CONTRA COSTA
WATER DISTRICT

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February 14, 2005

Ms. Debbie Irvin, Clerk to the Board
State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95812

RE: Issue 4c. New Objectives to Protect Drinking Water Quality

Dear Ms. Irvin:

Contra Costa Water District (CCWD) appreciates this opportunity to provide input to the State Water Resources Control Board (SWRCB) on new water quality objectives for the Municipal and Industrial Beneficial Uses for constituents such as bromides and other disinfection by-product precursors as part of your Periodic Review of the 1995 Bay-Delta Water Quality Control Plan (1995 Plan).

As was discussed in detail at the January 10 and January 12, 2005 workshops, urban water agencies face increasing challenges in providing drinking water that meets all treatment regulations and fully protects public health. California drinking water providers need to control the production of disinfection byproducts (DBP) in treated water and this can only be achieved if there is also management of DBP precursors in the source water[1]. A technical memorandum discussing DBPs and the drinking water treatment issues for drinking water providers, especially those that rely on Delta water, and the need for a multi-barrier approach to protect public health is attached (Attachment A). A summary of treated water quality from CCWD's and CCWD's raw water customers' drinking water treatment facilities and DBP data for 2000-2003 is also attached (Attachment B). A description of CCWD's facilities and operations is given in Attachment D. A discussion of the relationship between bromide concentration, chloride concentration and electrical conductivity is provided in Attachment E.

[1] Disinfection byproducts include trihalomethanes, bromate and haloacetic acids, which are suspected carcinogens

CCWD requests that the SWRCB:

1. Include a detailed analysis in the Water Quality Control Plan for different alternatives for protecting source water for drinking water as a beneficial use of Delta water. For example, the alternatives should include:
   (a) A 50 µg/L bromide objective year round (about 20 mg/L chloride)
   (b) A 150 µg/L bromide objective year round (about 50 mg/L chloride) consistent with the 1991 Plan goal
   (c) A 300 µg/L bromide objective year round (about 80 mg/L chloride) consistent with water quality projects being studied by the California Bay-Delta Authority, such as Franks Tract modification, increased storage, relocation of drinking water intakes, wastewater discharge reduction, and other source water quality improvements

2. Adopt a new bromide objective that protects drinking water quality that will be met through implementation of CALFED water quality projects, including intake relocation, on a time schedule consistent with those projects. CCWD believes a 300 µg/L bromide objective, applicable year round, is attainable, without additional water supply costs, if made applicable at the North Bay Aqueduct, Banks Pumping Plant, Tracy Pumping Plant, and at least one of CCWD's Delta intakes[2]. The bromide objective could also be reevaluated at a later date based on the schedule for implementation of the CALFED projects and completion of the Central Valley Drinking Water Policy.

A full analysis of a range of drinking water objective alternatives will help identify solutions that protect drinking water while balancing the needs of other beneficial uses. Note that a 300 µg/L bromide objective will not enable drinking water providers to consistently meet future drinking water regulations, unless accompanied by existing and planned capital improvements such as upgraded treatment processes, and other actions to improve source water quality that are not flow related (such as those listed in alternative (c) above). This also assumes that there will continue to be full compliance with the X2 estuarine habitat objectives in the 1995 Plan.

Lisa Holm, Drinking Water Quality Program Manager for the California Bay-Delta Authority, presented information to the State Board on January 12 that included hypothetical examples of how 250-300 µg/L bromide source water from the Delta, when blended with higher quality source water from other sources, e.g., previously stored high quality water, could be used to meet future more stringent drinking water regulations.

CCWD is currently studying relocating its Old River intake near the Highway 4 crossing to a new location on the western end of Victoria Canal. The purpose of the Alternative Intake Project is to provide CCWD access to improved drinking water quality. The project will both offset water quality degradation caused by increased Delta pumping and help meet CALFED drinking water quality improvement goals. The Alternative Intake Project is a key water quality element

[2] For example, if CCWD were to construct an alternative intake on Victoria Canal, which has better water quality than CCWD's Old River intake, the new objective could apply at this new location.

of the CALFED Delta Improvement Package. The Alternative Intake Project was authorized for design and construction in the recent federal CALFED legislation (Public Law 108-361 §103 (f)(1)(E)). The water quality at the new location is almost always much better than the water quality at CCWD's Old River intake.

