Comments
on
Draft Environmental Impact Report

Adoption of Regulations Permitting Statewide Residential Use of Chlorinated Polyvinyl Chloride (CPVC) Plastic Plumbing Pipe without First Making a Finding of Potential Premature Metallic Pipe Failure Due to Local Water or Soil Conditions

Amending Section 604.1 of the California Plumbing Code

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COMMENTS

The California Department of Housing and Community Development ("HCD") has prepared a Draft Environmental Impact Report[1] ("Draft EIR") pursuant to the requirements of the California Environmental Quality Act ("CEQA") for the proposed adoption of regulations that would modify Section 604.1 of the California Plumbing Code ("CPC") to permit statewide unconditional use of chlorinated polyvinyl chloride ("CPVC") plumbing pipe as an alternate material for hot and cold water distribution systems ("potable water systems") within residential structures. (Draft EIR at pp. 1 and 10.)

The current CPC regulations restrict the use of CPVC pipe for construction of residential potable water systems to those situations where local building officials make a finding that there is or will be a premature failure of metallic pipe due to corrosive water and / or soil conditions (referred to as "the findings requirement"). This findings requirement was adopted into the CPC in November 2000 with the approval of a Mitigated Negative Declaration[2] ("2000 MND"). In March 2005, the HCD analyzed the potential environmental impacts of removing the findings requirement in a Draft Addendum[3] to the 2000 MND ("2005 AMND"). The Lead Agency found the 2005 AMND to be deficient and decided that the public would be better served by an EIR that would provide a more in-depth analysis of removing the findings requirement ("Project" or "code change"). (Draft EIR at pp. 6-9.) This Draft EIR evaluates the potential environmental impacts on air quality, water quality, worker safety, and solid waste associated with the increased use of CPVC pipe.

The removal of the findings requirement is likely to increase the amount of CPVC pipe installed in new residential construction and re-pipings (*i.e.*, replacing piping in existing residences) as a direct result of builder choice over commonly used copper pipe. Sections of CPVC pipe are joined using fittings or connectors. The pipe is chemically fused to the connector using a process called "solvent welding" or "cementing." This process uses chemicals—cleaners, primers, and cements—which are

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[1] California Department of Housing and Community Development, Draft Environmental Impact Report, Adoption of Regulations Permitting Statewide Residential Use of Chlorinated Polyvinylchloride ("CPVC") Plastic Plumbing Pipe Without First Making a Finding of Potential Premature Metallic Pipe Failure Due to Local Water or Soil Conditions, July 2006, SCH #2006012044.

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

[3] California Department of Housing and Community Development, Draft Addendum to Adopted Mitigated Declaration Amending Section 604.1 of California Plumbing Code, March 3, 2005, SCH #2000091089.

applied to the end of the pipe and the inside of the fitting socket. The pipe ends and fittings are first cleaned, primer is applied to soften the pipe, and cement is applied to bond the pipe and fitting. The primers and cements (collectively referred to as adhesives) used to join CPVC pipes contain solvents that are volatile organic compounds ("VOCs"). These VOCs evaporate during the transfer, drying, surface preparation, and cleanup, resulting in VOC emissions into the atmosphere. Volatile organic compounds, together with nitrogen oxides ("NOx"), are the main reactants in the photochemistry that produces ozone in the troposphere, also referred to as photochemical smog.

As discussed in my comments below, the Draft EIR is deficient and many conclusions reached in the Draft EIR with respect to the significance of the Project's potential impacts on air quality are flawed and devoid of any real analysis. Dr. J. Phyllis Fox had submitted extensive comments on the 2005 AMND ("Fox 04/22/2005[4], attached as Exhibit 1.) Because some of these comments were disregarded or not adequately addressed, I incorporated portions of Dr. Fox's comments into this comment letter where applicable.

I. The Draft EIR Is Inadequate and Incomplete

The Draft EIR is inadequate and incomplete for a number of reasons as discussed in the following comments.

I.A Alternatives Analysis Is Inadequate

The CEQA Guidelines require lead agencies to analyze a range of reasonable alternatives to a project. CEQA requires that the discussion of alternatives shall focus on alternatives to the project which are capable of avoiding or substantially lessening any significant effects a project may have on the environment, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly. The CEQA Guidelines also require that an EIR evaluate the comparative merits of the alternatives, and identify the environmentally superior alternative from among those considered. (CEQA Guidelines Section 15126.6.)

The Draft EIR presents four alternatives: 1) the no-project alternative, 2) not eliminating the findings requirement but requiring the use of low-VOC adhesives, 3) eliminating the findings requirement and requiring the use of low-VOC adhesives (the preferred alternative), and 4) eliminating the findings requirement and not requiring the use of low-VOC adhesives. The Draft EIR acknowledges the requirement

[4] J. Phyllis Fox, Comments on Draft Addendum to Final Mitigated Negative Declaration Amending Section 604.1 of California Plumbing Code, April 22, 2005.

to analyze these alternatives yet provides no evaluation, analysis or discussion whatsoever of the environmental impacts associated with any of these alternatives with the exception of Alternative 3, the Draft EIR's preferred alternative. (Draft EIR at pp. 13-15.) While an EIR need not discuss each alternative in as much detail as the preferred alternative, it must include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed Project. Here, the Draft EIR fails to provide the requisite information.

The Draft EIR fails to provide any discussion how it arrived at the conclusion that Alternative 3 is, in fact, the environmentally superior and, thus, preferred alternative. It appears that Alternative 3 being the preferred alternative was a foregone conclusion and the description of other alternatives was only included as an afterthought. In fact, based on even just a brief reflection on the potential environmental impacts resulting from each of the described alternatives, it becomes clear that Alternative 3 is not the environmentally superior alternative.

For example, the Draft EIR finds that Alternative 3, the preferred alternative, would increase the statewide use of CPVC pipe and adhesives and therefore increase emissions of VOCs, which are ozone precursor compounds. The Draft EIR concludes that these increased VOC emissions would result in significant and unavoidable adverse impacts on air quality, both individually and cumulative. (Draft EIR at pp. 47-48.) In contrast, Alternative 2, *i.e.* not eliminating the findings requirement but requiring the use of low-VOC adhesives for those applications currently permitted under the findings requirement, would result in considerably lower emissions of VOCs compared to Alternative 3 because it would not result in new uses of CPVC and would require current applications to use low-VOC adhesives statewide, not just in some jurisdictions. Therefore, from an air quality perspective, Alternative 2 is clearly environmentally superior compared to Alternative 3 and should be the preferred alternative.

Another alternative that should have been considered in the Draft EIR's alternatives analysis is the use of one-step cements. One-step cements do not require the application of a primer. One-step cements with low-VOC contents are available and approved for use in California. The Draft EIR acknowledges the existence of such one-step cements whose use would result in lower emissions and reduced exposure of workers, to but fails to analyze their use as an alternative to the use of the proposed low-VOC primer/sealer combination or as a mitigation measure for the significant adverse impacts on air quality. (Draft EIR at pp. 11, 63, 65, and 96.)

The Draft EIR should be revised to include a reasonable range and meaningful analysis and discussion of alternatives and to identify the environmentally superior alternative based on facts not on foregone conclusions.

I.B Thresholds of Significance

The HCD first contemplated using local air district's quantitative CEQA thresholds of significance for construction to evaluate the Project's potential impacts on air quality. However, a number of comments received on prior CEQA documents indicating that the appropriate threshold would be an operational rather than construction threshold of significance, prompted the HCD to consult with the California Air Resources Board ("CARB"), the state agency with the authority to coordinate the efforts in the state to attain and maintain ambient air quality standards through the California Clean Air Act ("CCAA"). In response, the CARB advised HCD to evaluate emissions against both the operational and construction thresholds of significance to give "reasonable but conservative estimates of impacts." (Yee 05/11/2006[5]; Exhibit 2.) Despite this recommendation, the HCD, having no technical expertise in air quality analysis, chose to ignore the CARB's expert opinion and advice and declined to adopt either of these quantitative thresholds of significance. (Draft EIR at p. 42.)

The Draft EIR argues that construction thresholds of significance are inappropriate for this Project. (Draft EIR at p. 42.) This statement lacks any foundation, citation to evidence or description of the analytic process that led to this conclusion. The supporting assumptions are not relevant, not supported, and do not provide an analytic path to this conclusion. For example, the Draft EIR states that "[p]ipe replacements are likely to be widely distributed, not grouped together in a "project" and that "[i]t is not reasonable for the Lead Agency to assume that all estimated CPVC plumbing installations within a county on a particular day would be part of a single construction project." The Draft EIR further emphasizes that the VOCs generated from CPVC pipe installation would be only one part of the construction project calculations. (Draft EIR at pp. 42-43.) The Draft EIR appears to misunderstand the scope of a "Project" under CEQA. The Project in this case is not an individual residential development project but rather the change in the plumbing code itself. (CEQA Guidelines 15378.) This code change will result in a large number of installations on any given day and would result in continual emissions of VOCs from many individual concurrent projects.

With respect to operational significance thresholds, the Draft EIR emphasizes that the Project is a code change, not a site-specific "bricks and mortar" project, and argues that "[a]lthough VOCs will be released during construction which takes place pursuant to the code change, these releases are of short-term duration." The Draft EIR then concludes that because "VOC emissions will not be long-term, local air district significance thresholds for operational values are inappropriate for this project." (Draft EIR at p. 42.) Again, the Draft EIR appears to misunderstand the scope of a "Project" under CEQA. The Project is a change in the plumbing code which would result in

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[5] Judy Yee, California Air Resources Board, Email to Robin Gilb, California Department of Housing and Community Development, Re: Thresholds of Significance for VOC Impacts, May 11, 2006.

continual emissions of VOCs from CPVC installation throughout the state, day after day, year after year. The statement that VOC emissions from the Project "will not be long-term" is clearly contrary to the fact that increased VOC emissions would occur continually over an infinite number of years. Because the Project would result in ongoing and continual emissions with resultant adverse impacts on the State's air quality, it is perfectly appropriate and common practice to evaluate emissions against local air districts' operational thresholds of significance.

A building code sets forth specific conditions for individual but recurring activities. As such it is comparable to regulations issued by local air districts and their amendments. Such air district regulations and their amendments of rules are routinely evaluated against the respective local air district's operational CEQA threshold of significance. For example, Dr. Fox in her comments on the 2005 Amendment, discussed a comparable action to the Project, the South Coast Air Quality Management District ("SCAQMD")'s evaluation of potential air quality impacts resulting from relaxing limits on the VOC content allowed in primers and sealers used to weld CPVC pipes under SCAQMD Rule 1168. (Fox 04/22/2005[6], Comment I.B.2.b.) This action is very similar to the Project in that it involves a regulation that that would increase VOC emissions from the use of CPVC pipe, increases that would occur during project construction from a large number of small sources spread throughout the district. The SCAQMD concluded that the resulting increase in VOC emissions from the change to Rule 1168, reductions that would be foregone by the rulemaking, was significant because they exceeded the District's operational significance threshold of 55 lb/day. The Draft EIR failed entirely to address Dr. Fox's comment. Other examples include the CEQA Initial Study for proposed amendments to the Bay Area Air Quality Management District ("BAAQMD") Regulation 8, Rule 43: Surface Coating of Marine Vessels (BAAQMD 2001/03[7]), the SCAQMD's environmental assessment of an amendment to Rule 1157 – PM10 Emission Reductions from Aggregate and Related Operations (SCAQMD 2006/07[8]), or the SCAQMD's environmental assessment for the proposed fleet vehicle rules and related rule amendments (SCAQMD 2006/07[9]). Clearly, the Draft EIR's statements and

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[6] J. Phyllis Fox, Comments on Draft Addendum to Final Mitigated Negative Declaration Amending Section 604.1 of California Plumbing Code, April 22, 2005.

[7] Bay Area Air Quality Management District, CEQA Initial Study for Proposed Amendments to Bay Area Air Quality Management District Regulation 8, Rule 43: Surface Coating of Marine Vessels, March 6, 2001; http://www.baaqmd.gov/pln/ruledev/8-43/2001/0843_ceqa1_030601.pdf, accessed August 31, 2006.

[8] South Coast Air Quality Management District, Amend Rule 1157 — PM10 Emission Reductions and Related Operations, July 7, 2006; http://www.aqmd.gov/hb/2006/July/060735a.html, accessed August 31, 2006.

[9] South Coast Air Quality Management District, Final Program Environmental Assessment for: Proposed Fleet Vehicle Rules and Related Rule Amendments, June 5, 2000, SCAQMD No. 000307DWS;

conclusions regarding the applicability of local air districts' significance thresholds are contrary to the facts and inconsistent with universal practice. Moreover, the Draft EIR fails to identify any other quantitative thresholds but relies on a merely qualitative discussion of potential adverse impacts on air quality from the proposed code change.

I.C Failure to Discuss Adverse Health Impacts

The CEQA Guidelines, Section 15126.2(a), require that an EIR discuss health and safety problems caused by the physical changes that the proposed project will precipitate.

The Draft EIR concludes that the Project would cause significant unavoidable adverse impacts on regional air quality due to emissions of VOCs, which are ozone precursor compounds. (Draft EIR at pp. 47-48.) The human health and associated societal costs from ozone pollution are extreme. For example, the U.S. Environmental Protection Agency summarized the effects of ozone on public health as follows:

> "A large body of evidence shows that ozone can cause harmful respiratory effects, including chest pain, coughing and shortness of breath, which affect people with compromised respiratory systems most severely. When inhaled, ozone can cause acute respiratory problems; aggravate asthma; cause significant temporary decreases in lung function of 15 to over 20 percent in some healthy adults; cause inflammation of lung tissue, produce changes in lung tissue and structure; may increase hospital admissions and emergency room visits; and impair the body's immune system defenses, making people more susceptible to respiratory illnesses." (66 Fed. Reg. 5002, 5012, January 18, 2001.)

Here, the EIR offers only cursory acknowledgement that poor air quality due to increased formation of tropospheric ozone can lead to adverse impacts on human health. The Draft EIR offers only the following brief statement: "Ozone is a respiratory irritant that increases susceptibility to respiratory infections." (Draft EIR at p. 28.) However, there is no acknowledgement or analysis of the well-known connection between reduction in air quality and resultant increases in specific respiratory conditions and illnesses. (For an in-depth discussion of health impacts due to photochemical smog, refer to Fox 04/22/2005 Comment I.H.1.)

After reading the EIR, the public would have no idea of the health consequences that result when more VOCs are added to a non-attainment basin causing ozone levels to further increase. Recent court decisions have emphasized that this information is insufficient to acknowledge the well-known connection between reduction in air quality

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http://www.aqmd.gov/ceqa/documents/2000/aqmd/finalEA/1190/1190FEA.html, accessed August 31, 2006, accessed September 6, 2006.

and increases in specific respiratory conditions and illnesses. For example, one appellate court elaborates:

> "Guidelines section 15126.2, subdivision (a) requires an EIR to discuss, inter alia, health and safety problems caused by the physical changes that the proposed project will precipitate. Both of the EIRs concluded that the projects would have significant and unavoidable adverse impacts on air quality. It is well known that air pollution adversely affects human respiratory health. (*See, e.g.*, Bustillo, Smog Harms Childrens Lungs for Life, Study Finds, L.A. Times (Sept. 9, 2004).) Emergency rooms crowded with wheezing sufferers are sad but common sights in the San Joaquin Valley and elsewhere. Air quality indexes are published daily in local newspapers, schools monitor air quality and restrict outdoor play when it is especially poor and the public is warned to limit their activities on days when air quality is particularly bad. Yet, neither EIR acknowledges the health consequences that necessarily result from the identified adverse air quality impacts. Buried in the description of some of the various substances that make up the soup known as air pollution are brief references to respiratory illnesses. However, there is no acknowledgement or analysis of the well-known connection between reduction in air quality and increases in specific respiratory conditions and illnesses. After reading the EIRs, the public would have no idea of the health consequences that result when more pollutants are added to a nonattainment basin. On remand, the health impacts resulting from the adverse air quality impacts must be identified and analyzed in the new EIRs." (*Bakersfield Citizens for Local Control v. City of Bakersfield (2004) 124 Cal. App. 4th 1184.*)

The Draft EIR should be revised to contain an adequate discussion of health impacts resulting from the contribution of Project VOC emissions to regional ozone formation.

I.D Comparison of Project VOC Emissions to Natural Background VOC Emissions Is Irrelevant and Misleading

The Draft EIR attempts to trivialize the Project's potential impacts on air quality caused by emissions of ozone precursor compounds by comparing its potential VOC emissions to county and statewide VOC emissions from natural background sources, *i.e.* biogenic or geogenic sources or wildfires. (Draft EIR at pp. 47-48.) The Draft EIR declares that "VOC emissions projected to occur as a result of the change in the plumbing code are well below background ROG levels emitted by Natural Sources," implying that Project-related emissions would be negligible in comparison and, thus, irrelevant. (Draft EIR at p. 47.) This comparison is not only entirely immaterial in the context of a CEQA analysis, it is also deceiving.

On a state or county-wide mass emissions basis, natural background emissions of VOC, mostly biogenic emissions from vegetation, are indeed orders of magnitude higher than potential VOC emissions attributable to the Project. However, the actual contribution of biogenic and anthropogenic VOC emissions to local or regional ozone formation is dissimilar and can not be simply inferred from absolute mass emissions.

Biogenic hydrocarbon emissions from vegetation (mainly isoprene and monoterpenes) play a major role in ozone formation and accumulation in both urban and rural areas in large parts of the eastern United States, especially in the summertime. For example, in New York City, the contribution of biogenic VOCs is greater than that of anthropogenic VOCs. In contrast, in the South Coast Air Basin ("SoCAB"), the Central Valley, and other parts of California, anthropogenic VOC species are by far the largest contributor to ozone formation. (Griffin et al. 2004[10]; Martien et al. 2002[11].)

A number of factors contribute to this phenomenon including spatial and temporal distribution patterns of biogenic and anthropogenic VOC emissions. Spatial variability is important because the location of pollutant emissions and regional meteorological transport patterns affects how and where VOC and NOx react to form ozone. Further, the timing of the biogenic emissions, which peak at midday when insolation, *i.e.* solar radiation received at the earth's surface, and temperatures are high, may also be a factor. The late release of the biogenic emissions may make them relatively less reactive compared to emissions from anthropogenic sources that peak earlier.

A recent study conducted for CARB evaluated the incremental reactivity of 30 organic compounds using 3-D photochemical air quality models. Photochemical modeling was conducted for the South Coast Air Basin ("SoCAB") and Central California (including the San Francisco Bay Area, Sacramento and the San Joaquin Valley). Hot summertime conditions that were conducive to high levels of photochemical smog formation were considered in the modeling. A consistent finding for all eight South Coast urban monitoring sites examined was that biogenic VOC have low relative incremental reactivities compared to anthropogenic VOCs. This is because most of the biogenic emissions were located downwind of the urban sites that were examined. Results for central California were similar to those for the South Coast Air Basin. (Martien et al. 2002.)

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[10] Griffin RJ, Revelle M.K., and Dabdub D, Modeling the Oxidative Capacity of the Atmosphere of the South Coast Air Basin of California. 1. Ozone Formation Metrics, Environmental Science & Technology 2004, Vol. 38, pp. 746-752; http://albeniz.eng.uci.edu/dabdub/My_papers/2004_Griffin-Revell-Dabdub_EST.pdf, accessed September 3, 2006.

[11] Martien P., Harley R., Milford J., Hakami A., and Russell A., Development of Reactivity Scales via 3-D Grid Modeling of California Ozone Episodes, Final Report, Prepared for California Air Resources Board, Contract No. 98-309, May 2002; http://www.arb.ca.gov/research/apr/past/98-309.pdf, accessed September 3, 2006.

The Draft EIR's comparison also fails to take into account that most VOC emissions from the Project would occur in addition to the existing emissions in many areas where the air quality is already severely compromised and would therefore substantially contribute to existing violations of air quality. Furthermore, the construction season coincides with the ozone season, and the additional emissions during this period would further exacerbate the already severe non-attainment problems in many urban areas in California. The Draft EIR's attempt to downplay potential emissions from the proposed code change is misleading and fails to disclose the potential magnitude of adverse impacts on air quality.

II. The Draft EIR Considerably Underestimates Potential VOC Emissions from the Proposed Project

The Draft EIR admits that Project emissions may contribute substantially to an existing or projected violation of ambient air quality standards for ozone "where the addition of even a small amount of ozone precursors can be considered a substantial contribution" and concludes that the Project would have significant impacts on air quality. (Draft EIR at pp. 47-48.) As discussed in the comments below, the Draft EIR fails to use reasonable worst-case assumptions to estimate potential ozone precursor emissions. Draft EIR's emissions estimates contain numerous erroneous and unsupported assumptions, computational errors, and flawed use of statistical tools, resulting in considerably underestimated potential ozone precursors emissions from the proposed Project. As a result, the Draft EIR fails to disclose the potential magnitude of proposed Project's adverse effects on air quality.

II.A Reasonable Worst-case Analysis Is Required

It is common practice for CEQA analyses to present a reasonable worst-case scenario. A reasonable worst-case analysis, for example, accounts for variability in daily emissions that are not adequately portrayed by average daily emissions which are based on an annual average. Here, the Draft EIR Draft EIR systematically uses such annual averages or chooses low values for other factors such as market share to estimate potential emissions of VOC ozone precursor compounds from the Project. Instead of using a reasonable worst-case analysis based on conservative values for the factors involved in the calculations, as is common practice, the Draft EIR attempts to approach the potential variability in emissions with a flawed statistical analysis that does not account for many of the factors potentially being considerably higher than assumed by the Draft EIR. (*See* Comment II.F.) The Draft EIR should be revised to reflect reasonable worst-case assumptions.

II.B Potential Future Market Share of CPVC Pipe in California Is Underestimated

The Draft EIR's estimates of potential VOC emissions resulting from the proposed Project are based on the assumption that CPVC pipe would achieve a 30 percent market share in California. (Draft EIR at pp. 12-13 and 36). This value for future market share of CPVC is neither reasonable nor adequately supported by the facts and, as a result, significantly underestimates number of homes that can reasonably be expected to be piped with CPVC in California in the future.

The Draft EIR supports its assumption of a 30 percent "mature" market share for future CPVC pipe use in California with a citation to an email from Jeff Cash, the Business Director for Noveon, Inc., a CPVC manufacturer and patent holder for CPVC potable water pipe in the United States. (Draft EIR at pp. 36.) Yet this email provides only "ballpark estimates" for the total North American potable water pipe market of approximately 230 million pounds (as measured as CPVC). Jeff Cash estimates that about 70 million pounds or 30% of these 230 million pounds is CPVC, 40 million pounds or 17% is PEX, and the rest or 53% is copper. (Cash 02/23/2006[12], Exhibit 3.) There are a number of problems with the Draft EIR's assumption that this 30 percent market share for the North American potable water pipe market constitutes an adequate value for a "mature" market share for future CPVC pipe use in California.

First, HCD also received a later email from Bob Raymer, the Technical Director for the California Building Industry Association ("CBIA"), which states that of the total North American market for potable water pipe of 230 million pounds, CPVC is 90 million pounds or 39%, PEX is 40 million pounds or 17%, and copper is the rest, *i.e.* 44%. (Raymer 02/27/2006[13], Exhibit 4.) The DEIR fails to explain the discrepancy between these two estimates or how it determined that 30% was the more accurate number. In fact, the Draft EIR fails to even mention Raymer's email.

Second, the data provided by both Jeff Cash and Bob Raymer include California, which currently approves CPVC only with the findings requirement. California constitutes a considerable share of the North American housing stock. The 2005 estimate from the U.S. Census Bureau shows that about 10.4 percent of the total housing units in the U.S. are located in California.[14] (U.S. Census Bureau 06/08/2005[15].) This percentage

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[12] Jeff Cash, Noveon, Inc., Email to Robin Gilb, California Department of Housing and Community Development, Re: One More Market Question, February 23, 2006.

[13] Bob Raymer, California Building Industry Association, Email to Robin Gilb, California Department of Housing and Community Development, Re: One More Question, February 27, 2006.

[14] 2004 estimates for California 12,804,702 housing units, for U.S. 122,671,734 housing units: 12,804,702 / 122,671,734 = 0.104

must first be extracted from the total market share for the rest of the country to determine an acceptable value for the future market share of CPVC in the potable water market.

Third, the data provided by both Jeff Cash and Bob Raymer include PEX pipe, which is currently not permitted for use in potable water systems in California. It can therefore be reasonably assumed that in cases where an alternative for copper is sought 17 percent of users that would have used PEX would choose CPVC instead. This would further increase the market share of CPVC versus copper pipe in California.

Fourth, and most importantly, according to both industry sources, there are a lot of regional differences in the proportions of CPVC, PEX, and copper market shares of the total North American market. Both sources point out that "[f]or example, Florida is a heavy CPVC user while as you imagine California is not." (Cash 02/23/2006; Raymer 02/27/2006.) The Draft EIR's assumption of a "mature" market share for California being the same as the national market share appears to be picked out of thin air and clearly not supported by any facts.

As discussed in Comment II.A, CEQA requires a reasonable worst-case approach to assessing a project's potential environmental impacts. The Draft EIR fails to explain why it abandoned the reasonable worst-case approach used in the prior 2005 Addendum, which analyzed potential adverse impacts from the Project based on the use of 100% CPVC pipe in all new construction and re-piping of existing homes in California. (2005 AMND at p. 19.)

II.C Number of CPVC Re-pipes Is Underestimated

The Draft EIR states that its emission calculations assume that 100,000 units per year would be re-piped with CPVC pipe in the year the code change would be adopted. (Draft EIR at p. 3.) This assumption is based on a ballpark estimate provided by Bob Raymer, CBIA. (Raymer 03/22/2006[16], Exhibit 5.) Yet review of the Draft EIR's calculations reveals that only 30 percent of these estimated 100,000 CPVC re-pipes were taken into account to estimate potential VOC emissions from the Project for both the 2007 estimate and the 39-year average projection of future emissions.

Specifically, the Draft EIR assumes that the total number of units expected to be plumbed in California in 2007 includes 180,700 newly constructed units and 100,000 re-pipes for a total of 280,700 units. For future projections, the Draft EIR relies

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[15] U.S. Census Bureau, State and County QuickFacts, California, June 8, 2006; http://quickfacts.census.gov/qfd/states/06000.html, accessed September 6, 2006.

[16] Bob Raymer, California Building Industry Association, Email to Robin Gilb, California Department of Housing and Community Development, Re: Information for CPVC EIR, March 22, 2006.

on a 39-year average of housing units authorized by permits of 177,719 new units and 100,000 re-piped units for a total of 277,719 units. Based on the total number of units to be plumbed and the average percentage of single-family ("SF") and multi-family ("MF") units from 2003 through 2005, the Draft EIR calculates the number of units to be plumbed with CPVC for both SF and MF units for 2007 and the 39-year average. (*See* Draft EIR Tables 12 and 18.) The Draft EIR then assumes a 30 percent market share of CPVC pipe for the entire California potable water plumbing market and applies this market share to the previously calculated numbers of SF and MF units. This procedure effectively reduces the total number of units to be re-piped from 100,000 units to 30,000 units. As a result, the Draft EIR underestimates potential VOC emissions from re-piped units. The Draft EIR fails to explain the inconsistency between its statement that 100,000 units were assumed for its emissions calculations and the fact that it reduces this number by multiplying it with the projected future market share of CPVC of 30 percent.

