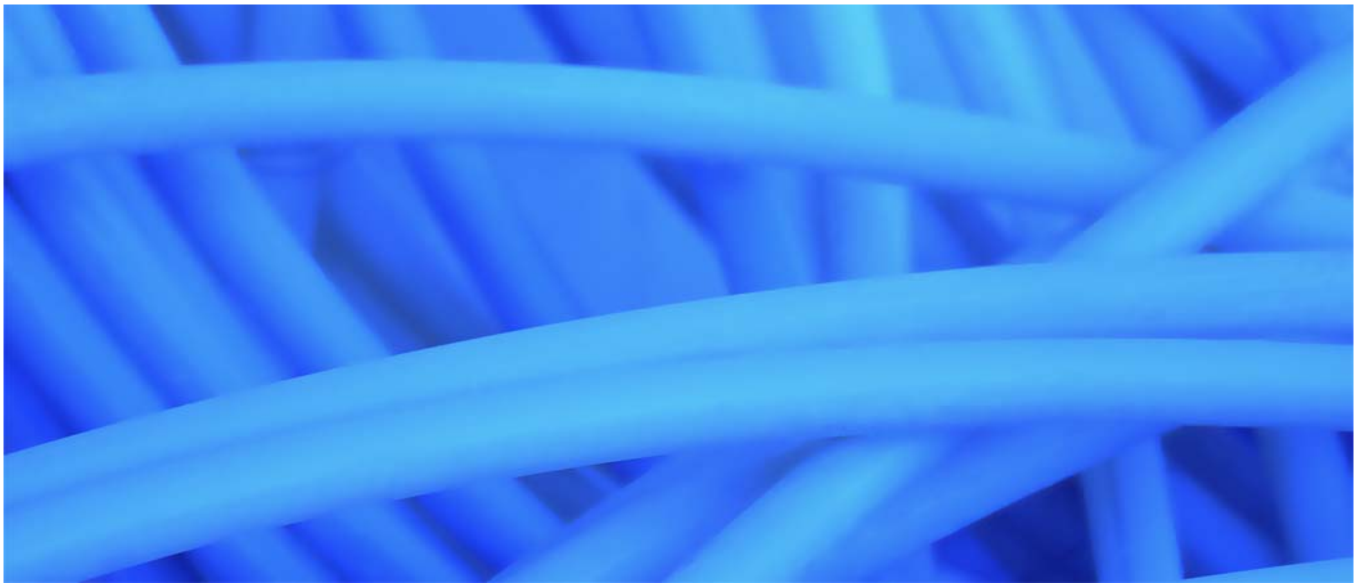
Recirculated Draft Environmental Impact Report

Adoption of Statewide Regulations Allowing the Use of PEX Tubing



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October 2008

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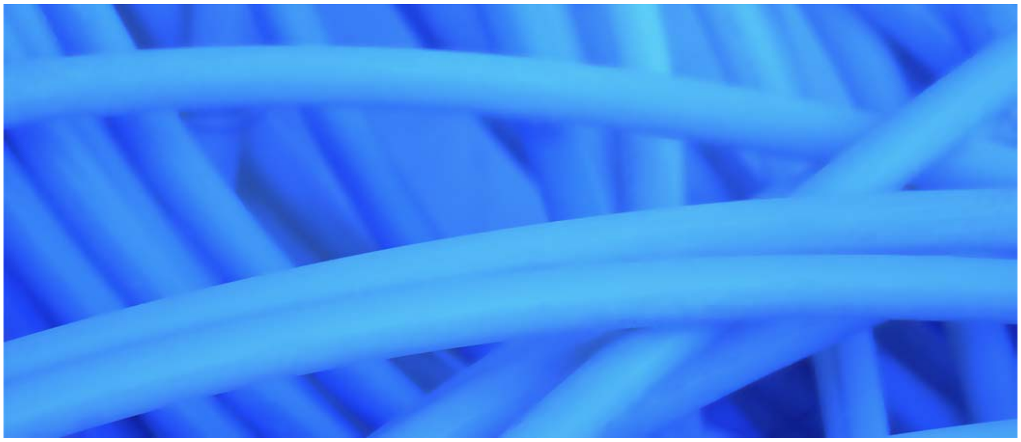

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October 2008

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EXHIBITS

ACRONYMS AND ABBREVIATIONS

AB	assembly bill
AB 1807	Tanner Air Toxics Act - Statutes of 1983
AB 2588	Air Toxics Hot Spots Information and Assessment Act of 1987-Statutes of 1987
ANSI	American National Standards Institute
aqua TAC	total allowable concentration
ARB	California Air Resources Board
ASTM	American Society for Testing Materials
ATCM	airborne toxics control measure
BACT	best available control technology for toxics
BSC	California Building Standards Commission
CAA	federal Clean Air Act
CAAA	federal Clean Air Act Amendments
CAAQS	California ambient air quality standards
Cal/OSHA	California Occupational Safety and Health Assessment Program
CBC	California Building Code
CBSC	California Building Standards Code
CCAA	California Clean Air Act
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CIWMA	California Integrated Waste Management Act
CIWMB	California Integrated Waste Management Board
CO	carbon monoxide
CO^2	carbon dioxide
CPC	California Plumbing Code
CPVC	chlorinated polyvinyl chloride
dbps	disinfection by-products
DEIR	draft environmental impact report
DFA	Department of Food and Agriculture
DHS	Department of Health Services
diesel PM	diesel particulate matter
DPH	Department of Public Health
DSA	Division of the State Architect
DWSAP	Drinking Water Source and Assessment Program
EIR	environmental impact report

EPA	U.S. Environmental Protection Agency
ETBE	ethyl-t-butyl ether
F rating	standards related to fire retardation
FEIR	Final EIR
GHG	greenhouse gas
HAA	haloacetic acids
HAA5	total haloacetic acids
HAP	hazardous air pollutant
HCD	California Department of Housing and Community Development
HDPE	high-density polyethylene
IAPMO	International Association of Plumbing and Mechanical Officials
LCR	Lead and Copper Rule
MAC	maximum acceptable concentration
MACT	maximum available control technology for toxics
MCL	maximum contaminant levels
mg/L	milligrams per liter
MIBK	4-methyl-2-pentanone
MTBE	methyl tertiary-butyl ether
mV	millivolt
NAAQS	national ambient air quality standard
NESHAP	national emissions standards for hazardous air pollutants
NO^2	nitrogen dioxide
NOC	Notice of Completion
NOP	Notice of Preparation
NO_X	oxides of nitrogen
NSF	NSF International, Inc.
OEHHA	Office of Environmental Health Hazard Assessment
OHB	Occupational Health Branch of California Department of Health Services
ORP	oxidative reduction potential
OSHA	federal Occupational Safety and Health Administration
OSHA	Occupational Safety and Health Administration
OSHPD	Office of Statewide Health Planning and Development
PB	polybutylene
PE	polyethylene
PET	polyethylene terephthalate
PEX	cross-linked polyethylene

PEX-AL-PEX	cross linked polyethylene with an aluminum layer
PHG	public health goal
PM^{10}	respirable particulate matter
$PM^{2.5}$	fine particulate matter
PP	polypropylene
ppb	parts per billion
PPFA	Plastic Pipe and Fittings Association
ppm	parts per million
psi	pounds per square inch
PVC	polyvinyl chloride
RDEIR	recirculated DEIR
ROG	reactive organic gases
SB	senate bill
SO_2	sulfur dioxide
SPAC	single product allowable concentration
STEL	short-term exposure level
T rating	standards related to temperature retardation
TAC	toxic air contaminant
TBA	tertiary butyl alcohol
T-BACT	best available control technology for toxic air contaminants
TCE	trichloroethylene
THM	trihalomethanes
TMDL	total maximum daily load
TOE	threshold of evaluation
TPY	tons per year
TTHM	trihalomethanes
UBC	Uniform Building Code
UPC	Uniform Plumbing Code
UV	ultraviolet
VOC	volatile organic compound
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter

1 INTRODUCTION

1.1 BACKGROUND AND PURPOSE OF THE RECIRCULATED DRAFT ENVIRONMENTAL IMPACT REPORT

In May 2008, the California Building Standards Commission (BSC) published the Draft Environmental Impact Report (DEIR) for the Adoption of Statewide Regulations Allowing the Use of PEX Tubing. The DEIR assessed the potential environmental impacts of implementing the proposed regulations. The regulations would remove from the California Plumbing Code the prohibition against the use of cross-linked polyethylene (PEX) tubing, a type of plastic pipe, for potable water uses, allowing the statewide use of PEX tubing for hot and cold water (including potable water) distribution for applications under the jurisdiction of the Responsible Agencies that adopt the regulations. This includes applications such as drinking water, irrigation, and wastewater. The proposed PEX tubing regulations would apply to all occupancies, including commercial, residential, and institutional building construction, rehabilitation, and repair under the jurisdiction of BSC and the Responsible Agencies in all areas of the state.

The DEIR was circulated for public review and comment for a period of 45 days that ended June 23, 2008. During and until the end of the review period, comments were received on the DEIR. The BSC reviewed those comments to identify specific environmental concerns and determine whether any additional environmental analysis would be required to respond to issues raised in the comments. The comment letters raised issues that resulted in the addition of significant new information to the EIR. This new information relates to: 1) the leaching of chemicals from PEX tubing, 2) the thresholds of significance for water quality, and 3) the determination that certain chemicals are no longer considered constituents of concern because they are not used in PEX, or are not present in a form that poses a threat to human health.

Section 15088.5 of the California Environmental Quality Act Guidelines (State CEQA Guidelines) requires lead agencies to recirculate information in an EIR when significant new information is added to the EIR after public notice is given of the availability of the DEIR for review. Significant new information requiring recirculation includes “changes in the project or environmental setting as well as additional data or other information.” Section 15088.5 requires recirculation of only the significant new information, rather than the entire DEIR. New information has resulted in changes to the significance threshold for water quality, and changes to significance determinations for two water quality impacts and one cumulative impact. As a result, certain mitigation measures initially proposed in the initial DEIR are no longer included in the EIR. Therefore, BSC has decided to recirculate the water quality and cumulative impacts sections of the DEIR for public review.

As required by Section 15088 of the State CEQA Guidelines, the BSC will evaluate and respond to all comments that were received on the DEIR and new comments submitted on the recirculated DEIR (RDEIR). All comments and responses will be included in the Final EIR (FEIR).

OVER-TIME TESTING AND LEACHING FROM PEX

As described in the DEIR, PEX manufacturers and industry experts have suggested that levels of methyl tert butyl ether (MTBE) and tertiary butyl alcohol (TBA) that may be higher in new PEX pipe, decline rapidly over time. While this assertion was made prior to release of the DEIR, limited data or other evidence was available to substantiate the claim. Testing by NSF was initiated in April 2008 (about the time of DEIR release) to determine if, and at what rate, the levels decline, and to determine if it is a reasonable assumption that levels would decline to concentrations at or below California criteria within a limited period of time. More specifically, the testing was conducted to determine the point at which the TBA extraction result would be equal to, or lower than 12 µg/L (the California notification level for TBA), and the MTBE extraction result would be equal to, or lower than 13 µg/L (the California primary maximum contaminant level [MCL] for MTBE).

NSF Standard 61, Section 4.5.4.3, is the multiple-time point protocol for over-time testing. The protocol states that the testing will be conducted over 90 days, and that extrapolation may be used by plotting the relationship between contaminant concentration and time using a minimum of five data points. In accordance with NSF Standard 61, testing of 10 samples of PEX tubing to evaluate the over-time extraction (i.e., leaching) of MTBE and TBA was completed in August 2008 (McLellan, pers. comm., 2008a). The 90-day timeframe was chosen because any chemicals that are likely to leach from the tubing would be expected to do so within 90 days (McLellan, pers. comm., 2008b), allowing identification of a trend.

The test results show a steady decline in the concentrations of TBA and MTBE for each PEX sample over time. All 10 samples reached the 13 µg/L primary MCL for MTBE by day 90, and 6 of 10 samples reached the 5 µg/L secondary MCL for taste and odor for MTBE by day 90. For TBA, 2 of the 10 samples reached the California notification level of 12 µg/L by day 90. For the 8 samples that did not reach 12 µg/L by day 90, the estimated time to reach that level based on extrapolated rates of decline is 97 days to greater than 2 years. (Although 8 of the 10 TBA samples did not reach the California notification level [a non-regulatory, advisory level] by day 90, new information is included herein to suggest that use of this figure as a significance threshold is inappropriate, overly conservative, and not supported by current science. See "Thresholds of Significance", below). Test results for TBA show that concentrations in all 10 samples were far below the health risk assessment-based NSF criterion of 9,000 µg/L by day 90, ranging from non-detect to 62 µg/L. Test methodology and results are included in Appendices F1 and F2 of this RDEIR.

With regard to taste and odor, NSF testing data show that new PEX pipe can leach MTBE at concentrations that exceed the secondary MCL for MTBE. However, based on over-time testing results described above, chemical concentrations decline rapidly with time, so that exceedances of guidelines for taste, odor, and appearance of water would be temporary. Importantly, a significant amount of PEX tubing is currently installed in California, the United States, and Europe, and there is no known record of consumer complaint regarding adverse taste and odor impacts attributable to PEX tubing (Taber, pers. comm., 2008). Furthermore, taste and odor impacts are aesthetic impacts, and are not health impacts. California Health and Safety Code, Section 116275(d), describes the purpose of establishing a secondary MCL. The statute states:

> "Secondary drinking water standards may apply to any contaminant in drinking water that may adversely affect the odor or appearance of the water and may cause a substantial number of persons served by the public water system to discontinue its use, or that may otherwise adversely affect the public welfare."

Thus, secondary drinking water standards are aesthetic, and do not directly pertain to public health risks. In contrast, "primary drinking water standards" are defined as a "maximum levels of contaminants that, in the judgment of the department, may have an adverse effect on the health of persons" (Health and Safety Code, Section 116275[c][1]).

THRESHOLDS OF SIGNIFICANCE

Evidence received during public review of the DEIR raises questions as to the validity of the California notification level for TBA and its applicability to human health risk assessment. This evidence thus casts doubt on the validity of using the notification level as a threshold of significance in the EIR. Correspondence was received from NSF indicating that the standard is inappropriate for several reasons. In summary, the notification level is not based on a sufficient human health risk assessment (Bestervelt, pers. comm., 2008); the process for derivation of the 12 µg/L notification level in 1999 was noted as an "interim assessment with preliminary calculations, and by no means represents a full risk assessment" and was "based on limited data" (OEHHA 1999); and the limit-setting process used methods that have since been determined to be not relevant to human health, a conclusion supported by U.S. EPA (Bestervelt, pers. comm., 2008). By definition, notification levels are "…nonregulatory, health-based advisory levels…for which maximum contaminant levels have not been established" (California Health and Safety Code Section 116455[c][3]). NSF conducted a human health risk assessment to allow toxicological assessment of TBA, an unregulated contaminant, in drinking water using risk assessment methodology developed by U.S. EPA (Appendix G) and identified levels of 900 to 40,000 µg/L as being protective of human health. The California Office of Environmental Health Hazard Assessment (OEHHA) evaluation of risk assessment for TBA (OEHHA 1999) is also included at Appendix G.

Based on this new information, it is determined that the non-regulatory California notification level of 12 µg/L is overly conservative and not appropriate for use as a threshold of significance for impact assessment purposes. In addition, over-time testing results (as described above) show that concentrations of MTBE and TBA steadily decline at predictable rates, and that TBA concentrations after 90 days are relatively low (ranging from non-detect to 62 µg/L) compared to the NSF health risk assessment-based criterion of 9,000 µg/L. Based on these facts, NSF criteria are considered protective of human health, and exposure to concentrations of TBA indicated in the over-time testing (that continue to decline over time) would not result in a significant impact to human health.

Finally, the question was raised as to whether *any* exceedance of a standard should constitute a significant adverse impact on human health. As described above, test results show that concentrations of TBA and MTBE decline over time. By day 90, all 10 samples met the 13 µg/L MCL for MTBE, and TBA concentrations decline to well below the NSF criterion of 9,000 µg/L. Although the test results show that MTBE and TBA concentrations for some samples are initially higher than the California notification level for TBA and MCL for MTBE, exposure to a chemical concentration that is higher than a California standard for a short period of time is not necessarily a valid indicator of human health risk. Thus, this standard is not a reasonable threshold of significance. The NSF health risk assessment-based criterion for TBA and the MCL for MTBE are based on long-term exposure to those chemicals. The California MCL for MTBE considers effects that may result from MTBE exposure and "estimates the level of the contaminant in drinking water that would pose no significant health risk to individuals consuming the water on a daily basis over a lifetime" (OEHHA 1999a). In addition, a risk assessment performed by NSF for MTBE resulted in a standard of 100 µg/L. Both the California MCL of 13 µg/L and the NSF standard of 100 µg/L are acceptable given current U.S. EPA risk management criteria and are protective of public health. In addition, the assumption behind the California MCL is a continuous exposure of the chemical at the regulated level over a lifetime. Because concentrations of contaminants leaching from plumbing products decay rapidly over time, they should not be assumed to be consistent and continuous over the lifetime of a product (Bestervelt, pers. comm., 2008). Therefore, short term exposure to TBA or MTBE at levels exceeding California standards would not cause a substantial adverse impact on human health.

PROPOSITION 65 CHEMICALS

Three Proposition 65 compounds (butyl benzyl phthalate, toluene diamine, and carbon black) thought to be potentially present in PEX formulations and for which there are no established California or federal drinking water criteria. According to NSF, butyl benzyl phthalate and toluene diamine are not found in PEX tubing (Bestervelt, pers. comm., 2008). Based on NSF's 20 years of experience in reviewing PEX formulations and testing PEX tubing, NSF has not seen and would not expect to see butyl benzyl phthalate or toluene diamine in the formulation for PEX or in chemical extraction test results of PEX tubing. (This erroneous information came from a study that considered constituents that could be present in PEX and other types of plastics, but did not identify the specific chemicals associated with each type of plastic.) These compounds are associated with polyurethane, and polyurethane is not an ingredient in PEX nor is it used as a liner or coating for PEX in potable water applications (Bestervelt, pers. comm., 2008). Therefore, butyl benzyl phthalate and toluene diamine are no longer considered constituents of concern, and are not considered further in this EIR.

Carbon black is also identified in the DEIR as a substance potentially present in PEX tubing, and is listed on the Proposition 65 list of "Chemicals Known to the State to Cause Cancer or Reproductive Toxicity." However, carbon black's risks relate to inhalation of airborne, unbound particles of respirable size (CAS No. 1333-86-4). Carbon black is not believed by NSF to be used in PEX tubing (McLellan, pers. comm., 2008c). In addition, reports of its potential use in some brands of PEX would not be a concern because the particles would be bound within the matrix of the pipe, and exposure to airborne particles of carbon black would not occur. Therefore, the

Proposition 65 listing for carbon black as airborne unbound particles of respirable size does not apply to PEX tubing (Chaudhuri, pers. comm., 2008). Furthermore, because any carbon black that could potentially be contained in PEX tubing is considered bound, any potential leaching of carbon black from PEX tubing is not a concern under Proposition 65 (Luong, pers. comm., 2008).

1.2 CONTENT OF THE RDEIR

Consistent with the requirements of Section 15088.5(c) of the State CEQA Guidelines, this RDEIR contains only those sections of the DEIR in which significant new information is provided (e.g., Water Quality, Cumulative Impacts, and Alternatives). This information is considered significant new information based on Section 15088.5(a) of the State CEQA Guidelines; therefore, the BSC is providing this information to the public for its review as part of this RDEIR.

The RDEIR consists of the following chapters and sections. All chapter and section numbering is consistent with the chapter and section numbering outline in the DEIR (released May 2008). Changes to the DEIR text are identified by underline for additions and strikeout (~~strikeout~~) for deletions, unless otherwise noted.

Chapter 1, "Introduction." Chapter 1 describes the purpose and organization of the RDEIR.

Chapter 3, "Description of the Proposed Project." Chapter 3 describes project location, background, proposed actions by the BSC, project characteristics, and project objectives. This chapter also describes PEX tubing and project regulatory requirements. No changes to the project description have occurred since publication of the DEIR in May 2008.

Section 4.4, "Water Quality." This section describes the project's potential water quality impacts, including impacts from exposure to chemicals as related to a new significance threshold. The new significance threshold reduces the level of significance for two impacts, and does not result in any new impacts.

Chapter 5, "Cumulative Impacts." This chapter contains a discussion of cumulative impacts that would result from the proposed project in combination with past projects, past environmental impacts, current projects, and probable future projects in the project area. The new significance threshold reduces the level of significance for one impact, and does not result in any new impacts.

Chapter 7, "Alternatives to the Project." This chapter describes the No Project Alternative and alternatives to the project that could mitigate the project's environmental impacts while meeting most of the project's objectives at a level consistent with CEQA requirements outlined in State CEQA Guidelines Section 15126.6(d). This chapter also describes alternatives previously considered and rejected. The discussion of alternatives is the same as that circulated in the DEIR except for the discussion of public health and hazards, and water quality impacts.

Chapter 8, "Preparers of the Environmental Document." This chapter identifies the DEIR authors and consultants who provided analysis in support of the RDEIR's conclusions.

Chapter 9, "References." This chapter sets forth a comprehensive listing of all sources of information used in the preparation of the DEIR, including agencies or individuals consulted during preparation of the RDEIR.

Appendices. Appendices contain various technical reports, letters, official publications, summarized or otherwise used for preparation of the RDEIR, as needed.

1.3 RELATIONSHIP TO THE DEIR

Consistent with the requirements of Section 15087 of the State CEQA Guidelines, this RDEIR is being made available on October 16, 2008, for public review for a period of 30 days. The public-review period ends on November 14, 2008. During this period, the general public, agencies, and organizations may submit written comments on the RDEIR to the BSC. Pursuant to procedures set forth in Section 15088.5(f)(2) of the State CEQA Guidelines, reviewers are requested to limit their comments to the information contained in this RDEIR.

As required under Sections 15087 and 15088.5(d) of the State CEQA Guidelines, the BSC has sent a notice of availability to all those who submitted comments on the DEIR, to all organizations and members of the public who were on the distribution list for the DEIR, and to any additional persons or organizations that have requested information about the EIR since the publication of the DEIR.

Copies of the RDEIR are available for review online at http://www.bsc.ca.gov/pex and at the following addresses:

California Department of General Services
Real Estate Services Division
Professional Services Branch, Environmental Services Section
707 Third Street, Suite 3-400
West Sacramento, CA 95605

California Building Standards Commission
2525 Natomas Park Drive, Suite 130
Sacramento, CA 95833

All written comments on this RDEIR should be addressed to:

California Department of General Services
Real Estate Services Division
Professional Services Branch, Environmental Services Section
Attn: Valerie Namba, Senior Environmental Planner
707 Third Street, Third Floor, MS 509
West Sacramento, CA 95605-9052
Telephone: (916) 376-1607

Public notices of availability of the RDEIR have been published in the *Los Angeles Times*, *San Francisco Chronicle*, *Sacramento Bee*, *Fresno Bee*, and the *Redding Record Searchlight* newspapers.

After close of the comment period, the BSC will consider all comments received on this RDEIR, prepare responses as required, and prepare the FEIR. The FEIR will consist of the DEIR, RDEIR, comments on the DEIR, comments on the RDEIR, responses to comments, and any text changes. The FEIR will be considered by the BSC for certification if it is determined that the FEIR has been completed in compliance with CEQA. Following certification of the EIR, the BSC will consider the proposed project for approval.

3 DESCRIPTION OF THE PROPOSED PROJECT

This recirculated draft environmental impact report (RDEIR) evaluates the environmental effects of the adoption of new state plumbing code regulations that would remove from the California Plumbing Code the prohibition against the use of cross-linked polyethylene (PEX) tubing, a type of plastic pipe, for potable water uses (proposed project). No changes to the proposed project have occurred since publication of the DEIR on May 9, 2008. As described below, proposed regulations are presented using a model code, with changes shown in italics and underline for additions and in strikeout for deletions. As such, strikeouts shown below in Section 3.4.2, "Proposed Regulations," reflect the project as originally proposed and should not be construed as changes since publication of the DEIR.

