Las Virgenes – Triunfo Joint Powers Authority
4232 Las Virgenes Road, Calabasas, CA 91302
818.251.2100

November 25, 2014

Pursuant to Government Code Section 54953(b), Director Glen Peterson will be participating in the Las Virgenes-Triunfo Joint Powers Authority Regular Board Meeting via teleconference from: Manchester Grand Hyatt Hotel, 1 Market Place, San Diego, CA 92101

This teleconference location is accessible to the public and will be opened to the public for attendance at this meeting.

A Regular Meeting of the Board of Directors of Las Virgenes-Triunfo Joint Powers Authority is hereby called and notice of said Regular Meeting is hereby given for 5:00 p.m. on Monday, December 1, 2014, at Las Virgenes Municipal Water District, 4232 Las Virgenes Road, Calabasas, California, 91302, to consider the following:

Pledge of Allegiance

1. **Call to Order and Roll Call**
2. **Approval of Agenda**
3. **Public Comments**
4. **Consent Calendar (See attached agenda)**
5. **Action Items (See attached agenda)**
6. **Board Comments**
7. **Administering Agent/General Manager Report**
8. **Future Agenda Items**
9. **Information Items (See attached agenda)**
10. **Public Comments**
11. **Closed Session (See attached agenda)**
12. **Adjournment**

By Order of the Board of Directors
CHARLES CASPARY, Chair

Daryl A. Betancur, CMC
Administering Agent Deputy Secretary

c: Each Director

LAS VIRGENES - TRIUNFO
JOINT POWERS AUTHORITY
AGENDA
4232 Las Virgenes Road, Calabasas CA 91302

CLOSING TIME FOR AGENDA IS 8:30 A.M. ON THE TUESDAY PRECEDING THE MEETING. GOVERNMENT CODE SECTION 54954.2 PROHIBITS TAKING ACTION ON ITEMS NOT ON POSTED AGENDA UNLESS AN EMERGENCY, AS DEFINED IN GOVERNMENT CODE SECTION 54956.5 EXISTS OR UNLESS OTHER REQUIREMENTS OF GOVERNMENT CODE SECTION 54954.2(B) ARE MET.

5:00 PM December 1, 2014

PLEDGE OF ALLEGIANCE

1. CALL TO ORDER AND ROLL CALL

A The meeting was called to order at _____ p.m. by _____ in the Las Virgenes Municipal Water District Headquarters and the Clerk of the Board called the roll.

Las Virgenes Municipal Water District	Present	Left	Absent
Charles Caspary, Chair	_____	_____	_____
Glen Peterson	_____	_____	_____
Leonard Polan	_____	_____	_____
Lee Renger	_____	_____	_____
Barry Steinhardt	_____	_____	_____
Triunfo Sanitation District			
Steven Iceland, Vice Chair	_____	_____	_____
Michael McReynolds	_____	_____	_____
Janna Orkney	_____	_____	_____
Michael Paule	_____	_____	_____
James Wall	_____	_____	_____

2. APPROVAL OF AGENDA

3. PUBLIC COMMENTS

Members of the public may now address the Board of Directors **ON MATTERS NOT APPEARING ON THE AGENDA**, but within the jurisdiction of the Board. No action shall be taken on any matter not appearing on the agenda unless authorized by Subdivision (b) of Government Code Section 54954.2

4. CONSENT CALENDAR

A **Minutes: Regular JPA Meeting of November 3, 2014 (Pg. 3)** Approve

5. ACTION ITEMS

A Woodland Hills Country Club Recycled Water System Extension: Pricing Policy Discussion (Pg. 8)

Provide direction to staff on pricing policy options for the sale of wholesale recycled water to the Los Angeles Department of Water and Power via the Woodland Hills Country Club Recycled Water System Extension.

B Financial Statements and Independent Auditor's Report for Fiscal Year 2013-14 (Pg. 17)

Receive and file the financial statements and audit for Fiscal Year 2013-14.

6. BOARD COMMENTS

7. ADMINISTERING AGENT/GENERAL MANAGER REPORT

8. FUTURE AGENDA ITEMS

9. INFORMATION ITEMS

A Southern California Coastal Water Research Project (Pg. 52)

B City of San Diego's Potable Reuse Initiative: Pure Water San Diego (Pg. 103)

C Tapia Disinfection By-Products Reduction Effort: Final Report (Pg. 128)

D SCADA Communications Upgrade Phase 1: Reject Bids and Authorize Revision of Plans and Specifications and New Call for Bids (Pg. 257)

E Supply and Delivery of Aluminum Sulfate and Sodium Bisulfite: Award of Contracts (Pg. 264)

F Tapia Primary Clarifier No. 1 Rehabilitation Project: Final Acceptance (Pg. 266)

G Board Meeting Follow-up Items (Pg. 268)

10. PUBLIC COMMENTS

Members of the public may now address the Board of Directors **ON MATTERS NOT APPEARING ON THE AGENDA**, but within the jurisdiction of the Board. No action shall be taken on any matter not appearing on the agenda unless authorized by Subdivision (b) of Government Code Section 54954.2

11. CLOSED SESSION

A Conference with District Counsel – Anticipated Litigation (Government Code Section 54956.9(b)):

One case

B Conference with District Counsel – Existing Litigation (Government Code Section 54956.9(a)):

Las Virgenes - Triunfo Joint Powers Authority v. United States Environmental Protection Agency and Heal the Bay, Inc. v. Lisa P. Jackson

12. ADJOURNMENT

LAS VIRGENES – TRIUNFO
JOINT POWERS AUTHORITY
MINUTES

5:00 PM November 3, 2014

PLEDGE OF ALLEGIANCE

The Pledge of Allegiance to the Flag was led by Chairman Caspary.

1. CALL TO ORDER AND ROLL CALL

A Call to order and roll call

The meeting was called to order at **5:00 p.m.** by Chairman Caspary in the Board Room at the Oak Park Library located at 899 Kanan Road, Oak Park, CA. Daryl Betancur, Clerk of the Board conducted the roll call.

Present:	Director(s):	Polan, Renger, Steinhardt, Peterson, Board Chairman Caspary, McReynolds, Orkney, Paule, Vice Chairman Iceland and Wall
Absent:	Director(s):	None

2. APPROVAL OFAGENDA

A Approval of agenda

Administering Agent/General Manager Pedersen indicated that there were no proposed changes to the agenda.

On a motion by Director Paule, seconded by Director Renger, the Board voted unanimously to approve the agenda as presented.

3. PUBLIC COMMENTS

There were no public comments.

4. CONSENT CALENDAR

A Minutes: Regular JPA Meeting of October 6, Approved

Director Renger moved to approve the minutes of October 6, 2014 as presented. Motion seconded by Director Iceland. Motion carried unanimously.

5. ACTION ITEMS

A Recycled Water Seasonal Storage Plan of Action: Acceptance of Proposal.

ITEM 4A

Accept the proposal from MWH Global, Inc., in the amount of $174,716, to prepare a Recycled

Water Seasonal Storage Plan of Action, and Authorize the Administering Agent/General Manager to execute a professional services agreement for the work.

Administering Agent/General Manager Pedersen provided a brief summary stating that the proposal is for a professional engineering firm to provide the key steps, sequence of steps and strategy to be followed because this is a complex project that has a lot of steps, which need to be followed and executed in a specific order; spoke about the scope work and made reference to the CEQA and NEPA processes that need to be followed for statutory compliance; made comments related to the guiding principles presented, which were approved by the JPA Board on June 2, 2014; further stated that the Request for Proposals (RFP) had been sent to 11 companies and that four proposals were received.

Administering Agent/General Manager Pedersen stated that among the firms that responded included Dudek and Associates and HDR Engineering, in addition to RMC and MWH Global Inc; commented that the Dudek and HDR proposals were weak in how they proposed to interact with the Board; whereas, the other two proposal clearly articulated how they would facilitate the process of interactions with the Board during this process; and explained the process of how a consultant was selected.

Jim Borchart, Principal with MWH Global, Inc., addressed the Board and made brief comments relative to the proposal stating that the process involved taking input from all participants, formulating issues from these comments and developing actionable items; that this process was based on facilitation and involved both stakeholders and shareholders.

There were a number of comments and questions from the Board relative to the process to be followed as it related to the level of involvement of the JPA Board, what to do with the amount of water saved, whether or not, through this effort, the District would be completely out of the business of discharging to the creek; whether or not this proposal included engineering work, and cost estimates; the length of time a project of this magnitude would take as well as the schedule and timeline; and the 5% escalation of hourly rates due to delays.

Administering Agent/General Manager Pedersen and Jim Borchart, Principal with MWH Global, Inc., answered the Board's questions.

Following a lengthy discussion, Director Renger moved to accept the proposal with three contingent items: 1) schedule a Special JPA Workshop with MWH prior to the start of the work; 2) allow for MWH's proposed 5% escalation of hourly rates only for time accrued after June 30, 2015, not March 30, 2015 as called for in the proposal; and 3) identify additional stakeholders for the effort including those in Ventura County. Motion seconded by Director Orkney. Motion carried by the following vote:

AYES:	Director(s):	Polan, Renger, Peterson, Board Chairman Caspary, McReynolds, Orkney, Paule, Vice Chairman Iceland and Wall
NOES:	Director(s):	None
ABSENT:	Director(s):	Steinhardt (Director Steinhardt was excused to leave early before vote)

B Design of Centrate Equalization Tank and Rehabilitation of Centrate Pipeline: Request for Proposals.

Approve the issuance of a Request for Proposals for design and environmental planning services for a new centrate equalization tank and rehabilitation of an existing centrate pipeline.

Administering Agent/General Manager Pedersen presented the staff report and indicated that this is a request to issue a Request for Proposals (RFP) for two projects that are intended to provide reliability for the centrate treatment system; stated that this proposal is meant for the two projects to be designed together as they are interrelated; explained the centrate system and how it functions; commented that the project is intended to add a new equalization tank, which in turn will add redundancy to the system; that the two interrelated projects are: 1) design the equalization tank and 2) rehabilitation of the original pipeline that was used for centrate.

There was a lengthy discussion with comments and questions from the Board related to: removing all nitrates from the centrate, investigations of alternative processes to descale the pipeline, scope of work and how it appeared that the term "construction management" should be replaced with the term "construction support" or "services during construction". Additionally, a comment was made relative to the evaluation criteria.

Director Orkney moved to approve with the noted comments. Motion seconded by Director Renger. Motion carried unanimously.

C Sewer System Management Plan: Approval of Recertification

Administering Agent/General Manager Pedersen states that this is a regulatory requirement to have a Sewer System Management Plan (SSMP) and that this plan requires updating every five-years.

David Lippman, Director of Facilities and Operations spoke briefly on the nature of the regulatory requirements and indicated that in May of 2006, the State Water Resources Control Board adopted state-wide general waste discharge requirements for sanitary sewers, which in essence, mandated that owners and operators of wastewater treatment facilities monitor, report and develop these type of plans.

There were several comments and questions from the Board related to who owned the gravity sewers. Mr. Lippman provided answers to these questions.

D Financial Review: First Quarter of Fiscal Year 2014-15. Received and Filed.

Administering Agent/General Manager Pedersen stated that with respect to the financial report, it appeared favorable; spoke about the results in terms of demand and supply and the correlated fiscal impacts and answered questions from the Board.

6. BOARD COMMENTS

Director Iceland offered good wishes to those running for office in the upcoming election and commented on the spraying of a great deal of water at the spray fields.

Director McReynolds commented on having attended the AWWA Water Infrastructure Conference in Atlanta, GA, and stated that it was interesting to learn that many wastewater agencies are changing the names of their waste-treatment plants to recycling centers; questioned whether or not the JPA had the right name for the Tapia facility.

7. ADMININSTERING AGENT/GENERAL MANAGER REPORT

Administering Agent/General Manager Pedersen reported on the rain event and the water levels in Malibu Creek, answered Director Iceland's comments regarding the spraying of water stating that we are still in the prohibition period that runs from April 15th, 2014 to November 15th, 2015; and commented on the special JPA Board meeting yet to be scheduled.

8. FUTURE AGENDA ITEMS

None

9. INFORMATION ITEMS

A Recycled Water Reservoir No. 2 Improvements: Construction Award

B Tapia Primary Clarifier No. 1 Rehabilitation Project: Change Order No. 2 Approval ITEM 4A

C Rancho Plow Mixer Discharge Conveyor: Purchase Order Authorization

D Board Meeting follow-up

There was a question on item 9B from Director McReynolds related to the funds and expenditures. Administering Agent/General Manager Pedersen and David Lippman, Director of Facilities and Operations stated that the bids had come in lower than anticipated, thus, the line item reflects why there is more budget.

10. PUBLIC COMMENTS

None.

11. CLOSED SESSION

The Board recessed to closed session at **7:01 p.m.**, and reconvened to open session at **7:05 p.m.**

General Counsel Lemieux reported that the Board had met in closed session, but that there were no reportable actions.

A. Conference with District Counsel- Existing Litigation pursuant to Government Code Section 54956.9 (a).

1. Las Virgenes – Triunfo Joint Powers Authority v. United States Environmental Protection Agency and Heal the Bay, Inc. v. Lisa P. Jackson

B. Conference with District Counsel- Anticipated Litigation pursuant to Government Code Section 54956. (b)

Number of Cases: 1

12. ADJOURNMENT

Seeing no further business to come before the Board, the meeting was duly adjourned at **7:05 p.m.**

Charles Caspary, Chair

ATTEST:

Steven Iceland, Vice Chair

December 1, 2014 JPA Board Meeting

TO: JPA Board of Directors

FROM: Facilities & Operations

Subject: Woodland Hills Country Club Recycled Water System Extension: Pricing Policy Discussion (Pg. 8)

SUMMARY:

On October 6, 2014, staff presented the JPA Board with four options for pricing wholesale recycled water sold to the Los Angeles Department of Water and Power (LADWP). After a thorough discussion, the JPA Board directed staff to perform additional analyses on two options: Option No. 2 - Pricing Based on Actual Cost, and Option No. 4 - Pricing Based on In-Lieu Potable Water Return. The pricing policy is important to ensure that the JPA recovers it cost to supply wholesale recycled water to LADWP over the projected 30-year term of the agreement.

RECOMMENDATION(S):

Provide direction to staff on pricing policy options for the sale of wholesale recycled water to the Los Angeles Department of Water and Power via the Woodland Hills Country Club Recycled Water System Extension.

FISCAL IMPACT:

Yes

ITEM BUDGETED:

Yes

FINANCIAL IMPACT:

The pricing policy option selected by the JPA Board will establish the basis for reimbursement of the JPA's cost to supply wholesale recycled water to LADWP over the term of the agreement, currently proposed to be 30 years.

DISCUSSION:

Introduction:

Beginning in February 2011, the JPA Board provided staff with direction during negotiation of terms for the Woodland Hills Country Club (WHCC) Recycled Water System Extension. On September 3, 2013, the attached term sheets were approved by the JPA Board. Subsequently, on August 4, 2014, the JPA Board approved a cooperative agreement with LADWP for the JPA to proceed with preliminary design and CEQA analysis for the project. The agreement is scheduled for approval by LADWP in early January 2015. The approved term sheets served as a basis for the cooperative agreement.

Recycled Water Demand Pattern:

Understanding the expected demand pattern for the recycled water to be used by WHCC is very important in establishing a pricing policy. The demand pattern determines the potential increase in potable water supplement required during the summer months and the decrease in disposal volumes during the remainder of the year (disposal during the shoulder months and Malibu Creek discharge during the non-shoulder months). Staff analyzed historical recycled water production, demand and potable water supplement volumes required from 2005 to present. This period includes a combination of wet, dry and normal water years, all of which influence demands.

The analysis of historical data enabled staff to distribute the expected annual recycled water usage for WHCC on a month-to-month basis. When comparing the distributed demand on a monthly basis to available supplies, the result was approximately 125 acre-feet of additional potable water supplement, 112.5 acre-feet of decreased disposal during the shoulder months and 62.5 acre-feet of decreased discharge to Malibu Creek outside the shoulder months. Attached is a chart that shows the results of the WHCC demand distribution graphically.

Costs and Benefits:

An average of 840 acre-feet of recycled water is produced by the JPA per month; however, the total annual supply utilized for beneficial reuse is limited due fluctuations in demand and the lack of storage. Currently, the addition of new recycled water demands cause an increase in potable water supplement volumes required during the summer months, which results in a cost, and decreases in disposal volumes during the shoulder months and Malibu Creek discharge volumes outside the shoulder months, which results in a benefit. Additionally, there are intangible benefits associated with increasing recycled water demands, such as achieve maximum beneficial reuse, creating regional partnerships, reducing imported water needs and minimizing discharges to Malibu Creek.

The cost of additional potable water supplement is the fully-burdened cost for LVMWD to supply potable water to the recycled water system. Based on the adopted Fiscal Year 2014-15 Budget, the cost is $1,533 per acre-foot. The value of the benefit of reduced disposal volumes is the reduced expense for disposal plus the additional revenue for sale of the recycled water that would otherwise be disposed. The sum of these items is $1,150 per acre-foot. The value of reducing discharge to Malibu Creek consists of a reduction in chemical addition, which is a minor cost overall compared to the total volume discharged.

Wholesale Recycled Water Pricing Options Review:

The following assumptions are made for the purpose of discussing pricing options *only*.

1. Although the JPA is actively planning to develop seasonal storage for recycled water, the storage facility will not be completed in the near-term and, therefore, is not considered for pricing scenarios.

2. The 2015 NPDES Permit for the Tapia Water Reclamation Plant will not include the a requirement for compliance with the new U.S. EPA TMDL limits for nutrients.

3. The pricing policy will apply only the Woodland Hills Country Club extension and not to any future extensions for service outside the JPA's service area.

4. The recycled water rate is intended recover the JPA's costs to provide wholesale recycled water to LADWP.

5. LADWP will always be considered the first to cause potable water supplement when demand exceeds supply because it has no capacity rights in the JPA's system.

6. The JPA will not include the estimated demands for the WHCC when calculating its wholesale recycled water rate for the JPA's partner agencies.

Option No. 2 - Pricing Based on Actual Cost

This option consists of charging LADWP the actual cost to supply recycled water to its connection based on the approved fiscal year budget. The price would consist of two components: (1) the cost of additional pumping to serve LADWP, and (2) the cost of potable water supplement. Based on the approved Fiscal Year 2014-15 Budget, the rate would be $951.63 per acre-foot. Table 1 shows the various components of cost contributing to the LADWP wholesale rate for the last three fiscal years, the current fiscal year and a projection for the next three fiscal years under this scenario. For pricing comparison purposes, Table 2 shows the LADWP wholesale rate as a percentage of both the JPA wholesale rate and LVMWD's blended potable water supply rate.

Table 1 Option 2 ($/AF)							
	FY 11-12	FY 12-13	FY 13-14	FY 14-15	FY 15-16	FY 16-17	FY 17-18
Additional Pumping (300 AF)	191.00	181.52	202.57	189.94	193.92	198.00	202.16
Potable Supplement MWD (125 AF)	348.75	367.50	412.92	420.00	435.00	445.00	465.83
Potable Supplement Distribution (125 AF)	237.08	216.25	182.08	218.75	242.50	241.25	240.42
Depreciation (340 AF)	108.24	108.24	108.24	108.24	108.24	108.24	108.24
Admin Cost (300 AF)	12.74	14.53	15.26	14.71	15.02	15.34	15.66
LADWP Rate	**897.80**	**888.04**	**921.06**	**951.63**	**994.68**	**1,007.82**	**1,032.30**

Table 2 Option 2							
	FY 11-12	FY 12-13	FY 13-14	FY 14-15	FY 15-16	FY 16-17	FY 17-18
LADWP Wholesale Rate ($/AF)	**897.80**	**888.04**	**921.06**	**951.63**	**994.68**	**1,007.82**	**1,032.30**
JPA Wholesale Recycled Rate ($/AF)	425.04	454.76	407.27	373.72	381.57	389.58	397.76
Percent of JPA Rate	211%	195%	226%	255%	261%	259%	260%
LVMWD Potable Water Blended Rate ($/AF)	837.00	882.00	987.00	1,008.00	1,044.00	1,068.00	1,118.00
Percent of Potable Rate	107%	101%	93%	94%	95%	94%	92%

Option No. 4 - Pricing Based on In-Lieu Potable Water Return:

In this option, LADWP would "return" potable water to the JPA through an existing LVMWD/LADWP interconnection in an amount equal to that required for recycled water supplement for WHCC. The wholesale recycled water price to LADWP would be equal to the sum of two components: (1) the additional pumping to serve LADWP, and (2) the difference between LVMWD's fully-burdened cost of potable water supplement and the blended MWD treated water rate. LVMWD would sell potable water supplement to the JPA at its fully-burdened rate, currently $1,533 per acre-foot.

The return of the potable water supplement to LVMWD would reduce its overall MWD purchases; therefore, a mechanism would be needed to confer the appropriate share of the benefit back to TSD through the JPA. One possibility would be for LVMWD to credit back to the JPA the value of the returned potable supplement at the blended MWD treated rate, resulting in allocation of 29.4% of the benefit to TSD. Based this approach and the approved Fiscal Year 2014-15 Budget, the LADWP wholesale rate would be $531.63 per acre-foot. Table 3 shows the various components of cost contributing to the LADWP wholesale rate for the last three fiscal years, the current fiscal year and a projection for the next three fiscal years under this pricing scenario. For pricing comparison purposes, Table 4 shows the LADWP wholesale rate as a percentage of both the JPA wholesale rate and LVMWD's blended potable water supply rate.

Table 3 Option 4 ($/AF)							
	FY 11-12	FY 12-13	FY 13-14	FY 14-15	FY 15-16	FY 16-17	FY 17-18
Additional Pumping (300 AF)	191.00	181.52	202.57	189.94	193.92	198.00	202.16
Potable Supplement MWD (125 AF)	0	0	0	0	0	0	0
Potable Supplement	237.08	216.25	183.75	218.75	242.50	241.25	240.42

Distribution (125 AF)							
Depreciation (340 AF)	108.24	108.24	108.24	108.24	108.24	108.24	108.24
Admin Cost (300 AF)	12.74	14.53	15.26	14.71	15.02	15.34	15.66
LADWP Rate	**549.05**	**520.54**	**509.81**	**531.63**	**559.68**	**562.82**	**566.46**

Table 4 Option 4							
		FY 12-13	FY 13-14	FY 14-15	FY 15-16	FY 16-17	FY 17-18
LADWP Wholesale Rate ($/AF)	**549.05**	**520.54**	**509.81**	**531.63**	**559.68**	**562.82**	**566.46**
JPA Wholesale Recycled Rate ($/AF)	425.04	454.76	407.27	373.72	381.57	389.58	397.76
Percent of JPA Rate	129%	114%	125%	142%	147%	144%	142%
LVMWD Potable Water Blended Rate ($/AF)	837.00	882.00	987.00	1,008.00	1,044.00	1,068.00	1,118.00
Percent of Potable Rate	66%	59%	52%	53%	54%	53%	51%

Staff will review the assumptions and two options in more detail at the Board meeting.

Prepared By: David R. Lippman, Director of Facilities & Operations

ATTACHMENTS:

Term Sheets

WHCC Demand Distribution

Terms Sheet: Recycled Water Wholesale Purchase Agreement

1. Agreement
    a. The intent of this agreement is for the wholesale sale of Recycled Water to LADWP from the JPA.
2. Pricing
    a. Mutually agreed price per acre-foot or fraction thereof. Price per acre-foot will be equal to the cost of wholesale recycled water plus a potable supplement component (currently estimated at $670 per acre-foot.)
3. Capital Cost
    a. LADWP will reimburse the JPA for the capital expenditure within the JPA service area
4. Escalation
    a. Annual price escalation based on Bureau of Labor Statistics, Consumer Price Index for All Urban Consumers (CPI-U); Los Angeles, Riverside, Orange Counties
5. Supplemental Supply
    a. JPA will provide supplemental supply during normal operating conditions
6. Planned or unplanned disruption
    a. During planned or unplanned disruption the JPA shall make every effort to resume recycled water delivery as soon as possible and shall keep LADWP informed as to the status of the event.
7. Water quality
    a. Water quality shall comply with JPA's RWQCB Water Reclamation Requirements and Title 22 at the point of regulatory compliance
    b. Water quality reports required by the RWQCB and/or SWRCB shall be made available to LADWP
    c. LADWP, the JPA and WHCC shall form an operating committee that meets periodically to review and operations and address any issues
8. Payments
    a. JPA shall invoice every 30 days and LADWP shall make payment within 45 days
9. Metering
    a. Wholesale sales shall be measured by a JPA meter at the service area boundary
10. LRP Funding
    a. LADWP shall apply for LRP funding
    b. LADWP shall receive all LRP funds
11. Ownership
    a. JPA shall own, operate and maintain facilities in their service area
    b. LADWP shall own, operate and maintain facilities in their service area
12. Termination
    a. Each party shall have the right to terminate the agreement with 180 day notice unless a shorter notice is mutually agreed
13. Term
    a. 30 years

b. Provide a mutually agreed renewal option for the same term as the original term

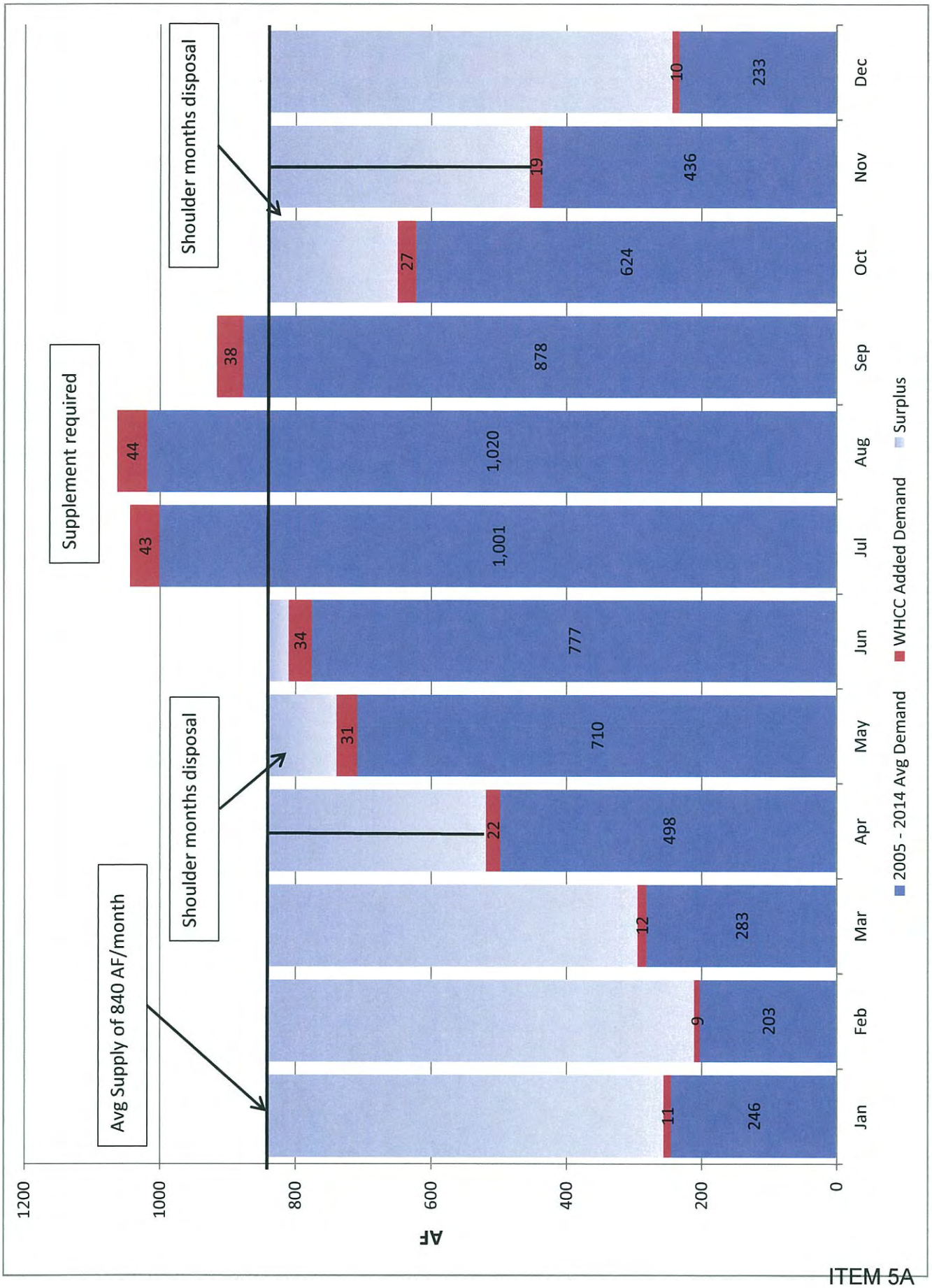
14. Point of Use Regulatory Compliance
    a. LADWP shall assure their retail customers comply with all necessary regulatory requirements for the use of recycled water
15. Minimum Pressure
    a. A minimum pressure of 100 psi shall be provided at the JPA/LADWP boundary
16. Each agency to indemnify each other, insure each other, pay their own attorney fees

Terms Sheet: Design & Construction Agreement

1. Agreement
    a. The intent of this agreement is to define responsibilities for the preliminary design, CEQA, design and construction of the facilities necessary to convey wholesale recycled water to the WHCC in LADWP's service area from the JPA
2. Preliminary Design
    a. The JPA will be responsible to complete necessary preliminary design for the facilities to convey wholesale recycled water to WHCC from the JPA
    b. Facilities within the JPA service area shall be designed to JPA standards and facilities within the LADPW service area shall be designed to LADWP standards
3. CEQA
    a. The JPA shall be the lead agency for the project with LADWP being a responsible agency
4. Design
    a. The JPA will be responsible to complete design for the facilities to convey wholesale recycled water to WHCC from the JPA
    b. Facilities within the JPA service area shall be designed to JPA standards and facilities within the LADWP service area shall be designed to LADWP standards
5. Construction
    a. The JPA shall be responsible to bid and hire a contractor to construct the project.
    b. The JPA shall be responsible to construct any metering and backflow protection facilities for JPA retail customers
    c. LADPW shall be responsible to construct any metering and backflow protection facilities for LADWP retail customers
6. Permits and Rights of Way
    a. The JPA shall obtain all necessary encroachment permits and right of way within their service area
    b. LADPW shall obtain all necessary encroachment permits and right of way within their service area
    c. The construction contractor shall obtain traffic control permits and develop traffic control plans assisted as necessary by the JPA and LADWP
7. Cost Share
    a. Preliminary design and CEQA costs shall be shared between the JPA and LADWP on prorated basis based on the ratio of pipe length in each service area to the total pipe length. The JPA costs shall be reimbursed by LADWP.
    b. JPA shall pay for the cost of design for facilities within their service area reimbursed by LADWP
    c. LADWP shall pay for the cost of design for facilities within their service area
    d. JPA shall pay for the cost of construction including services during construction and any necessary mitigation measures within their service area reimbursed by LADWP
    e. LADWP shall pay for the cost of construction including services during construction and any necessary mitigation measures within their service area

f. JPA shall pay any fees associated with permits with in their service area reimbursed by LADWP
g. LADWP shall pay for any fees associated with permits with in their service area
h. Common permits, such as the RWQCB SSWP permit shall be paid for on the same basis as preliminary design and CEQA cost
i. LADWP shall pay an administrative cost to the JPA of 10% of their share of project

8. Payment
    a. The JPA shall bill LADWP every 30 days with payment due in 45 days
9. Use of consultants
    a. The JPA reserves the right to use consultants of their choice in preforming the preliminary design, CEQA, design and construction management.
    b. Both parties need to agree to award preliminary design, CEQA, design and construction management contracts if the parties do not agree then
        i. The project can be rebid if mutually agreed
        ii. The agreements become void and all outstanding costs are to be paid
10. Award of Construction Contract
    a. Both parties need to agree to award the construction contract if the parties do not agree then
        i. The project can be rebid if mutually agreed
        ii. The agreements become void and all outstanding costs are to be paid
11. Each agency shall indemnify each other, insure each other, pay their own attorney fees
12. LADWP may elect to perform the design of their facilities. In case LADWP and the JPA shall coordinate the design effort to assure a complete, integrated bid and construction package.