Based on industry information it can be assumed that the re-pipe market in California would largely use CPVC rather than copper. In an email to HCD, Bob Raymer, CBIA, in noted the following: "One thing is very clear; the existing multifamily housing stock (apartments primarily) in California will be needing extensive plumbing system rehab in the coming years. The units built in the 1950's through 1970's will be needing substantial and expected rehab. Many of these rehab projects will be indefinitely postponed if allowable materials are limited to metal pipe. Regarding metal pipes, the labor costs associated with the time-extensive rehab of existing multi-family dwellings are simply too high to make many projects economically viable." (Raymer 02/27/2006.) This statement implies that the re-pipe market, at least for MF housing units, would almost exclusively be plumbed with CPVC if the code change would be adopted.

I have re-calculated potential VOC emissions from the Project based on the Draft EIR's calculations, only eliminating the use of the 30 percent market share for the 100,000 re-pipes. Attached Table A-1 shows the detailed calculations and inset Table 1 summarizes the Draft EIR and revised calculations and results.

Table 1: Calculation of statewide average number of SF and MF units to be plumbed with CPVC pipe in 2007 and resulting VOC emissions

Draft EIR*	Revised
Number of units to be plumbed with CPVC per year	
(180,700 new units + 100,000 re-piped units) × 0.30 market share = **84,210 units**	(180,700 new units × 0.30 market share = 54,210 new units) + 100,000 re-piped units = **154,210 units**
Number of SF and MF units to be plumbed with CPVC per year	
(84,210 units × 72.13% SF) = **60,741 SF units**	(54,210 new units + 100,000 re-piped units) × 72.13% SF = **111,232 SF units**
(84,210 units × 27.87% MF) = **23,469 MF units**	(54,210 new units + 100,000 re-piped units) × 27.87% MF = **42,978 MF units**
Amount of primer and sealer used per year	
(60,741 SF units × 0.27 L primer) + (23,469 MF units × 0.11 L primer) = **18,982 L primer****	(111,232 SF units × 0.27 L primer) + (42,978 MF units × 0.11 L primer) = **34,760 L primer**
(60,741 SF units × 0.81 L cement) + (23,469 MF units × 0.42 L cement) = **59,057 L cement****	(111,232 SF units × 0.81 L cement) + (42,978 MF units × 0.42 L cement) = **108,149 L cement**
VOC emissions per year	
(18,982 L primer × 550 g/L VOC) + (59,057 L cement × 490 g/L VOC) = **39,377,845 g VOC****	(34,760 L primer × 550 g/L VOC) + (108,149 L cement × 490 g/L VOC) = **72,110,883 g VOC**
VOC emissions per day	
39,377,845 g VOC / (454 g/lb) / (250 work-days) = **347 lb VOC/work-day**	72,110,883 g VOC / (454 g/lb) / (250 work-days) = **635 lb VOC/work-day**

* *Results are slightly different than results presented in Draft EIR, Table 14, due to rounding*

As Tables A-1 and 1 demonstrate, the Draft EIR considerably underestimates VOC emissions by applying a 30 percent market share to the 100,000 units estimated to be re-piped in California with CPVC in 2007. Based on this error, the Draft EIR calculates a statewide total of 347 lb / working-day of VOC emissions, whereas consideration of all 100,000 units to be re-piped results in VOC emissions of 635 lb / working-day. Thus, the Draft EIR has underestimated total average VOC emissions from the proposed Project by 288 lb / work-day[17] or 36.0 tons / year[18]. Results for the 39-year average projections are similar because the number of new housing units is similar and the number of re-pipes were assumed to be the same. Here the Draft EIR calculates a total of 343 lb / working-day instead of 632 lb / working-day of VOC emissions. (*See* Table A-2.)

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[17] (635 lb VOC / work-day) – (347 lb VOC / work-day) = 288 lb VOC / work-day

[18] (79.4 ton / year) – (43.4 ton / year) = 36.0 ton / year

It should be noted that these emission estimates only account for the incorrect application of the 30% market share. Actual emissions from the Project would be considerably higher as discussed in the following comments.

II.D Number of Re-piped Units Will Increase in the Future

The Draft EIR uses the estimate of 100,000 units to be re-piped with CPVC as an absolute number for its future projections, *i.e.* beyond 2007. However, this estimate is not a fixed absolute number but will rise along with the total number of housing units in California that need re-pipe or rehab work as the as entire California housing stock ages. Further, it is subject to year-to-year variation (uncertainty), due to various economic and societal factors.

II.E Use of CPVC Pipe to Repair Slab Leaks Is Not Considered

Bob Raymer, CBIA, identified another potentially large market for CPVC pipe, slab leaks in existing, aging housing units. (Raymer 03/22/2006.) A large number of homes in California were built with a concrete slab foundation and soft copper hot and cold water pipes located underneath the slab. Over the years, a number of factors including internal abrasion from hard water, metal fatigue from expansion and contraction of pipes during temperature changes, and seismic activity frequently lead to leaks. Slab leaks are a growing problem in California, particularly in Southern California. Because in many cases the existence of a leak indicates that the whole system is deteriorated to a point where more leaks can be expected, many homeowners opt to partially or even completely re-pipe the entire system by bypassing the slab rather than just spot patch the existing leak. Raymer estimated that re-routing or repair "could…be a very large quantity with probable 200,000 leaks per year in southern and Northern Cal." (Raymer 03/22/2006.)

The Draft EIR fails entirely to address the potential use of CPVC pipe for these slab leak re-pipes or repairs and, consequently, fails to include the associated VOC emissions in its emission estimates.

II.F VOC Emissions from Cleaners Are Not Included

The mating surface of CPVC pipe may contain waxy chemicals that are slippery and provide a barrier to cementing. These chemicals originate from extrusion aids and molding release agents used to manufacture the pipe. Mating surfaces must be free of dirt, dust, great, paint, water and other substances. If not removed, they "provide a serious jeopardy to the making of a successful joint." This may be done using a volatile solvent such as methyl ethyl ketone ("MEK") if deposits cannot be removed with a dry paper or cotton towel or rag. The solvents used to remove waxy, hydrocarbon-based contaminants are called cleaners. A cleaner is frequently used in addition to primer. An E-Z Weld (vendor of CPVC joining chemicals and source for the Draft EIR's values for cement use) Technical Note explains that: "[p]ipe cleaner is a non-aggressive mix of solvents used to remove contamination from joints and pipes prior to cementing. It will remove inks, dirt, oils and grease that could affect joint quality – and will not carry them into the plastic – as would primer." (Fox 04/22/2005 Comment I.E.6.a.) The Draft EIR failed to include VOC emissions from cleaners in its air quality analysis.

II.G Indirect VOC Emissions from Manufacturing Are Not Included

CEQA requires that both primary or direct and secondary or indirect consequences of a project be evaluated. (CEQA Guidelines Sec. 15064(d).) The Project will increase the demand for CPVC pipe, fittings, and joining chemicals. It is reasonable to assume that a portion of this increase in demand will be met by existing California manufacturers. The VOC emissions originate from storing and blending solvents in tanks, mixers, and dispensers. Some of the solvents used in these processes may also be manufactured in California, further increasing indirect emissions. This would increase VOC emissions from these existing manufacturing facilities, increasing the Project's adverse impacts on air quality. Given the magnitude of the increase in CPVC use proposed by the Project, the increase from existing manufacturing facilities in California could be individually and cumulatively significant. Dr. Fox's Comments on the 2005 AMND contain a detailed analysis of VOC emissions from several manufacturers of CPVC pipe, fittings, and joining chemicals in California, yet despite this detailed information, the Draft EIR has failed to address or incorporate indirect emissions. (Fox 04/22/2005 Comment I.C.) The Draft EIR should be revised to include indirect emissions from manufacturing in its air quality analysis.

II.H Statistical Analysis Is Flawed

The Draft EIR goes to great lengths to lay out its air quality analysis and presents 7 pages of text and 17 tables to support its calculations of potential VOC emissions from the proposed Project. (Draft EIR at pp. 35-42. and Appx. A, Tables 11 though 28.) Unfortunately, review of this air quality analysis reveals that it is riddled with computational errors, erroneous assumptions, and flawed use of statistical tools.

To forecast the potential impacts of the Project into the future, the Draft EIR analyzes the past and predicted future permitted units in California. The Draft EIR then calculates a statewide 39-year average (177,719 units) from the number of housing units permitted in California in the years 1970—2005 and the projected number of units to be permitted for 2006—2008. The Draft EIR further calculates the average plus 1 standard deviation (+1 STDEV) and plus 2 standard deviations (+2 STDEV) to determine the upper limits of the 68% and 95% confidence intervals for the projected number of housing units in California. Assuming that the relative proportion of permitted SF and

MF units in the preceding 3 years, 2003-2005, in each county is representative for future permitting activity[19], the Draft EIR calculates the projected number of SF and MF housing units for each county based on the California average and for the California average +1 STDEV and +2 STDEV, respectively. The Draft EIR then calculates potential annual average future VOC emissions from the Project as well as the upper limits for the 68% and 95% confidence levels based on the projected number of SF and MF housing units per year multiplied by a "mature market share" of 30 percent. The Draft EIR adds the number of re-piped housing units per year, 100,000 units, to the annual average and the annual average +1 STDEV and +2 STDEV, respectively, for each county. The Draft EIR then discusses potential impacts on air quality due to VOC emissions based on the average +2 STDEV housing unit numbers using Riverside County, the county with the largest percentage of statewide building permits, as an example. The Draft EIR calculates potential annual average VOC emissions of 58.7 lb / working-day and 85.2 lb / working-day based on a 95% confidence level. (Draft EIR at Appx. A, Tables 20 and 26.) There are a number of problems with this calculation, its results, and the Draft EIR's interpretation.

The subject analysis is flawed because it mischaracterizes the degree of confidence attributable to the result of its calculation. Specifically, calculation estimates the annual average VOC emissions (pounds / year) by multiplying the annual average number of housing units built (authorized by building permits) by an estimate of the amount of VOCs emitted from use of primer and cement during plumbing each unit. Unfortunately, the only uncertainty considered in the Draft EIR's analysis is that associated with the number of units built. However, the amount of primer and cement used in building each unit is also highly uncertain, as is the number of units re-piped each year, and future market share of CPVC. Yet the analysis completely ignores these uncertainties, yielding an incorrect result. As a result, the estimate of annual VOC emissions is highly uncertain. There is much less confidence in the annual emission estimate, even though there is reasonable confidence in the number of units built per year. As a result, the Draft EIR's presentation instills an unwarranted sense of accuracy in the reader. I will illustrate these problems and provide a revised VOC emission estimate using Riverside as an example in Comments II.H.1 through II.I.

II.H.1 Statewide and County-level Statistics for Housing Units Authorized by Permits Do Not Correspond

Using the statewide statistics for housing permits to calculate projected units at the county level is inappropriate. This is due, amongst other factors, to the counties'

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[19] The Draft EIR determines the relative proportion of single-family ("SF") and multi-family ("MF") units that would be constructed in each county in 2007 if the code change were approved based on the average percentage of permits issued for SF and MF units in the preceding three years, 2003-2005, and assuming that the number of units constructed approximately tracks the number of permits issued.

smaller population size, which results in greater uncertainty, as well as unpredictable developments in local real estate markets. As a result, counties in California have in the past 30 years experienced vastly differing levels of construction activity, with some counties having very little variation in the number of permits issued each year and other counties having extreme variations in permit activity. Riverside, in particular, is an example of a county that does not track California statistics very well. Figure 1 illustrates the number of units authorized by building permits for California from 1970 through 2004, and from 1993 through 2004 for each county. (Note that the units for California are on the right-hand y-axis and units for the counties are on the left-hand y-axis.)

Figure 1: Total number of housing units authorized by building permits by county and statewide

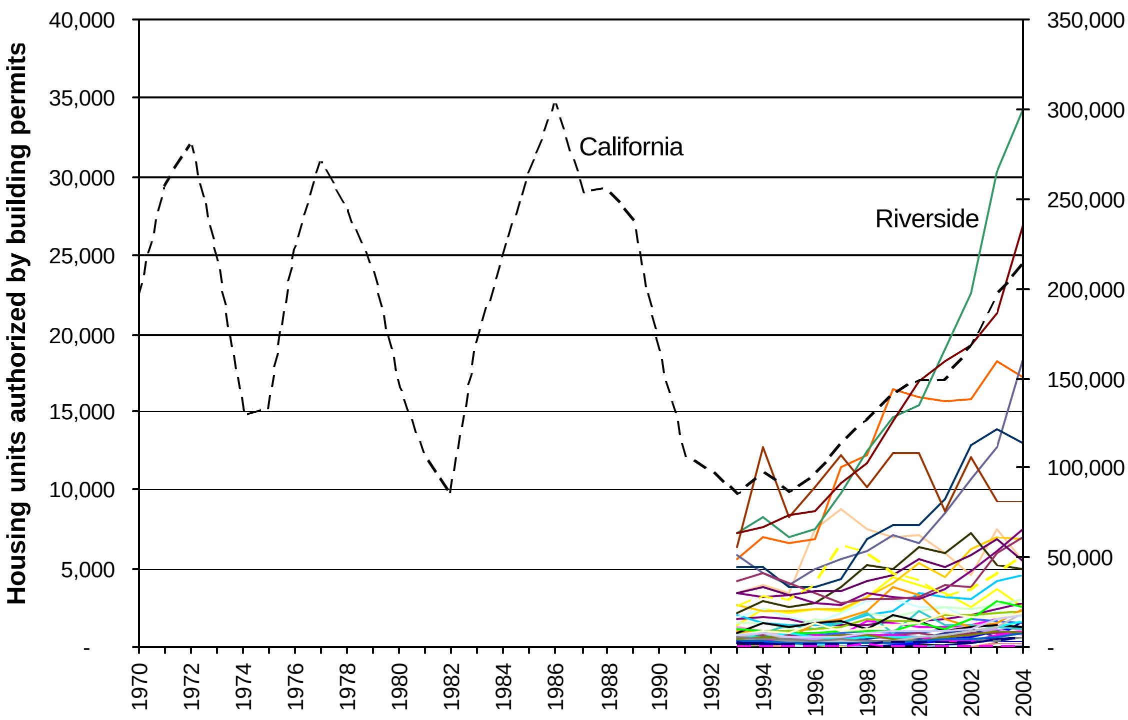

Figure 1 shows the extreme boom-and-bust cycles the construction industry has experienced in California over the past 34 years. To analyze how well counties track the statewide permit activity, I calculated the coefficient of variation, *i.e.* the ratio of the standard deviation to the average, for the number of housing units authorized by building permits in each county. Data are available for a 12-year period from 1993-2004 for California and each of its counties. (DoF 2006[20].) The coefficient of variation for

[20] Department of Finance, Economic Research Unit, California Statistical Abstract, I. Construction, Table I-6 — Residential Construction Authorized by Permits, Units, California and Counties; http://www.dof.ca.gov/html/fs_data/STAT-ABS/sec_I.htm, accessed September 9, 2006.

California-wide housing units authorized by building permits for the time period of 1970-2004 is 0.37 and for 1993-2004 it is 0.32. (*See* attached Table A-3.) Thus on a statewide basis, the coefficient of variation (relative variability) does not differ much for these two time periods. In contrast, the coefficient of variation on the county level for the years 1993-2004 shows a wide range: from 0.16 for Nevada County to 1.28 for Yuba County. Riverside has a coefficient of variation for this time period of 0.59, considerably higher than that of California in either time period. Accordingly, the Draft EIR's use of statewide variability to a county-level estimate does not correctly characterize the uncertainty (lack of confidence) in the county estimate, in this case Riverside's. In fact, if the uncertainty inherent in the components of the analysis were correctly propagated through the analysis, the potential for a very high VOC emission rate would be apparent. Consequently, the HCD's discussion of probability on a county-wide level is flawed. It underestimates the 95% probability for the number of housing units to be plumbed, ignores the uncertainty in the primer and cement use rates and in the number of re-piped units and, therefore, underestimates the potential VOC emissions on a county-wide level.

II.H.2 Propagation of Errors

The Draft EIR ignores the uncertainty (standard deviation) inherent in most of the factors used to calculate the annual VOC emissions from CPVC pipe use. In fact, the application considers only the uncertainty in the number of new units to be constructed in the future. It ignores the uncertainty inherent in other factors: the future market share of CPVC of the potable water pipe market (*see* Comment II.B), and the number of re-piped units per year (*see* Comment II.C). Even the uncertainty in the number of units to be constructed in Riverside County is incorrect. (*See* Comment II.H.1.) As a result, the standard deviation associated with the Draft EIR's annual average VOC emissions estimate is too small because it only considers the uncertainty in the number of housing units to be built and ignores all other uncertainties.

II.H.3 Computational Errors

The HCD provided the spreadsheets used to calculate the VOC emissions in response to a public records request. Review of the spreadsheets revealed a number of computational errors. For example, the spreadsheet used to calculate the average use of primer and cement for SF and MF housing units contains a number of incorrect input values as well as a number of incorrect cell references in the formulas calculating the averages and standard deviations. Attached Table A-4 shows the corrected values.

II.I Revised Potential VOC Emissions Estimate for Future CPVC Pipe Use in Riverside County

I recalculated the average daily VOC emissions and the upper limit of the 95% confidence interval for Riverside County. The latter is the estimated amount that has a

95% probability of not being exceeded, considering the uncertainty of all of the factors used in its derivation. I considered two cases: 1) I used all of the Draft EIR's assumptions, only correcting the average cement use for MF units (*see* Comment II.H.3) and propagating the errors inherent in every factor (*see* Comment II.H.2); and 2) I additionally revised the market share for CPVC for new units to 50% and for CPVC re-pipes to 100% (*see* Comment II.C).

For both cases, I first, I calculated the coefficient of variation for annual new housing unit permits for Riverside County for 1993-2004 (*see* Comment II.H.1) based on data from the Department of Finance. (DoF 2006; *see* attached Table A-3.) I then calculated the average annual number of housing units permitted for Riverside County using the HCD's statewide mean for the 39-year time period and the percentage of the state total HCD attributes to Riverside County for SF and MF units. I associated with this annual average a standard deviation that is of the same relative amount as I had calculated for the 1993-2004 period. In other words, I assumed that the coefficient of variation is the same in the 39-year period from 1970-2008 as it is in the 12-year period from 1993-2004. This is reasonable because inspection of a graph of statewide annual permits over the 39-year time period reveals no peculiarities during the most recent 12-year segment of that period. As mentioned above, the statewide coefficients of variation for these two periods are very similar. For Case 1, I assumed a market share for CPVC pipe in the California potable water pipe market of 30 percent for both new and re-piped units with a reasonably conservative standard deviation of 20%. For Case 2, I assumed a market share of 50 percent with a standard deviation of 20 percent for new units and of 100% for re-piped units.

Then, I calculated the mean and standard deviation of the amounts of primer and cement consumed in building each housing unit based on the same sources used by the HCD. (The Draft EIR's spreadsheet calculating the mean and standard deviation for primer and cement quantities contained computational errors; *see* Comment II.H.3). Like the Draft EIR, I assumed that cement and primer usage would be the same for re-piped units as it would be for new units. I further assumed that the standard deviation in the estimate of re-piped units is the same relative amount as in new construction, *i.e.* has the same coefficient of variation. Finally, I calculated the annual pounds of VOC emissions in identical fashion to the Draft EIR, but taking care to propagate the uncertainties (standard deviations) of factors throughout the calculation using elementary statistical formulas.

Case 1: Draft EIR's Assumptions but Corrected Primer Use and Propagation of Errors

Because all input values were the same as those used by the Draft EIR with the exception of the minor correction to the amount of primer used for MF units, this calculation results in the same daily VOC emissions based on a 39-year annual average as the Draft EIR's calculations, 58.7 lb / working-day. However, results for the 95 percent confidence level, *i.e.* a 95 percent probability that emissions will not exceed a certain level result in 125.9 lb / working-day, 40.7 lb / day more than the Draft EIR's estimate of 85.2 lb / working-day. (*See* attached Table A-5.) Thus, the Draft EIR has underestimated the potential VOC emissions in Riverside County by almost 50%. This estimate does not include a number of emission sources including VOC emissions from CPVC pipe use due to slab leaks or indirect emissions from manufacturing.

Case 2: Higher CPVC Market Share and Corrected Primer Use and Propagation of Errors

In contrast to the HCD's estimated annual average emissions 58.7 lb / working-day for Riverside County, this approach results in an annual average VOC emission rate of 133.1 lb / working-day and an annual average VOC emission rate of 248.6 lb / day at the upper 95 percent confidence level. Thus, the Draft EIR underestimates potential future emissions in Riverside County by more almost 50 lb / working-day and by 163 lb / working-day at the upper 95 percent confidence level. (*See* attached Table A-6.)

Even these average emissions of 248.6 lb / working-day at the upper 95 percent confidence level understate potential peak daily emissions because they ignore daily variations throughout the year in that they characterizes the annual average rather than average daily variability. The construction sector has considerable seasonal variations in California and the peak construction season coincides with the peak ozone season. Thus VOC emissions from the proposed code change will be exacerbating an already severe problem in many areas of California. Again, this estimate does not include a number of emission sources including VOC emissions from CPVC pipe use due to slab leaks or indirect emissions from manufacturing. Including reasonable estimates for these factors revised estimates would further increase potential VOC emissions from the Project.

III. All Feasible Mitigation Is Not Required

CEQA requires a lead agency to adopt all feasible mitigation measures or feasible project alternatives that can substantially lessen or avoid any significant effects on the environment associated with a project to be approved. (Pub. Res. Code, § 21000 et seq.) Such feasible mitigation measures exist and should be required by HCD and analyzed for their potential to reduce VOC emissions from the proposed code change.

As discussed in Comment I.A, one-step cements with low-VOC contents, which do not require the application of a primer, are available and approved for use in California. Their use instead of the proposed low-VOC primer / sealer combination would result in lower emissions and reduced exposure of workers. The Draft EIR should be revised to analyze the potential emission reductions and, if substantial reductions could be achieved, require the use of low-VOC one-step cements as a mitigation measure.

Another potential mitigation measure would be to fund research for primers and sealers with a lower VOC content that could aid in alleviating the potential significant impacts from the proposed Project.

IV. Cumulative Impacts Analysis Is Inadequate

The Draft EIR's cumulative impact analysis discussion consists of one short paragraph: "The project will indirectly generate ozone precursors that could lead to ozone formation. Several areas within California are classified as non-attainment for state and federal ozone regulation. Even a small addition of ozone to these areas will contribute to the problem. Even with the implementation of appropriate mitigation, the cumulative impact cannot be reduced to a less-than-significant level and will remain significant and unavoidable." (Draft EIR at p. 72.) The Draft EIR concludes that the proposed project would result in short-term air quality impacts from the proposed Project. (Draft EIR at p. 73.)

This discussion is merely a repetition of the air quality analysis for the Project and entirely inadequate as a cumulative impact analysis. Important direction to conducting a cumulative impacts analysis is found in Section 15130(a)(1) of the CEQA Guidelines: "As defined in Section 15355, a cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together *with other projects* causing related impacts." (Emphasis added). The CEQA Guidelines provide two methods for an adequate analysis of cumulative impacts: 1) the List Approach, which identifies all of the past, present and probable future projects contributing to the cumulative impact; and 2) the projection approach, which relies upon the cumulative impact analysis on a summary of projections of future development and impacts contained in an adopted general planning or related planning document, or in a prior environmental document that has been certified. The Draft EIR should be revised to contain an adequate cumulative impacts discussion according to the CEQA Guidelines.