The California Building Standards Commission (BSC) proposes to adopt new state plumbing code regulations that would remove the prohibition against the use of cross-linked polyethylene (PEX) tubing, a type of plastic pipe, for potable water uses from the California Plumbing Code. The tubing would be authorized for use in various cold and hot water (including potable water) plumbing applications in residential, commercial, and institutional buildings. This proposed adoption would be an activity undertaken by a public agency and has the potential to result in direct or indirect physical changes in the environment. As such, it constitutes a "project" under the California Environmental Quality Act (CEQA) (Public Resources Code Section 21065).

This chapter presents the location and setting of the proposed project, project background, and project goals and objectives. In addition, it provides an overview of the project, describes the different methods for cross-linking polyethylene, and presents project alternatives.

3.1 LOCATION AND SETTING

The proposed adoption of regulations related to PEX tubing is a statewide regulatory change. As such, the project area is the State of California (Exhibit 3-1).

Source: Created by EDAW in 2008

Proposed Project Area **Exhibit 3-1**

3.2 PROJECT BACKGROUND

BSC is a state agency responsible for approving and adopting building standards adopted or proposed by other agencies and BSC staff. Building standards ordinarily are based on model codes with any amendments or deletions deemed appropriate. Model codes are created by nonprofit organizations made up of government officials and industry representatives from across the nation, or around the globe if the model code is international. The popularity of model building codes can be attributed to two factors: (1) proprietary building codes are prohibitively expensive to develop and (2) model codes can accommodate local conditions. Modern building regulations are very complex; therefore, most jurisdictions are not technically or financially capable of developing and effectively maintaining them. Rather than drafting its own building codes, a state might choose to use the model building codes instead. The model building codes are either adopted (accepted without modifications) or adapted (modified) to a particular jurisdiction and then enforced by the adopting authority. In California, building standards approved or adopted by BSC become part of the California Code of Regulations (CCR), Title 24, also known as the California Building Standards Code, of which the California Plumbing Code (CPC) is a part. The CPC is a compilation of three types of plumbing standards from three different origins:

- plumbing standards that have been adopted by state agencies without change from plumbing standards contained in national model codes;
- plumbing standards that have been adopted and adapted from the national model code standards to meet California conditions; and
- plumbing standards, authorized by the California legislature, that constitute extensive additions not covered by the model codes that have been adopted to address particular California concerns, which become part of the CPC.

Model building codes are developed by independent standards organizations. These organizations put together a network of development committees comprising representatives from the various affected entities, both government and private. This method allows the standards organizations to pool the financial and intellectual resources to produce codes that remain current and technically sound. The model code developers are constantly working to update their codes to incorporate the latest research results and building technologies. Normally, model building codes are updated and a new edition of the model building code is published every 3 years. The adopted code is based on the most recent version of the model building code. However, because of the length of time that it takes for a jurisdiction to review and approve a new code, the currently enforced version of the state code is often not the most recent edition of the model building code. Also, when any given jurisdiction adopts a model building code, it adopts a specific edition of the model code. For example, the 2007 California Building Code is the adoption of the 2006 International Building Code with modifications, which then becomes the law of that jurisdiction. As a result of this practice, the adopted codes are not automatically updated. When a new edition of the model code is released by the model code developer, BSC and other adopting authorities may choose to ignore it and continue using the older version of the model code it adopted. California and most other jurisdictions update their codes triennially. State law requires the BSC to adopt the latest version of the model codes triennially; however, unforeseen circumstances can cause a disruption in this effort.

The model codes may either be adopted or rejected outright, or they may be adopted with amendments, deletions, or additional rules. In some cases, the amendments or additional requirements and exemptions are issued as a separate document. The State of California contracts with the International Association of Plumbing and Mechanical Officials (IAPMO) to print the California Building Standards Code, Part 5 of which is known as the CPC. The 2007 edition of the CPC incorporates, by adoption (with modifications), the 2006 edition of the Uniform Plumbing Code (UPC) model building code with the California State revisions.

IAPMO, a nonprofit organization, published the 2000 UPC, a model code, in October 1999. It included, for the first time, provisions allowing the use of PEX tubing and fittings for hot and cold water distribution, including potable water uses. Membership in IAPMO is open to anyone who has an interest in promoting the installation of safe and efficient plumbing and mechanical products (e.g., heating, ventilating, cooling, and refrigeration systems). IAPMO members are located in over 40 U.S. states and in many foreign countries including Canada, Japan, New Zealand, Mexico, and Saudi Arabia. IAPMO develops the UPC and the Uniform Mechanical Code, the world's only plumbing and mechanical codes accredited by the American National Standards Institute (ANSI).

During the adoption cycle for the 2001 triennial code, BSC proposed to adopt regulations approving the use of PEX tubing for potable water uses along with other proposed regulatory changes. However, BSC received comment letters during the regulatory process that suggested a number of potentially adverse environmental and public health effects associated with the use of PEX for potable water distribution. Based on the information in those comment letters, BSC and the Responsible Agencies withheld approval of the PEX provisions by affirmatively not adopting it for most potable water applications under their jurisdictions, pending future environmental review in compliance with CEQA. See Table 6-4, "UPC," in section 3.4.2, "Proposed Regulations," below for the currently proposed regulatory change that would strikeout the 2001 non-adoption language.

The Plastic Pipe and Fittings Association (PPFA) sued BSC, seeking to require BSC to adopt the PEX provisions. The trial court ruled in favor of PPFA, but that decision was overturned by the appellate court, which held that BSC's decision to withhold approval until PEX could be further reviewed was supported by "substantial evidence" as defined by CEQA (*Plastic Pipe and Fittings Assn. v. California Building Standards Com'n* [2004] 124 Cal.App.4th 1390). Specifically, the court found that information contained in a comment letter received by BSC from Thomas Reid on behalf of the Coalition for Safe Building Materials (the Coalition) "is substantial evidence both that PEX potentially may present an unreasonable risk of harm and that the information in the administrative record is insufficient to dispel the stated concerns" regarding the integrity of PEX tubing. Therefore, BSC was entitled to rely on that letter in rendering its decision to require an environmental impact report (EIR). The Coalition is a group made up of the California Pipe Trades Council, California Professional Firefighters, Consumer Federation of California, Planning and Conservation League, Center for Environmental Health, Sierra Club of California, and Communities for a Better Environment.

In 2006, the California Department of Housing and Community Development (HCD) sought to adopt regulations allowing use of PEX and completed an initial study/negative declaration on September 9, 2006 (HCD 2006a). However, HCD withdrew the initial study/negative declaration on October 16, 2006 because of ongoing controversy and the perceived need for more in-depth analysis.

Each iteration of the UPC from 2000 to the present has maintained the approval of PEX for hot and cold water distribution. However, California has not yet removed the prohibition in the CPC against the use of PEX tubing and fittings for hot and cold potable water distribution.

Based on substantial evidence in the record, BSC has determined that the project has the potential to have a significant effect on the environment and therefore has concluded that an EIR is required. This EIR provides the information necessary for BSC to draw conclusions regarding the potential environmental and human health effects of PEX tubing and its appropriateness for a variety of hot and cold water applications.

3.3 PROJECT OBJECTIVES

BSC proposes adoption of new state plumbing code regulations that would authorize the statewide use of PEX tubing for various cold and hot water (including potable water) plumbing applications in residential, commercial, and institutional buildings. Responsible Agencies, each of which will rely on this EIR for its own adoption of regulations, will be the California Department of Housing and Community Development (HCD), Division of the State Architect (DSA), Office of Statewide Health Planning and Development (OSHPD), Department of Public Health (DPH) (previously known as DHS), and the Department of Food and Agriculture (DFA). Cities and counties would not be responsible agencies because they would not have any authority to approve the project or to disapprove or add requirements or restrictions relating to the use of PEX within their jurisdictions after it is approved by BSC, unless they make express findings for such additions or deletions based on climatic, topographical, or geological conditions (CPC 101.8.1). BSC's objective in proposing these regulations is to provide an alternative plastic hot and cold water plumbing material for use in California.

3.4 PROJECT DESCRIPTION

3.4.1 PROJECT OVERVIEW

The proposed project is the adoption of regulations (i.e., building standards) pertaining to the use of PEX tubing. Implementation of the proposed project would allow the statewide use of PEX tubing for hot and cold water (including potable water) distribution for applications under the jurisdiction of the Responsible Agencies that adopt regulations based on environmental information and conclusions in this EIR. This includes applications such as drinking water, irrigation, and wastewater. The proposed PEX tubing regulations would apply to all occupancies, including commercial, residential, and institutional building construction, rehabilitation, and repair in all areas of the state. Examples of commercial occupancies include retail establishments, restaurants, office buildings, salons, theaters, farms, ranches, and food processing plants. Residential buildings include, but are not limited to, single-family dwellings, apartment houses, hotels, motels, lodging houses, dwellings, dormitories, condominiums, shelters for homeless persons, congregate residences, employee housing, factory-build housing, permanent buildings and permanent accessory buildings or structures constructed within manufactured home parks and special occupancy parks, and other types of dwellings containing sleeping accommodations with or without common toilet or cooking facilities including accessory buildings and facilities. Institutional building examples include schools and hospitals.

In this EIR, the terms “PEX tubing” and “PEX” refer to cross-linked polyethylene (PE) tubing also known as PEX tubing unless the context clearly indicates otherwise. These regulations, if approved, would become part of the CPC, which is a part of the California Building Standards Code. BSC is responsible for the final approval and adoption of the California Building Standards Code. BSC receives proposed code revisions from a number of public agencies that have statutory authority to propose codes for various types of occupancies. The Responsible Agencies for this project have regulatory authority over the commercial, residential, and institutional occupancies to which the proposed regulations would apply.

3.4.2 PROPOSED REGULATIONS

California Health and Safety Code Sections 18928, 18938, 17922, and 19990 direct BSC and the Responsible Agencies to adopt building standards that are reasonably consistent with recognized and accepted standards contained in the most recent editions of the UPC. California adopts the UPC on a triennial basis with modifications in strikeout for deletions and italics and underline for additions. This revised code becomes the CPC; no finalized version (i.e., without changes shown in strikeout and underlined italics) is prepared. BSC has selected the 2006 UPC published by IAPMO as the model code for this code adoption cycle. The proposed project is a change to Part 5, Title 24, CCR (hereinafter referred to as CPC), which is applicable to buildings under the jurisdiction of BSC, DFA, DPH, DSA, HCD, and OSHPD. Currently, PEX is authorized for use in radiant heating systems, manufactured homes, certain approved institutional uses, and for hot and cold water distribution, including potable water uses in some local jurisdictions (as discussed in Section 3.4.4 below). However, PEX was specifically not adopted (i.e., it was deleted) in the 2007 CPC for uses under the jurisdiction of BSC and the Responsible Agencies.

The modifications to the existing plumbing code would entail the following changes. ~~The above table (~~Table 6-4, “UPC”~~)~~ and the following text are excerpted from “The Express Terms for the Building Standards of the Building Standards Commission Regarding the Adoption of Amendments into the 2007 California Plumbing Code, California Code of Regulations,” Title 24, Part 5. The proposed changes to the regulations involve deletion of exceptions to the adoption of PEX in the CPC. As no additions are proposed to the CPC, no text is in italics.

TABLE 6-4. UPC

Material	Water Distribution Pipe and Fittings		Building Supply Pipe and Fittings
	Hot	Cold	
Asbestos – Cement			X
Brass	X	X	X
Copper	X	X	X
Cast Iron	X	X	X
CPVC	X	X	X
Galvanized Malleable Iron	X	X	X

TABLE 6-4. UPC			
Material	Water Distribution Pipe and Fittings		Building Supply Pipe and Fittings
	Hot	Cold	
Galvanized Wrought Iron	X	X	X
Galvanized Steel	X	X	X
PE			X
PE-AL-PE	X	X	X
PEX ~~[1]~~	X	X	X
PEX-AL-PEX[1]	X	X	X
PVC			X

[1] [BSC, DSA/SS & HCD] The use of~~ PEX and ~~PEX-AL-PEX in potable water supply systems is not adopted ~~for applications under the authority of the California Building Standards Commission, the Division of State Architect and the Department of Housing and Community Development.~~

604.1
Exceptions:

~~**(2) [For OSHPD 1, 2, 3 & 4]** Use of PEX piping is not permitted for applications under the authority of the Office of Statewide Health Planning and Development.~~

~~**(4) [For BSC]** Use of PEX piping is not adopted for applications under the authority of the Department of Health Services and the Department of Food and Agriculture.~~

604.11 PEX. ~~***[Not Adopted by BSC, HCD, DSA/SS, DHS, AGR & OSHPD 1, 2, 3 & 4]***~~ Crosslinked polyethylene (PEX) tubing shall be marked with the appropriate standard designation(s) listed in Table 14-1 for which the tubing has been listed or approved. PEX tubing shall be installed in compliance with the provisions of this section.

604.11.1 PEX Fittings. ~~***[Not Adopted by BSC, HCD, DSA/SS, DHS, AGR & OSHPD 1, 2, 3 & 4]***~~ Metal insert fittings, metal compression fittings, and cold expansion fittings used with PEX tubing shall be manufactured to and marked in accordance with the standards for the fittings in Table 14-1.

604.11.2 Water Heater Connections. ~~***[Not Adopted by BSC, HCD, DSA/SS, DHS, AGR & OSHPD 1, 2, 3 & 4]***~~ PEX tubing shall not be installed within the first eighteen (18) inches (457mm) of piping connected to a water heater.

~~***(2) [For OSHPD 1, 2, 3 & 4]** Use of PEX piping is not permitted for applications under authority of the Office of Statewide Health Planning and Development.*~~

~~***(4) [For AGR, DHS]** Use of PEX piping is not adopted for applications under the authority of the Department of Health Services and the Department of Food and Agriculture.*~~

3.4.3 PEX DESCRIPTION

PEX is a form of plastic tubing. The materials used in the production of plastics are natural products such as cellulose, coal, natural gas, salt, and crude oil. Crude oil is a complex mixture of thousands of compounds. To become useful, it must be processed.

The production of plastic begins with a distillation process in an oil refinery. The distillation process involves the separation of heavy crude oil into lighter groups called fractions. Each fraction is a mixture of hydrocarbon chains (chemical compounds made up of carbon and hydrogen), which differ in terms of the size and structure of their molecules. One of these fractions, naphtha, is the crucial element for the production of plastics.

The two major processes used to produce plastics are called polymerisation and polycondensation, and they both require specific catalysts. In a polymerisation reactor, monomers like ethylene and propylene are linked together to form long polymer chains. (A polymer is a compound of high molecular weight that consists of long chains of repeated, linked units known as monomers). Each polymer has its own properties, structure, and size depending on the various types of basic monomers used.

There are many different types of plastics, and they can be grouped into two main polymer families: thermoplastics (which soften when heated and then harden again when cooled) and thermosets (which never soften when they have been molded). PEX is made of PE, often high-density PE (HDPE), which is a thermoplastic. PEX is a member of the polyolefin family of polymers along with normal PE, HDPE, polypropylene (PP), and polybutylene (PB). Polyolefins are produced from oil or natural gas. They can be processed in two ways to make products—by extrusion or molding.

To manufacture plastic tubing, a process known as profile extrusion is used. This process is used to manufacture plastic products with a continuous cross section, such as drinking straws, decorative molding, window trimming, plastic pipes, and a wide variety of other products. The plastic is fed in pellet form into the extruder machine’s hopper. Then a rotating screw inside a heated barrel conveys the material continuously forward. The pellets are thus softened by both friction and heat. The softened plastic is then forced out through a die and directly into cool water where the product solidifies. This is similar to soft-serve ice cream coming out of a machine, except that the ice cream will melt rather than harden. From here it is conveyed onward into the take-off rollers, which pull the softened plastic from the die.

The die is a metal plate placed at the end of the extruder with a section cut out of its interior. This cutout, and the speed of the take-off rollers, determines the cross section of the product being manufactured. A simple way to understand this concept is to consider the shape of toothpaste as it comes out of a squeezed tube. The product comes out in a solid rod because of the opening at the end of the tube. If that opening had a differently shaped cross section, the product would take on that new cross section. Extrusion produces an inherently strong finished product, stronger than is produced by the molding process. This is one of the reasons that plastic pipe is rated at higher pressures than plastic fittings that are injection molded.

Cross-linked PE, or PEX, is a high-density plastic that is an alternative to ferrous and nonferrous piping for water distribution, such as copper, enamel coated steel, and chlorinated polyvinyl chloride (CPVC) plastic piping. Normal PE is unsuitable for hot water uses because it softens at elevated temperatures. However, for PE to be suitable for hot water uses, the individual polymer chains must be “cross-linked” together with supplemental chemical bonds. There are three commercial methods to cross-link polyethylene and thus, three classes of PEX:

(1) PEX-A uses the “Engle method” wherein the polyethylene resin and a chemical additive are heated to produce cross-linking. In the Engel method, peroxide is added to the base resin, which is then passed through an extruder. Through a combination of pressure and high temperature, the cross-linking takes place as the tubing is produced.

(2) PEX-B employs the “silane method” to produce silicon-oxygen cross-link bonds. The silane method, also called the moisture-cure method, involves grafting a reactive silane molecule to the backbone of the PE. The PEX tubing is produced by blending this grafted compound with a catalyst. While some of the cross-linking occurs in the extruder, the majority actually takes place in a water bath or in a sauna at elevated temperatures after the tubing passes through the extruder.

(3) PEX-C uses gamma or electron beam radiation to initiate cross-linking in what is called the “irradiation method.” The tubing is extruded like normal and HDPE tubing is then taken to an electron beam facility where it is dosed with a specific amount of radiation to initiate molecular cross-linking.

Because the different classes of PEX are formulated in different ways, they may perform differently or result in different environmental impacts. These possibilities are evaluated in Section 4.2, "Public Health and Hazards," and Section 4.4, "Water Quality," of this EIR.

In addition to cross-linking the polyethylene, other chemicals are added to the resin to prevent oxidation and ultraviolet light from weakening the tubing, which could lead to tubing failures. Such additives include antioxidants, ultraviolet blockers, fillers, and pigments.

3.4.4 CURRENT AND PROJECTED USES OF PEX

Use of PEX tubing is currently allowed throughout California for hydronic heating systems and all uses including potable water in manufactured homes. In the majority of existing buildings in California, including residential buildings, potable water pipe is made of metal, though CPVC plastic pipe was recently approved for statewide potable water uses, including use in residential buildings, beginning January 1, 2008. PEX tubing may also be used if it is approved by local ordinance or if the local agency with jurisdiction has approved it as an alternate material under the Alternate Materials, Methods of Design, and Methods of Construction provisions of the CPC. This provision authorizes local building officials to approve, on a project-by-project basis, alternate materials, provided the building official finds that the proposed design is satisfactory and complies with the provisions of the technical codes, and that the material, method, or work offered is, for the purpose intended, at least the equivalent of that prescribed in the technical codes in suitability, strength, effectiveness, fire resistance, durability, safety, and sanitation. (See California Health and Safety Code Section 17951[e], CPC 301.1 et seq. and CPC 108.7 et seq.) Such approval requires that the project proponent submit proof to support the building official's findings. It also must be recorded and entered in the local building departments files. Under these provisions, building officials may require an applicant to arrange for an outside agency designated by the building official at the applicant's expense to review an evaluation of the proposed alternate materials, methods of design, and methods of construction. In contrast, in the three jurisdictions that have approved the use of PEX by ordinance, no special approvals or submittals are needed to use PEX in a project.

Nearly 200 California cities and nearly 30 California counties have approved the use of PEX tubing in various cold and hot water plumbing (including potable water) applications in residential, commercial, and institutional buildings within their jurisdictions using the alternate materials provisions. In addition, at least three California cities (Palo Alto, Highland, and Santa Clarita) have adopted ordinances allowing the use of PEX tubing for all uses approved in the UPC without requiring special documentation. PEX currently makes up approximately 37% of the market for plumbing materials in new single-family homes in California. If the proposed regulations are adopted, PEX would be used in cities and counties that do not currently allow its use, and use of PEX would be expected to increase in the cities and counties that already allow PEX as an alternate material.

As of 2005 the market share for plumbing materials for all types of uses (including hydronic radiant heating and potable water distribution) in new homes in California was approximately 29% PEX, 13% CPVC, 54% copper, and 4% for all other materials. Market share, in this instance, means the percentage of new single-family homes that were plumbed with PEX. Other plumbing materials include galvanized steel and PEX-AL-PEX (polyethylene with an aluminum layer). (HCD 2006b and Ash, pers. comm. 2008.) Though more current market share data for copper and CPVC is not available, the most current data for PEX (2006) indicates that its share of the market for plumbing materials in new homes in California was approximately 37% (Ash, pers. comm. 2008). The net effect of adoption of the proposed regulations would probably be an increase in the use of PEX tubing, with a proportionate decrease in the use of other piping materials, particularly copper, because of the reduced labor costs associated with installation of PEX and also because of corrosivity issues with copper piping resulting from the increased use of chloramines for drinking water disinfection. The issue of corrosivity is discussed in further detail in Section 4.2, "Public Health and Hazards," and Section 4.4, "Water Quality."

3.5 REGULATORY REQUIREMENTS, PERMITS, AND APPROVALS

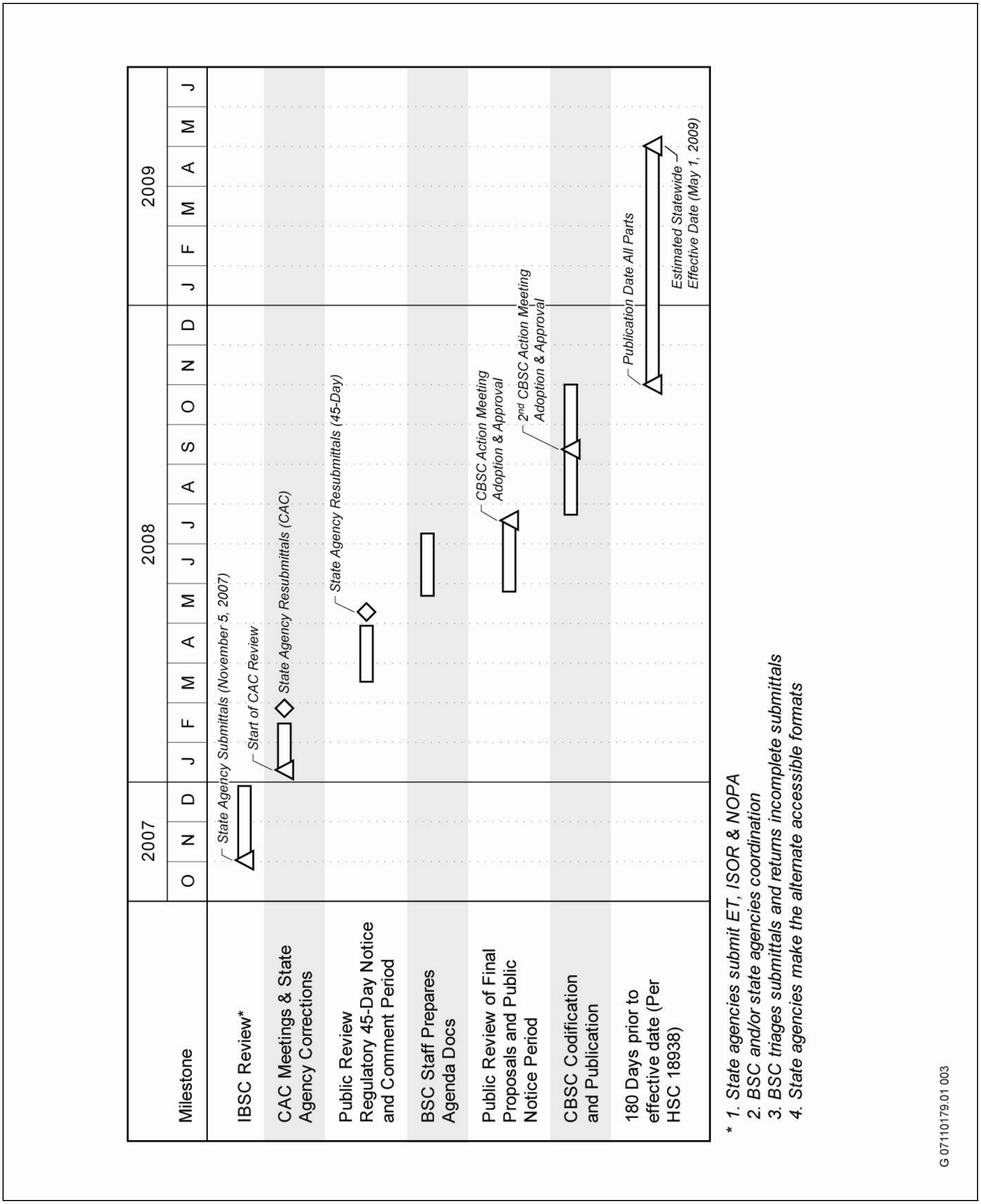
Two independent but related processes are taking place with regard to the proposed PEX regulations: the regulatory process and the EIR process.