The State Board adoption of new drinking water objectives will help facilitate timely implementation of source water quality improvement actions, and ensure that improvements that do occur as a result of implementation of CALFED water quality actions are maintained.

As discussed by a number of parties[3], the State Board's 1991 Plan and the August 2000 CALFED Record of Decision both pointed to the need for bromide goals to protect drinking water quality and public health. The specific goals were 150 µg/l bromide and 50 µg/l bromide, respectively. Previous discussions of bromide objectives are summarized in Attachment C to this letter.

Other parties have also noted the current efforts of the Central Valley Regional Water Quality Control Board (RWQCB) to develop a Central Valley Drinking Water Policy (Policy). Development of the Policy is a multi-year effort by the RWQCB to address contamination of source water by pollutants from a variety of urban, industrial, agricultural, and natural sources as the water flows out of the foothills and into the Central Valley and the Delta. The Regional Board's July 2004 Resolution No. R5-2004-0091 supports development of the Policy for the Sacramento–San Joaquin Delta and upstream tributaries. The work plan for development of the Policy tasks includes water quality monitoring, pollutant load evaluations, and identification of reasonably attainable, cost effective control strategies.

CCWD requests the State Board not wait until this Policy is completed before analyzing and adopting new objectives to protect drinking water quality. The Policy will address solutions related to reducing sources of contamination from upstream and Delta discharges of municipal wastewater and runoff from agriculture and municipal areas, but will not address the need to also improve water quality through operation of water supply facilities. This is consistent with the CALFED Bay-Delta Advisory Committee's Equivalent Level of Public Health Protection (ELPH) approach where operational changes and intake relocation are part of a set of tools that can be used to help meet public health goals. Objectives adopted by the State Board could be reevaluated and modified once the Drinking Water Policy is completed.

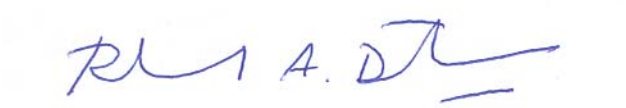
The 1995 Plan, while intended to also protect municipal and industrial beneficial uses, only mentioned the phrase "drinking water" three times in the introductory section and contained no specific objectives to protect drinking water quality. Current policies and plans for the Sacramento and San Joaquin Valleys and the Delta lack water quality objectives for several known drinking water constituents of concern, such as DBP precursors and pathogens, and do not include implementation strategies to provide effective source water protection. While the

[3] For example, CCWD's earlier letters on Issue 4, the California Urban Water Agencies January 6, 2005 letter, and the California Bay-Delta Authority's January 7 letter.

RWQCB Drinking Water Policy is a positive and long overdue step toward drinking water protection, the State Board should not further delay adopting objectives to protect public health.

CCWD looks forward to working with the SWRCB on this important review of the 1995 Plan. If you have any questions, please call me at (925) 688-8187.

Sincerely,



Richard A. Denton
Water Resources Manager

RAD/MM

Attachments
A. Technical Memorandum, Disinfection Byproducts, Public Health, and the Role of Delta Water Quality. By Edward G. Means III, December 10, 2004
B. Disinfection Byproduct Concentrations for CCWD and Its Raw and Treated Water Customers (2000-2003)
C. Previous Discussions of Bromide Objectives
D. Overview of CCWD Facilities and Operations
E. Relationship between Bromide, Chloride and Electrical Conductivity

cc: Chester V. Bowling (USBR)
Amy Aufdemberge (DOI)
Cathy Crothers (DWR)
Ken Landau (CV RWQCB)
Carl Nelson (BPMNJ)

Attachment A

Technical Memorandum

Disinfection Byproducts, Public Health, and the Role of Delta Water Quality

By Edward G. Means III
Sr. Vice President
McGuire Environmental Consultants, Inc.