Attached Tables

Table A-1:
Number of single-family and multi-family units
plumbed with CPVC in California in 2007 and VOC emissions

DRAFT EIR

		UNITS						PRIMER			CEMENT			VOC EMISSIONS				
	CPVC Market Share %	**Total Units Replumbed** units/year	**Total Units Replumbed with CPVC** units/year	**%SF** %	**SF** units/year	**%MF** %	**MF** units/year	**SF Primer** L/unit	**MF Primer** L/unit	**Total Primer** L/year	**SF Cement** L/unit	**MF Cement** L/unit	**Total Cement** L/year	**Primer** g/year	**Cement** g/year	**Total** g/year	**Total per year** ton/year	**Total per working-day** lb/day
New units	30%	180,700	54,210	72.13%	39,102	27.87%	15,108	0.27	0.11	12,219	0.81	0.42	38,018	6,720,652	18,628,748	25,349,400	27.9	223
Re-piped units	**30%**	100,000	30,000	72.13%	21,639	27.87%	8,361	0.27	0.11	6,762	0.81	0.42	21,039	3,719,232	10,309,213	14,028,445	15.4	124
Total units		**280,700**	**84,210**		**60,741**		**23,469**			**18,982**			**59,057**	**10,439,884**	**28,937,961**	**39,377,845**	**43.4**	**347**

REVISED

		UNITS						PRIMER			CEMENT			VOC EMISSIONS				
	CPVC Market Share %	**Total Units Replumbed** units/year	**Total Units Replumbed with CPVC** units/year	**%SF** %	**SF** units/year	**%MF** %	**MF** units/year	**SF Primer** L/unit	**MF Primer** L/unit	**Total Primer** L/year	**SF Cement** L/unit	**MF Cement** L/unit	**Total Cement** L/year	**Primer** g/year	**Cement** g/year	**Total** g/year	**Total per year** ton/year	**Total per working-day** lb/day
New units	30%	180,700	54,210	72.13%	39,102	27.87%	15,108	0.27	0.11	12,219	0.81	0.42	38,018	6,720,652	18,628,748	25,349,400	27.9	223
Re-piped units	**100%**	100,000	100,000	72.13%	72,130	27.87%	27,870	0.27	0.11	22,541	0.81	0.42	70,131	12,397,440	34,364,043	46,761,483	51.5	412
Total units		**280,700**	**154,210**		**111,232**		**42,978**			**34,760**			**108,149**	**19,118,092**	**52,992,791**	**72,110,883**	**79.4**	**635**

Table A-2
Number of single-family and multi-family units
plumbed with CPVC in California based on 39-year average and VOC emissions

DRAFT EIR

		UNITS						PRIMER			CEMENT			VOC EMISSIONS				
	CPVC Market Share %	Total Units Replumbed units/year	Total Units Replumbed with CPVC units/year	%SF %	SF units/year	%MF %	MF units/year	SF Primer L/unit	MF Primer L/unit	Total Primer L/year	SF Cement L/unit	MF Cement L/unit	Total Cement L/year	Primer g/year	Cement g/year	Total g/year	Total per year ton/year	Total per working-day lb/day
New units	30%	177,719	53,316	72.13%	38,457	27.87%	14,859	0.27	0.11	12,018	0.81	0.42	37,391	6,609,782	18,321,430	24,931,212	27.5	220
Re-piped units	30%	100,000	30,000	72.13%	21,639	27.87%	8,361	0.27	0.11	6,762	0.81	0.42	21,039	3,719,232	10,309,213	14,028,445	15.4	124
Total units		**277,719**	**83,316**		**60,096**		**23,220**			**18,780**			**58,430**	**10,329,014**	**28,630,643**	**38,959,657**	**42.9**	**343**

REVISED

		UNITS						PRIMER			CEMENT			VOC EMISSIONS				
	CPVC Market Share %	Total Units Replumbed units/year	Total Units Replumbed with CPVC units/year	%SF %	SF units/year	%MF %	MF units/year	SF Primer L/unit	MF Primer L/unit	Total Primer L/year	SF Cement L/unit	MF Cement L/unit	Total Cement L/year	Primer g/year	Cement g/year	Total g/year	Total per year ton/year	Total per working-day lb/day
New units	30%	177,719	53,316	72.13%	38,457	27.87%	14,859	0.27	0.11	12,018	0.81	0.42	37,391	6,609,782	18,321,430	24,931,212	27.5	220
Re-piped units	100%	100,000	100,000	72.13%	72,130	27.87%	27,870	0.27	0.11	22,541	0.81	0.42	70,131	12,397,440	34,364,043	46,761,483	51.5	412
Total units		**277,719**	**153,316**		**110,587**		**42,729**			**34,559**			**107,521**	**19,007,222**	**52,685,473**	**71,692,695**	**79.0**	**632**

Table A-3: Total new housing units authorized by building permits in California from 1993 to 2004

County	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Riverside																		
California Total	195,692	256,989	279,670	216,079	129,229	131,732	221,940	270,640	243,805	210,076	144,987	104,873	84,373	168,358	218,007	263,682	302,934	253,171

County	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Average
Riverside						7,299	8,286	6,946	7,499	9,784	12,493	14,579	15,410	19,014	22,664	30,361	34,226	15,713
California Total	255,559	237,747	164,313	105,919	97,407	84,656	97,047	85,293	94,283	111,716	125,707	140,137	148,540	148,757	167,761	195,682	212,960	134,378

Source: Department of Finance, Economic Research Unit, California Statistical Abstract,
I. Construction, Table I-6 — Residential Construction Authorized by Permits, Units, California and Counties

	Average	StDev	Coefficient of Variance
California 1970-2004	176,278	66,062	0.37
California 1994-2004	134,378	42,597	0.32
Riverside 1994-2004	15,713	9,213	0.59
Riverside 1970-2004			0.69

Table A-4:
Revised adhesive calculations

Single Family Unit, approximately 2200 sq. ft.							
Cement (liters)			**Source**			**E-Z Weld**	
	Source		**Estimate**	**REVISED**		**Calc tool**	**REVISED**
	Doc.191		0.35	0.35		0.90	0.90
	Doc.206**		0.76	0.76		0.75	0.75
	Doc.207*		0.47	0.47		0.70	0.70
	Doc.192		0.35	0.35		0.90	0.90
	Doc.189		0.24	0.24		0.79	0.79
		average	**0.43**	**0.44**		**0.81**	**0.81**
		std dev	0.18	**0.20**		0.08	**0.09**
Primer (liters)							
	Source						
	Doc.191		0.12	0.24		0.30	0.30
	Doc.206**		0.25	0.25		0.25	0.25
	Doc.207*		0.16	0.15		0.23	0.23
	Doc.192		0.12	0.12		0.30	0.30
	Doc.189		0.24	0.24		0.26	0.26
		average	**0.18**	**0.20**		**0.27**	**0.27**
		std dev	0.06	0.06		0.03	0.03
Multifamily Unit							
Cement (liters)			**Source**			**E-Z Weld**	
	Source		**Estimated**	**REVISED**		**Calc tool**	**REVISED**
	Doc.190*		0.12	0.11		0.51	0.51
	Doc.197**		0.33	0.33		0.33	0.33
		average	**0.23**	**0.22**		**0.42**	**0.42**
		std dev	0.11	**0.16**		0.09	**0.13**
Primer (liters)							
	Doc.190*		0.04	0.04		0.12	**0.17**
	Doc.197**		0.11	0.11		0.11	0.11
		average	**0.09**	**0.07**		**0.11**	**0.14**
		std dev	0.03	**0.05**		0.01	**0.04**
	Doc.190 used 975 sq. ft. as the unit size						
	Doc.197 used 1,200 sq. ft. as the unit size						
	*Source estimated adhesive using one-step cement (no primer).						
	For estimation purposes, we assume primer use would have been 1/3 the amount of cement.						
	** Source used E-Z Weld Calc tool to estimate adhesive use						
	Source data was converted to quarts and multiplied by 0.946 to obtain the volume in liters						

Table A-5:
Draft EIR VOC emissions estimates for 39-year average +2 STDEV for Riverside County

	Mean	Standard Deviation	Coefficient of Variation
Housing units authorized by permits			
new SF units	24,346	14,275	59%
new MF units	3,419	2,005	59%
re-pipe SF units	13,699	8,032	59%
re-pipe MF units	1,924	1,128	59%
CPVC use in housing units			
Market share CPVC new units	30%	20%	67%
Market share CPVC re-piped units	30%	20%	67%
new CPVC SF units	7,304	6,485	89%
new CPVC MF units	1,026	911	89%
re-pipe CPVC SF units	4,110	2,410	59%
re-pipe CPVC MF units	577	338	59%
CPVC SF units/yr	11,414	6,918	61%
CPVC MF units/yr	1,603	971	61%
Cement and primer use per housing unit			
L cement/SF unit	0.81	0.09	11%
L primer/SF unit	0.27	0.03	11%
L cement/MF unit	0.42	0.13	30%
L primer/MF unit	0.14	0.04	30%
VOC content			
VOC g/L cement	490		
VOC g/L primer	550		
VOC emissions			
g VOC from cement/SF unit	396	44	11%
g VOC from primer/SF unit	148	17	11%
g VOC cement/MF unit	205	62	30%
g VOC from primer/MF unit	77	23	30%
g VOC/SF unit	544	47	9%
g VOC/MF unit	282	66	23%
g VOC from SF units/year	6,205,272	3,799,450	61%
g VOC from MF units/year	451,445	293,251	65%
g VOC/year	6,656,717	3,810,751	57%

lb VOC/working-day	**mean**	**58.7**
	68% confidence level	**92.3**
	95% confidence level	**125.9**

Table A-6:
Revised VOC emissions estimates for Riverside County
for the proposed code change

	Mean	Standard Deviation	Coefficient of Variation
Housing units authorized by permits			
new SF units	24,346	14,275	59%
new MF units	3,419	2,005	59%
re-pipe SF units	13,699	8,032	59%
re-pipe MF units	1,924	1,128	59%
CPVC use in housing units			
Market share CPVC new units	50%	20%	40%
Market share CPVC re-piped units	100%	0%	0%
new CPVC SF units	12,173	8,640	71%
new CPVC MF units	1,710	1,213	71%
re-pipe CPVC SF units	13,699	8,032	59%
re-pipe CPVC MF units	1,924	1,128	59%
CPVC SF units/yr	25,873	11,797	46%
CPVC MF units/yr	3,633	1,657	46%
Cement and primer use per housing unit			
L cement/SF unit	0.81	0.09	11%
L primer/SF unit	0.27	0.03	11%
L cement/MF unit	0.42	0.13	30%
L primer/MF unit	0.14	0.04	30%
VOC content			
VOC g/L cement	490		
VOC g/L primer	550		
VOC emissions			
g VOC from cement/SF unit	396	44	11%
g VOC from primer/SF unit	148	17	11%
g VOC cement/MF unit	205	62	30%
g VOC from primer/MF unit	77	23	30%
g VOC/SF unit	544	47	9%
g VOC/MF unit	282	66	23%
g VOC from SF units/year	14,066,073	6,529,142	46%
g VOC from MF units/year	1,023,334	524,317	51%
g VOC/year	15,089,406	6,550,160	43%

lb VOC/working-day	**mean**	**133.1**
	68% confidence level	**190.8**
	95% confidence level	**248.6**

Exhibit 1:
J. Phyllis Fox, Comments on Draft Addendum to Final Mitigated Negative Declaration Amending Section 604.1 of California Plumbing Code, April 22, 2005

Comments
on

Draft
Addendum
To
Final Mitigated Negative Declaration
Amending Section 604.1
of
California Plumbing Code

March 3, 2005

Prepared by

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April 22, 2005

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COMMENTS

The California Department of Housing and Community Development ("HCD") approved an amendment to Section 604.1 of the California Plumbing Code ("CPC") in November 2000 in a Mitigated Negative Declaration ("2000 MND").[1] This amendment authorized local building officials to approve Chlorinated Polyvinyl Chloride ("CPVC") pipe as an alternate material for hot and cold water distribution systems ("potable water systems") within residential structures if a finding was made that there is or will be a premature failure of metallic pipe due to corrosive water and/or soil conditions ("the finding requirement"). Addendum, pp. 6-8.

The HCD issued a draft Addendum[2] to modify the 2000 MND in March 2005, proposing to amend Section 604.1 of the California Plumbing Code ("CPC") to eliminate the finding requirement. The project described in the Addendum is a change in the plumbing code that would allow the use of CPVC in the potable water system of up to 100% of residential piping jobs, while the project that is amended limited the use of CPVC to only those situations in which corrosive water and/or soil conditions had occurred or will occur. The Addendum does not disclose the substantial increase in CPVC use that would result from this change nor the significant impacts that would result.

The Addendum assumes that 310,980 residential units were piped in 2004. Addendum, p. 19.[3] An e-mail from Noveon, who holds the patents on CPVC, indicates that only 12,000 homes[4] were piped with CPVC in 2004 in California. (Moos 12/3/04.[5]) Thus, the project in the 2000 MND, which approved only limited use of CPVC, in areas with corrosion problems, resulted in only up to 4% CPVC use statewide. The proposed Project would allow unlimited use of CPVC, in up to 100% of residential piping jobs. This is a twenty-five fold increase in CPVC use – or an increase of 2500%. Thus, the current Project is far beyond the scope of the 2000 limited approval. The Project is not an amendment to the 2000 limited approval, but rather a new project.

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

[2] Department of Housing and Community Development, Draft Addendum to Adopted Mitigated Declaration, March 3, 2005.

[3] The Addendum reports there were 578 new residential units and 274 re-pipings per day in 2004. This amount to 852 per day or 310,980 per year.

[4] It is unclear whether this estimate includes residential uses not covered by the Addendum and thus is high, e.g., fire system, drain lines.

[5] E-mail from Harry Moos, Noveon, to Doug Hensel, HCD, Re: CPVC usage, December 3, 2004.

This substantial increase in CPVC use would result in new significant environmental problems that were not contemplated in the underlying 2000 MND due to the significantly different project scope – 33 units per day plumbed with CPVC in the 2000 MND compared with up to 852 in the Addendum. Air quality and other impacts increase in proportion to the number of units piped with CPVC. The air quality impacts from the project described in the Addendum are up to 25 times greater than those evaluated in the 2000 MND. Further, the regulatory framework has changed, e.g., new ozone and particulate matter standards. These changes result in impacts that were not even contemplated in 2000.

The following sections discuss some of the new impacts that would result from this substantial increase in the number of houses that can be piped with CPVC. These include air quality, public health, manufacturing and other impacts.

I. AIR QUALITY IMPACTS ARE SIGNIFICANT

Sections of CPVC pipe are joined using fittings or connectors. The pipe is chemically fused to the connector using a process call "solvent welding" or "cementing." This process uses chemicals -- cleaners, primers and cements -- which are applied to the end of the pipe and the inside of the fitting socket. The pipe ends and fittings are first cleaned, primer is applied to soften the pipe, and cement is applied to bond the pipe and fitting. See photos demonstrating the process. (PPFA Handbook, p. 3;[6] IPS Weld On Guide, pp. 5-9.[7]) The cleaners, primers, and cements used to join CPVC pipes contain high concentrations of solvents (85% - 100%) that are volatile organic compounds ("VOCs"). These VOCs are evaporated during the transfer, drying, surface preparation, and cleanup, resulting in VOC emissions. The VOCs are converted into ozone and fine particulate matter in the atmosphere, causing or contributing to violations of ambient air quality standards and attendant health effects.

The significance of a project's impacts is measured against actual physical conditions at the time the environmental analysis is commenced. The significance of an emission increase, such as the VOC emission increase from CPVC solvent cementing, is generally evaluated as follows:

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[6] PPFA, Installation Handbook: CPVC Hot & Cold Water Piping, 2002.

[7] IPS Weld·On, Guide to Solvent Cementing PVC and CPVC Plastic Pipe and Fittings.

(1) establish quantitative significance threshold(s), typically for emissions in pounds / day and / or ton / yr for each pollutant;

(2) estimate emissions in pounds per day and / or tons per year for each pollutant in the baseline year(s), prior to project approval;

(3) estimate emissions in pounds per day and / or tons per year in future years after project approval;

(4) calculate the increase in emissions by subtracting the baseline emissions estimated in step (2) from post-project emissions estimated in step (3);

(5) compare the emission increase(s) in step (4) to significance thresholds in step (1). If the emission increase(s) equal or exceed the threshold(s), the project results in a significant air quality impact.

The Addendum calculated the VOC emissions in the baseline year 2004 in step (2) but did not perform any of the other steps. The Addendum does not set any significance threshold, does not calculate future emissions, does not calculate the increase in emissions due to the Project, and does not compare the emission increase to a threshold. Further, the Addendum incorrectly characterizes the 2004 baseline emissions as an emission increase.

The increase in VOC emissions disclosed in the Addendum is significant when evaluated against any applicable significance threshold. Further, the actual increase in emissions due to the Project is up to eight times higher than disclosed in the Addendum when properly calculated.

A. An Improper Significance Threshold Was Used

The Addendum claims that it need only evaluate "new impacts associated from (sic) the expected increase in the use of CPVC and adhesives." Addendum, p. 18. The Addendum then claims that the Project would increase volatile organic compound ("VOC") emissions by 1,159 lb / day and concludes that the increase is not significant because it is a small percent of current VOC emissions. This "drop in the bucket" approach is improper and has been rejected by the courts.

The increase in VOC emissions is significant when evaluated against any applicable significance threshold. CEQA allows the adoption of "significance thresholds." (CEQA Guidelines § 15064.7(b).) If emissions exceed the significance threshold, then they are presumed to be significant under CEQA and an EIR is required. The Addendum's approach is erroneous and inconsistent with methods normally used to evaluate the significance of a project under CEQA. The VOC emissions of 1,159 lb/day are higher than emissions from many large industrial projects and much higher than CEQA significance thresholds adopted by air districts throughout the State.

The significance of air emissions under CEQA is normally evaluated by comparing the increase in emissions from a project to CEQA significance thresholds adopted by local air agencies. The applicable threshold depends on the air quality where the project is located and the nature of the project (construction or operation). Construction emissions are often allowed to be higher than operational emissions because of the short-duration of construction emissions, while operational emissions will occur over a period of many years.

The Addendum concluded that an increase in VOC emissions of 1,159 lb/day is not significant because it represents a small percentage increase in statewide VOC emissions. The Addendum never discloses the percent increase threshold it is relying on, but rather argues qualitatively that the increase in emissions is a small percentage of the statewide VOC emissions and thus is not significant. How small is small enough to result in no significant impact and what is the basis for this conclusion? The Addendum makes the stunning assertion that a project's emissions must exceed one to five percent of the statewide total emissions from all sources before it would be significant.

If the small percentage reasoning were applied elsewhere, most large industrial projects would escape CEQA review, eviscerating the intent of CEQA. In fact, I know of no project or facility anywhere in the State that generates more than five percent of the total emissions inventory for the State. The total VOC emissions from all sources in the State is 2461.663 ton/day = 4.9 million lb/day. Addendum, p. 19. One percent of this figure is 24.6 tons per day, or 49,220 lb/day, while five percent is 123 tons per day or 246,000 lb/day. No facility in the State generates this level of pollution. Thus, applying the Addendum's rationale, no project would ever be significant, and an EIR would never be required. The largest sources of VOC emissions in California are refineries.[8] Emissions from major projects at refineries and other large industrial sources are typically less than 1,159 lb/day, yet refinery emissions are generally considered significant, and EIRs are generally prepared for major refinery projects .

The modifications conducted at refineries in the 1990s to allow them to produce reformulated (lower emitting) gasoline are among the largest (and highest emitting) projects conducted since CEQA was adopted. The increases in

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[8] California Air Resources Board (CARB), The California Almanac of Emissions and Air Quality, 2005, Tables 2-1 to 2-6. http://www.arb.ca.gov/aqd/almanac/almanac05/

VOC emissions from most of these reformulated gasoline ("RFG") projects were less than 1,159 lb / day, yet were found to be significant and mitigated. Some examples include the following:

Table 1
Comparison Of Significance Of Project Emissions With Refinery Emissions

Project	VOC Emissions (lb / day)	CEQA Significance Threshold (lb / day)	Source
Arco RFG	1030	75	DEIR 2 / 93, Table 4.3-10
Chevron Richmond RFG	826	150	DEIR 8 / 93, Table IV.C-10
Mobile RFG	270	55	DEIR 11 / 93, Table 4-2
Unocal RFG	404	150	DEIR 6 / 94, Table 8-13
Tosco RFG	790	150	DEIR 7 / 94, Table 8-12
ARCO MTBE Phaseout	86	55	DEIR 11 / 2000, Table 4.1-11
Addendum	1,159	None	Addendum, p. 19

The daily emissions from major projects at refineries are less than those reported in the Addendum for using CPVC in new and re-piped homes. The Chevron Richmond Refinery, for example, is the second largest source of VOC emissions in the entire State. The RFG project at this refinery modified five existing processing units and built a new one to allow the refinery to produce reformulated gasoline. The Alkylation Unit, FCC Gasoline Hydrotreater, Aromatics Saturation Plant, and Hydrogen Recovery Plant were substantially modified and a new plant to produce tertiary amyl methyl ethyl ("TAME"), an oxygenated gasoline additive, was built. The project required ancillary support facilities, including a new cooling tower, a new flare, three new 150,000 barrel hydrocarbon storage tanks, three new 20,000 barrel hydrocarbon storage spheres, and new piping. This new project consumes about 1.8 trillion Btu of fuel, the equivalent of about 315,000 barrels of oil per year.

The Chevron project increased VOC emissions by 826 lb / day and was concluded to result in a significant increase in VOC emissions, calculated as the difference between future year and baseline year emission. (Richmond 1993, p. IV.C.22. [9]) However, under the Addendum's theory, a small percentage increase in statewide VOC emissions is not significant, and the emission increase from the massive Chevron project would be considered less than significant.

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[9] City of Richmond, Chevron Reformulated Gasoline and FCC Plant Upgrade Project, Volume I, August 1993.

The significance threshold used in the Addendum, a percent of a statewide total, is the wrong threshold to evaluate emission increases from the Project. The significance of an increase in emissions depends upon the absolute magnitude of the increase relative to the baseline against which it is measured.

A small percentage increase in statewide VOC emissions can be highly significant. The significance of emission increases is normally evaluated by comparing the emission increase to CEQA significance thresholds formally adopted by air districts. If the increase in emissions from a project equals or exceeds the CEQA significance threshold, the project has significant air quality impacts as a matter of law -- that is the very meaning of a significance threshold.

The use of a percentage increase hides both the magnitude of the increase and the baseline against which it is measured. For example, under the Addendum's approach, the worse a problem is, the less significant a project will appear. For example, if an area is already highly polluted, such as the Los Angeles air basin or the Central Valley, then even a major project such as a power plant will appear comparatively small since its emissions will only be a small percentage of the total pollution. However, the same project in a comparatively unpolluted area will appear more significant, since its emissions will be a large portion of the total. CEQA rejects such a percentage approach. In fact, in a highly polluted area, additional pollution is even more significant, since it is adding to an already unacceptable situation. Thus, the Addendum's percentage comparison approach turns CEQA on its head.

The Addendum has hidden the significance of the proffered 1,159 lb / day from the public by casting it as a small percentage increase in a huge baseline and failing to compare it to the significance thresholds adopted by the State's air pollution control districts. A small percent increase in this case is significant precisely because baseline emissions are very high, as admitted by the Addendum (2461.663 ton / day = 4.9 million lb / day). Addendum, p. 19. The very high baseline emissions of VOCs (and NOx) have resulted in violations of ambient air quality standards on ozone in many parts of California. See discussion in Comment I.H below.

This situation is similar to that considered by the court in *Kings County Farm Bureau v. City of Hanford,* 221 Cal. App. 3d at 718. The court concluded that an EIR inadequately considered an air pollution (ozone) cumulative impact. As discussed below, VOCs are ozone precursors. The court said: "The []EIR concludes the project's contributions to ozone levels in the area would be immeasurable and, therefore, insignificant because the [cogeneration] plant would emit relatively minor amounts of [ozone] precursors compared to the total volume of [ozone] precursors emitted in Kings County. The EIR's analysis uses the magnitude of the current ozone problem in the air basin in order to trivialize the project's impact." The court concluded: "The relevant question to be addressed in the EIR is not the relative amount of precursors emitted by the project when compared with preexisting emissions, but whether any additional amount of precursor emissions should be considered significant in light of the serious nature of the ozone problems in this air basin."[10] The ozone problems are serious, as demonstrated in Comment I.H.

B. The Increase In VOC Emissions Estimated In the Addendum Is Significant When Evaluated Against Any Proper Significance Threshold

The Addendum also argues that the VOC increase is not significant because it is distributed throughout various air basins and thus would not result in the violation of any air quality standards or contribute substantially to an existing or projected air quality standard. Addendum, pp. 19-23. This is incorrect for two reasons. First, as explained in Comment I.H, the Project's VOC emissions would contribute to existing violations of ambient air quality standards. Second, when the VOC increase is distributed throughout the 35 air basins, emissions are high enough to exceed CEQA significance thresholds established by six of the districts. In fact, the VOC increase admitted in the Addendum is high enough from a single housing development to cumulatively exceed significance thresholds in these same six districts, which contain about 65% of the State's 2004 population (Table 8).

Volatile organic compounds form ozone in the atmosphere (Comment I.H). The ozone created by VOC emissions does not recognize air district, county, city, or any other boundaries. It is well known that ozone is a regional pollutant and is transported over great distances. Ozone precursors such as VOC emitted in one air basin cause or contribute to exceedances of ozone standards in other basins, e.g., the SCAQMD and SJVAPCD impact Mojave Desert Air Basin; the Sacramento Valley and SJVAPCD impact the Mountain

[10] *Los Angeles Unified v. City of Los Angeles*, 58 Cal. App. 4th at 1024-1026 found an EIR inadequate for concluding that a project's additional increase in noise level of another 2.8 to 3.3 dBA was insignificant given that the existing noise level of 72 dBA already exceeded the regulatory recommended maximum of 70 dBA. The court concluded that this "ratio theory" trivialized the project's noise impact by focusing on individual inputs rather than their collective significance. The relevant issue was not the relative amount of traffic noise resulting from the project when compared to existing traffic noise, but whether any additional amount of traffic noise should be considered significant given the nature of the existing traffic noise problem.

Counties Air Basin,[11] the BAAQMD impacts the Central Coast and Central Valley Air Basins. (CARB 3/01;[12] CARB 4/01.[13]) Further, ozone transport is regulated, e.g., CCR, Title 17, Secs. 70600 and 70601. Ozone is a regional pollutant and its impacts must be cumulatively considered statewide. Regardless, the VOC emissions from the Project exceed significance criteria when evaluated on an air-district-wide basis.

The increase in VOC emissions of 1,159 lb/day estimated in the Addendum exceeds CEQA significance thresholds under a wide range of assumptions regarding project location and definition. In fact, every single air district in California that has considered VOC emissions has concluded that increases in VOC emissions much smaller than 1,159 lb/day is significant because ozone is a regional pollutant that is present throughout most of the State at levels that are injurious to public health and welfare. Thus, the conclusion that the Project will result in significant air quality impacts is very robust.

1. Statewide Emissions Are Significant

The Project is defined in the Addendum as an amendment to Section 604.1 of the California Plumbing Code ("CPC") to allow installation of CPVC drinking water pipe inside residential structures. Addendum, Secs. I, III. The CPC must be followed by local agencies that approve building permits. Therefore, the proposed regulatory change potentially would allow a substantial increase in the use of CPVC in residential construction throughout the State.

The proposed Project would make it a mandatory ministerial duty for all local building officials to approve the use of CPVC drinking water pipe in all residential developments and re-pipes since the local building officials must comply with the CPC. The State has fully preempted the field of building standards and building regulation in order to establish a uniform set of minimum statewide building standards. (*Baum Electric Company v. City of Huntington Beach* (1973) 33 Cal.App.3d 573, 581.) The courts have held that ensuring "protection of public health and safety" is the "paramount policy" underlying State preemption and the requirement that local governments comply with State building standards. (Ibid.) Thus, the proposed Project could

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[11] Emission Inventory Branch, PTSD, Area Designations for National Ambient Air Quality Standards, 1-Hour and 8-Hour Ozone, October 2004.

[12] CARB, Assessment of the Impacts of Transported Pollutants on Ozone Concentrations in California, March 2001.

[13] CARB, Ozone Transport: 2001 Review, 2001.

potentially result in 100% market penetration of CPVC pipe since local building officials will be divested of authority to deny approval to CPVC.

As discussed above, CPVC is joined using cleaners, primers, and sealants that release large amounts VOCs to the atmosphere. I am not aware of an agency-adopted CEQA significance threshold for VOC emission increases that applies statewide. In such cases, it is common to adopt the thresholds used by other agencies.[14] Twenty-one of California's 35 air districts have adopted CEQA guidelines that include significance thresholds for emission increases. These thresholds range from 5 lb/day to 550 lb/day (Table 2). I used two methods to evaluate the significance of a statewide increase of 1,159 lb/day in VOC emissions.

First, I used the upper end of the range (5 – 550 lb/day) of thresholds adopted by air districts. The increase in VOC emissions from the Project exceeds the highest of these 21 thresholds, 550 lb/day. Therefore, the increase in VOC emissions from the Project is significant when evaluated on a statewide basis using the highest adopted thresholds for any of 21 air districts.

Second, I calculated a housing-unit-weighted VOC significance threshold by multiplying the threshold of each district by the fraction of new housing units in 2004 in that district and summing. I used the number of new housing units permitted in 2004 in each county, as compiled by Construction Industry Research Board ("CIRB"). (CIRB 3/05.[15]) The Addendum relied on an earlier (outdated) version of this same information. (Raymer 3/1/05.[16]) This information is based on building permits for 523 reporting entities reported monthly and compiled by the CIRB. The year 2004 was used because the Addendum used the year 2004 to estimate VOC emissions. To be conservative, I used the highest threshold, 550 lb/day, for the districts that have not adopted a threshold. For example, if a district has a VOC significance threshold of 100 lb/day and 10 percent of the new housing units in 2004 were permitted in this district, its threshold would contribute 100 x 0.1 or 10 lb/day to the statewide threshold. The calculations are shown in Table 3. The statewide weighted-average VOC significance threshold is 122 lb/day. The increase in VOC emissions from the Project exceeds this threshold by about a factor of ten. Therefore, the increase in VOC emissions

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14 Governor's Office of Planning and Research, Thresholds of Significance: Criteria for Defining Environmental Significance, CEQA Technical Advice Series, September 1994.

15 Construction Industry Research Board (CIRB), New Housing Units and Building Permit Valuations by County, March 1, 2005.

16 E-mail from Bob Raymer, CBIA, to Bill Staack, Re: Revised Data, March 1, 2005. ("The housing-start data that I sent you last year has been updated by the Construction Industry Research Board. At present, CIRB is indicating that 211,000 dwelling units were constructed in 2004.")

from the Project is significant when evaluated on a statewide basis using a weighted-average VOC significance threshold.

