REGIONAL WATER QUALITY CONTROL BOARD, CENTRAL VALLEY REGION

Amendments To The Water Quality Control Plan for the Sacramento River and San Joaquin River Basins

To Establish Site-Specific Water Quality Objectives for Chloroform, Chlorodibromomethane, and Dichlorobromomethane for New Alamo and Ulatis Creeks and Permit Implementation Provisions

Draft Staff Report

November 2009

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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DISCLAIMER

This publication is a report by staff of the California Regional Water Quality Control Board, Central Valley Region. This report contains the evaluation of alternatives and technical support for the adoption of an amendment to the Water Quality Control Plan for the Sacramento and San Joaquin River Basin (Resolution No. R5-200x-xxxx). Mention of specific products does not represent endorsement of those products by the Regional Board.

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ACKNOWLEDGEMENTS:

Disclosure: Funding for this project has been provided in full or in part through an Agreement between the State Water Resources Control Board and the City of Vacaville, Agreement No. 03-910-150-0, “City of Vacaville Site-Specific Basin Plan Amendments for Old Alamo Creek and New Alamo Creek, Ulatis Creek and Cache Slough,” for the purpose of evaluating water quality standards in regard to beneficial uses and water quality objectives. Agreement No. 03-910-150-0 expired prior to project completion and was renewed July 2008 by Agreement No. 08-900-150-0.

EXECUTIVE SUMMARY

This Central Valley Regional Water Quality Control Board (Central Valley Water Board) Staff Report describes a proposal to amend the *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins* (Basin Plan) to add site-specific water quality objectives for chloroform, chlorodibromomethane (DBCM), and dichlorobromomethane (DCBM) for the lower segments of New Alamo and Ulatis Creeks and associated National Pollutant Discharge Elimination System (NPDES) permit implementation provisions. These constituents are members of a family of compounds called "trihalomethanes" (THMs). The site-specific objectives (SSOs) are proposed to support the municipal and domestic supply (MUN) beneficial use of the segments. To the extent this report refers to drinking water from the segments, that phrasing embraces any manner of water ingestion associated with the MUN use.

This report presents alternative standards refinement actions for the site, evaluates these alternatives, identifies staff's recommended action, evaluates the proposed action's consistency with other laws, plans and policies, and assesses environmental impacts associated with implementing the proposed Basin Plan amendments.

Project Description and Need for the Proposed Amendments

The City of Vacaville's Easterly Wastewater Treatment Plant (WWTP) disinfects treated effluent with sodium hypochlorite to inactivate pathogens that may be present in the wastewater. THM compounds are formed in the wastewater during the disinfection process. The wastewater discharge from the Easterly WWTP causes concentrations of DBCM and DCBM in lower New Alamo and Ulatis Creeks to exceed current human health water quality criteria established in the California Toxics Rule (Figure ES-1) (CTR) (40 CFR §131.38) as well as USEPA recommended human health criteria for chloroform (there currently is no adopted numeric criteria for chloroform). The Easterly WWTP discharge does not, however, cause the segments to exceed the Department of Public Health's drinking water Maximum Contaminant Level (MCL) of 80 µg/l, applicable for total THMs in treated drinking water supplies.

The City of Vacaville conducted a Use Attainability Analysis (UAA) for the lower portions of New Alamo Creek and Ulatis Creek to determine whether the MUN beneficial use designation for the lower segments of these water bodies is appropriate. The UAA documented that no drinking water use of segment waters has occurred in the past or is occurring presently. The UAA concluded that MUN is neither an existing nor an attainable use in these water body segments, and that no form of MUN use is reasonably expected to occur in the future in these water body segments based on system hydrologic and water quality characteristics, as well as the availability of higher quality water sources in the area (RBI 2007c). This finding was supported by Ms. Leah Walker of the California Department of Public Health (DPH, formerly Department of Health Services (DHS)), who, when attending the Central Valley Water Board's California Environmental Quality Act public scoping meeting for this standards refinement project on 28 June 2007, stated that the DPH supports the dedesignation of MUN from the UAA study segments.

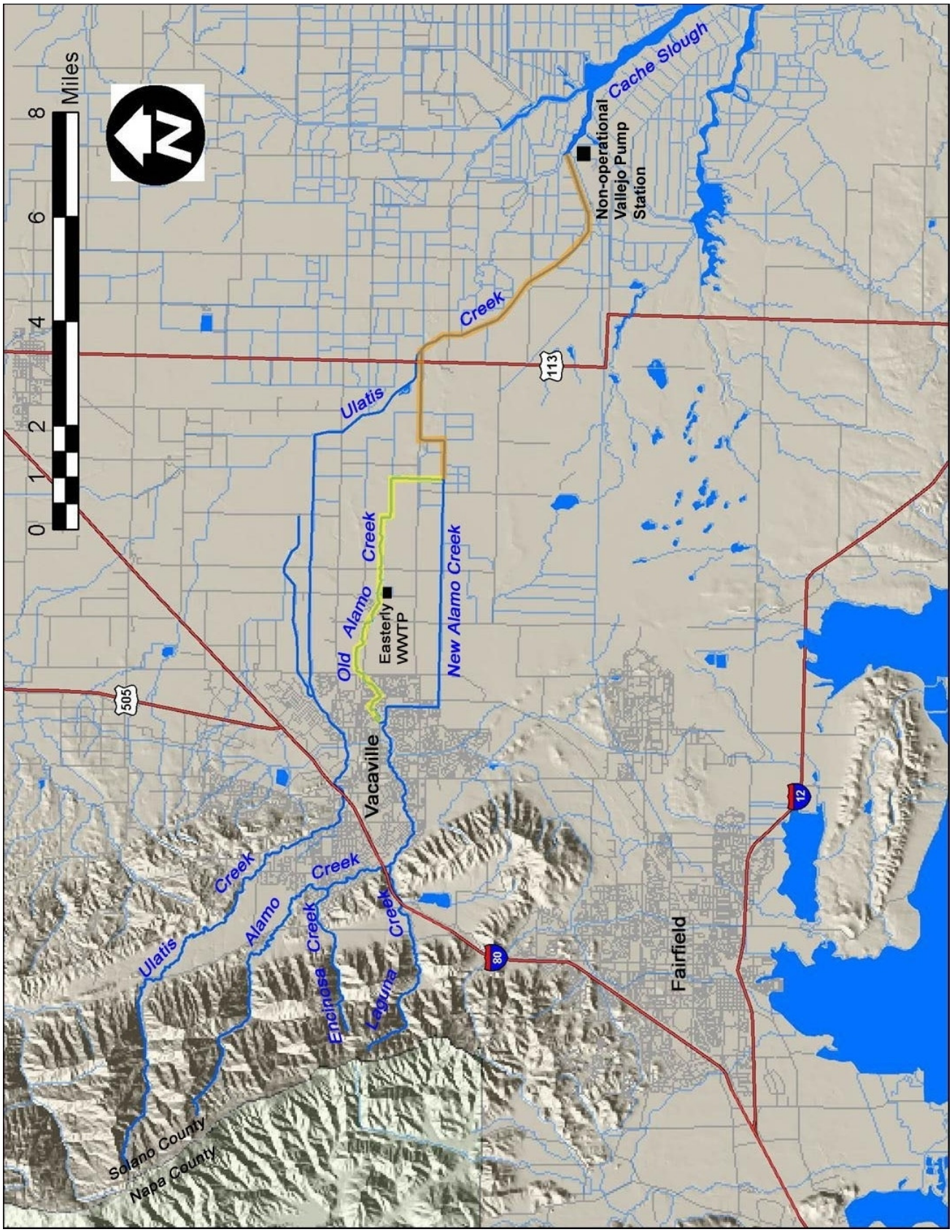

Figure ES-1. Project area map of Easterly WWTP, New Alamo Creek and Ulatis Creek. (RBI 2009). The proposed amendments would apply to the orange-highlighted segments.

Central Valley Water Board staff agree that municipal uses are not existing and likely not attainable because of the existing hydrologic conditions and water quality characteristics. However, staff believe that it is important to maintain the MUN designation in order to maintain water quality in the lower New Alamo Creek and Ulatis Creek segments at a level sufficient to protect potential future transient and incidental use of water in the creeks for drinking water should such a use ever occur. Therefore, this project consists of adopting site-specific THM objectives that meet the selection criteria in the following section, and that are appropriate for this potential, limited use as a means of:

1) providing appropriate levels of human health protection based on past, present, and reasonably foreseeable future drinking water use of segment waters,
2) maintaining current levels of MUN protection for THMs in water bodies downstream of the segments; and
3) resolving the significant THM regulatory compliance issue faced by the City of Vacaville in operating its Easterly WWTP in an efficient and cost-effective manner.

Based on the information compiled and evaluated, Central Valley Water Board staff have concluded that limiting THM concentrations in lower New Alamo and Ulatis Creek segments to levels required by current criteria is not necessary to protect MUN based on the type and degree of drinking water use occurring and expected to occur in the segments, yet would require costly upgrades to the Easterly WWTP in an effort to comply with current criteria. Consequently, adoption of site-specific objectives for DBCM, DCBM, and chloroform and associated implementation provisions through the Basin Plan amendment process is appropriate.

Alternatives Considered and Evaluated

This Staff Report evaluates four alternative sets of site-specific objectives (see Section 3) and their associated implementation provisions (see Section 4). The site-specific objectives together with their specific implementation provisions constitute the alternative Basin Plan amendments evaluated. The alternative Basin Plan amendments were evaluated based on their ability to meet the following selection criteria.

1) Provide site-specific objectives for DBCM, DCBM, and chloroform that provide reasonable protection of the MUN use of segment waters, while considering the current and potential future drinking water use, and maintain current criteria and levels of protection for all downstream waters.
2) Maintain consistency with federal and State water quality laws and policies.
3) Involve implementation procedures that are consistent with the procedures of the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (commonly referred to as the SIP).
4) Minimize additional future degradation of segment water quality for DBCM, DCBM, and chloroform.
5) Efficiently and cost-effectively resolve the THM regulatory compliance issue faced by the City of Vacaville in operating its Easterly WWTP, which was the impetus for this standards refinement effort.

Recommended Alternative

Site-specific Objectives

Based on use of the selection criteria listed above, the proposed site-specific objectives for the segments are:

- DBCM: 4.9 µg/l
- DCBM: 15.5 µg/l
- Chloroform: 45.5 µg/l

These objectives were derived to: 1) provide a lifetime 10^{-4} or lower (i.e., more protective) cancer risk level for DBCM, DCBM, and chloroform for any and all parties that could potentially make use of segments waters as a drinking water supply; and 2) control and limit DBCM, DCBM, and chloroform concentrations within the segments to the upper end of the concentration distributions observed for these constituents, based on historical monitoring data at the head of the segments. This was done by setting the site-specific objectives equal to the 99.9 percentile values observed at the upstream end of the segments, based on historical monitoring data, and confirming that these site-specific objectives would provide a lifetime 10^{-4} or lower cancer risk level, if segment waters were to be used in the future as a drinking water supply. Consistent with USEPA methodology (USEPA 2000, p. 2-6; 65 FR 31699) these site-specific objectives assure that the most highly exposed population would not exceed a 10^{-4} risk level, even if the population consumed 2 L/day of water and up to 17.5 g/day of fish/shellfish from the segments, which is not expected to occur. Any future drinking water use of segment waters is expected to be transient and incidental in nature and thus would not occur daily for a 70-year lifetime. Consequently, the expected cancer risk levels associated with the proposed site-specific objectives would be even lower than the risk levels calculated using the standard USEPA methodology, which assumes water consumption of 2 L/day for 70 years. Risk levels for potential future transient and incidental drinking water use from the segments are estimated to be lower than 10^{-5}. As such, the proposed site-specific objectives provide reasonable protection of the MUN use of segment waters, minimize additional future degradation of segment water quality for DBCM, DCBM, and chloroform, and efficiently and cost-effectively resolve the THM regulatory compliance issue faced by the City of Vacaville in operating its Easterly WWTP. The proposed site-specific objectives shall be adopted and implemented in a manner that is consistent with federal and State water quality laws and policies. Their specific implementation provisions are discussed further below.

Implementation Provisions

The State Water Board adopted the SIP to provide state regulations on implementation provisions for priority pollutant criteria and water quality objectives, which includes THM criteria. However, the SIP does not address situations where water bodies downstream of the first receiving water (i.e., New Alamo and Ulatis Creeks) have applicable water quality standards that are more stringent than the water quality standards for the first receiving water (i.e., Old Alamo Creek). Thus, the proposed Basin Plan amendments include implementation provisions for NPDES permitting, including procedures for assessing reasonable potential (also called the "Determination of the Need for Water Quality Based Effluent Limitations" in the SIP) and calculating effluent limitations. For assessing reasonable potential, the SIP requires the maximum effluent concentration (MEC) to be compared to the applicable water quality

criterion/objective. Strict application of the SIP could result in applying the criteria for New Alamo Creek in Old Alamo Creek. However, Old Alamo Creek does not have the beneficial use of MUN or accompanying water quality criteria associated with this use. In addition, THM levels are attenuated (i.e., decreased through volatilization) as water flows down Old Alamo Creek below the Easterly WWTP, the primary source of water to Old Alamo Creek. Thus, the MEC is not representative of whether a discharge to Old Alamo Creek has reasonable potential to cause or contribute to an exceedance of applicable THM criteria in New Alamo Creek. Accordingly, the proposed reasonable potential analysis for the THM objectives should account for the attenuation that occurs in Old Alamo Creek for all site-specific discharges into Old Alamo Creek. If the MEC for DBCM, DCBM, and chloroform does not exceed the site-specific objectives, no reasonable potential exists for the discharge. If the MEC for DBCM, DCBM, and chloroform exceeds the site-specific objectives, the maximum measured concentration of DBCM, DCBM, and chloroform at the terminus of Old Alamo Creek is compared to the site-specific objectives. Doing so accounts for the attenuation of these constituents within Old Alamo Creek, where MUN is not a designated use and thus the site-specific objectives do not apply. If the MEC exceeds a site-specific objective and the concentration of the same THM at the terminus of Old Alamo Creek exceeds the site-specific objective, then there is reasonable potential for that discharge to cause or contribute to an exceedence of that water quality objective in the segments. If the MEC for a discharge to Old Alamo Creek exceeds a site-specific objective but the concentration of the THM at the terminus of Old Alamo Creek does not exceed the objective, then there is no reasonable potential for this discharge to cause an exceedance of the objective within the segments.

The proposed methodology to derive effluent limitations, should reasonable potential exist, for point source discharges into Old Alamo Creek (e.g., Easterly WWTP) includes the use of "Attenuation Factors" to account for reductions in DBCM, DCBM, and chloroform concentrations between the point of discharge and the compliance monitoring location. The compliance monitoring location is specified as the terminus of Old Alamo Creek, where it discharges into the head of the New Alamo Creek segment. All other provisions of the SIP, not in conflict with the site-specific implementation provisions of the proposed amendment, also would apply to the derivation of water quality based effluent limitations.

Proposed Basin Plan Amendments

Based on the above considerations, the proposed site-specific objectives and their implementation provisions are as follows. Text additions to the existing Basin Plan language are underlined and text deletions are indicated by ~~strikethrough~~.

The first paragraph of the Chemical Constituents section of Chapter III. Water Quality Objectives would be revised as follows:

> Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. The chemical constituent objectives in ~~Table~~ Tables III-1 and III-1A apply to the water bodies specified.

The following table would be added to the Chemical Constituents section of Chapter III. Water Quality Objectives:

TABLE III-1A
ORGANIC CHEMICAL WATER QUALITY OBJECTIVES

CONSTITUENT	MAXIMUM CONCENTRATION (ug/l)	APPLICABLE WATER BODIES
Chlorodibromomethane (DBCM)	4.9 µg/l	New Alamo Creek, from Old Alamo Creek to Ulatis Creek Ulatis Creek, from New Alamo Creek to Cache Slough
Dichlorobromomethane (DCBM)	15.5 µg/l	New Alamo Creek, from Old Alamo Creek to Ulatis Creek Ulatis Creek, from New Alamo Creek to Cache Slough
Chloroform	45.5 µg/l	New Alamo Creek, from Old Alamo Creek to Ulatis Creek Ulatis Creek, from New Alamo Creek to Cache Slough

The following would be added to the Actions and Schedule to Achieve Water Quality Objectives section of Chapter IV. Implementation:

Point Source Discharges Containing Trihalomethanes
Lower New Alamo and Ulatis Creeks

Municipal wastewater that is chlorinated to remove bacteria generally contains trihalomethanes. The Policy for Implementation of Toxics Standards for Inland Waters, Enclosed Bays, and Estuaries of California ("State Implementation Plan" or "SIP") (see the 15th Policy in State Water Board Policies and Plans, page IV-10.01) implements criteria for priority pollutants, including trihalomethanes. However, the SIP does not address situations where water quality objectives for water bodies downstream of the first receiving water are more stringent than the water quality objectives for the first receiving water.

Old Alamo Creek is tributary to New Alamo Creek and Ulatis Creek. Ulatis Creek, downstream of the confluence with New Alamo Creek, is within the legal boundary of the Delta. Old Alamo Creek is not designated MUN, but New Alamo

and Ulatis Creeks are designated MUN. The SIP does not specifically address how to determine the need for water quality-based effluent limitations or calculate water quality-based effluent limitations in this situation, so special permitting provisions are needed for discharges of trihalomethanes to Old Alamo Creek.

With respect to the site-specific water quality objectives in Table III-1A for trihalomethanes in New Alamo Creek, from Old Alamo Creek to Ulatis Creek, and Ulatis Creek, from New Alamo Creek to Cache Slough, the following provisions shall apply to any point source discharges into Old Alamo Creek. For determining if water quality-based effluent limitations are necessary, Section 1.3 of the SIP does not apply. For calculation of water quality-based effluent limitations, Section 1.4 of the SIP does not apply, unless specified below.

Determination of Need for Water Quality-Based Effluent Limitations:

Step 1: For chlorodibromomethane (DBCM), dichlorobromomethane (DCBM) and chloroform, if the pollutant is not detected in the effluent and any of the reported detection limits is less than or equal to the site-specific objectives specified in Table III-1A (the site-specific objectives specified in Table III-1A will be referred to as C), then water quality-based effluent limitations are not necessary. If the pollutant is not detected in the effluent and all of the detection limits are greater than site-specific objectives (C), then proceed to Step 5. If the pollutant is detected in the effluent then proceed to *Step 2.*

Step 2: Determine the observed maximum ambient background concentration for DBCM, DCBM, and chloroform. The observed maximum ambient background concentrations shall be measured in New Alamo Creek at Lewis Road and is the B, as defined in section 1.4.3.1 of the SIP. If the background (B) is greater than the site-specific objectives (C), then water quality-based effluent limitations are necessary. If the background (B) is less than or equal to the site-specific objectives (C), then proceed to *Step 3.*

Step 3: Determine the observed maximum pollutant concentration for the effluent (MEC). If the MEC is less than or equal to the site-specific objectives (C), water quality-based effluent limitations are not necessary. If the MEC is greater than the site-specific objectives (C), then proceed to *Step 4* to determine if water quality-based effluent limitations are necessary.

Step 4: If the in-stream maximum concentrations of DBCM, DCBM or chloroform at the terminus of Old Alamo Creek are greater than the site-specific objectives (C), then water quality-based effluent limitations are necessary for the constituents that exceeded the applicable objectives.

Step 5: If the pollutant has not been detected in the effluent and all detection limits are greater than the site-specific objectives (C), then the discharger shall be required to conduct twice-monthly monitoring of the effluent and of the terminus of Old Alamo Creek between 1 November and 31 March using detection limits less than or equal to the site-specific objectives (C). Steps 1-4 above will then be

applied to these data to determine whether water-quality based effluent limitations are necessary.

Calculation of water quality-based effluent limitations for DBCM, DCBM, and chloroform shall be as follows:

An Attenuation Factor, which is the median of the individual sample attenuation values, is necessary because the water quality objectives do not apply in the first receiving water of the discharge (i.e., do not apply in Old Alamo Creek). If water quality-based effluent limitations are required, an attenuation factor to account for the reduction in constituent concentrations between the point of effluent discharge to Old Alamo Creek and the terminus of Old Alamo Creek shall be applied to the calculation of the Effluent Concentration Allowance (ECA), which is one of the factors used in the derivation of the effluent limitations as described in Section 1.4B of the SIP.

The ECA shall be calculated as:

ECA = Attenuation Factor x [C + D(C-B)] when C > B
ECA = Attenuation Factor x C when C ≤ B

Where:

Attenuation Factor = the median of the individual sample attenuation values derived from all representative historical data for the 1 November through 31 March period of each year. An individual sample attenuation value is calculated as the effluent constituent concentration measured on a given day divided by the in-stream constituent concentration at the terminus of Old Alamo Creek measured the same day.

C = the site-specific objective specified in Table III-1A

D = dilution credit, as determined in section 1.4.2 of the SIP

B = background concentration, as defined by Section 1.4.3 of the SIP, and measured in New Alamo Creek at Lewis Road

Dilution credits may be allowed in deriving water quality-based effluent limitations for DBCM, DCBM, and chloroform in accordance with Section 1.4.2 of the SIP.

The Average Monthly Effluent Limitation (AMEL) and the Maximum Daily Effluent Limitation (MDEL) shall be calculated in accordance with Section 1.4 of the SIP using the ECA calculated above.

The following would be added to the Self-Monitoring section of Chapter V. Surveillance and Monitoring:

For point source discharges to Old Alamo Creek that contain detectable concentrations of chlorodibromomethane (DBCM), dichlorobromomethane (DCBM) or chloroform, the discharger's monitoring and reporting program shall include coordinated monitoring of the effluent and Old Alamo Creek at its terminus, immediately prior to Old Alamo Creek's discharge into New Alamo Creek, for DBCM,

DCBM or chloroform. At a minimum, the discharger shall conduct the coordinated monitoring twice-monthly from 1 November through 31 March once during the 5-year term of the NPDES permit.

The proposed site-specific objectives are consistent with federal and State antidegradation policies, federal and State laws, and State Water Board and Central Valley Water Board policies and plans. Implementation of the site-specific objectives would have no significant effect on the environment.

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LIST OF ACRONYMS

AMEL	Average Monthly Effluent Limitation
ADWF	Average Dry Weather Flow
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CTR	California Toxics Rule
CWA	Clean Water Act
CWC	California Water Code
DBCM	Chlorodibromomethane
DCBM	Dichlororbromomethane
DPH	California Department of Public Health
EC	Electrical Conductivity
OEHHA	Office of Environmental Health Hazard Assessment
FR	Federal Register
MCL	Maximum Contaminant Level
MDEL	Maximum Daily Effluent Limitation
MEC	Maximum Effluent Concentration
mgd	million gallons per day
MUN	Municipal and Domestic Supply Beneficial Use
NPDES	National Pollutant Discharge Elimination System
NRWQC	National Recommended Water Quality Criteria
OAL	Office of Administrative Law
PHG	Public Health Goal
PRC	Public Resources Code
SIP	State Water Resources Control Board, *Policy for Implementation of Toxics Standards for Inland Waters, Enclosed Bays, and Estuaries of California*
THM	Trihalomethane
UAA	Use Attainability Analysis
USC	United States Code
USEPA	United States Environmental Protection Agency
WWTP	Wastewater Treatment Plant

1 INTRODUCTION AND EXISTING CONDITIONS

The purpose of this Staff Report is to provide the rationale and supporting documentation for proposed amendments to the *Water Quality Control Plan for the Sacramento and San Joaquin River Basin* (Basin Plan). Amendments to the Basin Plan are proposed for New Alamo Creek, from its confluence with Old Alamo Creek to its confluence with Ulatis Creek, and Ulatis Creek, from its confluence with New Alamo Creek to its confluence with Cache Slough for three trihalomethane (THM) compounds: chloroform, chlorodibromomethane (DBCM), and dichlorobromomethane (DCBM). The fourth member of the group of compounds referred to as THMs, bromoform, is not addressed by these amendments. The following sections describe the regulatory context for basin planning, watershed conditions and land uses, the Easterly Wastewater Treatment Plant (WWTP), a municipal discharger in the lower New Alamo and Ulatis creeks watershed, and the need for the proposed amendments to the Basin Plan.

1.1 REGULATORY AUTHORITY AND MANDATES FOR BASIN PLAN AMENDMENTS

The State Water Resources Control Board (State Water Board) and the nine Regional Water Quality Control Boards (Regional Water Boards) are the state agencies with primary responsibility for coordination and control of water quality. (California Water Code (CWC) §13000). Each Regional Water Board is required to adopt a water quality control plan, or basin plan, which provides the basis for regulatory actions to protect water quality. (CWC §13240 et seq.). Basin plans designate beneficial uses of water, water quality objectives to protect the uses, and a program of implementation to achieve the objectives. (CWC §13050(j)). Basin plans, once adopted, must be periodically reviewed and may be revised. (CWC §13240).