Avg Supply of 840 AF/month
Shoulder months disposal
Supplement required
Shoulder months disposal
AF
1200
1000
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December 1, 2014 JPA Board Meeting

TO: JPA Board of Directors

FROM: Finance & Administration

Subject: Financial Statements and Independent Auditor's Report for Fiscal Year 2013-14 (Pg. 17)

SUMMARY:

The public accounting firm of Pun & McGeady LLP, completed the annual audit of the JPA's financial statements and issued an unqualified opinion based on the audit. A representative of Pun & McGeady will be available at the JPA Board meeting to answer questions. Also, the audit firm representative will review the results of the audit with the JPA's Audit Committee on December 1, 2014, prior to the Board meeting.

The JPA's change in net position, as of June 30, 2014, is summarized below:

Description:	**Thousand $**:
Recycled Water Sales	$2,892
Other Operating Revenue	213
Non-operating Revenues	11
Total Revenues	**3,116**
Depreciation Expense	6,280
Other Operating Expense	15,153
Non-operating Expense	84
Total Expenses	**21,517**
Loss before Billings	(18,402)
Billings to Participants	12,037
Net Loss before Capital Contributions	(6,364)
Participant Capital Contributions	6,177
Net Position:	
Change in Net Position	(187)
Net Position – Beginning of Year	99,384
Net Position – End of Year	**$99,197**

RECOMMENDATION(S):

Receive and file the financial statements and audit for Fiscal Year 2013-14.

FISCAL IMPACT:

No

ITEM BUDGETED:

No

DISCUSSION:

Total operating revenue was 4% lower than the previous year due to a lower volume of wholesale recycled water sold to the JPA partners. Operating expenses decreased by 1%. Billings to the JPA partners were comparable to the previous year. Capital contributions increased by $2.76 million due to the progress on active capital projects during Fiscal Year 2013-14. Depreciation expenses were greater than the JPA partners' capital contributions, contributing to a minor overall decrease in net position by $187,000, or 0.2%.

Attached for reference is the final copy of the financial statements and audit. A representative of Pun & McGeady will be available at the Board meeting to answer any questions.

Prepared By: Joseph Lillio, Finance Manager

ATTACHMENTS:

JPA Financial Statements and Audit

Las Virgenes-Triunfo Joint Powers Authority

Independent Auditors' Reports and Financial Statements

For the Years Ended June 30, 2014 and 2013

ITEM 5B

ITEM 5B

Las Virgenes-Triunfo Joint Powers Authority

Table of Contents

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PUN & McGEADY LLP

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INDEPENDENT AUDITORS' REPORT

To the Board of Directors
of the Las Virgenes-Triunfo Joint Powers Authority
Calabasas, California

Report on the Financial Statements

We have audited the accompanying financials statements of the Las Virgenes-Triunfo Joint Powers Authority (the "JPA"), as of and for the year ended June 30, 2014, and the related notes to the financial statements, which collectively comprise the JPA's basic financial statements as listed in the table of contents.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the JPA as of June 30, 2014, and the changes in its financial position and cash flows thereof for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Other Matters

Required Supplementary Information

Accounting principles generally accepted in the United States of America require that the Management's Discussion and Analysis on pages 7 to 13 be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board, who considers it to be an essential part of financial reporting for placing the basic financial statements in an appropriate operational, economic, or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Other Information

Our audit was conducted for the purpose of forming an opinion on the financial statements that collectively comprise the JPA's basic financial statements. The Supplementary Schedule of Changes in Participants' Advance Accounts is presented for purposes of additional analysis and is not a required part of the basic financial statements.

The Schedule of Changes in Participants' Advance Accounts is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the basic financial statements. Such information has been subjected to the auditing procedures applied in the audit of the basic financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the basic financial statements or to the basic financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the Schedule of Changes in Participants' Advance Accounts is fairly stated, in all material respects, in relation to the basic financial statements as a whole.

2013 Financial Information

The Las Virgenes-Triunfo Joint Powers' basic financial statements for the year ended June 30, 2013 were audited by other auditors whose report thereon dated November 25, 2013, expressed unmodified opinions on the respective financial statements of the JPA. The report of the other auditors dated November 25, 2013, stated that the Supplemental Schedule of Changes in Participants' Advance Account for the year ended June 30, 2013 was subjected to the auditing procedures applied in the audit of the 2013 basic financial statements and certain additional auditing procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare those basic financial statements or the those basic financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America and, in their opinion, was fairly stated in all material respects in relation to the basic financial statements as a whose for the year ended June 30, 2013.

ITEM 5B

Other Reporting Required by *Government Auditing Standards*

In accordance with *Government Auditing Standards*, we have also issued our report dated November 24, 2014, on our consideration of the JPA's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the JPA's internal control over financial reporting and compliance.

Pun & McGeady LLP

Irvine, California
November 24, 2014

Kenneth H. Pun, CPA, CGMA
CPA Number: 88316

ITEM 5B

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PUN & McGEADY LLP

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REPORT ON INTERNAL CONTROL OVER FINANCIAL REPORTING AND ON COMPLIANCE AND OTHER MATTERS BASED ON AN AUDIT OF FINANCIAL STATEMENTS PERFORMED IN ACCORDANCE WITH *GOVERNMENT AUDITING STANDARDS*

Independent Auditors' Report

To the Board of Directors
of the Las Virgenes-Triunfo Joint Powers Authority
Calabasas, California

We have audited, in accordance with the auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States, the financial statements of the Las Virgenes-Triunfo Joint Power Authority (the "JPA"), as of and for the year ended June 30, 2014, and the related notes to the financial statements, which collectively comprise JPA's basic financial statements, and have issued our report thereon dated November 24, 2014.

Internal Control over Financial Reporting

In planning and performing our audit of the financial statements, we considered the JPA's internal control over financial reporting (internal control) to determine the audit procedures that are appropriate in the circumstances for the purpose of expressing our opinion on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of the JPA's internal control. Accordingly, we do not express an opinion on the effectiveness of the JPA's internal control.

A *deficiency in internal control* exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, misstatements on a timely basis. A *material weakness* is a deficiency, or a combination of deficiencies, in internal control, such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected on a timely basis. A *significant deficiency* is a deficiency, or a combination of deficiencies, in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance.

Our consideration of internal control was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies. Given these limitations, during our audit we did not identify any deficiencies in internal control that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

Compliance and Other Matters

As part of obtaining reasonable assurance about whether the JPA's financial statements are free from material misstatement, we performed tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements, noncompliance with which could have a direct and material effect on the determination of financial statement amounts. However, providing an opinion on compliance with those provisions was not an objective of our audit, and accordingly, we do not express such an opinion. The results of our tests disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards.*

Purpose of this Report

The purpose of this report is solely to describe the scope of our testing of internal control and compliance and the results of that testing, and not to provide an opinion on the effectiveness of the entity's internal control or on compliance. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the entity's internal control and compliance. Accordingly, this communication is not suitable for any other purpose.

Irvine, California
November 24, 2014

Kenneth H. Pun, CPA, CGMA
CPA Number: 88316

MANAGEMENT'S DISCUSSION AND ANALYSIS

This section of the Joint Powers Authority (JPA) annual financial report presents our analysis of the JPA's financial performance during the Fiscal Year that ended on June 30, 2014. Please read it in conjunction with the Financial Statements, which follow this section.

FINANCIAL HIGHLIGHTS

- The JPA's net position decreased by $187,242, or 0.2%.
- During the year the JPA's operating expenses, not including depreciation expense, decreased to $15.2 million, or down by 1%.
- Billings to JPA participants increased to $12 million or by 0.3% more than the prior fiscal year.

OVERVIEW OF THE FINANCIAL STATEMENTS

The discussion and analysis are intended to serve as an introduction to Las Virgenes and Triunfo Joint Powers Authority (JPA) financial statements. The JPA's basic financial statements comprise two components: Financial Statements and Notes to the Financial Statements. This report also contains other supplementary information in addition to the basic financial statements themselves.

BASIC FINANCIAL STATEMENTS

The Financial Statements of the JPA report information about the JPA using accounting methods similar to those used by private sector companies. These statements offer short- and long-term financial information about its activities. The Comparative Statements of Net Position (CSNP) includes all of the JPA's assets and liabilities and provides information about the nature and amount of investments in resources (assets) and the obligations to JPA creditors (liabilities). The CSNP also provides the basis for evaluating the capital structure of the JPA.

All of the current year's revenues and expenses are accounted for in the Comparative Statements of Revenues, Expenses and Changes in Net Position. These statements reflect the result of the JPA's operations over the past year.

The final required Financial Statements are the Comparative Statements of Cash Flows. The primary purpose of this statement is to provide information about the JPA's cash receipts and cash payments during the reporting period. The statement reports cash receipts, cash payments, and net changes in cash resulting from operations and investments. It also provides answers to such questions as where did cash come from, what was cash used for, and what was the change in cash balance during the reporting period.

FINANCIAL ANALYSIS OF THE JOINT POWERS AUTHORITY

Our analysis of the JPA begins on page 15 of the Financial Statements. One of the most important questions asked about the JPA's finances is "Is the JPA, as a whole, better off or worse off as a result of the year's activities?" The Comparative Statement of Net Position, the Comparative Statements of Revenues, Expenses and Changes in Net Position report information about the JPA's activities in a way that will help answer this question. These three statements report the net position of the JPA and changes in them. You can think of the JPA's net position—the difference between assets and liabilities—as one way to measure financial health or financial position. Over time, increases or decreases in the JPA's net position is one indicator of whether its financial health is improving or deteriorating. However, you will need to consider other non-financial factors such as changes in economic conditions, population growth, and new or changed government legislation.

NET POSITION

To begin our analysis, a summary of the JPA's Statement of Net Position is presented in Table 1.

TABLE 1
Condensed Statements of Net Position
(in thousands of dollars)

	FY 2014	FY 2013	Dollar Change	Percent Change
Current Assets	$ 7,310	$ 7,456	(146)	(2.0)%
Capital Assets	99,197	99,384	(187)	(0.2)%
Total Assets	**106,507**	**106,840**	**(333)**	**(0.3)%**
Due to Participants	6,534	6,648	(114)	(1.7)%
Other Liabilities	776	808	(32)	(4.0)%
Total Liabilities	**7,310**	**7,456**	**(146)**	**(2.0)%**
Total Net Position:				
Net Investment in Capital Assets	**$99,197**	**$99,384**	**$(187)**	**(0.2)%**

As can be seen from the table above, net position of the JPA is equivalent to capital assets. Everything else is either a current asset or a liability. The decrease in Net Position (and capital assets) is due to depreciation expense exceeding participant capital contributions.

TABLE 2
Condensed Statements of Revenues, Expenses and Changes in Net Position
(in thousands of dollars)

	FY 2014	FY 2013	Dollar Change	Percent Change
Recycled Water Sales	$2,892	$3,008	$(116)	(3.9)%
Other Operating Revenue	213	281	(68)	(24.2)%
Non-operating Revenues	11	14	(3)	(20.4)%
Total Revenues	**3,116**	**3,303**	**(187)**	**(5.7)%**
Depreciation Expense	6,280	6,377	(97)	(1.5)%
Other Operating Expense	15,153	15,307	(154)	(1.0)%
Non-operating Expense	84	315	(231)	(73.3)%
Total Expenses	**21,517**	**21,999**	**(482)**	**(2.2)%**
Loss before Billings	(18,402)	(18,696)	294	1.6%
Billings to Participants	12,037	12,004	33	0.3%
Net Loss before Capital Contributions	(6,364)	(6,692)	328	4.9%
Participant Capital Contributions	6,177	3,932	2,245	57.1%
NET POSITION:				
Change in Net Position	(187)	(2,760)	2,573	93.2%
Net Position – Beginning of Year	99,384	102,144	(2,760)	(2.7)%
Net Position – End of Year	**$99,197**	**$99,384**	**$(187)**	**(0.2)%**

As reflected in Table 2, revenue from recycled water sales decreased due to a decrease in demand compared to the prior fiscal year. Less water was sold due to an emphasis on water conservation due to the continuing drought conditions. Operating expenses decreased due to decreased demand for recycled water.

While the Statement of Net Position shows the change in financial position, the Statement of Revenues, Expenses and Changes in Net Position provides answers as to the nature and source of these changes.

BUDGETARY HIGHLIGHTS

The Boards of Directors for both participating agencies adopt the JPA Operating and Capital Improvement Budget prior to the start of the fiscal year. The participant Boards may approve budget revisions during the year. A FY 2014 budget comparison and analysis is presented in Table 3.

TABLE 3
FY 2014 Actual vs FY 2014 Budget
(In thousands of dollars)

	FY 2014 Actual	FY 2014 Budget	Dollar Change	Percent Change
Revenues:				
Recycled Water Sales	$2,892	$2,624	$268	10.2%
Other Operating Revenue	213	205	8	3.9%
Non-operating Revenue	11	20	(9)	(45.0)%
Total Revenues	**3,116**	**2,849**	**267**	**9.4%**
Expenses:				
Treatment Plant	4,403	4,724	(321)	(6.8)%
Recycled Water Transmission And Distribution	1,520	1,266	254	20.1%
Compost Plant	2,479	2,512	(33)	(1.3)%
Sewer	112	137	(25)	(18.2)%
General and Administrative	6,391	6,246	145	2.3%
Depreciation	6,280	6,377	(97)	(1.5)%
Other Operating Expenses	248	214	34	15.9%
Non-operating Expenses	84	0	84	-
Total Expenses	**21,517**	**21,476**	**41**	**0.2%**
Net Expenses	**$(18,401)**	**$(18,627)**	**$226**	**(1.2)%**

As reflected in Table 3, actual revenue was higher than what was anticipated in the adopted budget due to an increase in recycled water sales. Overall operating expenses were slightly over budget, and net operating expenses were lower than the budgeted amount by approximately $226,000.

CAPITAL ASSETS AND DEBT ADMINISTRATION

At the end of FY 2014, the JPA had net capital assets of $99.2 million as shown in Table 4.

TABLE 4
Capital Assets
(In thousands of dollars)

	FY 2014	FY 2013	Dollar Change	Percent Change
Land & Land Rights	$12,259	$12,259	$ 0	0.0%
Sewer & Treatment Plant	117,198	115,176	2,022	1.8%
Compost Plant	63,063	63,057	6	0.0%
Recycled Water System	31,845	31,677	168	0.5%
Construction in Progress	7,320	3,529	3,791	107.4%
Subtotal	**231,685**	**225,698**	**5,987**	**2.7%**
Less Accumulated Depreciation	(132,488)	(126,314)	(6,174)	4.9%
Total Capital Assets	**$99,197**	**$99,384**	**$(187)**	**(0.2)%**

The following is a summary of some of the major improvements to the system during FY 2014

TABLE 5
Major Capital Improvement Projects for FY 2014
(In thousands of dollars)

	FY 2014
Third Digester Construction-Rancho Las Virgenes	$5,185
Tapia Alternative Disinfection Project	259
Tapia Grit Cyclone Conveyor	125
Tapia Primary Tank Rehab	116
Total Major Projects	5,685
Total Other Projects	492
Total Projects	**$6,177**

As shown in Table 6, the JPA's FY 2015 Capital Improvement Budget appropriates $7.4 million for capital projects. The projects are financed by the participating agencies. More information about the JPA's Capital Assets is presented on page 24 in the Notes to the Basic Financial Statements.

TABLE 6
Fiscal Year 2015 Capital Budget
(In thousands of dollars)

	FY 2015
Recycled Water Projects	$2,768
Sanitation Projects	4,590
Total	7,358

LONG TERM DEBT

The JPA has no long-term debt nor is there any intention of issuing future debt. All funding is provided by the participating agencies.

ECONOMIC FACTORS AND NEXT YEAR'S BUDGET

The adopted budget for FY 2015 was developed considering the change to the wholesale recycled water rate, the changing costs of energy, costs of chemicals, and staff costs under the current Memorandums of Understanding with the general and office units (employee unions). The Memorandums of Understanding with the employee unions are effective through December 2014.

TABLE 7
FY 2015 Budget vs FY 2014 Actual
(In thousands of dollars)

	FY 2015 Budget	FY 2014 Actual	Dollar Change	Percent Change
Recycled Water Sales	$2,304	$2,892	$(588)	(20.3)%
Other Operating Revenue	188	213	(25)	(11.7)%
Non-Operating Revenues	20	11	9	81.8%
Total Revenues	**2,512**	**3,116**	**(604)**	**(19.4)%**
Depreciation Expense	6,280	6,280	0	0.0%
Other Operating Expense	15,279	15,153	126	0.8%
Non-Operating Expense	0	84	(84)	(100.0)%
Total Expense	**21,559**	**21,517**	**42**	**0.2%**
Net Expense	(19,047)	(18,401)	(646)	3.5%
Billings to Participants	12,767	12,037	730	6.1%
Excess of Net Expenses Over Billings to Participants	(6,280)	(6,364)	84	(1.3)%
Participant Capital Contributions	7,358	6,177	1,181	19.1%
Change in Net Assets	1,078	(187)	1,265	676.5%
Beginning Net Assets	99,197	99,384	(187)	(0.2)%
Ending Net Assets	**$100,275**	**$99,197**	**$1,078**	**1.1%**

ITEM 5B

Operating revenue is expected to decrease due to lower recycled water rates and a decrease in demand compared to the prior year. The budget anticipates a slight decrease in operating expenses due to savings in energy costs from the solar project and anticipating no losses on the disposal of capital assets.

CONTACTING THE DISTRICT'S FINANCIAL MANAGER

This financial report is designed to provide our residents, customers and creditors with a general overview of the JPA's finances and to demonstrate the JPA's accountability for the money it receives. The responsibility for the JPA's accounting and financial reporting rests with the staff of the Las Virgenes Municipal Water District. If you have questions about this report or need additional financial information, contact the Las Virgenes Municipal Water District, Department of Finance and Administration, 4232 Las Virgenes Road, Calabasas, California, 91302.

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Las Virgenes-Triunfo Joint Powers Authority
Statements of Net Position
June 30, 2014 and 2013

	2014	2013
ASSETS		
Current assets:		
Cash and investments	$ 6,164,190	$ 6,379,701
Accounts receivable	913,844	844,353
Interest receivable	3,894	4,303
Inventories	188,321	186,539
Prepaid items	40,173	40,917
Total current assets	7,310,422	7,455,813
Noncurrent assets:		
Capital assets, not being depreciated	19,579,202	15,788,042
Capital assets, being depreciated, net	79,617,592	83,595,994
Total capital assets	99,196,794	99,384,036
Total noncurrent assets	99,196,794	99,384,036
Total assets	106,507,216	106,839,849
LIABILITIES		
Current liabilities:		
Accounts and contracts payable and accrued liabilities	776,437	807,478
Due to participants	6,533,985	6,648,335
Total current liabilities	7,310,422	7,455,813
Total liabilities	7,310,422	7,455,813
NET POSITION		
Participants' investments in capital assets		
Las Virgenes Municipal Water District	66,060,269	66,145,824
Triunfo Santiation District	33,136,527	33,238,212
Participants' investments in capital assets	99,196,794	99,384,036
Total net position	$ 99,196,794	$ 99,384,036

ITEM 5B

See accompanying Notes to the Basic Financial Statements

Las Virgenes-Triunfo Joint Powers Authority
Statements of Revenues, Expenses, and Changes in Net Position
For the Years Ended June 30, 2014 and 2013

	2014	2013
OPERATING REVENUES:		
Recycled water sales	$ 2,891,658	$ 3,008,162
Other income	212,888	280,769
Total operating revenues	3,104,546	3,288,931
OPERATING EXPENSES:		
Treatment plant	4,402,610	4,296,602
Recycled water transmission and distribution	1,520,483	1,287,171
Compost plant	2,478,561	2,631,634
Sewer	112,231	324,692
Depreciation	6,280,274	6,376,786
General and administrative	6,391,286	6,488,492
Other operating expenses	247,853	278,453
Total operating expenses	21,433,298	21,683,830
OPERATING (LOSS) BEFORE BILLINGS TO PARTICIPANTS	(18,328,752)	(18,394,899)
Billings to participants	12,037,292	12,004,050
OPERATING (LOSS)	(6,291,460)	(6,390,849)
NONOPERATING REVENUES (EXPENSES):		
Interest income	11,186	14,063
Loss on disposal of capital assets	(83,961)	(315,338)
Total nonoperating revenues (expenses)	(72,775)	(301,275)
NET (LOSS) BEFORE PARTICIPANTS' CAPITAL CONTRIBUTIONS	(6,364,235)	(6,692,124)
Participants' capital contributions	6,176,993	3,932,299
CHANGES IN NET POSITION	(187,242)	(2,759,825)
NET POSITION:		
Beginning of year	99,384,036	102,143,861
End of year	$ 99,196,794	$ 99,384,036

ITEM 5B

See accompanying Notes to the Basic Financial Statements

Las Virgenes-Triunfo Joint Powers Authority
Statements of Cash Flows
For the Years Ended June 30, 2014 and 2013

	2014	2013
CASH FLOWS FROM OPERATING ACTIVITIES:		
Cash received from participants	$ 15,072,347	$ 15,190,823
Cash paid to suppliers for operations	(15,185,103)	(15,504,428)
Net cash (used in) operating activities	(112,756)	(313,605)
CASH FLOWS FROM CAPITAL AND RELATED FINANCING ACTIVITIES:		
Acquisition of capital assets	(6,176,993)	(3,932,299)
Capital contributions	6,176,993	3,932,299
Net amount received from (paid to) participants	(114,350)	748,740
Net cash provided by (used in) captial and related financing activities	(114,350)	748,740
CASH FLOWS FROM INVESTING ACTIVITIES:		
Interest received	11,595	15,314
Net cash provided by investing activities	11,595	15,314
Net increase (decrease) in cash and cash equivalents	(215,511)	450,449
CASH AND CASH EQUIVALENTS:		
Beginning of year	6,379,701	5,929,252
End of year	$ 6,164,190	$ 6,379,701
RECONCILIATION OF OPERATING LOSSES TO NET CASH USED IN OPERATING ACTIVITIES		
Operating loss	$ (6,291,460)	$ (6,390,849)
Adjustments to reconcile operating loss to net cash provided by (used in) operating activities:		
Depreciation	6,280,274	6,376,786
Changes in operating assests and liabilities:		
(Increase) decrease in accounts receivable	(69,491)	(102,156)
(Increaes) decrease in inventories	(1,782)	11,154
(Increase) decrease in prepaid items	744	4,111
Increase (decrease) in accounts and contracts payable and accrued liabilities	(31,041)	(212,651)
Net cash (used in) operating activities	$ (112,756)	$ (313,605)
NONCASH CAPITAL AND RELATED FINANCING ACTIVITIES:		
Loss on disposal of capital assets	$ (83,961)	$ (315,338)
NONCASH INVESTING ACTIVITIES:		
Unrealized gain on investments	$ 1,703	$ 1,681

ITEM 5B

See accompanying Notes to the Basic Financial Statements

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ITEM 5B

Las Virgenes-Triunfo Joint Powers Authority
Notes to Basic Financial Statements
For the Years Ended June 30, 2014 and 2013

Note 1- Reporting Entity

On October 12, 1964, Las Virgenes Municipal Water District ("LVMWD") and Triunfo Sanitation District ("TSD") established Las-Virgenes-Triunfo Joint Powers Authority ("JPA") to construct, operate, maintain and provide for the replacement of a joint sewerage system to serve the Malibu Canyon drainage area. The equity of each member is equal to the member's pro-rata share of capital assets, net of depreciation. LVMWD has been the designated administering agent.

Note 2 – Summary of Significant Accounting Policies

Basis of Presentation

Financial statement presentation follows the recommendations promulgated by the Governmental Accounting Standards Board ("GASB") commonly referred to as accounting principles generally accepted in the United States of America ("U.S. GAAP"). GASB is the accepted standard-setting body for establishing governmental accounting and financial reporting standards.

Measurement Focus, Basis of Accounting and Financial Statements Presentation

The Financial Statements (i.e., the statement of net position, the statement of revenues, expenses and changes in net position, and statement of cash flows) report information on all of the activities of the JPA.

The Financial Statements are reported using the *"economic resources"* measurement focus and the accrual basis of accounting. Revenues are recorded when earned and expenses are recorded when a liability is incurred, regardless of the timing of related cash flows. Interest associated with the current fiscal period is considered to be susceptible to accrual and so has been recognized as revenue of the current fiscal period.

In accordance with GASB Statement No. 63, *Financial Reporting of Deferred Outflows of Resources, Deferred Inflows of Resources, and Net Position,* the Statement of Net Position reports separate sections for Deferred Outflows of Resources, and Deferred Inflows of Resources, when applicable.

Deferred Outflows of Resources represent outflows of resources (consumption of net position) that apply to future periods and that, therefore, will not be recognized as an expense until that time.

Deferred Inflows of Resources represent inflows of resources (acquisition of net position) that apply to future periods and that, therefore, are not recognized as a revenue until that time.

Operating revenues are those revenues that are generated from the primary operations of the JPA. The JPA reports a measure of operations by presenting the change in net position from operations as "operating income" in the statement of revenues, expenses, and changes in net position. Operating activities are defined by the JPA as all activities other than financing and investing activities (interest expense and investment income), and other infrequently occurring transaction of a non-operating nature. Operating expenses are those expenses that are essential to the primary operations of the JPA. All other expenses are reported as non-operating expenses.

ITEM 5B

Note 2 – Summary of Significant Accounting Policies (Continued)

Cash and Cash Equivalents

Cash and cash equivalents include all highly liquid investments with original maturities of 90 days or less and are carried at cost, which approximates fair value.

The JPA participates in an investment pool managed by the State of California titled Local Agency Investment Fund (LAIF), which has invested a portion of the pool funds in structured notes and asset-backed securities. LAIF's investments are subject to credit risk with the full faith and credit of the State of California collateralizing these investments. In addition, these structured notes and assets-backed securities are subject to market risk and to change in interest rates. The reported value of the pool is the same as the fair value of the pool shares.

Certain disclosure requirements, if applicable for deposit and investment risk, are specified for the following areas:

- Interest Rate Risk
- Credit Risk
  - Overall
  - Custodial Credit Risk
  - Concentration of Credit Risk
- Foreign Currency Risk

Accounts Receivable

Customer accounts receivable consist of amounts owed by private individuals and organizations for services rendered in the regular course of business operations. Receivables are shown net of allowances for doubtful accounts, if any. The JPA also accrues an estimated amount for services that have been provided, but not yet billed. Management has evaluated the accounts and believes they are all collectible.

Inventories

Inventories consist of expendable supplies and are valued at average cost method.

Prepaid items

Payments made to vendors for services that will benefit periods beyond the fiscal year ended are recorded as prepaid items.

Capital Assets

Capital assets are valued at historical cost, or estimated historical cost, if actual historical cost was not available. Donated capital assets are valued at their estimated fair market value on the date donated. The JPA policy has set the capitalization threshold for reporting capital assets at $5,000, all of which must have an estimated useful life in excess of one year. Depreciation is recorded on a straight-line basis over estimated useful lives of the assets, which range from 3 to 100 years.

Plant	10 - 100 Years
Machinery and equipment	3 - 25 Years

Capital assets are shared in accordance with each participant's capacity rights reserved in each component of the joint system. The allocation of costs for projects in process is based upon engineering estimates of the capacity rights and could increase or decrease when the final capacity rights are determined.

ITEM 5B

Note 2 – Summary of Significant Accounting Policies (Continued)

Net Position

Net position represents the difference between all other elements in the statement of net position and should be displayed in the following three components:

Net Investment in Capital Assets – This component of net position consists of capital assets, net of accumulated depreciation, reduced by the outstanding balances of debt that are attributable to the acquisition, construction, or improvement of those assets.

Restricted – This component of net position consists of restricted assets reduced by liabilities and deferred inflows of resources related to those assets.

Unrestricted – This component of net position is the amount of the assets, deferred outflows of resources, liabilities, and deferred inflows of resources that are not included in the determination of net investment in capital assets or the restricted component of net position.

Use of Restricted/Unrestricted Net Position

When both restricted and unrestricted resources are available for use, it is the JPA's policy to use restricted resources first, then unrestricted resources as they are needed.

Use of Estimates

The preparation of financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of the contingent assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the reporting period. Actual results could differ from those estimates.

Note 3 – Cash and Investments

At June 30, 2014 and 2013, cash and investments are reported in the accompanying statements of net position as follows:

	2014	2013
Cash and investments	$ 6,164,190	$ 6,379,701

At June 30, 2014 and 2013, cash and investments consisted of the followings:

	2014	2013
Deposits:		
Pooled with Las Virgenes Municipal Water District	$ 462,115	195,108
Investments:		
California Local Agency Investment Fund	5,702,075	6,184,593
Total cash and investments	$ 6,164,190	$ 6,379,701

Demand Deposits

At June 30, 2014 and 2013, the carrying amounts of cash deposits were $462,115 and $195,108, respectively, which were fully insured and/or collateralized with securities held by the pledging financial institutions in the LVMWD's name as discussed below.