The CEQA emission significance thresholds adopted by 21 California air districts confirm that the Addendum's reliance on a percentage of the statewide VOC emissions is unreasonable. First, the increase in VOC emissions from this Project, 1,159 lb / day, significantly exceeds every one of these thresholds. Second, the percent increase represented by these thresholds ranges from 0.0043 percent to 0.0112 percent, two to twenty times smaller than the percent change the Addendum claims is not significant (0.0235%). Thus, the Addendum's conclusion that a 0.0235% increase in VOC emissions is not significant is inconsistent with the conclusion of every single air district in the State that has considered this issue. Thus, it is reasonable to conclude that VOC emissions from the Project are significant.

2. <u>District-Wide Emissions Are Significant</u>

The Addendum estimated that the Project would increase statewide VOC emissions by 1,159 lb / day. The Addendum did not estimate the emissions that would be generated in each air district. Instead, the Addendum concluded with the analysis that "the small increase in VOC emission would be distributed through various air basins where residential construction would take place, and the potential increase will not result in violation of any air quality standard or contribute substantially to an existing or projected air quality standard violation." Addendum, pp. 21-23. This is incorrect.

I distributed the Addendum's estimate of 1,159 lb / day among the 35 air districts in California based on new housing units permitted in each basin for 2004. (CIRB 3 / 05.) I then compared the VOC emission increase in each air district with operational significance thresholds adopted by each air district. The results, shown in Table 4, indicate the increase in VOC emissions in six air districts would exceed their CEQA significance thresholds. About 60.5% of the new housing permits were issued in these six districts, which include the Bay Area AQMD (133.6 lb / day), Sacramento Metro AQMD (71.0 lb / day), San Joaquin Valley APCD (162.7 lb / day), San Luis Obispo County APCD (11.7 lb / day), the South Coast AQMD (308.0 lb / day), and Ventura County AQMD (14.7 lb / day).

The VOC emissions are also very high in San Diego County APCD. This district has not adopted CEQA significance thresholds. However, New Source Review offset thresholds are commonly used as CEQA significance thresholds. The VOC offset threshold under San Diego Rule – is 15 ton / yr (82 lb / day). The Project would cause VOC emissions to increase by 95 lb / day in San Diego

County APCD, based on the Addendum's estimate of 1,159 lb / day. Thus, these emissions are significant, raising the total to seven districts in violation of significance thresholds containing 75% of the 2004 population.

a. VOC Emissions Are Significant When Evaluated Against Construction Significance Thresholds

Commenters previously suggested that construction significance thresholds should be used to determine the significance of VOC emissions and that operational significance thresholds do not apply to changes in the CPC. This is technically incorrect.

Only three air districts have established significance thresholds for VOC emissions during construction in their CEQA guidelines. These are the El Dorado Air Pollution Control District ("El Dorado APCD"), the San Joaquin Valley Air Pollution Control District ("SJVAPCD"), and the South Coast Air Quality Management District ("SCAQMD").

The construction and operational emission thresholds are identical for two of these districts, SJVAPCD and El Dorado. El Dorado County APCD concluded: "A project will be considered as having "significant" air quality impacts if any of the following quantitative conditions exist: ROG [VOCs] and NOx. The Project will result in *construction or operations* emissions of either of the two primary precursors of ozone, reactive organic gases (ROG)[17] or oxides of nitrogen (NOx), in excess of 82 lbs / day." (El Dorado CEQA Guide, p. 2.[18]) (Emphasis added.) Thus, the same threshold is used for both construction and operation. The VOC emissions in this district do not exceed this threshold.

The SJVAPCD guidance for VOC [ROG] construction emissions states: "[s]ame thresholds as above, but apply only during construction period. Ozone precursors calculated on an annual basis." (SJVAPCD CEQA Levels.[19]) The VOC threshold is 10 ton / yr, which is equivalent to 55 lb / day for projects, such as this one, which emit every day. When the Addendum's VOC estimate is distributed into individual air basins based on 2004 housing permits, 163 lb / day or 30 ton / yr of the increase occurs in the SJVAPCD (Table 4). These emissions exceed 10 ton / yr or 55 lb / day by a factor of three. ***Thus, significant air quality***

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[17] ROG and VOC mean the same thing, organic compounds that form ozone in the atmosphere.

[18] El Dorado County Air Pollution Control District, CEQA Guide, First Edition, February 2002.

[19] San Joaquin Valley Air Pollution Control District, CEQA Project Analysis Levels, Accessed April 8, 2005. www.valleyair.org / transportation / ceqaanalysislevels.htm.

impacts occur in the SJVAPCD (with 14% of the 2004 new housing permits) based on the Addendum's VOC estimate, ***regardless of whether construction or operational significance thresholds are used to evaluate impacts***.

The SCAQMD, on the other hand, has adopted a separate construction significance threshold (75 lb/day) for VOC emissions that is higher than its operational threshold (55 lb/day). (SCAQMD Handbook, p. 6-2.[20]) The largest gains in new residential units in 2004 were in the Riverside-San Bernardino-Ontario and Los Angeles metropolitan areas, all located in the SCAQMD. In fact, the Riverside-San Bernardino-Ontario metropolitan area accounted for 48 percent of the total increase in residential units statewide. (CIRB 2/28/05, pp. 1-2.[21])

When the Addendum's VOC estimate is distributed into individual air basins based on 2004 housing permits, the portion of the Addendum's VOC estimate that occurs in the SCAQMD is 308 lb/day (Table 4). This increase substantially exceeds both its construction (75 lb/day) and operational (55 lb/day) significance thresholds. ***Thus, significant air quality impacts occur in the SCAQMD, regardless of whether construction or operational significance thresholds are used in the evaluation***.

b. <u>VOC Emissions Are Significant When Evaluated Against Operational Significance Thresholds</u>

As discussed above, the Project's impacts are significant even if construction CEQA significance thresholds are employed. However, as a matter of law, the use of operational, not construction, CEQA significance thresholds is appropriate since the CPVC VOC impacts will occur on an ongoing basis for years to come, not on a short-term basis as in construction emissions. Thus the Project's impacts are even more significant than estimated above.

The proposed amendment to the CPC is an operational project and should be evaluated against operational significance thresholds. Construction and operational emissions are sometimes distinguished because construction emissions are temporary and short term while operational emissions are permanent and long term. For residential developments, construction typically takes place over a 1 to 5 year period, depending upon phasing of the development and thus is limited in duration. However, the Project is not a

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[20] SCAQMD, CEQA Air Quality Handbook, April 1993.

[21] Construction Industry Research Board (CIRB), California Construction Review, Private Building Construction, February 28, 2005.

residential development project, but rather a change in the plumbing code that applies statewide. The Project allows construction emissions to occur every day without limit for an infinite duration into the future. Thus, the Project's VOC emissions are really operational emissions, not construction emissions.

The SCAQMD distinguishes construction emission significance thresholds in its CEQA Guidelines, Section 6.4, "Construction Emission Thresholds for SCAB and Coachella Valley." The SCAQMD CEQA Handbook states, "However, since a project's impact is limited to the construction phase, and the level of mitigation, the procedure for determining significance is different than that for a project's operational impacts." (SCAQMD Handbook, p. 6-4.) The Sacramento Metropolitan Air Quality Management District ("SMAQMD") distinguishes them as: "short-term effects (construction)" and "long-term effects (operation)." (SMAQMD Memo.[22]) The Monterey Bay Unified Air Pollution Control District explains that "[e]missions from construction activities represent temporary impacts that are typically short in duration, depending on the size, phasing, and type of project." (MBUAPCD CEQA Guidelines, p. 5-2.[23].)

The emissions from the Project do not meet any of these criteria. They are not temporary and they are not short term. The Project's impacts should be evaluated using operational significance thresholds because they will occur every day for the foreseeable future. (As discussed above, some air districts do not distinguish between construction and operational significance thresholds – e.g. El Dorado and SJVACPD).

Operational emissions, on the other hand, occur continuously, every day after a project is built. The Project described in the Addendum is an operational project because it allows an increase in VOC emissions from the increase in use of CPVC to occur every day, year after year, following approval of the Project. Thus, while the Addendum emissions occur during construction of housing, they have the effect of an operational project because they occur continuously, every day into the future, so long as new houses are built and existing houses are re-piped.

The trend of population growth and new residential construction in California indicates that increased numbers of new residential units will continue

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[22] Memo from Norm Covell, Sacramento Metropolitan Air Quality Management District (SMAQMD), to Lead and Responsible Agencies, Consultants and Interested Persons, re: California Environmental Quality Act (CEQA) Revised Significance Criteria for Air Quality.

[23] Monterey Bay Unified Air Pollution Control District, CEQA Air Quality Guidelines, Adopted October 1995, revised September 2002.

to be built through at least 2030. The California Department of Finance ("CDF")[24] projects a 33% increase in population between 2004 (the baseline) and 2030. The Addendum admits that emissions of at least 1,159 lb / day in 2004. These emissions may increase by 33% to 1,543 lb / day by 2030. Therefore, the emissions from the Project should have been evaluated against operational emission thresholds, not construction emission thresholds, which only apply to emissions that are temporary and short term. This is confirmed by independent sources.

The South Coast, an area where most of the growth in new housing is occurring, recently (2004-2005) evaluated the air quality impacts of relaxing limits on the amount of VOCs allowed in primers and sealants used to weld CPVC pipes under SCAQMD Rule 1168. This action is very similar to the Project in that it involves a regulation that applies in the four county region of the SCAQMD that would increase VOC emissions from the use of CPVC pipe, increases that would occur during project construction from a large number of small sources spread throughout the district.

The SCAQMD evaluated the significance of the resulting increase in VOC emissions from the change to Rule 1168, reductions that would be foregone by the rulemaking. ***SCAQMD used its operational significance threshold of 55 lb/day, not its construction significance threshold of 75 lb/day***. (SCAQMD Rule 1168, Attach. 1, p. 2.[25]) ("The VOC emission reductions forgone by this proposed amendment would exceed the SCAQMD's VOC significance threshold of 55 pounds per day.") The SCAQMD concluded that foregone emission reductions of 1,206 lb / day after January 1, 2007, only slightly more than the Project's emissions of 1,159 lb / day, were significant because they exceeded 55 lb / day. (SCAQMD Rule 1168, Attach. 1, p. 2.) The same is true here. The Project's emissions are significant because they far exceed the operational significance thresholds in many air districts.

The SCAQMD also concluded that the increase in VOC emissions as a result of the amendment to Rule 1168 was a significant air quality impact. (SCAQMD FSEA, pp. 2-3.[26]) Further, the SCAQMD explicitly concluded that "[t]he implementation of the proposed amended rule [which included using primers and sealants to join CPVC] will not trigger any construction activity"

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[24] www.dof.ca.gov

[25] South Coast Air Quality Management District (SCAQMD), Attachment 1 to the Governing Board Resolution for Proposed Amended Rule 1168 – Adhesive and Sealant Applications: Statement of Findings and Statement of Overriding Considerations, December 22, 2004.

[26] South Coast Air Quality Management District (SCAQMD), Final Subsequent Environmental Assessment for: Proposed Amended Rule 1168 – Adhesive and Sealant Applications, December 22, 2004.

and "no construction and construction air quality impacts are anticipated for implementing PAR 1168." (SCAQMD FSEA, p. 4-3) SCAQMD reached similar conclusions when amending the same rule in 2002. (SCAQMD Rule 1168, Attach. 1,[27] "the delay of VOC emission reductions from plastic pipe cements and primers may result in emissions of VOC that exceed the SCAQMD's daily CEQA significance threshold of 55 pounds per day [the operational threshold].")

As discussed above, the SJVAPCD CEQA significance threshold for operational and construction VOCs is 10 ton / yr, which is equivalent to 55 lb / day. When the Addendum's VOC estimate is distributed into individual air basins based on 2004 housing permits, 163 lb / day or 30 ton / yr of the increase occurs in the SJVAPCD (Table 4). These emissions exceed 10 ton / yr or 55 lb / day by a factor of three. ***Thus, significant air quality impacts occur in the SJVAPCD*** (with 14% of the 2004 new housing permits) based on the Addendum's VOC estimate, ***regardless of whether construction or operational significance thresholds are used to evaluate impacts***.

The SCAQMD's CEQA significance threshold for operational VOC emissions is 55 lb / day and construction emissions is 75 lb / day. When the Addendum's VOC estimate is distributed into individual air basins based on 2004 housing permits, the portion of the Addendum's VOC estimate that occurs in the SCAQMD is 308 lb / day (Table 4). This increase substantially exceeds both its construction (75 lb / day) and operational (55 lb / day) significance thresholds. ***Thus, significant air quality impacts occur in the SCAQMD, regardless of whether construction or operational significance thresholds are used in the evaluation***.

The VOC emissions in other air districts also exceed their significance thresholds. These include the Bay Area AQMD (134 lb / day compared to a threshold of 80 lb / day); Sacramento Metropolitan AQMD (71 lb / day compared to a threshold of 65 lb / day); San Luis Obispo County APCD (12 lb / day compared to a threshold of 10 lb / day); and Ventura County APCD (14 lb / day compared to a threshold of 5 lb / day) (Table 4). Thus, significant air quality impacts also occur in these four air districts.

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[27] South Coast Air Quality Management District (SCAQMD), Attachment 1 to the Governing Board Resolution for Proposed Amended Rule 1168 – Adhesive and Sealant Applications: Statement of Findings and Statement of Overriding Considerations, May 2002.

3. Individual Housing Development Construction Emissions Are Cumulatively Significant

The preceding two sections demonstrate that the Addendum's estimate of VOC emissions is significant when evaluated on a statewide and district wide basis. These emissions are also significant when evaluated as an individual residential development project.

The Addendum estimated that 1.36 pounds of VOCs would be emitted per day during the piping of each residential unit. Addendum, p. 19. A California licensed plumber indicates that 20 homes per day could be piped on the same day in a large residential development. (Hall Letter,[28] Parag. 2.) The piping of these 20 homes would release 27 lb / day of VOCs (20 x 1.36 = 27).

These emissions (27 lb/day), by themselves, exceed the operational significance thresholds of several air districts, including 5 lb/day adopted by Ventura County, 10 lb/day adopted by the San Luis Obispo County, and 25 lb/day adopted by Butte, Colusa, Feather River, Northern Sierra, Santa Barbara, Shasta, Tehama County, and Ventura County Air Pollution Control Districts. The operational thresholds are used when a district has not adopted a construction threshold. (See, e.g., El Dorado CEQA Guide; SJVAPCD CEQA Levels.) None of the above districts have adopted different construction emission thresholds. Thus, the VOC emissions from individual housing developments in these districts would be significant, regardless of whether the Project is cast as a construction or operational project.

The emission increase from a single development does not individually exceed the construction significance thresholds adopted by El Dorado APCD (82 lb / day), the SJVAPCD (55 lb / day), and the SCAQMD (75 lb / day), based on the Addendum's estimate. However, the emission increase from an individual development project does exceed these thresholds for some conditions, based on the sensitivity analysis in Comment I.G.4.

However, the emissions from a single large housing development are cumulatively significant. "Cumulative impacts" are defined as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." The incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects. CEQA Guidelines, Section 15355(a). "Cumulative impacts can

[28] Letter from John Hall, Business Manager, UA Local 78, to Richard Drury, Adams Broadwell Joseph & Cardozo, Re: Issues Related to CPVC Plastic Pipe, April 7, 2005.

result from individually minor but collectively significant projects taking place over a period of time." (CEQA Guidelines, Section 15355(b).) CARB, for example, concluded in a recent rulemaking that "Although each consumer product may seem to be a small source of emission, the cumulative use of these products by over 35 million Californians results in significant emissions." (CARB Initial Statement. [29]) The Project's emissions are cumulatively significant for several reasons.

First, only 40 homes would have to be piped to exceed the SJVAPCD's construction significance threshold of 55 lb / day (55 / 1.36 = 40) and 55 homes would have to be pipe to exceed the SCAQMD's construction significance threshold of 75 lb / day (75 / 1.36 = 55). The CIRB indicates that 56,275 new homes were permitted in 2004 in the SCAQMD and 29,724 in the SJVAPCD (Table 4). This amounts to 154 new units per day in the SCAQMD and 81 new units in the SJVAPCD, assuming 365 workdays per year. (The actual number of units per day would be higher because there are only 250 workdays in a year.)

Thus, VOC emissions from an individual housing development would cumulatively exceed the construction significance thresholds in both the SCAQMD and SJVAPCD and are cumulatively significant. These increases are cumulative because all the houses are in the same air basin and ozone is a regional pollutant, affecting the entire basin where emissions occur. Further, growth tends to cluster. Multiple projects frequently occur nearby in time and space, following utilities, roads, and population.

Second, other construction activities occur when the 20 houses are piped with CPVC, including use of diesel-fueled construction equipment and application of architectural coatings. These activities emit VOCs, which should be combined with CPVC emissions when estimating cumulative impacts.

Third, other types of development could occur on the same day, such as commercial and industrial projects. CEQA documents posted on the SCAQMD's website, for example, identify several refinery projects that would occur at the same time as new residential construction that could be piped with CPVC as a result of this Project. ***Thus, the Project would clearly have cumulatively significant adverse air quality impacts due to construction of a single housing development in at least the SCAQMD and SJVAPCD. The impacts would also be significant in the San Luis Obispo County, Butte County, Colusa County,***

[29] CARB, Initial Statement of Reasons for Proposed Amendments to the California Aerosol Coating Products, Antiperspirants and Deodorants, and Consumer Products Regulations, Test Method 310, and Airborne Toxic Control Measures for Para-dichlorobenzene Solid Air Fresheners and Toilet / Urinal Care Products, Volume I: Executive Summary (2004).

Feather River, Glenn County, Northern Sierra, Santa Barbara County, Shasta, Tehama County, and Ventura County Air Pollution Control Districts (Table 4).

C. The Addendum Underestimated VOC Emissions Because It Excluded Indirect Emissions

The Project will increase emissions in two ways. First, VOCs will be emitted during CPVC cementing at individual homes. Second, the Project will increase the demand for CPVC pipe, fittings, and joining chemicals. The National Sanitation Federation's ("NSF's")[30] product database and other sources indicate that CPVC pipe and fittings, cement, and primers are manufactured in California at eight facilities. (NSF 2005.[31]) Seven of these was independently verified. (May Declaration.[32])

The CARB website reports VOC emissions for two of these facilities for 2000. The IPS facility in Gardena (SCAQMD) emitted 18.2 ton/yr of VOCs (100 lbs/day). The Oatey facility in Newark (BAAQMD) emitted 16.7 ton/yr of VOCs (91.5 lb/day)[33] The BAAQMD reported emission data for the Oatey facility of 26.78 ton/yr (145 lb/day) as of January 16, 2003. (Oatey Permit.[34]) The VOC emissions originate from storing and blending solvents in tanks, mixers, and dispensers. Some of the solvents used in these processes may also be manufactured in California, further increasing indirect emissions.

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[30] The Addendum erroneously identifies "NSF" as the National Science Foundation and goes to great length to emphasize that the National Science Foundation is a governmental entity that has allegedly tested and endorsed CPVC drinking water pipe. The National Science Foundation has not, to my knowledge, ever tested CPVC drinking water pipe. The tests cited in the Addendum were by the National Sanitation Foundation. The National Sanitation Foundation is a private entity funded primarily by fees from private companies. The National Sanitation Foundation is not a governmental entity and it was not established pursuant to an act of Congress (www.nsf.org). In fact, the U.S. Environmental Protection Agency has criticized tests conducted by the National Sanitation Foundation and refused to rely upon the NSF's testing. The US EPA refused to accept the National Science Foundations tests conducted on CPVC plastic pipe due to questions about the methodology used, and NSF's refusal to produce underlying data for peer-review. 63 Federal Register 10282 (Mar. 2, 1998). Thus, the US EPA appears to seriously question the validity of NSF testing, not endorse it as alleged in the Addendum.

[31] National Sanitation Foundation (NSF) Product and Service Listings, NSF/ANSI Standard 14, Plastics Piping System Components and Related Materials, updated April 10, 2005. (http://www.nsf.org)

[32] Declaration of Julia E. May Identifying California Manufacturing of CPVC Plastic Pipe Fittings, or Adhesives for Drinking Water Applications, and Air Emissions Associated with these California Manufacturing Facilities, April 21, 2005.

[33] www.arb.ca.gov/ei/emissiondata.htm.

[34] BAAQMD, Oatey Permit information as of January 16, 2003.

CEQA requires that both primary or direct and secondary or indirect consequences of a project be evaluated. CEQA Guidelines, 14 CCR Sec. 15064(d). The CEQA guidelines of some air districts explicitly recognize that their significance thresholds apply to direct plus indirect emissions. The SCAQMD Guidelines state: "Both direct and indirect emissions should be included when determining whether the project exceeds these thresholds." (SCAQMD Handbook, p. 6-2.) The San Joaquin Valley APCD CEQA Guidelines state: "CEQA requires that in evaluating the significance of a project's potential air quality impacts, the Lead Agency shall consider both primary (direct) and secondary (indirect) consequences….An example of a secondary impact would be the emissions associated with growth that may be facilitated by the expansion of a wastewater treatment plant." (SJVAPCD 2002, p. 23. [35])

The Project will increase the demand for CPVC pipe, fittings, and cementing compounds by up to a factor of 25 in residential construction (an increase of 2500%). The amount of CPVC joining compounds, for example, could increase by up to 356,000 gallons per year.[36] About 51 pounds of CPVC pipe and fittings is required to plumb a house with CPVC. (1983 EA, [37] p. IV.A-21.) Thus, the amount of CPVC pipe and fittings would increase by about 57,000 pounds per day by 2030. It is reasonable to assume that a portion of this increase in demand will be met by existing California manufacturers. This would increase VOC emissions from these existing manufacturing facilities, increasing the Project's impact.

The increase in emissions from manufacturing CPVC products to supply demand created by the Project are indirect emissions of the Project. These indirect emissions should be added to the direct emissions. The Addendum does not include the information required to estimate indirect emissions, but given the magnitude of the increase in CPVC use proposed by the Project, the increase from existing manufacturing facilities in California could be individually and cumulatively significant.

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[35] San Joaquin Valley Air Pollution Control District (SJVAPCD), Guide for Assessing and Mitigating Air Quality Impacts, January 10, 2002.

[36] From Table 5, the amount of joining compound required in 2030: (3.35 L / house)(1134 houses)(365 day / yr)(0.26417 gal / L) = 366,298 gal. Current demand: (3.35 L / house)(33 houses)(365 day / yr)(0.26417 gal / L) = 10,659. The increase in demand: 366,298 – 10,659 = 355,638 gal.

[37] SRI International, Environmental Review of Proposed Expanded Uses of Plastic Plumbing Pipe, March 1983.

If the IPS Gardena facility increased production by only 60% (55 / 100), it would result in an increase in operational VOC emissions of 55 lbs / day. This would exceed the SCAQMD operational VOC significance threshold. It is reasonable to assume that a 2500% increase in demand for CPVC pipe, cement and primers may result in a 60% increase in production at this facility. Thus, there is a fair argument that the proposed action may have adverse air quality impacts in the SCAQMD from manufacturing alone.

If the Oatey facility in Newark increased production by 54% (80 / 147), it would result in an increase in operational VOC emissions of 80 lbs / day. This would exceed the BAAQMD operational VOC significance threshold. It is reasonable to assume that a 2500% increase in demand for CPVC pipe, cement and primers may result in a 54% increase in production at this facility. Thus, there is a fair argument that the proposed action may have adverse air quality impacts in the BAAQMD from manufacturing alone.

Neither the Addendum nor the 2000 MND made any attempt to analyze manufacturing impacts. The failure of these documents to provide any analysis of manufacturing impacts expands the scope of the fair argument. (*Sundtrom v. Mendocino* (1988) 202 Cal. App. 3d 296, 311 ("If the local agency has failed to study an area of possible environmental impact, a fair argument may be based on the limited facts in the record. Deficiencies in the record may actually enlarge the scope of fair argument by lending a logical plausibility to a wider range of inferences.").)

D. The Addendum Underestimated VOC Emissions On The Maximum Day

The significance of a project under CEQA is generally based on the maximum emissions that can reasonably be anticipated over a given period, typically a day or year, from all direct plus indirect sources. The Addendum did not consider indirect emission sources at all (Comment C) and did not estimate emission on the maximum day. The SCAQMD, in its CEQA guidelines, for example, states: "In determining whether or not a project exceeds these thresholds, the project emission should be calculated in the same manner as that for the SCAB (e.g. utilizing the highest daily emissions)." (SCAQMD Handbook, p. 6-3. See also SCAQMD Rule 1168, Attach. 1, p. 4.)

The Addendum estimated that the Project would result in VOC emissions of 1,159 lbs / day. Addendum, p. 19. This VOC estimate was calculated by multiplying the number of residential units that would be plumbed with CPVC every day in 2004, 852 units, by the amount of VOCs estimated to be emitted from each unit or 1.36 pounds of VOCs (852 units / day x 1.36 lb / unit = 1156 lb / day).

The Addendum has underestimated both the number of new residential units and the amount of VOCs that would be emitted by each unit, thus substantially underestimating VOC emissions. Further, the HCD ignored exemptions in regulations that govern the amount of VOC in CPVC sealants and primers. This comment considers the number of units and Comment I.E addresses the amount of VOC per unit.

1. <u>Number of Units Plumbed With CPVC Underestimated</u>

The Addendum assumed that statewide, 578 new residential units and 274 re-pipings of existing residential units would be performed per day, for a total of 854 potential units piped with CPVC. Addendum, p. 19. This number, as explained below, represents an annual average day, does not consider seasonal variations in construction activity, and does not consider future growth. The failure to consider these factors substantially underestimates the number of units plumbed with CPVC and hence VOC emissions. The significance of air emissions is generally determined on the maximum day, not the average day. (See, e.g., SCAQMD CEQA Handbook, 1993.)

a. <u>Number Of Work Days</u>

The Addendum assumed 854 units would be plumed with CPVC. This number assumes 578 new residential units and 274 re-pipings. Addendum, p. 19. These numbers were derived by dividing annual totals by 365, the total number of days in a year, and thus assume the same number of houses is built every single day of the year into the foreseeable future. See the HCD's calculations in note 25, e.g., "100,000 / 365 – 273.97". Addendum, p. 19. Further, the HCD file discloses that the new unit estimate (578) is based on CIRB's estimate of 211,000 units constructed in 2004. (Raymer 03 / 01 / 05.[38]) The daily number assumed in the Addendum, 574, is derived by dividing 211,000 by 365 (211,000 / 365 = 578).

However, construction does not occur 365 days per year. Construction would either not occur on holidays and weekends or would at least occur at a substantially reduced level. Further, plumbers only work 5 days per week. (Hall Letter, Parag. 13; Calone Letter,[39] Parags. 8, 9). Construction emission estimates

[38] E-mail from Bob Raymer to Bill Staack, March 1, 2005, re: Revised Data.

[39] Letter from Robert Calone, Certified Inspector #016380, to Richard Drury, Adams Broadwell Joseph & Cardozo, Re: Issues Related to CPVC Plastic Pipe, April 15, 2002.

typically assume 250 work days in a year, based on 5 days for 52 weeks minus 10 holidays. Making this adjustment, the number of CPVC piping jobs that would potentially occur on a given day is about 1.5 times higher than the estimate in the Addendum (365/250 = 1.46) – 844 new residential units per day (211,000/ 250 = 844) and 400 re-pipes per day (100,000 / 250 = 400). Thus, the total potential number of CPVC piping jobs per day would be 1,244, not 852. The VOC emissions would be proportionately higher, or 1,692 lb/day (1244 units per day x 1.36 pounds of VOCs per unit = 1692 lbs VOC per day), but otherwise using the Addendum's assumptions.

b. Seasonal Variations

The peak construction period is summer and fall, when temperatures are mild to warm and rainfall is low. Construction slows down during the last quarter of the year and generally does not occur during rain. Pipes cannot be joined in the rain using the cement welding process as water ruins the joint. Installation guides commonly note the importance of a dry surface. Therefore, it is reasonable to expect that more houses would be built during the summer and fall than in the spring and winter.