Under the federal Clean Water Act (CWA), 33 USC §1251 et seq., the states are required to adopt water quality standards for surface waters. (CWA §303(c)). Water quality standards consist of: 1) designated uses; 2) water quality criteria necessary to protect designated uses; and 3) an antidegradation policy. (CWA 303(c)(2)(A) and (d)(4)(B); Title 40 Code of Federal Regulations (CFR) §131.6). In California, water quality standards are found in the basin plans, statewide water quality control plans adopted by the State Water Board, and the federal California Toxics Rule (CTR). Under the CWA, the states must review water quality standards at least every three years.

Regional Water Boards adopt and amend basin plans through a structured process involving peer review, public participation, and environmental review. Regional Water Boards must comply with the California Environmental Quality Act (CEQA) (Public Resources Code (PRC) §21000 et seq.) when amending their basin plans. The Secretary of Resources has certified the basin planning process as exempt from the CEQA requirement to prepare an environmental impact report or other appropriate environmental document. (PRC §21080.5; California Code of Regulations (CCR), Title 14, §15251(g)). Instead, State Water Board regulations on its exempt regulatory programs require the Regional Water Boards to prepare a written report and an accompanying CEQA Environmental Checklist and Determination with respect to Significant Environmental Impacts (CEQA Checklist) (CCR, Title 23, §3775 et seq.).

Basin Plan amendments are not effective until they are approved by the State Water Board and the regulatory provisions are approved by the State Office of Administrative Law (OAL). The United States Environmental Protection Agency (USEPA) also must review and approve amendments that add or modify water quality standards for waters of the United States. In this instance, it also would be necessary for the USEPA to revise the CTR, to delete the present criteria for DBCM and DCBM in the relevant segments, in favor of the site-specific objectives.

1.2 Watershed Conditions and Land Uses

Alamo Creek originates in the Vaca Mountains and flows east-southeast through the City of Vacaville ultimately joining Ulatis Creek on the Sacramento Valley floor (Figure 1). In the early 1960s, the Solano County Flood Control and Water Conservation District and the U.S. Department of Agriculture, Soil Conservation Service built the Ulatis Creek Watershed Protection and Flood Prevention Project (Solano County 1966-1968). As part of this project, portions of Alamo Creek were realigned to form a new channel bypassing the City of Vacaville.

Part of the original Alamo Creek channel was left in place and renamed Old Alamo Creek. The realignment of the creek cut off flows from the upper watershed to Old Alamo Creek leaving it dry with the exception of discharges from the Easterly WWTP, Kinder-Morgan groundwater remediation project, stormwater runoff, and agricultural runoff. Old Alamo Creek discharges into New Alamo Creek (Figure 1).

New Alamo Creek is an engineered earthen channel that conveys all of Alamo Creek's flows from just above Leisure Town Road to the confluence with Ulatis Creek (Figure 1). New Alamo Creek has two dams located within the project area (Brown-Alamo Dam and Maine Prairie Water District Dam). Overall, Alamo/New Alamo Creek travels roughly 20 miles before joining Ulatis Creek. Land uses within the Alamo/New Alamo Creek watershed include: agriculture at 57 percent; natural/forest at 25 percent; and urban at 18 percent.

Ulatis Creek also originates in the Vaca Mountains and flows through the City of Vacaville. New Alamo Creek is a major tributary to Ulatis Creek (Figure 1). Land uses within the Ulatis Creek watershed include: agriculture at 80 percent; natural/headwater at 11 percent; and urban at 9 percent.

Cache Slough begins at the terminus of Ulatis Creek, approximately 5.5 miles downstream of the confluence of New Alamo and Ulatis Creeks (Figure 1). The Cache Slough channel becomes wider, increasing from approximately 300 feet to 1,500 feet due to numerous tributaries entering from the north and east. The proposed amendments would be applicable to the lower segments of New Alamo Creek and Ulatis Creek, but would not be applicable to Cache Slough or downstream waters.

Immediately downstream of the confluence of Cache Slough and Ulatis Creek is the non-operational Vallejo Pump Station, an emergency drinking water intake for the City of Vallejo that has not been used since 1992. The City of Vallejo does not hold a current permit from the California Department of Public Health (DPH) to use the Vallejo Pump Station, nor are these facilities in operating condition (RBI 2007a).

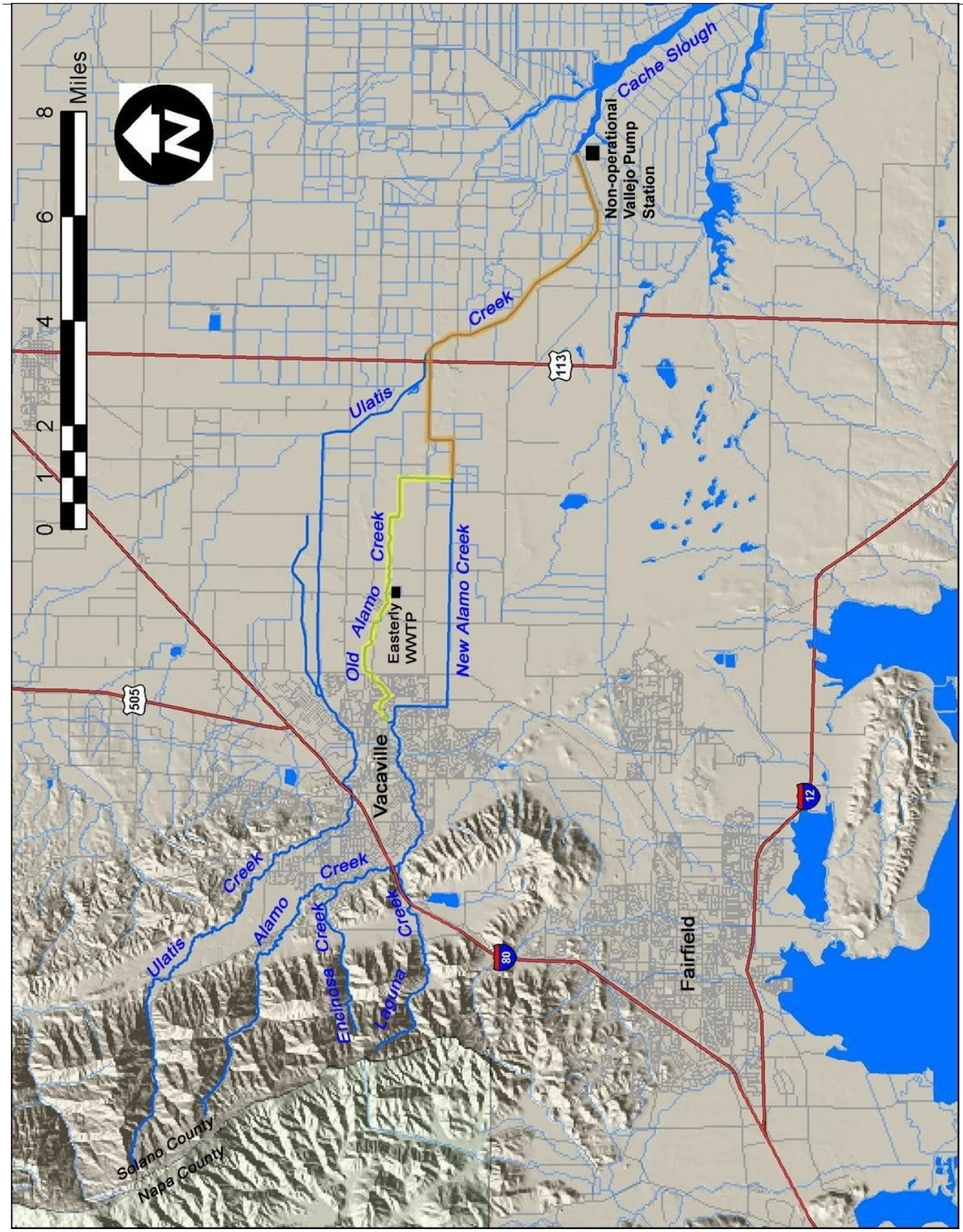

Figure 1. Project area map of Easterly WWTP, New Alamo Creek and Ulatis Creek. (RBI 2009). The proposed amendments would apply to the orange-highlighted segments.

1.3 EASTERLY WASTEWATER TREATMENT PLANT

The Easterly WWTP is located in Solano County, and serves the City of Vacaville and the unincorporated area of Elmira. Treated municipal wastewater is discharged directly into Old Alamo Creek (Figure 1). The Easterly WWTP consists of two parallel plants, the existing North Plant and the newly constructed South Plant. The current treatment system consists of headworks, primary sedimentation basins, aeration basins, secondary clarifiers, chlorination and dechlorination facilities, emergency ponds, dissolved aeration floatation thickener, anaerobic digesters, biosolids storage ponds, biosolids belt filter press, and biosolids drying beds.

The Easterly WWTP has discharged wastewater effluent to the Alamo Creek system since 1959 (CVRWQCB 1958). The Easterly WWTP is currently designed to discharge 15 million gallons per day (mgd), average dry weather flow (ADWF) and a peak wet weather flow of 55 mgd. Between 2020 and 2030, the City projects an expansion to 17.5 mgd, ADWF, and after 2030, a buildout expansion of 22 mgd, ADWF. The current discharge rate is approximately 9 mgd, ADWF. Easterly WWTP disinfects the treated effluent with sodium hypochlorite to inactivate pathogens that may be present in the wastewater. THM compounds, a contaminant of concern in finished drinking water supplies served to consumers, are formed in the wastewater during the disinfection process (RBI 2007c).

The Easterly WWTP discharge causes concentrations of DBCM and DCBM in the New Alamo and Ulatis creek segments to exceed current human health water quality criteria established in the CTR (40 CFR §131.38) as well as USEPA recommended human health criteria for chloroform (there currently is no adopted numeric criteria for chloroform). The Easterly WWTP discharge does not, however, cause the segment waters to exceed the Department of Public Health's (DPH) drinking water Maximum Contaminant Level (MCL) of 80 µg/l, applicable to total THMs in tap water. The THMs discharged from the Easterly WWTP are volatile compounds and thus attenuate (i.e., are reduced in concentration) with distance downstream from the Easterly WWTP. Most water treatment plants in the region disinfect raw surface water diverted supplies via chlorination processes and thus add THMs to the finished drinking water supply via the water treatment process. It is the finished drinking water supply, not the raw surface water supply, which is regulated by DPH's 80 µg/l total THM MCL. Based on the lowest applicable criteria for each of the individual THMs, the currently applicable CTR and USEPA recommended (for chloroform) criteria require that total THM concentrations in the lower New Alamo and Ulatis creek segments not exceed 10.97 µg/l. Limiting THM concentrations in lower New Alamo and Ulatis Creeks to such levels is not necessary to protect public health, yet would require costly upgrades to the Easterly WWTP (capital cost estimated at $34.8 million (West Yost Associates 2008)) in an effort to comply with current criteria.

1.4 BACKGROUND

In September 2001, the State Water Resources Control Board (State Water Board) held a hearing on the City of Vacaville's Easterly WWTP permit. It adopted Order WQO 2002-0015 addressing this appeal on 3 October 2002 (SWRCB. 2002). Among other things, the State Water Board Order directed the Central Valley Water Board to promptly initiate a use attainability analysis (UAA) which could be used as a basis for dedesignating the MUN use and various

aquatic life uses for Old Alamo Creek (Figure 1, yellow highlighted water body). The State Water Board made this recommendation because designation of these uses via the "tributary statement" and incorporation of Resolution 88-63 (Sources of Drinking Water Policy) into the Basin Plan resulted in NPDES permit limitations that could not be met without costly modifications to the Easterly WWTP, yet available evidence suggested that these uses are neither existing nor attainable in Old Alamo Creek. Refinement of the use designations through the UAA process provided a prudent course of action to resolve regulatory inconsistencies for discharges into Old Alamo Creek.

USEPA's final approval of the dedesignations of the MUN, COLD, MIGR, and SPWN uses for Old Alamo Creek on 7 August 2006 resolved key Easterly WWTP compliance issues associated with Easterly WWTP discharges into Old Alamo Creek. However, limiting the water quality standards refinement actions to Old Alamo Creek did not fully resolve the current regulatory issues associated with the MUN beneficial use – including compliance problems associated with meeting applicable water quality criteria for DBCM, DCBM, and chloroform. Rather, these compliance issues "moved" from the point of discharge into Old Alamo Creek (immediately adjacent to the plant outfall) to the confluence of Old Alamo Creek and New Alamo Creek, about 3.2 miles downstream of the outfall.

1.5 NEED FOR AMENDMENTS TO THE BASIN PLAN

There is need for Basin Plan amendments to refine the water quality standards associated with DBCM, DCBM, and chloroform applicable to the lower segments of New Alamo Creek and Ulatis Creek because the current standards are based on the assumption that people are using segment waters as their primary drinking water supply for their lifetime – a level of use that has never occurred in the past, is not currently occurring, and is not reasonably expected to occur in the future. As such, the current criteria are unnecessarily restrictive. Moreover, the current criteria create a significant regulatory compliance issue with the operation of the Easterly WWTP. The City of Vacaville conducted a study to evaluate the municipal and domestic water supply (MUN) use for the lower portions of New Alamo Creek and Ulatis Creek. The study presented water rights records, field surveys, and interviews indicating that the MUN use has not occurred since 28 November 1975, is not currently occurring, and is not expected to occur in the future based on system hydrologic and water quality characteristics (RBI 2007a).

This finding was supported by Ms. Leah Walker of the California Department of Public Health (DPH, formerly Department of Health Services (DHS)), who, when attending the Central Valley Water Board's California Environmental Quality Act public scoping meeting for this standards refinement project on 28 June 2007, stated that the DPH supports the dedesignation of MUN from the UAA study segments. Central Valley Water Board staff agree that municipal uses are not existing and likely not attainable because of the existing hydrologic conditions and water quality characteristics. However, staff believes that it is important to maintain the MUN use designation in order to maintain water quality in the lower New Alamo Creek and Ulatis Creek segments at a level sufficient to protect potential future transient and incidental use of water in the segments for drinking water should such use ever occur. Therefore, this project consists of adopting site-specific THM objectives that meet the selection criteria in the following section, and that are appropriate for this potential limited use. Developing and adopting site-specific

THM objectives provides the means of achieving the following standards refinement objectives for the segments:

1) adopt site-specific objectives for DBCM, DCBM, and chloroform that provide reasonable protection of the MUN use of segment waters while considering the past, present, and potential future drinking water use of segment waters;
2) maintain current levels of MUN protection for THMs in water bodies downstream of the segments; and
3) resolve the THM regulatory compliance issue faced by the City of Vacaville in operating its Easterly WWTP in an efficient and cost-effective manner.

Central Valley Water Board staff have concluded that limiting THM concentrations in the lower New Alamo and Ulatis Creek segments to levels required by current criteria is not necessary based on the information provided by the City of Vacaville (RBI 2007b) which documents the lack of drinking water use within the segments currently and in the past. In addition, as discussed in RBI 2007c, any future use of segment waters that may potentially occur is anticipated to be transient and incidental in nature. Moreover, costly upgrades to the Easterly WWTP would be required in an effort to comply with current criteria. Consequently, adoption of site-specific objectives for DBCM, DCBM, and chloroform and associated implementation provisions through the Basin Plan amendment process is appropriate.

This project addresses water bodies that are dominated by NPDES discharges. The Central Valley Water Board concluded in its last triennial review that addressing the regulatory issues presented in these water bodies is a high priority (CVRWQCB 2006).

MUN is not a designated use of Old Alamo Creek, the intervening water body between the Easterly WWTP discharge and New Alamo Creek; thus, it is not necessary to establish site-specific objectives to address this use within Old Alamo Creek. The CTR "organism only" criteria for DBCM (34 µg/l) and DCBM (46 µg/l) are applicable to Old Alamo Creek. Because the CTR reserved the organism only criterion for chloroform, staff relies upon USEPA's national recommended water quality organism-only criterion for chloroform for Old Alamo Creek, which is 470 µg/l. However, the current regulations (*Policy for Implementation of Toxics Standards for Inland Waters, Enclosed Bays, and Estuaries of California* (i.e. State Implementation Plan or SIP)) and guidance (USEPA 1991) do not include specific implementation procedures to address a situation where water bodies downstream of the first receiving water have applicable water quality objectives that are more stringent than the water quality objectives of the first receiving water. This is the situation for dischargers to Old Alamo Creek. Old Alamo Creek is the first receiving water and it does not have a MUN designated use. New Alamo Creek, the downstream receiving water, has a MUN designated use which must be protected. Therefore, it is necessary to adopt implementation procedures that address this unique situation.

2 BENEFICIAL USES

2.1 REGULATIONS THAT APPLY TO BENEFICIAL USE DESIGNATION

2.1.1 Federal Regulations and Guidance

Federal regulations require the protection of designated uses. Federal regulations establish special protections for CWA §101(a)(2) uses. CWA §101(a)(2) states that it is a national goal that wherever attainable, water quality should be sufficient "for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water." These uses are also referred to as "fishable/swimmable" uses. In order to de-designate, subcategorize, or not designate these uses, the state must support its demonstration of infeasibility with a use attainability analysis (40 CFR §131.10(j)).

A designated use, which is not an existing use, may be removed after demonstrating that attaining the use is not feasible due to one or more of the factors listed in 40 CFR 131.10(g). "Existing" uses are defined as uses that were attained on or after 28 November 1975 (40 CFR. §131.3(e)). An existing use is attained if the use has actually occurred or the water quality necessary to support the use has been achieved, even if the use itself is not currently established, unless physical factors prevent attainment of the use (USEPA 1994).

2.1.2 State Regulations and Guidance-State Water Board Sources of Drinking Water Policy (Resolution 88-63)

State Water Board Resolution No. 88-63, commonly known as the Sources of Drinking Water Policy, establishes state policy that all waters are considered suitable or potentially suitable to support the MUN beneficial use, with certain exceptions.

The Basin Plan implements State Water Board Resolution 88-63 ("Sources of Drinking Water Policy") by assigning MUN to all water bodies not listed in Table II-1. Exceptions to the MUN designation are allowed for surface and ground waters: 1) with total dissolved solids exceeding 3,000 mg/L (5,000 µS/cm EC), 2) with contamination that cannot reasonably be treated for domestic use, 3) where there is insufficient water supply for a single well to provide an average, sustained yield of 200 gallons per day, 4) in systems designed for wastewater collection or conveying or holding agricultural drainage, or 5) regulated as a geothermal energy producing source. Resolution 88-63 addresses only designation of water as drinking water sources; it does not establish objectives for constituents that are protective of the designated MUN use.

2.2 STATEMENT OF APPLICABLE BENEFICIAL USES

Designated uses include both existing uses and potential uses (40 CFR §131.3(f)). In Table II-1 of the Basin Plan, beneficial uses for listed water bodies within the Sacramento and San Joaquin River basins are identified as either Existing or Potential.

For tributary streams that are not listed in Table II-1, the Basin Plan states that "[t]he beneficial uses of any specifically identified water body generally apply to its tributary streams." (Basin Plan at II-2.00). The Basin Plan states, however, that in some cases, the beneficial use may

not be applicable to the entire water body and that the uses for unidentified waters will be evaluated on a case-by-case basis. (Id.) The Basin Plan also provides that water bodies not listed in Table II-1 are assigned MUN as a beneficial use in accordance with State Water Board Resolution No. 88-63.

Lower Ulatis Creek is located within the legal boundary of the Sacramento-San Joaquin Delta, which has beneficial uses specified in Table II-1 of the Basin Plan. The beneficial uses of New Alamo Creek are not identified in Table II-1 of the Basin Plan. Thus, the beneficial uses of the Sacramento-San Joaquin Delta are assigned to New Alamo Creek via the Basin Plan's tributary statement. The beneficial uses of the Sacramento-San Joaquin Delta include: municipal and domestic supply (MUN), agricultural supply (AGR), industrial service supply (IND), industrial process supply (PRO), water contact recreation (REC-1), non-contact water recreation (REC-2), warm freshwater habitat (WARM), cold freshwater habitat (COLD), migration of aquatic organisms (MIGR), spawning, reproduction, and/or early development (SPWN), wildlife habitat (WILD), and navigation (NAV).

Beneficial uses for Old Alamo Creek also are not specifically identified in Table II-1 of the Basin Plan and, therefore, its beneficial uses are assigned via the tributary statement except that MUN, COLD, MIGR, and SPWN do not apply to Old Alamo Creek from its headwater to the confluence with New Alamo Creek (Basin Plan, p. II-2.00 and II-2.01).

Water rights records, field surveys, and interviews indicate that the MUN use has not occurred nor is it expected to occur in New Alamo and Ulatis Creeks in the future, based on system hydrologic and water quality characteristics (RBI 2007b).

3 WATER QUALITY OBJECTIVES

3.1 REGULATIONS THAT APPLY TO ESTABLISHING WATER QUALITY OBJECTIVES

3.1.1 Federal Regulations and Guidance

Federal regulations require States to adopt narrative or numeric water quality criteria (synonymous with water quality objectives in California) to protect designated beneficial uses (40 CFR §131.11(a)(1)). States are required to adopt numeric criteria for constituents considered priority toxic pollutants (CWA §303(c)(2)(B)). Federal regulations permit States to establish water quality criteria based on criteria that USEPA publishes under CWA §304(a) modified to reflect site-specific conditions (40 CFR §131.11(b)(1)(ii)).

The USEPA promulgated criteria for priority toxic pollutants for surface waters of California in the CTR. The federal CTR (40 CFR §131.38) criteria for carcinogens were derived using a 10^{-6} risk level. The rationale was based, in part, on historical practices by the State. The standards adopted by the State in the now repealed *Enclosed Bays and Estuaries Plan and Inland Surface Waters Plan* contained a 10^{-6} risk level for most carcinogens. The preamble of the CTR acknowledges that the State has the discretion to adopt water quality criteria that protect to a higher risk level, as long as the most highly exposed subpopulations are protected (65 FR 31699):

> *"EPA, in its recent human health methodology revisions, proposed acceptable lifetime cancer risk for the general population in the range of 10^{-5} to 10^{-6}. EPA also proposed that States and Tribes ensure the most highly exposed populations do not exceed a 10^{-4} risk level….EPA, therefore, believes that derivation of criteria at the 10^{-6} risk level is a reasonable risk management decision protective of designated uses under the CWA. While outside the scope of this rule, EPA notes that States and Tribes, however, have the discretion to adopt water quality criteria that result in a higher risk level (e.g., 10^{-5}). EPA expects to approve such criteria if the State or Tribe has identified the most highly exposed subpopulation within the State or Tribe, demonstrates the chosen risk level is adequately protective of the most highly exposed subpopulation, and has completed all necessary public participation."*

USEPA intends to publish future national ambient water quality criteria at a 10^{-6} risk level, which it considers appropriate for the general population (USEPA 2000, p. 1-8 and 2-6). However, USEPA acknowledges that, on a local level (e.g., statewide, regional, or water body basis), a 10^{-5} risk level may be appropriate as long as the most highly exposed population groups do not exceed a 10^{-4} risk level (USEPA 2000, p. 2-6).

3.1.2 State Regulations and Guidance

CWC §13050 defines water quality objectives as "…the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area."

When adopting water quality objectives, the Regional Water Board is required to consider:

(a) Past, present, and probable future beneficial uses of water;
(b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto;
(c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area;
(d) Economic considerations;
(e) The need for developing housing within the region; and
(f) The need to develop and use recycled water (CWC §13241).

3.2 Statement of Applicable Water Quality Criteria and Objectives

Human health criteria for DBCM and DCBM applicable to New Alamo Creek and Ulatis Creek have been promulgated by the USEPA through the CTR. The CTR promulgated human health criteria for protection through the consumption of water and aquatic organisms and consumption of aquatic organisms only. The criteria for the consumption of water and aquatic organisms apply to all water bodies in California designated with the MUN use. The criteria for the consumption of aquatic organisms only apply to water bodies that are not designated MUN. The CTR did not promulgate criteria for chloroform, because the USEPA was re-evaluating the scientific basis for chloroform criteria at the time the CTR was promulgated. Section 304(a) of the Clean Water Act directs the USEPA to develop criteria for water quality that accurately reflect the latest scientific knowledge about the effects of pollutants on aquatic life and human health. States may use the criteria that are developed by USEPA to help set water quality standards that protect the uses of their waters or they may develop their own water quality criteria. The current National Recommended Ambient Water Quality Criteria includes criteria for DBCM, DCBM and chloroform (USEPA 2006). The USEPA released draft recommended ambient water quality criteria for chloroform in 2003, however, these draft criteria are not reflected in the current recommended criteria. Table 1 summarizes the current water quality criteria for DBCM, DCBM, and chloroform as well as the DPH MCL applicable to tap water (RBI 2009).

The Basin Plan does not contain individual water quality objectives for any of the THM compounds. However, there is a maximum contaminant level (MCL) of 80 µg/l applicable to tap water for the sum of the THMs (DBCM, DCBM, chloroform, and bromoform).