December 10, 2004

(attached as separate document)

Posted on SWRCB Bay-Delta Periodic Review webpage as SWRCB CCWD-EXH-05

Attachment B

Disinfection Byproduct Concentrations for CCWD and Its Raw and Treated Water Customers (2000-2003)

Annual Water Quality Report 2000

	PHG	MCL	CCWD		City of Antioch		City of Pittsburg		City of Martinez		Diablo Water District	
			Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
TTHM (ug/L)	n/a	100	33	19 - 46	43	19 - 54	12	5.0 - 23	6	3.1 - 9.1	ND	ND - 3.7
Bromate (ug/L)	--	--	ND	ND	NR	NR	NR	NR	4.6	ND - 15	23.4	ND - 69
HAA (ug/L)	--	--	9.1	ND - 14.2	11	4.5 - 23.7	6.0	2.0 - 9.0	2.3	1.2 - 2.9	2.6	ND - 6.7

Annual Water Quality Report 2001

	PHG	MCL	CCWD		City of Antioch		City of Pittsburg		City of Martinez		Diablo Water District	
			Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
TTHM (ug/L)	n/a	100	41	36 - 46	49	38 - 61	18	18	6.2	3.0 - 14	ND	ND
Bromate (ug/L)	--	--	2.6	ND - 15	NR	NR	NA	NA	4.3	ND - 15	4.6	ND - 15
HAA (ug/L)	--	--	9	6.5 - 13.6	5.1	1.2 - 8.4	3	2.0 - 4.0	2.3	ND - 6.3	2.2	ND - 6.9

TTHM = Total Trihalomethanes; HAA = Haloacetic acids

PHG = Public Health Goal; MCL = Maximum Contaminant Level

ND = Not detected; NR = Not required; n/a = Not applicable

Annual Water Quality Report 2002

	PHG	MCL	CCWD		City of Antioch		City of Pittsburg		City of Martinez		Diablo Water District	
			Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
TTHM (ug/L)	n/a	80	36	18 - 53	48	33 - 67	4.3	8.9 - 13	7.5	1.5 - 13	ND	ND - 4.7
Bromate (ug/L)	--	10	ND	ND - 7.3	NR	NR	NR	NR	ND	ND - 7	6.0	ND - 12
HAA (ug/L)	n/a	60	12	5 - 27	6.4	ND - 11.5	10.1	1.0 - 8.5	2	ND - 4.7	2.8	ND - 7.4

Annual Water Quality Report 2003

	PHG	MCL	CCWD		City of Antioch		City of Pittsburg		City of Martinez		Diablo Water District	
			Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
TTHM (ug/L)	n/a	80	32.1	8.5 - 69.7	49	35 - 49	26.7	4 - 110	8.5	ND - 15	ND	ND - 1.9
Bromate (ug/L)	--	10	ND	ND - 14	NR	NR	NR	NR	ND	ND	ND	ND - 14
HAA (ug/L)	--	60	8	ND - 14.8	7	1.6 - 11	4.8	3.6 - 6.8	1.9	ND - 7.5	1.4	ND - 2.9

TTHM = Total Trihalomethanes; HAA = Haloacetic acids

PHG = Public Health Goal; MCL = Maximum Contaminant Level

ND = Not detected; NR = Not required; n/a = Not applicable

Attachment C

Previous Discussions of Bromide Objectives

1991 Water Quality Control Plan recommended striving for 150 µg/l bromide source water

The SWRCB's 1991 Water Quality Control Plan for Salinity (1991 Plan) recognized the need to protect source water quality for drinking water purposes and the Board made the following finding (page 5-5):

> Due to concerns with DBPs in treated water from the Delta and in keeping with the goal (not objective) of obtaining the best available drinking water, the Board finds that, wherever feasible, municipal water supply agencies should strive to obtain bromide levels of 0.15 mg/l [equal to 150 µg/l bromide] or less (about 50 mg/L chloride in the Delta). Appropriate actions by these supply agencies include encouraging DWR and USBR to work with the SWRCB to ensure development of facilities to make maximum use of uncontrolled flows through off-stream storage, encouraging those agencies to move water supply intakes to better locations, working with the State and Regional Boards to eliminate problem discharges within the Delta, and continuing the development of alternative water treatment technologies.