Proposed draft regulatory changes were submitted to BSC by the Responsible Agencies in November of 2007. The BSC Code Advisory Committee held meetings regarding the proposed regulations in late January and early February 2008. The Plumbing, Electrical, Mechanical, and Energy BSC Code Advisory Committee considered all public comments in January, 2008 and relied on their own expertise in developing their recommendations to the BSC. After consideration of these recommendations by the pertinent state agencies, the original or revised proposed regulations were submitted to BSC by March 10, 2008 and a 45-day formal public review and comment period commenced March 28, 2008 and ends on May 12, 2008. BSC and the pertinent state agencies will prepare written responses to the comments received during the formal comment period. Exhibit 3-2 illustrates the draft regulatory timeline.

If, after this EIR is certified, BSC determines that the EIR supports a decision to approve the proposed regulatory changes, BSC may rely on the certified final EIR for subsequent approval of the proposed regulatory changes. In addition, the certified EIR will be forwarded to the Responsible Agencies, which may also rely on the final EIR for changes to their regulations, to the extent that those changes are within the scope of this EIR. If significant changes to the regulations are made after the publication of this draft EIR (DEIR), the DEIR will be revised as necessary to reflect those changes and, if necessary, recirculated.

3.6 SCOPE OF THIS EIR

The proposed project is limited to the proposed adoption of plumbing regulations to allow use of PEX tubing in a variety of hot and cold water applications (including potable water). These uses would apply to commercial, residential, and institutional building projects under the jurisdiction of the Lead Agency and Responsible Agencies in all California cities, cities and counties, and counties. The EIR will not assess any specific project that involves direct construction or modification to structures. Therefore, the environmental review will not include site specific analyses. In addition, the EIR will not evaluate the use of PEX-AL-PEX. PEX-AL-PEX is PEX tubing with a layer of aluminum embedded between the PEX layers. The proposed regulations will not address certain other potential uses of PEX tubing, such as for specific industrial or medical devices or machines. Uses other than cold and hot water plumbing uses (including potable water uses) for commercial, residential, and institutional buildings are beyond the scope of this project and thus beyond the scope of this EIR.



Source: Provided by the California Building Standards Commission in 2007, adapted by EDAW in 2008

Draft 2007 Annual Code Adoption Cycle (2007 Codes Supplement) **Exhibit 3-2**

4.4 WATER QUALITY

During the scoping period and in prior code adoption cycles, a number of comments were received regarding potential water quality issues related to the use of PEX and, consequently, maintaining the prohibition against the use of PEX. Comments fall into three main categories: permeability, leaching, and corrosion, each of which is addressed in this section of the draft environmental impact report (DEIR). In addition to these water quality concerns, concerns about the formation of biofilm and potential for increased risk of Legionnaire's disease have been raised in comments. Biofilm and Legionnaire's disease is addressed in this DEIR in Section 4.2, "Public Health and Hazards."

Many comments have been made regarding the potential for chemicals to permeate PEX tubing, meaning the potential for chemicals to enter the PEX tubing from surrounding soil, water, or air. Several comments have asserted that this DEIR should consider whether PEX tubing should be allowed to be installed under concrete slabs because of the potential for permeation to occur. This section considers the potential for chemicals to permeate PEX tubing and whether installation below the slab would increase this potential.

Concerns have been raised that PEX tubing has the potential to leach hazardous compounds, meaning that chemicals may come out of the tubing itself and enter drinking water. This section considers the potential for chemicals to leach from PEX tubing and whether any such leaching would result in significant environmental or human health impacts.

Finally, many comments have been made regarding the corrosion of copper piping and the threat posed by the trend toward use of chloramines in favor of chlorine for disinfection of drinking water supplies to increase the potential risks to impaired water bodies and human health from such corrosion. This DEIR evaluates this issue in the context of the No Project Alternative.

4.4.1 REGULATORY SETTING

Federal and State of California regulations related to the potential water quality impacts of using PEX pipes are described below. No local water quality plans, policies, regulations, or laws are applicable to the proposed project.

FEDERAL PLANS, POLICIES, REGULATIONS, AND LAWS

Federal Safe Drinking Water Act

Pursuant to the federal Safe Drinking Water Act (42 United States Code Section 300f et seq.), the U.S. Environmental Protection Agency (EPA) establishes national standards for drinking water using a two-step process. First, it establishes what are known as public health goals (PHGs), which are science-based standards at which there is no risk to human health. Second, it considers available technology and cost of treatment to determine the National Primary Drinking Water Regulations that set enforceable regulatory standards called maximum contaminant levels (MCLs). The Safe Drinking Water Act has strict standards for bacteria in drinking water and meeting these standards generally requires disinfection. Pursuant to the Supremacy Clause in the U.S. Constitution (Article VI, Clause 2) states may not adopt regulations that are less stringent than the federal standard. The federal act provides a floor of regulatory standards; it also provides the states authority to adopt more stringent standards.

Lead and Copper Rule

The Lead and Copper Rule (LCR), Code of Federal Regulations 141.81, was established in 1991. The goal of the LCR is to provide maximum human health protection by reducing lead and copper at consumers' taps. To accomplish this goal, the LCR establishes requirements for community and nontransient/noncommunity water systems. These systems must conduct periodic monitoring and optimize corrosion control. In addition, these systems must perform public education when the level of lead at the tap exceeds the lead action level, treat source water if it is found to contribute significantly to high levels of lead or copper at the tap, and replace lead service lines in the distribution system if the level of lead at the tap continues to exceed the lead action level after optimal corrosion control has been installed. The action levels are 0.015 milligrams per liter (mg/L) for lead and 1.3 mg/L for copper, and the maximum contaminant level goals, which is similar in concept to a PHG, is 0 mg/L for lead and 1.3 mg/L for copper.

The LCR requires water suppliers to (1) optimize their treatment system to control corrosion in customers' plumbing, (2) determine tap water levels of lead and copper for customers who have lead service lines or lead-based solder in their plumbing system, (3) rule out the source water as a source of significant lead levels, and (4) if lead action levels are exceeded, educate their customers about lead and suggest actions they can take to reduce their exposure to lead through public notices and public education programs. If a water system, after installing and optimizing corrosion control treatment, continues to fail to meet the lead action level, it must begin replacing the lead service lines under its ownership. Lead service lines are uncommon in California where the primary sources of lead in drinking water are lead solder and leaching from brass plumbing fixtures.

Disinfection By-Products Rules

EPA drinking water standards require the disinfection of drinking water to kill pathogenic microorganisms that can threaten human health. However, disinfectants, particularly chlorine, react with naturally occurring organic and inorganic matter present in water to form chemicals called disinfection by-products (dbps). EPA began promulgating rules to reduce exposures to dbps in 1979. That first rule applied only to community water systems serving at least 10,000 people and set the MCL at 0.10 mg/L for total trihalomethanes (TTHMs), a class of dbps of concern.

EPA has determined that a number of dbps pose a health concern. Certain dbps, including TTHMs and some of the total haloacetic acids (HAA5) have been shown to cause cancer in laboratory animals. Other dbps have been shown to affect the liver and the nervous system and cause reproductive or developmental effects in laboratory animals. There are also limited studies that indicate that certain dbps may produce similar effects in people.
In 1998, based on the above described studies, EPA finalized the Stage 1 rule, which applies to all community and nontransient noncommunity water systems that add a chemical disinfectant to the water. The rule established what are known as maximum residual disinfectant level goals and enforceable maximum residual disinfectant level standards for three chemical disinfectants: chlorine, chloramines, and chlorine dioxide. It also established maximum contaminant level goals for three trihalomethanes (THMs), two haloacetic acids (HAAs), and bromate and chlorite. It also lowered the MCLs for TTHMs and HAA5 to 0.080 mg/L and 0.06 mg/L, respectively. Under this rule, systems that use surface water, or groundwater under the direct influence of surface water, were required to remove increased percentages of organic materials that may react with disinfectants to create dbps.

In 2006, EPA adopted the Stage 2 rule, which focuses on identifying higher risk locations in distribution systems and on reducing exposures and lowering dbp peaks that have been associated with miscarriage in some smaller studies.

State Plans, Policies, Regulations, and Laws

California Safe Drinking Water and Toxic Enforcement Act

The California Health and Safety Code prohibits the discharge of chemicals that cause cancer or reproductive toxicity into drinking water (California Health and Safety Code Section 25249.5 et seq.). This code section was originally enacted as a part of the California Safe Drinking Water and Toxic Enforcement Act (popularly known as Proposition 65 or "Prop 65"). For purposes of Proposition 65, a "discharge" occurs if any detectable amount of the chemical is found. (*Mateel Environmental Justice Foundation v. Gray* [2003] 115 Cal.App.4th 8, 19.) Health and Safety Code Section 25249.9 provides an exemption to this prohibition, stating that the prohibition does not apply if (1) the discharge will not cause any significant amount of the discharged or released chemical to enter any source of drinking water and (2) the discharge is in conformity with all applicable laws, regulations, permits, requirements, and orders. The regulations implementing Proposition 65 (California Code of Regulations, Title 22, Division 2, Part 2, Chapter 3. Section 12711, subdivision [a]) state that, with certain exceptions, the levels of exposure deemed to pose no significant risk for drinking water are:

- drinking water MCLs adopted by the California Department of Public Health (DPH) for chemicals known to the state to cause cancer;
- drinking water action levels (also known as "notification levels") for chemicals known to the state to cause cancer for which MCLs have not been adopted;
- specific numeric levels of concentration for chemicals known to the state to cause cancer that are permitted to be discharged or released into sources of drinking water by a Regional Water Quality Control Board in a water quality control plan or in waste discharge requirements, when such levels are based on considerations of minimizing carcinogenic risks associated with such discharge or release.

Section 12805 establishes similar standards for chemicals that cause reproductive toxicity. Additionally, Section 12705 authorizes the Office of Environmental Health Hazard Assessment (OEHHA) to adopt "No Significant Risk Levels" for carcinogens and "Maximum Allowable Dose Levels" (MADLs) for reproductive toxicants that are intended to provide "safe harbors" for dischargers. MADLs represent the "No Observable Effect Level" (NOEL).

The act creates a cause of action that the State Attorney General may prosecute to assess civil penalties of up to $2,500 for each day of a violation and to enjoin the release of Proposition 65 chemicals. Enjoining is an equitable remedy imposed by courts as a means of making the injured party whole. In the case of a discharge into California drinking water, the court might require the discharge to be stopped and possibly for treatment or other affirmatives steps to be taken to remove the contamination and the source of the discharge. Courts have significant flexibility in crafting equitable remedies. The California courts have interpreted the act to prohibit discharge of Proposition 65 chemicals into drinking water from plumbing materials and fixtures through which drinking water passes (*People ex rel. Lungren v. Superior Court* [1986], 58 Cal.Rptr.2d 855). In that case, manufactures were required to pay millions of dollars in penalties to the state and to reformulate their fixtures to reduce the leaching of lead in compliance with the requirements of Proposition 65.

California Safe Drinking Water Act

The California Safe Drinking Water Act (California Health and Safety Code Section 116270) was passed to ensure that water delivered by public water systems is "pure, wholesome and potable" (California Health and Safety Code Section 116270[e]). The act states that, "It is the policy of the state to reduce to the lowest level feasible all concentrations of toxic chemicals that when present in drinking water may cause cancer, birth defects, and other chronic diseases" (California Health and Safety Code Section 116270[d]). The act provides for the process of adopting drinking water standards and, as described below, the California Administrative Code at Title 22, Division 4, Chapter 15, provides the standards for contaminants.

The act also provides for the establishment of "notification levels" and "response levels" (also known as source removal) (California Health and Safety Code Section 116454 et seq.). "Notification level" means the concentration level of a contaminant in drinking water delivered for human consumption that DPH determined may pose a health risk and warrants notification. Notification levels are nonregulatory, health-based advisory levels established by DPH for contaminants in drinking water for which MCLs have not been established. Notification levels are established as precautionary measures for contaminants that may be considered candidates for establishment of MCLs, but have not yet undergone or completed the regulatory standard-setting process prescribed for the development of MCLs. Chemicals for which notification levels are established may eventually be regulated by MCLs (after a formal regulatory process), depending on the extent of contamination, the levels observed, and the risk to human health. Notification levels may be revised to reflect new risk assessment information. The notification levels are calculated using standard risk assessment methods for noncancer and cancer endpoints, including assuming a 2-liter per day ingestion rate, a 70-kilogram adult body weight, and a 70-year lifetime. For carcinogens, the notification level is considered to pose "de minimis" risk, or one cancer risk in a population of one million people. Notification levels are not drinking water standards but are generally supported by a health risk assessment prepared by OEHHA.

A "response level" is the concentration of a contaminant in drinking water delivered for human consumption at which DPH recommends that additional steps, beyond notification, be taken to reduce public exposure to the contaminant. (California Health and Safety Code Section 116455.) If a chemical concentration exceeds the response level DPH recommends that the drinking water system take the water source out of service (DPH 2007a). Chemicals that pose a cancer risk have a response level that is generally 100 times the notification level.

Title 22 of the California Code of Regulations

Title 22 of the California Code of Regulations contains California standards for drinking water quality. Using a process similar to that used under the federal Safe Drinking Water Act, California sets its own PHGs and MCLs, which are at least as health protective as the federal standards. The California primary drinking water standard (i.e., the regulatory standard) is set through a two-step process: risk assessment, performed by OEHHA and expressed in a PHG and risk management assessment, performed by DPH expressed in an MCL.

In the risk assessment portion, OEHHA evaluates the risk to public health posed by the contaminant and, based on the results of the risk assessment, establishes a PHG. The PHG is the level at which the contaminant will not pose a significant risk of either acute (sudden and severe) or chronic (prolonged or repeated) effects to human health. In determining a PHG for a contaminant, OEHHA is allowed to consider only health-related data and not the economic costs of meeting the PHG. (California Health and Safety Code, Section 1163659[c]) A PHG is not an enforceable regulatory limit; rather, it is a goal and is also the health-related number that is used to determine the regulatory MCL.

DPH has the responsibility to assess risk management and is required to adopt an MCL as close as technically and economically feasible as possible to the PHG (Health and Safety Code Section 116365 [a]). DPH is required to consider the costs to public water systems, customers, and other affected parties to comply with the proposed standard including the cost per customer and the aggregate cost of compliance using the best available technology. The MCL, which is the enforceable regulatory limit, also known as the primary drinking water standard, is then included in the California Code of Regulations.

DPH also adopts what are known as secondary standards or secondary MCLs. Secondary MCLs address taste and odor concerns. Though secondary MCLs are not enforceable under federal law, they are enforceable in California at the request of an affected community.

California Health and Safety Code, Section 116275(d), describes the purpose of establishing a secondary MCL. The statute states:

> "Secondary drinking water standards may apply to any contaminant in drinking water that may adversely affect the odor or appearance of the water and may cause a substantial number of persons served by the public water system to discontinue its use, or that may otherwise adversely affect the public welfare."

Thus, secondary drinking water standards are aesthetic, and do not directly pertain to public health risks. In contrast, "primary drinking water standards" are defined as a "maximum levels of contaminants that, in the judgment of the department, may have an adverse effect on the health of persons" (Health and Safety Code, Section 116275[c][1]).

Odors

With respect to the proposed project, odor impacts would be in the form of perceived quality of water by the end user. PEX tubing is not completely impermeable; the molecular structure of the pipe material has very small openings, or pores, that could allow gases or liquids, depending on molecular size, to pass through in either direction. If compounds that affect taste and odor of water permeate from the soil into PEX tubing, it is possible that water quality as perceived by the user could be affected. Certain compounds with potential to leach from PEX tubing could also affect taste and odor and thus the perceived quality of drinking water. DPH sets primary standards designed to protect public health, but also secondary drinking water standards for taste and odor. For example, the taste and odor standard for methyl tertiary-butyl ether (MTBE) in drinking water, is 5 ug/L, or 5 parts per billion (ppb), below which odor or taste associated with this compound is imperceptible by most members of the public (DPH 2007b). The health-based standard for MTBE in drinking water is 13 ppb (DPH 2007b).

Drinking Water Source and Assessment Program

The 1996 federal Safe Drinking Water Act amendments require each state to develop and implement a Source Water Assessment Program. Section 11672.60 of the California Health and Safety Code requires DPH to develop and implement a program to protect sources of drinking water, specifying that the program must include both a source water assessment program and a wellhead protection program. In response to both of these legal mandates, DPH developed the Drinking Water Source and Assessment Program (DWSAP).

California's DWSAP addresses both groundwater and surface water sources. The groundwater portion of the DWSAP serves as the state's wellhead protection program. In developing the surface water components of the DWSAP, DPH integrated the existing requirements for watershed sanitary surveys.

Specifically for groundwater, the DWSAP includes requirements that specify the minimum distance, or the minimum "travel" time, between known contaminant plumes and municipal groundwater extraction well sites. The intent is to place municipal production wells a sufficient distance from known contaminant plumes to reduce or eliminate the possibility of extracting contaminated groundwater. Under DWSAP, all new and existing drinking water sources must undergo a drinking water source assessment before being permitted. The general elements of the assessment include delineation of an area around a drinking water source through which contaminants might move and reach the source, an inventory of possible contaminating activities that might lead to the release of microbiological or chemical contaminants within the delineated area, and a determination of the possible contaminating activities to which the drinking water source is most vulnerable (DPH 2000).

4.4.2 EXISTING SETTING

This section contains a brief overview of the current use of piping materials and the effects those materials may have on the environment at the present time. As is described below, every type of piping currently available for use raises certain environmental and public health concerns. Based on this setting, which is the baseline for purposes of environmental impact analysis, this DEIR assesses whether the projected increase in the use of PEX that would likely result from approval of the proposed project would result in a potentially significant and adverse impact on the environment or on human health.

Current market share of PEX and other plumbing materials in California establish the context for the existing environmental setting related to water quality and the baseline against which potential water quality impacts of the proposed project will be compared. As explained in Section 3.4.4, "Current and Projected Uses of PEX," as of 2005 the market share for various plumbing materials in new homes in California was approximately 29% PEX, 13% chlorinated polyvinyl chloride (CPVC), 54% copper, and 4% for all other materials (HCD 2006; Ash, pers. comm., 2008). Though more-current market share data for copper and CPVC is not available, the most current data for PEX (2006) indicates that its share of the market for plumbing materials in new single family homes in

California has grown to approximately 37% (Ash, pers. comm., 2008). No data is available on market share for commercial and industrial uses.

PEX

PEX was first developed in Europe and has since come into use around the world for a variety of applications. PEX has a 30-year history of use in the European market. It was first introduced in North America in 1984 where it has been primarily used for radiant floor heating, and more recently, for domestic water distribution systems. It is approved for potable hot and cold water supply systems as well as hydronic heating systems in all model plumbing and mechanical codes across the United States (NAHB Research Center 2006:1). PPFA estimates that 132 million feet of PEX were shipped to California in 2005 (PPFA 2007). According to PPFA (Church, pers. comm., 2007), PEX has been used in potable water applications in local jurisdictions in California including the Highland area, Santa Clarita, Redding, Chula Vista, and Village of Lakes since the early to mid-1990s.

PEX is currently used in California for radiant heating systems, manufactured homes, certain approved institutional uses, and for hot and cold water distribution, including potable water uses in approximately 230 local jurisdictions, as discussed in Section 3.4.4, "Current and Projected Uses of PEX." Those local jurisdictions make up more than 40% of California cities and more than 50% of California counties. These uses currently account for approximately 37% of the market for plumbing materials in new single-family homes in California. Some concerns with PEX include its potential to leach some of the chemicals from which it is made into the water passing through it and to be permeated by organic compounds, particularly solvents that may be present in contaminated soils or groundwater.

COPPER

According to the Copper Development Association, Copper has been in use in plumbing for over 2000 years (it has been found in serviceable condition in the ruins of ancient Egypt), though its widespread use in the United States began in the 1920s (Copper Development Association 2008). As recently as 10 years ago, copper accounted for 90% of all plumbing materials in existing homes throughout the United States. In 2004, copper made up 62% of the market for plumbing materials in new homes in California. It likely accounts for a significantly greater percentage in existing homes, though no current data are available for piping in existing homes. Copper is an essential nutrient, but is also toxic at elevated doses, which can harm the environment and human health (Risk Assessment Information System 2005). When it is newly installed before flushing, and again over time, copper corrodes and is released into water that passes through it. The concentration of copper released into the water is highly dependant on the corrosivity of the water flowing through the pipe, the duration of standing water in the pipe, and the age of the pipe (FDA 2003:109). With the trend toward use of chloramines for disinfection and reverse osmosis for treatment, water in many parts of the state is becoming increasingly corrosive. This has resulted in some water agencies failing to meet the requirements of the copper and lead rule and some wastewater agencies exceeding the total maximum daily load (TMDL) for copper in various water bodies throughout the state. A TMDL is a threshold that in California is established by the regional water quality control boards. Specifically, a TMDL is a calculation of the maximum amount of a pollutant that a water body can receive without impairing the beneficial uses of that particular water body (e.g., drinking water, agricultural uses, swimming) and an allocation of that amount to the pollutant's sources. The issue of corrosion and potential impacts on water quality is discussed in greater depth in Impact 4.4-3 below.

CPVC

For over 20 years California has approved the use of CPVC for street water mains and polyvinyl chloride (PVC) for the service line from the street water main to the house. From 2001 until January 1, 2008, the California Plumbing Code allowed the use of CPVC for residential potable water distribution if specific findings were made and worker safety and flushing requirements were met. (HCD 2006:106.) Since January 1, 2008, the California Plumbing Code has allowed the statewide use of CPVC for hot and cold water distribution, including potable water uses. Concerns with CPVC include emissions of reactive organic gases and ozone precursors, from the solvents used for installation of CPVC, in volumes that exceed local air district thresholds for reactive organic gases and in areas that are in nonattainment for federal and state ozone regulations.

ODORS

Odors are generally regarded as an annoyance rather than a health hazard. However, manifestations of a person's reaction to foul odors can range from psychological (e.g., irritation, anger, anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, headache).

With respect to odors, the human nose is the sole sensing device. The ability to detect odors varies considerably among the population and is quite subjective. Some individuals have the ability to smell very minute quantities of specific substances; others may not have the same sensitivity but may have sensitivities to odors of other substances. In addition, people may have different reactions to the same odor; in fact, an odor that is offensive to one person (e.g., from a fast food restaurant) may be perfectly acceptable to another. Unfamiliar odors are more easily detected than familiar odors and are more likely to cause complaints. This is because of the phenomenon known as odor fatigue, in which a person can become desensitized to almost any odor and recognition occurs only with an alteration in the intensity.

Quality and intensity are two properties present in any odor. The quality of an odor indicates the nature of the smell experience. For instance, if a person describes an odor as flowery or sweet, then the person is describing the quality of the odor. Intensity refers to the strength of the odor. For example, a person may use the word "strong" to describe the intensity of an odor. Odor intensity depends on the odorant concentration in the air. When an odorous sample is progressively diluted, the odorant concentration decreases. As this occurs, the intensity of the odor weakens and eventually becomes so low that detection or recognition of the odor is quite difficult. At some point during dilution, the concentration of the odorant reaches a detection threshold. An odorant concentration below the detection threshold means that the concentration in the air is not detectable by the average human.