Table 1. Adopted statewide human health criteria, Department of Public Health (DPH) MCL, and USEPA recommended criteria for DBCM, DCBM, and chloroform.

Constituent	**California Toxics Rule Criteria (µg/L)**		**DPH MCL (µg/L)**	**USEPA Recommended Criteria (µg/L)**
	Organisms Only	Water & Organisms		Water & Organisms
Chlorodibromomethane (DBCM)	34 [1]	0.41 [1]	80 (for the sum of the THMs) [4]	0.40 [1,2]
Dichlorobromomethane (DCBM)	46 [1]	0.56 [1]		0.55 [1,2]
Chloroform	[Reserved] [3]	[Reserved] [3]		5.7 [1,2,5] 68 (draft) [6]
[1] Based on a 10^{-6} cancer risk level.				

[2] USEPA National Recommended Water Quality Criteria (2006).
[3] USEPA reserved promulgation of criteria for chloroform in the California Toxics Rule (CTR) to allow for reassessment based on new information.
[4] Implemented as a 12-month running average of sample concentrations collected quarterly.
[5] Proposed for CTR, reserved in final CTR.
[6] *Ambient Water Quality Criterion for the Protection of Human Health: Chloroform - Revised Draft*. EPA-822-R-04-002. Office of Water. Washington, D.C. (not a final recommendation) (2003)

The CTR criteria were developed using USEPA's 1980 ambient water quality criteria approach (USEPA 1980). Criteria for DBCM and DCBM were derived based on a 10^{-6} cancer risk level. The proposed CTR contained a human health criterion for chloroform of 5.7 µg/L for the consumption of water and organisms, also based on a 10^{-6} cancer risk. The final CTR reserved promulgation of chloroform criteria to consider new data and analysis on chloroform's mode of action. The USEPA has since developed draft chloroform criteria based on non-cancer effect thresholds that are protective against cancer effects as well (USEPA 2003), but has not finalized the criteria. The State Office of Environmental Health Hazard Assessment (OEHHA) also has issued proposed "Public Health Goals" (PHGs) for THMs which, like the CTR, are based on 10^{-6} cancer risk level, but are non-regulatory.

The Stage 1 and Stage 2 Disinfectant and Disinfection Byproducts rules, USEPA regulations implementing the Safe Drinking Water Act, apply to drinking water served at the tap, and specify a total THM MCL of 80 µg/L. Title 22 of the CCR, Section 64439 references the most current USEPA drinking water regulations for compliance with the total THM MCL. However, unlike other CCR sections with MCLs (i.e., 64431, 64444, 64449), neither Section 64439 nor Table 64533-A (Disinfection Byproducts MCLs) of the CCR is incorporated by reference in the Basin Plan as a water quality objective for chemical constituents. Thus, the 80 µg/L MCL is not directly applicable as a water quality objective for surface waters.

3.2.1 Application of Water Quality Objectives

Water quality objectives are applied as maximum concentrations that are not to be exceeded. This is regardless of whether the water quality objectives are intended to be protective of acute situations or chronic long-term situations. Therefore, in permitting situations (described in Section 4.2, et. al.) the water quality objectives are applied as a maximum concentration to determine whether effluent limitations are necessarily and then are used as a maximum to derive any necessary effluent limitations. Also, water body impairments are determined by exceedance of the water quality objectives.

3.3 Alternative Site-Specific Objectives

Because drinking water use of the lower segments of New Alamo Creek and Ulatis Creek has not occurred in the past, is not occurring presently, and is not expected to occur in the foreseeable future, and because the expectation that any potential future use that may occur would involve exposure that is markedly less than that assumed in deriving the currently applicable THM criteria (i.e., consuming 2 liters per day (L/day) of water diverted from the segments and 6.5 grams of fish/shellfish consumed from segment waters for a 70-year lifetime), it is appropriate to establish site-specific THM objectives that are more consistent with the MUN use within these segments. The following sections outline alternative water quality objectives for DBCM, DCBM, and chloroform for lower New Alamo Creek and Ulatis Creek. The USEPA al-

lows a range in risk level from 10^{-6} to 10^{-4} for human health criteria as long as the most highly exposed population groups do not exceed a 10^{-4} risk level (USEPA 2000).

The alternative water quality objectives are described below. The detailed technical basis for these alternatives is provided in RBI 2009, *Derivation of Human Health Criteria for Trihalomethane Compounds for Segments of New Alamo Creek and Ulatis Creek, Solano County, California* .

3.3.1 Alternative 1. No Project

This alternative would not amend the Basin Plan; rather, it would continue to implement the current CTR criteria that were developed using USEPA's 1980 ambient water quality criteria approach for DBCM and DCBM. The CTR criteria are based on providing a 10^{-6} level of protection (i.e., risk of one additional cancer in 1,000,000 people based on an assumed consumption of 2 L/day of water and consuming 6.5 g of fish/shellfish per day over a 70-year lifetime). The resulting THM human health criteria under this alternative are:

- DBCM – 0.41 µg/L, and
- DCBM – 0.56 µg/L.

Chloroform would continue to be addressed through the narrative toxicity objective in the Basin Plan, because no numeric human health criteria/objective for chloroform has been promulgated at the federal or State level. The narrative toxicity objective can be interpreted, quantitatively, by USEPA's current national recommended water quality criteria for chloroform, which is 5.7 µg/l (USEPA 2006).

3.3.2 Alternative 2. USEPA's 2006 NRWQC – 10^{-6} Risk Level

This alternative would amend the Basin Plan to add site-specific objectives equivalent to USEPA's 2006 NRWQC. As such, these site-specific objectives would provide a 10^{-6} level of protection, based on an assumed consumption of 2 L/day of water and consuming 17.5 g of fish/shellfish per day over a 70-year lifetime. This alternative differs from Alternative 1 in that the DBCM and DCBM objectives would reflect USEPA's current human health methodology that uses higher default fish consumption rates than did the USEPA's 1980 methodology (USEPA 2000). Consistent with the 2006 NRWQC, the chloroform objective would be based on the USEPA's 1980 methodology. The resulting site-specific objectives for this alternative are:

- DBCM – 0.40 µg/L,
- DCBM – 0.55 µg/L, and
- Chloroform – 5.7 µg/L.

The actual human health risk for segment waters is expected to be substantially lower than the 10^{-6} level of protection identified above using the USEPA methodology and assumptions, given that no consumption of water from the segments is currently occurring nor is consumption of segment waters expected to occur in the future. Any potential future use would be transient and incidental in nature (e.g., days, months), and would not occur daily for the 70 year period of exposure assumed by the USEPA methodology.

3.3.3 Alternative 3. USEPA's 2006 NRWQC – 10^{-5} Risk Level

This alternative would amend the Basin Plan to add site-specific objectives derived using USEPA's 2006 NRWQC, adjusted to a 10^{-5} cancer risk level (i.e., risk of one additional cancer in 100,000 people based on an assumed consumption of 2 L/day of water and consuming 17.5 g of fish/shellfish per day over a 70-year lifetime). The resulting site-specific objectives for this alternative are:

- DBCM – 4.0 µg/L,
- DCBM – 5.5 µg/L, and
- Chloroform – 57 µg/L.

The actual human health risk for segment waters is expected to be substantially lower than the 10^{-5} level of protection identified above using the USEPA methodology and assumptions, given that no consumption of water from the segments is currently occurring nor is consumption of segment waters expected to occur in the future. Any potential future use would be transient and incidental in nature (e.g., days, months), and would not occur daily for the 70 year period of exposure assumed by the USEPA methodology.

3.3.4 Alternative 4. Maintain Existing Water Quality Conditions

This alternative would amend the Basin Plan to add site-specific objectives that would maintain existing water quality conditions within the segments for DBCM, DCBM, and chloroform and would provide reasonable protection for transient and incidental use (Appendix B), should such use ever occur in the future. Using the upper end of the concentration distributions observed from historical monitoring at the head of the segments (i.e., at the terminus of Old Alamo Creek) to derive the water quality objectives will maintain the current conditions because current and anticipated future sources of THMs enter the segments from Old Alamo Creek and the water quality objectives are applied as maximum concentrations not to be exceeded (see section 3.2.1). The proposed water quality objectives reflect the current water quality conditions where the concentrations of THMs within the segments decrease to the current CTR criteria levels in Cache Slough. This alternative does not include decreasing water quality objectives with increasing distance downstream from the confluence with Old Alamo Creek because such objectives would be overly complicated and unnecessary since any new point-source discharge or increased volume of waste discharge to the segments that could cause a degradation in THM or other water quality parameters, relative to current water quality, would require an antidegradation analysis prior to the State permitting the new or expanded-capacity discharge and any associated water quality degradation.

This alternative has the following two options.

Option A:

Site-specific objectives derived under this option would provide a composite 10^{-5} level of cancer risk protection, assuming consumption of 2 L/day of water and up to 17.5 g/day of fish/shellfish (USEPA 2006) (Appendix B, Table B-1). This alternative is similar to Alternative 3 in that the additive or composite cancer risk for consuming all three compounds at the USEPA's default consumption rates approximates 10^{-5}, but it differs from Alternative 3 in that the objectives for DBCM and chloroform are somewhat more restrictive and that for DCBM is

somewhat less restrictive. Its implementation would limit maximum concentrations to existing levels (i.e., 99.94 percentile concentrations historically observed at Brown-Alamo Dam (Appendix B, Table B-1)), thereby preventing further degradation with respect to maximum THM levels in the New Alamo and Ulatis creek segments. The objectives for Alternative 4A are:

- DBCM – 2.6 µg/L,
- DCBM – 9.0 µg/L, and
- Chloroform – 39.5 µg/L.

The incremental cancer risk levels associated with these objectives, based on consuming 2L/day of segment water at the Alternative 4A objective levels for a 70-year lifetime, range from $10^{-4.95}$ to $10^{-5.38}$ (see Appendix B, Table B-4). Consistent with USEPA guidance (USEPA 2000, p. 2-6; 65 FR 31699), these objectives assure that the cancer risk to the most highly exposed population would not exceed 10^{-4}, even if this population consumed 2 L/day of water and up to 17.5 g/day of fish/shellfish from the segments or more, which is not expected to occur. Consumption of water in these segments is never expected to be 2 L/day for a lifetime, so the actual human health risk for segment waters is expected to be substantially lower than the range cited above, given that no consumption of water from the segments is currently occurring nor is consumption of segment waters expected to occur in the future. Any potential future use would be transient and incidental in nature (e.g., days, months), and would not occur daily for the 70 year period of exposure assumed by the USEPA methodology. Therefore, for demonstration purposes, the USEPA methodology was used to estimate the cancer risk level should a person consume water from the segments containing DBCM, DCBM, and chloroform at Alternative 4A objective levels on a transient basis and water elsewhere containing DBCM, DCBM, and chloroform at the current CTR/USEPA criteria levels for the remainder of a 70-year period of exposure (see Appendix B, Table B-6). This approach also was used to determine the number of years individuals could consume water from the segments at Alternative 4A objective levels, and water from other sources for the remainder of the 70-year exposure period, and still achieve a 10^{-5} risk level (Table B-7). The calculations demonstrate that the risk levels associated with these objectives are most likely much lower than the risks calculated using the USEPA methodology under the assumption that 2L of segment water would be consumed each day for 70 years (Table B-4), with the incremental cancer risk levels anticipated to be substantially lower than 10^{-5} (Table B-6 and B-7). Alternative 4A objectives provide an upper limit or “cap” to existing conditions at Brown-Alamo Dam, which is protective of potential future exposure levels associated with transient and incidental drinking water use of segment waters.

Option B:

Historical THM data measured at the terminus of Old Alamo Creek, immediately prior to its confluence with New Alamo Creek, (Appendix A, Table A-2) (n=60) were analyzed statistically to determine the probabilities with which various concentrations of DBCM, DCBM, and chloroform have occurred at this location (Appendix B, Table B-2). This alternative derived objectives that would equate to the 99.9 percentile concentrations historically observed at the terminus of Old Alamo Creek. Use of the 99.9 percentile concentrations historically observed

at the terminus of Old Alamo Creek is consistent with the application of water quality objectives as maximum concentrations (see section 3.2.1). As such, these objectives would conservatively limit the maximum DBCM, DCBM, and chloroform concentrations at the head of the segments to existing levels (i.e., 99.9 percentile concentrations historically observed), thereby preventing further degradation with respect to maximum THM levels in the New Alamo and Ulatis creek segments from existing and currently regulated sources. These site-specific objectives are slightly more stringent than the Alternative 3 objectives for chloroform and slightly less stringent for DBCM and DCBM. The objectives for Alternative 4B are:

- DBCM – 4.9 µg/L,
- DCBM – 15.5 µg/L, and
- Chloroform – 45.5 µg/L.

The incremental cancer risk levels associated with these objectives, based on consuming 2L/day of segment water at the Alternative 4B objective levels for a 70-year lifetime, range from $10^{-4.55}$ to $10^{-4.91}$ (see Appendix B, Table B-5). Consistent with USEPA guidance (USEPA 2000, p. 2-6; 65 FR 31699), these objectives assure that cancer risk to the most highly exposed population would not exceed a 10^{-4}, even if the population consumed 2 L/day of water and up to 17.5 g/day or more of fish/shellfish from the segments for a 70-year lifetime (Appendix B, Table B-2) which is not expected to occur. Consumption of water in these segments is never expected to be 2 L/day for a lifetime, so the actual human health risk for segment waters is expected to be substantially lower than the range cited above, given that no consumption of water from the segments is currently occurring nor is consumption of segment waters expected to occur in the future. Any potential future use would be transient and incidental in nature (e.g., days, months), and would not occur daily for the 70 year period of exposure assumed by the USEPA methodology. Therefore, for demonstration purposes, the USEPA methodology was used to estimate the cancer risk level should a person consume water from the segments containing DBCM, DCBM, and chloroform at Alternative 4B objective levels on a transient basis and water elsewhere containing DBCM, DCBM, and chloroform at the current CTR/USEPA criteria levels for the remainder of a 70-year period of exposure (see Appendix B, Table B-8). This approach also was used to determine the number of years individuals could consume water from the segments at Alternative 4B objective levels, and water from other sources for the remainder of the 70-year exposure period, and still achieve a 10^{-5} risk level (Table B-9). The calculations demonstrate that the risk levels associated with these objectives are most likely much lower than the risk levels calculated using the USEPA methodology under the assumption that 2L of segment water would be consumed each day for 70 years (Table B-5), with the incremental cancer risk levels anticipated to be substantially lower than 10^{-5} (Table B-8 and B-9). Alternative 4B objectives provide an upper limit or "cap" to existing conditions at the head of the segments, which is protective of potential future exposure levels associated with transient and incidental drinking water use of segment waters.

3.4 Evaluation of Water Code Section 13241 Factors

Section 13241 of the Porter-Cologne Water Quality Act identifies six factors that must be addressed when evaluating a basin plan amendment. Factors to be considered are:

- Past, present, and probable future beneficial uses of water;
- Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto;
- Water quality conditions that could reasonably be achieved through the coordinated control of all factors that affect water quality in the area;
- Economic considerations;
- The need for developing housing within the region; and
- The need to develop and use recycled water.

The following sections discuss the factors as they relate to each alternative.

3.4.1 Beneficial Uses

The beneficial use of New Alamo and Ulatis Creeks most sensitive to DBCM, DCBM and chloroform concentrations is the MUN use. These constituents are carcinogens and the alternative site-specific objectives represent a variety of incremental cancer risk levels for the population when all individuals in the population ingest these constituents at the stated water and organism consumption rates over a 70-year lifetime. The alternatives represent a reasonable range of possible water quality objectives allowed under the federal guidance for the protection of the MUN use.

USEPA proposed that States ensure that the most highly exposed populations do not exceed a 10^{-4} cancer risk level (one cancer per 10,000 people). Therefore, all of the alternative sets of objectives proposed herein would adequately protect the MUN use, consistent with USEPA guidance, because all alternatives would protect at a cancer risk level substantially lower (i.e., substantially more protective) than 10^{-4}.

3.4.2 Environmental Characteristics of the Hydrographic Unit

The alternatives proposed would either maintain existing THM levels within the segments and in downstream waters or would require a reduction in historical THM levels. The site-specific objective would not alter any other water quality or hydrologic characteristics of the segments or other water bodies. Therefore, none of the alternatives would affect the environmental characteristics of the hydrographic unit.

3.4.3 Water Quality Conditions That Could Reasonably Be Achieved

DBCM is in compliance with the water quality objectives proposed under Alternatives 1 and 2 in Ulatis Creek about 0.6-mile downstream of the New Alamo and Ulatis Creek confluence. DCBM and chloroform are in compliance with the water quality objectives proposed under alternatives 1 and 2 at the non-operational Vallejo Pump Station, located 11.9 miles from the outfall just after the confluence of Ulatis Creek and Cache Slough. To achieve compliance with the water quality objectives proposed under Alternatives 1 and 2, additional wastewater treatment would need to be added to the Easterly WWTP at substantial cost, described in Section 3.4.4. In addition, under these two alternatives, a time schedule would be needed to allow time for the Easterly WWTP discharge to come into compliance.

All historical sampling data for New Alamo and Ulatis Creeks indicate that DBCM, DCBM, and chloroform are in compliance with the water quality objectives proposed under Alternatives 3, 4A, and 4B.

Under all alternatives, the current applicable water quality criteria (CTR) will apply and be met in Cache Slough.

3.4.4 Economic Consideration

Substantial modifications to Easterly WWTP facilities and operations would be required in an effort to comply with Alternative 1 and Alternative 2 objectives within the segments. Modifications to Easterly WWTP facilities (i.e., addition of year-round filtration and UV effluent disinfection system) in an effort to comply with Alternative 1 or Alternative 2 objectives have an estimated capital cost of $34.8 million (West Yost Associates 2008). Annual operations and maintenance costs also would increase substantially following these facility and operations modifications, which would include substantial increases to power usage at the facility. Even with these expenditures, full compliance at all times cannot be assured. Moreover, such expenditures would not provide greater public health protection because no drinking water use of segments waters is occurring or expected to occur in the future.

Neither the adoption of Alternative 3 objectives nor the adoption of Alternative 4A or 4B objectives are expected to require modifications to Easterly WWTP facilities or operations.

3.4.5 Need for Housing

Alternatives 1 and 2 would result in incrementally higher costs of housing in the Easterly WWTP service area than the other alternatives. None of the alternatives would restrict the development of housing.

3.4.6 Need to Develop and Use Recycled Water

None of the alternatives would restrict the development or use of recycled water. The alternatives, therefore, are consistent with the need to develop and use recycled water.

4 PROGRAM OF IMPLEMENTATION

4.1 REGULATIONS THAT APPLY TO ESTABLISHING IMPLEMENTATION PROGRAMS

4.1.1 Federal Regulations and Guidance

Section 402 of the CWA requires a permitting system which USEPA addressed by promulgating 40 CFR §122, which are the regulations pertaining to the National Pollutant Discharge Elimination System (NPDES) program. The State's regulations pertaining to NPDES permits must be consistent with the federal regulations.

Title 40 CFR §122.44(d)(1)(ii) sets forth the regulations for determining whether a discharge has a reasonable potential to cause or contribute to a violation of water quality standards. It states, "When determining whether a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above a narrative or numeric criteria within a State water quality standard, the permitting authority shall use procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, the sensitivity of the species to toxicity testing (when evaluating whole effluent toxicity), and where appropriate, the dilution of the effluent in the receiving water." While the federal regulations do not contain explicit procedures to derive effluent limitations, USEPA has provided guidance (USEPA 1991) that includes explicit procedures.

Title 40 CFR §122.47 sets forth the regulations for schedules of compliance for NPDES programs.

4.1.2 State Regulations and Guidance

Per the Porter-Cologne Water Quality Act Section 13050(j)(3), a basin plan amendment must include an implementation program to achieve water quality objectives. The CWC §13242 prescribes the contents of an implementation plan, which include the following:

- description of the actions necessary to achieve the water quality objectives;
- time schedule; and
- a monitoring and surveillance program.

The State Water Board adopted the *Policy for Implementation of Toxics Standards for Inland Waters, Enclosed Bays, and Estuaries of California* (i.e. State Implementation Plan or SIP) to provide state regulations on implementation provisions for priority pollutant criteria and water quality objectives. The Regional Water Boards must determine whether a discharge causes, has the "reasonable potential" to cause, or contributes to an excursion above an applicable narrative or numeric water quality criterion. An analysis of "reasonable potential" (also called the "Determination of the Need for Water Quality Based Effluent Limitations" in the SIP) determines an effluent's capability to cause such excursions. The analysis is typically calculated by comparing the maximum effluent concentration to the lowest applicable receiving water criterion. If the effluent concentration is equal to or exceeds the lowest applicable

receiving water criterion, then reasonable potential exists and an effluent limitation is required for that constituent.

Discharges to Old Alamo Creek, such as the Easterly WWTP discharge, present a unique circumstance for assessing the reasonable potential for the discharge to cause an excursion above applicable THM criteria for New Alamo Creek because the Easterly WWTP discharges directly into Old Alamo Creek, which has no MUN designation. The treated effluent discharged into Old Alamo Creek flows approximately 3.2 miles before its confluence with New Alamo Creek. Because THMs are volatile compounds, there is significant attenuation or loss of concentration of the THMs between the Easterly WWTP outfall and the terminus of Old Alamo Creek with New Alamo Creek. New Alamo Creek is the first downstream water body that has a MUN designation and thus THM objectives that must be met to protect the MUN use. Such a situation is not addressed in the SIP. Therefore, it is necessary to define additional or partially modified procedures for implementing the proposed site-specific THM water quality objectives for the segments. These procedures, along with time schedule for completion and the monitoring and surveillance program, are described in the following sections.

4.2 Actions Necessary to Achieve the Proposed Water Quality Objectives

Achievement of the proposed site-specific water quality objectives would be accomplished through the Central Valley Water Board's NPDES program. Monitoring of the effluent at the terminus of Old Alamo Creek and/or within New Alamo Creek would be required (see Section 4.4). In addition, effluent limitations would be imposed on point-source dischargers into Old Alamo Creek (e.g., Easterly WWTP) to control the discharge of DBCM, DCBM, and chloroform, should the monitoring data demonstrate that a reasonable potential to cause an excursion above the site-specific water quality objectives applicable to the segments exists.

The two steps in this process are: 1) determining the need for water quality-based effluent limitations, and 2) calculating effluent limitations. These aspects of the implementation program are addressed as part of the Basin Plan amendment because the necessary procedures to appropriately evaluate compliance with site-specific THM objectives for the New Alamo and Ulatis creek segments are not addressed by the SIP. Specifically, the SIP does not address situations where water bodies subsequent to (i.e., downstream of) the first receiving water (i.e., New Alamo Creek) have applicable water quality objectives that are more stringent than the water quality objectives for the first receiving water (i.e., Old Alamo Creek). Because the approach to this aspect of the implementation program varies somewhat depending on which set of alternative objectives are adopted for the segments, the specific implementation procedures associated with each set of alternative objectives are discussed below.

4.2.1 Determination of Need for Water Quality-Based Effluent Limitations

Determining the need for water quality-based effluent limitations for DBCM, DCBM, and chloroform would vary depending on whether Alternative 1, 2, 3, 4A, or 4B objectives are adopted for the segments. Consequently, the applicable approaches are described separately below.

For assessing reasonable potential, the SIP requires the maximum effluent concentration (MEC) to be compared to the applicable water quality criterion/objective. However, Old Alamo Creek, does not have the beneficial use of MUN or accompanying water quality criteria

associated with this use, and THM levels are attenuated (i.e., decreased through volatilization) as water flows down Old Alamo Creek. Thus, the MEC is not representative of whether a discharge to Old Alamo Creek has reasonable potential to cause or contribute to an exceedance of applicable THM criteria in New Alamo Creek. Accordingly, the reasonable potential analysis for the proposed site-specific THM objectives should account for the attenuation that occurs in Old Alamo Creek for all discharges into Old Alamo Creek. The alternatives described below identify the appropriate monitoring location to account for the attenuation from Old Alamo Creek.

Alternative 1 – No Project

Alternative 1 would consist of no Basin Plan amendment. Therefore, determination of the need for water-quality based effluent limitations for DBCM, DCBM, and chloroform for discharges into Old Alamo Creek would follow procedures defined in Section 1.3 of the SIP. Because Old Alamo Creek has no MUN use, the reasonable potential analysis would use the organism only criteria for DBCM, DCBM, and chloroform in Old Alamo Creek.