This narrative target was based on the findings of the Delta M&I workgroup, convened by the SWRCB as part of the development of the 1991 Plan. The focus in 1991 was on the U.S. Environmental Protection Agency (USEPA) drinking water regulations for total trihalomethanes (THMs, a class of DBP). The "selected alternative" in the 1991 Plan was Alternative 3, which included a goal of 0.15 mg/l bromides (Footnote 3 of Table 6-1, Page 6-3).

The SWRCB's 1991 Plan noted "while THMs are the DBP of current concern, further studies may indicate that other DBPs are of greater concern." This has proven to be the case, as concern over THM formation motivated utilities treating Delta water to convert to ozone-based disinfection in the years following the 1991 Plan. However, bromate formation in water treated by ozone has since become a major concern. In 1998, the USEPA Stage 1 Disinfectants/Disinfection Byproduct Rule established new Maximum Contaminant Levels (MCLs) for bromate, haloacetic acids and chlorite (other DBPs) and reduced the allowable THM concentrations. The USEPA Stage 2 Disinfectant-DBP rule, which goes into effect in 2005, will continue the current bromate and other MCL requirements.

1995 Water Quality Control Plan failed to address drinking water protection

Although the 1995 Plan states the municipal and industrial objectives are unchanged from the 1991 Bay-Delta Plan (1995 Plan at page 14), the bromide goal for drinking water quality

protection from the 1991 Plan was not carried forward into the 1995 Plan. This oversight may have been due to the emphasis in the 1995 Plan on fishery protection, and implementing the key components of the December 15, 1994 Bay-Delta Accord. The Sacramento-San Joaquin Delta, which is the source of drinking water for more than 23 million Californians, currently has no specific standards directed at drinking water quality from a public health perspective.

The 1995 Plan did not alter the Decision 1485 M&I standards requiring 250 mg/L chloride year round (about 900 µg/L bromide), and 150 mg/L chloride (about 500 µg/L bromide) for part of the year, which have become the de facto drinking water quality objectives in the Delta, in absence of other standards. These standards are not protective of human health, as these bromide levels far exceed those required to meet current bromate regulations in ozone-treated drinking water.

CALFED drinking water goal is based on 50 µg/L bromide

The target of the CALFED Drinking Water Quality Program for providing safe, reliable, and affordable drinking water in a cost-effective way, as described in the August 28, 2000 Record of Decision (ROD, page 65), is:

> … to achieve either: (a) average concentrations at Clifton Court Forebay and other southern and central Delta drinking water intakes of 50 µg/L bromide and 3.0 mg/L total organic carbon, or (b) an equivalent level of public health protection using a cost-effective combination of alternative source waters, source control and treatment technologies.

The specific bromide and organic carbon targets in the CALFED ROD were based on the findings of an expert panel convened in 1998 by the California Urban Water Agencies. The expert panel determined the source water quality needed to ensure urban agencies treating Delta water with conventional drinking water treatment technology (including ozone disinfection) could meet reasonably foreseeable future drinking water regulations.

Since 2001, the CALFED Bay-Delta Advisory Committee has worked to define what is meant by an Equivalent Level of Public Health Protection (ELPH), and how it can be achieved. A major component of this strategy is development of Regional ELPH Plans, in which local agencies work at a regional level to determine the suite of local, regional, state and federal actions needed to achieve an equivalent level of public health protection. The ELPH also recognizes that water quality objectives in source waters and water quality regulations protecting consumers are dynamic, and best met with flexible plans that look at all points in a drinking water system, from source to tap.