The California Government Code requires California banks and savings and loan associations to secure the LVMWD's cash deposits by pledging securities as collateral. This Code states that collateral pledged in this manner shall have the effect of perfecting a security interest in such collateral superior to those of a general creditor. Thus, collateral for cash deposits is considered to be held in the LVMWD's name.

The fair value of pledged securities must equal at least 110% of the LVMWD's cash deposits. California law also allows institutions to secure the LVMWD's deposits by pledging first trust deed mortgage notes having a value of 150% of the LVMWD's total cash deposits. LVMWD may waive collateral requirements for cash deposits, which are fully insured up to $250,000 by the Federal Deposit Insurance Corporation. LVMWD, however, has not waived the collateralization requirements.

Local Agency Investment Fund

The JPA's investments with Local Agency Investment Fund (LAIF) include a portion of the pool funds invested in Structured Notes and Asset-Backed Securities. These investments include the following:

- **Structured Notes** - debt securities (other than asset-backed securities) whose cash flow characteristics (coupon rate, redemption amount, or stated maturity) depend upon one or more indices and/or that have embedded forwards or options.
- **Asset-Backed Securities** - the bulk of which are mortgage-backed securities, entitle their purchasers to receive a share of the cash flows from a pool of assets such as principal and interest repayments from a pool of mortgages (such as CMO's) or credit card receivables.

LAIF is overseen by the Local Agency Investment Advisory Board, which consists of five members, in accordance with State statute.

As of June 30, 2014, the JPA had $5,702,075 invested in LAIF, which had invested 1.86% of the pool investment funds in Structured Notes and Asset-Backed Securities compared to $6,184,593 and 1.96% at June 30, 2013.

ITEM 5B

Note 3 – Cash and Investments (Continued)

Investments Authorized by the California Government Code and the JPA's Investment Policy

The JPA follows LVMWD's investment policy. The table below identifies the investment types that are authorized for the JPA by the California Government Code (or the LVMWD's investment policy, where more restrictive). The table also identified certain provisions of the California Code (or the LVMWD's investment policy, where more restrictive) that address interest rate risk, credit risk, and concentration of credit risk.

Authorized Investment Type	Maximum Maturity	Percentage of Portfolio	Maximum Investment In One Issuer
U.S. Treasury Bills, Bonds and Notes	5 Years	None	None
U.S. Government Sponsored Agency Securities	5 Years	None	None
Time Deposits	1 Year	25%	None
Repurchase Agreements	30 days	10%	None
California Local Agency Investment Fund (LAIF)	None	None	$50,000,000
Local Government Investment Pools	None	None	None
Bond issued by Local Agencies or States	5 Years	None	None

Disclosures Relating to Interest Rate Risk

Interest rate risk is the risk that changes in market interest rates will adversely affect the fair value of an investment. Generally, the longer the maturity of an investment, the greater the sensitivity of its fair value to changes in market interest rates. One of the ways that the JPA manages its exposure to interest rate risk is by purchasing a combination of shorter term and longer term investments and by timing cash flows from maturities so that a portion of the portfolio is maturing or coming close to maturity evenly over time as necessary to provide the cash flow and liquidity needed for operations.

The JPA's investments of $5,702,075 and $6,184,593 at June 30, 2014 and 2013, respectively made up of investments in LAIF. Investments in LAIF are highly liquid, as deposits can be converted to cash within twenty-four hours without loss of interest.

Disclosures Relating to Credit Risk

Generally, credit risk is the risk that an issuer of an investment will not fulfill its obligation to the holder of the investment. This is measured by the assignment of a rating by a nationally recognized statistical rating organization. Investments in LAIF of $5,702,075 and $6,184,593 at June 30, 2014 and 2013, respectively are unrated.

Disclosures Relating to Custodial Credit Risk

The custodial credit risk for investments is the risk that, in the event of the failure of the counterparty (e.g., broker-dealer) to a transaction, a government will not be able to recover the value of its investment or collateral securities that are in the possession of another party. The California Government Code and LVMWD's investment policy do not contain legal or policy requirements that would limit the exposure to custodial credit risk for investments. With respect to investments, custodial credit risk generally applies only to direct investments in marketable securities. Custodial credit risk does not apply to a local government's indirect investment in securities through the use of mutual funds or government investment pools (such as LAIF).

Note 4 – Capital Assets

Summary of changes in capital assets for the year ended June 30, 2014 is as follows:

	Balance July 1, 2013	Additions	Deletions	Balance June 30, 2014
Capital assets, not being depreciated:				
Land and land rights	$ 12,258,791	$ -	$ -	$ 12,258,791
Construction in progress	3,529,251	6,176,993	(2,385,833)	7,320,411
Total capital assets, not being depreciated	15,788,042	6,176,993	(2,385,833)	19,579,202
Capital assets, being depreciated:				
Sewer and treatment plant	115,176,568	2,199,634	(178,630)	117,197,572
Compost plant and farm	63,056,581	17,467	(11,055)	63,062,993
Recycled water system	31,676,544	168,732	-	31,845,276
Total capital assets, being depreciated	209,909,693	2,385,833	(189,685)	212,105,841
Less: accumulated depreciation				
Sewer and treatment plant	(69,405,896)	(3,324,923)	100,039	(72,630,780)
Compost plant and farm	(40,373,702)	(2,093,029)	5,685	(42,461,046)
Recycled water system	(16,534,101)	(862,322)	-	(17,396,423)
Total accumulated depreciation	(126,313,699)	(6,280,274)	105,724	(132,488,249)
Total capital assets, being depreciated, net	83,595,994	(3,894,441)	(83,961)	79,617,592
Total capital assets, net	$ 99,384,036	$ 2,282,552	$ (2,469,794)	$ 99,196,794

Summary of changes in capital assets for the year ended June 30, 2013 is as follows:

	Balance July 1, 2012	Additions	Deletions	Balance June 30, 2013
Capital assets, not being depreciated:				
Land and land rights	$ 12,258,791	$ -	$ -	$ 12,258,791
Construction in progress	2,237,518	3,932,299	(2,640,566)	3,529,251
Total capital assets, not being depreciated	14,496,309	3,932,299	(2,640,566)	15,788,042
Capital assets, being depreciated:				
Sewer and treatment plant	114,333,855	1,440,829	(598,116)	115,176,568
Compost plant and farm	63,201,671	1,199,737	(1,344,827)	63,056,581
Recycled water system	31,676,544	-	-	31,676,544
Total capital assets, being depreciated	209,212,070	2,640,566	(1,942,943)	209,909,693
Less: accumulated depreciation				
Sewer and treatment plant	(66,570,238)	(3,344,372)	508,714	(69,405,896)
Compost plant and farm	(39,305,619)	(2,186,974)	1,118,891	(40,373,702)
Recycled water system	(15,688,661)	(845,440)	-	(16,534,101)
Total accumulated depreciation	(121,564,518)	(6,376,786)	1,627,605	(126,313,699)
Total capital assets, being depreciated, net	87,647,552	(3,736,220)	(315,338)	83,595,994
Total capital assets, net	$ 102,143,861	$ 196,079	$ (2,955,904)	$ 99,384,036

Note 5 – Due to Participants

During the year ended June 30, 2014 and 2013, additional advances received from the participants were in the amount of $18,095,923 and $16,685,528, respectively. The advances received from the participants are used to pay for the operating, capital, and administrative cost of the JPA. At June 30, 2014 and 2013, due to participants were in the amount of $6,533,985 and $6,648,335, respectively.

Note 6 – Participant Contributions

Cost of the JPA is shared by the participants based on the following methodology. Variable operation and maintenance cost are prorated between the participants based on the average sewage flow contributed to the joint system. Fixed operating and maintenance cost are prorated between the participants based on the participants' respective capacity rights in the facility. Capital costs are prorated between the participants based on the participants' respectively capacity rights in the facility. Annual audit costs are shared equally. General and administrative costs are based on the actual cost of labor. Lastly, land acquisition costs are shared based on the capacity rights in the project for which the land is acquired. As of January 1, 2005, the joint system, except for the sewer collection system, is allocated by 70.6% to LVMWD and 29.4% to TSD.

The following is the summary of the contributions made by the participants for the years ended June 30, 2014 and 2013:

	2014			
	Operating Contribution	Percentage	Capital Contribution	Percentage
LVMWD	8,254,018	68.6%	4,360,957	70.6%
TSD	3,783,274	31.4%	1,816,036	29.4%
Total	12,037,292	100.0%	6,176,993	100.0%

	2013			
	Operating Contribution	Percentage	Capital Contribution	Percentage
LVMWD	8,131,007	67.7%	2,776,203	70.6%
TSD	3,873,043	32.3%	1,156,096	29.4%
Total	12,004,050	100.0%	3,932,299	100.0%

Note 7 – Risk Management

The JPA is covered under the LVMWD's insurance policies. The LVMWD retained Argonaut Insurance Company for general liability, property, auto and physical damage. The coverage for the general liability provided for $11 million per occurrence and $61 million for the aggregate, with a $50,000 deductible per occurrence. The coverage for the property provided for $60 million per occurrence with a deductible of $50,000 per occurrence.

During the past three fiscal years, none of the above programs of protection have had settlement or judgments that exceeded pooled or insured coverage. There have been no significant reductions in pooled or insured liability cover from coverage in the prior year.

ITEM 5B

Note 8 – Commitment and Contingencies

Lawsuits

The JPA is a defendant in various lawsuits. Although the outcome of these lawsuits is not presently determinable, it is the opinion of the JPA's legal counsel and the JPA's management that resolution of these matters will not have a material adverse effect on the financial condition of the JPA.

Commitments

The JPA had outstanding contract commitments of $ 1,340,205 and $6,657,967 for the years ended June 30, 2014 and 2013, respectively.

As of June 30, 2014, in the opinion of the JPA's management, there were no additional outstanding matters that would have a significant effect on the financial position of the JPA.

SUPPLEMENTARY INFORMATION

ITEM 5B

Las Virgenes-Triunfo Joint Powers Authority
Schedule of Changes in Participants' Advance Accounts
For the Years Ended June 30, 2014 and 2013

	Construction Funds		Operating Funds	
	Tapia Plant and Truck Sewers		Operations and Maintenance	
	Las Virgenes Municipal Water District	Triunfo Sanitation District	Las Virgenes Municipal Water District	Triunfo Sanitation District
Due to (from) Participants - Beginning of year	$ 1,310,610	$ 154,137	$ 2,319,846	$ 1,061,709
Advance from parcipants	-	191,819	8,257,024	3,785,000
Interfund activities with participants	-	-	-	839,098
Constructions costs allocated	(786,586)	(327,559)	-	-
Billings to participants for operating expenses	-	-	(8,257,024)	(3,785,000)
Billings to participants from replacement fund interest income	-	-	-	-
Interest income from (to) participants	3,326	686	-	-
Recycled water billings to Triunfo Sanitation District	-	-	-	(839,098)
Due to (from) Participants - End of year	$ 527,350	$ 19,083	$ 2,319,846	$ 1,061,709

(Continued)

Las Virgenes-Triunfo Joint Powers Authority
Schedule of Changes in Participants' Advance Accounts (Continued)
For the Years Ended June 30, 2014 and 2013

	Operating Funds			
	Replacement of Capital Assets			
	Las Virgenes Municipal Water District	Triunfo Sanitation District	Total	
			2014	2013
Due to (from) Participants - Beginning of year	$ 836,840	$ 965,193	$ 6,648,335	$ 5,899,595
Advance from parcipants	4,535,303	1,326,777	18,095,923	16,685,528
Interfund activities with participants	-	-	839,098	789,907
Constructions costs allocated	(3,574,371)	(1,488,477)	(6,176,993)	(3,932,299)
Billings to participants for operating expenses	-	-	(12,042,024)	(12,010,005)
Billings to participants from replacement fund interest income	3,006	1,726	4,732	5,955
Interest income from (to) participants	-	-	4,012	(439)
Recycled water billings to Triunfo Sanitation District	-	-	(839,098)	(789,907)
Due to (from) Participants - End of year	$ 1,800,778	$ 805,219	$ 6,533,985	$ 6,648,335
			-	-

ITEM 5B

INFORMATION ONLY

December 1, 2014 JPA Board Meeting

TO: JPA Board of Directors

FROM: General Manager

Subject: Southern California Coastal Water Research Project (Pg. 52)

SUMMARY:

The Southern California Coastal Water Research Project (SCCWRP) is a joint powers authority created by a unique collaboration of 14 member agencies, including sanitation, stormwater, and regulatory agencies, working together to infuse science into their environmental management activities. SCCWRP has approximately 50 full-time staff members with more than 65% of them holding advanced scientific degrees.

SCCWRP serves as a national leader in water quality and aquatic habitat research; brings new monitoring and assessment techniques to the forefront of application; builds consensus among diverse groups of stakeholders; and hoses several laboratories and a regional data-sharing center.

Following is a list of SCCWRP's member agencies:

- California State Water Resources Control Board
- California Regional Water Quality Control Boards, Los Angeles, Santa Ana and San Diego
- U.S. Environmental Protection Agency, Region IX
- California Ocean Protection Council
- City of Los Angeles
- Los Angeles County Sanitation Districts
- Orange County Sanitation District
- City of San Diego
- Ventura County Watershed Protection District
- Los Angeles County Department of Public Works
- Orange County Public Works
- County of San Diego

Significance of SCCWRP to JPA:

In March 2013, staff presented the JPA Board with a strategy report to address new, increasingly stringent regulatory standards proposed for Malibu Creek. The report (copy attached) outlined a multi-pronged strategy aimed to ensure that new regulatory standards for Malibu Creek, and the associated implementation schedules, are scientifically-based, thoroughly vetted with the affected stakeholders, and affordable to the JPA and its ratepayers. Among the items included in the strategy was to develop a better scientific understanding of the unique characteristics of the Malibu Creek and its impact on water quality. Staff believes that there may be an opportunity for partnership and/or collaboration with SCCWRP to advance this initiative.

Meeting w/SCCWRP Executive Director:

On November 20, 2014, the Administering Agent/General Manager and Director of Resource Conservation and Public Outreach met with Dr. Stephen B. Weisberg, Executive Director of SCCWRP, at his office in Costa Mesa. Dr. Weisberg provided a tour of SCCWRP's facilities, explained SCCWRP's governance structure, and made introductions for several of his key staff members. Also, Dr. Weisberg and his staff provided an overview of several of the key active research efforts, including those for state's nutrient numeric endpoint framework and biological objectives.

Attached for reference are copies of SCCWRP's brochures describing its role in supporting environmental management and goals/research activities. Also attached is a copy of its approved Fiscal Year 2014-15 Research Plan.

FISCAL IMPACT:

No

ITEM BUDGETED:

No

Prepared By: David W. Pedersen, Administering Agent/General Manager

ATTACHMENTS:

Strategy to Address Regulatory Standards

SCCWRP Brochures

Fiscal Year 2014-15 Research Plan

STRATEGY TO ADDRESS PROPOSED REGULATORY STANDARDS FOR MALIBU CREEK

March 29, 2013

Purpose:

The purpose of this report is to outline a multi-pronged strategy to address stringent proposed regulatory standards for Malibu Creek. The goal is to ensure that new regulatory standards for Malibu Creek, and the associated implementation schedules, are scientifically-based with demonstrable and achievable objectives, thoroughly vetted with the affected stakeholders, and affordable to the JPA and its ratepayers.

Background:

On March 22, 1999, U.S. District Court Judge Saundra Brown Armstrong approved an "Amended Consent Decree" (Consent Decree) to settle the case of Heal the Bay, Santa Monica Baykeeper, et al. v. Browner, et al. The Consent Decree stipulated that the U.S. Environmental Protection Agency (EPA) would establish 530 Total Maximum Daily Loads (TMDLs) for the Los Angeles Region of the Regional Water Quality Control Board (RWQCB) over a 13-year period. The TMDLs were organized into 92 analytical units. Analytical Unit 50 included two TMDLs for the reach of Malibu Creek from Malibu Lagoon to Malibou Lake: (1) nutrients (algae), and (2) unnatural scum/foam.

In response to the Consent Decree, the EPA established a nutrient TMDL for Malibu Creek on March 22, 2003. In general, the TMDL set winter-time limits for inorganic nitrogen and phosphorous levels of 8.0 mg/L and 3.0 mg/L, respectively, and summer-time limits for the same of 1.0 mg/L and 0.1 mg/L, respectively. However, the infrequent summer-time discharges from the Tapia Water Reclamation Facility (Tapia WRF) were characterized as de minimis, which provided some relief from the stringent summer-time limits. The JPA constructed major facility improvements for the Tapia WRF to comply with the new limits, costing the ratepayers approximately $10 million.

On September 1, 2010, the court approved a "Modified Amended Consent Decree" (Modified Consent Decree) that changed a number of terms of the original Consent Decree. Specifically, four new TMDLs were added to the Consent Decree, 14 TMDLs were removed, and the deadlines for seven TMDLs were extended to March 24, 2013. Among the newly added TMDLs were two for Malibu Creek: (1) benthic-macroinvertebrate bioassessments, and (2) sedimentation/siltation. The first TMDL was unusual because the EPA had not yet approved a Clean Water Act 303(d) listing for benthic-macroinvertebrate impairments in Malibu Creek and benthic-macroinvertebrates are not pollutants, which normally are to be paired with water bodies when establishing TMDLs pursuant to the Clean Water Act.

The EPA released a nearly 200-page draft TMDL to address benthic-macroinvertebrate bioassessments on December 12, 2012. The water quality limits proposed under the draft TMDL consisted of 1.0 mg/L for total nitrogen and 0.1 mg/L for total phosphorous. The JPA reviewed the document and provided detailed comments on the proposed TMDL, citing serious flaws in the science used as a basis for the new regulatory standards. The TMDL was largely dismissive of the unique characteristics of Malibu Creek and the surrounding geology, namely the Monterey Formation. At this time, the JPA believes that it is unrealistic that the EPA can earnestly address the extensive comments submitted by the JPA and other stakeholders by the March 24, 2013 deadline to establish the TMDL.

Strategy Development:

Following is a summary of the JPA's proposed strategy to address the TMDL, considering the regulatory process, public outreach, political advocacy, economic considerations, and scientific investigation.

1. Regulatory Process

Actively engage in the regulatory process for establishment and implementation of Malibu Creek water quality standards.

The JPA will continue to actively engage in the regulatory processes for Malibu Creek water quality standards. These regulatory processes for establishment and implementation of regulatory standards for Malibu Creek generally include opportunities for the affected stakeholders to review drafts and provide comments to the regulatory authority. Assuming that the EPA establishes the benthic-macroinvertebrate TMDL on March 24, 2013, it will be critical for the JPA to prepare in advance to review and comment on the proposed implementation of the TMDL. JPA staff will work to build a broad coalition of affected stakeholders to propose re-evaluation of the basis for the TMDL and a realistic implementation schedule. This approach may include stakeholder meetings with the Los Angeles RWQCB, the regulatory agency with implementation authority for the TMDL, prior to the release of any additional proposed regulations. The stakeholder group will include a cross-section of public agencies, community groups, and professional organizations (i.e. CASA, ACWA, SCAP, WEF, NACWA, AWWA). Additionally, staff will attempt to reach out to environmental organizations to seek common ground on the issues. The Ojai Valley Sanitation District has recently experienced a positive outcome with a similar approach for the Ventura River algae TMDL.

2. Economic Considerations

Determine and communicate to the JPA's ratepayers the total estimated cost of compliance with the proposed regulatory standards.

A complete assessment of the proposed regulations requires an understanding of the total cost of compliance, including initial capital costs and on-going operations and maintenance expenses. A preliminary report prepared in 2005 estimated that the 2003 summer-time TMDL standards (effectively similar to the currently proposed year-round standards) would require $160 million in infrastructure improvements with substantial on-going operations and maintenance costs. The estimate did not include the cost of brine disposal that would be required for the reverse osmosis treatment system recommended at that time because there were no practical options for its disposal. These brine disposal costs need to be estimated, and the 2005 figures should be updated to current day dollars. Potential financing options and the impact on wastewater rates also need to be considered. The cost of alternative methods of compliance, such as construction of an ocean outfall, should be established to allow the JPA Board to weight its options. In 2006, the estimated cost to construct a force main and gravity-flow pipeline through Malibu Canyon to a subsurface ocean outfall was $54.8 million. Finally, the economic impact must be communicated to the JPA's ratepayers in a meaningful way (i.e. explaining how it would affect their bill).

3. Public Outreach

Communicate effectively with the JPA's customers on the impacts of the proposed regulatory standards for Malibu Creek.

Communication with the JPA's customers on the impacts of the proposed regulatory standards for Malibu Creek will be important to ensure that their interests and concerns are adequately represented by staff. Also, customers should be provided with an explanation of the intent of the proposed regulations and information on whether or not the intended outcome is attainable. The communications will need to be understandable (i.e. no jargon) and two-way, allowing customers to provide input and feedback. The messages should be tailored to the target audience and provide sufficient context to enable customers to "bring it home" (i.e. determine the potential impact to their household). Additionally, the communications should offer possible solutions to address the problem rather than focusing entirely on the shortcomings of the proposed regulatory standards. Customers should also be provided with the opportunity to suggest solutions of their own. A variety of communication tools will likely be

utilized, including printed media, web-based outreach, social media, and speakers bureau presentations.

4. Political Advocacy

Advocate for balanced regulations and implementation schedules with the help and support of elected/appointed officials.

Elected and appointed officials representing the JPA's customers can influence the process to establish and implement new regulatory standards for Malibu Creek. Beginning with the JPA Board members, staff will brief these officials with key concerns and provide talking points for their use in communicating a consistent message to others. Briefings will also periodically be provided to local, state, and federal elected officials and/or their staffs to spread awareness and request assistance. Meetings with the Los Angeles RWQCB members and State Water Resource Control Board members may also be helpful prior to decision-making actions by the two governing bodies. Additionally, the JPA can submit comment letters on appointments to the State Water Resources Control Board and RWQCB, which require Senate confirmation, in an effort to ensure that the appointed officials will fairly balance the competing interests that come before their governing bodies.

5. Scientific Investigation

Develop a better scientific understanding of the unique characteristics of the Malibu Creek Watershed and its impact on water quality.

A thorough scientific understanding of the unique characteristics of the Malibu Creek Watershed and its impact on water quality is essential to ensure that proposed regulations are appropriate and effective. Additional study of the influence of the Monterey Formation on water quality and benthic-macroinvertebrate communities is necessary. A more thorough evaluation of the stressors affecting water quality and their linkage to Malibu Creek's water quality impairments is warranted. Partnerships and collaboration with universities and professional organizations will likely yield the greatest opportunities for better scientific understanding of the watershed. Also, it will be important to maintain the in-house expertise to critically evaluate the new regulatory standards and oversee the JPA's participation in relevant research efforts.

Summary and Conclusions:

The JPA's success to address stringent proposed regulatory standards for Malibu Creek will require a multi-pronged strategy, considering the regulatory process, public outreach, political advocacy, economic considerations, and scientific investigation. The strategy will require strong collaboration among the various stakeholders to ensure that the proposed regulatory standards are scientifically-based with demonstrable and achievable objectives, thoroughly vetted with the affected stakeholders, and affordable to the JPA and its ratepayers.

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SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT

What is SCCWRP?

SCCWRP is a Joint Powers Authority created by a unique collaboration of 14 member agencies, including sanitation, stormwater, and regulatory agencies, working together to infuse science into their environmental management activities.

Who is SCCWRP?

SCCWRP has approximately 50 full-time staff members; more than 65% of the staff hold advanced scientific degrees.

What does SCCWRP do?

- Serves as a national leader in water quality and aquatic habitat research.
- Brings new monitoring and assessment techniques to the forefront of application.
- Builds consensus among diverse groups of stakeholders.
- Houses several laboratories and a regional data-sharing center.

ITEM9A

Member Agencies

California State Water Resources Control Board

California Regional Water Quality Control Boards, Los Angeles, Santa Ana, and San Diego

US Environmental Protection Agency, Region IX

California Ocean Protection Council

City of Los Angeles

Los Angeles County Sanitation Districts

Orange County Sanitation District

City of San Diego

Ventura County Watershed Protection District

Los Angeles County Department of Public Works

Orange County Public Works

County of San Diego

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www.sccwrp.org

SCCWRP
Established 1969

A Public Agency for Environmental Research

SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT

Building a Scientific Foundation for Environmental Management

Find more online at **www.sccwrp.org**

SCCWRP investigates ways in which humans affect the coastal environment and vice-versa.

SCCWRP studies a variety of coastal aquatic environments, from watersheds to the ocean.

- SCCWRP scientists conduct impartial research to answer questions such as "Is the ecosystem healthy?" and "Is it safe to swim?"
- Research themes include regional monitoring, contaminants, stormwater, wetlands, nutrients, beach water quality, marine debris, and information management.

SCCWRP transitions new beach sand monitoring techniques to the user community.

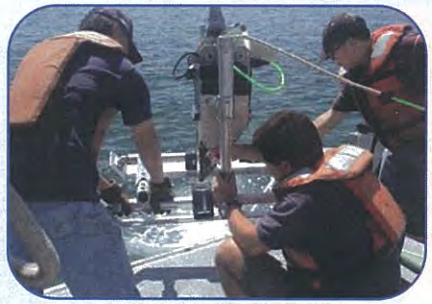
SCCWRP hosts an annual symposium to exchange knowledge with member agency staff.

SCCWRP provides a vital linkage between coastal environmental science and management.

- The SCCWRP Commission is made up of leaders from each member agency, representing both regulatory and regulated perspectives.
- This unique collaboration promotes integration of the latest scientific findings into environmental management practices.
- SCCWRP's structure forms a basis for positive interaction among government, nonprofit, and academic organizations.

SCCWRP conducts nearly all of its projects in partnership with other organizations.

- Partnerships are essential to building scientific consensus and effectively informing policy objectives.
- Pooling resources enables partners to more cost-effectively implement projects, utilize specialized skills, and obtain more robust results.
- Collaboration allows SCCWRP to engage audiences on a statewide, national, and global level.



SCCWRP and partners pilot test a new sediment quality assessment technology.

Featured Project: ***Southern California Bight Regional Monitoring Program***

Every five years SCCWRP facilitates a regional monitoring survey of the Southern California Bight, coordinating over 90 participating organizations to produce a spatially extensive, holistic assessment of environmental conditions.

Member Agencies

Water Boards

United States Environmental Protection Agency

California Ocean Protection Council

Orange County Sanitation District

City of Los Angeles Sanitation Department of Public Works

Metropolitan Wastewater Department

Sanitation Districts of Los Angeles County

Watershed Protection District Ventura County

The Noblest Motive is the Public Good — County of San Diego

County of Los Angeles Public Works

County of Orange California

ITEM 9A

Mission

Make a positive contribution to the scientific understanding of linkages among human activities, natural events, and the health of the southern California coastal environment, communicate this understanding to decision makers and stakeholders, and help develop strategies to protect the environment for this and future generations.

To learn more about SCCWRP research, download publications, or access data please visit our website:

www.sccwrp.org

Southern California Coastal Water Research Project

A Public Agency for Environmental Research

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Southern California Coastal Water Research Project

SCCWRP Established 1969

A Public Agency for Environmental Research

Southern California Coastal Water Research Project:

Science to Inform Environmental Management

History

The concept of a regional authority for marine research was conceived in the late 1960's by leaders of several southern California sanitation agencies. Originally intended as a three-year project, SCCWRP was created in 1969 through a Joint Powers Agreement (JPA).

Joint Powers Authority - A public agency that is formed when several government agencies have a common mission that can be better achieved by pooling resources and knowledge.

Strategic Goals

SCCWRP aims to:

- Answer questions relevant to coastal environmental management, such as:
  - ◊ Is it safe to eat fish?
  - ◊ Is it safe to swim?
  - ◊ Are natural resources protected?
  - ◊ Is the ecosystem healthy?
- Develop, participate in, and coordinate programs that will improve understanding of coastal ecology
- Effectively communicate the research findings to decision-makers and stakeholders
- Serve as a catalyst to form partnerships and alliances

Research Activities

Regional Monitoring

SCCWRP organizes collaborative programs that assess the cumulative effectiveness of environmental management in southern California. These serve to standardize methodologies regionally, provide context for interpreting local results, and foster collaborative development of data interpretation tools.

Stormwater

SCCWRP investigates processes that affect sources and fates of watershed derived pollutants in both wet and dry weather runoff. These data are used to generate models and other tools that assist managers in controlling the adverse effects of stormwater.

Wetlands

SCCWRP produces scientific data and diagnostic tools that improve regional capabilities for the assessment, conservation, restoration, and management of wetland and riparian resources.

Contaminants

SCCWRP develops methods that allow environmental managers to assess the ecological effects of both legacy and emerging contaminants (e.g., endocrine disruptors and current use pesticides).

Nutrients

SCCWRP works to ascertain the extent and magnitude of nutrient related impacts to California streams, estuaries, and coastal waters. SCCWRP also studies factors that stimulate ecosystem responses to nutrient loading, such as harmful algal blooms.

Beach Water Quality

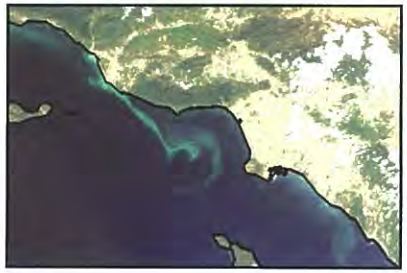
SCCWRP is developing new, molecular methods to improve beach monitoring. These are potentially much faster and better correlated with health risk. Molecular identification of fecal bacteria will allow managers to better mitigate contamination sources.

Marine Debris

SCCWRP assesses human impact on the marine environment by conducting studies to quantitatively characterize the type and amount of debris found on beaches and in marine ecosystems.

Other SCCWRP Research

SCCWRP is active in emerging fields of interest to the environmental management community, such as satellite oceanography and the atmospheric deposition of pollutants.



SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT

FY 2014/2015
RESEARCH PLAN

Commission Approved

June 2014

ITEM 9A

CONTENTS

INTRODUCTION

The Southern California Coastal Water Research Project Authority (SCCWRP) is a research institute studying the coastal ecosystems of Southern California, from watersheds to the ocean. SCCWRP works closely with its member agencies, among them dischargers, watershed managers, and regulators, to provide the scientific foundation for ambient water quality management in the region.

Each year, SCCWRP prepares a Research Plan describing anticipated research activities for the upcoming fiscal year. The Plan provides an overview of SCCWRP's research foci, as well as details about specific projects. Many of these projects and project areas remain consistent from year to year due to their alignment with multi-year strategic efforts. SCCWRP's quarterly Director's Report provides more frequent updates on research objectives and individual projects as related to the Research Plan. Both the Research Plan and the Director's Reports can be accessed year-round on the SCCWRP website (www.sccwrp.org).