The SIP does not specifically address situations where objectives apply downstream but not in the immediate receiving water. Applying the reasonable potential analysis in Section 1.3 of the SIP based on effluent concentrations and downstream uses, without considering attenuation (i.e., reduction) in Old Alamo Creek, could require effluent limitations that are not necessary to protect the MUN uses in New Alamo or Ulatis Creeks. For example, effluent concentrations might exceed one or more of the site-specific objectives for New Alamo Creek, but not have reasonable potential to cause or contribute to an exceedence in New Alamo Creek due to attenuation. Using the end-of-pipe method in Section 1.3 of the SIP would require using the New Alamo Creek site-specific objectives in determining reasonable potential as if they were the Old Alamo Creek water quality objectives, even though they do not apply to Old Alamo Creek. The No Project scenario does not address the ambiguity regarding how to determine reasonable potential for priority pollutants in downstream waters.

Alternative 2, 3, and 4A Objectives

In the case of determining the need for effluent limitations to achieve Alternative 2, 3 or 4A objectives in New Alamo Creek for DBCM, DCBM, and chloroform, the maximum concentrations of DBCM, DCBM, and chloroform measured at Brown-Alamo Dam in New Alamo Creek (the initial accessible location where Old Alamo Creek water is fully mixed with New Alamo Creek water) would be compared to the applicable site-specific objectives for New Alamo Creek. The use of Brown-Alamo Dam accounts for the attenuation that occurs in Old Alamo Creek for all discharges into Old Alamo Creek and the mixing that occurs as Old Alamo Creek discharges into New Alamo Creek.

If the MEC for DBCM, DCBM, and chloroform does not exceed the site-specific objectives, no reasonable potential exists for the discharge. If the MEC for DBCM, DCBM, and chloroform exceeds the site-specific objectives, the maximum measured concentration of DBCM, DCBM, and chloroform at the Brown-Alamo Dam is compared to the site-specific objectives. If the MEC exceeds the site-specific objectives and the concentration of the same THM at the Brown-Alamo Dam exceed the objectives, then there is reasonable potential for that discharge to cause or contribute to an exceedance of water quality objectives in the segments. If the

MEC for a discharge to Old Alamo Creek exceeds the site-specific objectives but the concentrations of the THMs at the Brown-Alamo Dam do not exceed the objectives, then there is no reasonable potential for this discharge to cause an exceedance within the segments.

The purpose of this alternative is to provide a means of taking into account the attenuation provided by Old Alamo Creek. Other than that, the remainder of the provisions of section 1.3 of the SIP will remain in effect. Since the Brown-Alamo Dam will be used as the location for determining reasonable potential, the point where the ambient background concentration will be determined, should be defined. The ambient background concentration (B as defined in Section 1.4.3 of the SIP) should be at a point that is not influenced by Old Alamo Creek yet is readily accessible year-round. At the point that Old Alamo Creek enters New Alamo Creek, there is a backwater eddy effect. The first point upstream of the backwater eddy effect, that is accessible for sampling year-round, is where Lewis Road crosses New Alamo Creek (approximately 0.75-mile upstream of the confluence of New and Old Alamo Creeks). Therefore, Lewis Road at New Alamo Creek is the location defined for measuring THM background concentration (B), as defined in the SIP.

Alternative 4B Objectives

To determine the need for effluent limitations to achieve Alternative 4B objectives in New Alamo Creek for DBCM, DCBM, and chloroform, the maximum concentrations of DBCM, DCBM, and chloroform measured at the terminus of Old Alamo Creek, immediately prior to its confluence with New Alamo Creek, would be compared to the Alternative 4B objectives. The use of the terminus of Old Alamo Creek accounts for the attenuation that occurs in Old Alamo Creek for all discharges into Old Alamo Creek.

If the MEC for DBCM, DCBM, and chloroform does not exceed the site-specific objectives, no reasonable potential exists for the discharge. If the MEC for DBCM, DCBM, and chloroform exceeds the site-specific objectives, the maximum measured concentration of DBCM, DCBM, and chloroform at the terminus of Old Alamo Creek is compared to the site-specific objectives. If the MEC exceeds the site-specific objectives and the concentration of the same THM at the terminus of Old Alamo Creek exceed the objectives, then there is reasonable potential for that discharge to cause or contribute to an exceedance of water quality objectives in the segments. If the MEC for a discharge to Old Alamo Creek exceeds the site-specific objectives but the concentrations of the THMs at the terminus of Old Alamo Creek do not exceed the objectives, then there is no reasonable potential for this discharge to cause an exceedance within the segments.

Background concentration (B) would be determined as described above for the Alternative 2, 3, and 4A Objectives.

4.2.2 Calculation of Effluent Limitations for DBCM, DCBM and Chloroform

The derivation of effluent limitations for DBCM, DCBM, and chloroform, triggered by the potential to cause an excursion of site-specific objectives within the segments, also would vary depending on whether Alternative 1, 2, 3, 4A, or 4B objectives are adopted for the segments. Consequently, the applicable approaches are described separately below.

Alternative 1 – No Project

Alternative 1 would consist of no Basin Plan amendments. Therefore, calculation of water-quality based effluent limitations for DBCM, DCBM, and chloroform for discharges into Old Alamo Creek would follow procedures defined in Sections 1.4.0 through 1.4.4 of the SIP.

Alternative 2, 3, and 4A Objectives

For calculating effluent limitations to achieve Alternative 2, 3 and 4A objectives in New Alamo Creek for DBCM, DCBM, and chloroform, an Attenuation Factor must be determined and used. Attenuation is the lessening of the concentration between two locations, in this case, between the effluent discharge and the monitoring location at the Brown-Alamo Dam in New Alamo Creek. Inclusion of an Attenuation Factor in this case addresses the unique circumstance of having:

1) an intervening water body (i.e., Old Alamo Creek) with less stringent water quality standards;
2) volatilization of DBCM, DCBM, and chloroform as water travels down Old Alamo Creek; and
3) initial dilution of Old Alamo Creek THM concentrations by New Alamo Creek water between the confluence of New and Old Alamo Creek and the monitoring location of Brown-Alamo Dam.

Brown-Alamo Dam represents the initial accessible location where Old Alamo Creek water is fully mixed with that of New Alamo Creek, and is located approximately 0.6 miles downstream of the New Alamo-Old Alamo Creek confluence.

An Attenuation Factor to account for THM volatilization and dilution in Old Alamo Creek and dilution within New Alamo Creek would be applied to the calculation of effluent limitations. The Attenuation Factor would be the median of the individual sample attenuation values between the effluent discharge location and Brown-Alamo Dam on New Alamo Creek derived from all representative historical data. An individual sample attenuation value is calculated as the effluent constituent concentration measured on a given day divided by the in-stream constituent concentration at the Brown-Alamo Dam on New Alamo Creek measured the same day. Both volatilization and dilution that occur between the effluent discharge location and the compliance monitoring location at Brown-Alamo Dam are being addressed via the Attenuation Factor. Use of the median of the attenuation values (rather than the mean of the attenuation values) results in less bias from atypically high or low individual sample attenuation values. More specifically, attenuation values for each monitoring event would be calculated as follows:

$$\text{Attenuation value} = \text{Measured effluent concentration} \div \text{Measured Brown-Alamo Dam concentration}$$

As an example for a given monitoring event, if the regulated effluent discharge into Old Alamo Creek had a concentration of 20 µg/l and the sample collected at Brown-Alamo Dam that day had a concentration of 5 µg/l, then the sample event attenuation value would be 20/5 = 4.0. The final Attenuation Factor used for deriving effluent limitations would be the median attenuation values derived from representative historical monitoring data for all months of the year.

The Effluent Credit Allowance (ECA) would be calculated as:

ECA = Attenuation Factor x C

Where C is the site-specific objective.

Dilution credit and ambient background concentration (within New Alamo Creek) are accounted for in the Attenuation Factor by having the compliance monitoring location at Brown-Alamo Dam.

Monthly average and daily maximum effluent limitations would be derived for each constituent for which reasonable potential to cause an excursion above a site-specific THM objective has been demonstrated. These effluent limitations would be calculated as described in Section 1.4 of the SIP using the ECA above.

Other than evaluation of reasonable potential and calculation of the effluent limitations as described above, all other provisions of the SIP that apply when water quality-based effluent limitations are found to be necessary would also apply when implementing the site-specific objectives for DBCM, DCBM, and chloroform for the lower segments of New Alamo Creek and Ulatis Creek. Example calculations of effluent limitations for Alternative 3 and 4A objectives are provided in Appendix C.

Alternative 4B Objectives

For calculating effluent limitations to achieve Alternative 4B objectives in New Alamo Creek for DBCM, DCBM, and chloroform, an Attenuation Factor also must be determined and used. However, the Attenuation Factor in this case is somewhat different due to the compliance assessment location being the terminus of Old Alamo Creek (immediately prior to its confluence with New Alamo Creek) rather than the Brown-Alamo Dam location. Thus, in this case, the attenuation is the lessening of the concentration between the effluent discharge location (e.g., the Easterly WWTP) and the monitoring location at the terminus of Old Alamo Creek due only to volatilization within Old Alamo Creek. Because Old Alamo Creek has been disconnected from its upper watershed, it does not convey significant watershed-derived flows that would provide dilution of Easterly WWTP discharges during the precipitation season. However, Old Alamo Creek does, in its lower reach, convey agricultural flows during the irrigation season. The non-irrigation season or the precipitation season is from 1 November through 31 March.

Based on the hydrologic characteristics of Old Alamo Creek, the Attenuation Factor would be the median of the individual sample attenuation values between the effluent discharge location and the terminus of Old Alamo Creek derived from all representative historical data for the 1 November through 31 March period of each year. An individual sample attenuation value is calculated as the effluent constituent concentration measured on a given day divided by the in-stream constituent concentration at the terminus of Old Alamo Creek measured the same day. Use of the November through March monitoring data only for deriving the attenuation values assures that the Attenuation Factor addresses primarily loss due to volatilization within Old Alamo Creek, so that dilution can be addressed separately and consistent with the SIP as shown below. Attenuation values for each monitoring event conducted during the 1 November through 31 March period would be calculated as follows:

Attenuation values = Measured effluent concentration ÷

Measured concentration at terminus of Old Alamo Creek

As an example for a given monitoring event, if the regulated effluent discharge into Old Alamo Creek had a concentration of 20 µg/l and the sample collected at the terminus of Old Alamo Creek that day had a concentration of 5 µg/l, then the sample event attenuation value would be 20/5 = 4.0. Again, the final Attenuation Factor used for deriving effluent limitations would be the median of the attenuation values derived from representative historical monitoring data for the period 1 November through 31 March of each year (RBI 2009).

The Effluent Credit Allowance (ECA) would be calculated as:

ECA = Attenuation Factor x [C + D(C-B)] when C > B

ECA = Attenuation Factor x C when C ≤ B

Where C and D are the site-specific objective and dilution credit as defined by the SIP. B is the ambient background concentration as defined by Section 1.4.3 of the SIP, and measured in New Alamo Creek at Lewis Road.

B is set at New Alamo Creek at Lewis Road which is the first readily accessible year-round location that is upstream of the backwater eddy influence of Old Alamo Creek.

In deriving effluent limitations, dilution credit and ambient background concentration would be addressed according to SIP procedures rather than in the Attenuation Factor as is proposed for Alternative 2, 3, and 4A objectives.

Monthly average and daily maximum effluent limitations would be derived for each constituent for which reasonable potential has been demonstrated. These effluent limitations would be calculated as described in Section 1.4 of the SIP using the ECA above.

Other than evaluation of reasonable potential and calculation of the effluent limitations as described above, all other provisions of the SIP that apply when water quality-based effluent limitations are found to be necessary would also apply when implementing the site-specific objectives for DBCM, DCBM, and chloroform for the lower segments of New Alamo Creek and Ulatis Creek. Example calculations of effluent limitations for Alternative 4B are provided in Appendix C.

4.3 TIME SCHEDULE

The necessary actions to implement the site-specific objectives would be made through an amendment of the Easterly WWTP NPDES permit, once the site-specific objectives are adopted and approved. Each subsequent permit renewal also would implement these objectives. If the City must implement actions to bring the Easterly WWTP, an existing NPDES discharger, into compliance with these site-specific objectives, then a time schedule in accordance with State Water Board Resolution No. 2008-0025, *Policy for Compliance Schedules in National Pollutant Discharge Elimination System Permits*, may be granted. In accordance with State Water Board Resolution No. 2008-0025, any new discharger to Old Alamo Creek will not be granted a time schedule.

4.4 MONITORING AND SURVEILLANCE PROGRAM

The monitoring and surveillance program for the DBCM, DCBM, and chloroform site-specific objectives would be implemented through the Central Valley Water Board's NPDES program and NPDES permit's Monitoring and Reporting Program.

The monitoring location to evaluate compliance with the site-specific objectives and make determinations for the actions described in Section 4.2 would be at Brown-Alamo Dam if Alternative 2, 3, or 4A objectives are adopted for the segments and would be at the terminus of Old Alamo Creek if Alternative 4B objectives are adopted for the segments.

For point source dischargers to Old Alamo Creek that contain detectable concentrations of DBCM, DCBM, and chloroform, the discharger's monitoring and reporting program would include coordinated monitoring of the effluent and of New Alamo Creek at Brown-Alamo Dam for DBCM, DCBM and chloroform (for Alternative 2, 3, and 4A objectives) monthly for one year during the 5-year term of the NPDES permit. Similarly, coordinated monitoring of the effluent and at the terminus of Old Alamo Creek (for Alternative 4B objectives) would be required twice-monthly from 1 November through 31 March once during the 5-year term of the NPDES permit, or consistent with other priority pollutant monitoring as defined in the NPDES permit. If the monitoring results for Brown-Alamo Dam (for Alternative 2, 3, and 4A objectives) or terminus of Old Alamo Creek (for Alternative 4B objectives) exceed the site-specific DBCM, DCBM and chloroform objectives adopted for the lower segments of New Alamo and Ulatis Creeks and the maximum effluent concentration for these constituents also exceeds the site-specific THM objectives, then effluent limitations would be required, as described in Section 4.2 of this report.

The monitoring for B will be consistent with the SIP and this proposed basin plan amendment will hold no special provisions.

Compliance monitoring data collected through the NPDES program would continuously add to the historical dataset currently available. Attenuation Factors would be calculated based on all available, representative historical monitoring data.

5 PROPOSED BASIN PLAN AMENDMENTS FOR WATER QUALITY OBJECTIVES

Sections 3 and 4 have proposed alternatives for site-specific objectives for DBCM, DCBM, and chloroform and specific implementation procedures for achieving the objectives. The proposed alternatives were evaluated based on their ability to meet the following selection criteria.

1) Provide site-specific objectives for DBCM, DCBM, and chloroform that provide reasonable protection of the MUN use of segment waters, while considering the current and potential future drinking water use, and maintain current criteria and levels of protection for all downstream waters.
2) Maintain consistency with federal and State water quality laws and policies.
3) Involve implementation procedures that are consistent with the procedures of the SIP.
4) Minimize additional future degradation of segment water quality for DBCM, DCBM, and chloroform.
5) Efficiently and cost-effectively resolve the THM regulatory compliance issue faced by the City of Vacaville in operating its Easterly WWTP, which was the impetus for this standards refinement effort.

Alternative 1 (No Project) and Alternative 2 (USEPA's 2006 NRWQC) objectives are not recommended because they are more stringent than is necessary for the lower New Alamo Creek and Ulatis Creek segments based on the past, present, and probable future drinking water use of segment waters (RBI 2007b) and, therefore, do not satisfy selection criterion 1. Moreover, these alternatives do not meet selection criterion 5. In addition, Alternative 1 implementation provisions do not contemplate the intervening water body, Old Alamo Creek, as having less stringent THM criteria due to no designated MUN use. As such, Alternatives 1 and 2 do not achieve the objectives defined for this standards refinement action (see Section 1.4).

Alternatives 3, 4A and 4B offer viable alternatives that reasonably meet the objectives defined for this standards refinement action, and all three alternatives fully achieve selection criteria 1 defined above. However, Alternatives 3 and 4A set the compliance location at the Brown-Alamo Dam, which sets an implicit mixing zone from the confluence of Old Alamo Creek and New Alamo Creek to the Brown-Alamo Dam and these alternatives have built in dilution in the implementation provisions. Alternative 4B does not set an implicit mixing zone and has specific provisions to allow dilution to be determined in accordance with the SIP; therefore, Alternative 4B is more consistent with the SIP than Alternatives 3 and 4A. Therefore, staff recommend the adoption of Alternative 4B objectives because it:

1) provides site-specific objectives for DBCM, DCBM, and chloroform applicable to the segments that provide reasonable protection of MUN use within the segments, and would maintain current levels of THM protection for downstream waters;
2) Maintains consistency with federal and State water quality laws and policies;

3) involves site-specific implementation procedures that are most consistent with the SIP procedures for assessing the need for water quality based effluent limitations and for deriving effluent limitations;

4) controls additional future degradation of segment water quality for DBCM, DCBM, and chloroform; and

5) would efficiently and cost-effectively resolve the THM regulatory compliance issue faced by the City of Vacaville in operating its Easterly WWTP, while achieving all other selection criteria.

In addition to the above, Alternative 4B objectives would be required to be met at all places within the segments. Finally, because the 4B objectives are based on the largest available historical monitoring data set, this alternative has the greatest likelihood of fully achieving selection criterion 5 (above).

The proposed Basin Plan amendments are shown below. Text additions to the existing Basin Plan language are underlined and text deletions are indicated by ~~strikethrough~~.

The first paragraph of the Chemical Constituents section of Chapter III. Water Quality Objectives would be revised as follows:

> Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. The chemical constituent objectives in ~~Table~~ Tables III-1 and III-1A apply to the water bodies specified.

The following table would be added to the Chemical Constituents section of Chapter III. Water Quality Objectives:

TABLE III-1A
ORGANIC CHEMICAL WATER QUALITY OBJECTIVES

CONSTITUENT	MAXIMUM CONCENTRATION (ug/l)	APPLICABLE WATER BODIES
Chlorodibromomethane (DBCM)	4.9 µg/l	New Alamo Creek, from Old Alamo Creek to Ulatis Creek Ulatis Creek, from New Alamo Creek to Cache Slough

CONSTITUENT	MAXIMUM CONCENTRATION (ug/l)	APPLICABLE WATER BODIES
Dichlorobromomethane (DCBM)	15.5 µg/l	New Alamo Creek, from Old Alamo Creek to Ulatis Creek Ulatis Creek, from New Alamo Creek to Cache Slough
Chloroform	45.5 µg/l	New Alamo Creek, from Old Alamo Creek to Ulatis Creek Ulatis Creek, from New Alamo Creek to Cache Slough

The following would be added to the Actions and Schedule to Achieve Water Quality Objectives section of Chapter IV. Implementation:

Point Source Discharges Containing Trihalomethanes
Lower New Alamo and Ulatis Creeks

Municipal wastewater that is chlorinated to remove bacteria generally contains trihalomethanes. The Policy for Implementation of Toxics Standards for Inland Waters, Enclosed Bays, and Estuaries of California ("State Implementation Plan" or "SIP") (see the 15th Policy in State Water Board Policies and Plans, page IV-10.01) implements criteria for priority pollutants, including trihalomethanes. However, the SIP does not address situations where water quality objectives for water bodies downstream of the first receiving water are more stringent than the water quality objectives for the first receiving water.

Old Alamo Creek is tributary to New Alamo Creek and Ulatis Creek. Ulatis Creek, downstream of the confluence with New Alamo Creek, is within the legal boundary of the Delta. Old Alamo Creek is not designated MUN, but New Alamo and Ulatis Creeks are designated MUN. The SIP does not specifically address how to determine the need for water quality-based effluent limitations or calculate water quality-based effluent limitations in this situation, so special permitting provisions are needed for discharges of trihalomethanes to Old Alamo Creek.

With respect to the site-specific water quality objectives in Table III-1A for trihalomethanes in New Alamo Creek, from Old Alamo Creek to Ulatis Creek, and Ulatis Creek, from New Alamo Creek to Cache Slough, the following provisions shall apply to any point source discharges into Old Alamo Creek. For determin-

ing if water quality-based effluent limitations are necessary, Section 1.3 of the SIP does not apply. For calculation of water quality-based effluent limitations, Section 1.4 of the SIP does not apply, unless specified below.

Determination of Need for Water Quality-Based Effluent Limitations:

Step 1: For chlorodibromomethane (DBCM), dichlorobromomethane (DCBM) and chloroform, if the pollutant is not detected in the effluent and any of the reported detection limits is less than or equal to the site-specific objectives specified in Table III-1A (the site-specific objectives specified in Table III-1A will be referred to as C), then water quality-based effluent limitations are not necessary. If the pollutant is not detected in the effluent and all of the detection limits are greater than the site-specific objectives (C), then proceed to Step 5. If the pollutant is detected in the effluent then proceed to *Step 2.*

Step 2: Determine the observed maximum ambient background concentration for DBCM, DCBM, and chloroform. The observed maximum ambient background concentrations shall be measured in New Alamo Creek at Lewis Road and is the B, as defined in section 1.4.3.1 of the SIP. If the background (B) is greater than the site-specific objectives (C), then water quality-based effluent limitations are necessary. If the background (B) is less than or equal to the site-specific objectives (C), then proceed to *Step 3.*

Step 3: Determine the observed maximum pollutant concentration of the effluent (MEC). If the MEC is less than or equal to the site-specific objectives (C), water quality-based effluent limitations are not necessary. If the MEC is greater than the site-specific objectives (C), then proceed to *Step 4* to determine if water quality-based effluent limitations are necessary.

Step 4: If the in-stream maximum concentrations of DBCM, DCBM or chloroform at the terminus of Old Alamo Creek are greater than the site-specific objectives (C), then water quality-based effluent limitations are necessary for the constituents that exceeded the applicable objectives.

Step 5: If the pollutant has not been detected in the effluent and all detection limits are greater than the site-specific objectives (C), then the discharger shall be required to conduct twice-monthly monitoring of the effluent and of the terminus of Old Alamo Creek between 1 November and 31 March using detection limits less than or equal to the site-specific objectives (C). Steps 1-4 above will then be applied to these data to determine whether water-quality based effluent limitations are necessary.

Calculation of water quality-based effluent limitations for DBCM, DCBM, and chloroform shall be as follows:

An Attenuation Factor, which is the median of the individual sample attenuation values, is necessary because the water quality objectives do not apply in the first receiving water of the discharge. If water quality-based effluent limitations are required, an attenuation factor to account for the reduction in constituent concentrations between the point of effluent discharge to Old Alamo Creek and the terminus of Old Alamo Creek shall be applied to the calculation of the Effluent Concentration Allowance (ECA), which is one of the factors used in the derivation of the effluent limitations as described in Section 1.4B of the SIP.

The ECA shall be calculated as:

ECA = Attenuation Factor x [C + D(C-B)] when C > B
ECA = Attenuation Factor x C when C ≤ B

Where:

Attenuation Factor = the median of the individual sample attenuation values derived from all representative historical data for the 1 November through 31 March period of each year. An individual sample attenuation value is calculated as the effluent constituent concentration measured on a given day divided by the in-stream constituent concentration at the terminus of Old Alamo Creek measured the same day.

C = the site-specific objective specified in Table III-1A

D = dilution credit, as determined in section 1.4.2 of the SIP

B = background concentration, as defined by Section 1.4.3 of the SIP, and measured in New Alamo Creek at Lewis Road

Dilution credits may be allowed in deriving water quality-based effluent limitations for DBCM, DCBM, and chloroform in accordance with Section 1.4.2 of the SIP.

The Average Monthly Effluent Limitation (AMEL) and the Maximum Daily Effluent Limiation (MDEL) shall be calculated in accordance with Section 1.4 of the SIP using the ECA calculated above.

The following would be added to the Self-Monitoring section of Chapter V. Surveillance and Monitoring:

For point source discharges to Old Alamo Creek that contain detectable concentrations of chlorodibromomethane (DBCM), dichlorobromomethane (DCBM) or chloroform, the discharger's monitoring and reporting program shall include coordinated monitoring of the effluent and Old Alamo Creek at its terminus, immediately prior to Old Alamo Creek's discharge into New Alamo Creek, for DBCM, DCBM or chloroform. At a minimum, the discharger shall conduct the coordinated monitoring twice-monthly from 1 November through 31 March once during the 5-year term of the NPDES permit.

6 CONSISTENCY WITH OTHER LAWS, PLANS AND POLICIES

Any proposed changes to the Regional Water Board Basin Plans must be consistent with existing Federal and State laws and regulations including adopted State and Regional Water Board policies. CWC §13146 requires that, in carrying out activities that affect water quality, all state agencies, departments, boards and offices comply with state policy for water quality control unless otherwise directed or authorized by statute, in which case they shall indicate to the State Water Board in writing their authority for not complying with such policy. This chapter summarizes existing Federal and State laws and policies that are relevant to the proposed site-specific objectives and implementation plan described by the proposed Basin Plan amendments.

6.1 ANTIDEGRADATION ANALYSIS

Both USEPA (40 CFR §131.12) and the State of California (State Water Board Resolution 68-16) have adopted antidegradation policies as part of their approach to regulating water quality. The Central Valley Water Board must ensure that its actions do not violate the federal or State antidegradation policies. This section of the Staff Report analyzes whether approval of the proposed amendments would be consistent with the federal and State antidegradation policies.