Attachment D

Overview of CCWD Facilities and Operations

The Contra Costa Water District (CCWD) serves approximately 500,000 people throughout central and eastern Contra Costa County. CCWD's customers also include 9 major industries, 36 smaller industries and businesses, and 50 agricultural users. The mission of the Contra Costa Water District is to strategically provide a reliable supply of high quality water at the lowest cost possible, in an environmentally responsible manner.

CCWD operates raw water distribution and storage facilities, water treatment plants, and treated water distribution facilities. CCWD supplies raw and treated water to the cities of Antioch, Pittsburg, Southern California Water Company (serving Bay Point), Clayton, Concord, Diablo Water District (serving Oakley), Pittsburg, Martinez, and parts of Brentwood, Pleasant Hill and Walnut Creek.

The treated water service area for CCWD encompasses all or part of the cities of Clyde, Martinez, Concord, Pleasant Hill, Walnut Creek, Clayton, and Port Costa. Treated water for this service area is provided from the District's Bollman Water Treatment Plant in Concord and the Randall-Bold Water Treatment Plant located in Oakley. The Bollman facility is a 75 MGD conventional plant... The Randall-Bold facility is a 40 MGD direct/deep-bed filtration plant. A portion of the water produced at Randall-Bold WTP is delivered to Diablo Water District ("DWD"), which serves customers in Oakley and a portion is delivered to the City of Brentwood.

CCWD is dependent on the Delta for its water supply. The Contra Costa Canal and the Los Vaqueros Project (completed in 1998) make up CCWD's principal water supply and delivery system. CCWD diverts unregulated flows and regulated flows from storage releases from Shasta, Folsom, and Clair Engle reservoirs into the Sacramento River as a contractor of the United States Bureau of Reclamation's ("Reclamation") Central Valley Project ("CVP"). Some CCWD customers have additional sources of water. The City of Antioch has a water rights permit to divert water from the lower San Joaquin River. Pittsburg, Brentwood, and DWD all have wells that can provide a portion of their needs.

CCWD has obtained its water supply from the Delta since 1940. Delta water is subject to large variations in salinity and mineral concentrations. The Delta is also vulnerable to many anthropogenic and natural sources of water quality degradation. Degradation in water quality is objectionable to many CCWD customers, costly to all residential and industrial users, and a health risk for some individuals. The most recent federal drinking water regulations implemented in December 1998 (Stage 1 Disinfectant/Disinfection By-Product Rule, or D/DBPR) impose stringent limits on disinfection by-products in treated water, making it difficult to achieve the required pathogen inactivation while minimizing disinfection by- product formation. The Stage 2 D/DBPR, to be implemented in 2005, will further limit flexibility in balancing disinfection with harmful by-product formation.

Bromide and total organic carbon (TOC) are the significant constituents in Delta water that affect CCWD's ability to meet disinfection by-product standards for bromate and trihalomethanes (THMs). To reduce production of THMs, CCWD retrofitted both water treatment plants in the 1990s to allow disinfection by ozone. Limiting the production of bromate during ozonation is an ongoing challenge for CCWD. Currently, CCWD's primary means of ensuring that disinfection byproduct regulations are met in the treated water is to ensure that bromide and TOC levels in the source water from the Delta are maintained below certain levels. Chlorides are monitored as an indicator of bromide levels. CCWD watches chloride levels in the Delta and adjusts operations to meet water quality goals in the source water to keep chlorides at an acceptable level.

Contra Costa Water District is committed to supplying its customers with the highest quality water practicable and providing all reasonable protection of the supply from any known or potential source of contamination. CCWD Resolution No. 88-45 states in part that:

> "CCWD is committed to reducing the concentration of sodium and chloride in the District's water, thereby reducing household and landscape irrigation concerns and industrial and manufacturing costs caused by the fluctuating sodium and chloride level of CCWD's Delta source...."