This seasonal variation in construction would increase the number of houses built per day, increasing maximum daily VOC emissions compared to the Addendum's estimate, which is an annual average. Licensed plumbers estimate that construction slows down by 20 to 30% during the rainy winter months. (Hall Letter, Parag. 12; Calone Letter, Parag. 7.) Thus, construction during the remaining nine months of the year would be approximately 10% higher than the mathematical average. This would result in an approximate 10% increase in daily emissions above the figures calculated above, increasing peak day emissions from 1,692 lbs VOC per day to 1,861 lbs of VOCs per day (1692 x 1.1), but otherwise using the Addendum's assumptions. This factor was not considered in the Addendum.

c. Future Years

The Addendum estimated the increase in VOC emissions for the year 2004. Addendum, p. 19, note 25. However, the Project evaluated in the Addendum would allow every new house built in California to use CPVC for drinking water piping for the foreseeable future. When a project allows emissions to increase in the future, as here (as population grows, more houses will be built), impacts are evaluated at several points in the future, e.g., 2010 and 2030. CARB, in e-mail correspondence with HCD, noted that "you need to grow the emissions to what ever year you will be covering in the CEQA eval." (Yee

11/5/04.[40]) The Addendum ignored CARB's instructions entirely and only evaluated the year 2004, which is the baseline year, even though the Project covers all future years.

The VOC emissions would increase in the future, in proportion to population, which is projected to increase. My projections of new or repiped residential units, based on Department of Finance population projections, indicate that the number would increase from 852 units per day assumed in the Addendum to 1,134 per day in 2030. See Comment I.G.2. This is consistent with CARB's method of projecting VOC emissions from adhesives, which also uses population growth from the Department of Finance. (Yee 11/5/04.)

Therefore, VOC emissions from the Project, under the Addendum's analysis method, would increase from 1,159 lb/day in 2004 to 1,542 lb/day in 2030, but otherwise using the Addendum's assumptions. Thus, air quality impacts would be even greater and more significant than discussed above in Comment I.B.

d. Recent CIRB Projections

The Addendum assumed 211,000 new residential units would be built per year. The HCD supporting file suggests this estimate is based on a March 1, 2005 e-mail from a CBIA lobbyist. (Raymer 3/1/2005.[41]) However, the CIRB recently released new housing statistics for 2004. The final tally is 211,731 or 580 per day, based on the Addendum's method of calculating averages, compared to 578 assumed in the Addendum. (CIRB 2005.[42]) By failing to use the most recent data, the Addendum underestimated Project emissions.

E. The Addendum Underestimated The VOC Emissions Per House

The Addendum assumes that 1.36 pounds of VOCs are emitted per house plumbed. This value was estimated by assuming that 2 pounds of "adhesive product" would be used and that 68 percent of the 2 pounds would be VOCs. Addendum, p. 19. This estimate is based on the one-step application process and an unsupported and unreasonable usage rate.

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[40] E-mail from Judy Yee, CARB, to Bill Staack, HCD, Re: Pipe cement sales from 1997 survey, November 5, 2004.

[41] E-mail from Bob Raymer, CBIA, to Bill Staack, Re: Revised Data, March 1, 2005.

[42] Construction Industry Research Board, New Housing Units and Building Permit Valuations by County, Calendar Year: 2004 (Preliminary), March 2005.

The Addendum does not explain how it arrived at the 2 pound "adhesive product" estimate.[43] Mr. Staack, HCD Legal Affairs Division, requested that an associate in HCD's Division of Codes and Standards "develop a *semi-accurate* estimate on the amount of adhesive would [sic] be used in a house to install CPVC water pipe." (Staack 11/3/04, (emphasis added).[44]) Subsequently, Mr. Staack asked Mr. Hensel: "I if safe to say [sic] that approximately 2 pounds of adhesives are would [sic] be used to glue a typical residences [sic] with CPVC?" (Staack 11/8/04.[45]) The record shows no response to this question, or any substantial evidence to support the 2 pound figure. Nevertheless, the 2 pound figure was used in the Addendum. I had to back calculate it from an estimate of 2-1/2 pints based on an e-mail summary of a conversation.

The 2 pound "semi-accurate" estimate is apparently based on a conversation between Mr. Hensel, tasked with making a "semi-accurate" estimate, and a person named “Harry” who claims he used “2 ½ pints of CPVC cement to do a 3bdrm, 3bath home.” (Hensel 11/9/04.[46]) My calculations indicate that this amount of low-VOC cement weighs about 2 pounds.[47] I did not find any other estimate of the amount of product that would be used. Thus, I assume that the Addendum’s estimate of 2 pounds of “adhesive product” is based on this conversation with “Harry”.

This is not a substantial or reasonable basis for a VOC estimate. First, it is based on a conversation with an unidentified person of unknown qualifications and experience. Second, it is based on an estimate for a single house. Third, the specific product that was used is not identified in the e-mail beyond “cement.” “Cement” could mean a one-step product (thus omitting the primer) or the cement used in the two-step process (including separate primer). Different amounts of each product would be required. Fourth, calculations presented

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[43] The Addendum states that its VOC emission estimate is based on “adhesive product,” presumably the sum of primer plus cements. Addendum, p. 19. However, the Addendum does not explain specifically what it means by “adhesive product” in the context of VOC emissions. The Addendum elsewhere defines “adhesives” as the primers and cements used to joint CPVC pipe and fittings. Addendum, p. 17. However, calculations presented elsewhere in these comments indicate that a one-step process is assumed.

[44] E-mail from Bill Staack, HCD, to Doug Hensel, HCD, Re: Adhesive used, November 3, 2004.

[45] E-mail from Bill Staack, HCD, to Doug Hensel, HCD, Re: Adhesives product used, November 8, 2004.

[46] E-mail from Doug Hensel to Bill Staack, Re: Adhesives product used, November 9, 2004.

[47] The specific gravity of Oatey low-VOC cement, as reported on the MSDS, is 0.96. Specific gravity is the ratio of the density or weight of a product to the density or weight of water. The density of water is 7.48 pounds per gallon. Thus, 2-1/2 pints of Oatey low-VOC cement would weigh about: (0.96)(7.48 lb/gal)(0.125 gal/pint)(2.5 pints) = 2.24 lbs.

below suggest the Addendum assumed the one-step joining process will be used for 100% of the homes. This is not a reasonable assumption because the two-step process, which uses primer and cement, is widely used.

My estimate, summarized in Table 5 and discussed below, indicates that about 4 pints of cement (3.7 lbs) and 3 pints of primer (2.3 lbs)[48] would be required to install CPVC in a typical California residence using the two-step process. This estimate is based on manufacturer's literature and special calculation methodologies developed specifically for this purpose by experts in the industry. Thus, about 6 pounds or over three times more adhesive product is required than the 2 pounds assumed in the Addendum.

As discussed below, the 6 pounds of joining material would emit 3.81 pounds of VOC per unit ("lb / unit") based on the two-step process or nearly three times more than assumed in the Addendum. Even if 100% use of the one step-process were assumed, 1.91 pounds of VOC per unit would still be emitted or 40% more than assumed in the Addendum, otherwise using the Addendum's assumptions. My estimate of 3.81 lb / unit is also low, for the reasons set out in Comment I.E.6. Thus, I prepared a sensitivity analysis in Comment I.G.4 to bracket the range of VOC emissions.

I estimated the VOC emission factor (lb / unit) for a typical residential unit from the number of fittings required to plumb the potable water system, the amount of primer and cement used per joint, and the VOC content of the primer and cement. The VOC emission factor was estimated from the following equation:

$$E = Sum(N_d*A_d*C)$$

Where

E = emission factor in pounds of VOC per residential unit

N = number of joints in the potable water system of a typical California residence with pipe diameter d

A = amount of primer and cement used per joint in liters for pipe of diameter d

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[48] Weight of low VOC cement used in typical house: (1.97 liters)(0.26417 gal / liter)(7.48 lb / gal)(0.96) = 3.74 lbs of cement. Weight of low VOC primer used in typical house: (1.38 liters)(0.26417 gal / liter)(7.48 lb / gal)(0.84) = 2.29 lbs primer. Specific gravities based on Oatey MSDSs. Volumes applied based on vendor guidelines summarized in Table 6.

C = concentration of VOC in primer and cement expressed in grams per liter.

The sources of data and methods that I used to determine each of these factors are discussed below. The results of my calculations are summarized in Table 5, which indicates that about 3.81 pounds of VOCs would be emitted for every home whose potable water supply system is plumbed using CPVC, compared to only 1.36 lb/unit assumed in the Addendum. This VOC emission factor was then used to estimate statewide, district-wide, and development-specific VOC emissions. Thus, even assuming the Addendum's VOC estimating procedure is correct (which it is not), plumbing 852 units per day with CPVC (the total number assumed in the Addendum) would generate up to 3,246 pounds per day of VOCs (3.81x852), not 1,159 pounds of VOCs as estimated by the Addendum (1.36x852).

1. <u>Typical House</u>

The Construction Industry Research Board ("CIRB") compiles statistics on construction in California. According to their most recent survey (2002), the average size of new homes in California in 1997 was 2,170 square feet ("ft^2"). Among the new homes built in 2001, 61% were single-family units with an average size of 2,120 ft^2, 11% were condominiums with an average size of 1,570 ft^2, and 28% were planned-unit developments with an average size of 2,515 ft^2. Generally, the average size of a new home in California increased from 1,610 ft^2 in 1982 to 2,170 ft^2 in 2001, or by 35%. (CIRB 2/02,[49] Table 2 and p. 9.) Further, amenities have also increased, including number of bathrooms, indoor saunas, and hot water recirculating systems, all of which require additional amounts of piping. (1998 DEIR,[50] p. 15.) This trend is expected to continue as California's population becomes more affluent.

My VOC emission factor assumes an average house size of about 2,000 ft^2, estimated assuming 32% of installed CPVC will be re-pipings of existing stock built in 1985 or later with an average size of 1,650 ft^2 and 68% will be new houses

[49] Construction Industry Research Board (CIRB), <u>Characteristics of New Homes Sold: California and Selected Counties, 1982-2001</u>, February 2002.

[50] State of California, Department of Housing and Community Development, Draft Environmental Impact Report Appendices for Chlorinated Polyvinyl Chloride (CPVC) Pipe for Potable Water Piping in Residential Buildings, June 30, 1998, State Clearinghouse Number 970820040.

built after 2001 with an average size of 2,170 ft^2).[51] I also conservatively assume that the size of a new home is frozen at this (2001) value and amenities common in many new homes today are omitted. VOC emissions would be larger if I had assumed a larger home.

2. Number of Joints per House (N)

Cements and primers are used to join sections of CPVC pipe, which comes in standard lengths of 10 or 20 ft. Fittings are used at 10 to 20 ft intervals and also at turns, transitions to different pipe sizes, and at each fixture (e.g., sink) or appliance (e.g., washing machine, dish washer) connected to the system. These fittings include couplings used to join straight runs of pipe, elbows used to join two pipe segments at angles, and tees used to join three pipe segments entering a junction from three directions. Cements and primers are used to attach these fittings to the pipe. Couplings and elbows require two joints each, one on either end, and tees require three. The number of joints was estimated by first determining the number of fittings of each type (e.g., ½" elbows, ¾" tees) in an average residence and then multiplying the number of fittings of each type by the number of joints. The calculations are shown in Section A of Table 5.

The type, number, and diameter of CPVC fittings required to plumb the potable water system of an average residence being constructed in California today was estimated by several professional California plumbers, using blueprints from typical houses. I used a detailed estimate prepared in 1998 by the Training Director of the Pipe Trades Training School. This estimate was confirmed in 2005 by a licensed Plumber, who stated the 1998 estimate is still reasonable and accurate, but may underestimate the number of joints due to the continued increase in the average size of new houses. (Hall Letter, Parag. 14.)

The breakdown of type, number, and size of pipe and fittings for the typical house is shown in Section A of Table 5. The average residence was assumed to be a single-family residence with about 2,000 ft^2 and two bathrooms, one bathtub, one kitchen, and one washroom with piping starting at the water meter. This average residence would require 211 fittings, of which 91 are ½" fittings, 82 are ¾" fittings, 22 are 1" fittings, and 16 are mixed diameter tees. These fittings would require the priming and cementing of 469 joints of which 209 are ½" joints, 206 are ¾" joints, and 54 are 1" joints. The actual number of fittings could be higher or lower, depending upon the number of physical

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[51] The average size of residential units, comprising 578 new units and 274 re-pipings (Addendum, p. 19) is: 0.32x1650 + 0.68x2170 = 2004 ft^2. The 0.32 factor is calculated as: 274 / 852. The 0.68 factor is calculated as: 578 / 854.

obstacles that are encountered during installation. Piping must be routed around obstacles, which requires additional fittings.

Since this estimate was prepared, the size of an average residence has increased, which means the average home is larger and would have more amenities. (CIRB 2/02, Table 2.) Further, no amenities commonly found in high-end homes today, including a third bathroom, indoor sauna, or recirculating hot water system, were included. (Hall Letter, Parag. 14.) A similar unit in a multi-family development, which comprise 28% of California residential construction (CIRB, 2/02, p. 9), would have longer runs of larger diameter pipe (1998 DEIR, p. 15) and hence more fittings. Thus, the number of joints in the typical home I used to estimate the VOC emission factor underestimates the number of joints in houses being built today in California.

My estimate (211 fittings) is lower than a 1998 estimate by Colton/East Highland plumbers (250-300)[52] and a recent estimate by a certified plumbing inspector (225-250). (Calone Letter, Parag. 6.) It is also consistent with an estimate of 200 joints in the 1983 Environmental Assessment ("1983 EA"). (1983 EA, Table IV-3, p. IV/A-21.) My estimate of 211 compared to 200 joints in 1983 is likely low because the size of homes has increased by about 50% since 1983 (2170/1450 = 1.50) and the number of bathrooms and other water-using amenities, e.g., sauna, has increased. Thus, I conservatively assumed 211 fittings in my VOC emission calculations.

3. Amount of Primer and Cement per Joint (U)

Two processes can be used to join CPVC – the one-step process and the two-step process. The two-step process uses a primer to soften the pipe, followed by a cement. The one-step process combines the primer and sealant in a single application, does not require a separate primer, and thus uses less total product. The Addendum assumes the one-step process will be used in all CPVC installations, but never specifically identifies it. However, the two-step process is more common, provides a safety factor for the installer, is allowed by plumbing codes, and emits more VOCs.

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[52] Major plumbing firms working in the Colton and East Highland areas, where CPVC pipe was/is permitted in residential potable water systems, were surveyed in 1998. Plumbers were asked to estimate the number of fittings required in a CPVC potable water system in an average residence, based on their experience installing such systems. Those surveyed stated that 250 to 300 fittings would be used in a typical installation.

A primer "consists of special solvents to soften, or etch the pipe prior to use of a cement." (E-Z Weld.[53]) Both cleaner and primer are recommended when the pipe and/or connectors are contaminated with inks, grease, waxes and/or oils, which is common. Cleaners contain solvents that emit VOCs, just like the primers and cements. The Addendum did not consider VOC emissions from primers or cleaners.

Plumbing codes historically have required the use of a primer for hot and cold water distribution systems. 2001 CPC, Sec. 316.1.3 ("A listed primer in compliance with ASTM F 656-96a shall be used on all CPVC solvent cemented joints.") The 2004 UPC proposes to allow the use of the one-step process for the first time, but continues to allow the two-step process. The 2004 UPC has not been approved in California, so the 2001 document is still operative. The 2001 CPC, as discussed above, does not allow the use of one-step cements and requires the use of a primer. If and when the California Building Standards Commission adopts the currently proposed CPC modification, either process may be used.

Installation guides frequently recommend the use of a primer to assure a good bond. They note that "extra care must be given to the installation" if a primer is not used. (See, e.g., IPS Weld-On Guide, p. 9.) There is rarely time for extra care in the competitive, rapid-paced housing construction market. Primer is even more important to pre-soften surfaces during cold weather. *Id.*, pp. 13-14. Oatey, one of the largest vendors of CPVC joining materials, recommends that "[a]ll pipe surface should be thoroughly cleaned with pipe cleaner." (Oatey FAQ.[54])

A vendor lists failure to apply primer as a cause of solvent welded joint failures and explains: "While in most cases the nature of the mating surface is such that the cement will provide an adequate weld by itself, conditions may exist that would require the use of a primer for adequate penetration…Because these conditions are randomly encountered and are neither easily detected or predicted, and because a primer will always help and wont hurt, the use of a primer, especially on pressure systems is recommended." (ElChem, pp. 4, 5.[55]) The patent-holder for FlowGuard drinking water pipe states that its own FlowGuard Gold One Step Cement™ is "technically preferred" on ½ to 2 inch pipe, but concedes that primer should be used on larger sized pipes and fitting

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53 E-Z Weld Technical Note, E-Z Weld Solvent Cementing FAQ.

54 Oatey, Frequently Asked Questions. www.oatey.com/faq.asp.

55 Pipe and Fitting Related Solvent Weld Joint Failures, http://www.elchem.com/joint_failures.htm.

and notes that primer should be used if required by local code. (FlowGuard 2004, p. 10.[56]) As discussed above, the currently operative CPC requires the use of a primer and prohibits the use of one-step cement.

The two-step process requires roughly twice as much product and emits more than twice as much VOCs. Further, a representative of Noveon (who holds the patents for CPVC) stated in an e-mail to HCD: "The combined two step process is over twice the exposure levels of VOC's [sic] than the one step process. Also handling storage and flushing are affect more adverse [sic] with the two step process." (Gage, 4/23/04.[57]) CEQA analyses are normally based on the maximum day or worst-case conditions. The two-step process should have been evaluated because it is widely used and achieves a better seal and hence lower failure rate. Further, the two-step process is required by the current CPC and will continue to be allowed even if the 2004 UPC is adopted by the State.

The Addendum stated that about 2 pounds of "adhesive product" would be used to install CPVC in a residential unit. Addendum, p. 19. The Addendum did not provide any support for this estimate, but the record before HCD suggests it is based on a conversation with "Harry" documented in an e-mail. (Hensel 11/9/04.) This amount of "adhesive product" is not consistent with vendor application instructions. "Harry" simply does not constitute substantial evidence.

The amount of cement and primer that is used depends on the number of joints (N), diameter of the pipe, the technique used to make the joint, ambient conditions (e.g., temperature, wind speed), and the care and training of the applicator. I estimated the amount of primer and cement used per joint from vendor literature. Some of the vendors of adhesive products and trade associations have published estimates of the amount of material used per joint. These estimates are summarized in Table 6. I used the average of the vendor estimates, which likely underestimates the amount of product for the reasons outlined below.

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56 Noveon, Inc., FlowGuard Gold and Corzan Pipe & Fittings, Design and Installation Manual for Water Distribution Systems, October 2004. FlowGuard Gold and Corzan are registered trademarks of Noveon IP Holdings Corp.

57 E-mail from Garry Gage, Noveon, Inc., to Bill Staack, HCD, Re: One-step primers, April 23, 2004.

4. VOC Content of Primers and Cements (C)

The amount of VOCs that may be emitted from CPVC cements and primers is currently regulated by 13 air districts.[58] The California Air Resources Board ("CARB") has adopted Reasonably Available Control Technology ("RACT") and Best Available Retrofit Control Technology ("BARCT") for adhesives and sealants, which include CPVC primers and sealants. (CARB Determinations 1998.[59]) These regulations establish maximum limits on the amount of VOCs that may be present in the primers and cements in grams per liter ("g/L"). Table 7 summarizes these regulations. These limits are all expressed in terms of VOC content "less water and exempt compounds." For low-solids CPVC primers and cements, this is equivalent to grams of VOC emitted per liter of material out of the can.

The limits that have been established are typically 490 g/L for CPVC cements and 650 g/L for primers. The CARB RACT/BARCT determinations represent current vendor ability to comply. (CARB Determinations 1998.) Some districts have set lower VOC limits (San Joaquin Valley, Yolo-Solano, SCAQMD), but vendors so far have been unable to meet them. The SCAQMD Rule 1168 has required lower limits than RACT/BARCT since 1991 for both CPVC primers and sealants, but SCAQMD had to rescind the lower limits, in December 1992, April 1997, October 2003 and most recently, in January 2005, because vendors could not meet them. The January 2005 revision to Rule 1168 sets a VOC limit of 550 g/L for primers which the SCAQMD Staff Report claims vendors can meet by July 1, 2005. The same staff report and rule revision retains the 490 g/L limit for CPVC cements and does not propose a future lowering. (SCAQMD Rule 1168.[60])

Although there is some uncertainty in the ability of vendors to meet the proposed primer limit of 550 g/L, to be conservative, I assume that vendors will comply with it statewide. If it is not achieved, I will have underestimated the impact of the Project. Thus, my calculations in Table 5 assume that all CPVC cements will contain 490 g/L of VOC and 550 g/L for CPVC primers of 550 g/L, which yields a VOC emission factor of 3.81 lb/unit. If I used the higher value of

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[58] The following districts have adhesive and sealant regulations: Antelope Valley Air Quality Management District ("AQMD"); Bay Area AQMD; El Dorado County Air Pollution Control District ("APCD"); Placer County APCD; Sacramento Metropolitan AQMD; San Diego APCD; San Joaquin Valley Unified APCD; Santa Barbara County APCD; Shasta County AQMD; South Coast AQMD; Tehema County APCD; Ventura County APCD; Yolo-Solano AQMD.

[59] CARB, Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Adhesives and Sealants, December 1998.

[60] SCAQMD Board Meeting, Amend Rule 1168 – Adhesives and Sealant Applications, January 7, 2005. http://www.aqmd.gov/hb/2005/050127a.html.

650 g/L, which is RACT/BARCT and required in most adhesive regulations (Table 7) ,the corresponding VOC emission factor would be 4.11 lb/unit. Relying on California adhesive and sealant regulations to determine VOC emissions underestimates VOC emissions for three reasons.

First, some of the products that are sold today as low-VOC materials do not comply with these standards, even though the label claims they do. A sample of Oatey low-VOC Purple Primer, for example, analyzed according to SCAQMD Methods 316A-92 and 304-91, contained 752 g/L of VOCs, rather than 650 g/L recorded on its label.

Second, I am not aware of any program that samples the VOC content of products used in construction. A contractor could bypass these regulations by ordering noncompliant products directly from vendors over the internet and transferring them into a properly labeled can.

Third, the adhesive regulations (Table 7) exclude small quantity uses, which could apply to a significant number of homes. These regulations frequently exempt low use, which is typically 20 to 55 gallons per year or 200 pounds per year per facility or source. Source and facility are typically defined broadly so that they could encompass a single home or housing development. These regulations, for example, appear to exempt repipings. Further, these regulations typically exempt small cans, 5 to 8 oz. The only district that excludes CPVC primers and cements from the small container exemption is the BAAQMD, even though the CARB RACT/BARCT determination recommends that the small-size exemption not apply to plastic welding adhesives and primers. BAAQMD Rule 8-51-123. Thus, actual emissions could be higher than I calculate in Table 5 since I make the conservative assumption that 100% of the primer and adhesive is low-VOC material meeting BARCT/RACT and SCAQMD regulations.

5. <u>VOC Emission Factor Per Housing Unit</u>

The VOC emission factor was calculated by multiplying the concentration of VOC in primer and cement (Table 7) by the total volume of each material required to pipe the potable water system in Section B of Table 5. These calculations are included in Section C of Table 5 and indicate that 3.81 lb/unit would be emitted from each residential unit that is piped with CPVC, compared to 1.36 lb/unit assumed in the Addendum. If a primer VOC concentration of 650 g/L were used, which is required in most of the State, the emission factor would increase to 4.11 lb/unit. ***Thus, the Addendum underestimated VOC emissions by about a factor of three.***

6. VOC Emissions May Be Higher Than 3.81 Lb / Unit

My estimate of VOC emissions, 3.81 lb / unit, likely underestimates potential VOC emissions because it does not include a number of factors that would increase emissions. These factors, discussed below, could not be included because the Addendum's project description and environmental setting are inadequate to fully evaluate the Project. The supporting HCD file is also inadequate to fully evaluate the Project.

a. VOC Emissions From Cleaners Were Not Included

The mating surface of CPVC pipe may contain waxy chemicals that are slippery and provide a barrier to cementing. These chemicals originate from extrusion aids and molding release agents used to manufacture the pipe. Mating surfaces must be free of dirt, dust, great, paint, water and other substances. If not removed, they "provide a serious jeopardy to the making of a successful joint." (ElChem, pp. 1, 4.)

This may be done using a volatile solvent such as methyl ethyl ketone if deposits cannot be removed with a dry paper or cotton towel or rag. (Chemtrol Manual, p. 16.[61]) Methyl ethyl ketone is a VOC. The solvents used to remove waxy, hydrocarbon-based contaminants are called cleaners. A cleaner is frequently used in addition to primer. (E-Z Weld [b].[62])

An E-Z Weld (vendor of CPVC joining chemicals) Technical Note explains that: "[p]ipe cleaner is a non-aggressive mix of solvents used to remove contamination from joints and pipes prior to cementing. It will remove inks, dirt, oils and grease that could affect joint quality – and will not carry them into the plastic – as would primer." The Addendum and my analysis did not consider VOC emissions from cleaners, which would increase my estimate of 3.81 lb / unit.

b. Vendor Usage Data Underestimates Usage Under Field Conditions

I estimated VOC emissions from vendor usage data. These data underestimate usage due to differences between controlled laboratory conditions and field conditions. (Hall Letter, Parag. 3; Calone Letter, Parag. 2). A certified plumbing inspector explains: "Plumbers almost always use more cement, primer and solvent than suggested by manufacturers when installing CPVC pipe. This is because it is expedient (there is no bonus for saving and there is a large penalty

[61] Chemtrol, Thermoplastic Piping Technical Manual, http://www.nibco.com.

[62] E-Z Weld Technical Note, Proper Solvent Cement Procedures.

for leaks)." (Calone Letter, Parag. 2.) The maximum day emissions should be based on the worst-case conditions. This is addressed in my sensitivity analysis in Comment I.G.4.

Vendors caution that the data in Table 6 are guides only and actual usage could be higher, depending upon application practices. IPS, for example, warns that "[t]hese figures are estimates based on our laboratory tests. Due to the many variables in the field, these figures should be used as a general guide only." (IPS Weld-On Guide.) The *Thermoplastic Piping Technical Manual* cautions: "…The PVC and CPVC solvent cement usage estimates…should only be considered as guideline. Actual usage could vary according to a wide variety of installation conditions…these estimates should in no way be used to restrict the liberal instructions in the Six Step Application Techniques…"

Conversations with vendors indicate that the usage data in Table 6 were measured in the laboratory on a small number of joints using small cans of product under ideal working conditions. There are a number of critical differences between laboratory and field application of primers and cements that could substantially increase field usage.