A water utility needs to provide drinking water free of objectionable tastes and odors, because users often judge water quality by its aesthetic properties. Leaching of system materials (such as those used in water distribution systems; here, PEX tubing) or the permeation of compounds from outside the system (e.g., from soil, water, or vapors) can affect the taste and odor of water.

4.4.3 ENVIRONMENTAL IMPACTS

ANALYSIS METHODOLOGY

This analysis relies, in part, on testing conducted by NSF International, Inc. (NSF). NSF, founded in 1944 as the National Sanitation Foundation, is a not-for-profit testing organization that has developed product standards and provided third-party conformity assessment services to government, users, and manufactures/providers of products and systems (McLellan, pers. comm., 2008). NSF has been developing standards for testing and certification of plastics since 1965. NSF is also one of only a handful of organizations certified by ANSI (American National Standards Institute) to perform testing and certification to ANSI/NSF Standard 61 (which is discussed below). Others include International Association of Plumbing & Mechanical Officials, Underwriters Laboratories Inc., and the Water Quality Association.

ANSI has served for nearly 90 years as administrator and coordinator of standardization programs in the United States (www.ansi.org). This private, nonprofit organization is comprised of more than 1,000 government agencies, professional societies, and corporations. ANSI facilitates the development of American National Standards by accrediting the procedures of organizations that develop standards. Accreditation by ANSI signifies that the procedures used by the standards body meet the ANSI's requirements for openness, balance, consensus, and due process. ANSI oversees hundreds of organizations that develop standards and over 10,000 American National Standards.

The analysis of environmental effects is based on review and application of the applicable laws and regulations identified in the regulatory setting above; the NSF/ANSI Standard 61—Drinking Water System Components and the NSF/ANSI Standard 14—Plastic Piping System Components and Related Materials Standard Testing Methods; PEX testing data received from NSF; and review of studies addressing potential permeability and leachability. This analysis relied on information contained in the following documents:

- Brocca, D., E. Arvin, and H. Mosbaek. 2002. Identification of organic compounds migrating from polyethylene pipelines into drinking water. *Water Research*, 36: 3675–3680.
- Chemaxx. 2005. Cross-linked polyethylene tubing and water contamination. Available: <http://www.chemaxx.com/polytube1.htm>. Last updated March 11, 2005.
- Durand, M. L., and A. M. Dietrich. 2007. Contributions of silane cross-linked PEX pipe to chemical/solvent odours in drinking water. *Water Science and Technology* 55(5): 153–160.
- Hoffmann, M. R. 2005. *Analysis of PEX and drinking water supplies relative to the UPC of California*. Report provided to the California Building Standards Commission.
- Lee, R. G. 1985 (November 5). *Investigation of plastic pipe permeation by organic chemicals*. Kentucky-Tennessee American Water Works Association Section Meeting.
- NSF International. 2000 (April). *NSF testing of Wirsbo Aqua PEX ½ inch*. Laboratory Report. Ann Arbor, MI.
- NSF International. 2005. *Frequently Asked Questions on Health Effects of PEX Tubing*. Ann Arbor, MI.
- NSF International. 2007. *Drinking Water System Components Health Effects*. NSF/ANSI Standard 61. Ann Arbor, MI.
- McLellan, Clifton. Director of toxicology services. NSF International, Ann Arbor, MI. March 12, 2008a—Letter from Clifton McLellan regarding extraction levels exceeding California drinking water standards. Ann Arbor, MI.
- Skjevrak, I., A. Due, K. O. Gjerstad, and H. Herikstad. 2003. Volatile organic components migrating from plastic pipes (HDPE, PEX and PVC) into drinking water. *Water Research* 37: 1912–1920.
- Tomboulian, P., L. Schweitzer, K. Mullin, J. Wilson, and D. Khiari. 2004. Materials used in drinking water distribution systems: contribution to taste and odor. *Water Science and Technology*, 45(9): 219–226.
- McClellan, Clifton. Director of Toxicology Services. NSF International, Ann Arbor, MI. August 6, 2008b—letter to Kelley Taber of Somach Simmons & Dunn regarding results of PEX testing to NSF/ANSI Standard 61 for PEX decay/over time testing for MTBE and TBA.

These documents are available for review at the California Department of General Services, Real Estate Services Division, Professional Services Branch, Environmental Services Division, 707 Third Street, Suite 3-400, West Sacramento, CA 95605.

THRESHOLDS OF SIGNIFICANCE

The significance criteria below were developed for use in assessing potential impacts to water quality resulting from implementation of the proposed project. The proposed project would result in a significant effect related to water quality if it would:

- cause or substantially contribute to the exceedance of a water quality standard such that implementation of the proposed project would result in a level of a contaminant in drinking water that would cause a substantial impact on human health; or

- cause or substantially contribute to the exceedance of a water quality standard such that implementation of the proposed project would result in a level of a contaminant in drinking water that would substantially exceed a federal or state secondary MCL for taste and odor.

~~The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the California Environmental Quality Act Guidelines. The proposed project would result in a significant effect related to water quality if it would:~~

- ~~violate any water quality standards such that implementation of the proposed project would result in a level of a contaminant in drinking water that exceeds a federal or state MCL, notification or response level, or a Proposition 65 Safe Harbor or other relevant Proposition 65 level; or~~

- ~~violate any water quality standards such that implementation of the proposed project would result in a level of a contaminant in drinking water that exceeds a federal or state secondary MCL for taste and odor.~~

IMPACT ANALYSIS

IMPACT 4.4-1

~~Water Quality—Noncompliance with Drinking Water Standards Resulting from Leaching~~ . ~~*The project would increase the use of PEX tubing in California. Because testing indicates that a proportion of PEX tubing has been associated with leaching levels of MTBE and tertiary butyl alcohol (TBA) at levels exceeding the California primary and secondary MCLs for MTBE and exceeding the California notification and response levels for TBA, and because PEX has the potential to leach Proposition 65 chemicals in concentrations higher than allowed under the Proposition 65 statute and its implementing regulations, this impact is*~~ **potentially** ~~***significant.***~~.

Water Quality—Human Health Impacts Resulting from Leaching of Chemicals from PEX Tubing. *Testing indicates that a proportion of new PEX tubing has been associated with leaching levels of methyl tertiary-butyl ether (MTBE) and tertiary butyl alcohol (TBA) at levels that exceed the California primary MCL for MTBE and the California notification level for TBA. However, testing by NSF demonstrates that this is characteristic of new pipe, and that concentrations of MTBE and TBA decline rapidly so as to preclude the potential for substantial impacts to human health. This impact is* ***less than significant.***

PEX tubing is tested by NSF International to determine whether compounds leaching from the piping are found at concentrations greater or less than the NSF reference criteria (which are derived from EPA and Health Canada drinking water standards and NSF-derived risk-based levels). Leaching means that chemicals are introduced into the drinking water from the PEX itself, which is a very different concept from permeation, where chemicals may be introduced into the drinking water from the chemicals in contaminated soils or groundwater water that surrounds and enters the drinking water through the tubing. For some compounds, California has adopted PHGs, or PHGs and MCLs, notification levels, response levels, Proposition 65 Safe Harbor levels, and secondary MCLs based on taste and odor considerations (which are not considered in the NSF protocol), that are more stringent than the standards used by NSF. Therefore, it is possible that some compounds could leach from PEX in concentrations that exceed California drinking water criteria, even though they may comply with EPA criteria or other criteria used by NSF.

NSF/ANSI Standard 61 Testing Protocol

NSF International has tested PEX piping from various manufacturers and certified the piping to NSF/ANSI Standard 61, Drinking Water System Components—Health Effects. This standard establishes requirements for the testing and evaluation of contaminants that are extracted from water that has been exposed to the material or products that convey potable water (McLellan, pers. comm., 2007). There are 271 PEX products produced at 47 manufacturing sites currently certified by NSF International to the health effects requirements of NSF/ANSI Standard 61 (Id.). PEX piping is tested by exposing the piping to formulated exposure waters of differing pH, and then analyzing the exposure waters for contaminants. Three separate formulated waters are used during the product exposure. Exposure waters of pH 5.0 and pH 10.0 are used because these waters aggressively extract metallic contaminant. An exposure water of pH 8.0 is used for extracting organic contaminants. The piping is tested with water heated to 140^{o}F (30^{o}C) for domestic hot water systems and to 180^{o}F (82^{o}C) for commercial hot water systems (NSF International 2005). Upon completion of exposure, the water is analyzed for a predetermined suite of compounds, including:

- volatile organic compounds;
- semi-volatile organic compounds;
- phenolics;
- regulated metals including antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, selenium and thallium;
- methanol;
- TBA;
- MTBE; and
- any other potential contaminants identified during the formulation review.

NSF International Drinking Water Criteria

NSF compares any detected compounds against the NSF drinking water criteria. These criteria are described in NSF/ANSI Standard 61, Drinking Water System Components Health Effects (NSF International 2007). The testing criteria established for NSF/ANSI 61 are contained in Annex D of NSF/ANSI 61. The criteria are established using:

- consensus EPA and Health Canada drinking water criteria,
- criteria for nonregulated contaminants that have been developed according to the toxicity data requirements of Annex A [of NSF/ANSI Standard 61] and that have been externally peer reviewed, and
- nonregulatory EPA guidance values that have been reviewed and found to satisfy Annex A toxicity data requirements.

Annex E of NSF/ANSI Standard 61 contains “informational” drinking water criteria, which have not undergone external peer review. The drinking water criteria in this annex are intended to be used as guidance in the determination of evaluation criteria for those compounds that do not have normative evaluation criteria established. NSF/ANSI Standard 61 states that its drinking water criteria do not include taste and odor considerations.

Testing Over-Time

PEX manufacturers have suggested that levels of MTBE~~BTE~~ and TBA that leach from PEX decline over-time. Testing by NSF was conducted~~has been initiated~~ to determine if, and at what rate, the levels decline, and to determine if it is a reasonable assumption that levels would decline to concentrations at or below California criteria within a limited period of time. NSF Standard 61, Section 4.5.4.3, is the multiple time point protocol for over-time testing. The protocol states that the testing is to ~~will~~ be conducted over 90 days. The protocol also states that extrapolation may be used by plotting the relationship between contaminant concentration and time using a minimum of five data points. PPFA provided further details on the protocol being followed, stating that the testing will result in 8 data points in the first 17 days of testing to establish an initial rate of reduction in contaminant levels (also known as decay). Data points were~~will be~~ taken every 2 weeks thereafter for at least 90 days to establish longer-term rates of decay (Taber, pers comm., 2008). Initial testing results as of day 21 indicated a general trend of decay of MTBE and TBA over time (see Appendix F1). The final testing results are described below and are summarized at Appendix F2.

Comparison of NSF Criteria and California Drinking Water Standards

For some compounds, California has developed drinking water criteria that are more stringent than those used by NSF. Therefore, it is possible that some compounds could be present in water from NSF-approved pipe that would exceed California drinking water criteria. A list of compounds that may leach from PEX piping was compiled based on various reports (Table 4.4-1). The first set of compounds in Table 4.4-1 (compounds in polyethylene (PE), high-density polyethylene [HDPE], and PEX) are from Tomboulian et al. (2004) who

compiled a list of compounds found by NSF to leach from various water distribution system components. Since publication of the DEIR, it has been determined that some~~Some~~ of these compounds, including butyl benzyl phthalate ~~may be present in PE or HDPE piping,~~ and toluene diamine are not found in PEX tubing~~, but the article does not differentiate between these materials~~ (Bestervelt, pers. comm., 2008). Tomboulian et al. (2004) also list compounds that have leached from polyurethane coatings and liners. These compounds are considered relevant because polyurethane coatings and liners are often used with PEX tubing. In addition to the compounds listed in this paper, additional potentially leachable compounds were compiled from other sources, including Skjevrak et al. (2003). Table 4.4-1 also lists the hierarchy of NSF drinking water criteria for these compounds and California drinking water standards and Proposition 65 listings, if available. Many of the listed compounds do not have NSF criteria or California standards. As discussed above under Section 4.4.1, “Regulatory Setting,” California drinking water standards include PHGs, MCLs, and secondary MCLs (which are usually based on aesthetic considerations), notification levels, response levels (also known as source removal), and Proposition 65 Safe Harbor levels.

There is some terminology that is used by NSF that helps one to better understand the testing methods and interpret the data, but which is unfamiliar to many people. The following explanations may be helpful. A total allowable concentration (which this DEIR refers to as “aqua TAC” to avoid confusion with term TAC as it is used in Air Quality) is the maximum concentration of a nonregulated contaminant allowed in a public drinking water supply, and the single product allowable concentration (SPAC) is 10% of the aqua TAC. A SPAC is the maximum concentration of a contaminant in drinking water that a single product is allowed to contribute. An aqua TAC is the maximum concentration of a nonregulated contaminant allowed in a public drinking water supply.

Evidence received during public review of the DEIR raises questions as to the validity of the California notification level for TBA and its applicability to human health risk assessment. This evidence thus casts doubt on the validity of using the notification level as a threshold of significance in the EIR. Correspondence was received from NSF indicating that the standard is inappropriate for several reasons. In summary, the notification level is not based on a sufficient human health risk assessment (Bestervelt, pers. comm., 2008); the process for derivation of the 12 µg/L notification level in 1999 was noted as an “interim assessment with preliminary calculations, and by no means represents a full risk assessment” and was “based on limited data” (OEHHA 1999); and the limit-setting process used methods that have since been determined to be not relevant to human health, a conclusion supported by U.S. EPA (Bestervelt, pers. comm., 2008). By definition, notification levels are "…nonregulatory, health-based advisory levels…for which maximum contaminant levels have not been established" (California Health and Safety Code Section 116455[c][3]). NSF conducted a human health risk assessment to allow toxicological assessment of TBA, an unregulated contaminant, in drinking water using risk assessment methodology developed by U.S. EPA (Appendix G) and identified levels of 900 to 40,000 µg/L as being protective of human health. The California Office of Environmental Health Hazard Assessment (OEHHA) evaluation of risk assessment for TBA (OEHHA 1999) is also included at Appendix G. As shown in Table 4.4-1, the aqua TAC for TBA is 9,000 µg/L.

Evidence was also received during public review of the DEIR concerning MTBE. A risk assessment performed by NSF in February 2008 identified a total allowable concentration (TAC) of 100 µg/L (Appendix H). Both the California MCL of 13 µg/L and the NSF standard of 100 µg/L are acceptable given current U.S. EPA risk management criteria, and are protective of public health (Bestervelt, pers. comm., 2008). California's risk assessment for MTBE (OEHHA 1999b) is also included at Appendix H.

NSF creates action levels (aqua TAC, SPACs, and short-term exposure levels [STELs]) for contaminants detected in laboratory testing of products in contact with drinking water and food, including potable water pipes and tubing. The basis for the action levels is the oral reference dose for noncancer risk assessment and the appropriate risk level for carcinogen risk assessment. EPA noncancer and cancer risk assessment procedures are followed and a risk assessment document is prepared.

Chemicals that are shaded in Table 4.4-1 are those for which the California primary or secondary MCL, the notification, response, or the Proposition 65 Safe Harbor levels are lower than the criteria used by NSF. The NSF testing results of PEX developed by specific manufacturers were not available, because individual pipe formulas and their test results are considered proprietary information. However, extraction levels for chemicals that may leach from PEX, for which the California primary or secondary MCL or the notification levels are more stringent than the NSF standards, without reference to specific types or manufacturers of PEX were able to be obtained from NSF (McLellan, pers. comm., 2008). These chemicals include benzene, cadmium, carbon disulfide, 1,1-dichloroethane, ethyl benzene, di(2-ethylhexyl) phthalate, MTBE, TBA, benzo(a)pyrene, and toluene. For all of the 271 PEX products that have been tested by NSF, the only chemicals found to exceed California MCLs or notification levels in some proportion of pipes tested were MTBE and TBA. Tables 4.4-2 and 4.4-3 depict NSF's actual extraction levels for MTBE and TBA.

Three Proposition 65 compounds (butyl benzyl phthalate, toluene diamine, and carbon black) thought to be potentially present in PEX formulations and for which there are no California or federal drinking water criteria were identified in the DEIR. According to NSF, butyl benzyl phthalate and toluene diamine are not found in PEX tubing (Bestervelt, pers. comm., 2008). Based on NSF's 20 years of experience in reviewing PEX formulations and testing PEX tubing, NSF has not seen and would not expect to see butyl benzyl phthalate or toluene diamine in the formulation for PEX or in chemical extraction test results of PEX tubing. These compounds are associated with polyurethane, and polyurethane is not an ingredient in PEX nor is it used as a liner or coating for PEX in potable water applications (Bestervelt, pers. comm., 2008). Therefore, butyl benzyl phthalate and toluene diamine are no longer considered constituents of concern, and are not considered further in this EIR.

Carbon black is also identified in the DEIR as a substance potentially present in PEX tubing, and is listed on the Proposition 65 list of "Chemicals Known to the State to Cause Cancer or Reproductive Toxicity." However, carbon black's risks relate to inhalation of airborne, unbound particles of respirable size (CAS No. 1333-86-4). Carbon black is not believed by NSF to be used in PEX tubing (McLellan, pers. comm., 2008d). In addition, reports of its potential use in some brands of PEX would not be a concern because the particles would be bound within the matrix of the pipe, and exposure to airborne particles of carbon black would not occur. Therefore, the Proposition 65 listing for carbon black as airborne unbound particles of respirable size does not apply to PEX tubing (Chaudhuri, pers. comm., 2008). Furthermore, because any carbon black that could potentially be contained in PEX tubing is considered bound, any potential leaching of carbon black from PEX tubing is not a concern under Proposition 65 (Luong, pers. comm., 2008).

Table 4.4-1
Chemicals Potentially Present in PEX Tubing and Comparison between NSF Criteria and California Drinking Water Standards (in Mg/L)

Chemical	NSF Values (Standard 61)[1] D1 USEPA/ Health Canada MCL/MAC mg/L	D1 USEPA/ Health Canada SPAC mg/L	D2 NSF Peer-Reviewed Aqua TAC mg/L	D2 NSF Peer-Reviewed SPAC mg/L	D2 NSF Peer-Reviewed STEL mg/L	D3 NSF based on USEPA guidance Aqua TAC mg/L	D3 NSF based on USEPA guidance SPAC mg/L	D4 TOE[7] mg/L	E1 NSF International Aqua TAC mg/L	E1 NSF International SPAC mg/L	E2 TOE[7] mg/L	California Standards Listed in Prop. 65?[2]	Prop 65 Safe Harbor mg/L	PHG[3] mg/L	MCL[4] mg/L	Secondary MCL [4] mg/L	Notification/ Response Levels[5] mg/L
Chemicals in Polyethylene, HDPE or PEX[8]																	
acetophenone			0.2	0.02	1												
2,4-bis(dimethylethyl)phenol																	
Benzene	0.005	0.0005										x	.0064	0.00015	0.001		
benzothiazole								x									
bis-(dimethylethyl)benzene																	
bisphenol A									0.1	0.01							
BHT (methyl di(t-butyl)phenol)																	
carbon disulfide	0.7	0.07										x					.16 / 1.6
cyclohexadienedione																	
cyclo-hexanone			30	3	40												
cyclopentanone								x									
diazadiketo-cyclotetradecane																	
dicyclopentylone																	
dimethylhexanediol								x									
di-t-butyl oxaspirodecadienedione																	
hydroxymethylethylphenyl ethanone																	
isobutylene								x									
methanol			20	2	20												
methyl butenal								x									
methyl di-t-butyl hydroxyphenyl proprionate			0.02	0.002	0.1												
methyl (di-t-butylhydroxy-phenyl) propionate																	
methylbutenol																	
nonylcyclopropane																	
phenolics																	
phenylenebis-ethanone																	
propenyl-oxymethyl oxirane																	
tertiary butyl alcohol			9	0.9	40												0.012/ 1.2
tetrahydrofuran									1	0.37							
trichloroethylene	0.005	0.0005										x		0.0008	0.005		
Polyurethane coatings and liners (h):																	
1,4-butanediol																	
4,4-methylenedianiline									0.001	0.0001		x	.0004				
bis(2-ethylhexyl)phthalate		0.0006	0.0006									x		0.012	0.004		
bisphenol A diglycidyl ether			1	0.1	5												
butyl benzyl phthalate						1	0.1					x					
diphenyl(ethyl)phosphine oxide																	
di-t-butyl methoxyphenol																	
ethylhexanol									0.05	0.05							
tetramethyl peperidinone											x						
toluene diamine												x					
Additional Chemicals[9]:																	
methyl tert butyl ether (MTBE)						0.1[6]~~05~~[6]								0.013	0.013	0.005	
phthalates																	
carbon black												x					
benzo(a)pyrene	0.0002	0.00002										x	.00006	0.000004	0.002		
mercury	0.002	0.0002										x		0.0012	0.002		
cadmium	0.005	0.0005										x	.0041	0.00004	0.005		
PAHs																	
Additional Chemicals[10]:																	
4-butoxyphenol																	
5-methyl-2-hexanone (MIAK)			0.06	0.006	0.8												
Additional Chemicals [11]:																	
chloroform	0.08	0.008										x	.02				
toluene	1	0.1										x	7	0.15	0.15		

Notes: Shaded chemicals represent those for which NSF values are higher than California drinking water values.
ANS = American National Standard; aqua TAC = total allowable concentration; MAC = maximum acceptable concentration; MCL = maximum contaminant level; mg/L = milligrams per liter; NSF = NSF International, Inc.; PEX = cross-linked polyethylene; PHG = public health goal; SPAC = single product allowable concentration; STEL = short-term exposure level; TOE = threshold of evaluation.
1 NSF and ANSI, 2007: Drinking water systems components Health effects. NSF/ANSI 61 - 2007.
2 OEHHA, 2007: Chemicals Known to the State to Cause Cancer or Reproductive Toxicity. Safe Drinking Water and Toxic Enforcement Act of 1986. [http://oehha.ca.gov/prop65/prop65_list/Newlist.html]
3 OEHHA, 2008: Public Health Goals for Water. [http://oehha.ca.gov/water/phg/allphgs.html]
4 CDPH, 2008: Table 64444-A, Table 64431-A and Table 64449-A. Title 22 California Code of Regulations California Safe Drinking Water Act & Related Laws and Regulations. [http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Lawbook.aspx].
5 OEHHA, 1999: Water Notification Levels. [http://www.oehha.ca.gov/water/pals/index.html].
6 NSF Comment Letter to DGS (Bestervelt, pers. comm., 2008). ~~This NSF value was not found in NSF (2007a), but has been referenced by other sources.~~
7 Chemicals that did not meet the minimum data requirements to develop chemical specific concentrations were evaluated under the threshold of evaluation (TOE). As defined by Section A.7.1 of NSF Standard 61 (NSF International 2007), a risk assessment is not required for a substance if the normalized concentration is less than or equal to the following concentrations: 3 µg/L (micrograms per liter) (chronic exposure, static normalization conditions), 0.3 µg/L (chronic exposure, flowing normalized conditions), and 10 µg/L (short-term exposure, initial laboratory concentration).
8 List of chemicals found by NSF to leach from system components (Tomboulian et al., 2004). Many of these chemicals may not be found in PEX.
9 Various sources.
10 Testing on PEX pipes conducted by Skjevrak et al. (2003).
11 Detected chemicals during NSF testing of Wirsbo Aqua PEX testing, April 2000. Only those with at least one available NSF value or California standard are listed.
Source: Provided by ENSR in 2008.

Table 4.4-2 Extraction Levels for TBA As a Percentage of All Products Tested between January 1, 2005 and December 31, 2007.				
Compound	Not Detected at 200 micrograms per liter (ug/L)	>200 to 1000 ug/L	>1000-9000 ug/L	< 9000 ug/L Resulting in Product Failure
tertiary butyl alcohol (TBA)	62.1%	19.4%	10.9%	7.6%
Source: NSF International 2008.				

Table 4.4-3 Extraction Levels for MTBE As a Percentage of All Products Tested between January 1, 2005 and December 31, 2007.				
Compound	Not Detected at 5 micrograms per liter (ug/L)	>5 to 13 ug/L	>13-20 ug/L	< 20 ug/L
methyl tertiary-butyl ether (MTBE)	74.6%	21.4%	4%	0%
Source: NSF International 2008.				