The Research Plan is organized by project purpose, with research activities falling into three main areas: development of new environmental assessment methodologies and tools, science to support management or regulatory programs, and regional monitoring programs to assess status and trends in ecosystem conditions. Projects are next grouped by scientific disciplines or habitats. Although some projects may be representative of more than one category, reflecting the interdisciplinary nature of SCCWRP research, each appears only once. Project descriptions detail the goals, current status, collaborators, funders, and lead investigator contact information for each project. Readers are encouraged to contact the project's lead investigator(s) for additional information.

A. ENVIRONMENTAL ASSESSMENT METHOD/TOOL DEVELOPMENT

One of SCCWRP's main research functions is to investigate, test, refine, validate, and transfer new environmental assessment technologies to Southern California's water quality management community. SCCWRP is consistently on the leading edge of environmental assessment method and/or tool development for the region, and in some cases, for the state, national, and international scientific community. Method/tool development is often initiated in response to a particular problem or need, morphing novel scientific techniques into usable and reliable applications. SCCWRP's emphasis is not only on discovering new ways of understanding the environment, but also on leveraging the organization's linkage to the management community to transition new methods and tools into real-world applications.

In support of this function, many of SCCWRP's current research activities take advantage of recent advances in molecular biology and genetic technology, which offer a new way of examining the diversity of aquatic life and how chemicals interact with biological systems. These methods offer potential advantages in time, cost, accuracy, reproducibility, and detection ranges. Additionally, new methods and tools are being developed to more fully understand previously unstudied contaminant classes and needs specific to California's ecosystems.

1. Chemistry Assessment

a. Emerging Contaminant Prioritization

Contaminants of emerging concern (CECs) encompass a vast number of largely unregulated compounds that lack data on occurrence and potential toxicity in the environment. A wide variety of substances including pharmaceuticals, flame retardants, contemporary pesticides, and even food additives are considered CECs. Many CECs have been present in the environment for years or even decades but were not previously detectable using available analytical methods. Recent technological advances have improved capabilities for CEC detection and quantification in environmental media, leading to increased attention on determining their potential hazards. Traditionally, identifying CECs with the highest risk to ecological and human health requires knowledge of their fate once discharged into the environment, as well as high quality exposure (occurrence) and toxicological data to support threshold development. The State of California previously sponsored an expert Science Advisory Panel for CECs to develop a prioritization approach to help guide permit monitoring programs. However, the expert panel was challenged by the limited amount of occurrence data available.

The purpose of this project is to enhance the availability of CEC occurrence data. This data will enable the state and advisory panel to continue prioritizing the CECs of greatest concern. SCCWRP will collect occurrence data in sediments at regional scales utilizing the Bight Regional Monitoring Program (see project C1a). A more spatially focused effort will also target potential CEC sources near Los Angeles. Tissue screening for CECs will be accomplished via a partnership with the National Oceanic and Atmospheric Administration's Mussel Watch program. Finally, SCCWRP will help develop a statewide monitoring study design and associated implementation plan for incorporating CECs into California's Surface Water Ambient Monitoring Program.

Lead Investigator: Dr. Keith Maruya (keithm@sccwrp.org)

Collaborators: Los Angeles Regional Water Quality Board (J. Michael Lyons), Los Angeles County Sanitation Districts (Joe Gully, Ann Heil), participants in the Bight '13 Regional Monitoring Program, Colorado School of Mines (Dr. Jorg Drewes), National Oceanic and Atmospheric Administration, State Water Resources Control Board

External Funding Support: State Water Resources Control Board, Los Angeles Regional Water Quality Control Board

b. Bioanalytical Screening Tools

While new chemical methods and environmental occurrence data can help prioritize monitoring and assessment efforts in the short term, the large number of potential CECs (in the tens of thousands of chemicals) makes it impractical to implement a traditional chemical-specific monitoring approach. The State of California's Science Advisory Panel for CECs encouraged development of bioanalytical screening techniques to meet this challenge. Bioanalytical screening techniques elicit cellular responses such as estrogenicity, androgenicity, or carcinogenicity after exposure to toxic compounds. These techniques can integrate measurement of multiple chemicals, account for unknown chemicals, and elucidate the cumulative potency of complex chemical mixtures.

This study evaluates whether selected bioanalytical methods can be used as monitoring tools for recycled water and ambient waters receiving treated wastewater effluent and stormwater discharge. Many bioanalytical screening tools adapt methods recently developed by the US Environmental Protection Agency and National Institute of Environmental Health Sciences for other, sometimes nonaquatic, exposure scenarios. This project will test and evaluate different methods to isolate the best performing bioanalytical screening tools for regional recycled water and ecosystem health applications. The best performing assays will be applied within the Bight '13 Regional Marine Monitoring Program (see project C1a) and as part of the Stormwater Monitoring Coalition's 5-year strategic plan to evaluate the tools' relevance to ecosystem protection where stressors (i.e.,

contaminant chemistry) and biological response (i.e., sediment toxicity tests and biological communities) are being measured synoptically. The new bioassays will also be evaluated on extracts from marine environmental samples (e.g., sediment, tissue) collected throughout the Southern California Bight.

Lead Investigator: Dr. Keith Maruya (keithm@sccwrp.org)

Collaborators: Griffith University (Dr. Fred Leusch), Life Technologies Inc. (Mr. John Printen), UC Riverside (Dr. Daniel Schlenk), University of Arizona (Dr. Shane Snyder), University of Florida (Dr. Nancy Denslow), University of Queensland (Dr. Beate Escher), University of South Florida (Dr. Sandy Westerheide), San Diego Regional Water Quality Control Board (Dr. Lilian Busse), Scripps Institution of Oceanography (Dr. Lihini Aluwihare), San Diego State University (Dr. Eunha Hoh).

External Funding Support: State Water Resources Control Board; Scripps Center for Oceans and Human Health

c. Non-targeted Analysis

Approved measurement methods have been developed for many historic environmental contaminants, but CECs number in the thousands and include a wide range of pharmaceuticals and personal care products, current-use pesticides, natural and/or synthetic hormones, and industrial and commercial chemicals. Measurement methods are available for only a handful of these and it is impractical to develop methods beyond those that are prioritized as markers for recycled and ambient waters. This creates a need for non-targeted analysis methods that can be used when bioanalytical screening reveals a sample of concern for which the unknown chemicals causing the response must be determined.

This project seeks to develop analytical methods for all CECs, including unknowns. It uses two dimensional gas chromatography and time-of-flight-mass spectrometry (GCxGC-TOF-MS) to identify, in a non-targeted manner, multiple classes of CECs in tissue, sediment, and water samples from selected receiving water environments. Non-targeted analysis may serve as a useful periodic screening tool or as guidance for selecting appropriate targeted analytical methods in regional monitoring projects. In addition, the comparison of non-targeted "fingerprints" may be useful in distinguishing source contaminants, such as those found in treated wastewater effluent and storm water, from naturally occurring contaminants. Work this year will focus on expanding the mass spectral library (chemical "fingerprints") representing sediment and biological tissue samples (e.g., bivalves, marine mammals, bird eggs) from coastal California as well as other regions.

Lead Investigator: Dr. Nathan Dodder (nathand@sccwrp.org)

Collaborators: CSU San Diego (Dr. Eunha Hoh), National Institute of Standards and Technology (Dr. John Kucklick), San Francisco Estuary Institute (Margaret Sedlak), University of Hohenheim (Dr. Walter Vetter)

External Funding Support: Scripps Center for Oceans and Human Health, University of Hohenheim

d. Analytical Methods for Emerging Contaminants

Traditional analytical methods determine the bulk amount of individual target chemicals in an environmental sample. Approved measurement methods have been developed for most historic environmental contaminants (e.g., DDTs, PCBs); however, these methods do not perform well for many classes of contaminants of emerging concern (CECs). Thus, new methods are needed for robust measurement of priority CECs, such as consumer and commercial chemicals that have a high probability for occurrence in potable and receiving waters at levels that pose a potential environmental threat.

This project involves developing analytical methods for priority CEC analytes such as alkylphenols (e.g., nonylphenol), synthetic musks used as fragrances in consumer products, and high production flame retarding chemicals. CEC residues will be quantified in environmental samples using accelerated solvent extraction and single quadrapole mass spectrometry. Method development will consist of optimizing extraction and determinative protocols for each targeted CEC class, followed by method performance validation in collaboration with other laboratories.

Lead Investigator: Dr. Keith Maruya (keithm@sccwrp.org)

Collaborators: University of Arizona (Dr. Shane Snyder), US Geological Survey (Dr. James Gray), Duke University (Dr. Lee Ferguson), Virginia Institute of Marine Science (Dr. Mark LaGuardia), CSU Long Beach (Richard Gossett), National Institute of Standards and Technology (Dr. John Kucklick), University of California, Riverside (Dr. Dan Schlenk)

External Funding Support: Los Angeles Regional Water Quality Control Board

e. Passive Samplers

Multiple line of evidence approaches to assessing sediment and water column contaminants typically measure total (bulk) contaminants. However, in many instances, bulk chemistry does not reflect the pool of contaminants available to organisms, resulting in a lack of concordance between observed chemistry and biological impact data. Attempts to improve contaminant partitioning estimates by modifying conventional measurements and/or parameters (e.g., total organic carbon normalization or toxic unit estimation) have

met with limited success. In contrast, passive sampling methods (PSMs), including solid phase microextraction and polyethylene samplers previously developed at SCCWRP, have shown great promise in quantifying the bioavailable contaminant pool for sediment- and water-associated organic constituents and metals. Further testing is needed to determine if PSMs can predict the amount of uptake and bioaccumulation by sentinel test species, such as fish and benthic invertebrates, and therefore the contaminants' potential toxic impacts.

This project will evaluate whether PSMs can better predict exposure, bioaccumulation, and observed sediment toxicity in coastal water bodies. Experiments and field studies will be performed using PSMs to quantify the bioavailable fraction of high priority water column and sediment contaminants (e.g., DDTs, pyrethroids, fipronil, PBDEs). They will take place in conjunction with efforts to characterize toxicity parameters (i.e., LC_{50}) and bioaccumulation profiles for the same model compounds. The extent of equilibrium for passive samplers will also be determined using preloaded performance reference compounds.

Lead Investigator: Dr. Keith Maruya (keithm@sccwrp.org)

External Collaborators: Exxon-Mobil (Dr. Tom Parkerton), National Oceanic and Atmospheric Administration (Dr. Peter Landrum, ret.), State Water Resources Control Board (Chris Beegan), Loyola Marymount University (Dr. Rachel Adams), US Environmental Protection Agency (Dr. Robert Burgess, Judy Huang), University of California, Riverside (Dr. Jay Gan), Applied Marine Sciences (Jay Johnson)

External Funding Support: University of California, Riverside, ITSI-Gilbane

2. Toxicity Assessment

a. Molecular Tools for Toxicity Identification Evaluation

The Toxicity Identification Evaluation (TIE) process uses a variety of chemical/physical separation methods and treatments to remove one or more toxicant classes, coupled with toxicity testing following each manipulation. Although helpful in identifying the contaminant classes of greatest concern, traditional TIE methods have several drawbacks including cost, poor chemical specificity, poor sensitivity to low-level toxic effects, and limited applicability to field exposure situations. Recent advances in molecular biotechnology may allow development and application of improved methods based on genomics (e.g., gene expression or protein production analysis). Gene microarrays, particularly when linked to higher level effects on the test organism (e.g., growth, reproduction), have the potential to simultaneously measure effects on multiple

physiological systems, providing a sensitive measure of a contaminant's or sample's toxicological effects.

This project will develop a new suite of TIE tools for both laboratory and field applications. This involves gene expression microarray development for sentinel organisms (including marine and freshwater fish and invertebrates), documentation of gene expression profiles for target contaminants, and comparison of the microarray results to conventional toxicity test and TIE methods. Models will be developed for toxicant identification based on amphipod gene expression, applying gene expression microarrays to investigate hornyhead turbot gene expression responses to legacy contaminants and CECs, and examining linkages between gene expression changes and higher order effects (protein production, histopathology, reproductive effects) in fathead minnows exposed to endocrine disrupting compounds.

Lead Investigator: Steve Bay (steveb@sccwrp.org)

Collaborators: Environment Canada (Graham Van Agglen), Los Angeles County Sanitation Districts, UC Berkeley (Dr. Chris Vulpe), UC Davis Marine Pollution Studies Laboratory (Brian Anderson), UC Riverside (Dr. Daniel Schlenk), University of Florida (Dr. Nancy Denslow), University of North Carolina (Dr. Susanne Brander)

External Funding Support: Environment Canada, Los Angeles County Sanitation Districts, San Francisco Estuary Institute

3. Biological Assessment

a. Rocky Reefs

Rocky reefs, most easily identified by forests of giant kelp (*Macrocystis*), are among the most productive marine ecosystems on earth. These habitats span at least one-quarter of the Southern California coastline, but are sensitive to water quality stress, suffer from fishing pressure, and respond dynamically to natural fluctuations such as temperature and wind and wave climates. A number of programs manage rocky reef habitats and associated biota, but lack standardized assessment tools that can be used to score sites, define status, and evaluate trends. This lack of standardization has limited communication of complex biological information to environmental managers in a simple, straightforward manner.

This project will develop a rocky reef assessment index. Previously held workshops built consensus among the state's rocky reef ecology experts about attributes used for ranking biological condition. This information will be used to implement status assessments and stressor responses via the Southern California Bight Regional Monitoring Program (see project C1a) and monitoring of the region's Marine Protected Areas, established in 2011.

Lead Investigator: Ken Schiff (kens@sccwrp.org)

Collaborators: Occidental College (Dr. Dan Pondella), UC Santa Barbara (Dr. Jenn Casselle), Marine Protected Area Monitoring Enterprise

External Funding Support: South Orange County Water District

b. DNA Barcoding

Species assemblages are often used as indicators of environmental condition; however, traditional methods for identifying and quantifying organisms can be time-consuming and labor-intensive. This project explores the efficacy of DNA barcoding, in which a short gene sequence from a standardized position in the genome is measured as an alternative tool for rapidly identifying species. The first step to barcoding is building a library of sequences from known reference specimens. After that, unknown specimens can be identified by looking up their sequences in the reference library. Species composition can then be translated to correspond with existing indices of biological integrity. Additionally, barcode speciation data could reveal instances where reassessment of taxonomy is warranted.

The goal of this project is to assess the efficacy of barcoding for rapidly identifying benthic invertebrate and algal species in marine and freshwater samples from Southern California. Aspects to this project include: a) establishing a DNA barcode reference library of voucher specimens identified both using traditional taxonomic methods and a genetically sequenced barcode; b) developing protocols for sample processing, including suitable fixatives that do not degrade genetic material; c) determining how to correlate barcode data with existing quantitative indices; and d) working toward next-generation sequencing methods to analyze composite DNA samples. This year's efforts will focus on leveraging the Bight Regional Monitoring Program (see project C1a) to enhance the barcoding library for the marine environment, analyzing the effect of increased taxonomic resolution from barcoding on sensitivity of existing freshwater biological indices, and evaluating the ability to determine invertebrate community composition from environmental DNA (eDNA; a composite of free-floating DNA extracted directly from the water column).

Lead Investigator: Dr. Eric Stein (erics@sccwrp.org)

Collaborators: Canadian Centre for DNA Barcoding (Dr. Peter Miller), SCCWRP member agencies, Stroud Water Research Center (Dr. Bernard Sweeney), US Environmental Protection Agency (Dr. Erik Pilgrim).

External Funding Support: None at this time

c. Cyanobacteria

Cyanobacteria blooms are a global problem and have been found throughout California in freshwater and brackish habitats. Cyanobacteria produce toxins that can cause wildlife mortality and are associated with liver cancer and tumors in humans. Cyanotoxins transported in coastal runoff can also affect marine ecosystems, causing mortality in California sea otters. Despite the health risks associated with cyanotoxins, insufficient data is available on the prevalence of cyanobacterial blooms and cyanotoxin concentrations in Southern California water bodies. A better understanding of the temporal patterns and environmental drivers for bloom occurrence and toxin production is needed before effective regulatory or remediation actions can be implemented.

The goals of this project are to a) document the prevalence of cyanobacterial blooms and toxin concentrations in a variety of fresh and brackish water habitats in Southern California, b) document temporal patterns of bloom occurrence and toxin concentrations by pilot-testing novel cyanotoxin monitoring methods, c) increase understanding of environmental drivers for cyanobacterial bloom occurrence and toxin production, and d) recommend ways to optimize monitoring. Habitats for cyanobacteria prevalence measurements will include depressional wetlands (see project C3b) and reference streams in the San Diego region (see project C2b).

Lead Investigators: Dr. Betty Fetscher (bettyf@sccwrp.org), Dr. Meredith Howard (merdithh@sccwrp.org)

Collaborators: UC Santa Cruz (Dr. Raphael Kudela)

External Funding Support: None at this time

d. Non-perennial Streams

More than 100 samples are collected from perennial wadeable streams each year in an effort to assess biological condition. The State Water Resources Control Board is developing biological objectives to create a regulatory framework for protecting highly functional streams and restoring impacted streams. However, only about one-third of the stream-miles in southern California coastal watersheds are perennial (have year-round flow). The majority of stream miles are non-perennial, and most of these are located in lightly developed watersheds susceptible to future urban growth. Ecosystem management and protection efforts for non-perennial streams will require development or adaptation of monitoring tools and assessment mechanisms.

This project will evaluate applicability of current biological assessment tools originally created for perennial streams in non-perennial systems. It has four components including

a) identifying reference sites with a range of non-perennial flow characteristics; b) sampling flow, biology, and a variety of physical and chemical parameters throughout wetting and drying cycles; c) calculating biological objective scores to identify critical flow conditions for biological communities; and d) comparing results across a host of non-perennial and perennial sites with a range of anthropogenic stress exposure. If existing scoring tools prove untenable, new scoring tools that better reflect the natural variability of non-perennial ecosystems must be evaluated.

Lead Investigator: Dr. Eric Stein (erics@sccwrp.org)

Collaborators: California Department of Fish and Wildlife (Dr. Peter Ode), San Diego Regional Water Quality Control Board (Dr. Lilian Busse)

External Funding Support: State Water Resources Control Board

e. Soft-bottom Benthos

Benthic community assessment is a cornerstone of marine monitoring and has become a central element of regulatory programs, such as the California's Sediment Quality Objectives for bays and estuaries. To date, SCCWRP researchers have calibrated and validated benthic indices for two nearshore habitats: Southern California marine bays and polyhaline (high salinity) portions of San Francisco Bay. There is still need for index development in other habitats, such as the low salinity mesohaline and tidal freshwater environments. These habitats are particularly challenging because the natural salinity stress leads to the community having a lesser number of, and more stress tolerant, organisms than in higher salinity habitats.

The objective of this project is to develop and calibrate benthic indices for the mesohaline environment of San Francisco Bay. The process will rely on an expert panel to define reference conditions prior to application of several index approaches, including the Index of Biotic Integrity, the Benthic Response Index and the AMBI.

Lead Investigator: Dr. Eric Stein (erics@sccwrp.org)

Collaborators: None at this time

External Funding Support: San Francisco Estuary Institute

4. Microbiological Assessment

a. Rapid Water Quality Indicators

Traditional growth-based methods used to enumerate indicator bacteria (i.e., multiple tube fermentation, membrane filtration, and chromogenic substrate) are too slow to effectively evaluate risk of swimmers' exposure to waterborne pathogens. These methods require 18- to 24-hour sample incubation periods, during which the public may be exposed to contaminated water. Correspondingly, beaches may post warnings or advisories for a day longer than necessary simply because of methodological lags in obtaining new results. In 2010 and 2011, pilot projects conducted at Orange County and LA County beaches demonstrated how a rapid bacterial indicator measurement method (quantitative polymerase chain reaction or qPCR) could be used for beach monitoring with same-day results. Several logistical and technological challenges remain, including method modification to address inhibition of the rapid reaction due to natural substances in environmental water samples. Such interference poses a concern because it can cause underestimation of pathogen levels. In addition, opportunities remain for speeding the monitoring process through assay automation.

This project continues development of rapid methods to augment or replace existing indicator bacteria methods. This year, SCCWRP will work to resolve inhibition issues, support technology transition in Southern California, and work with the Monterey Bay Aquarium Research Institute to develop an automated portable digital PCR platform capable of processing samples in the field and telemetering results back to the laboratory and public health agencies.

Lead Investigator: Dr. John Griffith (johng@sccwrp.org)

Collaborators: Stanford University (Dr. Ali Boehm), Monterey Bay Aquarium Research Institute (Dr. Chris Scholin), Arizona State University (Dr. Cody Youngbull)

External Funding Support: State Water Resources Control Board

b. Microbial Source Tracking and Identification

The State of California enacted the Clean Beaches Initiative (CBI) Grant Program in 2001 with the aim of restoring and protecting coastal beach water quality. The CBI has helped to improve water quality at many beaches by funding nearly $100 million in management measures, such as diverting storm drains to reduce runoff flows, repairing aging sewer lines, and creating natural filtration areas. Despite these successes, a number of beaches remain with poor water quality, primarily because the source of contamination is unknown. A variety of molecular methods designed to distinguish among fecal sources

have been developed over the last several years. A comprehensive examination of source-tracking methods in 2012 identified a suite of bacterial source identification markers suitable for use in California, leading to production of a standard guidance manual in 2013. However, it remains unclear how bacterial degradation in the environment compares to degradation of pathogens or fecal indicator bacteria (FIB) currently used for regulatory purposes. Thus, a knowledge gap exists regarding how to interpret results from source identification markers to inform mitigation efforts.

This project aims to discern how DNA-based bacterial fecal markers used to detect feces from various sources (e.g., bird, cow, human) undergo changes in freshwater, ocean water, and beach sands/sediments over time. SCCWRP will design and implement a study that tracks the relative degradation of DNA-based fecal markers, FIB, and pathogens in the environment. Ultimately, this research seeks to produce a model to inform decisions about mitigation efforts when DNA-based source identification markers are found in the environment.

Lead Investigator: Dr. John Griffith (johng@sccwrp.org)

Collaborators: Stanford University (Dr. Ali Boehm), UC Santa Barbara (Dr. Patricia Holden), UCLA (Dr. Jennifer Jay)

External Funding Support: State Water Resources Control Board

c. Wet Weather Epidemiology

Reducing fecal indicator bacteria (FIB) concentrations during wet weather may be one of the most difficult environmental challenges of current times. While few problematic beaches can be found in dry weather, wet weather FIB concentrations are so ubiquitously high that most Health Departments routinely post blanket warnings at beaches from San Diego to Santa Barbara to stay out of the ocean for the three days following rainfall without collecting a single sample. This has led to a number of regulatory options, including total maximum daily loads (TMDL) that mandates FIB reductions during wet weather. Managers remain perplexed, however, since many FIB sources in wet weather are non-human and the risk of illness from these non-human sources may not justify the radically expensive measures that will be required for wet weather FIB reductions.

The goal of this project is to conduct an epidemiological study to assess the risk of water contact illness following exposure to wet weather contaminated marine beach waters. Specifically, we will examine illness in surfers, the most chronically exposed population of ocean users in the winter months. If the risk of illness increases at wet weather impacted beaches, then SCCWRP will examine whether traditional FIB are predictive of illness. These data will be supplemented with information on human and non-human markers of fecal

host sources. If there are little to no human fecal sources, and the FIB:risk relationship is different (less risk) than those used to establish current water quality objectives for FIB, then managers may consider the option of developing site specific water quality objectives for wet weather based on this empirical health information.

Lead Investigator: Ken Schiff (kens@sccwrp.org)

Collaborators: University of California Berkeley (Dr. Jack Colford), Surfrider International

External Funding Support: County of San Diego, City of San Diego

d. Quantitative Microbial Risk Assessment

Current fecal indicator bacteria (FIB) criteria are based on epidemiological studies that tied swimmer health risk to FIB concentrations. These studies were largely conducted at beaches dominated by human sources of fecal inputs (sewage pollution), but many beaches, including those in Southern California, are subject to fecal pollution inputs from non-human sources. Due to differences in associated pathogen loading, health risks associated with non-human FIB levels may differ from those associated with human fecal inputs. To address situations where non-human fecal sources predominate, the EPA is considering the use of quantitative microbial risk assessment (QMRA) to develop site-specific objectives. QMRA models human health risks associated with non-human sources of fecal pollution based on source strength and pathogen load. However, very few QMRAs have been conducted globally, and none have been conducted at marine beaches in the US.

This project seeks to conduct a QMRA demonstration project at a Southern California marine beach. It will involve a) identifying sources in detail to ensure no or few human pathogen inputs exist, b) sampling fresh fecal material from identified non-human sources for pathogen analysis, c) characterizing swimmer exposure by modeling transport and fate of non-human source inputs, and d) quantifying the level of illness in the swimming population. This project will test the QMRA framework, evaluate assumptions associated with the modeling, and identify data gaps where research can improve QMRA as a future management tool.

Lead Investigator: Ken Schiff (kens@sccwrp.org)

Collaborators: Soller Environmental (Dr. Jeffrey Soller), US Environmental Protection Agency (Dr. Nick Ashbolt, John Ravenscroft)

External Funding Support: State Water Resources Control Board, US Environmental Protection Agency

5. Biogeochemical Cycling Assessment

a. Harmful Algal Blooms

Harmful algal blooms (HABs) have increased in frequency and severity along the US West Coast in recent years. They are linked to detrimental effects on commercial fisheries, tourism, and marine animals. In other parts of the world, anthropogenic nutrient inputs overwhelm most natural sources and are often a significant factor contributing to the increase in HABs. In contrast, large quantities of nutrients from the deep ocean rise to the surface of the nearshore zone in upwelling-dominated ecosystems such as the California Current, making the relative influence of local anthropogenic nutrients discharges on HAB development less clear. Scientists lack understanding about how bloom dynamics change in response to shifting environmental conditions and why certain "hot spots" are frequently impacted by harmful or toxic blooms.

The goal of this project is to understand the ecophysiological factors driving HABs in order to support improved monitoring, predictive modeling, and management approaches. This research will a) evaluate existing data to characterize trends in HABs and related phenomenon (hypoxia and acidification), b) conduct studies to understand the fate of anthropogenic nutrients in the SCB as well as the linkage between anthropogenic nutrients and algal bloom development, and c) maintain SCCWRP's relationship with the California Harmful Algal Bloom Monitoring and Alert Program (HABMAP).

Lead Investigator: Dr. Meredith Howard (meredithh@sccwrp.org)

Collaborators: Monterey Bay Aquarium Research Institute (Dr. Chris Scholin), Moss Landing Marine Laboratories (Dr. Jason Smith), National Oceanic and Atmospheric Administration (Dr. Greg Doucette), UCLA (Dr. Yi Chao), UC Santa Cruz (Dr. Raphael Kudela), University of Southern California (Dr. David Caron)

External Funding Support: National Oceanic and Atmospheric Administration

b. Ocean Acidification

Ocean acidification (OA) is the reduction of seawater pH associated with increasing global oceanic uptake of atmospheric carbon dioxide (CO_2). When CO_2 dissolves in seawater, it reduces the concentration of free carbonate ions. Waters undersaturated with carbonate can become corrosive to organisms that produce carbonate exoskeletons (such as shellfish, corals, and some species of plankton). Ocean monitoring programs have measured significant OA-related changes in ocean chemistry at a faster-then-expected rate with continuing acceleration. The US West Coast is particularly susceptible to OA due to seasonal upwelling, which brings waters high in nutrients, low in dissolved oxygen, and

low in pH onto the coastal shelf. In response to this knowledge, scientists, managers, regulators, and industries affected by OA began meeting in 2010 and are collaborating to develop a coordinated OA measurement network through the West Coast-wide California Current Acidification Network (C-CAN).

Goals of this research are to a) take a leadership role in C-CAN, b) assist the West Coast Governors Alliance for Ocean Health (WCGA) in developing a West Coast-wide strategy for addressing OA issues, and c) work with member agencies to determine the feasibility of upgrading existing monitoring programs to incorporate OA measurements into routine surveys. C-CAN is currently developing explicit guidance on monitoring program development (parameters, technology development, quality assurance, information management). Work in collaboration with the WCGA will include a) inventorying existing and potential assets and a plan to incorporate them into a West Coast-wide OA monitoring network, b) defining the science and policy questions most relevant to addressing stakeholder needs, and c) developing a prioritized research agenda based on these collective policy questions.

Lead Investigator: Dr. Karen McLaughlin (karenm@sccwrp.org)

Collaborators: C-CAN Steering Committee, SCCWRP member agencies

External Funding Support: None at this time.

c. Coastal Ocean Nutrient Modeling

Many of the documented hypoxic and acidification events on the West Coast result from shoaling of deep nutrient-rich ocean waters. However, local nutrient additions (e.g., from municipal treated wastewater plumes) have the potential to exacerbate hypoxia and acidification by stimulating algal growth, which affects the carbon cycle through rapid blooming and senescence. The relative contribution of local anthropogenic inputs to these processes is presently unknown, but is vital to understanding the potential benefits of management controls on local inputs. Calculating the relative importance of local anthropogenic nutrient inputs in hypoxic and acidification events requires a complex coupling of biogeochemical models. These models describe nutrient uptake and biological processing in conjunction with physical circulation models. They can help determine whether biogeochemical processes occur rapidly enough for the local inputs to generate effects while waters from land-based sources remain in the coastal zone.

This project facilitates development of complex causal models. SCCWRP hosted a modeling workshop convening coastal managers, scientists, and modelers in 2013 to a) distill which critical, unanswered questions and potential management scenarios the models should address; b) define the relevant temporal and spatial scales in which the models need to

operate; c) determine which models should be used; and d) identify the data required for model calibration and validation. SCCWRP will next conduct field and laboratory studies recommended by workshop participants to generate key data sets necessary to parameterize and validate the model, including a) nutrient inputs (stormwater, treated wastewater, and atmospheric deposition), b) rate processes (productivity, respiration, nutrient uptake and nutrient transformation) and how they change as a function of time and proximity to anthropogenic inputs, and c) validation data sets (CTDs, ocean moorings, gliders). Modeling results will be distilled into regional budgets to help discern the major causes of hypoxia and acidification changes over time.

Lead Investigator: Dr. Martha Sutula (marthas@sccwrp.org)

Collaborators: Center for Ocean Solutions (Dr. Fiorenza Micheli), UCLA (Dr. Mark Gold, Dr. Jim McWilliams), University of Washington (Dr. Curtis Deutsch), University of Georgia (Dr. Brock Woodson), SCCWRP member agencies

External Funding Support: None at this time.