6.1.1 Federal Antidegradation Policy

The Federal Antidegradation Policy (40 CFR §131.12) states:

> "(a) The State shall develop and adopt a statewide antidegradation policy and identify the methods for implementing such policy pursuant to this subpart. The antidegradation policy and implementation methods shall, at a minimum, be consistent with the following:
>
> (1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
>
> (2) Where the quality of the waters exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.
>
> (3) Where high quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of excep-

tional recreational or ecological significance, that water quality shall be maintained and protected.

(4) In those cases where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with section 316 of the Act."

The Easterly WWTP, which is the primary source of DBCM, DCBM, and chloroform to the segments, has discharged treated and chlorinated effluent at its present location since 1959 (CVRWQCB 1958). Adoption of the water quality objectives in Alternatives 1 through 4 would not, by themselves, cause any new or increased volume of waste to be discharged to surface waters. Moreover, the water quality objectives are designed to provide the level of water quality necessary to protect the beneficial uses within the segments, and downstream waters. Any new or increased discharge of any of these constituents would have to undergo permit-specific antidegradation analysis.

6.1.2 State Antidegradation Policy

Antidegradation provisions of State Water Board Resolution No. 68-16 ("Statement of Policy with Respect to Maintaining High Quality Waters in California") state, in part:

"(1) Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.

(2) Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

The Easterly WWTP, which is the primary source of DBCM, DCBM, and chloroform to the segments, has discharged treated and chlorinated effluent at its current location since 1959 (CVRWQCB 1958). Adoption of the water quality objectives in Alternatives 1 through 4 would not, by themselves, cause any new or increased volume of waste to be discharged to surface waters. Moreover, the water quality objectives are designed to provide the level of water quality necessary to protect the beneficial uses. Any new or increased discharge of any of these constituents would have to undergo permit-specific antidegradation analysis.

The Easterly WWTP facilities and their operations have been optimized to minimize the use of chlorine and, thus, formation of THMs to the extent practicable and thus represent best practicable treatment or control (BPTC) for the Easterly WWTP (RBI 2009).

Although water quality pertaining to THMs would not change in the segments or downstream waters upon the site-specific objectives becoming effective, the site-specific objectives would allow higher DBCM and DCBM concentrations in the New Alamo Creek and Ulatis Creek segments than do the existing CTR criteria for these same constituents. However, as stated previously, any new point-source discharge or increased volume of waste discharge to the segments that could cause a degradation in THM or other water quality parameters, relative to current water quality, would require an antidegradation analysis prior to the State permitting the new or expanded-capacity discharge and any associated water quality degradation. The site-specific objectives would have no effect on the levels of these constituents allowed in Cache Slough and downstream waters, which continue to be protected at the levels specified by the CTR.

6.2 Consistency with Federal and State Laws

Federal agencies have adopted regulations implementing federal laws to which Central Valley Water Board actions must conform. The following Federal laws are relevant to the proposed Basin Plan amendments:

- Antidegradation Policy (40 CFR §131.12)
- Clean Water Act
- Federal & State Endangered Species Acts (50 CFR *et seq*., California Fish and Game Code §2050-2116 *et seq*.)

These laws and their relevance to the proposed water quality objectives and implementation plan are described in the following sections.

6.2.1 Antidegradation Policy

The consistency with the federal Antidegradation Policy is discussed in Section 6.1.1.

6.2.2 Clean Water Act

6.2.2.1 State Adoption of Standard-Numeric Limit

Under Section 303(c) of the CWA, water quality standards adopted by a State are subject to USEPA approval. The CWA requires that numeric criteria be based on "(i) 304(a) Guidance; or (ii) 304(a) Guidance modified to reflect site-specific conditions; or (iii) other scientifically defensible methods" (40 CFR §131.11 (b) *et seq*.). The proposed actions are consistent with the CWA because the objectives are based on site-specific conditions and would be fully protective of the MUN use in segment and downstream waters.

6.2.2.2 Federal Regulations Pertaining to NPDES Permits

Section 402 of the CWA requires a permitting system which USEPA addressed by promulgating 40 CFR §122, which are the regulations pertaining to the NPDES (National Pollutant Discharge Elimination System) program. The State's regulations pertaining to

NPDES permits must be consistent with the federal regulations. Title 40 CFR § 122.44(d)(1)(ii) sets forth the regulations for determining whether a discharge has a reasonable potential to cause or contribute to a violation of water quality standards. It states, "When determining whether a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above a narrative or numeric criteria within a State water quality standard, the permitting authority shall use procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, the sensitivity of the species to toxicity testing (when evaluating whole effluent toxicity), and where appropriate, the dilution of the effluent in the receiving water." The proposed Basin Plan amendments provide procedures to account for the effect of an intervening water body which is similar to the effect of dilution. Therefore the proposed Basin Plan amendments are consistent with the federal regulations pertaining to the reasonable potential analysis.

Title 40 CFR §122.47 sets forth the regulations for schedules of compliance for NPDES programs. The proposed Basin Plan amendments do not anticipate a schedule of compliance; but does not preclude a schedule of compliance consistent with State Water Board Resolution No. 2008-0025, which is consistent with federal regulations.

While the federal regulations do not contain explicit procedures to derive effluent limitations, USEPA has provided guidance (USEPA 1991) that includes explicit procedures. The proposed Basin Plan amendments add procedures to account for the effect of an intervening water body which is analogous to allowing dilution to be included in the derivation of effluent limitations. Doing so is necessary to appropriately derive effluent limitations for the site-specific circumstances.

6.2.2.3 Requirements for Avoiding Wetland Loss

Under CWA Section 404 and the Rivers and Harbors Act of 1899 Section 10, alteration of waterways, including wetlands, that affect navigable waters requires a permit from the Federal government and assurance that impacts will be avoided or mitigated. The U.S. Army Corps of Engineers operates the 404 permit program with a goal of achieving "no net loss" of wetlands. For projects proposing unavoidable impacts on wetlands, compensatory mitigation in the form of replacing the lost aquatic functions is generally required. Under authority of CWA Section 401, the State also reviews projects affecting water bodies. The State may require compensatory mitigation for wetlands impacts not under the jurisdiction of the Federal government, e.g., for wetlands not contiguous with navigable waters.

The proposed Basin Plan amendments will not adversely affect or have net loss to wetlands. Therefore, these laws and regulations pertaining to wetland loss are not applicable to the proposed Basin Plan amendments.

6.2.3 Federal & State Endangered Species Act

The Federal Endangered Species Act of 1973 (50 CFR *et seq*.) was established to identify, protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the Interior Department's U.S. Fish and Wildlife Service (USFWS) and the Department of Commerce's National Oceanic and Atmospheric Administration's National Marine

Fisheries Service (NMFS). The USFWS has primary responsibility for terrestrial and freshwater organisms, while the NMFS has primary responsibility for marine species such as salmon and whales. In addition, the State of California enacted the California Endangered Species Act (California Fish and Game Code, Sections 2050-2116 *et seq*.), which is administered by the California Department of Fish and Game and similarly maintains State lists of rare, threatened and endangered species. The proposed Basin Plan amendments are not expected to affect fish and wildlife. Therefore, the Endangered Species Act is not applicable to the proposed Basin Plan amendments.

6.3 CONSISTENCY WITH STATE WATER BOARD POLICIES

The State Water Board is authorized to adopt state policy for water quality control (CWC §13140). State Water Board water quality control plans supersede any regional water quality control plans for the same waters to the extent of any conflict (CWC §13170). The following are the State Water Board policies:

- Statement of Policy with Respect to Maintaining High Quality of Water in California (Antidegradation Implementation Policy) (Resolution No. 68-16)
- Water Quality Control Policy for the Enclosed Bays and Estuaries of California (Resolution No. 74-43)
- Sources of Drinking Water Policy (Resolution No. 88-63)
- Pollutant Policy Document (Resolution No. 90-67)
- Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304 (Resolution No. 92-49)
- Consolidated Toxic Hot Spots Cleanup Plan (Resolution No. 99-065 and 2004-0002)
- Nonpoint Source Management Plan & the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (Resolution No. 99-114 and 2004-0030)
- Water Quality Enforcement Policy (Resolution No. 2002-0040)
- Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Resolution No. 2005-0019)
- Policy for Developing California's Clean Water Act Section 303(d) list (Resolution No. 2004-0063)
- Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options (Resolution No. 2005-0050)
- Policy for Compliance Schedules in Nation Pollutant Discharge Elimination System Permits (Resolution No. 2008-0025)
- Policy for Water Quality Control for Recycled Water (Resolution No. 2009-0011)

These policies and their relevance to the proposed water quality objectives and implementation plan are described in the following sections.

6.3.1 Resolution No. 68-16: Statement of Policy with Respect to Maintaining High Quality of Water in California (Antidegradation Implementation Policy)

The Antidegradation Implementation Policy includes the following statements:

> "1. Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in the policies.
>
> "2. Any activity which produces or may produce a waste or increase volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

This policy incorporates the Federal antidegradation standards for surface waters (Section 5.1.1).

As discussed in Section 5.1 and 6.1, the proposed Basin Plan amendments are consistent with both the federal and state antidegradation policies.

6.3.2 Resolution No. 74-43: Water Quality Control Policy for the Enclosed Bays and Estuaries of California

This policy was adopted by the State Water Board in 1974 and provides water quality principles and guidelines for the prevention of water quality degradation in enclosed bays and estuaries to protect the beneficial uses of such waters. The Regional Water Boards must enforce the policy and take actions consistent with its provisions. For the San Francisco Bay-Delta system, the policy requires implementation of a program which controls toxic effects through a combination of source control for toxic materials, upgraded waste treatment, and improved dilution of wastewaters to provide full protection to the biota and the beneficial uses of San Francisco Bay-Delta waters.

New Alamo Creek is tributary to Ulatis Creek and Cache Slough, which are within the San Francisco Bay-Delta. Because the proposed Basin Plan amendments will not degrade water quality, the actions taken to implement the Basin Plan amendments are also consistent with this policy.

6.3.3 Resolution No. 88-63: Sources of Drinking Water Policy

This policy states that all waters of the state are to be protected as existing or potential sources of municipal and domestic supply water. The proposed Basin Plan amendments are consistent with this policy because they do not remove the MUN beneficial use and protect that use.

6.3.4 Resolution No. 90-67: Pollutant Policy Document

This policy requires, in part, that the Central Valley and San Francisco Bay Water Boards use the Pollutant Policy Document (PPD) as a guide to update portions of their Basin Plans. The PPD requires that the Central Valley Water Board develop a Mass Emissions Strategy (MES) for limiting loads of pollutants from entering the Sacramento-San Joaquin Delta. The purpose of the MES is to control the accumulation in sediments and the bioaccumulation of pollutant substances in the tissues of aquatic organisms in accordance with the statutory requirements of the state Porter-Cologne Water Quality Act and the Federal CWA.

The proposed Basin Plan amendments will not have impacts to sediment accumulation or bioaccumulation of pollutant substances in tissues of aquatic organisms.

6.3.5 Resolution No. 92-49: Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under Water Code Section 13304

This policy contains procedures for the Central Valley Water Board to follow for oversight of cleanup projects to ensure cleanup and abatement activities protect the high quality of surface and groundwater. The proposed Basin Plan amendments do not include any requirement for cleanup and abatement activities; therefore, this policy is not applicable to the proposed Basin Plan amendments

6.3.6 Resolution No. 99-065 & Resolution No. 2004-0002: Consolidated Toxic Hot Spots Cleanup Plan

In June 1999, the State Water Board adopted the Consolidated Toxic Hot Spots Cleanup Plan (Cleanup Plan), as required by California Water Code Section 13394. The proposed Basin Plan amendments are not located within a toxic hot spot area; therefore, the Cleanup Plan is not applicable to the proposed Basin Plan amendments.

6.3.7 Resolution No. 99-114 & Resolution No. 2004-0030: Nonpoint Source Management Plan & the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program

In December 1999, the State Water Board adopted the Plan for California's Nonpoint Source (NPS) Pollution Control Program (NPS Program Plan) and in May 2004, the State Water Board adopted the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (NPS Policy). The NPS Policy explains how State and Regional Water Boards will use their planning and waste discharge regulation authority under the Porter-Cologne Act to implement and enforce the NPS Program Plan. The NPS Policy requires all nonpoint source discharges to be regulated under waste discharge requirements, waivers of waste discharge requirements, a Basin Plan prohibition, or some combination of these administrative tools. The NPS Policy also describes the key elements that must be included in a nonpoint source implementation program.

The proposed Basin Plan amendments include implementation procedures for point source discharges. Nonpoint source discharges to the creek segments are subject to the proposed water quality objectives, insofar as the objectives apply to these discharges, and are regulated under waste discharge requirements, waivers of waste discharge requirements, or some combination of these administrative tools.

6.3.8 Resolution No. 2002-0040: Water Quality Enforcement Policy

The State Water Board adopted this policy to ensure enforcement actions are consistent, predictable, and fair. The policy describes tools that the State and Regional Water Boards may use to determine the following: type of enforcement order applicable, compliance with enforcement orders by applying methods consistently, and type of enforcement actions appropriate for each type of violation. The State and Regional Water Boards have authority to take a variety of enforcement actions under the Porter-Cologne Water Quality Control Act. These include administrative permitting authority such waste discharge requirements (WDRs), waivers of WDRs, and Basin Plan prohibitions.

The proposed Basin Plan amendments do not implicate the Water Quality Enforcement Policy; therefore, this policy is not applicable to the proposed Basin Plan amendments.

6.3.9 Resolution No. 2005-0019: Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California

The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (a.k.a. State Implementation Plan or SIP) applies to discharges of toxic pollutants into the inland surface waters, enclosed bays, and estuaries of California subject to regulation under the Porter-Cologne Water Quality Control Act and the Federal CWA. Regulation of priority toxic pollutants may occur through the issuance of National Pollutant Discharge Elimination System (NPDES) permits or other regulatory approaches. The goal of the SIP is to establish a statewide, standardized approach for permitting discharges of toxic pollutants to non-ocean surface waters.

Municipal wastewater that is chlorinated to inactivate pathogens generally contains THMs, which are a human health concern. The SIP guides requirements for NPDES permits to protect the human health beneficial uses of the receiving waters. However, the SIP does not include specific provisions for situations where water bodies downstream of the first receiving water have applicable water quality objectives which are more stringent than the water quality standards for the first receiving water.

The proposed Basin Plan amendments add approaches for determining the need for water quality-based effluent limitations and calculating effluent limitations to accommodate the situation where there is an intervening water body, where MUN is not a beneficial use and thus no water and organism THM criteria are applicable. Since the proposed Basin Plan amendments provide site-specific implementation provisions for a situation that is not addressed in the SIP, the Basin Plan amendments are consistent with the SIP.

6.3.10 Resolution No. 2004-0063: Policy for Developing California's Clean Water Act Section 303(d) List

Pursuant to the CWC Section 13191.3(a), this State policy for water quality control describes the process by which the State Water Board and the Regional Water Boards will comply with the listing requirements of CWA Section 303(d). The Listing Policy establishes a standardized approach for developing California's Section 303(d) list to achieve water quality standards and maintain beneficial uses in all of California's surface waters. The Listing Policy applies only to the listing process methodology used to comply with CWA Section 303(d).

CWA Section 303(d) requires states to identify waters that do not meet, or are not expected to meet by the next listing cycle, applicable water quality standards after the application of certain technology-based controls and schedule such waters for development of Total Maximum Daily Loads (40 CFR §130.7(c) and (d)).

The proposed Basin Plan amendments consist of water quality objectives and an implementation program. The proposed water quality objectives are applied as maximum concentrations which is the same as other Basin Plan water quality objectives. This application is consistent with the Listing Policy.

6.3.11 Resolution No. 2005-0050: Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options

The State Water Board's Impaired Waters Policy incorporates the following:

- CWA Section 303(d) identification of waters that do not meet applicable water quality standards and prioritization for TMDL development;
- CWC Section 13191.3(a) requirements to prepare guidelines to be used by the Regional Water Boards in listing, delisting, developing, and implementing TMDLs pursuant to CWA Section 303(d) of 33 USC Section 1313(d); and
- CWC section 13191.3 (b) requirements that State Water Board considers consensus recommendations adopted by the 2000 Public Advisory Group when preparing guidelines.

The Impaired Waters Policy includes the following statements:

> "A. If the water body is neither impaired nor threatened, the appropriate regulatory response is to delist the water body.
>
> B. If the failure to attain standards is due to the fact that the applicable standards are not appropriate to natural conditions, an appropriate regulatory response is to correct the standards.
>
> C. The State Water Board and Regional Water Boards are responsible for the quality of all waters of the state, irrespective of the cause of the impairment. In addition, a TMDL must be calculated for impairments caused by certain EPA designated pollutants.
>
> D. Whether or not a TMDL calculation is required as described above, impaired waters will be corrected (and implementation plans crafted) using existing regulatory tools.

D1. If the solution to an impairment will require multiple actions of the Regional Water Board that affect multiple persons, the solution must be implemented through a Basin Plan amendment or other regulation.

D2. If the solution to an impairment can be implemented with a single vote of the Regional Water Board, it may be implemented by that vote.

D3. If a solution to an impairment is being implemented by a regulatory action of another state, regional, local, or federal agency, and the Regional Water Board finds that the solution will actually correct the impairment, the Regional Water Board may certify that the regulatory action will correct the impairment and if applicable, implement the assumptions of the TMDL, in lieu of adopting a redundant program.

D 4. If a solution to an impairment is being implemented by a non-regulatory action of another entity, and the Regional Water Board finds that the solution will actually correct the impairment, the Regional Water Board may certify that the non-regulatory action will correct the impairment and if applicable, implement the assumptions of the TMDL, in lieu of adopting a redundant program."

The project area creek segments are not impaired for THM constituents and therefore no regulatory policy is required to address impairments. Therefore, this policy is not applicable to the proposed Basin Plan amendments.

6.3.12 Resolution No. 2008-0025: Policy for Compliance Schedules in National Pollutant Discharge Elimination System Permits

A compliance schedule is given to a facility that is in noncompliance with receiving waters water quality objectives. The proposed Basin Plan amendments will eliminate the need for schedules to comply with limits for DBCM, DCBM and/or chloroform. However, the proposed Basin Plan amendments do not preclude a compliance schedule consistent with this Policy.

6.3.13 Resolution No. 2009-0011: Policy for Water Quality Control for Recycled Water

The purpose of the Recycled Water Policy is to increase the use of recycled water from municipal wastewater sources that meets the definition in Water Code Section 13050(n), in a manner that implements state and federal water quality laws. The proposed basin plan amendments would not restrict the development or use of recycled water, therefore, the amendments are consistent with the need to develop and use recycled water.

6.4 Consistency with Central Valley Regional Water Quality Board Policies

The following are the Central Valley Water Board policies:

- Urban Runoff Policy
- Controllable Factors Policy
- Water Quality Limited Segment Policy
- Antidegradation Implementation Policy
- Application of Water Quality Objectives Policy

- Watershed Policy

These policies and their relevance to the proposed water quality objectives and implementation plan are described in the following sections.

6.4.1 Urban Runoff Policy

On page IV-14.00 of the Basin Plan, the Central Valley Water Board's Urban Runoff Policy states:

"a. Subregional municipal and industrial plans are required to assess the impact of urban runoff on receiving water quality and consider abatement measures if a problem exists.

"b. Effluent limitations for storm water runoff are to be included in NPDES permits where it results in water quality problems."

The proposed Basin Plan amendments address constituents found in municipal waters and wastewaters and not urban runoff; therefore this policy is not applicable to the proposed Basin Plan amendments.

6.4.2 Controllable Factors Policy

On page IV-15.00 of the Basin Plan, the Central Valley Water Board's Controllable Factors Policy states:

> "Controllable water quality factors are not allowed to cause further degradation of water quality in instances where other factors have already resulted in water quality objective being exceeded. Controllable water quality factors are those actions, conditions, or circumstances resulting from human activities that may influence the quality of the waters of the State, that are subject to the authority of the State Water Board or Central Valley Water Board, and that may be reasonably controlled."

The proposed Basin Plan amendments are consistent with the Controllable Factors Policy because the amendments include implementation procedures to control the point sources and achieve compliance with the proposed water quality objectives.

6.4.3 Water Quality Limited Segment Policy

On page IV-15.00 of the Basin Plan, the Central Valley Water Board's Water Quality Limited Segment Policy states:

> "Additional treatment beyond minimum federal requirements will be imposed on dischargers to Water Quality Limited Segments. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment."

The creek segments identified for these Basin Plan amendments are not listed in the CWA Section 303(d) list as a water quality limited segments. Therefore, this policy is not applicable to the proposed Basin Plan amendments.

6.4.4 Antidegradation Implementation Policy

Consistency of the proposed Basin Plan amendments with the federal and state antidegradation policies is discussed in Section 5.1.

6.4.5 Application of Water Quality Objectives Policy

Excerpts from Policy for Application of Water Quality Objectives are presented below. The full text can be found on page IV-16.00 of the Basin Plan.

> " Water quality objectives are defined as 'the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water, or the prevention of nuisance within a specific area.'… Water quality objectives may be stated in either numerical or narrative form. Water quality objectives apply to all waters within a surface or ground water resource for which beneficial uses have been designated…
>
> " The numerical and narrative water quality objectives define the least stringent standards that the Regional Water Boards will apply to regional waters in order to protect beneficial uses.

The proposed numeric water quality objectives specifically protect the human health beneficial uses of New Alamo and Ulatis Creeks. Therefore, the proposed Basin Plan amendments are consistent with this policy.

6.4.6 Watershed Policy

On page IV-21.00 of the Basin Plan, the Central Valley Water Board's Watershed Policy states:

> "The Regional Water Board supports implementing a watershed based approach to addressing water quality problems. The State and Regional Water Boards are in the process of developing a proposal for integrating a watershed approach into the Board's programs. The benefits to implementing a watershed based program would include gaining participation of stakeholders and focusing efforts on the most important problems and those sources contributing most significantly to those problems."

The proposed Basin Plan amendments are consistent with the Watershed Policy. The Central Valley Water Board has conducted outreach to the stakeholders in the area encompassed by the proposed Basin Plan amendments. Staff held a CEQA scoping meeting to receive comments and information from local, State and Federal agencies, and other stakeholders during the preparation of the proposed Basin Plan amendments. The amendments will be considered

by the Regional Water Board during a public hearing, at which interested persons are invited to provide comment, after a 45-day written comment period. For these reasons, the proposed amendments are consistent with the Watershed Policy.

7 ENVIRONMENTAL ANALYSIS

The proposed Basin Plan amendments would modify the water quality objectives for DBCM, DCBM, and chloroform applicable to the lower segments of New Alamo and Ulatis Creeks as shown in Table 2.

Table 2. Comparison of existing DBCM, DCBM, and chloroform criteria to the proposed site-specific objectives.

Constituent	Current CTR Criteria	Proposed Site-specific Objectives
DBCM	0.41 µg/l	4.9 µg/l
DCBM	0.56 µg/l	15.5 µg/l
Chloroform	reserved	45.5 µg/

In addition, the proposed Basin Plan amendments would establish permitting procedures for implementation of the site-specific objectives (see Section 4.2). Current federal and state regulations do not provide any methodology for situations where the water body with applicable water quality standards is separated from the effluent discharge by water bodies to which the applicable standards are less stringent. In this case, the proposed Basin Plan amendments will require that the determination of whether there is reasonable potential to cause or contribute to a violation of water quality standards be done by comparing the maximum observed concentration at the end of Old Alamo Creek with the proposed site-specific objectives listed in Table 2. To account for the presence of Old Alamo Creek, which separates the effluent discharge from the water body with applicable water quality standards, the proposed basin plan amendment will incorporate an Attenuation Factor into the equations to derive effluent limitations from the SIP.

7.1 Environmental Impacts of the Proposed Project

The environmental impacts for the proposed project (i.e., the proposed Basin Plan amendments) are discussed in Appendix D, CEQA Checklist. Based on the CEQA evaluation, the proposed Basin Plan amendments and the reasonably foreseeable means of compliance will not result in any significant environmental impacts, and no mitigation measures are proposed.

7.2 Reasonable Foreseeable Methods of Compliance

The Central Valley Water Board is required to perform, at the time it adopts a rule or regulation requiring the installation of pollution control equipment, or a performance standard or treatment requirement, an environmental analysis of the reasonable foreseeable methods of compliance. (PRC §21159)

The proposed Basin Plan amendments are not anticipated to require the installation of pollution control equipment or a performance standard or treatment requirement because it will require that the current condition be maintained. However, if pollution control equipment is necessary to comply with the proposed water quality objectives, the Easterly WWTP would need to be modified with the addition of year-round filtration and UV effluent disinfection system which have an estimated capital cost of $34.8 million (West Yost Associates 2008). The

Central Valley Water Board is not required to perform project level analysis (PRC §21159 (d)). If the City of Vacaville finds that upgrades to the Easterly WWTP are necessary, then the City of Vacaville will conduct a project level environmental analysis.