~~There are certain Proposition 65 chemicals used in some PEX formulations for which NSF tests, but for which data were not available at the time of DEIR publication. These data have been requested, and protective mitigation recommended in the event extraction levels are shown to exceed~~ ~~**California primary or secondary MCLs, or the notification, response, or the Proposition 65 Safe Harbor levels.**~~

~~In addition, there are three Proposition 65 compounds (butyl benzyl phthalate, toluene diamine, and carbon black) used in some PEX formulations for which no California or federal drinking water criteria exist. NSF currently tests for one, butyl benzyl phthalate, and has adopted a total allowable concentration (or aqua TAC, detailed below) of 1 mg/L. NSF will need to conduct additional testing to certify that PEX meets Proposition 65 requirements for all listed compounds (see Mitigation Measure 4.4-1, below).~~

Summary of Studies Regarding Leaching of Chemicals from PEX

In addition to the actual testing data that is available from NSF, there have been leaching tests conducted on PEX by a number of scientists. According to some of these tests, the type of PEX tubing known as PEX-A in some cases has been reported to exhibit MTBE and TBA at levels that are higher than the California EPA drinking water criteria for those chemicals. (Brocca, Arvin, and Mosbaek 2002; Chemaxx 2005) These data suggest that in some cases PEX-A would not meet current California criteria for MTBE and TBA in potable water systems. Generally the other two types of PEX, PEX-B and PEX-C, are cross-linked by different methods, and are not expected to release MTBE or TBA. (Chaduri, pers. comm., 2008.) However, peroxide is sometimes used with PEX-B as well as PEX-A and this is what is thought to contribute to MTBE leaching from PEX.

A study with PEX-B found concentrations of the oxygenate compound, 2-ethoxy-2-methylpropane, commonly called ETBE (ethyl-t-butyl ether). Aqueous concentrations of ETBE in pipe leachate ranged from 23 micrograms per liter (μg/L) to greater than 100 μg/L. People were able to smell ETBE at a concentration of 5 μg/L, therefore ETBE contributed to odor. ETBE does not have a drinking water criterion; however, MTBE, which is a structurally similar oxygenate, has a secondary MCL of 5 μg/L in California. This study reports that PEX-B could have concentrations of ETBE that could contribute to the taste and odor of drinking water.

PEX tubing, similar to other plastic products, has been found to leach various chemicals, including degradation products of antioxidants (which are added to the PEX during the manufacturing process to resist chlorine degradation). Drinking water standards have not been established for most of these antioxidant chemicals and many of them are unregulated; therefore, it would require speculation to reach a conclusion regarding the significance of any potential leaching of chemicals lacking drinking water standards into drinking water. According to Hoffmann (2005; which is a nonpeer reviewed analysis report submitted to the California Building Commission) these chemical concentrations are below those likely to cause adverse health effects. This DEIR evaluates and draws conclusions regarding the significance of the potential leaching of any chemical that is regulated by the federal government or the State of California.

Testing Results of PEX Tubing from One Manufacturer

The NSF testing results of Wirsbo's one-half-inch Aqua PEX tubing (NSF International 2000) were made available and evaluated for comparison against California EPA drinking water criteria. The testing results showed that a number of compounds were detected in the test water (2,2-dichloropropane, chloroform, MTBE, toluene, and TBA). The compounds, their detected concentrations, and the NSF and California criteria are shown in Table 4.4-4. As shown in Table 4.4-4, the detected concentration of MTBE (17 µg/L) is less than the NSF criterion of 50 µg/L, but higher than the California MCL of 13 µg/L and secondary MCL of 5 µg/L. The detected concentration of TBA (6,900 µg/L) is less than the NSF criterion of 9,000 µg/L, but higher than the California EPA Notification Level of 12 µg/L and, in some cases higher than the California response level of 1,200 µg/L. The "response level" is the level at which DPH recommends removing a source from service. The other detected compound concentrations are lower than the NSF or California criteria (no criteria were available for 2,2-dichloropropane). These testing results show that some types of PEX tubing could leach compounds at concentrations higher than California criteria, even though these concentrations may be lower than EPA or other NSF criteria.

Results of Over-Time Testing

Testing by NSF was initiated in April 2008 (about the time of DEIR release) to determine if, and at what rate, the levels decline, and to determine if it is a reasonable assumption that levels would decline to concentrations at or below California criteria within a limited period of time. More specifically, the testing was conducted to determine the point at which the TBA extraction result would be equal to, or lower than 12 µg/L (the California notification level), and the MTBE extraction result would be equal to, or lower than 13 µg/L (the California primary maximum contaminant level [MCL] for MTBE). Testing of 10 samples of PEX tubing to evaluate the over-time extraction (i.e., leaching) of MTBE and TBA was completed in August 2008 (McLellan, pers. comm., 2008b). The 90-day timeframe was chosen because any chemicals that are likely to leach from the tubing would be expected to do so within 90 days (McLellan, pers. comm., 2008c), allowing identification of a trend.

The test results show a steady decline in the concentrations of TBA and MTBE for each PEX sample over time. All 10 samples reached the 13 µg/L primary MCL for MTBE by day 90, and 6 of 10 samples reached the 5 µg/L secondary MCL for taste and odor for MTBE by day 90. For TBA, 2 of the 10 samples reached the California notification level of 12 µg/L by day 90. For the 8 samples that did not reach 12 µg/L by day 90, the estimated time to reach that level based on extrapolated rates of decline is 97 days to greater than 2 years. Test results for TBA show that concentrations in all 10 samples were far below the health risk assessment-based NSF criterion of 9,000 µg/L by day 90, ranging from non-detect to 62 µg/L. Test methodology and results are included in Appendices F1 and F2 of this RDEIR.

Conclusion

Adoption of this regulation would likely increase the use of PEX for potable water uses in California. The leaching of TBA and MTBE at levels that exceed the California notification level and primary and secondary MCLs for these chemicals is associated with PEX-A and certain PEX-B formulations that use t-butyl peroxide for cross-linking polyethylene piping, as discussed in Chapter 3, "Description of the Proposed Project." These chemicals have been determined by the State of California to be potential human carcinogens.

Table 4.4-4
Results of NSF Testing of Wirsbo Aqua PEX (PEX-A) Testing and Comparison against Health-Based Criteria[1]

Chemical[2]	CAS	Detected Concentration	NSF Values (Standard 61)[3]						California Values				
			EPA/Health Canada MCL/MAC	EPA/Health Canada SPAC	NSF Peer-Reviewed Aqua TAC	NSF Peer-Reviewed SPAC	NSF Peer-Reviewed STEL	NSF based on USEPA guidance TAC	Listed in Prop. 65?[4]	PHG[5]	MCL[6]	Secondary MCL[6]	Notification/ Response Level[7]
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L
2,2-dichloropropane	594-20-7	0.0017	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA
chloroform	67-66-3	0.0062	0.08	0.008	NA	NA	NA	NA	x	NA	NA	NA	NA
MTBE	1634-04-4	0.017	0.05[8]							0.013	0.013	0.005	NA
toluene	108-88-3	0.0012	1	0.1	NA	NA	NA	NA	x	0.15	0.15	NA	NA
2-methyl-2-propanol (tertiary butyl alcohol/ TBA)	75-65-0	6.9	NA	NA	9	0.9	40	NA		NA	NA	NA	0.012 / 1.2

Notes:
ANS = American National Standard; aqua TAC = total allowable concentration; EPA = U.S. Environmental Protection Agency; MCL = maximum contaminant level; MAC = maximum acceptable concentration; mg/L = milligrams per liter; NA = not available; NSF = NSF International, Inc.; PEX = cross-linked polyethylene; SPAC = single product allowable concentration; PHG = public health goal; STEL = short-term exposure level.

[1] Testing conducted in April, 2000.

[2] Detected chemicals.

[3] NSF and ANSI 2007: Drinking water systems components Health effects. NSF/ANSI 61—2007.

[4] OEHHA 2007: Chemicals Known to the State to Cause Cancer or Reproductive Toxicity. Safe Drinking Water and Toxic Enforcement Act of 1986. [http://oehha.ca.gov/prop65/prop65_list/Newlist.html]

[5] OEHHA 2008: Public Health Goals for Water. [http://oehha.ca.gov/water/phg/allphgs.html]

[6] DPH 2008: Table 64444-A and Table 64431-A. Title 22 California Code of Regulations California Safe Drinking Water Act & Related Laws and Regulations. http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Lawbook.aspx

[7] OEHHA 1999: Water Notification Levels. [http://www.oehha.ca.gov/water/pals/index.html].

[8] This NSF value was not found in NSF (2007), but has been referenced by other sources.

Source: Provided by ENSR in 2008.

As described above, evidence received during public review of the DEIR raises questions as to the validity of the California notification level for TBA and its applicability to human health risk assessment, and thus its use as a threshold of significance in the EIR. Based on this new information, it is determined that the non-regulatory California notification level of 12 µg/L is overly conservative and not appropriate for use as a threshold of significance for impact assessment purposes. In addition, over-time testing results (as described above) show that concentrations of MTBE and TBA steadily decline at predictable rates, and that TBA concentrations after 90 days are relatively low (ranging from non-detect to 62 µg/L) compared to the NSF health risk assessment-based criterion of 9,000 µg/L. Based on these facts, NSF criteria are considered protective of human health, and exposure to concentrations of TBA indicated in the over-time testing (that continue to decline over time) would not result in a significant impact to human health.

Finally, the question was raised as to whether *any* exceedance of a standard should constitute a significant adverse impact on human health. As described above, test results show that concentrations of TBA and MTBE decline over time. By day 90, all 10 samples met the 13 µg/L MCL for MTBE, and TBA concentrations decline to well below the NSF criterion of 9,000 µg/L. Although the test results show that MTBE and TBA concentrations for some samples are initially higher than the California notification level for TBA and MCL for MTBE, exposure to a chemical concentration that is higher than a California standard for a short period of time is not necessarily a valid indicator of human health risk. Thus, this standard is not a reasonable threshold of significance. The NSF health risk assessment-based criterion for TBA and the MCL for MTBE are based on long-term exposure to those chemicals. The California MCL for MTBE considers effects that may result from MTBE exposure and "estimates the level of the contaminant in drinking water that would pose no significant health risk to individuals consuming the water on a daily basis over a lifetime" (OEHHA 1999a). In addition, a risk assessment performed by NSF for MTBE resulted in a standard of 100 µg/L. Both the California MCL of 13 µg/L and the NSF standard of 100 µg/L are acceptable given current U.S. EPA risk management criteria and are protective of public health. Furthermore, the assumption behind the California MCL is a continuous exposure of the chemical at the regulated level over a lifetime. Because concentrations of contaminants leaching from plumbing products decay rapidly over time, they should not be assumed to be consistent and continuous over the lifetime of a product (Bestervelt, pers. comm., 2008). Therefore, short term exposure to TBA or MTBE at levels exceeding California standards would not cause a substantial adverse impact on human health.

Because over-time test results show that concentrations of TBA and MTBE decline over-time, and by day 90, all 10 PEX samples met the 13 µg/L MCL for MTBE and TBA concentrations decline to well below the NSF criterion of 9,000 µg/L; the NSF standard for MTBE of 100 µg/L is protective of public health; and short term exposure to TBA or MTBE at levels exceeding California standards would not cause a substantial adverse impact on human health, this impact is **less than significant**.

~~In addition, there are Proposition 65 chemicals that may or may not leach from PEX, three of which (butyl benzyl phthalate, toluene diamine, and carbon black) have no California or federal drinking water criteria and do not have Proposition 65 Safe Harbor levels. Because PEX has been associated with the leaching of MTBE at levels that, at least initially, exceed State of California health-based MCLs; leaching of TBA at levels that, at least initially, exceed the California notification and response levels; and that may or may not leach certain Proposition 65 chemicals at levels that exceed Safe Harbor or other levels authorized by Proposition 65 and the regulations implementing Proposition 65, this would represent a **potentially significant** impact.~~

~~Mitigation Measure 4.4-1: Noncompliance with Drinking Water Standards Resulting from Leaching.~~

~~NSF certifies that each formulation of PEX tubing for potable water with the marking "NSF ®-pw" has met the NSF 61 standards for drinking water. Every PEX formulation from each manufacturer is tested before certification. Before using PEX for human consumption uses, PEX must receive NSF certification that any leached concentrations of MTBE, TBA, or Proposition 65 chemicals is below the relevant MCL, notification, or Safe Harbor level or other applicable Proposition 65 level for those chemicals. The Building Standards Commission shall require that PEX installed in California for water for human consumption be physically marked~~

in a manner that indicates that the pipe is certified for California human consumption water uses and meets all California drinking water criteria under the California Safe Drinking Water Act and Proposition 65.

Significance after Mitigation: Adoption of Mitigation Measure 4.4.1 would reduce potential impacts relative to leaching of MTBE, TBA, or Proposition 65 chemicals to **less than significant** levels.

IMPACT 4.4-2 Water Quality—Adverse Taste and Odor Impacts. *The proposed project would result in the increased use of PEX tubing in California, 25.4% of which initially (i.e., in new pipe) exceeds the secondary MCL for MTBE for taste and odor set by DPH. However, because: 1) concentrations of these chemicals leaching from plumbing pipes decline rapidly with time (see discussion above and at Appendix F2), 2) secondary standards relate to taste and odor qualities of water and not human health; and 3)there are no known consumer complaints of taste and odor impacts from PEX tubing, this impactThus, a substantial number of people would be affected by unpleasant tastes and odors in drinking water on a frequent basis. This is considered* **less thana significant.** *impact.*

The occurrence and severity of taste and odor impacts depend on numerous factors, including the nature, frequency, and intensity of the source. Although offensive tastes and odors rarely cause any physical harm, they can be unpleasant, leading to considerable distress and often generating citizen complaints to local governments and regulatory agencies. With respect to the proposed project, installation of PEX could lead to leaching or permeation of chemicals into drinking water which, a recent study has shown, declines rapidly with time. Presence of certain chemicals in drinking water can lead to unpleasant odor and taste of water as perceived by the user. Water utilities strive to provide drinking water that does not have unpleasant taste and odor. DPH sets primary MCLs for drinking water to protect public health, and secondary MCLs to address aesthetic properties of drinking water. Table 4.4-5 below summarizes taste and odor standards and potential for use of PEX to affect taste and odor of drinking water.

Table 4.4-5
Potential Chemicals Present in Drinking Water Transported through PEX Tubing and Secondary Maximum Contaminant Level Standards

Substance	NSF Standard for PEX	PEX Performance	Secondary MCL	Perceived Taste or Odor
MTBE	50 ppb	25.4% of pipe exceeds 5 ppb	5 ppb	turpentine
bisphenol-A	0.1 ppm	> 0.1 ppm	-	medicinal

Note:
MCL = maximum contaminant levels; MTBE = methyl tertiary-butyl ether; ppb = parts per billion; ppm = parts per million
Source: California Safe Drinking Water Act and Related Laws and Regulations (Title 22, California Code of Regulations, Section 64448); Tomboulian et al. 2004; data provided by ENSR in 2008.

The proposed project could result in the leaching of chemicals into drinking water that affect taste and odor. NSF testing data provided in the record demonstrate that PEX is known to leach MTBE in concentrations that would exceed the secondary MCL for MTBE. However, based on over-time testing results described above, chemical concentrations decline rapidly with time, so that exceedances of guidelines for taste, odor, and appearance of water would be temporary. Importantly, a significant amount of PEX tubing is currently installed in California, the United States, and Europe, and there is no known record of consumer complaint regarding adverse taste and odor impacts attributable to PEX tubing (Taber, pers. comm., 2008). Furthermore, taste and odor impacts are aesthetic impacts, and are not health impacts. California Health and Safety Code, Section 116275(d), describes the purpose of establishing a secondary MCL. The statute states:

"Secondary drinking water standards may apply to any contaminant in drinking water that may adversely affect the odor or appearance of the water and may cause a substantial number of persons served by the public water system to discontinue its use, or that may otherwise adversely affect the public welfare."

Thus, secondary drinking water standards are aesthetic, and do not directly pertain to public health risks. However, there is no other chemical for which quantitative evidence of exceedance of a secondary MCL exists. Based on the exceedances of the secondary MCL, as documented by NSF, the impacts on the aesthetic Therefore, this impact is considered **less than significant.** properties of drinking water (taste and odor) would be **significant**.

Mitigation Measure 4.4-2: Adverse Taste and Odor Impacts.

Before using PEX for human consumption water uses, PEX must receive NSF certification that any leached concentrations of MTBE is below the secondary California MCL for this chemical. PEX manufacturers claim that MBTE and TBA levels leached from PEX decline over time. They may pursue testing by NSF to determine whether the levels decline to below California criteria within a limited time.

Significance after Mitigation: Adoption of Mitigation Measure 4.4.2 would reduce taste and odor impacts on drinking water from leaching MTBE to less than significant.

IMPACT 4.4-3 Water Quality—Noncompliance with Drinking Water Standards Resulting from Permeation. *In cases where PEX is placed below the slab (i.e., in bare soil) where contaminated soils are present and permeated by solvents or gasoline, it has the potential to introduce chemicals into drinking water at levels in exceedance of federal and California MCLs, notification and response levels, or the Proposition 65 Safe Harbor levels, as well as to introduce Proposition 65 chemicals for which there are no adopted federal or California standards. Because the project would allow the use of PEX for hot and cold water distribution including potable water uses and the proposed regulations provide no restriction on uses below the slab this project could result in a* potentially significant *impact.*

Summary of Case Reports of Permeation

Lee (1985) discussed several case histories of permeation of plastic pipes by organic compounds in the environment. The East Bay Municipal Utility District in Oakland, California reported four instances of apparent petroleum distillate penetration of polybutylene (PB) water service lines. A case in Maryland was reported in which concentrations up to 5,500 µg/L of toluene were found in a water sample collected from a service line consisting of both PE and PB. The soil surrounding the service line was contaminated with gasoline as a result of a leaking underground storage tank. The Alabama Department of Environmental Management reported permeation of PB service pipes with diesel fuel. In another incident, a private residence in Chattanooga, Tennessee reported that gasoline had leaked from the resident's car in the vicinity of a three-quarter-inch PE service line and permeated the service line. A similar incident occurred in Darien, Connecticut where a resident complaint of gasoline odor in tap water resulted in sample analysis which showed benzene (>100 µg/L) and toluene (>50 µg/L) in the tap water. The odors were absent after flushing and when the homeowners' plumbing was in daily use. Samples collected after the system had not been used for 2 days contained approximately16 µg/L benzene and a gasoline odor. The resident's 1¼-inch PE service line was replaced with copper after it was determined that an abandoned underground gasoline storage tank on the resident's property had developed a leak and saturated the ground surrounding the line. Although PB, PE, and PEX are all members of the polyolefin family, this does not mean that PEX will automatically behave similarly to PB and PE. However, there is a lack of data regarding how PEX may behave differently from other members of the polyolefin family when it comes to issues of permeability.

Permeation by Various Organic Compounds

Lee (1985) also discussed a research investigation carried out by the American Water Works Service Company to determine the extent and nature of permeation of several different organic compounds through the types of service lines in use in the American Water Works system. Five pipe materials were used—iron, copper, PE, PB, and PVC. The conditions of exposure were designed to simulate worst-case field conditions. One exposure tank involved exposure of the five piping materials to a vapor environment. The second exposure tank involved exposure of the five piping materials to a moist soil environment to which sufficient chemical was added; the pipe was above the saturated soil, but still within the moist capillary zone. Three organic compounds were investigated in each exposure tank—gasoline, trichloroethylene (TCE) and chlordane. The pipes were in contact separately with the three organic compounds for a minimum 10-week exposure period. The pipes were unjointed three-quarter-inch lines filled with tap water. Water samples were analyzed at four intervals during the exposure period. The results were reported as follows:

- Iron and copper pipes were not permeated by any of the organic compounds in either the soil or the vapor environments.
- PE pipe was permeated by TCE within 1 week in both the soil and vapor exposure conditions. Gasoline permeation occurred within 1 day in the vapor and 3 weeks in the soil exposure. Chlordane did not permeate the polyethylene pipe in either the soil or vapor exposure condition.
- Chlordane did not permeate the polybutylene and PVC pipes. Both types of pipes showed permeation of TCE and gasoline in both the soil or vapor exposure conditions.

The study authors concluded that plastic pipe is susceptible to permeation from certain organic compounds, particularly solvents. Based on these results, the authors recommend that limitations are desirable in areas where the potential for soil contamination is high, such as a gasoline storage area.

Theoretical Calculations of Permeation

In his analysis report, Hoffmann (2005) conducted theoretical calculations on the length of time that would be required for an organic compound to permeate through the walls of PEX pipe. He estimated the characteristic time for diffusion of a compound through PEX pipe with a wall thickness of 0.5 centimeter (0.2 inch) and a diffusion coefficient of 1.0 x 10–12 centimeters squared per second to be 8,000 years. The diffusion coefficient used by Hoffmann appears to be representative of termiticides (he lists six representative termiticides—bifenthrin, chlorpyrifos, cypermethrin, fenvalerate, imidachoprid, and permethrin). However, Hoffmann does not comment on the experimental results of Lee (1985) where the author found that PE pipe was permeated by both TCE and gasoline (in both the soil and vapor phase) within several weeks. Lee (1985) found that chlordane did not permeate any of the pipes. Therefore, it is possible that Hoffmann's theoretical calculations apply only to organic compounds that are termiticides or pesticides (such as chlordane). However, his calculations may not apply to solvents, such as gasoline or TCE, which appear to have much faster permeation rates through plastic pipes based on the experimental results reported in Lee (1985).

Permeation by Solvents, Gasoline, Pesticides, and Termiticides

Evidence shows that use of PEX tubing should be restricted under certain soil conditions and, in fact, manufacturers recommend restrictions in certain instances. (Vanguard Piping Systems, Inc. 2000:19.) Manufacture installation handbooks regularly provide warnings such as "must not be installed underground in areas of known chemical contamination of the soil, such as organic solvents or petroleum distillates, or where there is a high risk of chemical spills." (Id.) A permeation study showed that polyethylene pipe was permeated by both TCE and gasoline (in both the soil and vapor phase) within several weeks. Chlordane was also tested for permeation; however, polyethylene pipe was not permeated by chlordane. The same study also tested iron and copper pipes, which were not permeated by any of the organic compounds in either the soil or the vapor environments. The study authors concluded that plastic pipe is susceptible to permeation by certain organic compounds, particularly solvents. Based on these results, the authors recommend that limitations are desirable in areas where the potential for soil contamination is high, such as a gasoline storage area. Theoretical calculations on permeation of termiticides indicated that these types of organic compounds would not permeate PEX piping (Hoffmann 2005). Therefore, termiticides or pesticides are less likely to permeate PEX piping, and do not represent a concern. However, compounds such as gasoline and chlorinated solvents could present concerns for permeation.

As discussed above, in cases where PEX is placed in contaminated soils and permeated by solvents or gasoline, it has the potential to introduce chemicals into drinking water at levels far in exceedance of federal and state MCLs. Because the project would allow the use of PEX for hot and cold water distribution including potable water uses and the proposed regulations provide no restriction on uses below the slab (i.e. under the house) this project could result in a **potentially significant** impact.

Mitigation Measure 4.4-3: Noncompliance with California and Federal Drinking Water Standards (including Proposition 65) Resulting from Permeation.

The regulation shall prohibit~~require~~ the installation of PEX for potable water uses ~~above the slab unless:~~ below the slab (i.e., in bare soil) unless:

- ~~a Phase 1 Environmental Site Assessment is conducted following the ASTM E1527-05 standard, for every project that would use PEX below the slab, which concludes that contamination of the soils or groundwater in areas where PEX tubing would be placed or could be reasonably permeated by nearby contamination with solvents or gasoline is unlikely; or,~~

- ~~The~~ PEX is sleeved by a metal or other material that is impermeable to solvents and petroleum products.