B. TECHNICAL SUPPORT FOR MANAGEMENT/REGULATORY PROGRAMS

A second major function of SCCWRP's research is to integrate the body of available scientific knowledge and new studies to build a technical foundation for effective management and regulatory programs. California's environmental management programs often shape the development of national programs, and SCCWRP is uniquely positioned at the interface of science and management on both levels. As a result, SCCWRP is often called upon to serve as one of a handful of organizations offering expertise to discern the best scientific approaches for achieving environmental policy goals. This type of service is usually requested when environmental issues are widely acknowledged and well documented, but support is needed to develop effective, practicable management.

SCCWRP's research activities in this area are intended to guide the unbiased development of the best available methods for tracking progress and for ultimately achieving environmental management goals. While the goals themselves are set by policy and management agencies, SCCWRP helps to interpret and transition scientific methods to support program implementation.

1. Nutrient Objectives

a. Nutrient Objectives in Streams and Lakes

Many aquatic environments in California experience accelerated accumulation of organic matter and plant overgrowth due to excess nutrient enrichment. Consequences of this overgrowth may include harmful algal blooms, hypoxia, altered aquatic food webs, or degradation of critical habitat. The California State Water Resources Control Board (SWRCB) is working to develop scientifically based statewide water quality objectives that relate these endpoints to management controls. Their nutrient numeric endpoint (NNE) framework will consist of narrative nutrient objectives accompanied by numeric guidance. The NNE framework has two components: a) response indicators and regulatory endpoints that specify how to assess water body condition, and b) nutrient-response models that can be used to link response indicators to nutrients and other management controls (e.g., hydrology) on a water body-specific basis. To overcome challenges associated with a best professional judgment approach, the SWRCB preliminarily offered "benthic biomass spreadsheet models" as scoping tools to relate ambient nutrient concentrations to algal biomass while accounting for physical factors such as stream flow velocity and canopy cover. However, early validation efforts indicated these spreadsheet tools require refinement. Stakeholders also need technical assistance in working through how to implement the NNE in management programs such as Total Maximum Daily Loads, 303(d) listing, and discharge permits.

This project will provide a scientific foundation for NNEs in streams and lakes. Five primary tasks for streams include a) documenting statistical thresholds in the dose-response relationships between proposed NNE indicators and metrics of aquatic life use in streams (algae and benthic macroinvertebrate indices of biological integrity); b) documenting "reference levels" of proposed NNE indicators and the percent of stream miles exceeding statistical or proposed regulatory thresholds; c) validating stream NNE spreadsheet models, identifying sources of error, and proposing refinements to NNE scoping tools; d) developing calibrated, site-specific, dynamic models to better understand factors controlling algal responses to nutrients; and e) using tools and data to assist with decisions about how to implement the NNE to set watershed-based nutrient targets. Given the diversity of lakes in California, model validation requires compilation of a substantial data set reflecting the range of conditions. To address these needs, researchers will a) compile existing data on phytoplankton biomass, nutrient concentrations, cyanobacterial dominance, and cyanotoxins in California lakes; and b) validate the NNE spreadsheet model for lakes, identifying sources of error and proposed refinements.

Lead Investigator: Dr. Martha Sutula (marthas@sccwrp.org)

Collaborators: US Environmental Protection Agency (Dr. Naomi Dettenbeck), Tetra Tech (Dr. Jon Butcher), San Francisco Estuary Institute (Dr. Thomas Jabusch), UC Santa Cruz (Dr. Raphael Kudela)

External Funding Support: County of San Diego, State Water Resources Control Board, US Environmental Protection Agency

b. Nutrient Objectives in Estuaries

California has a variety of estuarine classes and habitat types (i.e., intertidal flats, seagrass, unvegetated subtidal) for which numeric endpoints and nutrient-algal response models would be expected to differ. Initially, this project inventoried California estuaries, reviewed candidate indicators and science supporting decisions on assessment framework thresholds for algae and dissolved oxygen, developed a work plan to proceed with assessment framework and nutrient-response model development for the state's estuaries, and conducted experiments to document the threshold for effects of macroalgae on intertidal flats in perennially tidal estuaries. Because the San Francisco Bay-Delta encompasses approximately 80% of the state's estuarine habitat, but differs from many small estuaries in other areas of California, a site-specific NNE assessment framework and nutrient algal-response model will be developed for San Francisco Bay and for the Delta.

To address the technical needs for nutrient objectives in estuaries, SCCWRP will help develop indicators, conduct dose-response studies, and hold expert workshops to support selection of regulatory endpoints for intertidal flats, seagrass habitats, and unvegetated

subtidal habitat across the range of estuarine classes in the state. In addition, SCCWRP will develop nutrient-algal response models including statistical stress-response models, "pilot" mechanistic models for Southern California Bight estuaries, calibrate dynamic simulation models for individual estuaries, and a conceptual model/modeling strategy for the San Francisco Bay.

Lead Investigator: Dr. Martha Sutula (marthas@sccwrp.org)

Collaborators: San Francisco Estuary Institute (Dr. Dave Senn), UCLA (Dr. Peggy Fong), UC Santa Cruz (Dr. Raphael Kudela), US Geological Survey (Dr. Jim Cloern), Elkhorn Slough National Estuarine Research Reserve (Dr. Kirsten Wassen), Morro Bay National Estuary Program (Adrienne Harris)

External Funding Support: San Francisco Estuary Institute Regional Monitoring Program, San Francisco Regional Water Quality Control Board, State Water Resources Control Board

2. Sediment Quality Objectives

Sediment quality objectives (SQOs) were recently approved for use in California's enclosed marine bays and estuaries. SCCWRP helped to develop and validate the assessment framework and data analysis tools needed to interpret sediment quality in the context of SQOs. Regulatory agencies are currently in the process of incorporating SQOs into monitoring programs, permitting processes, and cleanup actions, raising continuing technical questions about study design and data interpretation, applicability in new habitats, and stressor identification. A second phase of SQO is also under development to investigate indirect relationships between sediment contamination and potential impacts on organisms (e.g., marine birds, predatory fish, and humans) through the food chain. Bioaccumulation in organisms consumed by humans and wildlife is often a driving factor in ecological risk assessments, especially with respect to common Southern California contaminants like DDTs, PCBs, and mercury. Still, the assessment of indirect effects due to sediment contamination is more complex than direct effects and requires a different conceptual approach. The potential for indirect effects on an organism is influenced by numerous factors, including the fraction of sediment contaminants biologically available to prey species, complexity of the food web, movement of receptor organisms, food consumption rates, and species-specific variations in chemical sensitivity.

This project has three primary goals. For indirect effects assessment, SCCWRP will refine a framework for evaluating sediment contamination risks to human and ecosystem health based on multiple indicators. This will include incorporation of new information on bioaccumulation pathways in California food webs and development of tools for data analysis. For direct effects, SCCWRP will develop guidance for toxicity stressor

identification and develop biological assessment tools for new habitats such as mesohaline estuaries. Finally, SCCWRP will provide technical support to regulatory agencies and the Ports of Los Angeles and Long Beach to develop guidance for implementing the SQOs into regulatory programs such as TMDLs.

Lead Investigator: Steve Bay (steveb@sccwrp.org)

Collaborators: State Water Resources Control Board, Ports of Los Angeles and Long Beach

External Funding Support: San Diego Regional Water Quality Control Board, San Francisco Estuary Institute, State Water Resources Control Board

3. Flow Criteria

Southern California is one of the most urbanized regions in the country. The process of urbanization affects stream courses directly through channel engineering, and indirectly through altered watershed hydrology (hydromodification). Hydromodification can have adverse effects on stream habitat, surface water quality, and water supply, while associated stream erosion may threaten infrastructure, homes, and businesses. To address this issue, state and local agencies are developing and implementing standards and policies in an attempt to control and/or mitigate hydromodification effects on natural and semi-natural stream courses. SCCWRP has spent many years developing support tools to assist managers by a) mapping the streams most at risk from hydromodification; b) estimating the magnitude of hydromodification effects such as erosion, sedimentation, and habitat loss based on increases in impervious land cover; and c) identifying a suite of the most effective management measures to offset hydromodification effects. Although additional work is needed to improve capacity for predicting hydrological and physical effects of hydromodification, some of the biggest unanswered questions relate to the relationships between these physical changes and biological responses, which is a core endpoint of management concern.

This project will define the relationship between stream flow and biological community impacts as measured by benthic macroinvertebrate communities. It involves a) identifying reference sites (defined by lack of human influence), b) developing flow models to estimate hydrologic conditions in unmodified streams, c) establishing the natural variation in stream flow versus biological community relationships at reference sites, and d) comparing these reference relationships to stream flow/biological condition relationships in hydromodified streams.

Lead Investigator: Dr. Eric Stein (erics@sccwrp.org)

Collaborators: California Department of Fish and Wildlife (Dr. Peter Ode), Colorado State University (Dr. Brian Bledsoe), US Geological Survey (Dr. Darren Carlisle)

External Funding Support: State Water Resources Control Board, US Geological Survey

4. Modeling

a. Modeling of Best Management Practices

As watersheds urbanize, stormwater best management practices (BMPs) are increasingly being used to mitigate the adverse effects of hydromodification and contaminant loading. However, the effectiveness of BMPs for achieving stream water quality and biological objectives is rarely tested, despite increasing regulatory requirements for their installation that greatly increase the costs of stormwater management. In particular, a key management need is identifying the optimal placement, type, and numbers of BMPs to achieve sufficient hydraulic detention/capture and desired management endpoints. Because of site-specific variability in BMP effectiveness and the need to integrate effects at a watershed scale, the most efficient means to address this management need is modeling. Models including mechanistic BMP models, watershed hydrology and chemical loading models, and biological stress response models have been developed and used on an individual basis. However, they have not been coupled on a watershed scale to examine the effects of BMP implementation on the watershed hydrology and receiving water chemical and biological responses. Experimental data have documented the effects of BMPs on a treatment catchment in Melbourne, Australia, monitoring the effects on hydrology, water chemistry, and biology over a ten-year period and providing a unique opportunity to calibrate linked models for Southern California.

The goal of this project is to develop a toolkit of linked models that will optimize BMP density, type, and location at a watershed scale. It will include a) mechanistically modeling BMP performance at a site scale; b) modeling effects of implemented BMPs on watershed hydrology and water quality for wet and dry weather; c) developing mechanistic stress-response models to link BMP performance, watershed hydrology, and water quality to biological endpoints; and d) using the tools in tandem to optimize the placement, type, and density/size of BMPs within the watershed. Models of BMP performance will be calibrated as a function of intrinsic factors such as geology, soil type, and slope using existing Southern California BMP performance data.

Lead Investigator: Dr. Ashmita Sengupta (ashmitas@sccwrp.org)

Collaborators: UC Irvine (Dr. Stanley Grant, Dr. Brett Sanders, Dr. Jean-Daniel Saphores), University of Melbourne (Dr. Tim Fletcher)

External Funding Support: National Science Foundation

b. Stressor Response Modeling

The linkage between management actions and the recovery of receiving water bodies is often obscure. This is most obvious in Southern California estuaries, located at the terminus of urbanized watersheds and subjected to the adverse effects of hydromodification and contaminant loading. Complicating factors in the linkage between management actions in the watershed and downstream changes in estuaries include the high degree of variability in freshwater flow and contaminant concentrations, the large diversity of estuarine ecotypes, temporal and spatial patterns in estuarine hydrology that affects the transport and biological fate of pollutants, and the ultimate interaction between water quality and biology. Because of the complexity of these site-specific factors, scientists turn to mechanistic stressor-response models to better understand and predict the linkage between management actions and the fate and effects of contaminants in estuaries. Unfortunately, these mechanistic models are rare in Southern California largely due to the significant effort required. As a result, managers lack the confidence needed for implementing management actions in the watershed to protect downstream estuarine resources.

This project will begin developing linked stressor-response models that managers can routinely use for managing estuaries. Developing linked stressor-response models begins with developing simple hydrodynamic models for various estuarine ecotypes. The base hydrodynamic model will include a) advection and dispersion, b) interaction of freshwater inflow with saline ocean waters, and c) residence times in the estuaries. The hydrodynamic model will then be coupled with either a biological response model for nutrients or a chemical fate model for contaminants of emerging concern (CECs). The biological response model for nutrients will include eutrophication processes such as predicting biomass and dissolved oxygen concentrations. The fate model for CECs will include contaminant dependent processes, such as sorption/desorption and transformation. The simple model will be calibrated and validated with regional monitoring data (see project C1a) and compared to model output from existing, more complex three-dimensional mechanistic models.

Lead Investigator: Dr. Ashmita Sengupta (ashmitas@sccwrp.org)

Collaborators: University of Massachusetts (Dr. Mi-Hyun Park), University of Rhode Island (Dr. Christopher Kinkaid), Space and Naval Warfare Systems Command (Dr. P.F. Wang), Mississippi State University (Dr. James Martin)

External Funding Support: None at this time

5. Freshwater Biological Objectives

a. Analysis of Biological Thresholds

Direct measures of biological condition are increasingly preferred as assessment endpoints because they link most closely to water body beneficial uses or other functions relevant to environmental protection and management. In contrast, traditional chemistry- or toxicity-based assessment endpoints require inferences about their relationship with the ecological integrity of natural systems. Biological indicators have the added advantage of integrating conditions over space and time, thus providing a more comprehensive assessment than traditional indicators. As a result, the California State Water Resources Control Board is working to develop biological objectives (bio-objectives) for perennial streams and rivers. Currently, the State is focused on benthic macroinvertebrates as a primary stream bioindicator because of their well-studied life histories, comparatively sessile nature, readily available taxonomy, and relative ease of collection. However, there are number of other potential bioindicators that could be used for bio-objectives other than benthic invertebrates, such as upper trophic level organisms (i.e., fish, amphibians, birds) that link to beneficial uses including wildlife habitat, cold water habitat, warm water habitat, or the ability to support rare species. Ultimately, the State Board would like to include an approach for integrating multiple biological indicators across many trophic levels to support the bio-objectives framework.

This project will continue developing the technical foundation for bio-objectives. SCCWRP previously helped develop the technical foundation for biological objectives based on benthic macroinvertebrate indicators. This year, technical support will include refining bioassessment tools for a variety of "modified" stream types throughout the state, investigating approaches to establishing thresholds, and assessing the relationship between benthic macroinvertebrates and higher trophic level organisms such as amphibians, fish, and birds.

Lead Investigators: Eric Stein (erics@sccwrp.org), Ken Schiff (kens@sccwrp.org)

Collaborators: California Department of Fish and Game (Dr. Peter Ode), Southern California Stormwater Monitoring Coalition, State Water Resources Control Board, US Environmental Protection Agency, US Geological Survey (Dr. Robert Fisher)

External Funding Support: County of San Diego, State Water Resources Control Board

b. Causal Assessment

Only a fraction of the streams in California will achieve a desired condition based on an assessment of biological condition. For those streams that fail to achieve a desired

"biological objective," the next step involves diagnosing the likely causative factors affecting the biology so that appropriate management actions can be determined. Scientists exploit the complexity of biological communities and their differential response to various stressors to decipher the responsible stressor(s). This is an inexact science that relies largely on a "weight-of-evidence" approach to either diagnose or refute a stressor. No single assessment tool or measurement device can provide an answer, but many tools used in combination help build a case towards identifying the responsible stressor(s). The most commonly used and best-developed approach to causal assessment is the US Environmental Protection Agency's Causal Analysis/Diagnosis Decision Information System (CADDIS), an online decision support system to help scientists identify the stressors responsible for undesirable biological conditions in aquatic systems (http://www.epa.gov/caddis). Earlier work demonstrated the use of CADDIS in California through four case studies, the results of which were used to produce a CADDIS guidance manual.

This work will build on the foundation provided in the CADDIS guidance manual by developing additional assessment tools that can be used to more definitively identify causes, separate anthropogenic effects from natural patterns, and inform ultimate management responses. The project will develop a case study in San Diego through development of additional diagnostic and assessment tools.

Lead Investigators: David Gillett (davidg@sccwrp.org), Eric Stein (erics@sccwrp.org)

Collaborators: Southern California Stormwater Monitoring Coalition, San Diego Regional Resources Control Board, US Environmental Protection Agency, Tetra Tech

External Funding Support: County of San Diego, San Diego Regional Water Quality Control Board

C. REGIONAL MONITORING

Monitoring is a cornerstone of environmental management, providing stakeholders with information about changes in ecosystem condition and the effectiveness of management programs. SCCWRP's research focus on monitoring programs helps guide implementation of problem-driven investigations and ongoing status tracking efforts. In the early stages, these efforts focus on defining clear monitoring questions and appropriate sampling designs to answer questions. Subsequently, approaches and assessment methodologies must be standardized across multiple monitoring agencies from a regional perspective. At later stages, SCCWRP supports the data management and quality assurance needs of ongoing monitoring efforts.

SCCWRP began conducting regional surveys in the 1970s. The agency continues to coordinate the Southern California Bight Regional Monitoring Program, which monitors waters from the shoreline to the coastal shelf in five-year cycles. SCCWRP also maintains extensive pollutant emissions data from many dischargers to the Southern California Bight dating back to 1971. Recently initiated efforts involve development of monitoring solutions for other habitats, including streams, wetlands, and Areas of Special Biological Significance.

1. Regional Marine Monitoring

a. Southern California Bight Regional Monitoring Program

The Southern California Bight Regional Monitoring Program is currently conducted in five-year cycles and has involved over 100 different stakeholder organizations. This program has been useful in monitoring trends over time, as well as establishing regional reference conditions, developing new environmental assessment tools, standardizing data collection approaches in Southern California, and providing a support network for special studies. The next iteration of the regional monitoring program began in 2013 (Bight '13). The Bight '13 survey has five components: coastal impact assessment (offshore sediment condition), nutrient impact (water column condition), microbiology (beach water quality condition), marine protected areas (rocky reef condition), and debris assessment (especially plastics).

This project will coordinate sampling and conduct data analyses, assessments, and reporting for Bight '13 Regional Monitoring Program. Project planning steps including study design, sampling and analysis preparation, and pre-survey quality assurance activities occurred in 2012. In 2013, sampling and laboratory analyses were completed for approximately 400 sites, and results submitted through an integrated data system (see project D2). Hundreds of indicators were measured including sediment chemistry and toxicity; benthic infauna, fish, and invertebrates; contaminant bioaccumulation in bird eggs; trash and debris; physical water column characteristics; nutrients and algae; fecal

indicator bacteria; and human pathogens. The focus of the current year is to create consensus-based assessments from the results of the regional survey data.

Lead Investigator: Ken Schiff (kens@sccwrp.org)

Collaborators: Numerous participating organizations

External funding support: In-kind contributions from participating organizations

b. Pollutant Sources Data Cataloguing

Mass emission estimates enable comparisons among different pollution sources to assess relative risks and track trends over time. SCCWRP has estimated mass emissions from large publicly owned treatment works (POTWs) annually for the last 38 years, and from other sources (such as small POTWs, industrial dischargers, dredged material disposal, urban runoff, oil platforms, vessel discharges, and aerial deposition) about every five years. Pollutant mass emissions from the four largest Southern California POTWs have declined by more than 95% over the last 40 years due to increased effluent treatment, source control, industrial pretreatment, and reclamation. At the same time, nonpoint source discharges (such as stormwater runoff) have become a proportionately greater contributor to overall pollutant loading to the ocean. Regulated stormwater agencies have recently begun to standardize monitoring approaches and methods in order to estimate concentrations and loads; however, these agencies still lack an integrated data management system for compiling monitoring data.

This project aims to estimate mass emissions from stormwater, industrial dischargers, power generating stations, and large POTWs to the Southern California Bight. In addition to being used for status and trends tracking, the stormwater data will be transferred to the California Environmental Data Exchange Network for use in statewide water quality assessments.

Lead Investigator: Dr. Eric Stein (erics@sccwrp.org)

Collaborators: City of Los Angeles, City of San Diego, Los Angeles County Sanitation Districts, Orange County Sanitation District, Southern California Stormwater Monitoring Coalition

External Funding Support: None at this time

c. Areas of Special Biological Significance

Areas of Special Biological Significance (ASBS) are water quality protected areas in California where the waste discharge is prohibited. There are 34 ASBS throughout the state, and about half are located in Southern California. Mapping studies conducted in 2003 identified nearly 1,700 outfalls that discharge into ASBS statewide, and in 2006, voters approved a $5.4 million water bond with a portion of the funds dedicated to reducing pollutant inputs into ASBS. To date, 14 grants totaling $1.3 million have been authorized by the State Water Resources Control Board (SWRCB) for ASBS-regulated parties. While the SWRCB requires monitoring for each grant, there is no coordination among grantees with respect to monitoring questions, study designs, measurement indicators, or methods. This makes it difficult to assess the overall effectiveness of the Proposition 84 grant program.

This project provides technical support for coordinating Proposition 84 grantee monitoring. The monitoring program should determine a) the mass of pollutants removed from ASBS discharges as a result of Proposition 84 grants and b) the condition of ASBS receiving waters, especially near grant implementation sites. Earlier work focused on reviewing and improving grantee monitoring plans and quality assurance project plans. Current efforts focus on data compilation and analysis from grantee monitoring.

Lead Investigator: Ken Schiff (kens@sccwrp.org)

Collaborators: None at this time

External funding support: State Water Resources Control Board

2. Regional Watershed Monitoring

a. Stormwater Monitoring Coalition Regional Watershed Monitoring

In-stream bioassessment monitoring in Southern California is currently conducted by more than a dozen different organizations. In the past, each of these organizations had disparate programs varying in design, sampling frequency, and measured indicators. Even where designs were similar, field techniques, laboratory methods, and quality assurance requirements often diverged, making cumulative assessments impossible. To address these issues, a comprehensive and integrated monitoring program was designed by the Southern California Stormwater Monitoring Coalition (SMC). This program mirrors SCCWRP's Southern California Bight Regional Monitoring Program, wherein each participating group assesses its local geography and contributes a small portion to the regional assessment. The SMC program establishes comparability in the field and the laboratory, performance-based quality assurance guidelines, and an information management system for sharing data. In this way, it can address large-scale management needs and provide answers to the

public about the overall health of southern California's streams and rivers. The SMC program also provides an opportunity to investigate novel issues and/or monitoring parameters.

This project supports ongoing implementation and development of the SMC's regional watershed monitoring program for Southern California's coastal streams and rivers. The program's first five-year cycle is near completion. SCCWRP will continue providing support for data compilation and interpretation, including special studies from the 2014 summer sampling season, and guiding the future directions of the program for the next five-year cycle to begin in 2015. In addition, SCCWRP will continue developing a methodology for multi-indicator assessment of riparian wetland ecosystem condition in California. This requires integration of existing biological assessment tools, including benthic macroinvertebrate and algal indices of biotic integrity, physical habitat assessment (PHAB), and the California Rapid Assessment Method (CRAM), to provide an overall ecosystem assessment for riverine wetlands.

Lead Investigator: Ken Schiff (kens@sccwrp.org)

Collaborators: Regional Water Quality Control Boards 4, 8, and 9; Southern California Stormwater Monitoring Coalition; State Water Resources Control Board's Surface Water Ambient Monitoring Program

External Funding Support: Southern California Stormwater Monitoring Coalition, State Water Resources Control Board

b. Background Concentrations of Contaminants in San Diego Reference Streams

The streams and rivers in Orange and San Diego County watersheds have become increasingly urbanized in recent decades. Urbanization brings additional wet and dry weather runoff to streams, resulting in increased loads of bacteria, nutrients, heavy metals, and other contaminants. Management of these water quality issues in the San Diego region is currently hampered by the lack of a consistent set of scientifically defensible numeric targets for in-stream water quality. Further, standards must account for natural sources of constituents. One approach to developing numeric targets that account for natural sources involves quantifying concentrations in, or loads from, streams in minimally disturbed or "reference" condition.

The goal of this project is to collect the data necessary to derive reasonable and accurate wet and dry weather numeric targets for bacteria, nutrients, and heavy metals, based on a reference approach. This project also provides an opportunity to demonstrate the use of new bioassessment approaches to identify reference conditions by a) establishing the biomass, cover, and taxonomic composition of algae associated with reference streams; and

b) investigating toxicity sources to invertebrates using newly developed molecular Toxicity Identification Evaluations (see project A2a).

Lead Investigator: Dr. Martha Sutula (marthas@sccwrp.org)

Collaborators: None at this time

External Funding Support: City of San Diego, Counties of Orange and San Diego and their co-permittees

c. Atmospheric Deposition of Nutrients to Coastal Watersheds

Recent data from the Stormwater Monitoring Coalition Regional Stream Monitoring Program indicate that heavy algal cover (>30%) occurs even at sites with predominantly undisturbed catchments, suggesting that atmospheric deposition may be a significant source of nutrients to streams. Previous SCCWRP research found that atmospheric deposition can be a significant source of trace metals to Southern California watersheds, but only limited data exists on atmospheric deposition of nutrients and its contribution to water quality in this region. A lack of standardized techniques for direct measurement of atmospheric nutrient deposition is one reason for such limited data. Inferential methods, which have frequently been used in other regions, are both costly and time-consuming. Surrogate surfaces offer a simple, cost-effective method for direct measurement of atmospheric nutrient deposition, but surrogates have not been extensively tested in the semi-arid conditions of Southern California.

The goals of this project are to a) provide reliable measurement techniques for atmospheric nutrient deposition in Southern California, and b) to estimate rates of atmospheric nutrient deposition in selected sites in Southern California. The combination of the most successful methods (static surface samplers versus conventional denuders) and isotope tracking methods are being used to measure rates of wet and dry atmospheric at six regional stream bioassessment reference sites in Southern California across an annual cycle, to capture natural gradients in land cover type (e.g., forested, chaparral).

Lead Investigator: Dr. Karen McLaughlin (karenm@sccwrp.org)

Collaborators: US Forest Service (Dr. Pamela Padgett)

External Funding Support: County of San Diego, US Environmental Protection Agency

3. Regional Wetland Monitoring

a. Wetlands Status and Trends

Billions of dollars have been invested over the last 20 years for the protection and restoration of California's wetlands and riparian areas. However, the effectiveness of these investments is uncertain due to a lack of systematic monitoring. At a national level, the US Fish and Wildlife Service National Wetland Inventory program has adopted a probability-based survey approach to assess trends in wetland acreage and produce status and trends plots. The new design was also incorporated into the EPA's National Wetland Condition Assessment (NWCA). Within the state, the California Wetlands Monitoring Workgroup (CWMW) has developed and is working to implement a statewide Wetland and Riparian Area Monitoring Program (WRAMP). The goal of the WRAMP is to produce regular reports on trends in wetland extent and condition, and to relate these trends to management actions, climate change, and other natural and anthropogenic factors, in order to inform future decisions. In addition, new tools to track and evaluate the success of wetland restoration programs are needed, such as performance curves that forecast how beneficial uses and functional capacity of restoration projects should improve over time. These new tools for mitigation and restoration planning will help ensure individual projects contribute to an overall net gain (or no net loss) in wetland extent and condition throughout California.

This project will help build a framework for wetland and riparian monitoring and assessment through participation in the CWMW, support for implementing the NWCA and WRAMP, and development of new technical tools for wetland tracking. Current efforts include identifying ways to refine the technical approach, reduce sample error, and evaluate proposed change assessment methodologies. SCCWRP participates in an interagency team to develop a long-term implementation and funding strategies for wetland monitoring. In addition, performance curves based on the California Rapid Assessment Method (CRAM) are being developed for perennial estuarine and coastal riverine wetlands, using regional reference sites to evaluate the curves with respect to best achievable condition.

Lead Investigator: Dr. Eric Stein (erics@sccwrp.org)

Collaborators: California Department of Fish and Game, San Francisco Estuary Institute (Dr. Josh Collins), CSU Northridge (Dr. Shauna Dark), US Environmental Protection Agency, US Fish and Wildlife Service National Wetlands Inventory, California Wetlands Monitoring Workgroup

External Funding Support: US Environmental Protection Agency, California Coastal Conservancy, California Resources Agency Coastal Impact Assistance Program

b. Depressional Wetlands

Freshwater depressional wetlands are the state's most diverse wetland class and comprise approximately 45% of California's 3.6 million wetland acres. This class includes vernal pools, freshwater marshes, and wet meadows, and may have near-persistent to intermittent surface water flows that connect them to other surface waters. Depressional wetlands may be natural, actively-maintained manmade features, or abandoned manmade features. While they perform the entire range of functions typically associated with wetlands, depressional wetlands are particularly important as seasonal refuges and breeding areas in dry habitats. They also contribute to groundwater recharge, water purification, and attenuation of surface runoff, thus reducing the impact of excessive flow to streams, lentic water bodies, and coastal environments downstream. To date, the state's Surface Water Ambient Monitoring Program has focused almost entirely on wadeable streams; most monitoring and assessment of depressional wetlands is associated with specific impact or mitigation projects. As a result, the available monitoring data is limited in space and time, and there is little knowledge about the overall extent and condition of depressional wetlands.

This project will establish a foundation for a statewide ambient monitoring program for depressional wetlands by a) developing, modifying, and testing assessment tools; b) creating a monitoring design; and c) demonstrating the monitoring program approach through pilot implementation at a subset of depressional wetland types in Southern California. It will also test the Periphyton Index of Biotic Integrity, originally developed for streams, for potential application in depressional wetlands. Repeated measurement of seasonal wetlands will help evaluate the influence of drying on invertebrate communities and refine appropriate monitoring periods.

Lead Investigator: Dr. Eric Stein (erics@sccwrp.org)

Collaborators: CSU San Marcos (Dr. Robert Sheath), UC Berkeley

External Funding Support: California Resources Agency Coastal Impact Assistance Program; San Diego, Los Angeles, and Santa Ana Regional Water Quality Control Boards; US Environmental Protection Agency

D. INFORMATION MANAGEMENT AND ANALYSIS

The scale of data collection grows exponentially as new technologies and techniques become available. Regional data can be obtained via large-scale monitoring programs or satellite or aerial imaging. Lab analysis for a variety of chemical and biological data types, especially for emerging molecular methods and DNA barcoding, also generate extremely large datasets. In addition, new automated technologies have data collection methodologies that bypass human intervention. With these changes, new approaches are needed to collect, store, manage, and analyze these large datasets in a manner that effectively serves the needs of the scientific community and environmental managers. Emerging methods for data storage, including cloud databases, require further research and development applied to environmental data storage and access. Further, new tools are needed to process data sets for various applications (e.g., index computation, environmental models) and produce information in useful formats like scores, charts, graphs, maps, animations, and other types of visualizations.

SCCWRP has historically played a primary role in helping member agencies and others produce comparable data products that maximize value and usability among the environmental management community. The essential next step is developing mechanisms to more effectively collect, manage, and share data, as well as to deliver analytical results.