First, in the field, there is a large penalty for joint failure. Joints are not tested until the complete system is assembled and pressure tested. Once a system is assembled, it is very difficult to isolate leaks and very expensive to repair them, particularly if they occur after a unit is occupied. Further, it is well known that the most common cause of joint failures is failure to apply adequate amounts of cement. (ElChem, pp. 5-6.)   IPS estimates that 90% of joint failures are caused by insufficient coatings of cement. (IPS Weld-On Notice.[63])

Therefore, applicators routinely apply excess primer and cement to assure good seals because there is no penalty for excesses. The lab technician who develops the usage values, has no such motivation to assure a good seal. Laboratory-prepared joints are not pressure tested and there is no penalty for poor joints.

Second, plumbing codes, plumbing manuals, and vendors recommend applying "liberal" and "heavy" amounts. These terms mean different things to different people and can result in substantial over applications. Further, due to ease of installation compared to copper pipe soldering, CPVC is sometimes

[63] IPS Weld-On, Notice, Most Joint Failures are Caused by "Dry Joints"!

installed by less skilled labor, potentially resulting in more frequent incidence of improper workmanship and excessive application. (Builders Websource 2002.[64])

Step 8 of the CPVC joining process in the 2001 CPC states: "Apply a liberal coat of CPVC solvent cement to the outside surface of the pipe to the depth of the fitting socket." CPC, Sec. 316.1.2. Noveon, who holds the patents for CPVC, recommend a "heavy coat." (FlowGuard 2004, p. 10.) The Harvel Engineering & Installation Guide recommends "a heavy, even coat of cement to the outside pipe end." (Harvel 2004,[65] p. 72.) Instructions on the cans direct one to apply a "liberal coat" (Oatey Lo-VOC 1-Step CPVC Cement; Oatey Low-VOC Medium Bodied CPVC Cement).

Hercules states: "apply a liberal amount." (Hercules 2004.[66]) The Plastic Pipe and Fittings Association's ("PPFA's") *Plumber's Installation Handbook* recommends applying a "heavy" coat of cement. (PPFA Handbook, p. 6.[67]) Harvel, a vendor of CPVC pipe, recommends: "[a]pply a heavy coat of cement to the outside of pipe ends." (Harvel CTS.[68]) Harrington's Engineering Handbook for Industrial Plastic Piping Systems recommends applying a "liberal coat of solvent cement." (PPFA Handbook, p. 80.) Ace Hardware recommends: "[l]iberally apply cement first to the pipe end..." (Ace Hardware.[69])

Third, high temperatures and winds can increase the amount of material required per joint. The laboratory is a controlled environment with ideal joining conditions. The temperature is usually around 70°F. Field temperatures can range from subzero to 110 °F in desert portions of California where most of the new residential construction is occurring. Pipes are often stored outdoors in the hot sun and assembled at elevated temperatures. Extreme ambient temperatures and other conditions (e.g., winds, rain, snow) make it difficult to control application when it occurs in unprotected areas. Further, high temperatures and weather conditions, such as those that occur during the peak construction period throughout much of California where rapid growth is occurring (e.g., Mojave

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64 Builders Websource, CPVC vs. Copper Plumbing, Updated October 28, 2002. http://www.builderswebsource.com/techbriefs/cpvccopper.htm#Introduction.

65 Harvel Plastics, Inc., Engineering & Installation Guide. PVC and CPVC Extruded Pipe, Duct, and Machining Stock, 2004.

66 Hercules Chemical Company, Inc., Plastic Pipe Cements: Primers, Cleaner & Accessories, 2004.

67 Plastic Pipe and Fittings Association (PPFA), Plumber's Installation Handbook, August 2003. http://www.ppfahome.org/pdf/PIH_Aug03.pdf

68 Harvel, Copper Tube Size (CTS), http://www.harvel.com/piping-cts-join-tech.asp.

69 Ace Hardware, Working with Plastic Pipe.

Desert, Central Valley, South Coast), substantially increase losses from volatilization and hence usage per joint compared to lab conditions.

Fourth, in the field, there is always pressure to perform work quickly to minimize labor costs. Therefore, the time is virtually never taken to carefully replace the lids on the primer and cement cans between joints, as practiced in the lab and instructed on the cans. This increases the volatilization loss per joint. Field observations indicate that the cans are typically left half open, with the dauber off to one side. More care is taken with the cement because solvent evaporation thickens the cement, but even in this case, the lid is virtually never screwed on.[70]

Fifth, accidental spills occur in the field that do not occur in the laboratory. An industrial hygiene survey found that in 14 out of 280 15-min exposure periods, or 5% of those monitored, small spills covering less than about 3 ft^2 were observed. Some workers also applied primers and cements very liberally, sprinkling their clothes, the pipes, and nearby surfaces with drips and small splashes. (CDOHS 1989, p. 15.[71]) See also color photos filed with these Comments. These types of conditions do not occur in the laboratory.

Sixth, primers and cements typically come in cans ranging from ¼ pint to 1 quart in size. The lab work typically uses smaller cans, while field application will typically use the largest size available due to cost savings. The daubers that come with the larger sized cans are too big for ½" and ¾" diameter pipes. Cement and primer applied with the oversized daubers is squeezed out each time the dauber is pushed into a fitting, substantially increasing the amount of material used per joint, compared to lab conditions. (Calone Letter, Parag. 2; CDOHS 1989,[72] p. 15.)

Seventh, the VOC estimate in Table 5 does not include VOC emissions from storing and cleaning the brushes used to apply the cleaners, primers, and cement. These brushes (or daubers) must be cleaned to keep them pliable and free of contaminated dried material and stored in solvent. A wide-mouth container, such as a coffee can, and methyl ethyl ketone are commonly used. (Chemtrol Manual, p. 17.) The brush cleaning process can emit large amounts of VOCs.

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[70] Personal communication, Jim Bellows (author of CDOHS 1989), August 18, 1998.

[71] California Department of Health Services, *Plastic Pipe Installation: Potential Health Hazards for Workers*, April 1989.

[72] California Department of Health Services (CDOHS), Plastic Pipe Installation: Potential Health Hazards for Workers, April 1989.

Handbooks recommend that the cleaner containers be covered to slow the evaporation of solvent. (Chemtrol Manual, p. 17.) ("If overnight storage of materials and tools is inside, it is not necessary to do more than throw a shop towel across the tops of the brush handles in their storage container to keep contaminants out and further suppress the slow evaporation rate of MEK [a VOC].") However, this is rarely done.

Seventh, as discussed in Comment I.E.6.a, solvents may also be used to clean the pipe and connectors before joining and to clean and store the brushes. Further, some operations occur in the field that do not occur in the lab that increase the volatilization of solvent. These include stirring the can to test and renew freshness, transferring the contents of small cans to large cans, discarding cans with drips and leaks on the sides and lid (which evaporate), spills, wiping the brush on the mouth of the container to squeeze out excess material, drying of the applicator can overnight, and long-term storage of brushes and other applicators. (Chemtrol Manual, p. 17.) All of these operations would increase the release of VOCs, compared to vendor usage data that I rely on. Thus, actual VOC emission could be much higher in the field than I estimate.

Finally, there is no limit on the quantity of adhesives that can be used per joint or per unit, as admitted in the Addendum, p. 53, Finding 4.B. Thus, more product than indicated in vendor usage estimates could be used.

In sum, there are a large number of conditions that are commonly encountered in the field that are not present during controlled lab testing of primers and cements. These conditions tend to increase field usage compared to lab usage. I am not aware of any conditions that would decrease field usage compared to lab usage.

Neither the Addendum nor the 2000 MND considered any of these factors. Thus, the Addendum substantially underestimates Project emissions and the resulting significance of air quality impacts.

c. <u>Hot Windy Days Would Increase VOC Emissions</u>

The primers and sealants used to join CPVC pipe are very volatile. The amount of VOCs that is emitted depends on weather conditions -- the ambient temperature and wind speed at the job site. The higher the temperature and wind velocity, the larger the amount of VOCs that are emitted.` An adhesive vendor guide to solvent cementing of CPVC plastic pipe and fittings explains:

> Solvent cements for plastic pipe contain high strength solvents which evaporate faster at elevated temperatures. This is especially true when

> there is a hot wind blowing. If the pipe is stored in direct sunlight, the pipe surface temperatures may be from 20 F to 30 F higher than the ambient temperature.

(IPS Weld-On Guide, p. 13.). A plastic pipe engineering manual contains an almost identical caution. (PPFA Handbook 2003, p. 83.) A CPVC pipe vendor notes: "As the temperature and / or wind increase, the rate of solvent evaporation quickens." (Chemtrol Manual, p. 20.)

The higher the temperature and wind speed, the higher the amount of adhesive product evaporated and amount of VOC emitted. The highest ambient temperatures and winds occur during the peak construction period, May through November. VOC emissions would be much higher on a hot summer day than a cool winter or spring day, e.g., more would evaporate from the container, brush, and coated surfaces. Further, weather conditions affect priming and cementing action, requiring repeated applications during severe conditions. (IPS Weld On Guide, p. 6).

I estimated the increase in VOC emissions at typical summer temperatures compared to winter temperatures based on tabulated vapor pressures of the three major chemicals in low-VOC one-step cement: tetrahydrofuran, methyl ethyl ketone, and cyclohexanone. These calculations indicate that 3.6 times more methyl ethyl ketone, which makes up 30-40% of the weight of Oatey low-VOC one-step cement, would be emitted at 77 F than at 32 F. Similarly, about 1.8 times more tetrahydrofuran, about 30-40% of the Oatey product, would be emitted at 86 F than at 50 F. And about 1.6 times more cyclohexanone, 5-15% of the Oatey product, would be emitted at 86 F than at 68 F.[73] Thus, over two times more VOCs would be emitted on a summer day than on a winter day. This was not considered in the Addendum's calculations or my calculations in Table 5 and could increase maximum daily emissions by factor of two. I considered this issue in my sensitivity analysis in Comment I.G.4.

F. The Increase In VOC Emissions Was Not Correctly Calculated

The Addendum calculated VOC emissions in the year 2004, but improperly called it a "statewide increase" and "expected increase." Addendum,

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[73] The vapor pressure of methyl ethyl ketone increases from 3.51 kPa at 32 F to 12.6 kPa at 77 F (CRC Handbook of Chemistry and Physics, 75th Ed., 1994, p. 6-85). The vapor pressure of tetrahydrofuran increases from 0.06 atm at 32 F and 0.11 atm at 50 F to 0.26 atm at 86 F. The vapor pressure of cyclohexanone increases from 4 mm at 68 F to 6.2 mm at 86 F. (K. Verschueren, Handbook of Environmental Data on Organic Chemicals, 3rd Ed., 1996).

p. 19 and note 25. This is the wrong metric for evaluating impacts under CEQA. The increase in VOC emissions should have been calculated as follows:

> Increase in VOC emissions = [VOC emissions in future years – VOC emissions in baseline].

The Addendum only estimated the VOC emissions in a baseline year, 2004, and incorrectly characterized it as a "statewide increase." Addendum, p. 19. The Addendum's estimate is not an increase, but rather absolute emissions in a baseline year, 2004. Thus, the discussion in the Addendum in note 25 (p. 19) is incorrect. The increase in VOC emissions, which I calculate below in Comment I.G, is much higher.

1. <u>The Hypothetical Future Use Of Copper Piping Is The Wrong Baseline</u>

The HCD and others previously claimed that VOC emissions should be evaluated compared to emissions from joining copper pipe using acetylene torches and soldering flux. This is not correct for the reasons set out below. The baseline is not 100% future use of copper, but the actual conditions that existed when the environmental review commenced.

The significance of a project's impacts is measured relative to actual physical conditions at the time review is commenced, not for a hypothetical future condition, i.e., future use of 100% copper piping compared with 100% CPVC. (The CEQA Guidelines define "environmental setting" as "the physical environmental conditions in the vicinity of the project, *as they exist at the time . . . environmental analysis is commenced*, from both a local and regional perspective. *This environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant*. . . ." Guidelines, Section 15125(a).)

Impacts under CEQA are evaluated relative to a baseline, the condition at the time the environmental analysis is commenced, not relative to hypothetical future conditions, e.g., use of copper pipe instead of CPVC pipe. The impacts at future times, after the project is approved, are compared to the impacts during the baseline, at or before environmental review. The Project allows the use of CPVC in up to 100% of future residential pipings. These future pipings were not present in the baseline. Therefore, the correct impact metric is future VOC emissions minus baseline VOC emissions. The baseline is actual use, which includes CPVC, copper, brass, galvanized metals, and PEX pipe, among other uses. CPC Sec. 604.1.1. The future, which results from the Project, includes up to 100% CPVC.

The Addendum also claims its VOC estimate is conservative because it "does not take into account the reduction in VOC emissions as a direct result of not installing copper pipe, which also creates VOCs during installation." Addendum, p. 19 and note 25. This statement makes no sense because the Addendum did not calculate an increase, but rather absolute emissions in 2004.

2. VOC Emissions From Soldering Copper Pipe Are Small

Copper pipe used in drinking water systems is joined by soldering, using a relatively low melting point alloy to form a bond between the parts. (Copper Tube Handbook 2004, p. 43.[74]) The pipe ends are cleaned by abrasion, a flux is brushed on, and a torch is used to melt solder into the joint. (Copper Tube Handbook 2004, pp. 42-48; 1998 FEIR, pp. 100, 118). I include VOC emissions from soldering copper pipe in the baseline in my calculations in Comment I.G. Therefore, I estimate VOC emissions from copper soldering below.

There are three potential sources of VOC emissions from soldering copper pipe: the solder itself, the flux, and the soldering torch. Worst-case assumptions (that overestimate the emissions from joining copper pipe) set out below indicate that VOC emissions from copper pipe soldering are only 0.26 lb/unit, less than 10% of the emissions from joining CPVC pipe. Thus, even if one compared 100% copper with 100% CPVC, the VOC emissions would still be 81% of the emissions estimated in the Addendum (1.36-0.26/1.36=0.81). Thus, regardless of how one calculates the increase in VOC emissions, it is significant.

a. There Are No VOC Emissions From Solder

The solder is typically metal -- antimony, tin, copper, and sometimes a small amount of lead, less than 0.2% in drinking water systems. Thus, the solder itself does not emit VOCs. (Taramet 2004.[75]) See also 1983 EA, p. III-32.

b. VOC Emissions From Flux Are Small

Fluxes are a potential source of VOC emissions because they can contain organics. The flux is used to remove residual traces of oxides, to promote wetting, and to protect the pipe surface from oxidation during heating. (Vianco 1999, p. 291,[76] Copper Tube Handbook 2004, pp. 44-46.)

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[74] Copper Development Association, The Copper Tube Handbook, 2004.

[75] Material Safety Data Sheet, Taramet Sterling Lead-Free Solder, 2004.

[76] Paul T. Vianco, Soldering Handbook, American Welding Society, 3rd Ed., 1999.

Fluxes are mixtures of three primary components: (1) a corrosive agent such as an acid or in some cases, an alkaline material; (2) a vehicle, typically water or alcohol, which puts the corrosive agent into solution or suspension as a mixture for ease of handling and application; and (3) wetting agents which are chemicals to help the flux spread over the surface and into gaps and holes.

Water-soluble, organic-based fluxes are commonly used today due to recent changes in plumbing codes. (Calone Letter, Parag. 11, NoKorode Aqua.) The material safety data sheets ("MSDSs") for some typical organic fluxes that I found in local plumbing supply stores are filed with these Comments (Flux MSDSs.[77]) Organic fluxes typically contain one or more of the following organic acid compounds: stearic acid, glutamic acid, citric acid, lactic acid, and oleic acid. Amines such as urea and diethylene triamine are also used. Organic halides are used as activators. The vehicles are polyglycols, alcohols, or water. (Vianco 1999, p. 300.) Organic fluxes are typically about 65% organics. (Vianco 1999, pp. 300, 302.)

I did not find any research on the disposition of flux chemicals during soldering. The organic fraction is typically a solid or liquid at room temperature and is not volatile at room temperature, e.g., petrolatum, triethanolamine hydrochloride. (Flux MSDSs and Vianco 1999, p. 300.) Thus, there would be no VOC emissions during flux application.

Some VOCs could be emitted during pipe heating with the torch. *The Soldering Handbook* indicates that "[d]uring the soldering process, the vehicle and wetting agents are lost through volatilization." (Vianco 1999, p. 291.) The vehicle is typically water for copper pipe and the wetting agent, e.g., surfactants, a small percent of the total. Thus, if soldering is correctly done (torch flame to the connector; temperature around 456 F), the flux should melt, flow into the joint, and be covered by solder, not emitted as VOC. (Hall Letter, Parag. 11). Thus, flux VOC emissions during heat application should be negligible if correct soldering procedures are used. However, due to the lack of test data, I assumed a worst-case scenario -- that 100% of the flux weight is organic and would volatilize during soldering.

The 1983 EA concluded that about 1 pound of solder would be used to pipe a typical house and would require about 2 ounces of flux. (1983 EA, p. III-31.) This is consistent with a recent estimate by a California Certified Plumbing Inspector. (Calone Letter, Parag. 10.) This proportion of flux to solder is

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[77] Material Safety Data Sheets for: (1) Fry Technology Water Flo Paste Flux; (2) Fry Technology Water Flow 2000 Paste Flux; (3) Nokorode Aqua Flux; (4) Oatey H2O (5) Water Soluble Flux

consistent with the 2004 edition of *The Copper Tube Handbook*. (Copper Tube Handbook 2004, p. 48.)

To be conservative, I doubled the estimate of 1 pound of solder. Thus, 4 ounces of flux or about 0.25 pounds would be required per house (4x0.0625=0.25). Assuming 100% of the flux is organics and is emitted as VOCs during heating, about 0.25 pounds of VOCs would be emitted during soldering copper pipe at a typical house. This amounts to about 213 lb/day of VOCs for 852 houses (0.25x852 = 213).

c. The VOC Emissions From Torching Are Small

The pipe connector is heated and solder is melted into the joint using a torch. Most residential copper pipe is soldered using a hand-held MAPP,[78] acetylene, or propane torch that is lighted either manually or electrically.[79] Electric torches are the most common. The gas ignites almost instantly with an electric torch. In either case, gas leakage is much less than 1% if used by a skilled operator. Further, large numbers of joints are generally setup in advance and soldered in sequence, requiring only a single lighting of the torch per set. (Hall Letter, Parags. 5, 7; Calone Letter, Parags. 3, 4).)

Assuming propane, a typical hand-held torch uses a 14.1-oz cylinder, which is enough to pipe 2 to 3 houses. (Hall Letter, Parag. 6.) If 1% of the propane is wasted during lighting and two houses are piped, the VOC emissions per home from propane wastage would be about 0.00044 pounds of VOC ([14.1 oz x 0.0625 lb/oz x 0.01]/2 units =0.0044 lb/unit). Assuming MAPP, a typical 7.5 pound gas cylinder is enough to pipe 4 to 5 houses. (Calone Letter, Parag. 5.) If 1% of the MAPP is wasted, 0.02 pounds of VOC will be released per house ([7.5 lb x 0.01]/4 units = 0.01875 lb/unit). The difference between VOC emissions from propane and MAPP wastage is immaterial and thus the average or 0.012 lb/unit is used to calculate gas wastage VOC emissions.

Soldering torches burn the fuel at very high temperatures, converting it into carbon dioxide and water vapor. A very small amount, much less than 1 percent of the organics in the fuel, can be emitted as VOCs. The combustion of propane releases only 0.0071% of the organics in the fuel as VOCs.[80] The VOC

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[78] MAPP gas is a stabilized mixture of methylacetylene and propadiene. Alkane and alkene hydrocarbons are added as stabilizers. (Compressed Gas Association, Handbook of Compressed Gases, Van Nostrand Reinhold, New York, 1990, pp. 466-469.)

[79] See, for example, products at: http://www.gossonline.com/hand_torches.htm.

[80] The U.S. EPA reports that 0.3 pounds of VOCs, calculated as total organic compounds (TOC) less methane, would be released per 1000 gallons of propane combusted. (AP-42, Table 1.5-1) The density of propane is 4.22 lb/gal (Phillips Petroleum Co., Reference Data for Hydrocarbons

emissions from acetylene and MAPP would be lower because they burn at higher temperatures than propane,[81] converting most of the carbon to carbon dioxide and water.

Assuming the same 14.1-oz cylinder, the propane that is not lost during lighting would be burned in the torch and combustion byproducts emitted. Thus, torching would release an additional 0.000031 pounds of VOCs per house or 0.03 lb / day for 852 units ([14.1 oz x 0.0624 lb / oz x 0.99 x 0.000071] / 2 x 852 units / day = 0.026 lb / day).

d. <u>VOC Emissions From Soldering Copper Pipe Are Small</u>

The total VOC emissions from soldering copper pipe, under worst-case conditions in the future would be about 0.26 pounds per housing unit, comprising 0.012 pounds from torch wastage, 0.000031 pounds from combustion, and 0.25 pounds from evaporation of organic flux. This is 93% less VOCs emissions than the 3.81 pounds of VOCs that I estimate would be generated by plumbing the same house with CPVC (Comment I.E), and 80% less than the 1.36 pounds of VOCs that the Addendum estimates.

If all 852 homes assumed to be piped each day in the Addendum were plumbed with copper, they would only generate 222 pounds of VOCs per day (0.26x852), compared to the 1,159 pounds per day estimated in the Addendum and the more accurate 3,246 pounds of VOCs per day using my estimate (852 units x 3.81 pounds of VOCs per unit = 3,246 pounds of VOCs per day). Thus, no matter what number of homes would be plumbed each year, plumbing the homes with copper rather than CPVC would generate between 80% and 93% less VOC emissions than plumbing the same homes with CPVC.

3. <u>Mechanical Joints Do Not Emit VOCs</u>

Previous comments and responses to comments on baseline emissions assume that only copper piping would be used and that it would be soldered. The Addendum also assumes that only copper pipe would be used. Addendum, p. 19. This assumption is wrong and would underestimate VOC emissions.

Some PEX is allowed by local building officials, is used in the baseline, and would likely continue to be used in the future. PEX is mechanically joined and thus emits no VOCs.

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and Petro-Sulfur Compounds, 1974.). Thus, only 0.0071 percent of the organics in the propane is emitted as VOC during combustion: 0.3 / (1000)(4.22) = 0.000071. = 0.0071%.

[81] http://www.twi.co.uk/j32k/protected/band_3/jk49.html

Copper piping also can be joined using mechanical joints, rather than soldered. Plumbing codes already recognize the use of mechanical joints. These include the use of compression fittings and the copper press system (ProPress™). (Rigid / Viega.[82]) Mechanical joints are used frequently for underground tubing, for joints where the use of heat is impractical, and for joints that may have to be disconnected from time to time. (Copper Tube Handbook 2004, p. 43.) The press system uses crimp joining, eliminating the need to clean the copper tube, flux joints, and heat and solder joints. (Rigid / Viega.) It has been widely used, including for residential construction.[83] VOCs are not emitted during the installation of mechanical joints.

G. Revised VOC Emissions Are Significant

The Addendum made numerous errors in estimating VOC emissions from the Project, some of which increase emissions while others decrease them. However, combined, these errors and omissions result in a significant underestimation of VOC emissions. Further, the Addendum used the wrong significance threshold to evaluate the underestimated VOC emissions.

The errors and omissions include: (1) failure to calculate the increase in VOC emissions as future emissions minus baseline emissions; (2) underestimates the number of housing units, due to failure to consider work days, construction season, and increases due to population growth in future years; (3) underestimates VOC emissions per house, due to failure to consider weather conditions, vendor usage data, and a realistic current home size; and (4) uses wrong significance threshold to evaluate increase.

I estimated the increase in VOC emissions, correcting some of the errors that were made in the Addendum. I was unable to correct all errors because the Addendum and HCD's supporting file do not contain the information I need to estimate emissions[84]. However, I consider these additional factors in a sensitivity analysis in Comment I.G.4.

The increase in VOC emissions should have been calculated as follows:

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[82] Rigid / Viega, ProPress Crimping Tool Makes Housing Project Job No Sweat.

[83] http://www.propresssystem.com/

[84] *Planning and Conservation League v. Dept. of Water Resources* (2000) 83 Cal. App. 4th 892, 911 ("The description must be straightforward and intelligible, assisting the decision maker and the public in ascertaining the environmental consequences of doing nothing; requiring the reader to painstakingly ferret out the information from the reports is not enough." Citing, *Environmental Planning & Information Council v. County of El Dorado* (1982) 131 Cal. App. 3d 350, 357.

Increase in VOC emissions = [VOC emissions in future years – VOC emissions in baseline].

The Addendum only estimated the VOC emissions in the baseline year (1,159 lb/day) and incorrectly characterized it as a "statewide increase." Addendum, p. 19. It is not an increase, but rather absolute emissions in a baseline year, 2004.

My calculations, explained below, indicate that the Project would increase average VOC emissions from piping residential units with CPVC, rather than copper, by 3,185 lb/day in 2010 and 3,982 lb/day in 2030 (Comment I.G.3). Maximum daily emissions would be much higher.

1. <u>VOC Emissions In The Baseline</u>

The baseline is the condition at the time the environmental assessment is commenced. The baseline would ordinarily be emissions in 2003 and in some limited cases, 2004 and/or prior years, where emissions vary from year to year. I used 2004 because this results in the smallest emission increase and facilitates comparison with the Addendum, which estimated emissions in 2004. I considered a lower baseline, 2001-2004, in the sensitivity analysis. The sensitivity analysis shows that if an average of prior years had been included in my calculations, or an earlier year, such as 2003, the VOC increase would be even higher than I estimate here.

The number of housing units in the baseline consists of new construction plus re-pipings. The Addendum estimated 578 new units and 274 repipings in 2004, based on 365 work days per year, for a total of 852 units per day. These two choices, 365 work days during which the same number of houses is built and 2004 as the baseline year, underestimate VOC emissions, but are used here to facilitate comparison with the Addendum and to assure a conservative estimate. The effect of these two choices is demonstrated below in my sensitivity analysis.

The year 2004 overestimates baseline emissions and thus underestimates the increase in emissions because a steady increase in housing units and CPVC-piped units occurred from 2001 to 2004. CIRB new housing unit data indicates that the number of new housing units increased by 42% between 2001 and 2004, from 148,757 units in 2001 to 167,761 units in 2003 to 195,682 units in 2003 to 211,731 units in 2004. (CIRB 3/05.) The average number of new housing units for 2001 to 2004 is 180,982. Thus, the number of new units in the baseline could be as low as 496 per day (180,982/365=496).

The file produced by HCD indicates that the number of CPVC-piped homes increased only slightly from 2,200 CPVC-pipings in 2001 and 2002, to 2,700 in 2003, but there was a dramatic jump to 12,000 homes in 2004. (Moos 12/3/04.[85]) This represents a four-fold increase from 2003 to 2004. The jump from 2,700 CPVC-piped units in 2003 to 12,000 units in 2004 is anomalous and inflates the baseline. When a baseline year, like 2004, is anomalous, it is standard practice to select alternate years that are more indicative of typical historic conditions.

I used 12,000 CPVC-piped units in 2004 or 33 per day in my baseline calculations to assure a conservative VOC increase estimate, i.e., a higher baseline results in a lower increase. However, the average number of CPVC-piped units for the four baseline years is 4,775 per year or 13 per day. I demonstrate the impact of this decision in my sensitivity analysis, presented below. The balance of the units would have been piped with copper, galvanized metals, brass, or PEX, under plumbing codes and local approvals. PEX is joined using mechanical fittings and thus emits no VOCs. I assumed 100% copper in the baseline to be conservative.