8 REFERENCES

Central Valley Regional Water Quality Control Board (CVRWQCB). 1958. Waste Discharge Requirements, City of Vacaville, Solano County. Resolution No. 58-335. September.

CVRWQCB. 2006. 2005 Triennial Review and Workplan. Resolution No. R5-2006-0027. March.

Office of Environmental Health Hazard Assessment. 2009. California Environmental Protection Agency. Public Health Goal for Trihalomethanes in Drinking Water. Draft. June.

Robertson-Bryan, Inc. (RBI) 2007a. Use Attainability Analysis for Alamo Creek and Downstream Water Bodies. Technical Memorandum No. 1. Hydrologic and Physical Characteristics of Alamo Creek, Ulatis Creek, and Cache Slough. August.

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Appendix A. Historical Easterly Wastewater Treatment Plant THM Data within Old Alamo, New Alamo and Ulatis Creeks and Cache Slough

Table A-1 Easterly WWTP Effluent Data

	DBCM	DCBM	Chloro-form
Report-ing Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
9/10/2002	2.5	11	24
10/16/2002	2.2	12	34
11/5/2002	2.2	12	29
12/3/2002	2.0	11	29
1/8/2003	4.1	17	35
2/11/2003	7.7	26	54
3/11/2003	5.0	19	53
4/9/2003	2.5	11	24
5/6/2003	3.6	12	22
6/3/2003	4.1	15	30
7/8/2003	3.2	13	32
8/12/2003	2.3	10	29
9/9/2003	2.8	12	25
10/15/2003	3	12	43
11/4/2003	2	10	25
12/2/2003	4	19	52
1/6/2004	3.4	14	37
2/4/2004	4.6	17	60
3/9/2004	4.9	22	46
4/13/2004	3.9	17	50
5/11/2004	4.5	19	50
6/8/2004	3.3	13	27
7/13/2004	4.9	14	39
8/10/2004	3.7	12	33
9/7/2004	2.6	12	34
10/18/2004	1.9	11	47
11/16/2004	2.6	11	36
12/7/2004	1.7	8.6	22
1/11/2005	3.9	13	21
2/7/2005	3.3	12	27

	DBCM	DCBM	Chloro-form
Report-ing Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
3/8/2005	6.7	20	32
4/19/2005	6.8	24	47
5/10/2005	4.5	18	39
6/14/2005	4.3	17	40
7/12/2005	4.3	21	48
8/9/2005	4.2	21	56
9/13/2005	14	43	56
10/11/2005	3.8	16	58
11/8/2005	3.4	17	46
12/13/2005	2.4	15	49
1/10/2006	3.8	11	31
2/7/2006	3.2	17	40
3/14/2006	3.1	12	22
4/18/2006	3.7	13	26
5/9/2006	3.6	17.1	37
6/6/2006	3.4	19.1	50.4
7/11/2006	3.1	17.2	46.2
8/8/2006	13	30.3	37.4
9/12/2006	3.1	18.0	53.7
10/24/2006	2.8	17	45
11/14/2006	1.9	12.9	41.5
12/5/2006	2.3	14.2	42.4
1/9/2007	2.2	13.0	52
2/6/2007	2.7	17.1	52.3
3/16/2007	2.3	14.6	43.9
4/17/2007	2	13.0	73
5/8/2007	2.9	15.5	44.5
6/12/2007	3.8	19	47.1
7/10/2007	3.4	22	61
8/14/2007	2.2	16	60

Table A-2 End of Old Alamo Creek before New Alamo Confluence Data

	DBCM	DCBM	Chloro-form
Reporting Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
9/10/2002	0	1.2	6.6
10/16/2002	0	1.9	8.6
11/5/2002	0.6	3	17
12/3/2002	0.8	3.7	21
1/8/2003	1.3	4.4	11
2/11/2003	1.9	7.1	21
#REF!	1.5	4.9	20
4/9/2003	0	0.6	14
5/6/2003	0.7	2.0	8.5
6/3/2003	0.8	2.6	8.7
7/8/2003	0	1.6	6.2
8/12/2003	0	1.2	7.7
9/9/2003	0	1.4	6.4
10/15/2003	0	1.3	6.5
11/4/2003	0.6	2.5	12
12/2/2003	1.1	4.6	19
1/6/2004	1.5	5.2	16
2/4/2004	1.1	3.7	12
3/9/2004	1.3	5.1	15
4/13/2004	1.2	2.2	10
5/11/2004	0.9	3.5	12
6/8/2004	0	1	3.9
7/13/2004	0	1.3	4.9
8/10/2004	0	1	5.2
9/7/2004	0	0.9	4.7
10/13/2004	0	1.1	6.1
11/16/2004	0.5	1.9	8.2
12/7/2004	0.6	3	11
1/11/2005	0.6	1.9	3.8
2/7/2005	1.1	3.3	13

	DBCM	DCBM	Chloro-form
Report-ing Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
3/8/2005	2.3	5.9	15
4/19/2005	0	0	5.9
5/10/2005	0	0	5.3
6/14/2005	0	0	5.5
7/12/2005	0	1.8	6.6
8/9/2005	0.5	2.3	9.7
9/13/2005	1.9	4.8	13
10/11/2005	0.5	1.9	8.3
11/8/2005	0.5	2.5	13
12/13/2005	0.7	3.8	19
1/10/2006	1.6	4.8	12
2/7/2006	1.0	4.9	17
3/14/2006	0.6	2.4	5.8
4/18/2006	1.4	4.6	13.9
5/9/2006	1.0	4.3	15.5
6/6/2006	0.8	3.1	12
7/11/2006	0	1.9	6.9
8/8/2006	1.7	3.6	6.6
9/12/2006	0	1.8	7.8
10/24/2006	0.5	2.8	17.4
11/14/2006	0.6	3.3	17.0
12/5/2006	0.6	3.9	19.2
1/0/1900	0.5	3.2	17.3
1/0/1900	0.6	4.1	25.1
3/16/2007	0.7	4.2	23.9
4/17/2007	0	1.2	6.7
5/8/2007	0	1.8	9.0
6/12/2007	0.5	1.9	8.2
7/10/2007	0	1.9	8.1
8/14/2007	0	2	10.2

The zero is reported as a non-detect at the reporting limit.

Table A-3 New Alamo Creek at Lewis Road Data

	DBCM	DCBM	Chloro-form
Reporting Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
4/9/2003	0	0	0
5/6/2003	0	0	0
6/3/2003	0	0	0
7/8/2003	0	0	0
8/12/2003	0	0	0
9/9/2003	0	0	0
10/15/2003	0	0	0
11/4/2003	0	0	0
12/2/2003	0	0	0
1/6/2004	0	0	0
2/4/2004	0	0	0
3/9/2004	0	0	0
4/13/2004	0	0	0
5/11/2004	0	0	0
6/8/2004	0	0	0
7/13/2004	0	0	0
8/10/2004	0	0	0
9/7/2004	0	0	0
10/13/2004	0	0	0
11/16/2004	0	0	0
12/7/2004	0	0	0
1/11/2005	0	0	0
2/7/2005	0	0	0
3/8/2005	0	0	0
4/19/2005	0	0	0
5/10/2005	0	0	0
6/14/2005	0	0	0
7/12/2005	0	0	0
8/9/2005	0	0	0
9/13/2005	0	0	0
10/11/2005	0	0	0
11/8/2005	0	0	0
12/13/200	0	0	0

5			
1/10/2006	0	0	0

The zero is reported as a non-detect at the reporting limit.

Table A-4 New Alamo Creek at the Brown-Alamo Dam Data

	DBCM	DCBM	Chloro-form
Reporting Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
4/9/2003	0	0	5.8
5/6/2003	0.7	1.8	6.4
6/3/2003	0.7	2	6.9
7/8/2003	0.5	1.9	7.9
8/12/2003	0	1	5.3
9/9/2003	0.5	1.5	5.9
10/15/2003	0	1.1	5.8
11/4/2003	0	1.9	9.1
4/13/2004	1.2	1.9	8.7
5/11/2004	0.8	3.4	11
6/8/2004	0	1	4.3
7/13/2004	0	1	4.3
8/10/2004	0	0.8	4.9
9/7/2004	0	1.1	6.6
10/13/2004	0	0.6	3.2
2/7/2006	0	1.9	6.5
3/14/2006	0.1	0.6	1.4
5/9/2006	0.5	2.1	7.2
6/6/2006	0.5	2.1	8.2
7/11/2006	0.3	1.1	4.4
8/8/2006	1.3	2.9	6.1
9/12/2006	0.2	1.2	5.3
10/24/2006	0.5	2.6	14.3
11/14/2006	0.3	1.7	8.6
12/5/2006	0.5	3.2	15.8
1/9/2007	0.5	3	15.1
2/6/2007	0.5	3.5	18.1
3/16/2007	0.5	2.9	14.9
4/17/2007	0	1.4	7.6
5/8/2007	0.5	2.2	10.1
6/12/2007	0.6	2.3	8.9
7/10/2007	0.4	2	8.1
8/14/2007	0.5	2.9	15

The zero is reported as a non-detect at the reporting limit.

Table A-5 End of New Alamo Creek before Confluence with Ulatis Creek Data

	DBCM	DCBM	Chloro-form
Reporting Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
11/5/2002	0	2	11
12/3/2002	0.5	2.2	12
1/8/2003	0	1.2	3.6
2/11/2003	0.9	3.1	10
1/0/1900	0.8	2.4	9.9
4/9/2003	0	1.1	6.8
5/6/2003	0	1	5.3
6/3/2003	0	0.6	3.1
7/8/2003	0	0	1.4
8/12/2003	0	0.5	3.6
9/9/2003	0	0	2.5
10/15/2003	0	0.7	4.6
11/4/2003	0	1	5.9
12/2/2003	0	1.8	7.7
1/6/2004	0.7	2.2	7.1
2/4/2004	0	1.5	4.8
3/9/2004	0	0	0
4/13/2004	0	0	1.6
5/11/2004	0	0	1.7
6/8/2004	0	0.6	3.3
7/13/2004	0	0	2
8/10/2004	0	0.6	3.1
9/7/2004	0	0.8	3.9
10/13/2004	0	0.6	4.5
11/16/2004	0	1.1	5.4
12/7/2004	0	0	1.2
1/11/2005	0	0	0.6
2/7/2005	0	0.82	4.3
3/8/2005	0	1.1	3.1

	DBCM	DCBM	Chloro-form
Reporting Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
4/19/2005	0	0	4.6
5/10/2005	0	0	6.4
6/14/2005	0	0	4.9
7/12/2005	0	1.2	6
8/9/2005	0	0.55	3.6
9/13/2005	0	1.4	7.6
10/11/2005	0	0	0
11/8/2005	0.1	0.4	1.9
12/13/2005	0.5	2.2	11
1/10/2006	0.3	0.8	2.1
2/7/2006	0	1.4	6.3
3/14/2006	0	0.2	0.7
4/18/2006	0.18	0.56	1.6
5/9/2006	0.5	1.9	8.2
6/6/2006	0.3	1.1	4.9
7/11/2006	0.2	0.7	3.8
8/8/2006	0.5	1.5	5.4
9/12/2006	0.3	1.3	7.3
10/24/2006	0.3	1.3	8.6
11/14/2006	0.2	1	5
12/5/2006	0.2	1.8	10.5
1/9/2007	0.4	2.1	11.8
2/6/2007	0.3	2.1	12.6
3/16/2007	0.4	2	11.1
4/17/2007	0	0.5	3.5
5/8/2007	0	1	5.8
6/12/2007	0	0.6	4
7/10/2007	0	0.9	5
8/14/2007	0	0.8	5.1

The zero is reported as a non-detect at the reporting limit.

Table A-6 Ulatis Creek Upstream of New Alamo Creek Data

	DBCM	DCBM	Chloro-form
Reporting Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
4/9/2003	0	0	0
5/6/2003	0	0	0
6/3/2003	0	0	0
7/8/2003	0	0	0.7
8/12/2003	0	0	0
9/9/2003	0	0	0
10/15/2003	0	0	0
11/4/2003	0	0	0
12/2/2003	0	0	0
1/6/2004	0	0	0
2/4/2004	0	0	0
3/9/2004	0	1.1	3.9
4/13/2004	0	0	0
5/11/2004	0	0	0
6/8/2004	0	0	0
7/13/2004	0	0	0
8/10/2004	0	0	0
9/7/2004	0	0	0.6
10/13/2004	0	0	0
11/16/2004	0	0	0
12/7/2004	0	0	0
1/11/2005	0	0	0
2/7/2005	0	0	0
3/8/2005	0	0	0
4/19/2005	0	0	0
5/10/2005	0	0	0
6/14/2005	0	0	0
7/12/2005	0	0	0
8/9/2005	0	0	0
9/13/2005	0	0	0
10/11/2005	0.37	1.6	9.1
11/8/2005	0	0	0
12/13/200	0	0	0

5			
1/10/2006	0	0	0

The zero is reported as a non-detect at the reporting limit.

Table A-7 Ulatis Creek at Maine Prairie Data

	DBCM	DCBM	Chloro-form
Reporting Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
11/5/2002	0	0	2.7
12/3/2002	0	0.7	3.9
1/8/2003	0	0	1.1
2/11/2003	0	1.3	4.4
1/0/1900	0	1	4
4/9/2003	0	0	1.6
5/6/2003	0	0	1.8
6/3/2003	0	0	1.7
7/8/2003	0	0	0
8/12/2003	0	0	1.4
9/9/2003	0	0	0
10/15/2003	0	0	1.4
11/4/2003	0	0	2.9
12/2/2003	0	0.6	3
1/6/2004	0	0.9	2.9
2/4/2004	0	0	0.9
3/9/2004	0	0	1.2
4/13/2004	0	0	1.4
5/11/2004	0	0	2.2
6/8/2004	0	0	0.9
7/13/2004	0	0	1.6
8/10/2004	0	0	0.8
9/7/2004	0	0.5	4.1
10/13/2004	0	0	1.2
11/16/2004	0	0.57	2.6
12/7/2004	0	0	0
1/11/2005	0	0	0
2/7/2005	0	0	1.7
3/8/2005	0	0	0.75

	DBCM	DCBM	Chloro-form
Reporting Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
4/19/2005	0	0	0
5/10/2005	0	0	0
6/14/2005	0	0	1.2
7/12/2005	0	0.51	3.3
8/9/2005	0	0	2.4
9/13/2005	0	0.8	5.1
10/11/2005	0	0.66	3.7
11/8/2005	0	0.1	0.7
12/13/2005	0.2	0.9	5.2
1/10/2006	0.1	0.3	0.7
2/7/2006	0	0.6	2.6
3/14/2006	0	0	0.1
4/18/2006	0.06	0.18	0.49
5/9/2006	0.2	0.7	3.1
6/6/2006	0.09	0.3	2
7/11/2006	0	0.29	1.7
8/8/2006	0.1	0.3	1.3
9/12/2006	0	0.9	4.8
10/24/2006	0	0.6	3.9
11/14/2006	0	0.3	1.5
12/5/2006	0	0.9	6.4
1/9/2007	0.2	1.1	6.2
2/6/2007	0	1	7.2
3/16/2007	0	1	6
4/17/2007	0	0.4	3.3
5/8/2007	0	1	6.8
6/12/2007	0	0	1.7
7/10/2007	0	0.3	1.6
8/14/2007	0	0.2	1.6

The zero is reported as a non-detect at the reporting limit.

Table A-8 Ulatis Creek at Brown Road Data

	DBCM	DCBM	Chloro-form
Reporting Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
1/8/2003	0	0	0
2/11/2003	0	1.3	4.4
1/0/1900	0	0.7	3.1
4/9/2003	0	0	1.8
5/6/2003	0	0	1.3
6/3/2003	0	0	0
7/8/2003	0	0	0
8/12/2003	0	0	0.5
9/9/2003	0	0	0.6
10/15/2003	0	0	0
11/4/2003	0	0	2.5
12/2/2003	0	0	2.4
1/6/2004	0	1.1	4.1
2/4/2004	0	0.6	2
3/9/2004	0	0	1.4
4/13/2004	0	0	0
5/11/2004	0	0	0.6
6/8/2004	0	0	0
7/13/2004	0	0	0.6
8/10/2004	0	0	0
9/7/2004	0	0	1
10/13/2004	0	0	0.5
11/16/2004	0	0	2.1
12/7/2004	0	0	0
1/11/2005	0	0	0
2/7/2005	0	0	2.1
3/8/2005	0	0	1.3
4/19/2005	0	0	0

	DBCM	DCBM	Chloro-form
Reporting Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
5/10/2005	0	0	0
6/14/2005	0	0	0
7/12/2005	0	0	0.6
8/9/2005	0	0	0
9/13/2005	0	0	2.8
10/11/2005	0	0.35	2.2
11/8/2005	0	0.1	0.6
12/13/2005	0.1	0.6	4.7
1/10/2006	0.2	0.4	1.2
2/7/2006	0	0.9	3.6
3/14/2006	0	0	0.2
4/18/2006	0.11	0.28	0.82
5/9/2006	0	0.5	2.2
6/6/2006	0	0.1	0.7
7/11/2006	0	0	0.4
8/8/2006	0	0	0.2
9/12/2006	0	0.2	1.3
10/24/2006	0	0	1
11/14/2006	0	0.3	1.8
12/5/2006	0	0.6	5.3
1/9/2007	0.2	0.9	5.7
2/6/2007	0	0.7	6.2
3/16/2007	0	0.9	5.4
4/17/2007	0	0	0.3
5/8/2007	0	0	0.4
6/12/2007	0	0	0.6
7/10/2007	0	0	0.3
8/14/2007	0	0	0.3

The zero is reported as a non-detect at the reporting limit.

Table A-9 Cache Slough at Vallejo Pump Station Data

	DBCM	DCBM	Chloro-form
Reporting Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
1/0/1900	0	0	2
4/9/2003	0	0	1.4
5/6/2003	0	0	0.8
6/3/2003	0	0	0
7/8/2003	0	0	0
8/12/2003	0	0	0
9/9/2003	0	0	0
10/15/2003	0	0	0
11/4/2003	0	0	0.7
12/2/2003	0	0	2
1/6/2004	0	0	2.4
2/4/2004	0	0	1.1
3/9/2004	0	0	0
4/13/2004	0	0	0
5/11/2004	0	0	0
6/8/2004	0	0	0
7/13/2004	0	0	0
8/10/2004	0	0	0
9/7/2004	0	0	0
10/13/2004	0	0	0
11/16/2004	0	0	0.72
1/11/2005	0	0	0
2/7/2005	0	0	1.1
3/8/2005	0	0	1.1
4/19/2005	0	0	0
5/10/2005	0	0	0

	DBCM	DCBM	Chloro-form
Reporting Limit	0.5 µg/L	0.5 µg/L	0.5 µg/L
Date			
6/14/2005	0	0	0
7/12/2005	0	0	0
8/9/2005	0	0	0
9/13/2005	0	0	0
10/11/2005	0	0	0.47
11/8/2005	0	0.2	1.8
12/13/2005	0	0.1	1.3
1/10/2006	0	0.3	0.9
2/7/2006	0	0.2	1.3
3/14/2006	0	0.1	0.4
4/18/2006	0	0.2	0.99
5/9/2006	0	0.3	1.1
6/6/2006	0	0	0.2
7/11/2006	0	0	0
8/8/2006	0	0	0.1
9/12/2006	0	0	0.2
10/24/2006	0	0	0.2
11/14/2006	0	0	0.9
12/5/2006	0	0	4.3
1/9/2007	0	0	1.1
2/6/2007	0	0.2	3.7
3/16/2007	0	0.4	4
4/17/2007	0	0	0
5/8/2007	0	0	0
6/12/2007	0	0	0
7/10/2007	0	0	0
8/14/2007	0	0	0

The zero is reported as a non-detect at the reporting limit.

Appendix B. Statistical Analyses of the Historical THM Data, Probabilities of Occurrence of THM Constituents at Brown Alamo Dam and the Terminus of Old Alamo Creek, and Associated Cancer Risk Levels for Use

The purpose of this appendix is to statistically characterize and define the distribution of dibromochloromethane (DBCM), dichlorobromomethane (DBCM), and chloroform data historically collected in Old Alamo Creek at the terminus (i.e., just upstream from New Alamo Creek) and in New Alamo Creek at Brown-Alamo Dam. In order to define the upper end of the historical data distribution and to project future concentrations, statistical distributions were determined from the measured THM datasets to calculate the probability of occurrence for each THM. As discussed in the Technical Support Document for Water Quality-based Toxics Control (TSD) (USEPA 1991), the assumed distribution for effluent data above the detection limit is lognormal while the distribution of monthly averages (based on multiple data points) is assumed to be normally distributed. Environmental water quality data often shows a positive skew toward higher values that is best represented by a lognormal distribution. If a normal distribution is incorrectly assumed, probabilities from the normal distribution will under predict the true probability of occurrence for higher values at the upper tail end of the distribution.

A statistical assessment was made for both lognormal and normal distributions to determine their suitability in fitting the measured data for each THM at each location. Distributional assessments were made with USEPA statistical software ProUCL (version 4.00.02) because it provides a more robust handling of non-detect values using regression on order statistics (ROS) than the SIP procedure, which uses half the detection limit for non-detects (USEPA 2007). First, estimates were made for non-detect values by fitting the detected values to an assumed distribution (e.g., lognormal ROS). If normal ROS estimates for non-detects resulted in several negative numbers, then that normal distributional fit was considered invalid. Next the goodness of the fit was evaluated for the whole dataset (i.e., detects and estimated non-detect values) using, as relevant, quantile-quantile plots (Q-Q) plots), Shapiro-Wilks, Kolmogorov-Smirnov, and Lilliefors (a special case of Kolmogorov-Smirnov) statistical tests. Shapiro-Wilks is used for smaller datasets (N<50). To test the goodness of the fit for lognormal distributions, the dataset is log-transformed and then the transformed dataset is tested for normality with the above referenced statistical tests. The determination for statistically significant fits ($\alpha = 0.05$) for each THM and each location is summarized in **Table B-1** along with the number of non-detects in the dataset.

Both normal and lognormal distributions fit the DCBM data at Brown-Alamo Dam, so the dataset was examined more closely. The dataset at Brown-Alamo Dam (n=33) is much smaller than the dataset in Old Alamo Creek at the terminus (n=60). Furthermore, the dataset at Brown-Alamo Dam primarily consists of data collected during the April–October irrigation season (n=25) versus the November–March non-irrigation season (n=8). Since hydrographs of New Alamo Creek show rapid fluctuations in streamflow in response to rainfall, the highest THM values are expected to occur between significant rainfall events during the non-irrigation season (i.e., when irrigation and agricultural return flows are not present and winter base flow is low). **Table B-2** shows that the dataset at Brown-Alamo Dam does not include the highest anticipated THM concentration that are expected to have occurred during the monitoring period, based on the dataset at the terminus of Old Alamo Creek. For DBCM and DCBM, there is only one measurement at Brown-Alamo Dam corresponding to dates for the top 10 highest measurements at the terminus of Old Alamo Creek. Consequently, the high values expected to be part of the data set at Brown-Alamo Dam, based on measurements at the terminus of

Old Alamo Creek, are simply not represented due to sparse monitoring at Brown-Alamo Dam during the months when the highest concentrations occurred in the system.

Table B-1. Statistically significant (α = 0.05) distribution fits to lognormal or normal regression on order statistics (ROS) distributions for measured trihalomethane data calculated with ProUCL 4.0 (USEPA 2007).

THM Constituent	Size of Dataset	Non-Detects	Statistical Test (α = 0.05)	Critical Value	Test Value for Normal Fit	Test Value for Lognormal Fit	Conclusion
Old Alamo Creek (all data)							
DBCM	60	22	Lilliefors ROS	<0.114	0.117	0.071	Lognormal
DCBM	60	3	Lilliefors ROS	<0.114	0.116	0.091	Lognormal
Chloroform	60	0	Lilliefors	<0.114	0.138	0.086	Lognormal
Brown-Alamo Dam (all data)							
DBCM	33	11	Shapiro-Wilks ROS	>0.931	0.907	0.964	Lognormal
DCBM	33	1	Shapiro-Wilks ROS	>0.931	0.971	0.938	Lognormal [1]
Chloroform	33	0	Shapiro-Wilks	>0.931	0.906	0.946	Lognormal

Notes:
ROS = Regression on order statistics
[1] Both normal and lognormal distributions are statistically significant fits. Lognormal fit chosen as best fit given limited non-irrigation season data at Brown-Alamo Dam.