1. Mobile Data Acquisition Technologies

Mobile technologies offer vast new opportunities for onsite data collection. SCCWRP is dedicated to developing field data tools that can be implemented on everyday mobile devices such as smart phones and tablet computers. By leveraging built-in capabilities such as GPS receivers, cameras, and wireless connectivity, newer mobile devices can capture nearly limitless types of monitoring information. Users can also take advantage of communication networks to record information, either automatically or with human input, and directly transfer that data from the field to the office. Moreover, mobile applications can be used to ensure data is collected and structured consistently with quality checks, handled instantaneously at the point of collection, before scientists leave the site.

This project explores rapidly evolving mobile technologies to further extend the capabilities of field sampling programs. Capabilities currently under investigation include a) mobile (smart phone/tablet-based) applications to capture sample event data including location, station occupation observations, site descriptions and images, and then transfer data to cloud-based databases; b) survey applications to collect interview and participant-supplied data; c) image capture devices, including cell-phone cameras, as microscopes to optically identify species in the field; and d) wireless environmental sensors that

communicate with mobile devices to aid in data acquisition, sensor testing and maintenance, and real-time adaptive monitoring capabilities.

Lead Investigator: Dr. Steve Steinberg (steves@sccwrp.org)

Collaborators: UC Berkeley

External Funding Support: None at this time

2. Seamless Data Sharing

Data are essential to environmental management and planning on a variety of levels. When data are not readily accessible, it impedes many of the decision-making processes that depend on current, reliable, and high quality data. When data sharing is ineffective, it increases lost opportunities and the potential for making suboptimal management decisions. The benefits of additional information include context, for example the ability to consider data from adjacent areas or view a time-series to provide perspective. Modern data sharing tools provide opportunities for rapid and accurate data sharing. These tools enable managers and the public to have transparent access to understandable environmental information. SCCWRP previously helped develop and support the California Environmental Data Exchange Network (CEDEN), which is utilized by the State Water Resources Control Board to prepare the 303(d) list of impaired water bodies. SCCWRP also designed, developed, and maintained the Beach Watch database, which serves as the central repository for beach water quality monitoring information statewide.

This research a) facilitates collection and submission of data to a consistently accessible data server, and b) facilitates access to data and analytical results needed by the scientific and management community. SCCWRP is currently redesigning and updating the Beach Watch database to a modernized cloud-based system, which serves as the central repository for beach water quality monitoring information statewide. This new system will provide rapid data availability to managers and the public and, when complete, will integrate with CEDEN. Other current efforts focus on recruiting and training regional data providers, developing data visualization and extraction tools, providing user-friendly web-based data access and documentation, and connecting CEDEN with other state and US Environmental Protection Agency (EPA) data servers. These databases will serve managers and the public through the California Water Quality Monitoring Council's website (see project D3) and a number of other applications that are "powered by CEDEN."

Lead Investigator: Dr. Steve Steinberg (steves@sccwrp.org)

Collaborators: Moss Landing Marine Laboratories (Rusty Fairey), San Francisco Estuary

Institute (Meredith Williams), State Water Resources Control Board, Dr. Michael L. Johnson, LLC.

External Funding Support: State Water Resources Control Board

3. Dynamic Data Processing and Visualization

Data visualization provides valuable insights into understanding data relationships and interactions. Visualization includes ways to effectively convert data into information, as well as ways to present information using visualization techniques such as index computation and integration of dynamically generated charts, maps, and animations. With the advent of more sophisticated scientific and spatial modeling tools and capabilities, important opportunities have arisen to extend capabilities for environmental data modeling and visualization, particularly within a geospatial framework. For data visualization to be useful, however, it must be driven by development and validation of scientifically appropriate and robust analytical techniques.

This project focuses on enhancing options for reporting and presenting real-time statistical data analysis as well as visualization techniques for data output to the web or mobile device. Three areas of current research include a) assisting the State Water Board in making monitoring data and data interpretations accessible to the public through water quality portals (http://www.waterboards.ca.gov/mywaterquality/); b) creating a web-based prototype "dashboard" for stormwater managers and regulators to track program effectiveness, which track progress towards both programmatic and technical goals; and c) developing approaches that infer ecosystem condition from spatial data or track changes over time under different management scenarios, in order to integrate past, present, and future management approaches to achieve specific recovery goals in Southern California watersheds (e.g., Tijuana River Valley).

Lead Investigator: Dr. Steve Steinberg (steves@sccwrp.org)

Collaborators: California Department of Public Health (Mark Emmerson), Water Education Foundation, Tijuana River National Estuarine Research Reserve (Jeff Crooks), Sacramento State University (David Ceppos and Brian Currier), San Francisco Estuary Institute (Robin Grossinger), California Coastal Conservancy (Greg Gauthier), State Water Resources Control Board (Greg Gearhardt)

External Funding Support: State Water Resources Control Board, National Estuarine Research Reserve System Science Collaborative (NERRS)

4. San Diego Integrated Water Resource Data Management System

Water data in San Diego County is collected, managed, accessed and assessed by a variety of government agencies for both regulatory and management as well as tribal, academic, NGO and consultant communities. Traditionally, given a variety of disparate data systems, accessing these data in a consistent and comparable manner is difficult.

Building upon SCCWRP's history and expertise in data management systems, the IM&A Department, in collaboration with The Center for Collaborative Policy, a program of California State University Sacramento, will develop recommendations and specifications to serve as a basis for the future development of a web-based water data management system for the San Diego County region.

Lead Investigator: Dr. Steve Steinberg (steves@sccwrp.org)

Collaborators: San Diego IRWM, Sacramento State University, Center for Collaborative Policy

External Funding Support: County of San Diego.

E. MEMBER AGENCY SUPPORT

SCCWRP research is generally applicable to collective environmental management concerns. To ensure scientific resources are communicated to and used by the core network of end users (SCCWRP's 14 member agencies), attention is also devoted to supporting individual member agency activities and sub-groups of member agencies facing similar questions. SCCWRP provides ongoing on-call support for these organizations.

1. General Support

This project encompasses a variety of forms in which SCCWRP provides periodic assistance to member agencies, such as training, quality-assurance audits, field and laboratory services, method or document review, monitoring guidance, administrative support, meeting organization, data processing, technical advice, memo or fact sheet preparation, response to media requests, and communication/presentations to the member agencies' governing boards.

Lead Investigator: Dr. Steve Weisberg (stevew@sccwrp.org)

2. Effects of Ocean Outfall Diversion on Nutrient Cycling

The relative influence of anthropogenic versus natural factors in regulating nitrogen cycling and primary productivity has not been well established in the Southern California Bight. One challenge is isolating the effect of individual factors, such as wastewater effluent input, from the other factors at play. In 2012, the Orange County Sanitation District diverted discharge from its main ocean outfall to a pipe that discharged effluent closer to shore in shallower water. This diversion presented an opportunity to observe the effect of wastewater on dominant pathways of nitrogen cycling and primary production before and after the area received effluent input. Similarly, in 2013 the City of Los Angeles Hyperion Treatment Plant diverted their outfall to conduct routine maintenance, providing a further opportunity to continue gathering information. SCCWRP joined a team of researchers using gliders and ship-based sampling to track the effluent plume during the diversions to monitor for any detrimental environmental impacts, such as increased algal growth.

This project a) compares rates of nitrification and denitrification between reference areas and sites near the temporary effluent discharge before and after diversions, and b) monitors phytoplankton productivity and species composition changes during the diversion. Field sampling will continue in 2014. Researchers are also reporting earlier results in a special issue of the journal *Estuarine, Coastal and Shelf Science*.

Lead Investigator: Dr. Meredith Howard (meredithh@sccwrp.org)

Collaborators: National Oceanic and Atmospheric Administration (Dr. Greg Doucette), Orange County Sanitation District, University of Southern California (Dr. David Caron)

External Funding Support: None at this time

INFORMATION ONLY

December 1, 2014 JPA Board Meeting

TO: JPA Board of Directors

FROM: General Manager

Subject: City of San Diego's Potable Reuse Initiative: Pure Water San Diego (Pg. 103)

SUMMARY:

On November 18, 2014, the San Diego City Council approved a cooperative agreement between the City of San Diego and four environmental organizations, establishing a plan and schedule known as "Pure Water San Diego" to develop 83 MGD of advanced treated wastewater for potable reuse by 2035. This report provides a brief summary of the regulatory challenges faced by the City of San Diego for disposal of its treated wastewater, and the role of Pure Water San Diego in addressing those challenges, while providing a future source of water supply.

Background:

The City of San Diego's Point Loma Wastewater Treatment Plant has a capacity of 240 MGD and discharges its effluent to the Pacific Ocean via a 4.5-mile-long outfall at a depth of 300 feet, one of the longest and deepest in the world. The Clean Water Act required publically-owned treatment works to implement full secondary treatment standards by 1977. The Point Loma Wastewater Treatment Plant meets all secondary requirements except those for TSS and BOD; the cost to upgrade the plant for these parameters is estimated to be $2.1 billion.

Ocean Pollution Reduction Act of 1994:

In 1994, federal legislation, the Ocean Pollution Reduction Act of 1994, was passed to allow the City to avoid upgrading Point Loma to full secondary treatment under a modified NPDES permit provided that the City performed advanced ocean monitoring and constructed 45 MGD of recycled water capacity at a cost of $340 million. Since that time, the City has been under increasing pressure from the regulatory and environmental community to take additional steps.

Pure Water San Diego:

Through a collaborative process with a number of environmental organizations, the City negotiated a cooperative agreement in support of its Pure Water San Diego program. Pure Water San Diego provides for the City to redirect 83 MGD of effluent from the ocean outfall to be used for potable reuse by 2035 in exchange for the environmental organizations to provide support for new federal legislation and all future NPDES permit renewals, allowing the Point Loma Wastewater Treatment Facility to be permitted under a concept of "secondary equivalency" to be achieved through potable reuse. Additionally, Pure Water San Diego includes two interim deadlines: the first 15 MGD of potable reuse by 2023 and 30 MGD of cumulative potable reuse by 2027.

Attached for reference are copies of the staff report submitted to the San Diego City Council and the Cooperative Agreement in Support of Pure Water San Diego.

FISCAL IMPACT:

No

ITEM BUDGETED:

No

ITEM 9B

Prepared By: David W. Pedersen, Administering Agent/General Manager

ATTACHMENTS:

Staff Report to San Diego City Council

Cooperative Agreement in Support of Pure Water San Diego

COUNCIL ACTION
EXECUTIVE SUMMARY SHEET
CITY OF SAN DIEGO

DATE: 9/25/2014
ORIGINATING DEPARTMENT: Public Utilities
SUBJECT: Point Loma Wastewater Treatment Plant - National Pollutant Discharge Elimination System (NPDES) Permit Application
COUNCIL DISTRICT(S): Citywide
CONTACT/PHONE NUMBER: Ann Sasaki/858-292-6402 MS 901A

DESCRIPTIVE SUMMARY OF ITEM:
Approval of the Mayor's proposal to submit the renewal application for a modified National Pollutant Discharge Elimination System (NPDES) Permit for the Point Loma Wastewater Treatment Plant and authorization to enter into a Cooperative Agreement between the City of San Diego and San Diego Coastkeeper, Surfrider Foundation San Diego Chapter, Coastal Environmental Rights Foundation, and the San Diego Audubon Society in support of the Point Loma National Pollutant Discharge Elimination System (NPDES) Permit and Pure Water San Diego.
STAFF RECOMMENDATION:
Staff recommends approval of the requested actions.
EXECUTIVE SUMMARY OF ITEM BACKGROUND:
The City of San Diego operates the Metropolitan Sewerage System (Metro System) which provides wastewater treatment and disposal for the City of San Diego (City) and 12 Participating Agencies. It serves a population of 2.5 million and consists of four treatment plants, major pipelines and pump stations, as well as, two ocean outfalls. The Point Loma Wastewater Treatment Plant (Point Loma) is the main treatment facility with a permitted capacity of 240 million gallons per day (mgd). It discharges treated effluent into the Pacific Ocean 4.5 miles offshore at a depth of over 300 feet.

Point Loma operates with a modified National Pollutant Discharge Elimination System (NPDES) Permit that includes a variance from the Federal Clean Water Act (CWA) secondary requirements for the discharge of Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD). The permit contains modified standards for only these two substances; all other constituents in the discharge must meet the same standards as in a secondary permit.

Section 301(h) of the CWA allows the Environmental Protection Agency (EPA) to grant variances to ocean dischargers who demonstrate that the modified standards are not harmful to the ocean. Additionally, in the 1990s, the City worked with the local congressional delegation to pass special legislation modifying the CWA to provide the City with its own unique ability to apply for a modified permit for the Point Loma Plant. This legislation known as the Ocean Pollution Reduction Act (OPRA) was signed into law on October 31, 1994 and as a result, the City received its first modified permit (waiver) in 1995. The permit must be renewed every five years. The current Point Loma permit expires on July 31, 2015. Regulations require that a renewal application be submitted six months in advance or by February 1, 2015.

In determining what course of action to take at Point Loma, the City considered the following factors,
- Protecting the Environment;
- Meeting regulatory requirements;
- Protecting ratepayers and reducing rate impacts; and
- Ensuring future water supply needs

The City has several alternatives:

1. Convert the Point Loma Wastewater Treatment Plant to Secondary Treatment;
2. Submit a modified permit application with no other commitments; and
3. The Preferred Alternative - Submit a modified permit application, commit to building potable reuse and modify the Clean Water Act to allow for secondary equivalency

To develop consensus on how to move forward with the modified permit renewal, city staff has been meeting regularly since July 2013 with a diverse group of stakeholders. These stakeholders include the Metro Participating Agencies, as well as the local environmental groups represented by the San Diego Coastkeeper, Surfrider Foundation, Coastal Environmental Rights Foundation, and the San Diego Audubon Society. As a result of this effort, a consensus has been reached on a recommended strategy. This strategy includes submitting a modified permit renewal application, implementation of the Pure Water Program and working on obtaining approval of secondary equivalency.

To memorialize the support of the environmental stakeholders, City staff has negotiated a Cooperative Agreement with the environmental stakeholders. Under the terms of the Agreement the City will to commit to the implementation of Pure Water San Diego and the production of 83 million gallons per day (mgd) of potable reuse by 2035 in return for the environmental stakeholder's commitment to support the City's next, and all future Point Loma permit applications and to support secondary equivalency. The Cooperative Agreement outlines each party's responsibilities, provides a schedule for implementation of the Pure Water Program, and includes remedies and opportunities for renegotiation should any part of the overall strategy not be possible to implement.

FISCAL CONSIDERATIONS:
Not applicable at this time. Any future expenditure of funds related to the Point Loma Wastewater Treatment Plant - National Pollutant Discharge Elimination System (NPDES) Permit Application or Pure Water San Diego will require future council approval.

EQUAL OPPORTUNITY CONTRACTING INFORMATION (IF APPLICABLE): N/A

PREVIOUS COUNCIL and/or COMMITTEE ACTION:
On July 17, 2012 the City Council accepted (R-307584) the Recycled Water Study. On April 23, 2013 the City Council accepted (R-308121) the Water Purification Demonstration Project Report. On April 29, 2014 the City Council (R-308906) adopted a resolution in support of Pure Water San Diego. This action was heard by the Committee on the Environment on October 8, 2014 and forwarded to the full Council with no recommendation. The committee approved a

motion for the Council President to take action to confirm the City's eligibility for the State Revolving Fund loans and other State funding. Additionally Public Utilities Department is to provide the City Council with projections for rates beyond 2020 when this item is heard at Council. Public Utilities will present projections at Council.

COMMUNITY PARTICIPATION AND PUBLIC OUTREACH EFFORTS:
The Independent Rates Oversight Committee approved the recommended actions on September 15, 2014. The Metro Commission will review the recommended actions on October 16, 2014.

In April 2014, the City formed the Pure Water Working Group to provide diverse viewpoints and input on the City's efforts to provide a safe, secure and local drinking water supply. The group includes representatives from community planning groups, businesses, City Council District Offices, environmental groups, and water coalitions. The group has been meeting on a monthly basis since May 2014.

City staff has made over 200 presentations regarding potable reuse and the water purification demonstration plant at the North City Water Reclamation Plant since 2010.

KEY STAKEHOLDERS AND PROJECTED IMPACTS:
Water and Wastewater Ratepayers, Environmental Community, Business Community.

Sasaki, Ann
Originating Department

Heinrichs, Tony
Deputy Chief/Chief Operating Officer

COOPERATIVE AGREEMENT IN SUPPORT OF PURE WATER SAN DIEGO

City of San Diego
San Diego Coastkeeper
San Diego County Surfrider
CERF
San Diego Audubon Society

October 2014

COOPERATIVE AGREEMENT
IN SUPPORT OF
PURE WATER SAN DIEGO

This Cooperative Agreement (Agreement) is entered into this _____ day of _____, 2014, by and between San Diego Coastkeeper (Coastkeeper), the San Diego Chapter of Surfrider Foundation (Surfrider), the Coastal Environmental Rights Foundation (CERF), and the San Diego Audubon Society (Audubon), collectively referred to as Stakeholders, and the City of San Diego (City), a municipal corporation, for purposes of supporting and implementing potable reuse of wastewater and secondary equivalency at the Point Loma Wastewater Treatment Plant, known as the Pure Water San Diego program.

RECITALS

A. The City's Point Loma Wastewater Treatment plant operates under a National Pollutant Discharge Elimination System (NPDES) permit which allows for a variance from secondary treatment requirements pursuant to sections 301(h) and 301(j)(5) of the Clean Water Act.

B. On March 18, 2005, the City entered into a settlement agreement with Surfrider, Coastkeeper (then known as San Diego Baykeeper), and the San Diego Chapter of the Sierra Club wherein pending litigation over the City's NPDES permit was dismissed in return for the City evaluating an improved ocean monitoring program, testing new treatment technology at the Point Loma Wastewater Treatment Plant, and studying and evaluating an expanded water reuse program.

C. On February 17, 2009, the City entered into a cooperative agreement with Surfrider and Coastkeeper wherein they agreed not to oppose the renewal of the City's NPDES permit in return for the City conducting a study of ways to offload wastewater from the Point Loma Wastewater Treatment Plant through increased water reuse, which later became known as the Recycled Water Study.

D. On July 17, 2012, the City Council received the Recycled Water Study, which concludes that potable reuse achieves favorable water costs, provides reliability and local control of the water supply, enhances environmental sustainability, improves water quality, and empowers long-term cost control, pursuant to Resolution No. R-307585.

E. Stakeholders have expressed continuing concern over the City's NPDES permit for the Point Loma Wastewater Treatment Plant while supporting water reuse strategies described in the Recycled Water Study.

F. The City has determined that instead of converting the Point Loma Wastewater Treatment Plant to a secondary treatment plant, equivalent results can be achieved by offloading wastewater flow from the Plant to other existing and new facilities (secondary equivalency).

G. The strategy of achieving secondary equivalency at the Point Loma Wastewater Treatment Plant through potable reuse of wastewater has been named the Pure Water San Diego program.

H. On April 29, 2014, the City Council gave its approval and support for the Pure Water San Diego program, pursuant to Resolution No. R-308906.

NOW, THEREFORE, in consideration of these recitals and for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Stakeholders and the City hereby agree as follows:

AGREEMENT

ARTICLE 1 – PROPOSED LEGISLATION

1.1 Ocean Pollution Reduction Act. The Stakeholders shall designate from among themselves one or more parties to act as Stakeholder representatives. The City and the Stakeholder representatives will use reasonable efforts to have federal legislation passed in accordance with the proposal called the Ocean Pollution Reduction Act II (OPRA II), which is attached as Exhibit A and incorporated herein by reference. Generally, OPRA II will allow the City's NPDES permit to be based on secondary equivalency with a commitment to implement potable reuse of wastewater.

1.2 Lobbying. The City shall retain the services of one or more professional lobbyists to advocate for OPRA II. The City and the Stakeholder representatives shall also meet with elected and appointed officials as each may determine is reasonably necessary to support OPRA II. If the City and the Stakeholder representatives are jointly meeting with elected or appointed officials, the City may, in its sole discretion, pay for the travel and lodging of the Stakeholder representatives according to the same rules applicable to City employees.

1.3 Other Environmental Groups. Stakeholders shall meet with other environmental groups not signatory to this Agreement that Stakeholders reasonably believe may object to OPRA II. Stakeholders will use reasonable efforts to convince those environmental groups not to object to OPRA II. The City shall jointly attend a reasonable number of such meetings with other environmental groups at the request of Stakeholders. The City may, in its sole discretion, enter into separate agreements with other environmental groups or other organizations to support OPRA II and the City's applications for NPDES permits.

1.4 Legislative Amendments. If OPRA II is introduced or amended with language that is materially different than that in Exhibit A, the City and Stakeholders shall meet as soon as reasonably possible to discuss whether the legislation is mutually acceptable. If the legislation is not mutually acceptable, and the parties cannot agree on a strategy to return OPRA II to its original or other mutually acceptable form, then this Agreement may be terminated pursuant to sections 5.3.2 or 5.4.2.

1.5 Legislative Deadline. If OPRA II is not enacted by August 1, 2019, it shall be considered a *force majeure* event entitling the parties to an extension in time for performance pursuant to section 5.2. If OPRA II is not enacted by thirty days before the deadline for the City to file the next application after the 2015 application to renew the NPDES permit, this Agreement may be terminated pursuant to sections 5.3.3 or 5.4.3.

1.6 Regular Meetings. The City and Stakeholders anticipate that regular meetings will be necessary to discuss the progress of the Pure Water San Diego program, at least until OPRA II is enacted. The City shall host, and Stakeholders shall attend, at least four meetings per year to discuss the progress of, and potential impediments to, the Pure Water San Diego program until OPRA II is enacted. After OPRA II is enacted, scheduling and attendance at meetings will be optional.

ARTICLE 2 – PERMIT APPLICATIONS

2.1 2015 Application. The City shall submit an application to renew the NPDES permit for the Point Loma Wastewater Treatment Plant no later than January 30, 2015, unless an extension is granted by the United States Environmental Protection Agency (EPA). The City shall diligently pursue approval of the 2015 application. The Stakeholder representatives shall attend all administrative hearings where the 2015 application will be discussed and express their support for approval of the 2015 application in the context of secondary equivalency and potable reuse. Stakeholders not expressing their support at the administrative hearings shall provide such support in writing to the agencies conducting the administrative hearings.

2.2 Content. The City's 2015 application shall be submitted to EPA in compliance with OPRA II in anticipation of its enactment. The City's 2015 application shall also comply with sections 301(h) and 301(j)(5) (as it currently exists) of the Clean Water Act in the event OPRA II is not enacted before the EPA completes its review of the City's application.

2.3 Amendments. If it becomes necessary for the City to amend its 2015 application, the City shall share the proposed amendment with Stakeholders for review and comment, at least thirty (30) days before submitting the amendment to EPA. The City shall consider comments received from Stakeholders, but the City is not obligated to incorporate comments into the amendment. Any amendments submitted by the City must comply with OPRA II. A Stakeholder may submit any dispute over an amendment to mediation pursuant to Article 6.

2.4 Subsequent Applications. If the City receives a NPDES permit pursuant to its 2015 application, the City shall timely submit subsequent applications for NPDES permits in compliance with OPRA II.

2.5 Waiver. Each Stakeholder waives and relinquishes its right to challenge or protest the eligibility, validity or legality of the City's 2015 application and the resulting NPDES permit, both administratively and through litigation, whether the NPDES permit is issued under OPRA II, or under sections 301(h) and 301(j)(5) of the Clean Water Act provided the application and NPDES permit comply with OPRA II. This waiver similarly applies to subsequent applications and NPDES permits, but only if the subsequent applications and NPDES permits comply with

OPRA II. This waiver does not prohibit a Stakeholder from challenging whether the City is in compliance with its NPDES permit (as opposed to the validity or legality of the NPDES permit itself). This waiver does not apply to a Stakeholder that has withdrawn from this Agreement pursuant to section 5.3.

ARTICLE 3 – PROGRAM IMPLEMENTATION

3.1 Program Implementation. The City shall design, construct, and operate facilities shown in Exhibit B in accordance with the deadlines and milestones set forth therein, contingent on all of the following events occurring in time for the City to meet them. The City shall further use reasonable efforts to ensure the following events occur in a timely manner:

3.1.1 Legislation. OPRA II is enacted.

3.1.2 Environmental Review. Environmental review is completed under the California Environmental Quality Act, and the National Environmental Policy Act if applicable.

3.1.3 Funding. Sufficient funding is identified and appropriated pursuant to San Diego City Charter sections 80 and 99.

3.1.4 Harbor Drive Site. The City receives the necessary approvals and plan amendments to construct and operate a new treatment facility on the 25-acre site near Harbor Drive currently leased to the Public Safety Training Institute.

3.1.5 Regulatory Approval. The City receives regulatory approval to implement potable reuse at the flow rates specified in OPRA II.

3.2 Deadlines and Milestones. The deadlines and milestones for achieving the requirements of OPRA II are identified in Exhibit B.

3.2.1 Deadlines. Except as otherwise provided in this Agreement, the failure to meet a deadline is a material breach of this Agreement. If the City or a Stakeholder believes one of the events listed in section 3.1 may not occur in time for the City to meet a deadline, the parties shall promptly meet to discuss changing the deadline or event through an amendment to this Agreement.

3.2.2 Milestones. The failure to meet a milestone is not a material breach of this Agreement. The City may extend milestones by up to one year each by sending written notice to Stakeholders prior to the date of the milestone describing the length and reason for the extension. If the City or a Stakeholder believes the City may not meet a milestone, even after extended by the City, the parties shall promptly meet to discuss ways to keep the Pure Water San Diego program on schedule.

3.3 Pure Water CIP Plan. The City shall develop a Capital Improvements Program (CIP) plan for the Pure Water San Diego program by July 1, 2015, and provide copies to Stakeholders for review and comment. The Pure Water CIP plan shall include a description of all new, expanded,

and modified facilities necessary to comply with OPRA II, the dates when the design, construction, testing and operation of the facilities are anticipated to start and finish, and the estimated cost of each facility. The Pure Water CIP plan shall be based on indirect potable reuse, but the City may revise the plan later if direct potable reuse is feasible. The City shall meet with Stakeholders to discuss their comments, but the City is not obligated to incorporate comments into the Pure Water CIP plan. A Stakeholder may submit any dispute related to the Pure Water CIP plan to mediation pursuant to Article 6.

3.4 Progress Reports and Updates. The City shall prepare progress reports annually by December 31 describing the City's progress in meeting the deadlines, milestones, and the Pure Water CIP plan. The City shall also update the Pure Water CIP plan annually by December 31, if necessary. The Pure Water CIP plan is subject to change based on factors such as feasibility studies, environmental analysis, changes in the cost of labor and material, new water reclamation projects of other agencies, and evolving regulatory requirements for potable reuse. If a progress report demonstrates that the City is not on schedule to meet the deadlines, milestones, or the Pure Water CIP plan, the progress report shall include a plan to bring the City back on schedule. The City shall provide the progress reports and any updates to the Pure Water CIP plan to Stakeholders for review and comment. The City shall consider comments received from Stakeholders, and meet with Stakeholders at their request, but the City is not obligated to incorporate comments into the progress reports. A Stakeholder may submit any dispute related to the City's progress reports or updates to the Pure Water CIP plan to mediation pursuant to Article 6.

ARTICLE 4 – OCEAN MONITORING

4.1 Ocean Monitoring. The City shall continue the ocean monitoring program for the Point Loma outfall as set forth in NPDES Permit No. CA0107409 (Order No. R9-2009-0001), which is hereby incorporated by reference.

4.2 Reports. The City shall annually complete a Receiving Waters Monitoring and Assessment Report, or equivalent report, for the Point Loma Ocean Outfall and post the latest report on the City's website by every July 31. The City shall notify Stakeholders once the report is available on the City's website.

4.3 Program Changes. If the City's NPDES permit requires ocean monitoring that differs from the ocean monitoring required by this Agreement, the City shall comply with whichever requirements are stricter. If the City or a Stakeholder desires to change the ocean monitoring required by this Agreement, the City and Stakeholders shall meet to discuss potential modifications to the program. If the City and Stakeholders agree on changes to the ocean monitoring program, such changes shall be memorialized in writing signed by the parties, and become an enforceable obligation under this Agreement. If the City and Stakeholders cannot reach an agreement, the dispute shall be submitted to mediation pursuant to Article 6 upon the request of any party. Ocean monitoring required by this Agreement shall not be changed, however, without the written consent of all parties. This section does not preclude the City from performing additional ocean monitoring beyond what is required by this Agreement.

ARTICLE 5 – DURATION OF AGREEMENT

5.1 Term of Agreement. This Agreement shall be effective on the date of the last signature to this Agreement. This Agreement shall expire on December 31, 2035, or the date 83 million gallons per day of potable reuse is achieved, whichever occurs later, unless this Agreement is terminated sooner pursuant to this Article.

5.2 Force Majeure. In the event the performance of the City or Stakeholders is delayed due to causes which are outside their control, and could not be avoided by the exercise of due care, which may include, but is not limited to, war, terrorist attack, act of God, government regulations, labor disputes, strikes, fires, floods, adverse weather or elements necessitating cessation of work, inability to obtain materials, labor or equipment, then the time for performance shall be extended by an amount equivalent to the length of delay. *Force majeure* also includes the events listed in section 3.1 to the extent the City's performance is delayed because any of the listed events has not yet occurred, or if OPRA II is not enacted by August 1, 2019, pursuant to section 1.5.

5.3 Termination by Stakeholders. Any Stakeholder may withdraw from this Agreement prior to its expiration date upon the occurrence of any of the qualifying events set forth below by giving written notice of such withdrawal to the City. Such notice shall set forth the grounds for withdrawal and be delivered by certified mail with return receipt for delivery. Withdrawal shall be effective sixty (60) days after receipt of the notice. The right to withdraw must be exercised by mailing notice to the City within one year of the qualifying event or the right to withdraw is deemed waived unless an extension is agreed to in writing by the City. Each occurrence of a qualifying event gives rise to a new right to withdraw. The qualifying events are:

5.3.1 Breach. A material breach of this Agreement by the City which is not cured within thirty (30) days of written notice of the breach from the Stakeholders.

5.3.2 Legislative Amendments. OPRA II is introduced or amended prior to enactment with language unacceptable to the Stakeholder pursuant to section 1.4.

5.3.3 Legislative Deadline. OPRA II is not enacted by thirty days before the deadline for the City to file the next application after the 2015 application to renew the NPDES permit, pursuant to section 1.5.

5.3.4 Change in Law. OPRA II is enacted, but later repealed or amended to allow the Point Loma Wastewater Treatment Plant to discharge wastewater with a higher concentration or level of suspended solids or biological oxygen demand than the levels in OPRA II, or to allow the City to implement potable reuse in a flow rate less than specified in OPRA II.