~~A "project" subject to the Phase I assessment requirement could be anything from a single housing unit to a project of several thousand units of housing. So for a project of one unit or of multiple units, only one Phase I assessment would be required for the entire project. A Phase I Environmental Site Assessment, often referred to as "environmental due diligence," is used by purchasers and lenders to evaluate a property for potential environmental contamination and to assess the potential liability for contamination present at the property. Compliance with ASTM E1527-05 standards would include:~~

- ~~review of federal, state, and local environmental databases;~~

- ~~interviews with local environmental oversight agencies and interviews with property owners and/or other interested party(ies);~~

- ~~review of historical building permits, historical insurance (Sanborn) maps, historical city directories, historical topographic maps, and historical aerial photographs;~~

- ~~inspection of subject property and surrounding areas;~~

- ~~research of public agency records pertaining to historical land use (e.g., GeoTracker database); and~~

- ~~conclusions regarding the presence or potential presence of environmental liabilities at the subject property.~~

~~The conclusions will include a determination regarding the likelihood of the presence of solvents or gasoline in soils on the property. This will provide adequate assurance that the property is not contaminated with solvents or gasoline.~~

Significance after Mitigation: Adoption of Mitigation Measure 4.4-3 would ensure that potential impacts to public health ~~on compliance with Drinking Water Standards~~ resulting from permeation are reduced to **less than significant**.

4.4.4 SIGNIFICANT AND UNAVOIDABLE IMPACTS

Because all potentially significant and significant impacts would be reduced to less than significant with the implementation of mitigation, no water quality impacts would be significant and unavoidable.

5 CUMULATIVE IMPACTS

5.1 INTRODUCTION

California Environmental Quality Act (CEQA) Guidelines (State CEQA Guidelines), Section 15130, require that an environmental impact report (EIR) discuss cumulative impacts of a project and determine if the project's incremental effect is "cumulatively considerable." The definition of cumulatively considerable is provided in Section 15065(a)(3):

> "Cumulatively considerable" means that 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.

According to Section 15130(b) of the State CEQA Guidelines:

> "[t]he discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact."

For purposes of this EIR, the project would have a significant cumulative effect if:

- The cumulative effects of related projects (past, current, and probable future projects) without the project are not significant and the project's incremental impact is substantial enough, when added to the cumulative effects, to result in a significant impact.

- The cumulative effects of related projects (past, current, and probable future projects) without the project are already significant and the project contributes measurably to the effect. The standards used herein to determine measurability are that either the impact must be noticeable or must exceed an established threshold of significance.

- The cumulative effects of related past environmental impacts added to project's incremental impacts results in a significant impact.

Mitigation measures are to be developed, where feasible, that reduce the project's contribution to cumulative effects to a less-than-significant level.

This draft EIR (DEIR) identified potentially significant and significant environmental impacts associated with implementation of the proposed project; those impacts are addressed in Chapter 4, "Affected Environment, Thresholds of Significance, Environmental Impacts, and Mitigation Measures."

5.2 RELATED PROJECTS AND PAST ENVIRONMENTAL IMPACTS

The analysis of cumulative environmental impacts associated with the project addresses the potential incremental impacts of the project in combination with those of other past, present, and probable future projects. For the purposes of this analysis, the chlorinated polyvinyl chloride (CPVC) plastic plumbing pipe project is a related past project.

The Adoption of Regulations Permitting Statewide Residential Use of CPVC Plastic Plumbing Pipe (CPVC) project is the adoption of regulations (i.e., building standards) pertaining to the use of CPVC pipe for potable water plumbing applications in a variety of structures including hotels, motels, apartment houses, condominiums, and shelters for homeless persons. The lead agency for the CPVC project was the State of California Department of Housing and Community Development (HCD). The regulations were recently approved, and became effective January 1, 2008, and are now part of the California Plumbing Code (CPC) (HCD 2006:11).

PEX tubing is currently used in California for hydronic heating systems, all uses including potable water in manufactured homes, use as an alternate material in nearly 200 California cities and nearly 30 California counties, and all uses in three cities that have approved its use by ordinance (see Chapter 3, "Description of the Proposed Project"). Implementation of the proposed project would increase the use of PEX tubing for potable water applications, with a proportionate decrease in the use of other piping materials (such as copper). It is assumed that the proposed project would increase the estimated percentage use of PEX tubing in California from approximately 37% to 45% because of the reduced labor costs associated with installation of PEX and because of corrosivity issues with copper piping resulting from the increased use of chloramines for drinking water disinfection (see Section 3.4.4, "Current and Projected Uses of PEX").

Without considering the potential approval of the statewide use of PEX tubing, adoption of the CPVC project was projected to increase the estimated percentage use of CPVC piping in California from approximately 13% to 30% and proportionately decrease the use of other plumbing materials (HCD 2006b). Because both the CPVC project and the proposed PEX project will result in more plastic plumbing materials being used in California, the CPVC project is a relevant related past project and will be considered in the following cumulative impact analysis.

The analysis of cumulative environmental impacts associated with the project also addresses the potential incremental impacts of the project in combination with those of past environmental impacts. For the purposes of this analysis, the presence of methyl tertiary butyl ether (MTBE) ~~or tertiary butyl alcohol (TBA)~~ in drinking water sources is considered a past environmental impact.

MTBE has been detected in a number of drinking water sources in California at levels greater than MTBE's California primary MCL of 0.013 mg/L and secondary MCL of 0.005 mg/L. In addition, MTBE has been detected in drinking water sources at levels less than 0.005 mg/L (CDPH 2006). As described in Impact 4.4-1 (see Section 4.4, "Water Quality"), testing indicates that a proportion of PEX tubing has been associated with leaching levels of MTBE and TBA at levels exceeding the California primary and secondary MCLs for MTBE and exceeding the California notification and response levels for TBA.

5.3 ANALYSIS OF CUMULATIVE IMPACTS

The following sections contain a discussion of the cumulative effects anticipated from project implementation along with the related CPVC project and MTBE and TBA contamination for each of the four environmental issue areas evaluated in Chapter 4 of this DEIR. The analysis conforms with Section 15130 of the State CEQA Guidelines, which specifies that the "discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided of the effects attributable to the project alone."

5.3.1 AIR QUALITY

CRITERIA AIR POLLUTANT AND TAC EMISSIONS

Criteria air pollutants include ozone, carbon monoxide (CO), nitrogen dioxide, sulfur dioxide, fine particulate matter, respirable particulate mater (PM_{10}), and lead. Ozone is a photochemical oxidant, a substance whose oxygen combines chemically with another substance in the presence of sunlight. Hydrocarbons are organic gases that are formed solely of hydrogen and carbon. There are several subsets of organic gases including volatile organic compounds (VOCs) and reactive organic gases (ROGs). Certain VOCs are considered ROGs. ROGs and oxides of nitrogen (NO_X) are emitted primarily by mobile sources and stationary combustion equipment. Another source of hydrocarbons is evaporation from petroleum fuels, adhesives, solvents, dry cleaning solutions, paint, primer, and cement. ROG emissions combine with NO_X to form ozone. ROG and NO_X are therefore ozone precursors. Adhesives and solvents can evaporate and react with other chemicals to form ozone. Because installation and repair of PEX tubing would not require the use of adhesives or solvents (i.e., ROGs), would not require soldering (which is a source of PM_{10}), and PEX tubing is not manufactured in the State of California, the proposed project would not increase emissions of ozone precursors (e.g., ROGs and NO_X), lead, sulfur oxides, CO, or PM in California. Thus, criteria air pollutant impacts would not occur and the project would not combine cumulatively with the CPVC project to result in any significant criteria air pollutant impacts. In addition, the project would not result in or contribute to cumulative toxic air contaminant (TAC) impacts. Compared to copper, the transportation of lighter weight PEX tubing would reduce truck transport emissions of ROGs, PM, and diesel PM (a TAC).

Because the proposed project would not emit any criteria air pollutants and would not result in an increased risk of exposure of sensitive receptors to TAC emissions, cumulative impacts would be **less than significant**, and the proposed project's contribution would not be cumulatively considerable.

PEX AND CPVC INCINERATION

Upon incineration in the event of a structure fire, plastic piping materials (including PEX and CPVC) could release chemicals considered TACs, which could then pose a health hazard to the public or emergency personnel. As described in Section 4.1, "Air Quality," the expanded use of all types of plastics as well as other building materials and contents and the products of combustion generated by these materials in the fire environment creates an increasingly toxic environment within a burning structure. However, common materials and products made from wood and other organic fibers also produce toxic products of combustion hazardous to the health of humans. The quantity of plastic tubing is relatively insignificant when compared to all the other materials within a typical structure. It takes about 500 feet of PEX with a total weight of approximately 65 pounds (similar to the weight of a typical coffee table) to plumb an average single family home. Therefore, the added toxic products of combustion generated by PEX tubing (or CPVC) in a fire would be comparatively minor, and testing and field data indicate that gases emitted from plastic piping are no more toxic than other common building and furnishing materials found in structures (such as carpeting, electronics, insulation, and wood). The extent to which plastic tubing would contribute to this risk would be minor in comparison to the total, and additionally, structure fire would be considered an anomaly and not part of the baseline under CEQA.

The impacts associated with TAC emissions from incineration of plastic plumbing materials (including PEX and CPVC) as a result of a structure fire would be **less than significant**, and the project's contribution would not be considerable.

CLIMATE CHANGE

An individual project cannot generate enough greenhouse gas (GHG) emissions to significantly influence global climate change. The project participates in this potential impact by its incremental contribution, combined with the cumulative contributions of all other sources of GHGs, which, when taken together, cause global climate change impacts. Subsections 4.1.1 and 4.1.2 of Section 4.1, "Air Quality," provide a discussion of the existing physical and regulatory setting related to climate change and GHG emissions.

Because no thresholds of significance or methods of analysis of GHG emissions are adopted or recommended, an appropriate approach is to examine the proposed project in context relative to existing conditions. The following discussion reviews the proposed project's potential generation of GHGs and its incremental contribution to the cumulative effect resulting from emissions of GHGs.

PEX tubing is already being produced at manufacturing facilities outside of California. Industrial sources of GHG emissions made up 4.6% of the total United States GHG emissions inventory in 2005 (EPA 2007:12). The proposed project would generate GHG emissions associated with increased demand for PEX as it would replace other approved plumbing materials in California. According to a life cycle assessment for production of plumbing materials, PEX pipe was estimated to result in approximately 370 pounds of carbon dioxide (CO_2) equivalent (a measurement used to normalize the global warming potential of all GHGs to that of an equivalent mass of CO_2) per 1,000 feet of water pipe produced (PPFA 2007:75). CPVC pipe was estimated to result in approximately 425 pounds of CO_2 equivalent, and copper tubing was estimated to result in more than 700 pounds of CO_2 equivalent. Because plumbing pipe production is a function of market demand, the proposed project would not increase the overall demand for plumbing pipe in the marketplace. Rather, PEX would be used in place of some other existing allowable material. In California, copper tubing currently constitutes the majority of the existing market share in plumbing materials. However, the market share for copper tubing would decrease as the market share for PEX tubing and CPVC pipe increase.

The proposed project would result in a reduction in GHG emissions associated with pipe production as compared with the existing condition, which was estimated to result in substantially higher GHGs emissions over the life cycle. Increased CPVC market share would also result in a reduction in GHG emissions associated with pipe production as compared to the existing condition. The proposed project would not result in a substantial increase in GHG emissions relative to existing conditions, and would not result in a cumulatively considerable contribution to the impact of global climate change, and this impact would be **less than significant**.

5.3.2 PUBLIC HEALTH AND HAZARDS

BIOFILM, FIRE IGNITION RISK, FIRE SPREAD RISK, AND WORKER SAFETY HAZARD IMPACTS

Biofilm growth, fire ignition and spread risk, premature PEX failure leading to formation of mold and worker safety hazards are concerns that have been raised regarding the proposed project and the CPVC project. However, impacts related to biofilm growth, fire ignition and spread risk, and worker safety hazards are considered less than significant under the project because:

- PEX does not have increased levels of biofilm as compared to copper beyond the first 200 days of use and, even if it did, biofilm growth does not correspond to higher amounts of *Legionella* bacteria and the project would not lead to increased risk of human contact with a pathogenic bacteria;

- PEX is not particularly flammable and the project would conform to applicable CPC requirements and design and installation guidelines which are protective against potential fire spread hazards; and

- the proposed project does not require the use of solvents, glues, or open flames during installation.

Because the project's biofilm, fire spread risk, and safety hazard impacts would be less than significant, no mitigation measures are required and no significant public health or hazards impacts would occur. Because the CPVC project would also conform to applicable CPC requirements and design and installation guidelines, and because safety hazards associated with the CPVC project are less than significant (HCD 2006:ES), these impacts would be considered **less than significant** both on an individual project and cumulative basis, and the project's contribution would not be considerable.

PREMATURE PEX FAILURE, FLOODING AND POTENTIAL MOLD IMPACTS

As discussed in Section 4.2, "Public Health and Hazards," the impact associated with risk of premature or unexpected PEX failure potentially increasing the incidence of mold would be potentially significant because the ASTM F2023 testing standard does not test for continuously recirculating hot chlorinated water. However, this impact would be mitigated to less-than-significant levels through the Building Standards Commission's adoption of regulatory language requiring certification using the NSF P171 CL-R standard or a yet-to-be adopted equally rigorous standard that assumes 100% continuously recirculating chlorinated hot water, would ensure a conservative product lifetime of 40 years and is approved by the Building Standards Commission for testing PEX for continuously recirculating hot chlorinated water. The CPVC project must also meet applicable testing standards; therefore, additive effects would not result from the combination of the CPVC project and the proposed project.

Implementation of the project with the proposed mitigation would not create increased risk of premature PEX failure and would not result in any cumulatively considerable incremental contributions to any significant cumulative impacts. This would be a **less-than-significant** cumulative public health and hazard impact, and the project's contribution would not be considerable.

5.3.3 SOLID WASTE

Similar to the proposed PEX tubing project, the approval of CPVC for statewide potable water use would be expected to increase the volume of plastic tubing debris requiring disposal. Plastic tubing debris would be generated when CPVC and PEX tubing is replaced in an existing structure, when CPVC and PEX tubing is installed in a structure, and when various types of buildings and structures containing PEX and CPVC tubing are demolished. Assuming plastic pipes and fittings represent 100% of all durable plastic items in the construction and demolition waste stream, and PEX and CPVC tubing represent 100% of all plastic pipes and fittings, PEX and CPVC tubing would represent up to 0.04% of the waste placed in landfills annually. Although PEX is not currently recyclable, some amount of PEX tubing could be diverted and sold for other uses such as composite lumber, nonpressure irrigation, or filler in cement and asphalt. CPVC is recyclable, and it would be reasonable to assume that some CPVC would be diverted in the future. Therefore, the maximum amount of PEX and CPVC solid waste generated annually would not be substantial in relation to the total amount of landfilled solid waste.

Although implementation of the proposed project, in combination with increased CPVC plastic tubing debris, would be expected to increase the volume of plastic debris requiring disposal, because the amount of PEX and CPVC solid waste generated annually would not be substantial in relation to the total amount of landfilled solid waste, this would be a **less-than-significant** cumulative impact, and the project's contribution would not be cumulatively considerable

5.3.4 WATER QUALITY

LEACHING IMPACTS

Testing indicates that a proportion of new PEX tubing has been associated with the leaching of methyl tertiary-butyl ether (MTBE) at levels that initially exceed California's primary and secondary MCLs for MTBE, and of tertiary butyl alcohol (TBA) at levels that initially exceed the California notification level for TBA. As described in Section 4.4, "Water Quality," it was suggested by industry experts that this condition is only a feature of new pipe and that these constituents decay rapidly with use. To test this assertion, NSF conducted a study that sampled concentrations of MTBE and TBA over a 90-day period. The study shows that MTBE concentrations in all 10 samples were below the California MCL of 13 µg/L by day 90. In addition, TBA concentrations in all 10 samples were far below the NSF criterion of 9000 µg/L by day 90; 8 out of 10 samples were far below the NSF criterion but above the California notification level of 12 µg/L, ranging from non-detect to 62 µg/L; and 2 out of 10 samples were below the notification level.

As described also in Section 4.4, "Water Quality," Evidence received during public review of the DEIR raises questions as to the validity of the California notification level for TBA and its applicability to human health risk assessment. This evidence thus casts doubt on the validity of using the notification level as a threshold of significance in the EIR. Correspondence was received from NSF indicating that the standard is inappropriate for several reasons. In summary, the notification level is not based on a sufficient human health risk assessment (Bestervelt, pers. comm., 2008); the process for derivation of the 12 µg/L notification level in 1999 was noted as an "interim assessment with preliminary calculations, and by no means represents a full risk assessment" and was "based on limited data" (OEHHA 1999); and the limit-setting process used methods that have since been determined to be not relevant to human health, a conclusion supported by U.S. EPA (Bestervelt, pers. comm., 2008). By definition, notification levels are "…nonregulatory, health-based advisory levels…for which maximum contaminant levels have not been established" (California Health and Safety Code Section 116455[c][3]). NSF conducted a human health risk assessment to allow toxicological assessment of TBA, an unregulated contaminant, in drinking water using risk assessment methodology developed by U.S. EPA (Appendix G) and identified levels of 900 to 40,000 µg/L as being protective of human health. The California Office of Environmental Health Hazard Assessment (OEHHA) evaluation of risk assessment for TBA (OEHHA 1999) is also included at Appendix G.

Based on this new information, it is determined that the non-regulatory California notification level of 12 µg/L is overly conservative and not appropriate for use as a threshold of significance for impact assessment purposes. In addition, over-time testing results (as described above) show that concentrations of MTBE and TBA steadily decline at predictable rates, and that TBA concentrations after 90 days are relatively low (ranging from non-detect to 62 µg/L) compared to the NSF health risk assessment-based criterion of 9,000 µg/L. Based on these facts, NSF criteria are considered protective of human health, and exposure to concentrations of TBA indicated in the over-time testing (that continue to decline over time) would not result in a significant impact to human health.

Finally, the question was raised as to whether *any* exceedance of a standard should constitute a significant adverse impact on human health. As described above, test results show that concentrations of TBA and MTBE decline over time. By day 90, all 10 samples met the 13 µg/L MCL for MTBE, and TBA concentrations decline to well below the NSF criterion of 9,000 µg/L. Although the test results show that MTBE and TBA concentrations for some samples are initially higher than the California notification level for TBA and MCL for MTBE, exposure to a chemical concentration that is higher than a California standard for a short period of time is not necessarily a valid indicator of human health risk. Thus, this standard is not a reasonable threshold of significance. The NSF health risk assessment-based criterion for TBA and the MCL for MTBE are based on long-term exposure to those chemicals. The California MCL for MTBE considers effects that may result from MTBE exposure and "estimates the level of the contaminant in drinking water that would pose no significant health risk to individuals consuming the water on a daily basis over a lifetime" (OEHHA 1999a). In addition, a risk assessment performed by NSF for MTBE resulted in a standard of 100 µg/L. Both the California MCL of 13 µg/L and the NSF standard of 100 µg/L are acceptable given current U.S. EPA risk management criteria and are protective of public health. In addition, the assumption behind the California MCL is a continuous exposure of the chemical at the regulated level over a lifetime. Because concentrations of contaminants leaching from plumbing products decay rapidly over time, they should not be assumed to be consistent and continuous over the lifetime of a product (Bestervelt, pers. comm., 2008). Therefore, short term exposure to TBA or MTBE at levels exceeding California standards would not cause a substantial adverse impact on human health.

With regard to taste and odor, NSF testing data show that new PEX pipe can leach MTBE at concentrations that exceed the secondary MCL for MTBE. However, based on over-time testing results described above, chemical concentrations decline rapidly with time, so that exceedances of guidelines for taste, odor, and appearance of water would be temporary. Importantly, a significant amount of PEX tubing is currently installed in California, the United States, and Europe, and there is no known record of consumer complaint regarding adverse taste and odor impacts attributable to PEX tubing (Taber, pers. comm., 2008). Furthermore, taste and odor impacts are aesthetic impacts, and are not health impacts. California Health and Safety Code, Section 116275(d), describes the purpose of establishing a secondary MCL. The statute states:

> "Secondary drinking water standards may apply to any contaminant in drinking water that may adversely affect the odor or appearance of the water and may cause a substantial number of persons served by the public water system to discontinue its use, or that may otherwise adversely affect the public welfare."

Thus, secondary drinking water standards are aesthetic, and do not directly pertain to public health risks.

~~As discussed in Section 4.4, "Water Quality," the proposed project would result in potentially significant leaching and permeation impacts, as well as significant taste and odor impacts. Because testing indicates that a proportion of PEX tubing has been associated with the leaching of levels of methyl tertiary-butyl ether (MTBE) and tertiary butyl alcohol (TBA) at levels exceeding California drinking water standards, and because PEX has the potential to leach Proposition 65 chemicals in concentrations higher than allowed under Proposition 65 and its implementing regulations, leaching impacts would be potentially significant. In addition, testing indicates that a proportion of PEX tubing has been associated with levels of MTBE at levels exceeding the California secondary maximum contaminant levels (MCL) for taste and odor; this would be a significant impact. However, these impacts would be mitigated to less-than-significant levels by ensuring that, before using PEX tubing for potable water uses, it receives NSF certification that any leached concentrations of MTBE, TBA, or Proposition 65 chemicals are below the relevant California MCL, California secondary MCL, California notification level, Proposition 65 Safe Harbor, or other relevant Proposition 65 levels for those chemicals.~~

The CPVC project would be required to ~~must also~~ meet applicable testing standards for leachates; therefore, additive effects causing substantial human health impacts would not result from the combination of the CPVC project and the proposed project.

Because the proposed project would not result in levels of contaminants in drinking water that would cause substantial human health impacts, and the CPVC project would be required to~~must~~ meet applicable testing standards for leachates, this would be a **less-than-significant** cumulative water quality impact, and the project's contribution would not be considerable.

PERMEATION IMPACTS

The proposed project would also have potentially significant permeation impacts. In cases where PEX is placed below the slab where contaminated soils are present and permeated by solvents or gasoline, PEX has the potential to introduce chemicals into drinking water at levels in exceedance of federal and state MCLs. Because the project would allow the use of PEX tubing and the proposed regulations provide no restriction on uses below the slab (i.e., in the ground), permeation impacts would be potentially significant. However, this impact would be mitigated to a less-than-significant level by prohibiting the installation of PEX for potable water uses below the slab unless ~~a Phase I Environmental Site Assessment for the project is conducted following the ASTM E1527-05 standard, demonstrating that the soil is clean or, that~~ the pipe is sleeved using a metal or other material that is impermeable to solvents and petroleum products.

Because permeation impacts are not associated with CPVC piping, additive effects would not result from the combination of the CPVC project and the proposed project. Additionally, the potentially significant impact of permeation would be mitigated to a less-than-significant level by prohibiting the installation of PEX for potable water uses below the slab unless ~~a Phase I Environmental Site Assessment for the project is conducted following the ASTM E1527-05 standard, demonstrating that the soil is clean or, that~~ the pipe is sleeved using a metal or other material that is impermeable to solvents and petroleum products and so would not combine with past impacts of contaminated soils or groundwater. This would be a **less-than-significant** cumulative water quality impact, and the project's contribution would not be considerable.

ADDITIVE MTBE ~~AND TBA~~ IMPACTS

The use of PEX tubing for human consumption uses has the potential to contribute to drinking water contamination from MTBE ~~or TBA~~ when used in combination with certain environmental conditions. MTBE has been detected in 0.6 % (i.e., 89 out of 14,351) ~~a number of~~ drinking water sources in California at levels greater than either ~~MTBE's~~ the California primary MCL for MTBE of 0.013 mg/L ~~and~~ or secondary MCL of 0.005 mg/L. ~~Furthermore~~Only~~,~~ 0.2 % of these sources (i.e., approximately 28) exceeded the primary MCL for MTBE, and another 28 sources had a peak level higher than the secondary MCL but lower than the primary MCL (DPH 2006). In addition, MTBE has been detected in several drinking water sources at levels less than 0.005 mg/L.