In May 1987, CCWD's Board of Directors adopted water quality objectives for water distributed within its service area. The acceptable concentration levels for sodium and chloride were established at 50 milligrams per liter (mg/l) and 65 mg/l, respectively. In 1988, the voter-constituents of CCWD approved the issuance of bonds to finance a $450 million water quality and reliability project known as the Los Vaqueros Project. The primary purposes of the Los Vaqueros Project are to improve the quality of water supplied to CCWD customers and minimize seasonal quality changes, and to improve the reliability of the emergency water supply available to CCWD. The Los Vaqueros Project consists of a reservoir with 100,000 acre-feet of storage, a new point of diversion at Old River, south of the Highway 4 crossing, which operates in conjunction with the current Rock Slough diversion point, plus associated water conveyance and delivery facilities, pumping plants, and other facilities. On January 28, 1999, the first filling of Los Vaqueros Reservoir to 100,000 acre-feet was completed.

A key to successful performance of the Los Vaqueros Project is the District's ability to fill and continue to refill the reservoir with high quality water from Old River at times when it is available, typically late winter through early summer, and to use that water for blending when salinity at the District's Delta intakes exceeds the 65 mg/L chloride goal, generally late summer through early winter. Increased Delta salinity will increase the demand on blending water from the reservoir and reduce the availability of high quality water for refilling. The District and its 500,000 customers will be impacted through higher pumping costs to replace the extra blending water that is released and through the additional treatment costs, increased corrosion, and health effects of delivering higher salinity water. These impacts erode the $450 million investment that CCWD customers made in high quality drinking water through the Los Vaqueros Project.

Attachment E

Relationship between Bromide, Chloride and Electrical Conductivity

The following data are provided to show the relationship between the bromide concentration discussed in this letter and the current water quality objectives expressed in terms of either chloride concentration or electrical conductivity[4] (EC). These relationships are for water containing primarily seawater. The relationship between bromide and chloride is essentially the same when agricultural drainage is present. However, water containing agricultural drainage has less bromide and less chloride for a given electrical conductivity (see Figures E-2 and E-3).

The current M&I chloride objectives of 150 mg/L and 250 mg/L represent approximately 500 and 900 µg/L bromide, respectively. Similarly, the CALFED drinking water goal is expressed in terms of 50 µg/L bromide, or about 20 mg/L chloride. The 1991 Water Quality Control Plan suggested urban agencies should strive to achieve 150 µg/L bromide or about 50 mg/L chlorides. 300 µg/L bromide is about 75-90 mg/L chlorides.

Table E-1: Conversions between bromide, chloride and EC

Bromide (µg/L)	Chloride (mg/L)	EC (mmhos/cm)
50	18-20	200-240
100	35-40	280-360
150	50-55	320-420
200	60-70	370-450
250	70-80	400-500
300	75-90	420-540
350	90-110	450-600
400	100-120	500-620
450	110-145	520-670
500	**140-160**	590-750
600	170-190	760-920
700	190-210	820-960
800	220-240	930-980
900	**240-255**	1060-1100

[4] Note that the conductivity of water is actually measured and reported as specific conductance, i.e., electrical conductivity adjusted to a constant temperature of 25 degrees Celsius. The EC values discussed here are all related to a constant temperature of 25 ˚C.

Figure E-1: Relationship between bromide and chloride at the entrance to Rock Slough, CCWD's Old River intake at Highway 4 and in Suisun Bay at Mallard Island