5.4 Termination by the City. The City may terminate this Agreement prior to its expiration date upon the occurrence of any of the qualifying events set forth below by giving written notice of such termination to Stakeholders. Such notice shall set forth the grounds for termination and be delivered by certified mail with return receipt for delivery. Termination shall be effective

sixty (60) days after receipt of the notice. The right to terminate must be exercised by mailing notice to Stakeholders within one year of the qualifying event or the right to terminate is deemed waived unless an extension is agreed to in writing by Stakeholders. Each occurrence of a qualifying event gives rise to a new right to terminate. The qualifying events are:

5.4.1 Breach. A material breach of this Agreement by a Stakeholder which is not cured within thirty (30) days of written notice of the breach from the City.

5.4.2 Legislative Amendments. OPRA II is introduced or amended prior to enactment with language unacceptable to the City pursuant to section 1.4.

5.4.3 Legislative Deadline. OPRA II is not enacted by thirty days before the deadline for the City to file the next application after the 2015 application to renew the NPDES permit, pursuant to section 1.5.

5.4.4 Change in Law. A change in State or Federal law, or implementation of existing State or Federal law, will require the Point Loma Wastewater Treatment Plant to discharge wastewater with a lower concentration or level of suspended solids or biological oxygen demand than the levels in OPRA II.

5.4.5 Order. A Court order or the order of a State or Federal agency requires the Point Loma Wastewater Treatment Plant to discharge wastewater with a lower concentration or level of suspended solids or biological oxygen demand than the levels in OPRA II.

5.4.6 Withdrawal by Stakeholder. A Stakeholder has withdrawn from this Agreement pursuant to section 5.3 and subsequently takes action inconsistent with the purpose or intent of this Agreement.

5.5 Effect of Termination. Withdrawal by a Stakeholder shall release that Stakeholder from all obligations under this Agreement upon the effective date of termination. Withdrawal by a Stakeholder shall terminate the Agreement only as to them, and shall not affect the Agreement as to the City and any remaining Stakeholders unless the City terminates the Agreement. Termination of this Agreement by the City shall release all parties from their obligations under this Agreement upon the effective date of the City's termination.

ARTICLE 6 – DISPUTE RESOLUTION

6.1 Mandatory Mediation. If a dispute arises between the City and any Stakeholder relating to a party's obligations under this Agreement, the interpretation of OPRA II, the validity or legality of the City's application or NPDES permit, or the City's compliance with its NPDES permit, that cannot be resolved through informal discussions and meetings, notwithstanding anything to the contrary in the Clean Water Act the City and the Stakeholder shall first endeavor to settle the dispute in an amicable manner, using mandatory non-binding mediation under the rules of JAMS, AAA, or any other neutral organization agreed upon by the parties before having recourse in a court of law. Unless otherwise agreed in writing by the parties, mediation must be

completed prior to termination of this Agreement by Stakeholders or the City, except if the reason for termination is because OPRA II was not enacted by the time specified in section 1.5.

6.2 Selection of Mediator. A single mediator that is acceptable to the City and the Stakeholder shall be used to mediate the dispute. The mediator will be knowledgeable in the subject matter of this Agreement, if possible, and chosen from lists furnished by JAMS, AAA, or any other agreed upon mediator.

6.3 Mediation Expenses. The expenses of witnesses for either side shall be paid by the party producing such witnesses. All mediation costs, including required traveling and other expenses of the mediator, and the cost of any proofs or expert advice produced at the direct request of the mediator, shall be borne by the City if the subject of the mediation is the City's compliance with its NPDES permit, or if mediation has not occurred under this Article within the last twenty-four months. Otherwise, mediation costs shall be paid half by the City and half by the Stakeholders unless otherwise agreed.

6.4 Conduct of Mediation. Mediation hearings will be conducted in an informal manner. Discovery shall not be allowed. The discussions, statements, writings and admissions will be confidential to the proceedings (pursuant to California Evidence Code Sections 1115 - 1128) and will not be used for any other purpose unless otherwise agreed by the parties in writing. The parties may agree to exchange any information they deem necessary. The City and the Stakeholder shall have representatives attend the mediation who are authorized to settle the dispute, though the City's recommendation of settlement may be subject to the approval of the Mayor and City Council. Either party may have attorneys, witnesses or experts present.

6.5 Mediation Results. Any resultant agreements from mediation shall be documented in writing. The results of the mediation shall not be final or binding unless otherwise agreed to in writing by the parties. Mediators shall not be subject to any subpoena or liability and their actions shall not be subject to discovery.

ARTICLE 7 – REMEDIES

7.1 Remedies for Breach. Except as otherwise provided in this section, the sole and exclusive remedy for breach of this Agreement is termination pursuant to sections 5.3 and 5.4. Damages shall not be recoverable by any party. Specific performance shall be available to enforce ocean monitoring under article 4 and mediation under article 6. This Agreement shall not affect any remedies available to the parties under the Clean Water Act.

ARTICLE 8 – GENERAL PROVISIONS

8.1 Contract Interpretation. This Agreement and its exhibits are intended to be complementary and interpreted in harmony so as to avoid conflict, with words and phrases interpreted in a manner consistent with industry standards. This Agreement is entered into and shall be construed and interpreted in accordance with the laws of the State of California without regard to the conflicts or choice of law provisions thereof.

8.2 Mutual Obligations. The City and Stakeholders commit at all times to cooperate fully with each other, and proceed on the basis of trust and good faith, to permit each party to realize the benefits afforded under this Agreement.

8.3 Successors-In-Interest. This Agreement and all rights and obligations contained herein shall be in effect whether or not any or all parties to this Agreement have been succeeded by another entity, and all rights and obligations of the parties signatory to this Agreement shall be vested and binding on their successors in interest.

8.4 Third Party Beneficiaries. Nothing in this Agreement shall grant rights or benefits to anyone other than the City and Stakeholders, and any alleged third party beneficiaries are hereby expressly disclaimed.

8.5 Severability. Should any provision of this Agreement be held invalid or illegal by a court or administrative agency of competent jurisdiction, such invalidity or illegality shall not invalidate the whole of this Agreement, but, rather, the Agreement shall be construed as if it did not contain the invalid or illegal provision, and the rights and obligations of the parties shall be construed and enforced accordingly, except to the extent that enforcement of this Agreement without the invalidated provision would materially and adversely frustrate either or both parties' essential objectives set forth in this Agreement.

8.6 Waivers. Except as otherwise specified in this Agreement, the failure of either party to enforce any of the provisions of this Agreement or to require performance of the other party of any of the provisions hereof shall not be construed to be a waiver of such provisions unless the waiver is in writing. Prior waivers shall not preclude the right of either party to thereafter enforce each and every provision of this Agreement.

8.7 Limitation on Powers. Nothing in this Agreement shall be construed as a limitation upon the powers of the City as a chartered city of the State of California.

8.8 Notices. All notices required to be given under this Agreement must be in writing and either served personally, sent by facsimile transmission, or mailed by express or certified mail with delivery confirmation. Notices shall be effective upon receipt. Notices shall be mailed to:

Surfrider Foundation
San Diego County Chapter
9883 Pacific Heights Blvd., Suite D
San Diego, CA 92121

San Diego Coastkeeper
2825 Dewey Road, Suite 200
San Diego, CA 92106

Coastal Environmental Rights Foundation
1140 South Coast Highway 101
Encinitas, CA 92024

San Diego Audubon Society
4010 Morena Blvd., Suite 100
San Diego, CA 92117

City of San Diego
Public Utilities Department
9192 Topaz Way
San Diego, CA 92123

8.9 Assignment. Neither party shall assign its rights or obligations under this Agreement without the other party's prior written approval, which shall not be unreasonably withheld. Any attempted assignment in violation of this section shall be void and incapable of creating any contractual relationship between a party and a putative assignee.

8.10 Incorporation of Exhibits. All exhibits referenced in this Agreement are hereby incorporated into and made a part of this Agreement by reference.

8.11 Integration Clause. The City and Stakeholders represent, warrant and agree that no oral promise or agreement not expressed herein has been made to them, that this Agreement contains the entire agreement between the parties, that this Agreement supersedes any and all prior oral agreements or understandings between the parties unless otherwise provided herein, and that in executing this Agreement, neither party is relying on any statement or representation made by the other party concerning the subject matter, basis or effect of this Agreement other than as set forth herein, and that each party is relying solely on its own judgment and knowledge. This Agreement may not be amended except by an instrument in writing signed by both parties.

8.12 Counterparts. This Agreement may be executed in counterparts, which when taken together, shall constitute a single signed original as though all parties had executed the same page.

[remainder of page intentionally blank]

IN WITNESS WHEREOF, this Agreement is executed by the City of San Diego pursuant to San Diego Resolution No. R-_____ authorizing such execution, and the Stakeholders acting by and through their authorized officers.

SAN DIEGO COASTKEEPER

By: M Baehrens

Name: Megan Baehrens

Date: 10/21/14

SAN DIEGO AUDUBON SOCIETY

By: _____

Name: _____

Date: _____

SURFRIDER FOUNDATION
SAN DIEGO COUNTY CHAPTER

By: _____

Name: _____

Date: _____

THE CITY OF SAN DIEGO

By: _____

Name: _____

Date: _____

COASTAL ENVIRONMENTAL RIGHTS FOUNDATION

By: M. Gonzalez

Name: Marco Gonzalez

Date: 11/4/13

I HEREBY APPROVE the form and legality of the foregoing agreement this _____ day of _____, 2014.

JAN I. GOLDSMITH, City Attorney

By: _____
Deputy City Attorney

IN WITNESS WHEREOF, this Agreement is executed by the City of San Diego pursuant to San Diego Resolution No. R-_____ authorizing such execution, and the Stakeholders acting by and through their authorized officers.

SAN DIEGO COASTKEEPER

By:_____

Name:_____

Date:_____

SAN DIEGO AUDUBON SOCIETY

By:_____

Name:_____

Date:_____

SURFRIDER FOUNDATION
SAN DIEGO COUNTY CHAPTER

By: Roger C Kube, Jr

Name: Roger C Kube, Jr

Date: 10/15/14

THE CITY OF SAN DIEGO

By:_____

Name:_____

Date:_____

COASTAL ENVIRONMENTAL RIGHTS FOUNDATION

By:_____

Name:_____

Date:_____

I HEREBY APPROVE the form and legality of the foregoing agreement this _____ day of _____, 2014.

JAN I. GOLDSMITH, City Attorney

By:_____
Deputy City Attorney

IN WITNESS WHEREOF, this Agreement is executed by the City of San Diego pursuant to San Diego Resolution No. R-_____ authorizing such execution, and the Stakeholders acting by and through their authorized officers.

SAN DIEGO COASTKEEPER

By:_____

Name:_____

Date:_____

SAN DIEGO AUDUBON SOCIETY

By: Ed Henry

Name: Edward O. Henry

Date: 9-26-14

SURFRIDER FOUNDATION
SAN DIEGO COUNTY CHAPTER

By:_____

Name:_____

Date:_____

THE CITY OF SAN DIEGO

By:_____

Name:_____

Date:_____

COASTAL ENVIRONMENTAL RIGHTS FOUNDATION

By:_____

Name:_____

Date:_____

I HEREBY APPROVE the form and legality of the foregoing agreement this _____ day of _____, 2014.

JAN I. GOLDSMITH, City Attorney

By:_____
Deputy City Attorney

EXHIBIT A

OCEAN POLLUTION REDUCTION ACT II

SECTION 1. SHORT TITLE.

This Act may be cited as the "Ocean Pollution Reduction Act II."

SECTION 2. FINDINGS AND POLICY

In 1972, Congress passed the Federal Water Pollution Control Act Amendments, which required Publicly Owned Treatment Works to achieve secondary treatment capability by 1977.

In 1994, the Federal District Court for the Southern District of California determined that upgrading the City of San Diego's Point Loma Wastewater Treatment Plant to secondary treatment level would not be in the public interest, being excessively costly without producing additional environmental benefits.

The Point Loma Plant currently meets all the requirements of secondary treatment except for the removal of total suspended solids and biological oxygen demand.

At the direction of Congress, the Environmental Protection Agency (EPA) requested that the National Research Council advise the agency on ways to improve wastewater management in coastal urban areas. The resulting study, "*Managing Wastewater in Coastal Urban Areas,*" produced several important findings, including:

- Biological oxygen demand discharged thru a well-designed outfall is generally of no ecological concern in open coastal waters.

- Total suspended solids can be adequately controlled by advanced primary treatment and high dilution outfalls.

- Over-control is particularly likely along ocean coasts, but nevertheless full secondary treatment is required regardless of cost or lack of benefits.

Past reviews by the City, the EPA, the State of California, and scientists affiliated with the Scripps Institution of Oceanography and the University of California at San Diego, as well as other organizations have concluded the Point Loma Plant does not have a significant adverse impact on the ocean environment.

The ocean outfall for the Point Loma Plant discharges effluent 4.5 miles from the coast at a depth of over 300 feet, one of the longest and deepest in the world.

Implementing full secondary treatment at the Point Loma Plant will cost approximately $2.1 billion.

Implementing full secondary treatment is contrary to the national interest, in that it will compromise views from the Cabrillo National Monument and interfere with the Navy's use of adjacent property.

The City generates all the energy it needs to operate the Point Loma Plant onsite through co-generation. Implementing full secondary treatment will turn a "green" facility into one of the region's largest energy consumers, requiring the purchase of over $17 million each year in electricity and producing more than 100,000 tons of greenhouse gas emissions annually.

Implementing full secondary treatment at the Point Loma Plant will require removal of 1,250,000 tons of earth from environmentally sensitive habitat immediately adjacent to the Point Loma Ecological Reserve.

Recognizing the unique situation surrounding the Point Loma Plant, Congress adopted the Ocean Pollution Reduction Act of 1994 (OPRA). OPRA allowed the Point Loma Plant to avoid conversion to full secondary treatment and instead operate under a modified permit according to standards contained in OPRA and section 301(h) of the Clean Water Act.

The City has complied with all requirements of OPRA and the results have been significant, including reduction in the discharge of total suspended solids and biological oxygen demand, advanced ocean monitoring, and construction of 45 million gallons per day of reclaimed water capacity at a cost of approximately $340 million.

Successor legislation to OPRA will capitalize on the record of improvements initiated under OPRA and provide a framework for further enhancements to the City's water and wastewater systems, increased potable water reliability, and additional meaningful environmental protection.

The City has completed its Water Purification Demonstration Project showing that municipal wastewater can successfully be treated to levels suitable for potable reuse. The City completed its Recycled Water Study in 2012 describing how wastewater can be diverted from the Point Loma Plant to new treatment facilities to generate water suitable for potable reuse. Through the construction and operation of new treatment facilities, the City can reduce the total suspended solids discharged by the Point Loma Plant to the same or lower levels as would be achieved by implementing full secondary treatment, while creating an important new local source of water.

The City currently relies on imported water for over 85% of its water supply. A new local source of water can significantly reduce the environmental impacts of importing water to San Diego from the Colorado River and the California Bay-Delta by offsetting the City's demand for imported water.

Due to severe drought in California, the 2014 water allocation from the State Water Project is only 5% of normal, forcing water agencies to draw down water reserves, implement mandatory conservation measures, and search for new, dependable sources of water.

SECTION 3. SAN DIEGO SECONDARY TREATMENT EQUIVALENCY.

Section 301(j)(5) of the Federal Water Pollution Control Act (33 U.S.C. 1311(j)(5)) is amended to read as follows:

(5) SAN DIEGO SECONDARY TREATMENT EQUIVALENCY.

(A) IN GENERAL. Notwithstanding anything to the contrary in the Federal Water Pollution Control Act or the Coastal Zone Management Act, an application for the Point Loma Wastewater Treatment Plant shall be reviewed and processed as the equivalent of an application for a secondary treatment discharge pursuant to subsection (b)(1)(B) and section 402 of the Federal Water Pollution Control Act, provided that the application includes a commitment to:

(i) maintain a deep ocean outfall from the Point Loma Wastewater Treatment Plant with a discharge depth of no less than 300 feet.

(ii) discharge no more than 12,000 metric tons of total suspended solids per year commencing on December 31, 2015, no more than 11,500 metric tons of total suspended solids per year commencing on December 31, 2025, and no more than 9,942 metric tons of total suspended solids per year commencing on December 31, 2027.

(iii) discharge no more than a concentration of 60 milligrams per liter of total suspended solids calculated as a thirty day average.

(iv) remove no less than 80% of total suspended solids on a monthly average, and no less than 58% of biological oxygen demand on an annual average, from wastewater flow tributary to the Point Loma Plant. Wastewater flow is tributary to the Point Loma Plant if it is discharged into the applicant's wastewater system, or into any wastewater system connected to the applicant's wastewater system, excluding wastewater flow treated and discharged from facilities separately permitted under section 402.

(v) meet all other effluent limitations of secondary treatment, as defined by the Administrator pursuant to section 304(d)(1), except for any effluent concentration limits for biological oxygen demand.

(vi) comply with federal anti-degradation policy as determined by the Administrator.

(vii) perform ocean monitoring that meets or exceeds the Administrator's requirements for section 301(h) dischargers.

(B) POTABLE REUSE. To be eligible to submit an application under this paragraph, the applicant must demonstrate to the satisfaction of the Administrator that to the extent potable reuse is permitted by federal and state regulatory agencies, at least 83 million gallons per day of water suitable for potable reuse on an annual average will be produced by December 31, 2035, from wastewater in the applicant's wastewater system and wastewater systems connected to the applicant's wastewater system as of the date of this Act. The Administrator shall determine development milestones necessary to ensure compliance with this paragraph and include said milestones as conditions in each permit issued prior to December 31, 2035.

(C) PREVIOUS OCEAN MONITORING DATA. The applicant must demonstrate to the satisfaction of the Administrator that the applicant has performed monitoring that meets or exceeds the requirements for section 301(h) dischargers for at least the last 10 years.

(D) PENDING APPLICATIONS. Any application for the Point Loma Wastewater Treatment Plant pending on the effective date of this Act shall be reviewed and processed under this paragraph.

(E) SECONDARY TREATMENT. Nothing in this Act shall prevent the applicant from submitting an application for the Point Loma Wastewater Treatment Plant that complies with secondary treatment pursuant to subsection (b)(1)(B) and section 402

EXHIBIT B

Pure Water San Diego Project Deadlines and Milestones

Environmental Review		
Task	Deadline	Milestone
Issue Notice of Preparation of Program EIR		January 31, 2015
Publish draft Program EIR for public review		January 31, 2017
Certify Final Program EIR	January 31, 2018	

North City Projects		
Task	Deadline	Milestone
Issue NTP for pre-design of transmission pipelines		July 31, 2014
Issue NTP for pre-design of a 15 mgd potable reuse facility		July 31, 2015
Issue NTP for full design of transmission pipelines		January 31, 2017
Issue NTP for full design of a 15 mgd potable reuse facility		May 31, 2017
Advertise for bids to construct transmission pipelines		October 31, 2019
Advertise for bids to construct a 15 mgd potable reuse facility		January 31, 2020
Issue NTP to construct transmission pipelines		October 31, 2020
Issue NTP to construct à 15 mgd potable reuse facility		January 31, 2021
Complete construction of transmission pipelines	June 30, 2023	
Complete construction of a 15 mgd potable reuse facility	June 30, 2023	
Produce a total of at least 15 mgd of potable reuse	December 31, 2023	

South Bay* Projects		
Task	Deadline	Milestone
Issue NTPs for pre-design of a potable reuse facility and pipelines		September 30, 2018
Issue NTPs for full design of a potable reuse facility and pipelines		September 30, 2020
Issue NTPs to construct a potable reuse facility and pipelines		September 30, 2024
Complete construction of a potable reuse facility and pipelines	June 30, 2027	
Produce a cumulative total of at least 30 mgd of potable reuse**	December 31, 2027	

Harbor Drive* Projects		
Task	Deadline	Milestone
Complete real property appraisal of Harbor Drive site		June 30, 2015
Complete acquisition of Harbor Drive site		December 31, 2019
Issue NTPs for pre-design of a potable reuse facility and pipelines		June 30, 2025
Issue NTPs for full design of a potable reuse facility and pipelines		June 30, 2027
Issue NTPs to construct a potable reuse facility and pipelines		June 30, 2031
Complete construction of a potable reuse facility and pipelines	June 30, 2035	
Produce a cumulative total of at least 83 mgd of potable reuse**	December 31, 2035	

* actual location of projects subject to change in accordance with changes to the Pure Water CIP plan.

** cumulative totals of potable reuse include projects that may be implemented by the participating agencies signatory to the 1998 Metro Agreement (Doc. # OO-18517).

INFORMATION ONLY

December 1, 2014 JPA Board Meeting

TO: JPA Board of Directors

FROM: Facilities & Operations

Subject: Tapia Disinfection By-Products Reduction Effort: Final Report (Pg. 128)

SUMMARY:

The September 2010 NPDES Permit for the Tapia Water Reclamation Facility included a Time Schedule Order and Cease and Desist Order, requiring reductions in the levels of disinfection by-products (DBPs) discharged in the plant effluent. In response to the new requirements, the JPA converted Tapia's disinfection process to chloramines, a combination of chlorine and ammonia, to minimize the formation of DBPs in its treated water.

Construction of the chloramination facilities was completed in late 2013. As required, a final report to evaluate the effectiveness of the new chloramination process was prepared and submitted to the Los Angeles Regional Water Quality Control Board on October 13, 2014. Overall, the report shows that the chloramination process has been effective in controlling DBP formation in the plant effluent to meet regulatory standards.

Attached for reference is a copy of the final report.

FISCAL IMPACT:

No

ITEM BUDGETED:

No

DISCUSSION:

Tapia's NPDES Permit issued in September 2010 included a Time Schedule Order (TSO) and Cease and Desist Order (CDO), requiring reductions in the levels of DBPs discharged in the plant effluent. DBPs result from the reaction of organic matter in the effluent and chlorine, which is used for disinfection purposes. The CDO and TSO consisted of limits for dichlorobromomethane (DCBM) in water discharged to Malibu Creek and total trihalomethanes (TTHMs - the sum of dichlorobromomethane, chloroform, bromoform, and dibromochloromethane) in water discharged to the Los Angeles River.

A DCBM limit was first established in Tapia's 1997 NPDES permit, which included a TSO for nutrients and DCBM discharged to Malibu Creek. Tapia was generally compliant with the DCBM limits, and the TSO expired in 2002. However, in 2000, the EPA implemented the California Toxics Rule, which established a new regulatory basis for the application of DCBM limits. Tapia's 2005 NPDES Permit included a daily average DCBM limit of 46 mg/L. Tapia's discharge remained generally compliant with the limit until the biological nutrient reduction (BNR) process was placed in service to reduce nitrogen levels in the plant effluent.

The BNR process required Tapia to maintain a higher solids concentration to support nutrient reduction targets for the new treatment process. Unfortunately, the higher solids concentration increased the amount of organic matter that was available to react with free chlorine used for disinfection, increasing DCBM formation. As a result of DCBM violations, a CDO was included Tapia's 2010 NPDES Permit, which established final DCBM limits of 46 mg/L as a daily average and 77 mg/L as a daily maximum concentration for the plant effluent.

A TSO was also included in Tapia's 2010 NPDES Permit to establish new TTHM limits for discharges to the Los Angeles River. The TTHM limits only apply to discharges to the Los Angeles River, whereas the DCBM limits apply to both Malibu Creek and Los Angeles River discharges. The TSO established a final limit of 80 mg/L for TTHMs, which is the current standard for drinking water. The basis for the new limit was that the Los Angeles River is designated for use as groundwater recharge for drinking water sources and, therefore, the California Code of Regulations Title 22 Drinking Water Standards were applied directly to discharges to river.

The JPA began design of the chloramination facilities to reduce DBPs in early 2011 and completed construction in late 2013. One requirement of the permit was to compile and submit a final report evaluating the effectiveness of the chloramination process.

The report includes the following items:

- A description of the alternative disinfection technologies considered and selected.
- A summary of any significant issues encountered during the design and construction/installation phase.
- An analysis of the data collected over a six-month period immediately preceding the alternative disinfection installation and a comparison with the data collected during (and, if possible, after) the process optimization process.
- An evaluation of the alternate disinfection technology's effectiveness with quality assurance results.

Overall, the report shows that the chloramination process has been effective in controlling DBP formation in the plant effluent to meet regulatory standards.

Attached for reference is a copy of the final report submitted to the Los Angeles Regional Water Quality Control Board on October 13, 2014.

Prepared By: Brett Dingman, Water Reclamation Manager

ATTACHMENTS:

TSO/CDO Final Report to RWQCB

Las Virgenes Municipal Water District
Tapia Water Reclamation Facility
NPDES Permit No. CA0056014, CI4760
Order No. R4-2010-0165
Time Schedule Order R4-2010-0166
Cease and Desist Order R4-2010-0167
Final Report

As required by Time Schedule Order R4-2010-0166 and Cease and Desist Order R4-2010-0167 this final report includes the following components.

1. A description of the alternative disinfection technologies considered and chosen.
2. A summary of any significant issues encountered during the design and installation phase.
3. An analysis of the data collected six over six months immediately preceding the alternative disinfection technology installation with data collected during (and if possible, after) the process optimization process.
4. An evaluation of the alternate technology disinfection technology's effectiveness with quality assurance results.

Component 1:
A description of the alternative disinfection technologies considered and chosen.

Please see the attached Technical Memorandum on the Concept-Level Evaluation of Disinfection Alternatives for Tapia completed by MWH in Appendix 1. The alternative chosen was chloramination with a potential future upgrade to UV disinfection.

Component 2:
A summary of any significant issues encountered during the design and installation phase.

One significant issue that was encountered as a part of this project was the requirement to be included in the California Accidental Release Program (CalARP). The application progress was lengthy. A Copy of the Risk Management Plan from CalARP is included in Appendix 2.

Component 3:
An analysis of the data collected six over six months immediately preceding the alternative disinfection technology installation with data collected during (and if possible, after) the process optimization process.

DCBM at 001 Discharge Point

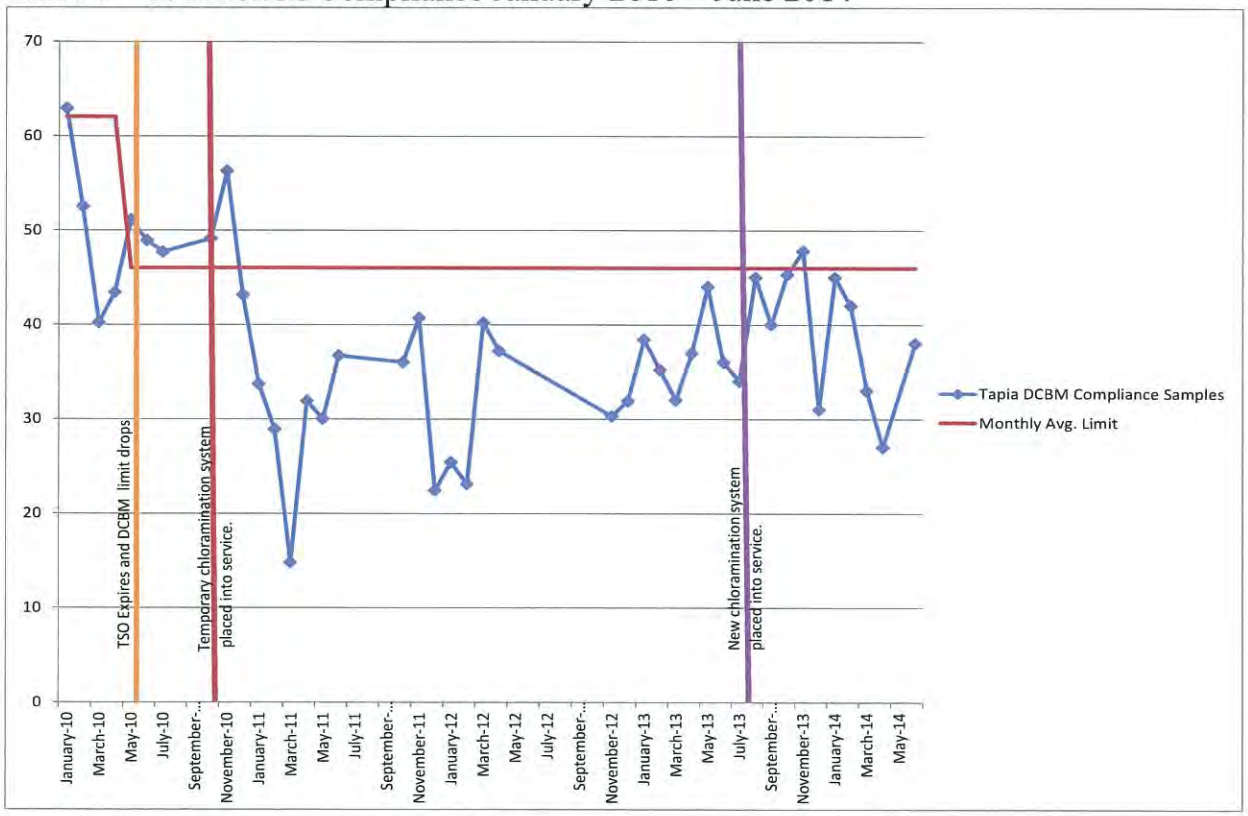
DCBM data from July 2010 through April 2014 is attached for reference in Tables 1 and 2 Appendix 3.

Tapia's NPDES permit includes a Cease and Desist Order (No. R4-2010-0167) for discharge to points 001, 002, 003 and 005 with a final limit of 46 µg/L as a daily average and 77 µg/L as a daily maximum for DCBM and an interim limit of 62 µg/L as a daily average and 77 µg/L as a daily maximum. In the Cease and Desist Order, point 37 of the Conclusion states that "Compliance with the interim effluent limitation and time schedule for DCBM in this CDO does not exempt the Discharger from

mandatory minimum penalties for violations of the final effluent limitations for DCBM in Order No. R4-2010-0165." These limits are 46 µg/L as a daily average and 77 µg/L as a daily maximum.

Because of this statement, the interim limits are moot, and final effluent limits for DCBM were to be complied with immediately. To address this issue, an interim ammonia injection system was constructed using 275 gallon IBC tanks containing aqua ammonia. The interim ammonia injection system was placed into service in November, 2010. DCBM data back to January, 2010 is included in Appendix 3.