Levels of MTBE ~~or TBA~~ in drinking water could combine with MTBE ~~or TBA~~ leached from PEX tubing to reach~~at~~ levels exceeding the California primary and secondary MCLs for MTBE. ~~The Building Standards Commission Regulation will include a prohibition on using PEX in buildings served by water sources with known MTBE and/or TBA contamination such that anticipated MTBE or TBA leaching from PEX in combination with existing water contamination would cause chemicals in the water to exceed California primary or secondary MCL drinking water standards.~~

~~The use of PEX tubing for human consumption uses has the potential to contribute to drinking water contamination from MTBE or TBA when used in combination with certain environmental conditions.~~ This impact has the greatest potential to occur where the source water (either well water or water from a public water provider) ~~also~~ contains a ~~those~~ contaminant~~s~~. In that case, depending on the situation, the water served by a public water provider or a well, for example, could contain a level of a contaminant, such as MTBE, that does not exceed the MCL. However, combined with the MTBE from PEX, also below the California MCL for MTBE, the MCL could be exceeded, even though the contribution from PEX is individually insignificant. Based on the incidence of known drinking water sources in California with MTBE at levels greater than MTBE's California primary MCL of 0.013 mg/L and secondary MCL of 0.005 mg/L (i.e., 89 out of 14,351), this situation would be rare. As described under "Leaching Impacts" above (see also Section 4.4, "Water Quality" and Appendices F1 and F2), an NSF over-time testing study found that MTBE concentrations may be higher in new pipe, but decline rapidly with time. All tested samples were below the California MCL of 13 µg/L by day 90. Chemical concentrations leaching from plumbing pipes decline over time, so that in most cases any exceedances of drinking water standards would be temporary. Potential temporary additive exposure to concentrations of MTBE slightly in excess of 13 µg/L (and far less than the NSF "aqua TAC" of 100 µg/L) would not result in a level of a contaminant in drinking water that would cause a substantial human health impact.

With respect to taste and odor, based on the over-time testing results described above, chemical concentrations decline rapidly with time, so that exceedances of guidelines for taste, odor, and appearance of water would be temporary. Importantly, a significant amount of PEX tubing is currently installed in California, the United States, and Europe, and there is no known record of consumer complaint regarding adverse taste and odor impacts attributable to PEX tubing. Furthermore, taste and odor impacts are aesthetic impacts, and are not health impacts. California Health and Safety Code, Section 116275(d), describes the purpose of establishing a secondary MCL. The statute states:

> "Secondary drinking water standards may apply to any contaminant in drinking water that may adversely affect the odor or appearance of the water and may cause a substantial number of persons served by the public water system to discontinue its use, or that may otherwise adversely affect the public welfare."

Thus, secondary drinking water standards are aesthetic, and do not directly pertain to public health risks.

Therefore, the cumulative impact on drinking water from chemicals leaching from PEX in combination with certain environmental conditions would be **less than** significant, and the project's contribution would not be~~be potentially~~ cumulatively considerable.

~~Mitigation Measure 5-1: Cumulative Noncompliance with Drinking Water Standards Resulting from Leaching.~~

~~For water service areas that have detectable levels of MTBE or TBA in drinking water or where there is known MTBE or TBA contamination of a source of drinking water, PEX tubing installed for human consumption uses must be certified not to leach detectable levels of MTBE or TBA.~~

~~Significance after Mitigation: Adoption of Mitigation Measure 5-1 would prevent any cumulatively considerable contribution of MTBE or TBA from PEX and would reduce this impact to **less than significant**.~~

7 ALTERNATIVES TO THE PROJECT

The California Environmental Quality Act (CEQA) Guidelines (State CEQA Guidelines) (Section 15126.6[a]) require evaluation of "a range of reasonable alternatives to the project, or the location of the project, which would feasibly attain most of the basic project objectives but would avoid or substantially lessen any of the significant effects, and evaluate the comparative merits of the alternatives." The purpose of the alternatives analysis is to determine whether or not a variation of the project would reduce or eliminate significant project impacts, within the basic framework of the objectives.

Thus, alternatives considered in an environmental impact report (EIR) should be feasible and should attain basic project objectives. As described in Section 3.3, "Project Objectives," the objective of the proposed project is to provide an alternative hot and cold water plumbing material for use in California.

7.1 RANGE OF ALTERNATIVES CONSIDERED

The range of alternatives studied in the EIR is governed by the "rule of reason," requiring evaluation of only those alternatives "necessary to permit a reasoned choice" (State CEQA Guidelines Section 15126.6[f]). Further, an EIR "need not consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative" (State CEQA Guidelines Section 15126.6[f][3]). The analysis should focus on alternatives that are feasible (i.e., that may be accomplished in a successful manner within a reasonable period of time) and that take economic, environmental, social, and technological factors into account. Alternatives that are remote or speculative need not be discussed. Furthermore, the alternatives analyzed for a project should focus on reducing or avoiding significant environmental impacts associated with the project as proposed.

The State CEQA Guidelines (Section 15126.6[e]) require that, among other alternatives, a "no-project" alternative be evaluated in comparison to the project and that it "discuss the existing conditions, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with the available infrastructure and community services." Accordingly, a No Project Alternative is analyzed in this draft EIR (DEIR).

Descriptions of project alternatives are provided below. The advantages and disadvantages of each, compared to the project, are presented and an evaluation of each alternative's ability to meet the project's objective is included. Any significant environmental impacts created exclusively by an alternative are also identified. Finally, a summary of the impacts for each resource area, as compared to the project, is provided at the end of each discussion (i.e., less, greater, or similar).

A more detailed description of the baseline conditions, evaluation methodology, and results are included in Chapter 4 of this DEIR.

7.2 SUMMARY OF ENVIRONMENTAL IMPACTS

The purpose of this section is to summarize the specific environmental constraints, as identified and discussed in Chapter 4, "Affected Environment, Thresholds of Significance, Environmental Impacts, and Mitigation Measures," of this DEIR. Potential environmental impacts, including indoor air quality (i.e. mold) and drinking water quality could result in significant or potentially significant environmental impacts. After implementation of the proposed mitigation measures, all of the impacts associated with the project would be reduced to less-than-significant levels. The potential for the alternatives to avoid or reduce the project's significant impacts was considered in the analysis of alternatives.

As discussed in Section 4.1, “Air Quality,” the project could result in a potential significant increase in pipe failure and as a result of pipe failure, a resultant exposure of sensitive receptors to molds, which would be an indoor air quality impact. PEX tubing which has not been tested under NSF P171 CL-R in buildings with continuously recirculating hot chlorinated water systems within jurisdictions that use chlorine may have shorter product lives than copper, chlorinated polyvinyl chloride (CPVC), or PEX used in traditional domestic systems. However, proposed mitigation would require PEX to be tested using the NSF P171 CL-R standard or a comparable yet-to-be-adopted test which tests for continuously recirculating hot chlorinated water and incorporates a safety factor to account for unusually high chlorine levels or harsh water conditions. With implementation of recommended mitigation, this impact would be reduced to a less-than-significant level.

As discussed in Section 4.2, “Public Health and Hazards,” the project could result in a significant increase in pipe failure and as a result of pipe failure, exposure of sensitive receptors to molds. PEX tubing which has not been tested under NSF P171 CL-R in buildings with continuously recirculating hot chlorinated water systems within jurisdictions that use chlorine may have shorter product lives than copper, chlorinated polyvinyl chloride (CPVC), or PEX used in traditional domestic systems. However, proposed mitigation would require PEX to be tested using the NSF P171 CL-R standard or a comparable yet-to-be-adopted test which tests for continuously recirculating hot chlorinated water and incorporates a safety factor to account for unusually high chlorine levels or harsh water conditions. With implementation of recommended mitigation, this impact would be reduced to a less-than-significant level.

As discussed in Section 4.4, “Water Quality,” the project would increase the use of PEX tubing in California. ~~and testing indicates that a proportion of PEX tubing has been associated with the leaching of methyl tertiary butyl ether (MTBE) at levels exceeding the primary and secondary California maximum contaminant level (MCL), and tertiary butyl alcohol (TBA) at levels exceeding the California notification and response levels. In addition, PEX has the potential to leach Proposition 65 chemicals in concentrations higher than allowed under Proposition 65 and its implementing regulations. The California Building Standards Commission (BSC) will adopt mitigation to ensure that that any leached concentrations of MTBE, TBA, or Proposition 65 chemicals are below the relevant MCL, notification level, Proposition 65 Safe Harbor, or other applicable Proposition 65 level for those chemicals. With implementation of recommended mitigation, this impact would be reduced to a less-than-significant level.~~

~~Additionally, i~~In cases where PEX is placed below the slab (i.e., underneath the house) where contaminated soils or water is present and is permeated by solvents or gasoline, PEX has the potential to introduce those chemicals into drinking water at levels in exceedence of federal and California MCLs, notification or response levels, or the Proposition 65 safe harbor or other applicable levels. However, BSC will adopt mitigation that prohibits the installation of PEX for potable water below the slab unless ~~a Phase I Environmental Site Assessment in accordance with ASTM E1527-05 is conducted and concludes that site soils are not contaminated, or~~ the PEX tubing is sleeved. With implementation of recommended mitigation, this impact would be reduced to a less-than-significant level.

~~Finally, the proposed project would result in the increased use of PEX tubing in California, 25.4% of which exceeds the secondary MCL for MTBE for taste and odor set by the California Department of Public Health. BSC will adopt a mitigation measure to ensure that that any leached concentrations of MTBE are below the secondary MCL for MTBE. With implementation of this mitigation, this impact would be reduced to a less-than-significant level.~~

7.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

State CEQA Guidelines Section 15126.6(c) provides that an EIR “should also identify any alternatives that were considered by the lead agency but rejected as infeasible during the scoping process and briefly explain the reasons underlying the lead agency’s determination.”

One alternative considered but rejected from consideration is an alternative that would have limited the use of PEX to highly acidic or highly alkaline soils because copper is known to corrode in highly alkaline or highly acidic soils, so perhaps PEX would be a better material to use in that case. However, restricting use to a certain type of soil would be infeasible to implement because it would require soil testing for each project.

Another alternative considered was to evaluate other types of plastics for plumbing uses in California. However, there are no new plastic piping materials that the BSC is aware of that are not already approved for use in California for which there is sufficient information for California to make an informed decision regarding its efficacy and safety at this time.

7.4 ALTERNATIVES CONSIDERED FOR DETAILED EVALUATION

The analysis presented below evaluates two alternatives to the project: No Project Alternative and a Mitigated Design Alternative. These alternatives were selected based on their ability to reduce or avoid the project's significant impacts based on the constraints identified in Section 7.2, "Summary of Environmental Impacts." Although the number of alternatives considered is relatively limited, given the nature of the project, adoption or not of specific plumbing regulations that would allow the use of PEX, the range of alternatives is reasonable. Because the basic objective of the project involves providing another plastic piping alternative for use in California, alternatives that are inconsistent with this objective are not considered. All the alternatives considered herein are designed to reduce the impacts of the project and provide a reasonable range of alternatives for consideration by decision makers.

7.4.1 ALTERNATIVE A: NO PROJECT ALTERNATIVE

The proposed project would adopt new state plumbing code regulations that would remove the prohibition against the statewide use of PEX tubing in various cold and hot water plumbing (including potable water) applications in residential, commercial, and institutional buildings. As discussed in Chapter 3, "Description of the Proposed Project," PEX is widely used throughout California for hydronic radiant heat flooring and is authorized for all uses in manufactured homes. Three cities have adopted ordinances allowing unrestricted PEX use and nearly 200 California cities and nearly 30 California counties have approved the use of PEX as an alternate material. The No Project Alternative is defined as the current pipe usage in California plus the reasonably foreseeable future pipe usage for approved plumbing materials if the regulation is not adopted and the prohibition against the use of PEX for hot and cold water distribution (including potable water uses) is not removed.

The 2005 California market shares for piping materials for new single-family homes were approximately 29% PEX, 13% CPVC, 54% copper, and 4% for all other materials. More recent data on PEX indicate that it now constitutes 37% of the California market for piping materials for new single-family homes. Assuming that the proposed regulation is not adopted, the market share for PEX could remain at about 37% for new single-family homes. The November 2006 recirculated DEIR for the Adoption of Regulations Permitting the Statewide Residential Use of CPVC (HCD 2006:45) projected that with the adoption of that regulation, the market share for CPVC for new single-family homes would increase to approximately 30%, which is equal to the percent of the nationwide market share for CPVC. Therefore, a likely distribution of market share in California for new single-family homes under a No Project scenario could eventually comprise approximately 30% CPVC, 37% PEX, 29% copper, and 4% all other materials.

With or without the proposed project, it is anticipated that the market share for copper in California will continue to decline and the proportion of plastic pipe use will continue to grow proportionately. This is due in part to recent changes to federal drinking water standards to reduce exposures to disinfection by-products (dbps), specifically trihalomethanes, which are known carcinogens and reproductive toxicants. The most economical way for public water agencies to meet the new federal standards to reduce exposure to dbps is to switch from chlorine to chloramines for disinfection of water supplies (EPA 2007a). That switch has been a recent trend in California

(EPA 2007b). As discussed in Section 4.2, "Public Health and Hazards," and Section 4.4, "Water Quality," chloramines have a corrosive effect on copper tubing. This fact, combined with the lower costs for materials and labor related to the use of plastic piping materials, means that it is likely that the plastic tubing market in California will continue to grow, even under the No Project Alternative. If use of PEX in California were to decline under the No Project Alternative, it is likely that the result would be an increase in the use of CPVC rather than an increase in the use of copper for the reasons discussed above.

Consistent with CEQA requirements, this No Project Alternative is evaluated in this DEIR. The No Project Alternative would not meet the project's basic objective to provide an alternative hot and cold water plumbing material for use in California, but it allows decision makers and the public a way to compare the impacts of approving the proposed project with the impacts of not approving the proposed project.

ENVIRONMENTAL ANALYSIS

Air Quality

The No Project Alternative would involve the continued use of copper, CPVC, and other plastic tubing in California, in a market historically dominated by copper. The production process of copper is environmentally intensive. Copper ore is strip-mined, shipped, and smelted during its life cycle (Mitchem, pers. comm., 2007). Under the No Project Alternative, the generation of toxic air contaminant (TAC) emissions and related exposure associated with production and manufacture of copper tubing would not result in any change relative to existing conditions.

In the short term, installation and repair of copper tubing, the dominant material in water tubing use in California, requires soldering, which releases toxic and carcinogenic smoke and vapors into the atmosphere. A study measuring organic vapors generated during soldering of copper tubing demonstrated that the vapors contain the following chemicals, known to be present on the California Air Resources Board's (ARB's) TAC Identification List: chlormethane; vinyl chloride; chloroethane; carbon disulfide; isopropyl alcohol; methlyene chloride; hexane; vinyl acetate; 2-butanone; benzene; 1,2 dichlorethane; trichloroethylene; 1,4-dioxane; toluene; 4-methyl-2-pentanone; tetrachlorethylene; ethyl benzene; chlorobenzene; m/p-xylene; o-xylene; styrene; and benzyl chloride (ARB 2008, HCD 2006). Though the amount of these chemicals emitted into the atmosphere during the copper soldering process was not quantified in this study, it provides a basis for the potential air quality effects from copper tubing installation under existing conditions (Research Triangle Park Laboratories 2006, as cited in HCD 2006:34–35). See Section 4.2, "Public Health and Hazards," for an analysis of worker exposure to solder emissions associated with installation of copper tubing. The generation of TAC emissions and related exposure associated with installation of copper would not result in any change relative to existing conditions.

In addition, as described above under the No Project Alternative, the market for allowable plumbing materials in California would continue to trend toward plastic tubing, and CPVC is the only plastic tubing currently approved for statewide potable water uses. Installation of CPVC requires the use of adhesives and solvents that emit volatile organic compounds into the atmosphere, including reactive organic gases (ROG), which are precursors to the criteria air pollutant, ozone. As analyzed in the DEIR prepared for CPVC, allowing the expanded use of CPVC in California would result in a significant and unavoidable impact with respect to emissions of ROGs in several California Air Districts (HCD 2006:49–50). Under the No Project Alternative, the market would continue to trend further toward the use of CPVC in California, thus, further increasing ROG emissions associated with adhesives and solvents used in installation of CPVC, and increasing the severity of this already significant and unavoidable impact (i.e., increased emissions of criteria air pollutants or precursors). This would be a significant impact of the No Project Alternative.

Because this alternative would increase ROG emissions associated with adhesives and solvents used in the installation of CPVC, increasing the severity of this significant and unavoidable impact, this alternative would result in **greater** air quality impacts than the proposed project.

Public Health and Hazards

Under the No Project Alternative, increased risk of *Legionella* growth would be similar to the project because all piping materials exhibit some amount of biofilm formation, and no direct quantitative correlation exists between measurements of biofilm and growth of *Legionella* (Veenendaal and van der Kooij 1999). Therefore, increased biofilm growth does not correspond to higher amounts of *Legionella* bacteria, and the use of CPVC and PEX tubing in California would not lead to increased risk of human contact with pathogenic bacteria. This is a less-than-significant impact, and is this alternative would result in **similar** biofilm impacts as the project.

Copper tubing requires an open flame for welding pieces together, and this may pose a fire threat if safety precautions are not implemented. However, because welders using copper tubing are required to comply with industry safety regulations, the threat of increased fire hazard during welding of copper tubing is very unlikely. Copper also has a very high melting point, 1,984.3°F (Environmental Chemistry 2008), which is much hotter than the average structural fire. The continued use of copper tubing is unlikely to result in increased fire hazards.

CPVC was recently approved for use in California on January 1, 2008, and therefore, data pertaining specifically to how CPVC reacts in fires is not readily available. However, CPVC pipes have similar characteristics to other plastic pipes. Therefore, the discussion in Impact 4.2-2, for the proposed project, applies to CPVC pipes. The use of plastic pipes, including CPVC, is not likely to increase fire ignition and fire spread. The use of copper and CPVC would not result in increased fire hazard. Therefore, this impact is less than significant, and fire spread impacts would be **similar** to the proposed project.

Since the introduction of chloramines to disinfect the potable water supply in place of chlorine, in some areas copper tubing has failed because of corrosion from the use of chloramines. Additionally, jurisdictions with "aggressive" (i.e., corrosive) water may experience copper tubing failure because of the corrosive nature that is characteristic of this type of water. While copper tubing failure does occur, this problem is confined to certain areas within California where chloramines are used and where aggressive water is a problem. Therefore, copper tubing failure is not representative of the historical and statewide use of copper tubing. Further, the current and projected use of CPVC, PEX (in some jurisdictions), and other materials for potable water plumbing provide viable alternatives for the specific parts of California where chloramines and aggressive soils cause copper tubing failure. Although PEX tubing may potentially have a shorter product lifespan than copper when used in continuously recirculating, hot chlorinated water systems, there is no evidence showing widespread PEX failure when PEX is used with such systems, and recommended mitigation would ensure a conservative product lifetime of 40 years (see Section 4.2, "Public Health and Hazards"). Therefore, impacts would be **similar**. ~~Because the No Project Alternative provides for plumbing material that will not result in pipe failure, it would not result in a significant mold impact, and this alternative's mold impacts are considered **less** than those associated with the proposed project.~~

Copper tubing is currently used for the majority of potable water pipes installed in California. The recirculated DEIR for CPVC (CPVC RDEIR) (HCD 2006) assessed worker safety issues for the installation of copper tubing (HCD 2006:134–139). Installing copper requires the application of flux (a substance used to promote fusion, such as rosin) and the use of a propane torch to join pipe pieces together. The application of flux presents danger to workers if not done correctly because of the corrosive nature of flux and potentially harmful fumes. The CPVC RDEIR cites studies that concluded that numerous toxic organic vapors are generated during the copper tubing soldering process. These materials are released into the workplace atmosphere and can be inhaled by workers if safety precautions are not implemented. Additionally, heat sources generated and used during soldering can cause serious burns and start fires. Copper tubing also poses a risk of electrocution because it conducts electricity very well. Health risks associated with copper tubing installation would not be expected to occur to installers who comply with recommended installation and safety practices (HCD 2006:134–139). Because there are industry standards regarding health and safety issues for workers, this is considered a less-than-significant impact.

CPVC was approved for statewide use beginning January 1, 2008. Existing law and regulations require that employers provide the safety equipment recommended in label directions and safe use instruction on the Materials Safety Data Sheet. Compliance with label directions and safe use instruction is enforced by the California Occupational Safety and Health Administration, and a failure to comply could result in penalties. The CPVC RDEIR cites worker safety studies from the National Institute for Occupational Safety and Health, the California Department of Health Services, Robert G. Tardiff, and Thomas Reid. Both short-term and long-term exposure was assessed. This RDEIR concluded that inhalation exposure to vapors from CPVC installation, dermal exposure to CPVC adhesives, and carcinogenic effects from CPVC adhesives, were all less-than-significant worker safety impacts (HCD 2006:142–152). Because the impact under the proposed project is beneficial, while under the No Project Alternative it is less than significant, this alternative would result in **greater** safety impacts than the proposed project

PEX can be as durable as or even more durable than other currently approved plumbing materials, however it is prone to oxidation under certain conditions. The NSF and ASTM testing standards generally provide adequate assurances that PEX will last for the duration that it is certified to last (generally at least 40–50 years). However, ASTM does not currently test for continuously recirculating chlorinated hot water and this fact creates the possibility of a potentially significant mold impact if PEX should fail under certain circumstances. It is not that PEX certified under ASTM 2023 would necessarily fail in a continuously recirculating system, rather, it is that NSF 171 CL-R is the only currently used standard that considers chorine resistance under this particular use of PEX. ~~Because the No Project Alternative provides for plumbing materials that would not result in a significant mold impact, this alternative would avoid the project's potentially significant mold-related impact, and this alternative would result in **less** mold impacts than the proposed project. However~~In any case mitigation is recommended to increase the certainty that PEX will have a reasonable service life, and after mitigation, the potential impacts of the proposed project would be reduced to less-than-significant levels and the public health and hazards impacts of the No Project Alternative and the proposed project (after mitigation) would be **similar**. ~~In summary, the proposed project would result in potentially significant mold-related impacts, and these impacts would be reduced to less-than-significant levels after mitigation.~~

~~Because the No Project Alternative provides for plumbing materials that would not result in a significant mold impact, this alternative would avoid the project's potentially significant mold-related impact, and mold impacts under this alternative would be less than the proposed project. Overall, the No Project Alternative would result in **less** public health and hazards impacts than the proposed project.~~

Solid Waste

Under the No Project Alternative, the use of PEX would be expected to remain at current levels or perhaps decrease slightly while the use of CPVC would be expected to increase from about 14% of the market share for new single-family homes to about 30% (HCD 2006). The use of copper is projected to decrease under all of the alternatives. However, this reduction may be slightly less under the No Project Alternative because fewer tubing choices would be available in many jurisdictions.

CPVC plastic pipe was recently approved for statewide potable water uses including residential buildings beginning January 1, 2008. Similar to the proposed PEX tubing project, the approval of CPVC for statewide potable water use is expected to increase the volume of plastic tubing debris requiring disposal. Plastic tubing debris would be generated when CPVC and PEX tubing is replaced in an existing structure, when CPVC and PEX tubing is installed in a new structure, and when various types of buildings and structures containing PEX and CPVC tubing are demolished. Assuming plastic pipes and fittings represent 100% of all durable plastic items in the construction and demolition waste stream, and PEX and CPVC tubing represent 100% of all plastic pipes and fittings, PEX and CPVC tubing would represent up to 0.04% of the waste placed in landfills annually. Although PEX is not currently recyclable, some amount of PEX tubing could be diverted and sold for other uses such as composite lumber, irrigation tubing, or filler in cement and asphalt. CPVC is recyclable, and it would be reasonable to assume that some CPVC would be diverted in the future. In addition, future new technologies, markets, or policies could possibly emerge resulting in the diversion of additional PEX and CPVC from landfills. Therefore, the maximum amount of PEX and CPVC solid waste generated annually under the No Project Alternative would not be substantial in relation to the total amount of landfilled solid waste, and would not affect the ability of any landfill to accept the waste or result in early closure of any landfill. The volume of solid waste generated under the No Project Alternative may be slightly less than the amount of solid waste generated under the proposed project if the decline in copper use is reduced because of fewer alternative tubing materials available in some jurisdictions. Therefore, the potential solid waste impact of the No Project Alternative is less than significant.

