities
- Cyanide Manufacturing
- Lumber Mills
- Steel Rolling Plants
- Research and Development Laboratories
- Bioengineering Laboratories
- Aggregate Quarries and Riverbed Mining
- Underground Mineral Mining
- Wind Energy Facilities
- Geothermal Energy Plants
- Biomass Energy Plants
- Waste to Energy Plants
- Coal-fired Energy Plants
- Petroleum Coke-fired Energy Plants
- Tank Farms
- Communication Towers
- Sanitary Landfills
- Industrial Waste Disposal Sites
- Wastewater Treatment Programs
- Transfer Stations/materials Recovery
- Construction Waste Recycling
- Franchise Collection
- Green Waste Composting
- Hazardous Waste Collection, Treatment and Disposal

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

ATTACHMENTS TO THE COMMENTS
OF
THOMAS REID ASSOCIATES

August 29, 1998

List of Attachments to Comments from Thomas Reid Associates on the 1998 CPVC EIR

A) Gesellschaft fur Arbeitsplatz und Umweltanalytik "Orientational air studies for PCDF/D during the extrusion of C-PVC"

B) BF Goodrich " Patents: No. 5,591,497, No. 5,194,471, No. 4,377,459"

C) Excerpts from BF Goodrich "Flowguard Gold" FG-2G re: Cold Weather Considerations and Chemical Compatibility of FlowGuard Gold CPVC Products

D) USEPA letter to Unibell PVC Pipe Association re: vinyl chloride contamination of a Kansas public water supply, April 1, 1993

E) European Council of Vinyl Manufacturers website: www.pvc.org, "Question and Answer Page"

F) Dickens, "Costs of Plastic Pipe Not Considered or Inadequately Analyzed in the Draft Environmental Impact Report on Plastic Plumbing Pipe"

G) Thomas Reid Associates, "Material Cost Comparison: CPVC vs. Copper Plumbing" August 21, 1998

H) Inside Cal/EPA "EPA Region IX Poised to Reverse Water Board Decision on Dioxin" July 10, 1998

I) Thomas Reid Associates, "Solvent Content of Cement and Primer Comparison" August 21, 1998

J) Ron Coiner Deposition, BF Goodrich vs. Village in the Lake in the Hills, Sept. 3, 1997

K) Ron Coiner Deposition, BF Goodrich vs. Village in the Lake in the Hills, March 24, 1998

L) NSF International, NSF Tetrahydrofuran Task Group, "Minutes for the July 10, 1997 Task Group Meeting" July 25, 1997

M) British Standards Institute, "Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of water, Part 4. Method of Test - The GCMS identification of water leachable organic substances" 1998

N) Seinen, et al, "Toxicity of Organotin Compounds. II. Comparative in Vivo and in Vitro Studies with Various Organotin and Organolead Compounds in Different Animal Species with Special Emphasis on Lymphocyte Cyctotoxicity" April 4, 1977

O) 1998 Testing Results, Anresco Incorporated

P) 1998 Testing Results, Quanterra Environmental Services

Q) 1998 Testing Results, West Coast Analytical Service, Inc.

R) 1998 Testing Results, TRI/Environmental, Inc.

8/26/98