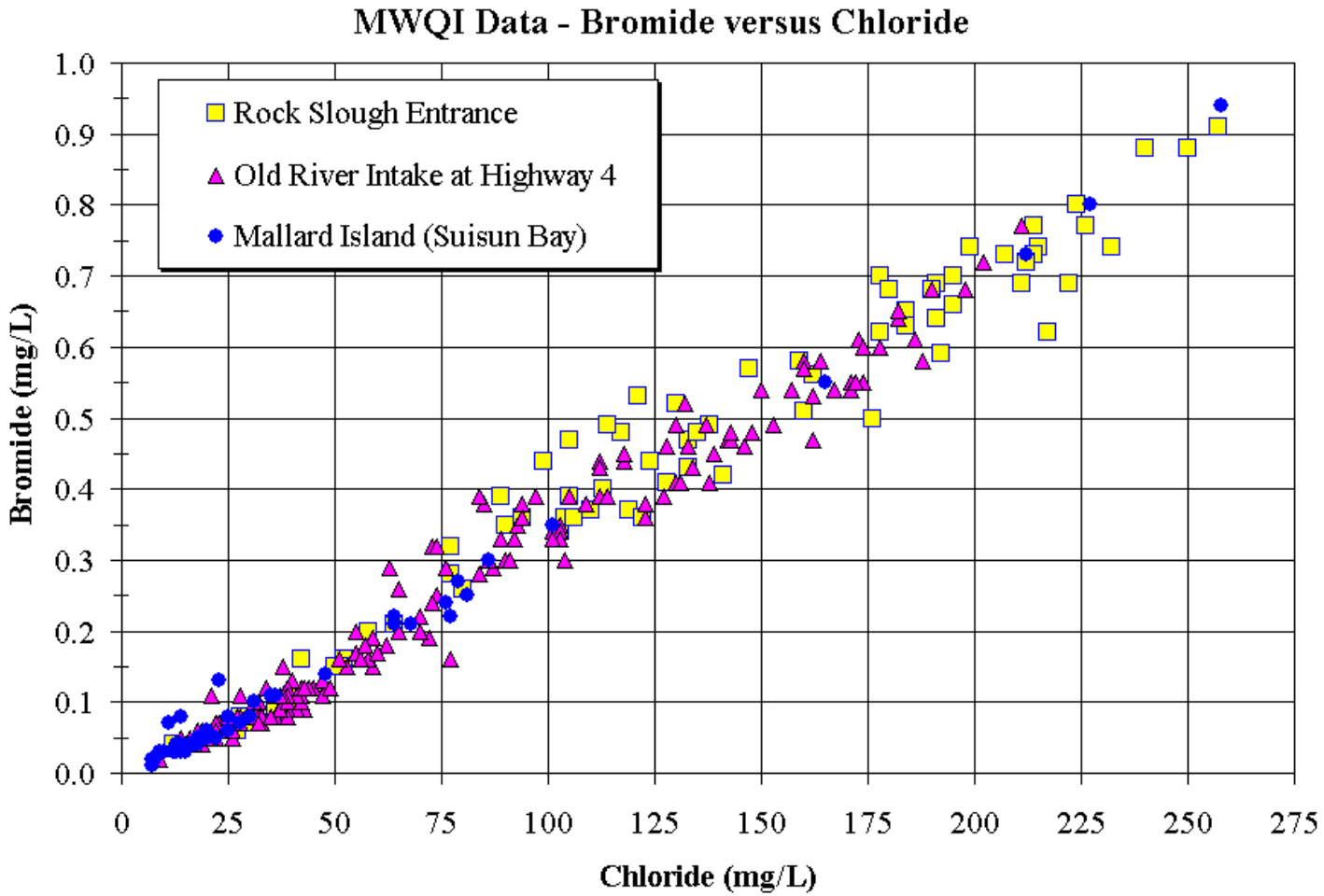


Figure E-2: Relationship between bromide and EC at the entrance to Rock Slough, CCWD's Old River intake at Highway 4 and in Suisun Bay at Mallard Island