My baseline calculations assume 33 units per day would be piped with CPVC and 819 per day with copper in the year of 2004. Piping with copper would emit up to 0.26 pounds of VOC per unit (Comment I.F.2). Piping with CPVC would emit 3.81 of VOC per unit. Thus, baseline VOC emissions would be 339 lb/day.[86]

2. VOC Emissions In Future Years

The Addendum calculated VOC emissions in 2004, the baseline year, but did not calculate VOC emissions in future years, after the Project is approved and implemented. The increase in VOC emissions due to the increased use of CPVC in future years should have been evaluated.

The increase in VOC emissions is directly proportional to the number of residential units that are plumbed with CPVC, which is proportional to the increase in population. The Addendum, for example, calculated the increase in VOC emissions by multiplying the number of new residential units by 1.36 pounds per unit. The Addendum's estimate is based on 578 new residential units and 274 re-pipings per day in 2004. The number of new residential units

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[85] E-mail from Harry Moos, Noveon, to Doug Hensel Re: CPVC usage, December 3, 2004.

[86] The VOC emissions in the baseline (2004): (3.81 lb/unit CPVC)(33 CPVC units) + (0.26 lb/Cu unit)(852-33) = 125.73 + 212.94 = 338.67 lb/day.

increases as the population increases. This is consistent with CARB's method of projecting VOC emission increases from using similar products. (Yee 11/5/04.) However, the Addendum failed to calculate future VOC emissions from the Project.

I calculated the increase in emissions due to the Project in 2010 and 2030 assuming that 100% of new and repiped units would be plumbed with CPVC, as allowed by the Project and assumed in the Addendum. I also tested the sensitivity of this assumption by evaluating a case that assumes 50% CPVC and 50% copper.

I estimated the number of residential units that would be built in 2010 and 2030 in each air district using CDF population data available on the internet. The data are summarized in Table 8. I assumed the number of repipings would increase at the same rate as the number of new units. This is conservative and underestimates the number of repipings, which would grow at a faster rate than new units, because, historically, new units have increased faster than they are projected to increase in the future.

These population projections indicate that up to 925 units per day could be piped with CPVC in 2010 (852 x 39,246,767/36,144,267) and 1,134 units in 2030 (852 x48,110,671/36,144,267). Assuming 100% CPVC, the VOC emissions from piping 925 units in 2010 would be **3,524 lb/day** (925x3.81=3,524). The VOC emissions from 1,134 units in 2030 would be **4,321 lb/day** (1134x3.81=4321). I assumed that 100% of these future units would be piped with CPVC, as allowed by the Project and as assumed in the Addendum.

3. <u>Increase In VOC Emissions</u>

The metric that is evaluated under CEQA to determine the significance of air quality impacts is the increase in emissions caused by a project, calculated as the difference between future emissions and baseline emissions. The baseline and future year calculations in Comments I.G.1 and I.G.2 indicate that the Project would increase VOC emissions as follows:

Table 9
Increase In VOC Emissions Due To The Project

	2010 lb / day	2030 lb / day	Assumptions
Post project	3,524	4,321	925 CPVC units 2010 1,134 CPVC units 2030 100% CPVC at 3.81 lb / unit
Baseline (2004)	339	339	819 Cu units at 0.26 lb / unit 33 CPVC units at 3.81 lb / unit
Increase	3,185	3,982	Post project - baseline

These calculations indicate that the Project would increase VOC emissions by 3,185 lb / day in 2010 and 3,982 lb / day in 2030. These emission increases are much higher than the 1,159 lb / day increase calculated in the Addendum. As discussed elsewhere, the Addendum used the wrong procedure to calculate emission increases. Further, as discussed in Comment I.B, even the Addendum's estimate is significant when evaluated using proper significance thresholds.

These emissions are significant on a statewide basis. They exceed the maximum CEQA threshold established by any air district, 550 lb / day, and the statewide population-weighted CEQA threshold of 122 lb / day (Table 3), as discussed in Comment I.B.1.

These emissions, when distributed among the air districts based on CDF population projections, would generate emissions exceeding the CEQA operational significance thresholds in ten air districts that contain about 82% of the State's 2004 population: Antelope Valley APCD, Bay Area AQMD, Butte County APCD (2030 only), Mojave Desert AQMD, Sacramento Metropolitan AQMD, San Joaquin Valley AQMD, San Luis Obispo County APCD, Santa Barbara County APCD, South Coast AQMD, and Ventura County APCD. These districts include two that have the most severe ozone air pollution in the United States – the South Coast and San Joaquin Valley.

The increases in VOC emissions in these ten districts would be significant because emissions would exceed CEQA significance thresholds (Table 10). The Project would generate emissions in the SCAQMD far in excess of the SCAMQD's construction significance threshold of 75 lb / day -- by about a factor of twenty or more in both 2010 (949 lb / day) and 2030 (1,098 lb / day). The projected emissions from the Project in the SJVAPCD would far exceed the SJVAPCD's construction and operational significance threshold of 55 lb / day, by a factor of five or more in 2010 (266 lb / day) and 2030 (412 lb / day).

The VOC emission increase also would be very large in the San Diego County APCD, 279 lb / day in 2010 and 349 lb / day in 2030. The air in this district frequently violates ozone ambient air quality standards (Comment I.H.3). This district has not adopted CEQA significance thresholds. However, in the past it has used its New Source Review Rule 20.3 offset threshold of 15 ton / yr (82 lb / day) or the SCAQMD CEQA Guidelines (55 lb / day), common bases for establishing CEQA significance thresholds. Thus, the VOC emission increases in San Diego County are also significant.

These emissions also exceed construction and operational thresholds for a single housing development. The Project would increase VOC emissions by 3,185 lb / day from piping 925 units with CPVC in 2010 and by 3,982 units from piping 1,134 units in 2030. Thus, each CPVC housing unit would increase VOC emissions by about 3.5 pounds in the future.[87] Up to 20 houses can be piped on the same day at a large residential development. (Hall Letter, Parag. 2.) Thus, a single residential development could increase VOC emissions by 70 lb / day (3.5x20=70.0). This exceeds the CEQA operational significance threshold of 12 air districts and the construction significance threshold of the SJVAPCD.

All sources of VOC emissions must be considered when evaluating the significance of a "construction" project. VOCs are also emitted from architectural coatings and exhaust from construction equipment. These additional sources would amount to more than 10 lb / day at a large residential development project. Thus, VOC emissions from piping 20 houses per day plus other contemporaneous VOC emissions would exceed the SCAQMD's (75 lb / day) and El Dorado County APCD's (82 lb / day) CEQA construction significance thresholds.

Finally, the increase in VOC emissions that would be caused by the Project, summarized in Table 10, are cumulatively significant for both construction and operation, regardless of what geographic division is used to evaluate the significance – statewide, district wide, or project level -- because all past, present, and future projects must be considered. Thus, even though only 20 house per day would be piped at a single development, a cumulative analysis must include the houses piped in the past, present, and future at neighboring developments.

4. <u>Sensitivity Analysis</u>

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[87] The future increase, 3.5 lb / unit, is lower than the increase calculated in Table 10, 3.81 lb / unit, because baseline emissions are considered in the former, but not the latter.

The foregoing discussion indicates that many assumptions must be made to estimate the increase in VOC emissions. These include the number of work days per year, the weather conditions during piping, the type of product that is used (one-step, two-step), the baseline year(s), the amount of VOC emitted per house when piped with CPVC and copper, and the number of units piped with copper and CPVC in both the baseline and future years.

I calculated the increase in emission due to the Project in 2030 for a range of assumptions, changing one variable at a time while holding everything else constant (at the level assumed in my calculations in Table 9). I also calculated the increase in emissions assuming all of the sensitivity analysis assumptions were simultaneously true. The following table summarizes the results:

Table 11
Sensitivity Analysis
VOC Emissions in 2030

Item	My Assumption Table 9	Sensitivity Analysis	Increase In VOC Emissions In 2030 (lb / day)
Number of Work Days per Year	365	250	5,814[88]
Summer Weather	1.0[a]	2.0[a]	8,177[89]
Cementing Process (lb / unit)	3.81[d]	1.36[b]	1,284[90]
Cementing Process (lb / unit)	3.81[d]	2.13[c]	2,132[91]
Baseline Year(s)	2004	2001-2004	4,142[92]
CPVC Market Penetration	100%	50%	1,969[93]

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[88] Increase in VOC emissions assuming 250 work days per year: [(1134)(365 / 250)(3.81) – [(819)(365 / 250)(0.26) + (33)(365 / 250)(3.81)] = 6,307.99 – 494.46 = **5,813.53 lb/day.**

[89] Increase in VOC emissions assuming a hot summer day that doubles the amount of VOCs emitted during CPVC joining: [(1134)(3.81)(2) – [(819)(0.26) + (33)(3.81)(2)] = 8,641.08 – 464.40 = **8,176.68 lb/day.**

[90] Increase in VOC emissions assuming the one-step process, based on Addendum estimate of 1.36 lb / unit: [(1134)(1.36) – [(819)(0.26) + (33)(1.36)] = 1,542.24 – 257.82 = **1,284.42 lb/day.**

[91] Increase in VOC emissions assuming the one-step process, based on my calculations for cement from Table 5 or 2.13 lb / unit: [(1134)(2.13) – [(819)(0.26) + (33)(2.13)] = 2,415.42 – 283.23 = **2,132.19 lb/day.**

[92] Increase in VOC emissions using the period 2001 to 2004 as the baseline: [(1134)(3.81) – [(496)(0.26) + (13)(3.81)] = 4,320.54 – 178.49 = **4,142.05 lb/day.** See Comment I.G.1 for discussion of 2001-2004 baseline.

Item	My Assumption Table 9	Sensitivity Analysis	Increase In VOC Emissions In 2030 (lb / day)
Copper Joining (lb / day)	0.26	0.125	4,088[94]
All Of Above Sensitivity Analysis			2,214[95]
Addendum			1,159
My analysis, Table 9			3,982

[a] Summer day multiplier, e.g., VOC emission factor in lb / day is multiplied by a factor of two for CPVC only (Comment I.E.6.c) to account for increased volatilization of solvents on hot summer days. The copper VOC emission factor would not increase because the VOC emissions from copper soldering are not due to the volatilization of solvents under ambient conditions.
[b] One-step process based on Addendum, p. 19.
[c] One-step process, based on my estimate for cement in Table 5.
[d] Two-step process, primer plus cement, based on my estimate in Table 5.

This analysis shows that the increase in VOC emissions ranges from 1,284 lb / day to 8,177 lb / day. Even the lower end of the range is higher than the Addendum's estimate of 1,159 lb / day. Thus, the increase in VOC emissions due to the Project is significant under a wide range of conditions. I previously demonstrated that an increase of 1,159 lb / day is significant when evaluated on a statewide, district-wide, and housing project level basis (Comment I.B). The emission increases in Table 11 are more significant, both individually and cumulatively, than previously discussed.

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93 Increase in VOC emissions assuming only 50% of housing units piped in 2030 use CPVC and the balance use copper: [(1134)(3.81)(0.5) + (1134)(0.26)(0.5)] – [(819)(0.26) + (33)(3.81)] = 2,307.69 – 338.67 = **1,969.02 lb/day**.

94 Increase in VOC emissions, assuming VOC emissions from copper soldering are 0.13 lb / unit rather than 0.26 lb / unit: (1134)(3.81) – [(819)(0.13) + (33)(3.81)] = 4,320.54 – 232.20 = **4,088.34 lb/day**.

95 The increase in VOC emissions assuming all conditions in Table 11 occur simultaneously. These assumptions are: 250 work days per year; VOC emissions per house are twice as high on a hot summer day for CPVC as during an annual average day; the one-step process assumed in the Addendum emits 1.36 lb / day; the baseline is the average number of units for the period 2001-2004 (509, of which 496 are Cu and 13 CPVC); only 50% of future units is piped with CPVC; and the copper VOC emission factor is one-half of the value I estimate in Comment I.F.2, assuming 50% of the flux is emitted as VOC. The four-year average baseline VOC emissions: (496)(365 / 250)(0.13) + (13)(365 / 250)(1.36)(2) = 94.14 + 51.62 = **145.77 lb/day**. The 2030 VOC emissions: (1134)(365 / 250)(0.5)(1.36)(2) + (1134)(0.5)(365 / 250)(0.13 lb / unit) = 2,251.67 + 107.62 = **2,359.29 lb/day**. The increase in emissions: 2,359.29 – 145.77 = **2,213.52 lb/day.**

I distributed the results of the sensitivity analysis (2,214 lb / day) and the maximum estimated value (8,177 lb / day) among air districts, based on CDF 2030 population projections. The results, summarized in Table 10, indicate that the worst-case emissions would exceed district operational significance thresholds in 16 air districts (bolded on Table 10, column labeled "summer 2030") and construction thresholds in two districts. The sensitivity analysis emissions would exceed operational thresholds in 7 air districts (bolded on Table 10, column labeled "All 2030") and construction thresholds in two districts.

Emissions from a single residential development, in which 20 homes are piped with CPVC on the same day, would be 144 lb / day for the maximum case (20x8177 / 1134) and 39 lb / day for the sensitivity analysis case (20x2214 / 1134). The maximum case individually exceeds the significance thresholds in 9 districts (Antelope, Bay Area, Mojave, Monterey, Sacramento, San Diego, San Joaquin Valley, South Coast, Ventura). The sensitivity analysis emissions are also cumulatively significant in at least these same districts.

H. The Increase In VOC Emissions Would Contribute To Violations Of Ozone Ambient Air Quality Standards

Volatile organic compounds ("VOCs") are converted into ozone and particulate matter in the atmosphere through a series of very complex chemical reactions between sunlight, VOCs, NOx, and other pollutants. The regulated pollutants are ozone and particulate matter (PM10, PM2.5). Ozone is discussed in this comment and particulate matter in Comment I. Further, the presence of VOC emissions enhances the formation of ozone from NOx, which occurs at the highest levels where most of the new housing is being built. (NOx Designations 2004.[96]) Thus, VOCs are precursors to both ozone and particulate matter as well as promoters of ozone formation by other compounds. (CARB Initial Statement; SCAQMD Handbook, Chapter 3.[97])

1. <u>Ozone Is A Regional Pollutant That Causes Significant Health Impacts</u>

Ozone is a regional pollutant and is the most pervasive of all the regulated criteria air pollutants. It is not emitted directly into the air. Instead, it results from complex chemical reactions in the atmosphere between VOCs and NOx in the presence of sunlight. VOCs emitted in one area may not result in significant impacts in that area, but yet can cause or contribute to ozone impacts in adjacent

[96] Emission Inventory Branch, PTSD, 2004 Area Designations for State Ambient Air Quality Standards, Nitrogen Dioxide, October 2004.

[97] SCAQMD, CEQA Air Quality Handbook, April 1993. Chapter 3. Basic Air Quality Information, November 2001 (Version 3).

areas. Thus, ozone and its precursors, VOCs and NOx, must be evaluated on both a local, project-level basis, regional, and cumulative basis. It is not reasonable to conclude that small VOC emissions in one region are not significant without considering their cumulative effect on nearby regions.

An understanding of the nature of ozone pollution is important to understand why it is important to do evaluate the significance of ozone emissions on a statewide, district-wide, and cumulative basis. Ozone, the principal element of smog, is a secondary pollutant produced when two precursor air pollutants — volatile VOCs and NOx — react in sunlight. *American Petroleum Institute v. Costle*, 665 F.2d 1176, 1181 (D.C. Cir. 1981). VOCs and NOx are emitted by a variety of sources, including cars, trucks, industrial facilities, petroleum-based solvents, and diesel engines.

The human health and associated societal costs from ozone pollution are extreme. In proposing a new rulemaking limiting emissions of NOx and particulate matter from certain diesel engines, EPA summarized the effects of ozone on public health:

> "A large body of evidence shows that ozone can cause harmful respiratory effects, including chest pain, coughing and shortness of breath, which affect people with compromised respiratory systems most severely. When inhaled, ozone can cause acute respiratory problems; aggravate asthma; cause significant temporary decreases in lung function of 15 to over 20 percent in some healthy adults; cause inflammation of lung tissue, produce changes in lung tissue and structure; may increase hospital admissions and emergency room visits; and impair the body's immune system defenses, making people more susceptible to respiratory illnesses." (66 Fed. Reg. 5002, 5012 (Jan. 18, 2001).)

Similarly, CARB concluded in a recent rule making to reduce VOC emissions from similar products:

> While we cannot accurately assess potential risk reduction due to reducing VOC and PM emission, it has long been known that exposure to ground level ozone and PM have adverse impacts on public health. Research has shown that, when inhaled, ozone and PM can cause respiratory problems, aggravate asthma, and impair the immune system. Any reduction in PM or ozone precursors, namely VOCs, results in improving health in California.

(CARB Initial Statement, p. 24.)

Moreover, ozone is not an equal opportunity pollutant, striking hardest the most vulnerable segments of our population: children, the elderly, and people with respiratory ailments. (*Id.*) Children are at greater risk because their lung capacity is still developing, because they spend significantly more time outdoors than adults — especially in the summertime when ozone levels are the highest and most of the construction activity occurs, and because they are generally engaged in relatively intense physical activity that causes them to breathe more ozone pollution. (*Id.*)

Ozone has severe impacts on millions of Americans with asthma. While it is as yet unclear whether smog actually causes asthma, there is no doubt that it exacerbates the condition. (*See* 66 Fed. Reg. 5002, 5012 (Jan. 18, 2001) (EPA points to "strong and convincing evidence that exposure to ozone is associated with exacerbation of asthma-related symptoms").) Moreover, as EPA observes, the impacts of ozone on "asthmatics are of special concern particularly in light of the growing asthma problem in the United States and the increased rates of asthma-related mortality and hospitalizations, especially in children in general and black children in particular." (62 Fed. Reg. At 38864.) In fact:

> "[A]sthma is one of the most common and costly diseases in the United States. . . . Today, more than 5 percent of the US population has asthma [and] [o]n average *15 people died every day* from asthma in 1995. . .. In 1998, the cost of asthma to the U.S. economy was estimated to be $11.3 billion, with hospitalizations accounting for the largest single portion of the costs." (66 Fed. Reg. at 5012.)

The health and societal costs of asthma are wreaking havoc here in California. There are currently 2.2 million Californians suffering from asthma. (CDOHS Asthma.[98]) In 1997 alone, nearly 56,413 residents, including 16,705 children, required hospitalization because their asthma attacks were so severe. Shockingly, asthma is now the leading cause of hospital admissions of young children in California. *Id.* at 1. Combined with very real human suffering is the huge financial drain of asthma hospitalizations on the State's health care system. The most recent data indicate that the statewide financial cost of these hospitalizations was nearly $350,000,000, with nearly a third of the bill paid by the State Medi-Cal program. (*Id.* at 4.)

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[98] California Department of Health Services, California County Asthma Hospitalization Chart Book, August 1, 2000.

2. <u>The Sensitivity Of Photochemical Models Is Not A Reasonable Ozone Significance Threshold</u>

The Addendum argues that the 1,159 lb/day increase in VOC emissions is not significant because it is distributed throughout various air basins and thus would not result in the violation of any air quality standards or contribute substantially to an existing or projected air quality standard. Addendum, pp. 19-23. However, the Addendum presented no analysis or facts that support this statement. The basis for this belief apparently is that:

> …the sensitivity of air quality models requires emissions in the range of 1 to 5% of the existing inventory for the air models to shows changes in air quality. Thus, because the excessively conservative potential increase in VOC emissions of less than 0.023% of the statewide inventory is substantially below the sensitivity level of the air quality models used to predict new violations or increases in existing violations of ambient air quality, the Department has determined that the proposal to remove the Findings Requirement would result in a less than significant impact.

Addendum, p. 21, note 28. This is similar to the small percent increase argument the Addendum makes for VOC emissions, discussed above, but here applies it to increases in ambient ozone levels due to VOC emissions. The HCD has ignored the important issue of cumulative impacts from a regional pollutant, misinterpreted the information provided by CARB, ignored applicable and duly-adopted CEQA significance thresholds, and used an unreasonable significance threshold for a regional pollutant with well established health effects.

This argument apparently originates from the "belief" of HCD that added emissions would not be measurable in an air quality model and thus would not be significant. (Staack 11/3/04.[99].) ("My belief is that the added emissions would not be measurable in an air quality model.")

The HCD asked CARB to confirm that "the sensitivity of an air model for ROGs [VOCs] is in the range of 1 to 5% of the inventory." However, CARB declined to confirm this statement, instead explaining that CARB's guidance: "recommends that photochemical models may be used on a case by case basis to evaluate control measures when the change in average emission density over the

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[99] E-mail from Bill Staack, HCD, to eibweb@arb.ca.gov, Re: Adhesive inventory, November 3, 2004.

entire modeling domain is 1-5% or greater. Use of models for a smaller emission changes requires additional technical justification." (DaMassa 3/3/05.[100])

CARB did not, as claimed in the Addendum (p. 19, note 28), state that "the sensitivity of air quality models requires emissions in the range of 1 to 5% of the existing inventory for the air models to show changes in existing air quality." Addendum, note 28, p. 21. Regardless, this is not an appropriate test of significance under CEQA for a regional air pollutant that exceeds existing health-based standards throughout most of the State.

The "air models" referred to in the Addendum are "photochemical" computer models that simulate complex physico-chemical interrelationships among many pollutants, including VOCs. These models convert VOC emissions into ambient ozone concentrations downwind of the emission source. These models are generally not used to evaluate impacts of a single project nor to determine compliance with ambient ozone standards for CEQA review.

The Court of Appeal has recently held that an agency may not rely on a threshold adopted for non-CEQA purposes to determine the significance of an impact within the meaning of CEQA. (*Communities for a Better Environment v. Calif. Resources Agency* (2002) 103 Cal. App. 4th 98). This is precisely the erroneous methodology employed in the Addendum. Most of the CEQA VOC emission significance thresholds discussed above in Comment I.B.2 were adopted pursuant to detailed procedures set forth in CEQA, and are the only appropriate threshold used to evaluate the significance of ozone impacts under CEQA. See summary in Table 2.

These "air models" require huge amounts of data, time, and money to run, including emissions data for many other pollutants for all sources in the modeled domain, a huge task given the statewide impacts of the Project. These models are also not sensitive to inputs, requiring large increases in emissions to show any change in ambient ozone concentrations and thus are not appropriate for most projects. Their insensitivity per se is reason not to use them, rather than to justify insignificant impacts. These models exceed the resources generally available for a CEQA analysis. Thus, they are generally only used by regulatory agencies to determine the impact of State Implementation Plans, and to evaluate interbasin ozone transport.[101]

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[100] E-mail from John DaMassa, CARB, to Bill Staack, HCD, Re: Sensitivity of air quality models, March 3, 2005.

[101] See, for example, CARB, Air Quality Impacts of the Use of Ethanol in California Reformulated Gasoline, Appendix B, Photochemical Modeling, November 10, 1999. http://www.arb.ca.gov/fuels/gasoline/ethanol/ethfate/airq/appb.pdf

The San Joaquin Valley APCD explains in its CEQA guidelines that VOC emission significance thresholds are used to evaluate the CEQA significance of a project's ozone impacts, and expressly declines to determine CEQA significance using atmospheric models due to their lack of sensitivity:

> A violation of air quality standards can be predicted for pollutants that can be modeled for atmospheric concentration. This is the case for carbon monoxide for which violations can be predicted using a dispersion model. Ozone, however, is the product of a photochemical reaction that may occur many miles away from the source of emissions. Although atmospheric ozone models exist, they are only sensitive enough to register changes caused by the largest projects. What is more important for determining ozone impacts is a project's contribution to existing violations of the ozone standard in the SJV. By comparing a project's ozone precursor emissions [VOCs] with emission levels considered important under State law, this impact can be evaluated. One such level is the stationary source emissions offset threshold required by the CCAA.

(SJVAPCD 2002, p. 22.)

Using an atmospheric ozone model to attempt to determine whether a project will have significant impacts within the meaning of CEQA is similar to using a bathroom scale to measure the weight of a slice of bread. The scale is simply not sensitive enough to weigh the bread, and it is likely to appear as if there is nothing there at all. Of course, from the perspective of a hungry person, the piece of bread may be very significant.

I have prepared and reviewed well over a hundred CEQA documents. I have never seen photochemical models used to determine whether VOC emissions are significant on a project-level basis under CEQA. Precisely because of these constraints, air districts have adopted VOC emission significance thresholds to assure that emission increases from individual projects do not cause or contribute to violations of ozone ambient air quality standards. These thresholds were discussed in Comment I.B.2 and are summarized in Table 2. In fact, SCAQMD prepared an EIR for a similar project involving CPVC cements under Rule 1168 that would result in an increase in emissions in that area. SCAQMD prepared an EIR because the project would result in an increase in emissions above the SCAQMD's 55 lb / day significance threshold, without any reference to atmospheric ozone models.

The Addendum did not use CEQA significance thresholds to evaluate the significance of the Project's estimated VOC emissions. Instead, the Addendum asserts that VOC emissions are below the level required to estimate a change in ozone using air models. This is irrelevant because these models are not very sensitive to VOC emissions and were never adopted as CEQA significance thresholds. The sensitivity of air models is not relevant to whether the emissions result in public health, welfare or other environmental impacts. An emission increase may be significant even though it cannot be converted into ambient ozone concentrations using a model. Other options exist for determining significance and should have been used.

3. VOC Emissions Would Cause Or Contribute To Significant Ozone Impacts

The U.S. EPA and California have both set ambient air quality standards on ozone to protect public health and welfare. The U.S. EPA and California have both lowered their ozone standards since the 2000 MND was published, in recognition of its significant impacts at low levels.

These standards are exceeded throughout much of the State. (See, e.g., National 1-Hour Ozone Designations.[102]) On April 15, 2004, U.S. EPA designated all or parts of 35 counties in California as nonattainment for the new federal 8-hour ozone standard effective June 15, 2005. (CARB Initial Statement, p. 4.) This standard and these classifications did not exist when the 2000 MND was adopted. The South Coast, where most of the residential housing growth is occurring, has the highest ozone levels in the United States, followed by the San Joaquin Valley.[103] Any increase in ozone in an area that significantly exceeds ozone ambient air quality standards, regardless of the level that can be detected with a model, should be considered significant.

The large increase in ozone precursors that would be caused by approval of CPVC drinking water pipe in all residential developments in the South Coast and other areas that currently violate ozone standards would be significant. The VOC emissions admitted in the Addendum will cause and/or contribute to violations of ozone air quality standards throughout most of California.

Ozone is continuously measured at 175 sites in California. The most recent CARB analysis of this ozone monitoring data indicates that many areas currently exceed ambient air quality standards on ozone:

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[102] Emission Inventory Branch, PTSD, Area Designations for National Ambient Air Quality Standards, 1-Hour Ozone, October 2004.

[103] Two air districts are classified as "extreme" ozone nonattainment areas -- SCAQMD and SJVAPCD. Extreme nonattainment is a formal classification under the Clean Air Act for areas that have the highest 1-hour ozone levels.