In light of the previous discussion and whereas both normal and lognormal distributions are statistically good fits (α = 0.05) for the DCBM data, the lognormal distribution was chosen as the better fit since it provides a more accurate prediction of the probabilities of high DCBM values at Brown-Alamo Dam. This is further supported by January 2009 daily THM monitoring by the City at Brown-Alamo Dam, which found a higher average DCBM value (2.9 µg/L vs. 1.8 µg/L) and higher maximum DCBM value (4.8 µg/L vs. 3.5 µg/L) than previously seen in the historical (n=33) DCBM dataset used to evaluate normality/lognormality. The THM data set used to evaluate normality/lognormality is presented in Table B-2. The January 2009 THM data are presented in Table B-3.

Table B-2. Trihalomethane concentrations in Old Alamo Creek (OAC) at its terminus and the corresponding value, when measured, at Brown-Alamo Dam, ranked from highest to lowest for each constituent based on the value at OAC.

Dibromochloromethane (µg/L)			Dichlorobromomethane (µg/l)			Chloroform (µgL)		
Date	End of OAC	Brown Alamo Dam	Date	End of OAC	Brown Alamo Dam	Date	End of OAC	Brown Alamo Dam
3/8/05	2.3		2/11/03	7.1		2/6/07	25.1	18.1
2/11/03	1.9		3/8/05	5.9		3/16/07	23.9	14.9
9/13/05	1.9		1/6/04	5.2		12/3/02	21	
8/8/06	1.7	1.3	3/9/04	5.1		2/11/03	21	
1/10/06	1.6		3/11/03	4.9		3/11/03	20	
3/11/03	1.5		2/7/06	4.9	1.9	12/5/06	19.2	15.8
1/6/04	1.5		9/13/05	4.8		12/2/03	19	
4/18/06	1.38		1/10/06	4.8		12/13/05	19	
1/8/03	1.3		12/2/03	4.6		10/24/06	17.4	14.3
3/9/04	1.3		4/18/06	4.6		1/9/07	17.3	15.1
4/13/04	1.2	1.2	1/8/03	4.4		11/5/02	17	
12/2/03	1.1		5/9/06	4.3	2.1	2/7/06	17	6.5
2/4/04	1.1		3/16/07	4.2	2.9	11/14/06	17	8.6
2/7/05	1.1		2/6/07	4.1	3.5	1/6/04	16	
2/7/06	1	0.25	12/5/06	3.9	3.2	5/9/06	15.5	7.2
5/9/06	1	0.5	12/13/05	3.8		3/9/04	15	
5/11/04	0.9	0.8	12/3/02	3.7		3/8/05	15	
12/3/02	0.8		2/4/04	3.7		4/9/03	14	5.8
6/3/03	0.8	0.7	8/8/06	3.6	2.9	4/18/06	13.9	
6/6/06	0.8	0.5	5/11/04	3.5	3.4	2/7/05	13	
5/6/03	0.7	0.7	2/7/05	3.3		9/13/05	13	
12/13/05	0.7		11/14/06	3.3	1.7	11/8/05	13	
3/16/07	0.7	0.5	1/9/07	3.2	3	11/4/03	12	9.1
1/11/05	0.63		6/6/06	3.1	2.1	2/4/04	12	
11/5/02	0.6		11/5/02	3		5/11/04	12	11
11/4/03	0.6	0.25	12/7/04	3		1/10/06	12	
3/14/06	0.6	0.1	10/24/06	2.8	2.6	6/6/06	12	8.2
11/14/06	0.6	0.3	6/3/03	2.6	2	1/8/03	11	
12/5/06	0.6	0.5	11/4/03	2.5	1.9	12/7/04	11	
2/6/07	0.6	0.5	11/8/05	2.5		8/14/07	10.2	15
12/7/04	0.59		3/14/06	2.4	0.6	4/13/04	10	8.7
11/16/04	0.54		8/9/05	2.3		8/9/05	9.7	
8/9/05	0.5		4/13/04	2.2	1.9	5/8/07	9	10.1
10/11/05	0.5		5/6/03	2	1.8	6/3/03	8.7	6.9
11/8/05	0.5		8/14/07	2	2.9	10/16/02	8.6	
10/24/06	0.5	0.5	10/16/02	1.9		5/6/03	8.5	6.4
1/9/07	0.5	0.5	11/16/04	1.9		10/11/05	8.3	
6/12/07	0.5	0.6	1/11/05	1.9		11/16/04	8.2	
9/10/02	0.25		10/11/05	1.9		6/12/07	8.2	8.9
10/16/02	0.25		7/11/06	1.9	1.1	7/10/07	8.1	8.1
4/9/03	0.25	0.25	6/12/07	1.9	2.3	9/12/06	7.8	5.3
7/8/03	0.25	0.5	7/10/07	1.9	2	8/12/03	7.7	5.3
8/12/03	0.25	0.25	7/12/05	1.8		7/11/06	6.9	4.4
9/9/03	0.25	0.5	9/12/06	1.8	1.2	4/17/07	6.7	7.6
10/15/03	0.25	0.25	5/8/07	1.8	2.2	9/10/02	6.6	
6/8/04	0.25	0.25	7/8/03	1.6	1.9	7/12/05	6.6	
7/13/04	0.25	0.25	9/9/03	1.4	1.5	8/8/06	6.6	6.1
8/10/04	0.25	0.25	10/15/03	1.3	1.1	10/15/03	6.5	5.8
9/7/04	0.25	0.25	7/13/04	1.3	1	9/9/03	6.4	5.9
10/18/04	0.25	0.25	9/10/02	1.2		7/8/03	6.2	7.9
4/19/05	0.25		8/12/03	1.2	1	10/18/04	6.1	3.2
5/10/05	0.25		4/17/07	1.2	1.4	4/19/05	5.9	
6/14/05	0.25		10/18/04	1.1	0.6	3/14/06	5.8	1.4
7/12/05	0.25		6/8/04	1	1	6/14/05	5.5	
7/11/06	0.25	0.3	8/10/04	1	0.8	5/10/05	5.3	
9/12/06	0.25	0.2	9/7/04	0.9	1.1	8/10/04	5.2	4.9
4/17/07	0.25	0.25	4/9/03	0.6	0.25	7/13/04	4.9	4.3
5/8/07	0.25	0.5	4/19/05	0.25		9/7/04	4.7	6.6
7/10/07	0.25	0.4	5/10/05	0.25		6/8/04	3.9	4.3
8/14/07	0.25	0.5	6/14/05	0.25		1/11/05	3.8	
Median	0.60	0.50	Median	2.45	1.90	Median	10.10	7.20
Average	0.70	0.45	Average	2.74	1.84	Average	11.35	8.23
Maximum	2.30	1.30	Maximum	7.10	3.50	Maximum	25.10	18.10

Table B-3. Trihalomethane concentrations in the Easterly WWTP effluent at the outfall, Old Alamo Creek (OAC) at its terminus, and in New Alamo Creek at Brown-Alamo Dam (BAD) collected by the City of Vacaville during January 2009.

Morning	1/5/09 AM			1/6/09 AM			1/7/09 AM			1/8/09 AM			1/9/09 AM			Weekly Maximum		
Analyte	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD
DBCM	2.1	0.8	0.5	1.8	0.5	0.5	1.3	0.6	0.5	1.4	0.4	0.4	1.4	0.4	0.4	2.1	0.8	0.6
DCBM	12.7	3.7	2.9	13.2	3.3	2.5	11.1	3.7	2.9	12.7	2.9	2.9	11.8	2.4	2.3	13.2	5.0	4.3
Chloroform	43.3	16.0	12.7	49.3	15.1	11.6	38.8	16.6	13.6	49.6	15.6	15.5	45.6	15.3	11.6	51.0	23.7	20.5

Afternoon	1/5/09 PM			1/6/09 PM			1/7/09 PM			1/8/09 PM			1/9/09 PM		
Analyte	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD
DBCM	1.3	0.5	0.5	1.4	0.8	0.6	1.9	0.5	0.5	1.2	0.7	0.4	1.3	0.5	0.2
DCBM	10.6	3.4	2.9	12.4	5.0	4.3	11.2	4.2	3.3	11.8	4.9	2.4	12.2	3.2	1.4
Chloroform	38.3	15.8	13.3	48.9	23.7	20.5	39.0	20.6	18.0	48.0	23.0	15.3	51.0	17.5	13.1

Morning	1/12/09 AM			1/13/09 AM			1/14/09 AM			1/15/09 AM			1/16/09 AM			Weekly Maximum		
Analyte	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD
DBCM	1.3	0.4	0.3	1.6	0.4	0.3	1.6	0.6	0.5	1.7	0.5	0.4	2.0	0.7	0.6	2.0	0.8	0.7
DCBM	12.0	2.8	2.2	13.7	3.0	2.2	13.4	3.8	3.2	13.0	2.9	2.7	14.1	4.2	3.8	14.1	5.4	4.8
Chloroform	50.6	16.5	12.6	55.8	16.1	12.3	50.8	19.0	16.2	47.8	14.3	13.2	46.1	16.8	15.1	55.8	28.1	24.1

Afternoon	1/12/09 PM			1/13/09 PM			1/14/09 PM			1/15/09 PM			1/16/09 PM		
Analyte	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD
DBCM	1.2	0.4	0.3	1.5	0.7	0.6	1.5	0.6	0.3	1.7	0.8	0.7	2.0	0.7	0.4
DCBM	12.0	3.5	2.0	13.2	5.4	4.7	12.4	4.1	2.1	13.0	5.4	4.8	14.1	4.1	2.4
Chloroform	54.4	21.4	15.7	53.7	28.1	24.1	49.5	22.1	16.6	45.4	25.3	22.5	46.9	20.1	16.2

Afternoon	1/19/09 PM			1/20/09 PM			1/21/2009			1/22/09 PM			1/23/09 PM			Weekly Maximum		
Analyte	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD
DBCM	1.2	0.3	0.2	2.1	0.5	0.3	1.9	0.5	0.5	1.9	1.0	0.3	1.7	0.7	0.6	2.1	1.0	0.6
DCBM	11.3	2.9	2.6	15.2	3.9	2.5	12.7	3.7	3.5	13.7	6.2	1.8	14.1	4.3	3.4	15.2	6.2	3.5
Chloroform	43.8	18.1	15.6	48.4	19.4	15.6	38.6	16.1	14.0	43.2	24.3	7.3	49.1	18.3	14.9	49.1	24.3	15.6
					Sample Time >		0838	1155	1215									

	Study Minimums			Study Averages			Study Maximums		
Analyte	Outfall	OAC	BAD	Outfall	OAC	BAD	Outfall	OAC	BAD
DBCM	1.2	0.3	0.2	1.6	0.6	0.4	2.1	1.0	0.7
DCBM	10.6	2.4	1.4	12.7	3.9	2.9	15.2	6.2	4.8
Chloroform	38.3	14.3	7.3	47.2	19.2	15.3	55.8	28.1	24.1

THM concentrations for various probabilities of occurrence were calculated for New Alamo Creek at Brown-Alamo Dam (**Table B-4**) and Old Alamo Creek at the terminus (**Table B-5**). These tables indicate the THM concentration that corresponds to specified probabilities of occurrence, based on historical monitoring data. For calculations of probabilities, ROS was used to estimate the non-detect values prior to fitting the data distribution. The corresponding cancer risk levels, also presented in Tables B-4 and B-5, were derived based on the USEPA's NRWQC methodology that assumes consumption of 2 L/day of water and up to 17.5 g/day of fish/shellfish from the water body (at the criterion concentration) for a 70-year lifetime. However, consumption of water in these segments is never expected to be 2 L/day for a lifetime, so the actual human health risk for segment waters is expected to be substantially lower than the risk levels cited in Tables B-4 or B-5. Any potential future use would be transient and incidental in nature (e.g., days, months), and would not occur daily for the 70 year period of exposure assumed by the USEPA methodology. Thus, for demonstration purposes, the USEPA methodology was used to estimate the cancer risk level should a person consume water from the segments containing DBCM, DCBM, and chloroform at the levels prescribed by Alternatives 4A and 4B water quality objectives on a transient basis and water elsewhere containing DBCM, DCBM, and chloroform at the current CTR/USEPA criteria levels for the remainder of a 70-year period of exposure.

Tables B-6 and B-7 present the cancer risk level of the Alternatives 4A and 4B objectives assuming a person drinks water on a transient and incidental basis from the segments at the worst-case scenario concentration (i.e., at a concentration equal to the objective) for the time specified in the tables, and water from another source(s) outside the segments at its worst-case scenario concentration (i.e., concentrations equal to the CTR criteria for DBCM and DCBM and the USEPA NRWQC of 5.7 µg/l for chloroform which all equate to a 10^{-6} risk level) for the remainder of the 70 year period of exposure assumed by the USEPA's 2000 human health criteria methodology. To estimate risk levels, an assumption was made that this exposure scenario could be approximated as a time-weighted average concentration for the entire 70-year period as follows:

$$C_{AVG} = f_{SSO} \times C_{SSO} + f_{10^{-6}} \times C_{10^{-6}}$$

Where: C_{AVG} = time weighted average concentration, f_{SSO} = fraction of 70 years spent drinking water at the SSO, C_{SSO} = SSO concentration, $f_{10^{-6}}$ = fraction of 70 years spent drinking water at the 10^{-6} risk level, and $C_{10^{-6}}$ = 10^{-6} risk level concentration. The risk level was then calculated from C_{AVG} assuming using USEPA's 2000 human health criteria methodology and default exposure assumptions for fish and water consumption (USEPA 2000).

Tables B-8 and B-9 present the number of years a person must drink water from the segments containing DBCM, DCBM, and chloroform at concentrations equal to the Alternative 4A and 4B objectives to reach the specified risk levels. This also assumes that the person consumed water from another source(s) outside the segments at CTR criteria concentrations for DBCM and DCBM, and USEPA's NRWQC for chloroform. To calculate the required number of years, the concentration associated with that risk level was inserted into the above equation as C_{AVG} and the equation was solved for f_{SSO}.

Table B-4. Probability (based on lognormal distribution) of occurrence for trihalomethane concentrations (µg/L) in New Alamo Creek at Brown-Alamo Dam, and associated cancer risk levels for each concentration.

Data Period: 11/2002 to 8/14/2007							
Probability	**Dibromochloromethane**		**Dichlorobromomethane**		**Chloroform [2]**		**Composite Index for Three THMs [1] Log (Cancer Risk)**
	µg/L	Log(CR)	µg/L	Log(CR)	µg/L	Log(CR)	
99.99%	3.4	-5.07	11.6	-4.67	50.7	-5.05	-4.89
99.98%	3.1	-5.12	10.6	-4.72	46.2	-5.09	-4.93
99.97%	2.9	-5.14	10.0	-4.74	43.6	-5.12	-4.96
99.96%	2.7	-5.16	9.6	-4.76	41.9	-5.13	-4.98
99.95%	2.6	-5.18	9.3	-4.77	40.5	-5.15	-4.99
99.94%	2.6	-5.19	9.0	-4.78	39.5	-5.16	-5.00
99.93%	2.5	-5.20	8.8	-4.79	38.6	-5.17	-5.01
99.92%	2.4	-5.21	8.7	-4.80	37.8	-5.18	-5.02
99.91%	2.4	-5.22	8.5	-4.81	37.1	-5.19	-5.03
99.9%	2.3	-5.23	8.4	-4.82	36.5	-5.19	-5.04
99.8%	2.1	-5.29	7.5	-4.87	32.7	-5.24	-5.09
99.6%	1.8	-5.34	6.6	-4.92	29.1	-5.29	-5.14
99.5%	1.7	-5.36	6.4	-4.94	27.9	-5.31	-5.16
99.4%	1.7	-5.38	6.2	-4.95	27.0	-5.32	-5.17
99.2%	1.6	-5.41	5.8	-4.97	25.6	-5.35	-5.20
99%	1.5	-5.43	5.6	-4.99	24.5	-5.37	-5.22
98%	1.3	-5.50	4.8	-5.06	21.3	-5.43	-5.28
97%	1.2	-5.54	4.4	-5.09	19.5	-5.47	-5.32
96%	1.1	-5.57	4.1	-5.12	18.2	-5.50	-5.35
95%	1.0	-5.60	3.9	-5.15	17.2	-5.52	-5.38
90%	0.8	-5.69	3.2	-5.23	14.2	-5.60	-5.46
85%	0.7	-5.76	2.8	-5.29	12.5	-5.66	-5.52
80%	0.6	-5.81	2.6	-5.33	11.3	-5.70	-5.56
75%	0.6	-5.85	2.3	-5.37	10.4	-5.74	-5.60
70%	0.5	-5.89	2.2	-5.41	9.6	-5.77	-5.64
60%	0.4	-5.96	1.9	-5.47	8.3	-5.84	-5.70
50%	0.4	-6.02	1.6	-5.53	7.3	-5.89	-5.76

Notes: Log(CR) = logarithm of cancer risk, based on consumption of 2L/day of water and 17.5 g fish and shellfish/day for a 70-year lifetime.

[1] Composite Index:. Converted from log(CR) to cancer risk, averaged, and then converted back to log(CR).

[2] There were no non-detect data for chloroform, therefore, regression on order statistics (ROS) was not necessary.

Table B-5. Probability (based on lognormal distribution) of occurrence for trihalomethane concentrations (µg/L) at end of Old Alamo Creek, and associated cancer risk levels for each concentration.

Data Period: 11/2002 to 8/14/2007							
Probability	**Dibromochloromethane**		**Dichlorobromomethane**		**Chloroform**		**Composite Index for Three THMs [1] Log (Cancer Risk)**
	µg/L	Log(CR)	µg/L	Log(CR)	µg/L	Log(CR)	
99.99%	7.6	-4.72	22.9	-4.38	61.8	-4.97	-4.62
99.98%	6.7	-4.78	20.5	-4.43	56.6	-5.00	-4.67
99.97%	6.2	-4.81	19.2	-4.46	53.7	-5.03	-4.70
99.96%	5.9	-4.83	18.3	-4.48	51.7	-5.04	-4.72
99.95%	5.6	-4.85	17.6	-4.50	50.2	-5.06	-4.74
99.94%	5.4	-4.87	17.0	-4.51	48.9	-5.07	-4.75
99.93%	5.3	-4.88	16.6	-4.52	47.9	-5.08	-4.76
99.92%	5.1	-4.89	16.2	-4.53	47.0	-5.08	-4.77
99.91%	5.0	-4.90	15.8	-4.54	46.2	-5.09	-4.78
99.9%	4.9	-4.91	15.5	-4.55	45.5	-5.10	-4.79
99.8%	4.2	-4.98	13.7	-4.61	41.0	-5.14	-4.85
99.6%	3.6	-5.05	11.9	-4.67	36.8	-5.19	-4.91
99.5%	3.4	-5.07	11.3	-4.69	35.4	-5.21	-4.93
99.4%	3.3	-5.09	10.9	-4.70	34.4	-5.22	-4.95
99.2%	3.0	-5.12	10.2	-4.73	32.7	-5.24	-4.97
99%	2.9	-5.14	9.7	-4.75	31.4	-5.26	-4.99
98%	2.4	-5.23	8.2	-4.82	27.5	-5.32	-5.07
97%	2.1	-5.28	7.4	-4.87	25.3	-5.35	-5.11
96%	1.9	-5.32	6.8	-4.91	23.7	-5.38	-5.15
95%	1.8	-5.35	6.4	-4.93	22.5	-5.40	-5.17
90%	1.4	-5.46	5.1	-5.03	18.9	-5.48	-5.27
85%	1.2	-5.53	4.4	-5.10	16.8	-5.53	-5.33
80%	1.0	-5.59	3.9	-5.15	15.3	-5.57	-5.39
75%	0.9	-5.64	3.5	-5.19	14.1	-5.61	-5.43
70%	0.8	-5.69	3.2	-5.23	13.1	-5.64	-5.47
60%	0.7	-5.77	2.7	-5.30	11.5	-5.70	-5.54
50%	0.6	-5.85	2.3	-5.37	10.1	-5.75	-5.60

Notes: Log(CR) = logarithm of cancer risk, based on consumption of 2L/day of water and 17.5 g fish and shellfish/day for a 70-year lifetime.

[1] Composite Index: Converted from log(CR) to cancer risk, averaged, and then converted back to log(CR).

Table B-6. Level of protection provided by Alternative 4A objectives based on various levels of transient and incidental use of segment waters that could potentially occur in the future.

Time Drinking Water from Segments	Caner Risk Level, 10^{-x}		
	DBCM	DCBM	Chloroform
4 months	-5.98	-5.96	-5.98
6 months	-5.98	-5.95	-5.97
1 year	-5.96	-5.91	-5.95
3 years	-5.90	-5.78	-5.89

Table B-7. Level of protection provided by Alternative 4B objectives based on various levels of transient and incidental use of segment waters that could potentially occur in the future.

Time Drinking Water from Segments	Risk Level, 10^{-x}		
	DBCM	DCBM	Chloroform
4 months	-5.97	-5.94	-5.98
6 months	-5.96	-5.92	-5.97
1 year	-5.93	-5.85	-5.95
3 years	-5.82	-5.66	-5.88

Table B-8. Approximate number of years of transient and incidental drinking water use from the segments at Alternative 4A objectives required to result in the defined cancer risk levels.

Cancer Risk Level	Years Drinking Water from Segments to Reach Risk Level		
	DBCM	DCBM	Chloroform
$10^{-5.5}$	27.5	9.8	24.4
10^{-5}	115.4	41.0	103.6

Table B-9. Approximate number of years of transient and incidental drinking water use from the segments at Alternative 4B objectives required to result in the defined cancer risk levels.

Cancer Risk Level	Years Drinking Water from Segments to Reach Risk Level		
	DBCM	DCBM	Chloroform
$10^{-5.5}$	13.4	5.5	20.8
10^{-5}	56.3	23.2	88.0

Appendix C. Example Derivation of NPDES Permit Effluent Limitations Under the Proposed Basin Plan Amendment, Should Limitations be Required

Table C–1. Example derivation of NPDES effluent limitations for Alternative 3 site-specific objectives.

Constituent	Dibromochloromethane	Dichlorobromomethane	Chloroform
TYPE	HH, Long-term	HH, Long-term	HH, Long-term
Units	µg/L	µg/L	µg/L
Criteria (applicable in downstream segments)	**4.0**	**5.5**	**57**
Median Attentuation Factor (1)	**5.80**	**8.95**	**5.15**
Location	New Alamo Cr. @ BAD	New Alamo Cr. @ BAD	New Alamo Cr. @ BAD
Begin sample date	9/10/2002	9/10/2002	9/10/2002
End sample date	8/14/2007	8/14/2007	8/14/2007
count	n = 33	n = 33	n = 33
Maximum concentration at BAD	**1.3**	**3.5**	**18.1**
mean	0.45	1.84	9.76
std deviation	0.27	0.87	4.67
CV	0.59	0.47	0.48
z-statistic (95% probability basis)	1.645	1.645	1.645
z-statistic (99% probability basis)	2.326	2.326	2.326
ECA	23.200	49.225	293.550
ECA multiplier	NA	NA	NA
LTA	NA	NA	NA
Sampling n	4	4	4
AMEL	**23.2**	**49.2**	**293.6**
AMEL Multiplier (95%)	1.54	1.43	1.43
MDEL Multiplier (99%)	3.07	2.56	2.59
MDEL	**46.2**	**88.4**	**531.0**

Notes:
AMEL = Average monthly effluent limitation
BAD = Brown-Alamo Dam
MDEL = Maximum daily effluent limitation
NA = Not applicable, due to long-term average criteria
(1) Median value; Effluent/(New Alamo Creek @ BAD); see Table B-3

In the above table, the maximum concentration measured at Brown-Alamo Dam is less than the C (Alternative 3 objectives), thus, effluent limitations would not be needed in this example. Nevertheless, effluent limitations are derived to illustrate the steps in the calculation. The ECA is calculated as:

ECA = Attenuation Factor x C

C is the site-specific objective and the attenuation factor is the median of the individually calculated attenuation factors derived from representative historical data for all months of the year (see Table B-3).

The AMEL and MDEL are calculated as:

AMEL = ECA

MDEL = ECA x MDEL multiplier/AMEL multiplier

The AMEL and MDEL multipliers are determined from the equations provided in Section 1.4.0 of the SIP. The SIP specifies that if the sampling frequency is four times per month or less, than the "n" for determining the AMEL multiplier shall be set equal to 4.

Table C–2. Example derivation of NPDES effluent limitations for Alternative 4A site-specific objectives.