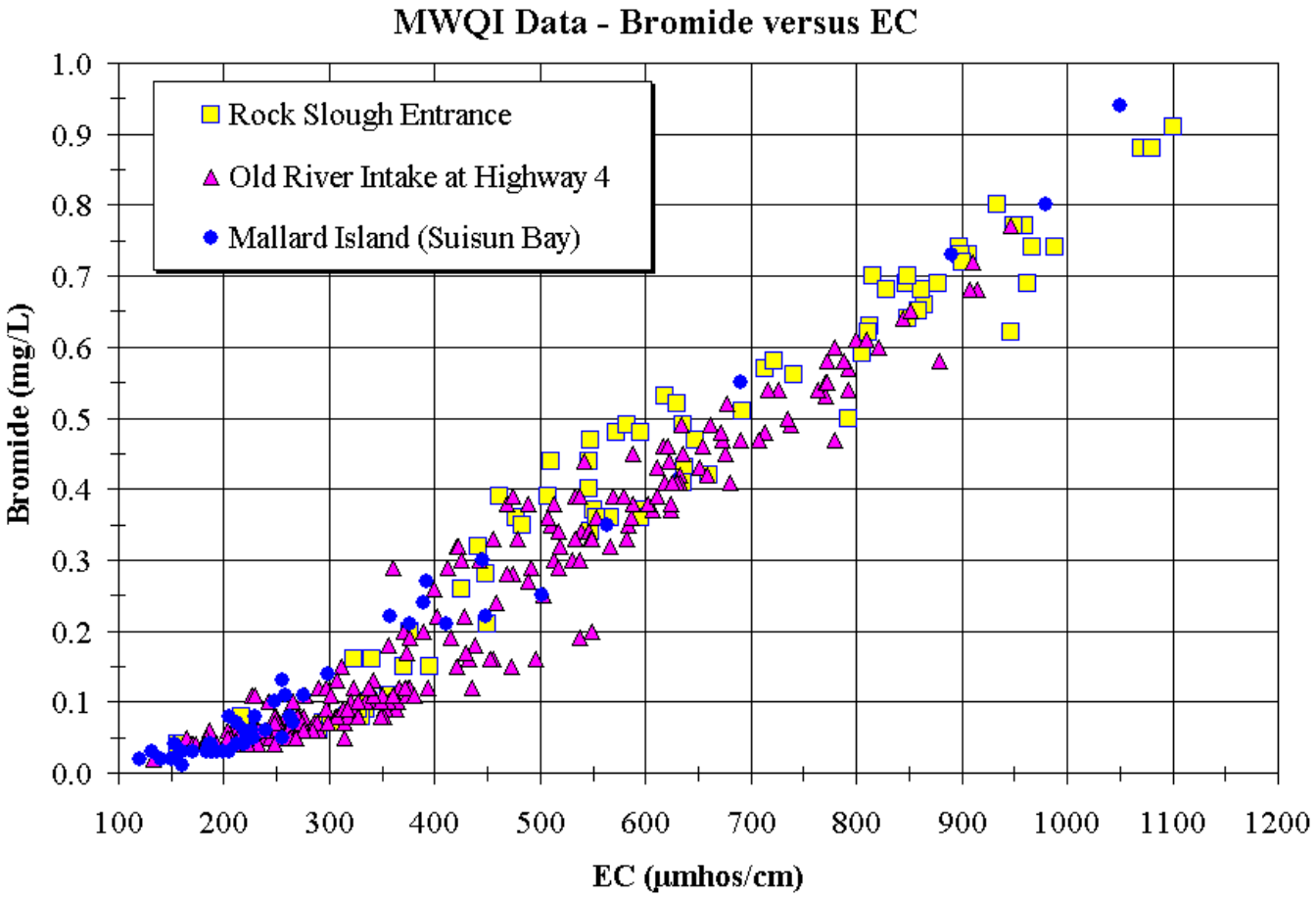


Figure E-3: Relationship between chloride and EC at Pumping Plant #1, the entrance to Rock Slough, Suisun Bay at Mallard Island (representing seawater) and the San Joaquin River at Vernalis (representing agricultural drainage). Agricultural drainage has a much lower chloride content (for a given EC) than seawater. Note that the Pumping Plant #1 data show periods where the water in the Contra Costa Canal consists of a mixture of seawater and agricultural drainage.