> The highest number of exceedance days for both the State and federal 1-hour standards occurred in the San Joaquin Valley Air Basin and the South Coast Air Basin. Both areas had more than 115 State standard exceedance days and 31 or more federal standard exceedance days during each of the three years from 2001 through 2003. The Sacramento Metro Area, Mojave Desert Air Basin, and Salton Sea Air Basin all averaged more than 50 State standard exceedance days and averaged 6 or more federal standard exceedance days during 2001 through 2003. The remaining five areas (Mountain Counties Air Basin, San Diego Air Basin, San Francisco Bay Area Air Basin, South Central Coast Air Basin, and the Upper Sacramento Valley) averaged from 12 to 45 State standard exceedance days.

CARB Review 2005, p. 1-3 and Chapter 7 and Figs. 7-2, 7-3.[104] This ozone monitoring data also indicates that the highest concentrations of ozone occur throughout the State during the July to September period which coincides with the peak construction period. Id., Figs. 7-4, 7-5. Thus, the highest VOC emissions occur when the ambient air quality is worse. Most of these violations occur in the regions experiencing the highest growth rates and hence the majority of new construction. (CARB Review 2005.) The future increases allowed by this Project would continue to cause and/or contribute to violations of ozone air quality standards. These impacts are significant on a statewide, district wide, project level and cumulative basis.

The fact that the Project's emissions are a small percentage of statewide VOC emissions is irrelevant because statewide emissions have caused or contributed to violations of ambient air quality standards. Any project that causes the violation of a regional plan intended to protect the environment is per se significant under CEQA. (CEQA Guidelines, Appendix G (IX (b); *Bakersfield Citizens for Local Control v. Bakersfield* (2004) 124 Cal. App. 4th 1184). Any increase in VOC emissions in areas where ozone standards are currently exceeded should be considered to be significant unless analyses demonstrate that it is not. The Addendum has ignored this fact by casting the very substantial increase in VOC emissions from this Project as a tiny percentage increase in statewide VOC emissions.

However, given the widespread violation of ozone standards, the regional nature of the ozone problem, the failure of much of the State to meet ozone standards, and the public health threat presented by ozone pollution, any

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[104] California Air Resources Board (CARB), Review of the California Ambient Air Quality Standard for Ozone, Staff Report, Initial Statement of Reasons for Proposed Rulemaking, March 11, 2005. http://www.arb.ca.gov/research/aaqs/ozone-rs/ozone-final/ozone-final.htm

increase in ozone precursors that will contribute to an existing exceedance of ozone standards should be considered to be significant under CEQA, regardless of the sensitivity of computational models. Thus, the HCD must prepare an EIR for the Project to fully analyze, disclose to the public and consider mitigation measures to address this important public health problem.

I. The Project Would Increase Particulate Matter, Contributing To Violations Of Particulate Matter Ambient Air Quality Standards

The Project would increase particulate matter emissions. The Addendum did not evaluate the impact of the Project on particulate matter. I also did not find any analysis of particulate matter impacts in previous documents or the HCD file. The Project would increase particulate matter emissions in four ways.

First, VOCs are converted into fine particulate matter in the atmosphere through condensation of VOCs or complex reactions of VOCs with other compounds in the atmosphere. CARB considered the conversion of VOCs to PM2.5 in a recent rule-making on consumer products, which includes adhesives for CPVC pipe. CARB concluded that reduction of ozone, due to the reduction of VOC emissions from consumer products similar to those considered here would reduce particulate matter by reducing secondary organic aerosol formation. (CARB Initial Statement, pp. 23-24.)

Second, particulate matter is emitted during manufacturing of CPVC pipe, fittings, and joining compounds. These emissions must be evaluated as indirect emissions (Comment I.C) and manufacturing[105] emissions. Four facilities in California manufacture CPVC pipe and fittings, located in the San Joaquin Valley and South Coast. (NSF 2005.) These facilities import resin, pneumatically blow it into silos, blend it with additives, extrude CPVC pipe and fittings, and process the scrap. (May Declaration, p. 4.) The final product is shipped to end users. Each of these steps emits particulate matter. The Project would increase the demand for CPVC pipe and fittings and thus would likely increase production at these existing facilities or result in new facilities locating in California.

Particulate matter is also emitted during manufacturing of primers and cements. (See, e.g., BAAQMD Oatey Permit information.) Four facilities manufacture these products in California: IPS Corp. in Gardena, T. Christy

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[105] CEQA requires analysis of manufacturing-related impacts of building standards decisions, such as impacts from increases in manufacturing. For example, the court of appeals has held that when adopting standards requiring the use of double-paned glass, CEQA review was required to analyze the impacts of increased glass-production that would be caused by the rule. *Building Code Action v. Energy, Resources, Conservation Comm.* (1980) 102 Cal. App. 3d 577.

Enterprises in Orange, Spear Manufacturing in Gardena and Oatey in Newark. (NSF 2005.)

Third, particulate matter is emitted during installation of CPVC. The pipe must be cut square to obtain the proper insertion depth in the connector and to provide maximum bonding area for solvent cementing. The pipe is usually cut with a wheel-type plastic tubing cutter, ratchet-style cutter, fine-toothed hand saw (hack saw), or power saws. Burrs, filing, shavings, etc. caused by the cutting process must be removed from the outside and inside of the pipe. (Harvel 2004, p. 72.) These processes generate fine CPVC dust.

Fourth, the eight California manufacturing facilities import raw materials – resins, additives, and solvents and export product -- pipe, connectors, primers and cement. These materials would be transported by rail, truck or marine vessel, which would release particulates in exhaust emissions and fugitive dust emissions.

The increase in particulate matter can be evaluated in two ways. First, the increase in emissions due to the Project can be estimated and compared to emission significance thresholds, as discussed above for VOCs. Second, the impact of the Project's emissions on ambient air quality can be evaluated. Both methods are discussed below and indicate that the Project would result in a significant cumulative particulate matter impact.

1. The Project Would Result In Significant Particulate Matter Emissions

I cannot estimate the increase in particulate matter emissions due to the Project alone because the project description in the Addendum does not contain adequate information. However, at least 0.26 pounds of PM10 are emitted at a manufacturing facility per ton of material throughput (0.0335+0.014+0.04+0.17). (May Declaration, p. 4.) Thus, some particulate matter is generated by manufacturing the CPVC pipe and fittings for each CPVC-piped house. Based on my knowledge of other projects, these emissions plus those from other past, present, and future projects would be cumulatively significant on a statewide, district-wide, and project-level basis.

2. The Project Would Result In Significant Impacts On Ambient Air Quality

The particulate matter emissions discussed in Comment I.1 typically has an aerodynamic diameter of less than 2.5 microns ("PM2.5") or less than 10 microns ("PM10").[106] These small particles easily penetrate into the airways and lungs where they may produce harmful health effects such as the worsening of heart and lung diseases. Thus, the U.S. EPA and CARB have both promulgated ambient air quality standards on PM10 and PM2.5 to protect public health. The PM2.5 standards and California's revised PM10 standard did not exist at the time that the 2000 MND was adopted and thus these impacts could not have been evaluated. I did not find any evidence that HCD has ever evaluated the impact of the Project on particulate matter.

Historically, health impacts due to particulate matter were regulated only through ambient air quality standards on PM10. Nearly the entire State currently violates California’s ambient air quality standards on PM10. (State PM10 Designations.[107]). A significant portion of the State also violates the more lax federal PM10 standards, including the fastest growing areas where most of the residential construction is occurring. (National PM10 Designations.[108])

A substantial amount of important new research has been published, documenting new health impacts at much lower concentrations and for different size fractions of particulate matter than was previously known and reflected in ambient air quality standards on larger sizes of particulate matter (PM10). (U.S. EPA 3/01.[109]) This new information led the U.S. EPA and California to adopt ambient air quality standards on PM2.5 and to California lowering its PM10 standard.

This new research documents that the inhalation of particulate matter, particularly the smallest particles, causes a variety of health effects, including premature mortality, aggravation of respiratory (*e.g.*, cough, shortness of breath, wheezing, bronchitis, asthma attacks) and cardiovascular disease, declines in lung function, changes to lung tissues and structure, altered respiratory defense mechanisms, and cancer, among others. Concentrations of PM10 and PM2.5 above current standards may result in harmful health effects.[110]

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[106] 10 microns equals about 0.0004 inches or about four one-hundred thousands of an inch (4/100,000).

[107] Emission Inventory Branch, PTSD, 2004 Area Designations for State Ambient Air Quality Standards, PM10, October 2004.

[108] Emission Inventory Branch, PTSD, Area Designations for National Ambient Air Quality Standards, PM10, October 2004.)

[109] U.S. EPA, Air Quality Criteria for Particulate Matter, Second External Review Draft, March 2001.

[110] http://www.arb.ca.gov/research/aaqs/pm/pm.htm

The U.S. EPA promulgated a national ambient air quality standard for PM2.5 in 1997 (62 FR 38652[111]) of 15 μg/m^3 annual average and 65 μg/m^3 24-hour average. These standards were stayed by the court and not in effect until 2001, after the 2000 the MND was adopted. The federal PM 2.5 regulation did not become effective until Feb. 27, 2001, when it was upheld by the US Supreme Court. (*Whitman v. American Trucking Assoc*. (Feb. 27, 2001) 531 U.S. 457.) The new standards were based on new research indicating that small particulate matter is more harmful to human health than previously believed. Implementation is underway. In February 2004, California for the first time identified areas that do not currently comply with the new federal PM2.5 standards:

Table 12
Areas Classified by CARB
as Nonattainment for Federal PM2.5 Standards
February 11, 2004[112]

Nonattainment Area	Areas Included
1. South Coast Air Basin	Western Los Angeles (including Catalina and San Clemente Islands), Orange, Southwestern San Bernardino, and Western Riverside Counties
2. San Joaquin Valley Air Basin	San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Western Kern Counties
3. San Diego County**	San Diego County
4. Calexico**	City of Calexico

**Recommended nonattainment for the annual average standard only.

The same areas, as well as additional areas, e.g., most of the Bay Area, Sacramento County, violate California's more stringent PM2.5 ambient air quality standard. (National PM10 Designations.)

The areas that currently violate the federal and California PM2.5 standards are the areas with the highest growth rates where over 50% of the new residential construction and repiping jobs occurred in 2004 and are projected to continue to occur. A portion of the Project's VOC emissions would be converted

[111] National Ambient Air Quality Standards for Particulate Matter: Final Rule, Federal Register, v. 62, no. 138, July 18, 1997.

[112] http://www.arb.ca.gov/desig/pm25desig/encl1_feb11_04.doc

to organic aerosols, a component of PM10 and PM2.5 and thus would contribute to existing violations of federal PM2.5 standards. This is a significant air quality impact.

The CARB adopted new particulate matter standards in June of 2002, responding to requirements of the Children's Environmental Health Protection Act (Senate Bill 25, Escutia 1999). This Act requires the evaluation of all health-based ambient air quality standards to determine if the standards adequately protect human health, particularly of infants and children.[113] This rulemaking became effective June 5, 2003.[114] It lowered the California annual PM10 standard from 50 ug/m^3 to 20 ug/m^3 and set a new standard of 12 ug/m^3 on PM2.5, lower than the federal standard of 15 ug/m^3. The new, more stringent standards are based on new research indicating that small particulate matter is more harmful to human health than previously believed. The areas that currently violate these standards are shown in the SJVAPCD Guide for Assessing and Mitigating Air Quality Impacts (SJVAPCD 2002) and include the areas where the highest growth and most of the residential construction activity occurs and is projected to occur. Thus, the Project would contribute to an existing violation of California's ambient air quality standards on PM10 and PM2.5.

The CARB review (CARB Review 2005) demonstrated that the particulate matter standards in effect when the 2000 MND was adopted did not protect public health. Thus, any conclusion in the 2000 MND with respect to ambient air quality are outdated. The Addendum did not evaluate the new PM10 and PM2.5 standards.

II. THE PROJECT MAY RESULT IN SIGNIFICANT HEALTH IMPACTS

The VOCs discussed above are toxic air contaminants ("TACs"), chemicals which individually and cumulatively result in health impacts, in addition to their impacts as ozone and particulate matter precursors. TACs arise during installation of CPVC pipe and during manufacturing of the pipe, fittings, and joining compounds and their ingredients. TACs can also arise from household, landfill, and other fires.

The Addendum and its predecessor documents did not evaluate the public health impacts from increased emissions of TACs. These impacts cannot be fully evaluated here because the Addendum does not contain sufficient

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[113] http://www.arb.ca.gov/research/aaqs/std-rs/pm-final/pm-final.htm#Summary; http://www.arb.ca.gov/research/aaqs/std-rs/std-rs.htm

[114] http://www.arb.ca.gov/research/aaqs/std-rs/std-rs.htm

information. However, the information that I was able to collect during the public review period indicates that there is a fair argument that the increase in emissions of TACs would cause significant health impacts.

A. Health Impacts Due To CPVC Solvent Cementing

The cleaners, primers, and cements used to join CPVC contain a wide array of toxic chemicals. These are listed on product MSDSs and in patents and include acetone, methyl ethyl ketone, cyclohexanone, and tetrahydrofuran. The health effects of these chemicals are discussed in the U.S. EPA Integrated Risk Information System ("IRIS")[115] and were previously reviewed with respect to CPVC pipe.[116] These chemicals can be inhaled by workers during CPVC installation, by neighbors of construction sites, and by occupants of CPVC-piped houses (from flushing pipes prior to occupancy and from long-term seepage).

The IRIS database reports reference doses ("RfDs") for three of these chemicals. A RfD is an estimate of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime. The daily exposure that a plumber would receive, compared to the RfDs:

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[115] http://www.epa.gov/iris/

[116] Peggy Lopipero and Martyn T. Smith, Comments on the Draft Environmental Impact Report for Chlorinated Polyvinyl Chloride (CPVC) Pipe Use for Potable Water Piping in Residential Buildings, Final Report, August 1998.

Table 13
Exposure Of Plumbers To CPVC Joining Chemicals

Chemical	Composition VOC Vapors (Wt %)	RfD IRIS (mg/kg-day)	Daily Exposure[a] (mg/kg-day
Acetone	5	0.9	0.44-0.82[117]
Methyl ethyl ketone	80	0.6	7.1-13.2[118]
Cyclohexanone	15	5	1.32-2.47[119]
Tetrahydrofuran	5	N/A	N/A

[a] Screening levels assumptions: (1) a plumber can pipe about one house per day with CPVC (8 hr/day using one-step or 12 hr/day using two-person crew), VOC emissions per house of 1.36 to 3.81 lb, one-one thousandth of the vapors is inhaled (0.001), and a typical body weight of 70 kg.

Thus, a worker installing CPVC in a single residence could potentially inhale much more methyl ethyl ketone than is safe, based on EPA's RfD. This conclusion is valid even if the RfD is adjusted to reflect the shorter exposure duration for a worker compared to a resident (0.14). An individual worker could also receive a much larger dose than one-one thousandth of the VOC vapors assumed in the Table 14 estimate. Thus, the impacts from acetone and cyclohexanone could also be significant. If the subject plumber worked in an area where multiple houses were being simultaneously piped with CPVC (which is possible given the large expansion in CPVC under the Project), the dose inhaled could be even larger than shown in Table 13. Thus, installing CPVC could result in significant health impacts to a plumber.

The NSF publishes total allowable concentrations of these chemicals in drinking water. NSF-61, Tables D2, D3, and E1. The corresponding RfDs are much lower than the IRIS RfDs: acetone 0.17 mg/kg-day; methyl ethyl ketone 0.61 mg/kg-day, cyclohexanone 0.86 mg/kg-day, and tetrahydrofuran 0.03 mg/kg-day. Worker health impacts are significant for all of these chemicals when screened using NSF RfDs. All of the NSF RfDs, except tetrahydrofuran, have been lowered since the 2000 MND was adopted.

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[117] Acetone using Addendum per house VOC emissions: (1.36 lb/unit-day)(0.05)(0.001)(454 g/lb)(1000 mg/g)/70 kg = 0.44 mg/kg-day. Acetone using Table 5 VOC emissions: (8/12) (3.81 lb/unit-day)(0.05)(0.001)(454 g/lb)(1000 mg/g)/70 kg = 0.82 mg/kg-day.

[118] Methyl ethyl ketone using Addendum per house VOC emissions: (1.36 lb/unit-day)(0.80)(0.001)(454 g/lb)(1000 mg/g)/70 kg = 7.06 mg/kg-day. Methyl ethyl ketone using Table 5 VOC emissions: (8/12)(3.81 lb/unit-day)(0.80)(0.001)(454 g/lb)(1000 mg/g)/70 kg = 13.2 mg/kg-day.

[119] Cyclohexaonoe using Addendum per house VOC emissions: (1.36 lb/unit-day)(0.15)(0.001)(454 g/lb)(1000 mg/g)/70 kg = 1.32 mg/kg-day. Cyclohexanone using Table 5 VOC emissions: (8/12)(3.81 lb/unit-day)(0.15)(0.001)(454 g/lb)(1000 mg/g)/70 kg = 2.47 mg/kg-day.

Members of the public who live adjacent to construction sites where CPVC is being installed and occupants of CPVC-piped homes may also be adversely impacted (from long-term seepage of vapors and initial flushing of pipes prior to occupancy.) An EIR should be prepared to evaluate these health impacts.

B. Health Impacts Due To Manufacturing

As discussed in Comments I.C and I.I.1, the Project will likely increase the in-state manufacturing of CPVC pipe and fittings as well as primers and cements. These processes emit toxic chemicals that can cause significant health impacts, including dioxins, organotins, e.g., tributyltin, and solvents.

1. Cancer Risks From Dioxins

Imported CPVC resin is extruded into plumbing products. The extrusion process emits dioxins (polychlorinated dibenzo dioxins). Dioxins are among the most toxic chemicals known to science and cause adverse health effects, including cancer, birth defects, immune system damage, reproductive dysfunction (including infertility, endometriosis, micropenis, and others), diabetes, and hormonal abnormalities at extremely low levels.

The CPVC resin, CPVC pipe, and workroom air all contain dioxins. (MRI 1991.[120]) The dioxin emissions during extrusion may result in a significant cancer inhalation risk to both workers and the public. Dioxins were analyzed in workroom air at a German extrusion shop. The study found 1.03 picograms of dioxin equivalents per cubic meter of air ("pg TE/m^3") and 0.41 pg TE/m^3, directly above the head of the extruders working with CPVC and PVC, respectively. (Wacker Chemie 1991.[121]) About two and one half times more dioxin was emitted during the extrusion of CPVC than of PVC.

These dioxin concentrations were converted into an increase in cancer risk[122] by multiplying them by the Office of Environmental Hazard Assessment's

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[120] Midwest Research Institute, Polychlorinated Dibenzo-p-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) Analysis of Chlorinated PVC Samples, Project No. 6415-A, December 17, 1991.

[121] Wacker Chemie GmbH, Orientational Air Studies for PCDF/D During the Extrusion of CPVC, November 1991.

[122] Health risk is expressed in terms of the probability of a person contracting cancer from inhaling a chemical. It is typically defined as the number of additional cancer cases per million people exposed. If one million people are exposed to dioxin, for example, and one person contracts cancer, the risk is stated as one in one million or 1×10^{-6} or 0.000001 or 0.0001%.

("OEHHA's") cancer inhalation unit risk factor for dioxin equivalents, 38 excess cancer per ug/m^3 in ambient air,[123] and adjusting the exposure duration for that of a worker. Thus, the cancer risk to CPVC extruders would be 5 excess cancers per million.[124]

Typically, the significance of cancer risk is evaluated using a significance threshold of one in one million (0.0001% or 1×10^{-6}) to ten in one million (0.001% or 1×10^{-5}). The federal Clean Air Act, for example, establishes that a cancer risk of greater than one in one million is significant. Clean Air Act §112(f). CARB has established that a cancer risk of greater than one in one million requires the use toxics best available control technology.[125]

The Addendum did not establish a cancer risk significance threshold. The lower end of the range is appropriate here because this analysis is a screening level assessment for a single chemical. Other carcinogens may be emitted, and cancer risk is cumulative. Thus, the cancer risk to workers is significant because it is greater than one in one million. The dioxin emissions from extrusion facilities could also pose a significant cancer risk to offsite individuals in commercial or residential areas around the extrusion facility.

Thus, by increasing the amount of CPVC that is extruded in California, the Project would increase the risk of cancer from inhalation of dioxins in the workplace and in areas around the extrusion facilities. The background cancer risk in the SCAQMD, the BAAQMD, and other air districts is already significant.[126] Thus, the Project would likely result in cumulatively significant health impact to both workers and the public.

2. Health Risks From Other Chemicals

The facilities that manufacture CPVC pipe and fittings import resin, blend it with additives, including lubricants and stabilizers, and extrude it. The melt mixing generally occurs at temperatures of from about 300 F to about 480 F. The chemicals added or included in the resin include organotin compounds.

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[123] http://www.oehha.ca.gov/risk/pdf/092204cpf_alpha.pdf

[124] Increase in cancer risk: (1.03 pg TE/m^3)(10^{-6} ug/pg)(38 cancers per ug/m^3)(0.14) = 5.5 excess cancers. The 0.14 factor adjusts a 70-year exposure duration to a worker exposure duration of 8 hr/day, 240 day/yr for 40 yrs.

[125] California Air Resources Board (CARB), Risk Management Guidelines for New and Modified Sources of Toxic Air Pollutants, July 1993.

[126] See, for example, South Coast Air Quality Management District (SCAQMD), Multiple Air Toxics Exposure Study in the South Coast Air Basin, MATES-II, Final Report, March 2000.

(Noveon Patent.[127]) A study of the emissions from heating PVC indicates that large amounts of highly toxic organotin compounds are released at temperatures above 230 F. (Becker et al. 1997, Table 6.[128]) Some of these chemicals likely would be emitted to the atmosphere and thus impact workers and residents around extrusion facilities.

The facilities that manufacture primers and cements also use large amounts of solvents – methyl ethyl ketone, tetrahydrofuran, cyclohexanone, and acetone. See May Declaration. These solvents are very volatile and are released into the atmosphere. The BAAQMD, for example, indicates that the Oatey facility in Newark emitted 26.78 ton / yr (147 lb / day) of VOCs, which are apparently all solvents. (Oatey Permit.) The health effects of these chemicals were previously discussed above.

The HCD should evaluate the health impacts of increased emissions of these chemicals due to increased manufacturing. These emissions, coupled with dioxin emissions, are likely to result in a significant public health impact.

C. Health Impacts Due To Fires

In fires, CPVC releases large amounts of toxic chemicals, including hydrogen chloride, vinyl chloride, and dioxins. The Addendum and the 2000 MND did not evaluate the health impacts of fires. These were evaluated in the 1998 FEIR, but the analysis is outdated and technically incorrect.

There are two potential exposure routes to toxic gases from fires that could result from the Project: (1) fires in areas where large amounts of CPVC are present, e.g., landfills and (2) fires in homes. The following discusses both PVC and CPVC, which are chemically similar except CPVC has more chlorine. Tabulated toxic potency values for the smoke from fires involving PVC and CPVC indicate that CPVC smoke is more toxic. (Nevaiser and Gann, 2004.[129]) Thus, PVC underestimates the health impacts of fire fumes from CPVC.

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[127] IPS Corporation, Patent Application No. US 2000651824 filed August 30, 2000, Low VOC (volatile organic compounds), dimethyl-2-piperidone solvent-bases, PVC and CPVC pipe and component adhesives and primers containing minimal or no tetrahydrofuran.

[128] Gerhard Becker, Karel Janak, and others, Speciation of organotin compounds released from poly(vinyl chloride) at increased temperature by gas chromatography with atomic emission detection, Journal of Chromatography A, 775 (1997), 295-306.

[129] Julie L. Neviaser and Richard G. Gann, Evaluation of Toxic Potency Values for Smoke from Products and Materials, Fire Technology, v. 40, 2004, pp. 177-199.

A study published in 2001 of the impact of a fire in a plastics recycling plant in Canada on the surrounding community concluded: "PVC plastic recycling plants pose potential health hazards to civilian populations....Fire in PVC recycling plants that abut residential areas pose potential health risks to surrounding communities...Policymakers, public-health officials, and environmental officials should be cognizant of the threats posed to civilian populations by plastics recycling plants located close to residential areas." (Upshur et al. 2001.[130]) A fire in a recycling plant would be similar to a fire in a landfill or any other locations, such as a distribution center or construction storage yard, where large amounts of CPVC were stored.

The 1998 FEIR argued that the presence of CPVC in a residence would not significantly change the toxicity of the fire environment, claiming fire toxicity is due primarily to carbon monoxide, CPVC is stable up to 900 F, the pipes are full of water, and most of the pipe is not in the living space. The FEIR does not point to any support, e.g., reports, articles, calculations, for these conclusions. 1998 FEIR, pp. 71-72. The 2000 MND and the Addendum do not address toxic chemical release during fires. The 1998 FEIR's conclusions are incorrect.

In fires, CPVC releases large quantities of hydrochloric acid and other toxins, threatening building occupants and neighbors as well as firefighters. Some firefighting associations are working to educate the public about these hazards and are supporting municipal and State policies to reduce CPVC use.

The FEIR incorrectly claims that PVC is stable up to 900 F. PVC smolders and releases toxic fumes at lower temperatures, long before it ignites. If PVC is gradually warmed, more than half of its weight is given off as fumes before it gets hot enough to burst into flames. (Dyer and Esch,[131] 1976, p. 394.) The hydrochloric acid released by burning PVC is potentially lethal to people caught in a burning building. Other products of PVC combustion, such as dioxin, have long-term health effects.

The FEIR incorrectly claims that the fact that most PVC pipe is not in the dwelling space isolates building occupants from fire hazards. The fumes from a fire can migrate into living spaces through cracks, joints, and openings for pipes, and through doors and windows, among others.

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[130] Ross Upshur and others, Short-term Adverse Health Effects in a Community Exposed to a Large Polyvinylchloride Plastics Fire, Archives of Environmental Health, v. 56, no. 3, May/June 2001.
[131] R.F. Dyer RF and H.H. Esch, Polyvinyl Chloride Toxicity in Fires, Journal of the American Medical Association, 1976.

The FEIR incorrectly claims that the toxicity of gases from residential building fires is due primarily to carbon monoxide. This is incorrect. Carbon monoxide is produced after CPVC starts to burn. However, large amounts of hydrogen chloride are released before carbon monoxide is formed. This HCl can be released without the warning that smoke provides, while residents are asleep. Further, medical researchers have found elevated levels of long-term respiratory and other health problems in firefighters who put out fires involving large quantities of PVC and have identified hydrochloric acid – acting alone or in combination with carbon monoxide and soot – as the probably cause of the damages. (Dyer and Esch 1976.)

The FEIR also claims that water in the pipes would prevent release of toxic chemical during fires, but does not explain how this water would prevent gas release. Water likely would not be standing in vertical rises of pipe. Any water standing in pipes would be evaporated at the boiling point of water, 212 F, thus providing no protection at elevated temperatures at which toxics are released. Finally, the presence of water inside a pipe would not keep the outside of the pipe from smoldering and releasing toxic vapors.

Exhibit 2:
Email from Judy Yee, CARB, to Robin Gilb, HCD, May 01, 2005

Exhibit 3:
Email from Jeff Cash, Noveon, Inc., to Robin Gilb, HCD, February 23, 2006

Exhibit 4:
Email from Bob Raymer, CBIA, to Robin Gilb, HCD, February 27, 2006

Exhibit 5:
Email from Bob Raymer, CBIA, Email to Robin Gilb, HCD, March 22, 2006