Constituent	Dibromochloromethane	Dichlorobromomethane	Chloroform
TYPE	HH, Long-term	HH, Long-term	HH, Long-term
Units	µg/L	µg/L	µg/L
Criteria (applicable in downstream segments)	**2.6**	**9.0**	**39.5**
Median Attentuation Factor (1)	**5.80**	**8.95**	**5.15**
Location	New Alamo Cr. @ BAD	New Alamo Cr. @ BAD	New Alamo Cr. @ BAD
Begin sample date	9/10/2002	9/10/2002	9/10/2002
End sample date	8/14/2007	8/14/2007	8/14/2007
count	n = 33	n = 33	n = 33
Maximum concentration at BAD	**1.3**	**3.5**	**18.1**
mean	0.45	1.84	9.76
std deviation	0.27	0.87	4.67
CV	0.59	0.47	0.48
z-statistic (95% probability basis)	1.645	1.645	1.645
z-statistic (99% probability basis)	2.326	2.326	2.326
ECA	15.080	80.550	203.425
ECA multiplier	NA	NA	NA
LTA	NA	NA	NA
Sampling n	4	4	4
AMEL	**15.1**	**80.6**	**203.4**
AMEL Multiplier (95%)	1.54	1.43	1.43
MDEL Multiplier (99%)	3.07	2.56	2.59
MDEL	**30.0**	**144.6**	**367.9**

Notes:
AMEL = Average monthly effluent limitation
BAD = Brown-Alamo Dam
MDEL = Maximum daily effluent limitation
NA = Not applicable, due to long-term average criteria
(1) Median value; Effluent/(New Alamo Creek @ BAD); see Table B-3

In the above table, the maximum concentration measured at Brown-Alamo Dam is less than the C (Alternative 4A objectives), thus, effluent limitations would not be needed in this example. Nevertheless, effluent limitations are derived to illustrate the steps in the calculation. The ECA is calculated as:

ECA = Attenuation Factor x C

C is the site-specific objective and the attenuation factor is the median of the individually calculated attenuation factors derived from representative historical data for all months of the year (see Table B-3).

The AMEL and MDEL are calculated as:

AMEL = ECA

MDEL = ECA x MDEL multiplier/AMEL multiplier

The AMEL and MDEL multipliers are determined from the equations provided in Section 1.4.0 of the SIP. The SIP specifies that if the sampling frequency is four times per month or less, than the "n" for determining the AMEL multiplier shall be set equal to 4.

Table C–3. Attenuation Factors for Dibromochloromethane (DBCM), Dichlorobromomethane (DCBM), and Chloroform for New Alamo Creek at Brown-Alamo Dam. Attenuation Factor = Effluent Concentration /New Alamo Creek at Brown-Alamo Dam Concentration).

Dibromochloromethane (DBCM)				
Year	Month	Effluent (µg/L)	End of OAC (µg/L)	Attenuation Factor
2003	4	2.5	0.5	5.00
	5	3.6	0.7	5.14
	6	4.1	0.7	5.86
	7	3.2	0.5	6.40
	8	2.3	0.5	4.60
	9	2.8	0.5	5.60
	10	3	0.5	6.00
	11	2	0.5	4.00
2004	4	3.9	1.2	3.25
	5	4.5	0.8	5.63
	6	3.3	0.5	6.60
	7	4.9	0.5	9.80
	8	3.7	0.5	7.40
	9	2.6	0.5	5.20
	10	1.9	0.5	3.80
2006	2	3.2	0.5	6.40
	3	3.1	0.1	31.00
	5	3.6	0.5	7.20
	6	3.4	0.5	6.80
	7	3.1	0.3	10.33
	8	13	1.3	10.00
	9	3.1	0.2	15.50
	10	2.8	0.5	5.60
	11	1.9	0.3	6.33
	12	2.3	0.5	4.60
2007	1	2.2	0.5	4.40
	2	2.7	0.5	5.40
	3	2.3	0.5	4.60
	4	2	0.5	4.00
	5	2.9	0.5	5.80
	6	3.8	0.6	6.33
	7	3.4	0.4	8.50
	8	2.2	0.5	4.40
			Median	**5.80**

Dichlorobromomethane (DCBM)				
Year	Month	Effluent (µg/L)	End of OAC (µg/L)	Attenuation Factor
2003	4	11	0.5	22.00
	5	12	1.8	6.67
	6	15	2	7.50
	7	13	1.9	6.84
	8	10	1	10.00
	9	12	1.5	8.00
	10	12	1.1	10.91
	11	10	1.9	5.26
2004	4	17	1.9	8.95
	5	19	3.4	5.59
	6	13	1	13.00
	7	14	1	14.00
	8	12	0.8	15.00
	9	12	1.1	10.91
	10	11	0.6	18.33
2006	2	17	1.9	8.95
	3	12	0.6	20.00
	5	17.1	2.1	8.14
	6	19.1	2.1	9.10
	7	17.2	1.1	15.64
	8	30.3	2.9	10.45
	9	18	1.2	15.00
	10	17	2.6	6.54
	11	12.9	1.7	7.59
	12	14.2	3.2	4.44
2007	1	13	3	4.33
	2	17.1	3.5	4.89
	3	14.6	2.9	5.03
	4	13	1.4	9.29
	5	15.5	2.2	7.05
	6	18.5	2.3	8.04
	7	22	2	11.00
	8	16.3	2.9	5.62
			Median	**8.95**

Chloroform				
Year	Month	Effluent (µg/L)	End of OAC (µg/L)	Attenuation Factor
2003	4	24	5.8	4.14
	5	22	6.4	3.44
	6	30	6.9	4.35
	7	32	7.9	4.05
	8	29	5.3	5.47
	9	25	5.9	4.24
	10	43	5.8	7.41
	11	25	9.1	2.75
2004	4	50	8.7	5.75
	5	50	11	4.55
	6	27	4.3	6.28
	7	39	4.3	9.07
	8	33	4.9	6.73
	9	34	6.6	5.15
	10	47	3.2	14.69
2006	2	40	6.5	6.15
	3	22	1.4	15.71
	5	37	7.2	5.14
	6	50.4	8.2	6.15
	7	46.2	4.4	10.50
	8	37.4	6.1	6.13
	9	53.7	5.3	10.13
	10	45	14.3	3.15
	11	41.5	8.6	4.83
	12	42.4	15.8	2.68
2007	1	52	15.1	3.44
	2	52.3	18.1	2.89
	3	43.9	14.9	2.95
	4	73	7.6	9.61
	5	44.5	10.1	4.41
	6	47.1	8.9	5.29
	7	61	8.1	7.53
	8	60	15	4.00
			Median	**5.15**

Table C–4. Example derivation of NPDES effluent limitations for Alternative 4B site-specific objectives.

Constituent	Dibromochloromethane	Dichlorobromomethane	Chloroform
TYPE	HH, Long-term	HH, Long-term	HH, Long-term
Units	µg/L	µg/L	µg/L
Criteria (applicable in downstream segments)	**4.9**	**15.5**	**45.5**
Median Attentuation Factor (1)	**3.43**	**3.91**	**2.57**
Location	Terminus of OAC	Terminus of OAC	Terminus of OAC
Begin effluent sample	9/10/2002	9/10/2002	9/10/2002
End effluent sample	8/14/2007	8/14/2007	8/14/2007
count	n = 60	n = 60	n = 60
Maximum concentration at OAC	**2.3**	**7.1**	**25.1**
mean	0.70	2.74	11.35
std deviation	0.51	1.54	5.40
CV	0.73	0.56	0.48
z-statistic (95% probability basis)	1.645	1.645	1.645
z-statistic (99% probability basis)	2.326	2.326	2.326
ECA	16.807	60.605	116.935
ECA multiplier	NA	NA	NA
LTA	NA	NA	NA
Sampling n	4	4	4
AMEL	**16.8**	**60.6**	**116.9**
AMEL Multiplier (95%)	1.68	1.52	1.43
MDEL Multiplier (99%)	3.69	2.95	2.58
MDEL	**36.9**	**118.0**	**211.1**

Notes:
AMEL = Average monthly effluent limitation
MDEL = Maximum daily effluent limitation
NA = Not applicable, due to long-term average criteria
OAC = Old Alamo Creek
(1) Median value; Effluent/(End of Old Alamo Creek); Nov-Mar when no irrigation flows are present; see Table B-5

In the above table, the maximum concentration measured at the terminus of Old Alamo Creek is less than the C (Alternative 4B objectives), thus, effluent limitations would not be needed in this example. Nevertheless, effluent limitations are derived to illustrate the steps in the calculation. The ECA is calculated as:

ECA = Attenuation Factor x [C + D(C-B)]

C is the site-specific objective and the attenuation factor is the median of the individually calculated attenuation factors derived from representative historical data for the November through March months of the year (see Table B-5). D and B are dilution credit and background concentration as defined by the SIP. In this example, no dilution credit is provided in the calculation of the effluent limitations.

The AMEL and MDEL are calculated as:

AMEL = ECA

MDEL = ECA x MDEL multiplier/AMEL multiplier

The AMEL and MDEL multipliers are determined from the equations provided in Section 1.4.0 of the SIP. The SIP specifies that if the sampling frequency is four times per month or less, than the "n" for determining the AMEL multiplier shall be set equal to 4.

Table C–5. Attenuation Factors for Dibromochloromethane (DBCM), Dichlorobromomethane (DCBM), and Chloroform for Old Alamo Creek. Attenuation Factor = Effluent Concentration /End of Old Alamo Creek Concentration for the months of November through March of each year.

Dibromochloromethane (DBCM)				
Year	Month	Effluent (µg/L)	End of OAC (µg/L)	Attenuation Factor
2002	11	2.2	0.6	3.67
	12	2	0.8	2.50
2003	1	4.1	1.3	3.15
	2	7.7	1.9	4.05
	3	5	1.5	3.33
	11	2	0.6	3.33
	12	4	1.1	3.64
2004	1	3.4	1.5	2.27
	2	4.6	1.1	4.18
	3	4.9	1.3	3.77
	11	2.6	0.54	4.81
	12	1.7	0.59	2.88
2005	1	3.9	0.63	6.19
	2	3.3	1.1	3.00
	3	6.7	2.3	2.91
	11	3.4	0.5	6.80
	12	2.4	0.7	3.43
2006	1	3.8	1.6	2.38
	2	3.2	1	3.20
	3	3.1	0.6	5.17
	11	1.9	0.6	3.17
	12	2.3	0.6	3.83
2007	1	2.2	0.5	4.40
	2	2.7	0.6	4.50
	3	2.3	0.7	3.29
			Median	**3.43**

Dichlorobromomethane (DCBM)				
Year	Month	Effluent (µg/L)	End of OAC (µg/L)	Attenuation Factor
2002	11	12	3	4.00
	12	11	3.7	2.97
2003	1	17	4.4	3.86
	2	26	7.1	3.66
	3	19	4.9	3.88
	11	10	2.5	4.00
	12	19	4.6	4.13
2004	1	14	5.2	2.69
	2	17	3.7	4.59
	3	22	5.1	4.31
	11	11	1.9	5.79
	12	8.6	3	2.87
2005	1	13	1.9	6.84
	2	12	3.3	3.64
	3	20	5.9	3.39
	11	17	2.5	6.80
	12	15	3.8	3.95
2006	1	11	4.8	2.29
	2	17	4.9	3.47
	3	12	2.4	5.00
	11	12.9	3.3	3.91
	12	14.2	3.9	3.64
2007	1	13	3.2	4.06
	2	17.1	4.1	4.17
	3	14.6	4.2	3.48
			Median	**3.91**

Chloroform				
Year	Month	Effluent (µg/L)	End of OAC (µg/L)	Attenuation Factor
2002	11	29	17	1.71
	12	29	21	1.38
2003	1	35	11	3.18
	2	54	21	2.57
	3	53	20	2.65
	11	25	12	2.08
	12	52	19	2.74
2004	1	37	16	2.31
	2	60	12	5.00
	3	46	15	3.07
	11	36	8.2	4.39
	12	22	11	2.00
2005	1	21	3.8	5.53
	2	27	13	2.08
	3	32	15	2.13
	11	46	13	3.54
	12	49	19	2.58
2006	1	31	12	2.58
	2	40	17	2.35
	3	22	5.8	3.79
	11	41.5	17	2.44
	12	42.4	19.2	2.21
2007	1	52	17.3	3.01
	2	52.3	25.1	2.08
	3	43.9	23.9	1.84
			Median	**2.57**

Appendix D: California Environmental Quality Act Checklist

Establish Site-Specific Water Quality Objectives for Chloroform, Chlorodibromomethane, and Dichlorobromomethane for New Alamo and Ulatis Creeks and Permit Implementation Provisions

California Environmental Quality Act Requirements

The Central Valley Regional Water Quality Control Board (Central Valley Water Board or Board), as a Lead Agency under the California Environmental Quality Act (CEQA), is responsible for evaluating all the potential environmental impacts that may occur due to changes made to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan). (Public Resources Code (PRC) §21000 et seq.) The Secretary of Resources has determined that the Central Valley Water Board's Basin Planning Process qualifies as a certified regulatory program pursuant to PRC section 21080.5 and California Code of Regulations, title 14, section 15251(g). This determination means that the Central Valley Water Board's Basin Planning process needs only to comply with abbreviated CEQA requirements. The Staff Report and this Checklist satisfy the requirements of State Water Board's Regulations for Implementation of CEQA, Exempt Regulatory Programs, which are found at California Code of Regulations, title 23, section 3775 et seq.

Proposed Project

The proposed project is to establish site-specific water quality objectives for chlorodibromomethane (DBCM), dichlorobromomethane (DCBM) and chloroform for New Alamo and Ulatis Creeks. Current water quality criteria applicable to these water bodies may be overly stringent for protection of human health. These three constituents, known as trihalomethanes (THMs), are produced in the City of Vacaville's Easterly Wastewater Treatment Plant's (WWTP) treatment process. The wastewater discharge causes concentrations of THMs to exceed water quality criteria to protect human health in New Alamo and Ulatis Creeks.

The Easterly WWTP has discharged wastewater effluent to the Alamo Creek system since 1959. Easterly WWTP is currently designed to discharge 15 million gallons per day (mgd), average dry weather flow (ADWF) and a peak wet weather flow of 55 mgd. Between 2020 and 2030, the City projects an expansion to 17.5 mgd, ADWF, and after 2030, a buildout expansion of 22 mgd, ADWF. Current flows are approximately 9 mgd, ADWF. Easterly WWTP disinfects the treated effluent with sodium hypochlorite to inactivate pathogens that may be present in the wastewater. Trihalomethane (THM) compounds, a contaminant of concern in drinking water, are formed in the wastewater during the disinfection process (RBI 2007c).

The City of Vacaville conducted a study to evaluate the municipal and domestic uses for the lower portions of New Alamo Creek and Ulatis Creek to determine the occurrence of drinking water use. The study presented information indicating that drinking water use has not occurred nor is it expected to

occur in the future based on system hydrologic and water quality characteristics (RBI 2007c). However, water quality data demonstrates that MUN is an "existing use" under USEPA's basin planning regulations (40 CFR §131.3(e)) because both New Alamo and Ulatis Creeks have attained applicable water quality standards.

Due to the lack of occurrence of drinking water usage now and in the foreseeable future, site-specific THM objectives may be established for these segments. These objectives will protect the MUN use of these segments.

1. **Project title:** Establish Site-Specific Water Quality Objectives for Chloroform, Chlorodibromomethane, and Dichlorobromomethane for New Alamo and Ulatis Creeks and Permit Implementation Provisions
2. **Lead agency name and address:** California Regional Water Quality Control Board, Central Valley Region, 11020 Sun Center Drive, #200, Rancho Cordova, CA 95670
3. **Contact person and phone number:** Holly Grover, Environmental Scientist
   (916) 464-4747
4. **Project location:** The project is located within Solano County, encompassing Alamo and Ulatis Creeks and Cache Slough. The project portion of Ulatis Creek and Cache Slough are located within the legal boundary of the Sacramento-San Joaquin Delta.
5. **Project sponsor's name and address:** California Regional Water Quality Control Board, Central Valley Region, 11020 Sun Center Drive, #200, Rancho Cordova, CA 95670
6. **General plan designation:** N/A
7. **Zoning:** N/A
8. **Description of project:** The Central Valley Water Board is proposing amendments to the Basin Plan to establish site-specific water quality objectives for DBCM, DCBM and chloroform for New Alamo and Ulatis Creeks and permit implementation provisions.
9. Surrounding land uses and setting:
   Alamo Creek originates in the Vaca Mountains and flows east-southeast through the City of Vacaville ultimately joining Ulatis Creek on the Sacramento Valley floor. In the early 1960s, the Solano County Flood Control and Water Conservation District and the U.S. Department of Agriculture, Soil Conservation Service built the Ulatis Creek Watershed Protection and Flood Prevention Project (Solano County 1966-1968). As part of this project, portions of Alamo Creek were realigned to form a new channel bypassing the City of Vacaville.

   The original Alamo Creek channel that flowed through the City of Vacaville was left in place and renamed Old Alamo Creek. The realignment of the creek cut off flows from the upper watershed to Old Alamo Creek leaving it dry with the exception of discharges from the Easterly WWTP, Kinder-Morgan groundwater remediation project, stormwater runoff, and agricultural runoff. Eventually, Old Alamo Creek discharges into New Alamo Creek.

   New Alamo Creek is an engineered earthen channel that conveys all of Alamo Creek's flows from just above Leisure Town Road to the confluence with Ulatis Creek. New

Alamo Creek has two dams located within the project area (Brown-Alamo Dam and Maine Prairie Water District Dam). Overall, Old Alamo/New Alamo Creek travels roughly 20 miles before joining Ulatis Creek. Land uses within the Alamo/New Alamo Creek watershed includes: agriculture at 57 percent; natural/forest at 25 percent; and urban at 18 percent.

Ulatis Creek also originates in the Vaca Mountains and flows through the City of Vacaville. Old Alamo/New Alamo Creek is a major tributary to Ulatis Creek. Land uses within the Ulatis Creek watershed include: agriculture at 80 percent; natural/headwater at 11 percent; and urban at 9 percent.

Cache Slough begins at the terminus of Ulatis Creek, approximately 5.5 miles downstream of the confluence of New Alamo and Ulatis Creeks. The Cache Slough channel becomes wider, increasing from approximately 300 feet to 1,500 feet due to numerous tributaries entering from the north and east.

Immediately downstream of the confluence of Cache Slough and Ulatis Creek is the non-operational Vallejo Pump Station, an emergency drinking water intake for the City of Vallejo that has not been used since 1992. The City of Vallejo does not hold a current permit from the California Department of Public Health (DPH) to use the Vallejo Pump Station, nor are these facilities in operating condition (RBI 2007a).

10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)
State Water Resources Control Board
Office of Administrative Law
United States Environmental Protection Agency

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology /Soils
☐ Hazards & Hazardous Materials	☐ Hydrology / Water Quality	☐ Land Use / Planning
☐ Mineral Resources	☐ Noise	☐ Population / Housing
☐ Public Services	☐ Recreation	☐ Transportation/Traffic
☐ Utilities / Service Systems	☐ Mandatory Findings of Significance	

DETERMINATION: (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☒ The proposed project COULD NOT have a significant effect on the environment, and, therefore, no alternatives or mitigation measures are proposed.

☐ The proposed project MAY have a significant or potentially significant effect on the environment, and therefore alternatives and mitigation measures have been evaluated.

PAMELA C. CREEDON
Executive Officer
California Regional Water Quality Control Board
Central Valley Region

DATE

Environmental Checklist Form

The following provides issue-specific checklists identifying the project's potential to result in significant impacts. Each issue-specific checklist is followed by a discussion of each environmental issue/question in the checklist.

The baseline for environmental analysis is the current condition in the creeks.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
I. **AESTHETICS**: Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). The proposed project will have not affect scenic vistas or degrade visual character. It will not result in any visible change; therefore, the proposed project will have no effect on aesthetic resources.

II. **AGRICULTURE RESOURCES**: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
Williamson Act contract?				
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). At the proposed concentrations, these water quality objectives protect human health and have no effect on croplands or crops; therefore, the proposed project will have no effect on agricultural resources.

III. **AIR QUALITY:** Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:

a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☒
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). Although these constituents are volatile, they will not violate any air quality standard, cause any impact to sensitive receptors, or create objectionable odors, Therefore, the proposed project will have no effect on air quality.

IV. **BIOLOGICAL RESOURCES:** Would the project:

a) Have a substantial adverse effect, either directly or	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?				
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☐	☒
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). At the proposed concentrations, these water quality objectives protect human health and have no adverse effect on fish or wildlife resources. The proposed project will not affect any sensitive species, habitat, or habitat protection plan. Therefore, the proposed project will have no adverse effect on biological resources.

V. **CULTURAL RESOURCES:** Would the project:				
a) Cause a substantial adverse change in the signifi-	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
cance of a historical resource as defined in §15064.5?				
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). Therefore, the proposed project will have no effect on cultural resources.

VI. **GEOLOGY AND SOILS:** Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
substantial risks to life or property?				
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). The proposed project will not impact any seismic ground shaking, landslides, or soils. Therefore, the proposed project will have no effect on geology and soils.

VII. **HAZARDS AND HAZARDOUS MATERIALS**: Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
an adopted emergency response plan or emergency evacuation plan?				
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). The proposed project will not create, emit or expose people to hazardous materials. Therefore, the proposed project will have no effect on hazards and hazardous materials.

VIII. **HYDROLOGY AND WATER QUALITY:** Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). The proposed project will bring the creek segments into compliance with water quality objectives and will not degrade water quality. Adoption of the water quality objectives would not cause any new or increased volume of waste to be discharged to surface waters. Moreover, the water quality objectives are designed to provide the level of water quality necessary to protect the beneficial uses. Water rights records, field surveys, and interviews indicate that New Alamo and Ulatis creeks have not been used for drinking water purposes nor are they reasonably likely to be so used in the future, based on system hydrologic and water quality characteristics (RBI 2007c). It will not deplete groundwater supplies, alter existing drainage, contribute runoff, place housing or other structures within the 100-year flood hazard area, or expose people or structures to significant risk. Therefore, the proposed project will not have any adverse effect on hydrology and water quality.

IX. **LAND USE AND PLANNING:** Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). The proposed project will not conflict with land uses and plans or communities. Therefore, the proposed project will have no effect on land use and planning.

X. **MINERAL RESOURCES:** Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). The proposed project will not result in the loss of any mineral resources. Therefore, the proposed project will have no effect on mineral resources.

XI. **NOISE:** Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact

in the project area to excessive noise levels?

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). The proposed project will not create or expose any persons to additional noise. Therefore, the proposed project will have no effect on noise levels.

XII. **POPULATION AND HOUSING:** Would the project:

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). The proposed project will not induce population growth or displace existing housing or people. Therefore, the proposed project will have no effect on population and housing.

XIII. **PUBLIC SERVICES:**

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
i) Fire protection?	☐	☐	☐	☒
ii) Police protection?	☐	☐	☐	☒
iii) Schools?	☐	☐	☐	☒
iv) Parks?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
v) Other public facilities?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). The proposed project will not impact fire and police protection, schools or parks. Therefore, the proposed project will have no effect on public services.

XIV. **RECREATION:**

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). The proposed project will not increase the use of existing neighborhood and regional parks or include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment. Therefore, the proposed project will have no effect on recreation.

XV. **TRANSPORTATION/TRAFFIC:** Would the project:

a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	☒
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Result in inadequate parking capacity?	☐	☐	☐	☒
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). The proposed project will not increase ground or air traffic, hazards, parking capacity, or conflict with adopted transportation plans and policies. Therefore, the proposed project will have no effect on transportation and traffic.

XVI. **UTILITIES AND SERVICE SYSTEMS:** Would the project:

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations). The proposed project will not exceed wastewater treatment requirements, result in new or expanded wastewater treatment facilities that would cause significant environmental effects with construction, result in new stormwater drainage facilities and result in the change of capacity. Therefore, the proposed project will have no effect on utilities and service systems.

XVII. MANDATORY FINDINGS OF SIGNIFICANCE:

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	☒
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☐	☒
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

The proposed project establishes site-specific water quality objectives for chloroform, DBCM, and DCBM for New Alamo and Ulatis Creeks and permit implementation provisions. (i.e., calculation of the attenuation factor and effluent limitations) and is not expected to cause any changes to the environment either individually or cumulatively. The proposed project will not result in any direct or indirect increase in greenhouse gas emissions, either individually or cumulatively.

The baseline for environmental analysis is the current condition in the creeks. If the baseline was that

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact

the discharge from the Easterly WWTP was at the levels specified by current applicable water quality criteria for New Alamo and Ulatis Creeks, then project impacts would be less than significant because the project protects the MUN beneficial use.

References

Robertson-Bryan, Inc. (RBI) 2007a. Use Attainability Analysis for Alamo Creek and Downstream Water Bodies. Technical Memorandum No. 1. Hydrologic and Physical Characteristics of Alamo Creek, Ulatis Creek, and Cache Slough. August.

RBI. 2007c. Use Attainability Analysis for Municipal and Domestic Supply (MUN) Use in Segments of New Alamo Creek and Ulatis Creek, Solano County, California. Prepared for Central Valley Regional Water Quality Control Board, on behalf of City of Vacaville.

Solano County. 1966-68. Ulatis Creek Watershed Protection and Flood Prevention Project. Plans for the construction of Ulatis Creek channel U-3 and Alamo Creek Channel A-2b. As Built Drawings.