Because the proposed project would not result in any significant impacts related to solid waste and the No Project Alternative would not reduce or avoid any significant impacts related to this issue area, **similar** impacts would occur.

Water Quality

Noncompliance with Drinking Water Standards Resulting from Leaching

PEX tubing is tested by NSF International to determine whether compounds that may leach from PEX are found at concentrations greater than the NSF reference criteria (which are derived from U.S. Environmental Protection Ageny (EPA) and Health Canada drinking water standards and NSF-derived risk-based levels). For some compounds, California has adopted Public Health Goals (PHGs), or PHGs, MCLs, notification levels, Proposition 65 Safe Harbor levels, and secondary MCLs based on taste and odor considerations (which are not considered in the NSF protocol), that are more stringent than the standards used by NSF. Therefore, it is possible that some compounds could leach from PEX in concentrations that exceed California drinking water criteria, even though they may comply with EPA criteria or other criteria used by NSF. Under the No Project Alternative, the use of PEX would remain the same as under current conditions or possibly decline slightly. The proposed project would increase the use of PEX tubing, and testing indicates that a proportion of PEX tubing has been associated with leaching levels of MTBE at levels initially exceeding California MCLs for MTBE and exceeding the California notification and response levels for TBA. However, for the reasons stated in ~~S~~section 4.4, "Water Quality," these impacts are not considered significant. ~~In addition, PEX has the potential to leach Proposition 65 chemicals in concentrations higher than allowed under the Proposition 65 statute and implementing regulations. Proposed project impacts would be reduced to less-than-significant levels after mitigation.~~ Because the increased use of PEX would not result in significant water quality impact from leaching,~~the use of PEX under~~ impacts of ~~the No Project alternative would remain the same as under current conditions, and PEX use would increase under the proposed project,~~ the No Project Alternative would be **similar** to ~~avoid~~ the proposed project~~'s leaching impacts, and impacts would be **less** under this alternative~~.

Noncompliance with Drinking Water Standards Resulting from Permeation

In cases where PEX is placed below the slab where contaminated soils are present and permeated by solvents or gasoline, PEX has the potential to introduce chemicals into drinking water at levels that exceed federal and California MCLs, notification and response levels, or Proposition 65 Safe Harbor levels, which could result in a potentially significant impact. The proposed project would increase the use of PEX tubing. Proposed project impacts would be reduced to less-than-significant levels after mitigation. Because the use of PEX under this alternative would remain the same as under current conditions, and PEX use would increase under the proposed project, this alternative would avoid proposed project permeation impacts, and impacts would be **less** under this alternative.

Noncompliance with California MCL for Copper in Drinking Water or TMDL for Copper in a Surface Water Body

In situations where the pH of water is below 6.5, the potential exists for copper to leach from copper tubing into drinking water at concentrations above allowable levels (NSF International 2004). It is not unusual for drinking water to become slightly acidic (i.e., pH less than 7.0) because dissolution of naturally occurring carbon dioxide (CO_2) or nitrogen dioxide (NO_2) from the atmosphere into surface water can cause water to take on acidic properties (carbonic acid, nitric acid, respectively). Treatment processes, such as reverse osmosis and ozone, which are commonly used in California, are also known to lower the pH of water.

One effect of the federal disinfection by-products rules has been a trend of public water systems toward using chloramines in favor of chlorine for drinking water disinfection. According to EPA, because chloramines are not as reactive as chlorine, it forms fewer disinfection by-products. Because residual from chloramines is more stable and longer lasting than free chlorine, it provides better protection against bacterial regrowth in systems with large storage tanks and dead-end water mains. (EPA 2007a.) Chloramines, like chlorine, are effective in controlling biofilm, which is a coating in the pipe caused by bacteria. Controlling biofilm also tends to reduce coliform bacteria concentrations and biofilm-induced corrosion of pipes. Because chloramines do not tend to react with organic compounds, many systems will experience fewer taste and odor complaints when using chloramines. Chloramine technology is relatively easy to install and operate. It is also among the less-expensive disinfectant alternatives to chlorine.

Use of chloramines can result in potential water quality problems (e.g., nitrification and corrosion) if the treatment process is not carefully controlled and the system's operational practices are not appropriately adjusted for the new disinfectant. Chloramines can change the chemical properties of the water, which can corrode lead and copper. Chloramines can indirectly affect corrosion of lead and copper in two ways. First, when chloramines are used in water treatment as a residual disinfectant, it can change the chemical properties of the water, which subsequently can corrode lead and copper. Certain conditions related to pH, alkalinity, and dissolved inorganic carbonate levels in the water can cause lead to dissolve from pipe material. Second, chloramination, if not properly optimized, can result in nitrification (conversion of ammonia into nitrite and then nitrate) in the presence of bacteria. Nitrification can lower the pH of the water, which can increase corrosion of lead and copper. EPA makes the following recommendations to reduce the increased risk of corrosion as a result of the switch to chloramines:

- The water system should perform an optimal corrosion control treatment study before introducing chloramines into the distribution system.
- The water system should add chemicals to the finished water to form a protective coating on the pipes, such as an orthophosphate corrosion inhibitor.
- The water system should optimize the chloramination process to minimize the possibility of nitrification that can reduce pH and increase corrosion.

These recommendations are not mandatory, and there is no penalty for drinking water agencies that fail to implement them. Thus it cannot be stated with certainty that chloramine-induced corrosion will not continue to occur in copper pipes. However, t~~T~~he No Project Alternative would not likely increase the use of copper above current levels and thus would result in a less-than-significant impact regarding copper in drinking water. Compared to current levels, copper use would likely decrease under the proposed project. Because copper use under the No Project Alternative would be higher than copper use under the proposed project, this alternative would result in **greater** copper-related impacts.

Exposure of Sensitive Receptors to Odors

The No Project Alternative would involve the continued use of copper, CPVC, and other plastic pipe in California, in a market historically dominated by copper. In situations where the pH of water is below 6.5, there is the potential for copper to leach from copper tubing into drinking water in concentrations above allowable levels (NSF International 2004). This situation is not uncommon; drinking water can become slightly acidic (i.e., pH less than 7.0) from dissolution of CO_2 or NO_2 into surface water from the atmosphere, which can cause water to take on acidic properties (carbonic acid, nitric acid, respectively), and treatment processes commonly used in California are also known to lower the pH of water.

Chemicals found to leach from currently allowed pipe materials, the applicable secondary MCLs, and perceived taste and odor of the drinking water are summarized in Table 7-1.

Under existing conditions, taste and odor of drinking water are affected by dissolved chemicals and may cause associated taste and odor impacts for some individuals. The No Project Alternative would not result in a change from existing conditions and because no substantial adverse condition is known to exist, the impact would be considered less than significant. The proposed project would result in the increased use of PEX tubing in California, 25.4% of which initially exceeds the secondary MCL for MTBE for taste and odor set by DPH~~, and this would be a significant impact~~. However, as noted in section 4.4.1 (Impact 4.4-2) the project also would not have a significant impact to taste and odor. Because ~~the No Project alternative would not result in a change from existing conditions, and would avoid the~~ taste and odor impacts would be less than significant under both the existing condition and the proposed project, ~~associated with MTBE,~~ impacts would be ~~**less**~~ **similar** under this alternative.

Table 7-1
Potential Chemicals Present in Drinking Water Transported through Allowable Materials under No Project Alternative and Secondary Maximum Contaminant Level Standards

Substance	NSF Standard for Copper or CPVC	Secondary MCL	Perceived Taste or Odor and Threshold
copper	-	1 ppm[1]	metallic
antimony	-	-	metallic/5 ppb
m-chlorophenol	-	-	phenolic (sour or bitter)/ 5 ppb
cyclohexanone	-	-	acetone/0.12 ppm

Notes:
CPVC = chlorinated polyvinyl chloride; MCL = maximum contaminant levels; ppb = parts per billion; ppm = parts per million
[1] California Secondary MCL is more stringent than ANSI/NSF Standard 61, which provides information to water utilities on potential taste and odor concerns from materials used in contact with drinking water.
Source: Title 22, California Code of Regulations, Section 64448, Tomboulian et al. 2004

~~Overall, the No Project alternative would avoid potentially significant and significant project-related water quality impacts, and water quality impacts would be **less** under this alternative.~~

CONCLUSION

The No Project Alternative would be environmentally ~~**superior**~~ **similar** to the project with respect to public health and hazards (after mitigation), leaching of chemical compounds into drinking water and indoor air quality (i.e., mold)~~. It would be similar to the project with respect~~ , and ~~to~~ solid waste, and would result in greater environmental impacts to outdoor air quality (ROGs) and leaching of copper into drinking water and wastewater. Overall, the No Project Alternative is ~~environmentally superior~~similar to the proposed project. ~~T~~In addition, this alternative would not attain the project's objective of providing an alternative plastic hot and cold water plumbing material for use in California. Thus, BSC has rejected this alternative due to its failure to meet the project's objective.

7.4.2 ALTERNATIVE B: MITIGATED ALTERNATIVE

Alternative B would provide another plastic hot and cold water plumbing material for use in California. ~~Under Alternative B, all PEX used in California for human consumption purposes would be certified by NSF to meet the relevant primary and secondary MCL, notification, Proposition 65 Safe Harbor, or other applicable Proposition 65~~

~~levels for drinking water.~~ Alternative B would ~~also~~ require that PEX only be used above the slab unless ~~a Phase 1 Environmental Site Assessment for the project is conducted following the ASTM E 1527-05 standard, which concludes that contamination of the soils or groundwater in the project area is unlikely, or unless~~ the PEX is sleeved by a metal pipe or other proven impermeable barrier. Finally, for all continuously recirculating hot water systems in jurisdictions where chlorination is used for disinfection of water, PEX tubing must be certified using the NSF P171-CL-R standard or a yet-to-be-adopted comparable standard.

ENVIRONMENTAL ANALYSIS

Air Quality

Because installation and repair of PEX tubing would not require the use of adhesives or solvents (i.e., ROGs) or require soldering (which is a source of respirable particulate matter [PM_{10}]), it would not increase emissions of ozone precursors (e.g., ROGs and oxides of nitrogen), lead, sulfur oxides, carbon monoxide, or PM. Thus, this discussion does not focus on the project's potential to increase emissions of criteria air pollutants or precursors, and these pollutants will not be discussed further. The exposure of sensitive receptors to TAC emissions from the production of PEX and construction-related activities is discussed separately below.

PEX tubing is not currently produced in the State of California. It is also not produced in the States of Washington, Oregon, Nevada, Arizona, or in Baja, Mexico (Taber, pers comm., 2008). Industrial facilities, such as chemical plants and manufacturing plants where PEX is currently produced in the United States are required by federal measures to reduce emissions and to obtain air pollution permits to ensure compliance with the federal Clean Air Act (CAA) (EPA 2008). Although the proposed project may increase demand for PEX tubing and could result in the need to increase PEX production, air pollutant emissions from the facilities at which PEX is produced are regulated. Compliance with the federal CAA and state and local permit processes can reasonably be expected to maintain emissions from PEX manufacturing facilities within acceptable limits. Thus, Alternative B would not result in exposure of sensitive receptors in California to excessive pollutant concentrations. Alternative B would not result in an increase in stationary-source emissions in California. Any potential increase in stationary-source emissions in another state would be controlled by the EPA and would be subject to EPA and local permitting processes. Thus, this impact would be less than significant and is **similar** to the proposed project.

Construction activities associated with PEX installation would not require any change from business as usual. Specifically, the proposed project would not result in an increased construction work force or labor hours needed to install pipe, nor would the proposed project result in greater quantities of on-site construction equipment. Moreover, given the light weight of PEX as opposed to copper, less fuel would be required to truck the tubing to the construction site and may result in a reduction of PM_{10} and other trucking-related emissions. Emissions of air pollutants attributable to construction worker commute and construction equipment exhaust would not differ from existing conditions. To the extent that PEX would be used in place of copper tubing, this would eliminate the TAC and PM_{10} emissions associated with the soldering process during installation. This impact would be beneficial and is **similar** to the proposed project.

As discussed in Impact 4.2-3 (see Section 4.2, "Public Health and Hazards"), chlorinated potable water could cause PEX that is used in continuously recirculating hot water systems to prematurely fail if it is not certified under the NSF P171 CL-R standard or a yet-to-be-adopted comparable standard, described more fully in section 4.2. Premature failure of PEX tubing could lead to moisture buildup in structures. If the failure goes unnoticed for an extended period of time in a poorly ventilated area of the structure, the potential exists for biological agents to grow and spread. Biological agents including bacteria, viruses, fungi (e.g., molds) can cause allergic reactions; asthma; eye, nose, and throat irritation; and humidifier fever, influenza, and other infectious diseases (ARB 2003). Because PEX tubing could prematurely fail and could lead to moisture buildup in structures, exposing sensitive receptors to mold, this impact is potentially significant. However, because Alternative B requires certification under the NSF P171 CL-R standard or a yet-to-be-adopted equally rigorous standard, this potential mold impact is reduced to less-than-significant and impacts would be **less** than the proposed project.

Overall, because air quality impacts under Alternative B are less than or similar to the proposed project, air quality impacts would be **less** under this alternative.

Public Health and Hazards

Because biofilm could potentially harbor pathogenic bacteria such as *Legionella*, there is concern that higher amounts of biofilm could potentially lead to increased risk of human contact with pathogenic bacteria. All piping materials exhibit some biofilm formation (Chaudhuri, pers. comm., 2008). Although formation of biofilm is initially slower in copper tubing compared to PEX tubing, no substantial difference exists over longer periods. No direct quantitative correlation exists between measurements of biofilm and growth of *Legionell*a. Therefore, increased biofilm growth does not correspond to higher amounts of *Legionella* bacteria, and the use of PEX would not lead to increased risk of human contact with pathogenic bacteria. Therefore, this is considered a less-than-significant impact of Alternative B and is **similar** to the proposed project.

Comments have been made that when filled with water, PEX is not likely to be flammable, but when exposed to heat during a fire, the PEX may rapidly rupture. PEX rupture may drain or depressurize the plumbing system and create openings in wall studs that may encourage the spread of fire (Coalition for Safe Building Materials 2005:44). Concerns exist that the use of PEX tubing poses a significant fire threat, and parties have commented that PEX is highly flammable ~~because of the highly flammable characteristics of PEX~~ (Coalition for Safe Building Materials 2005:44). Please see discussion under Impact 4.2-2 in Section 4.2 for a detailed discussion of this issue. PEX tubing carrying water within a building is not likely to be flammable because plastic is not particularly flammable generally and when full of water flammability is further reduced. Conformance to CPC requirements and applicable design and installation guidelines, including the use of approved firestop material, would reduce any potential fire hazards related depressurization of plastic tubing during structural fires. Additionally, plastic tubing is not an efficient heat conductor and structural fires generally do not exceed the temperature necessary to cause plastic tubing to catch on fire, so the use of PEX would not increase fire hazards. Because PEX meets the firestop standards specified in the California Administrative Code, Section 1501.1 et seq., PEX does not increase fire hazards or encourage fire spread. Therefore, this impact is considered less than significant and is **similar** to the proposed project.

Risk of Premature or Unexpected PEX Failure Potentially Increasing the Incidence of Mold

UV light, certain firestop materials, and chlorine can contribute to failure of PEX. However, PEX manufacturers add UV resistant material into the pipe and include instructions to avoid UV degradation, which decreases the impact of UV light on PEX. Numerous firestop materials are compatible with PEX and as long as those are used, firestop materials do not degrade PEX. Finally, the possibility of PEX failure from chlorine degradation would be confined to jurisdictions that have not yet switched to chloramine disinfection and specifically to projects in those jurisdictions that use continuously recirculating, hot, chlorinated water systems. Without attack from chloramines or aggressive water or soils, copper tubing is known to outlast the buildings in which they are installed. However, no data shows the actual life expectancy of CPVC and PEX; there is only data from the NSF and ASTM testing methods which is based on extrapolation. Because the ASTM standard does not consider systems with continuously recirculating hot chlorinated water or incorporate a design factor, while the NSF test does, the level of certainty provided by ASTM F2023 is not as great as that provided by NSF P171. Because PEX tubing within jurisdictions that use chlorine and continuously recirculating hot chlorinated water systems may have shorter product lives that copper, CPVC or PEX in traditional domestic applications, this is considered a potentially significant impact.

As discussed in Impact 4.2-3 (see Section 4.2, "Public Health and Hazards"), chlorinated potable water in continuously recirculating systems could cause PEX that is not certified to the NSF P171-CL-R standard to prematurely fail, though this is not certain. Please see Impact 4.2-3 for a complete discussion of this issue. Premature failure of PEX tubing could lead to moisture buildup in structures. If the failure goes unnoticed for an extended period of time in a poorly ventilated area of the structure, the potential exists for biological agents to grow and spread. Biological agents including bacteria, viruses, fungi (e.g., molds) can cause allergic reactions; asthma; eye, nose, and throat irritation; and humidifier fever, influenza, and other infectious diseases (ARB 2003). Because Alternative B would require that PEX used in continously recirculating systems in jurisdictions that use chlorination to disinfect water supplies be certified under the NSF-P171-CL-R standard or a yet-to-be adopted equally rigorous standard that assumes 100% continuously recirculating chlorinated hot water, would ensure a conservative product lifetime of 40 years and is approved by the Building Standards Commission for testing PEX for continuously recirculating hot chlorinated water, this potential impact is less-than-significant and may be **less** than the proposed project.

Overall, because public health and hazards impacts under Alternative B are less than or similar to the proposed project, public health and hazards impacts would be **less** under this alternative.

Solid Waste

PEX tubing is currently approved for statewide use in California hydronic radiant heating systems and all manufactured home uses. Nearly 200 cities and 30 counties in the state have approved PEX tubing for hot and cold water (including potable water) applications in residential, commercial, and institutional buildings using alternate materials provisions (see Chapter 3, "Description of the Proposed Project"). Implementation of the proposed project would increase the use of PEX tubing for potable water applications, with a proportionate decrease in the use of other piping materials (such as copper). It is assumed that Alternative B would increase the estimated percentage use of PEX tubing in California from approximately 37% to 45% because of the reduced labor costs associated with installation of PEX and because of corrosivity issues with copper piping resulting from the increased use of chloramines for drinking water disinfection (see Section 3.4.4, "Current and Projected Uses of PEX"). Alternative B implementation would also change the estimated percentage use of other types of plastic pipe.

Although Alternative B would slightly increase the amount of scrap PEX generated for disposal (i.e., a maximum of 0.03% of the total annual solid waste sent to landfills statewide), the maximum amount of solid waste annually generated by proposed project implementation is not substantial in relation to the total amount of landfilled solid waste (i.e., 40,235,328 tons). (Please see Section 4. 3, "Solid Waste," for an in-depth discussion of the potential solid waste impacts of PEX.) In addition, PEX tubing could be diverted and sold for other uses, and new recycling technologies, markets, or policies could emerge. Furthermore, beyond speculation, it is difficult to estimate exactly where or when PEX tubing would be disposed and what the capacity of various existing and future landfills throughout the state will be at the time of disposal, exactly to what extent it will be reused or recycled, or what the plastics disposal laws will be at that time. In any case, there is no substantial evidence that the addition of PEX waste, in and of itself, would be sufficient to substantially consume landfill capacity or otherwise shorten the planned disposal life of any landfill. Therefore, this impact is considered less than significant, and is **similar** to the proposed project.

The California Integrated Waste Management Act (CIWMA) requires cities and counties to reduce their solid waste stream by 50% by "through source reduction, recycling, and composting activities" (Section 41780). This requires cities and counties to divert a substantial portion of the waste stream that would otherwise go to landfills by a variety of means. From 1989 to 2004, the estimated annual statewide diversion rate increased steadily from 10% to 48%, and in August 2006, the California Integrated Waste Management Board (CIWMB) announced that the state had met the legislatively imposed 50% waste diversion rate. In 2005, California achieved a 52% waste diversion rate, and increased the diversion rate to 54% in 2006 (CIWMB 2008). Exhibit 4.3-1 illustrates these trends. Assuming these trends continue into the future, California will continue to meet the 50% waste diversion requirement as required by the CIWMA.

Although implementation of Alternative B would be expected to slightly increase the amount of solid waste going to statewide landfills, the maximum amount of solid waste generated annually by the proposed project is not substantial in relation to the total amount of landfilled solid waste. In addition, PEX diversion will likely increase in the future as PEX producers continue to establish markets for composite lumber and cement and asphalt filler, and new recycling technologies or policies emerge. Because the State of California is currently meeting the CIWMA diversion rate goal, the statewide diversion rate trend is on an upward trajectory, PEX diversion will likely increase in the future, and implementation of the proposed project would not indirectly violate or cause noncompliance with the CIWMA, this impact is considered less than significant and is **similar** to the proposed project.

Overall, because solid waste impacts under Alternative B are similar to the proposed project, solid waste impacts would be **similar** under this alternative.

Water Quality

~~PEX tubing has been associated with the leaching of levels of MTBE and TBA at levels exceeding the California MCL and the California notification level, respectively. This would represent a potentially significant impact. In addition, PEX has the potential to leach Proposition 65 chemicals in concentrations higher than allowed under Proposition 65 and its implementing regulations, and this would also represent a potentially significant impact. However, Alternative B would require certification by NSF that PEX used in California meets the relevant primary and secondary MCL, notification, Proposition 65 Safe Harbor, or other applicable Proposition 65 levels for water for human consumption. Therefore, this impact would be less-than-significant, and impacts under this alternative would be **less** than the proposed project.~~

In cases where PEX is placed below the slab where contaminated soil or water is present and is permeated by solvents or gasoline, it has the potential to introduce chemicals into drinking water at levels in exceedance of federal and state MCLs. Because Alternative B would restrict the use of PEX for hot and cold water distribution including potable water uses to uses above the slab (i.e. above the foundation) unless ~~a Phase 1 Environmental Site Assessment is conducted and concludes that site soils are not likely contaminated, or unless~~ the PEX is sleeved by metal pipe or another form of pipe which has been proven to be impermeable and has been accepted by the BSC as an impermeable sleeving material, this impact would be less-than-significant, and **less** than under the proposed project.

~~The proposed project could also result in the leaching of chemicals into drinking water that affect taste and odor. Quantitative evidence is available in the record demonstrating that PEX is known to leach MTBE in concentrations that would exceed the secondary MCL for MTBE. However, there is no other chemical for which there is quantitative evidence of exceedance of a secondary MCL. Under Alternative B, PEX must be certified to meet California's secondary MCLs. Therefore, this potential impact would be less than significant, and impacts under this alternative would be **less** than under the unmitigated proposed project.~~

Overall, because water quality impacts under Alternative B are less than proposed project impacts, water quality impacts would be **less** under this alternative.

CONCLUSION

Alternative B would be environmentally superior to the project with respect to public health and hazards, water quality and air quality. It would be similar to the project with respect to solid waste. Overall, this alternative is environmentally superior to the proposed project. The overall objective of the proposed project is to provide another plastic piping alternative for use in California. Alternative B would authorize the use of an additional type of plastic pipe in California, and thus would attain the project objective.

7.5 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

Overall, the No Project Aalternative would be similar to the proposed project. The No Project Alternative would be environmentally superior to the project with respect to public health and hazards, leaching of chemical compounds into drinking water and indoor air quality. It would be similar to the project with respect to solid waste, and would result in greater environmental impacts in outdoor air quality (ROGs) and leaching of copper into drinking water and wastewater. Overall, this alternative is environmentally superior to the proposed project. This alternative would not attain the project's objective of providing an alternative plastic hot and cold water plumbing material for use in California.

Alternative B, which is essentially the proposed project with recommended mitigation incorporated, would be environmentally superior to the project with respect to public health and hazards, water quality and air quality. It would be similar to the project with respect to solid waste. Overall, this alternative is environmentally superior to the proposed project. The overall objective of the proposed project is to provide another plastic piping alternative for use in California. Alternative B would authorize the use of an additional type of plastic pipe in California, and thus would attain the project objective.

Alternative B: Mitigated Alternative is the overall environmentally superior alternative of all the alternatives evaluated.

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