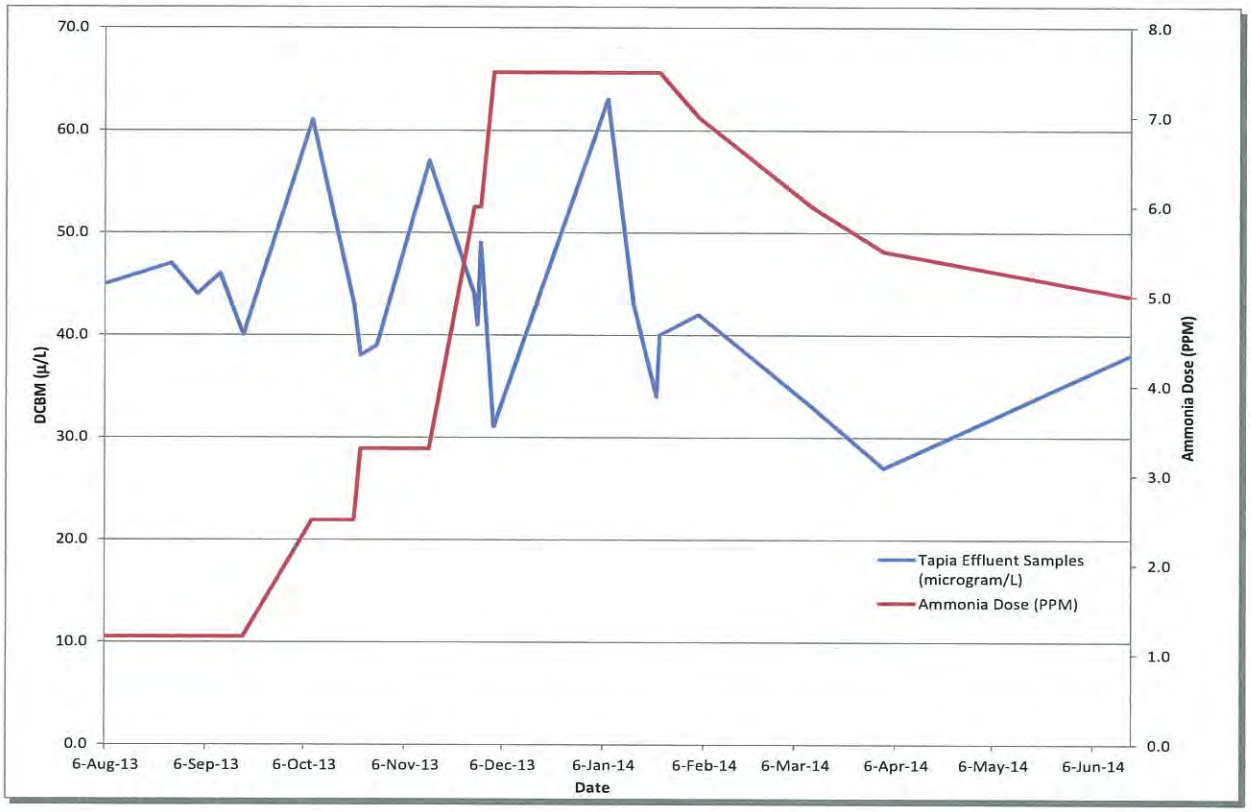
Chart 1 – 001 DCBM Compliance January 2010 – June 2014



As can be seen from Chart 1, soon after interim ammonia injection system was placed into service, compliance with the DCBM limit was achieved. There is one exceedance of the 46 µg/L limit after the new permanent chloramination system was placed into service. This is a result of a change in the location of ammonia injection. There are two locations where ammonia can be introduced into the treatment process; in the filters before filtration or at the head end of the chlorine contact channel (after filtration). In November 2013, the ammonia was introduced at the head end of the chlorine contact channel. This method of ammonia injection did not give enough time for the ammonia to mix with the flow before chlorine injection and so the DCBM level was elevated.

Chart 2, below, shows the effect of ammonia dose upon DCBM levels. This data was taken after the installation of the permanent chloramination facilities where the ammonia dose is flow paced.

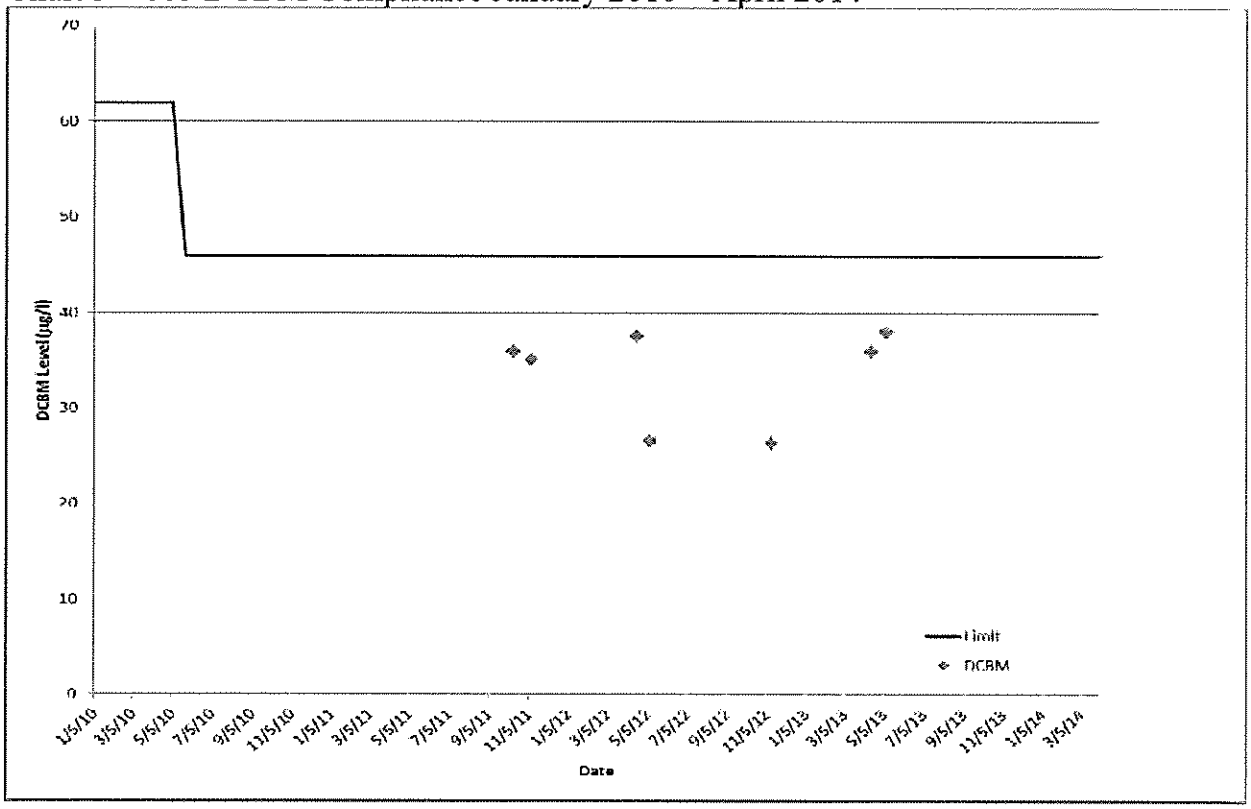
Chart 2 – Ammonia Dose Response for DCBM



DCBM at 005 Discharge Point

As can be seen from Chart 3 below, compliance with the DCBM limit at the 005 outfall has not been an issue. All compliance samples taken have met the final limit of 46 µg/l. There is limited data available due to the limited use of the 005 discharge point. Data used for 005 DCBM analysis is included in Appendix 3.

Chart 3 – 005 DCBM Compliance January 2010 – April 2014



TTHM's at 005 Discharge Point

Tapia's NPDES permit includes a Time Schedule Order (No. R4-2010-0166) for discharge to point 005 with a final limit of 80 µg/L as a monthly average for TTHM's with an interim limit of 154 µg/L as a daily average. TTHM level results are provided in Chart 4 below. This data only goes back to October of 2010 because there were no previous TTHM limits; and therefore, no monitoring.

As can be seen from Chart 4, TTHM levels have been erratic. There have only been seven compliance samples for TTHM taken at the 005 outfall since the issuance of the Time Schedule Order in October 2010 through January 2013. This is because the demand for recycled water has been high due to weather and drought conditions and there has been little need to discharge to the 005 outfall. Additional non-compliance sampling could be scheduled, to determine TTHM level, but due to potable water addition in the recycled water reservoir to supplement the recycled water system, the samples would not be representative.

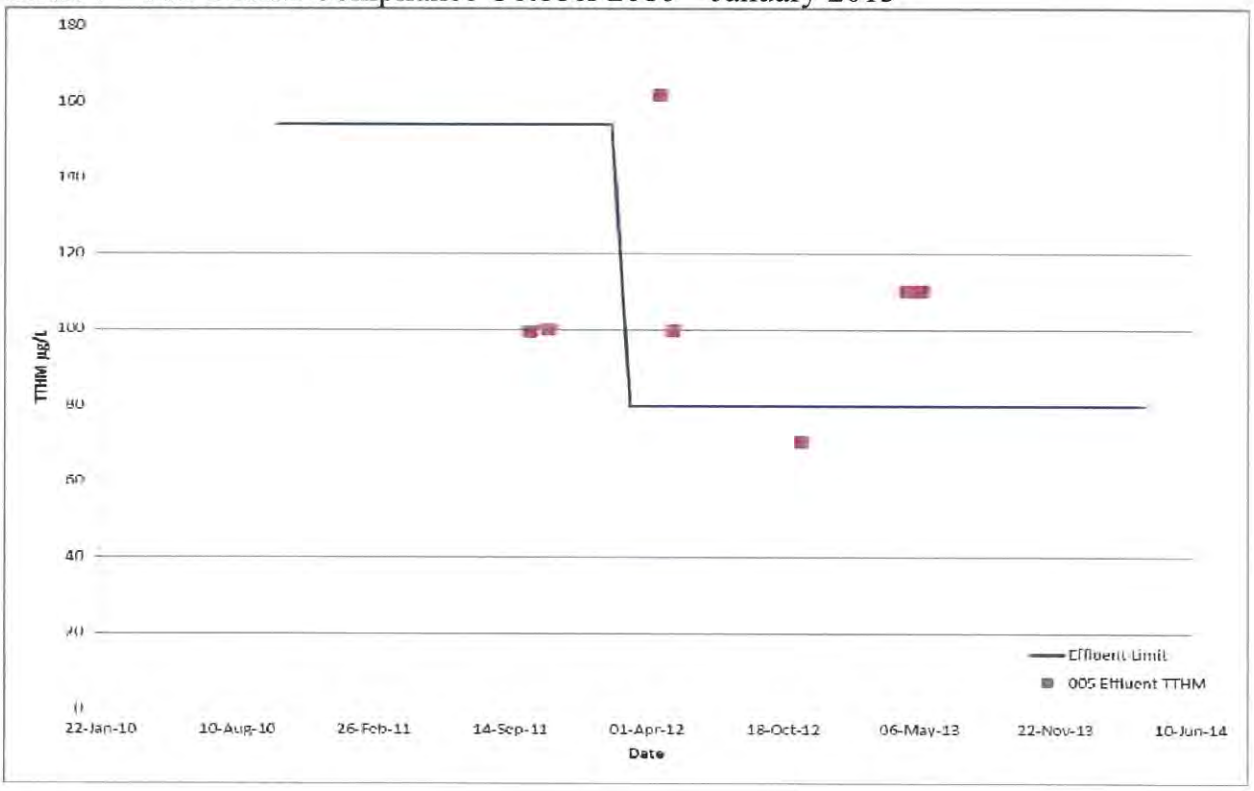
Of the three compliance samples which resulted in permit violations, none were taken after the completion of the permanent chloramination facilities in October of 2013.

Testing of recycled water at the Tapia WRF shows an erratic level of TTHM's as well. Currently, the chloramination system is being adjusted to address potential violations at the 005 outfall.

We are currently soliciting bids for a project that will improve the quality of the water in the recycled water storage reservoir # 2. The scope of this project is to clean the 45 acre foot reservoir and then line the sides with an HDPE liner (the bottom is already concrete). As a future option, shade balls may be placed on the surface of the reservoir to prevent sunlight penetration and associated algal growth. It is expected that this project will improve the quality of the recycled water and help prevent the formation of TTHMs.

TTHM data for the 005 discharge point from October, 2010 through April, 2014 is included in Table 3 in Appendix 3 for reference.

Chart 4 – 005 TTHM Compliance October 2010 – January 2013

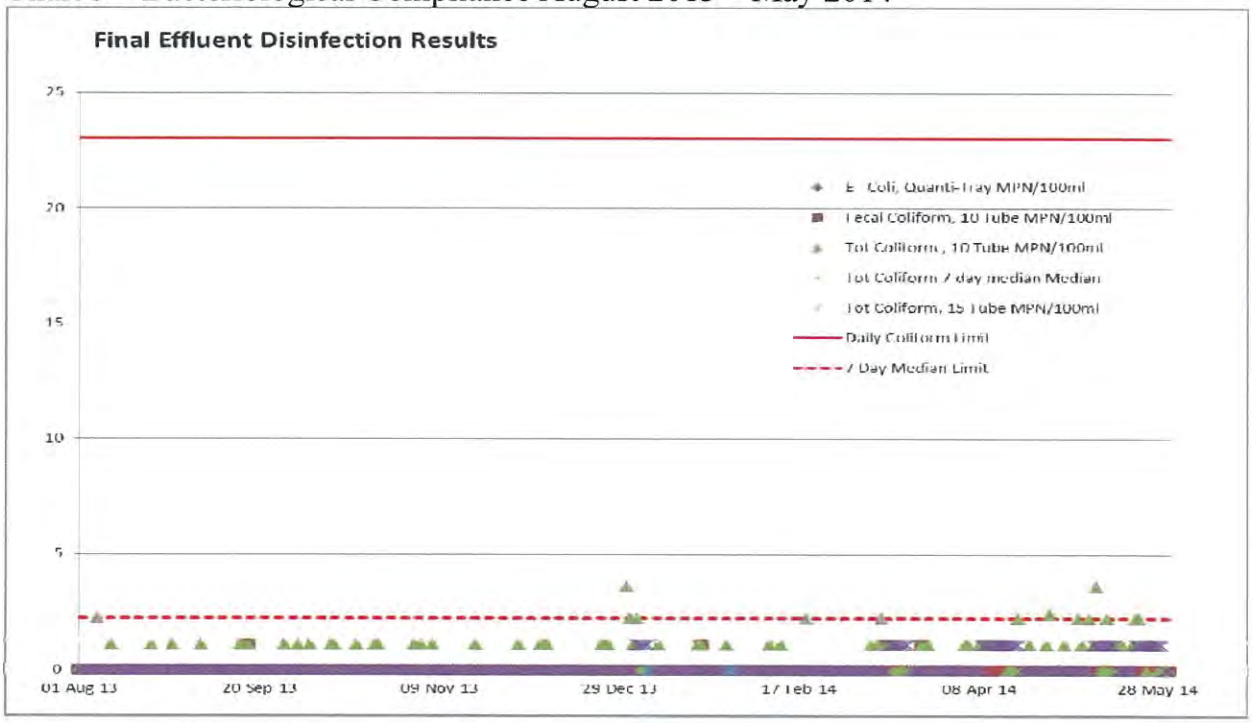


Component 4:
An evaluation of the alternate technology's disinfection effectiveness with quality assurance results.

As can be seen in chart 5 below, there have been no violations of Tapia's disinfection

requirements since the new permanent chloramination facilities were placed into service in August of 2013. All compliance testing is performed in accordance with the quality control requirements of National Environmental Laboratory Accreditation Program (NELAP).

Chart 5 – Bacteriological Compliance August 2013 – May 2014



Appendix 1: Technical Memorandum on the Concept-Level Evaluation of Disinfection Alternatives for Tapia completed by MWH

TECHNICAL MEMORANDUM

MWH

BUILDING A BETTER WORLD

To:	Brett Dingman	**Date:**	March 17, 2011
From:	Roger Stephenson Sarah Munger Jamal Awad	**Reference:**	1010371
Subject:	Concept-Level Evaluation of Disinfection Alternatives for Tapia FINAL	**Client:**	Las Virgenes Municipal Water District/Triunfo Sanitation District Joint Powers Authority

INTRODUCTION

The Las Virgenes Municipal Water District/Triunfo Sanitation District Joint Powers Authority (JPA) operates the Tapia Water Reclamation Facility (Tapia). In September 2010, a new National Pollutant Discharge Elimination System (NPDES) permit for Tapia was adopted. The new NPDES permit includes a cease and desist order (CDO) for the discharge of Dichlorobromomethane (DCBM) to the Los Angeles River and Malibu Creek and a Time Schedule Order (TSO) for Total Trihalomethanes (TTHMs) discharged to the Los Angeles River. The JPA has entered into a contract with MWH to investigate alternative disinfection technologies that may be implemented to reduce the DCBM and TTHMs in Tapia's treated effluent. The purpose of this Technical Memorandum is to document the investigation into the four alternative disinfection technologies that may be implemented at Tapia namely mixed oxidants, ultraviolet light (UV), ozone and chloramination.

BACKGROUND

Tapia uses the following treatment processes: coarse screening, grit removal, primary sedimentation, activated sludge secondary treatment, filtration, chlorination, and dechlorination. Tapia uses an activated sludge process with nitrification and denitrification (NDN) with secondary clarification. The tertiary treatment process consists of filtration through anthracite media. Chlorination and dechlorination are accomplished through the use of sodium hypochlorite and sodium bisulfite. A general process flow diagram for the treatment plant is shown on **Figure 1**. The filtration and disinfection facilities are illustrated in more detail on **Figure 2**.

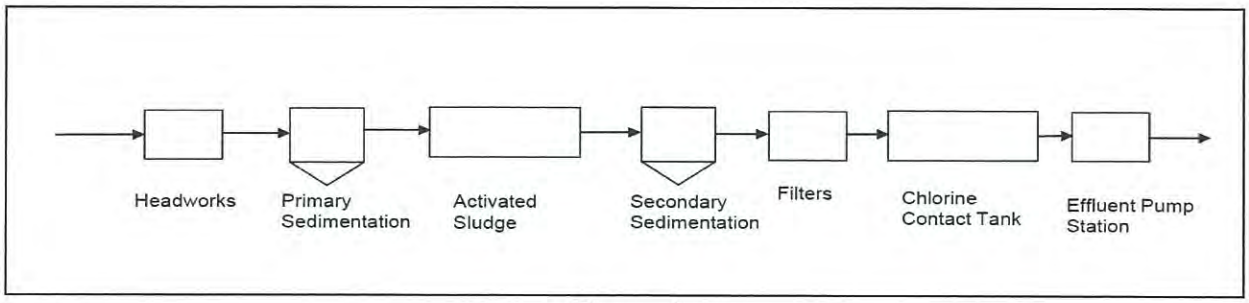


Figure 1
Tapia Process Flow Diagram

Tapia currently treats approximately 9.5 mgd, which is reused or discharged to the Los Angeles River (outfall 005) or Malibu Creek (outfall 001). Reuse of 60 percent of the tertiary effluent produced annually is achieved through an extensive recycled water system. Although the facility is rated at 16.1 mgd, nutrient removal planning efforts over the last 10 years have considered 12 mgd as the necessary maximum capacity for the foreseeable future. Non-recycled effluent is disposed of by discharging to the Los Angeles River (outfall 005), Malibu Creek (outfall 001) or by the use of JPA operated spray fields. The Malibu Creek discharge is only allowed from November 15th to April 15th each year. Discharge to Malibu Creek and the Los Angeles River are regulated under a NPDES permit issued by the Los Angeles Regional Water Quality Control Board (Regional Board).

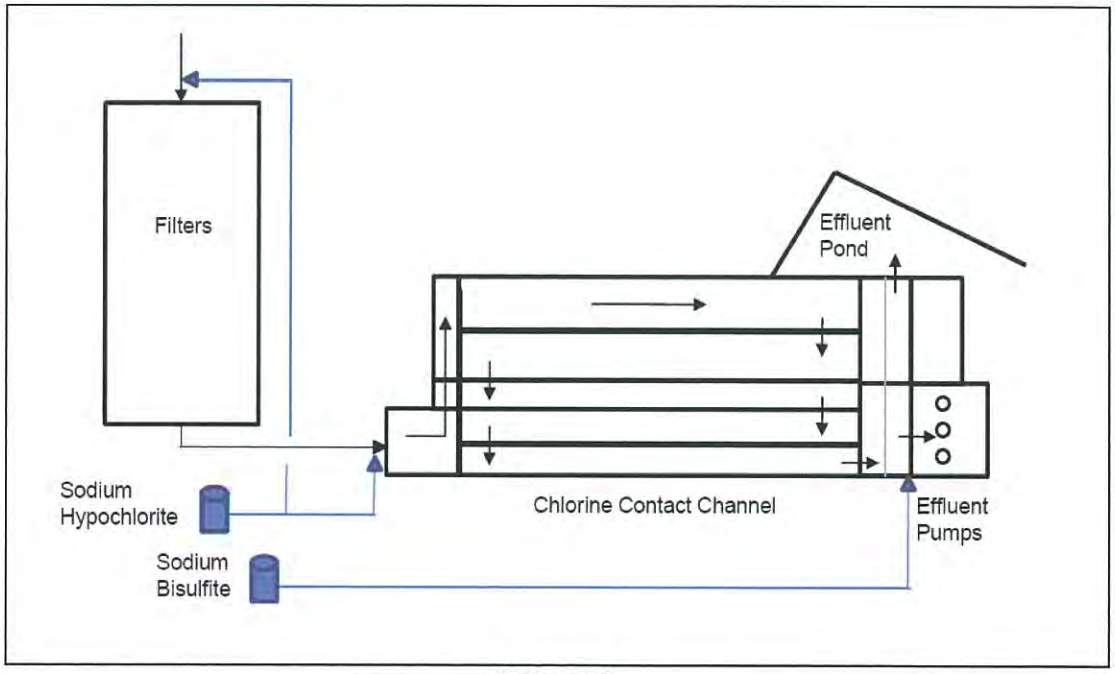


Figure 2
Tertiary Process Flow Diagram

When chlorine is added to wastewater it oxidizes organic matter and this results in the formation of disinfection by-products that include THMs. There are four trihalomethane (THM) compounds that are regulated under the NPDES permit: Dichlorobromomethane (DCBM),

dibromochloromethane (DBCM), chloroform, and bromoform. The TTHM limit set forth in the NPDES permit is the sum of these four THMs.

The Regional Water Quality Control Board adopted an NPDES permit for the Tapia WRF in 2005 that included an interim average monthly effluent limit for DCBM of 62 mg/l and a final limit of 46 mg/l. DCBM levels were in compliance with both the interim and final limit and trending downward until April of 2008 when construction of the BNR upgrades at Tapia WRF and Rancho Las Virgenes Composting Facility began. New BNR facilities were placed into service in August and September of 2009 and construction was completed in October 2009. DCBM levels have remained at elevated levels since the completion of BNR construction. As a part of the 2010 NPDES permit issued by the RWQCB, a Cease and Desist Order for DCBM and a Time Schedule Order for TTHM were issued. TTHM limits only apply to L.A. River Discharge while DCBM limits apply to all discharge points. **Figure 3** and **4** present DCBM and TTHM concentrations, respectively, from 2005 to the present.

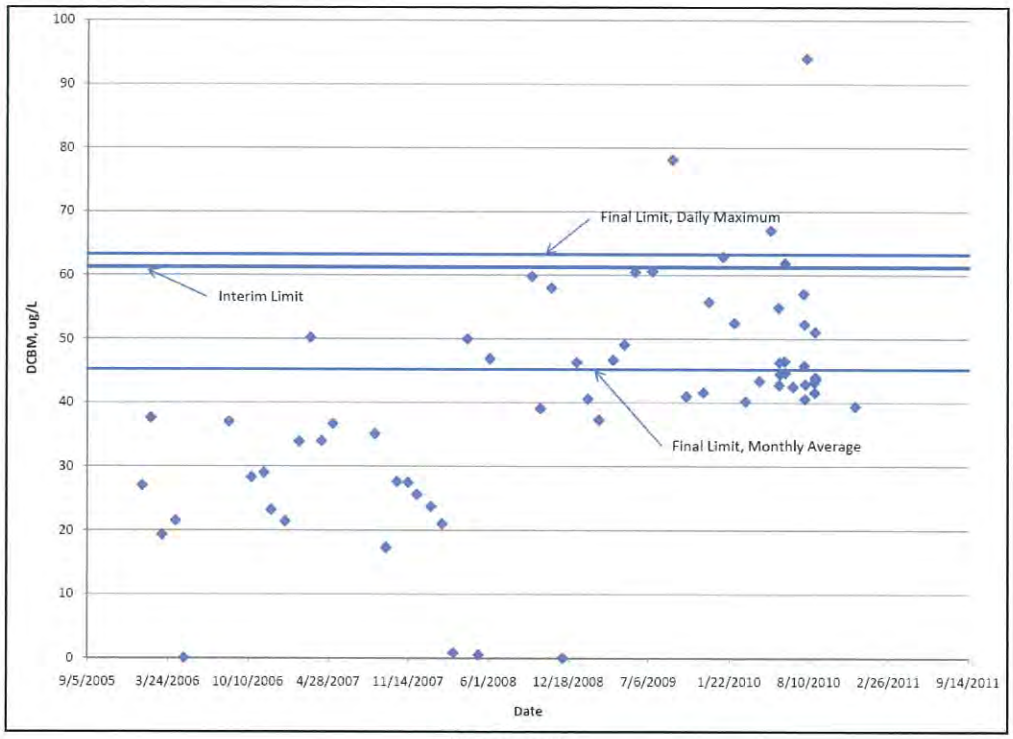


Figure 3
Plant Effluent Data for DCBM

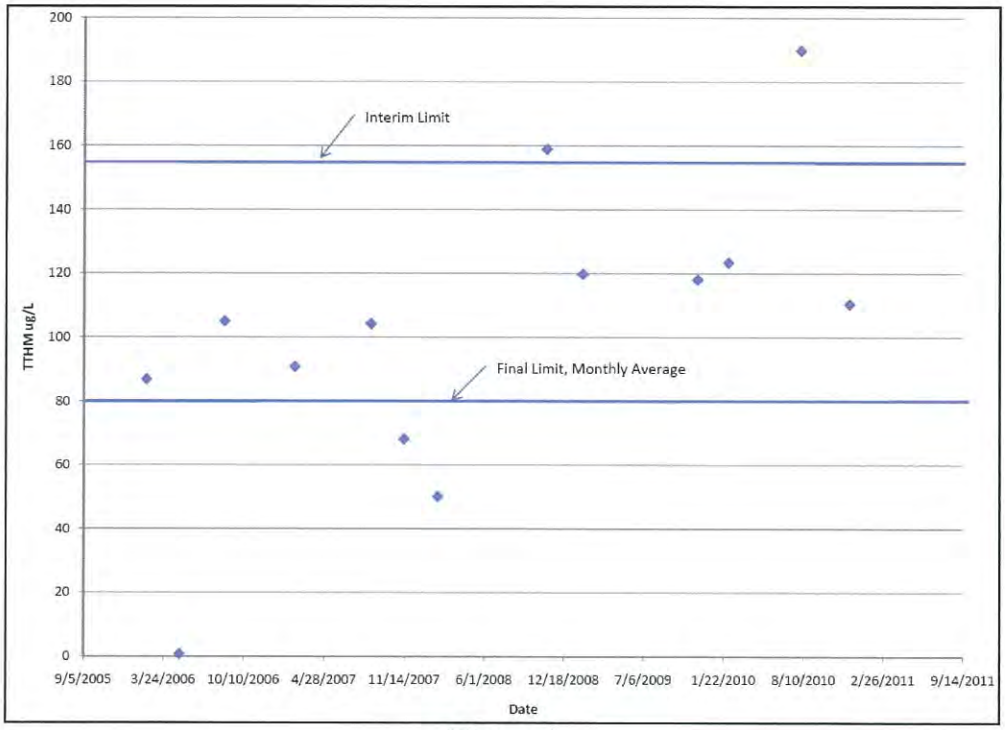


Figure 4
Plant Effluent Data for TTHM

The interim and final limits of the 2010 permit are tabulated in **Table 1** below. The final limit for discharge of TTHM to the Los Angeles River is the current drinking water standard for that parameter. TTHMs in drinking water are regulated by the EPA through the Stage 1 Disinfectants and Disinfection Byproducts Rule.

Table 1
Tapia Discharge Limits for DCBM and TTHM

Discharge	Interim Limit, µg/L	Final Limit, Monthly Average, µg/L	Final Limit, Daily Maximum, µg/L
Los Angeles River			
DCBM	62	46	64
TTHM	154	80*	N/A
Malibu Creek			
DCBM	62	46	64
TTHM	N/A	N/A	N/A

*80 µg/L = Drinking Water Standard

Both the CDO and the TSO have common schedules for compliance with options based upon the technology selected. Easy-to-implement technologies, which require a process change or replacement without substantial construction and permitting, such as mixed oxidants as specifically indicated in Regional Board documentation, would have required a work plan to be submitted for approval by December 2, 2010. That work plan was to have included a schedule to optimize and evaluate the performance of the technology by March 2, 2012.

Technologies that require design, construction, permitting, and other substantial activities, require a work plan to be submitted for approval by February 2, 2011 and include a schedule to optimize and evaluate the performance of the technology by September 2, 2014.

The JPA has considered the use of UV disinfection in the past and that was the purpose of two prior studies, one conducted in 1994 and the other in 1998. The 1994 study recommended a low pressure, low intensity system. That study recommended that the UV disinfection system be installed in the chlorine contact channels. In 1998, disinfection alternatives were further evaluated. That study recommended that a medium pressure UV system be installed in the chlorine contact channels. Based on visits to local installations by JPA staff, medium pressure technology was eliminated as a viable option. That resulted in the conversion from the then gaseous chlorine and sulfur dioxide system to the use of bulk liquid sodium hypochlorite and sodium bisulfite.

The purpose of this Technical Memorandum is to document the current investigation into four alternative disinfection technologies that may be implemented to reduce the DCBM and TTHM: mixed oxidants, UV, ozone and chloramination. A fifth alternative that results from combining UV disinfection with continued use of the existing disinfection system is also presented.

DISINFECTION TECHNOLOGIES

There are two basic methods that can be used to reduce effluent THMs at Tapia: (1) implement an alternative disinfection technology, or (2) modify the existing chlorination practice. Alternative disinfection technologies that will be considered are UV and ozone. The use of mixed oxidants and chloramination are both modifications to the existing practices at Tapia. The Regional Board specifically indicated the use of "mixed oxidants", as an example alternative. The generation of mixed oxidants is achieved through the electrolytic generation of chlorine and, therefore, is a modification to the existing chlorination practice. These four alternatives are presented and discussed below with an assessment of their positive and negative attributes.

UV Disinfection

UV disinfection uses UV light radiation to penetrate the cell wall of the organism and destroy the cell's ability to reproduce. The source of UV radiation is either a medium-pressure or low-pressure mercury arc lamp with low or high output. There are various configurations for UV systems that are characterized by the type of UV lamp employed, and whether the UV reactor is an enclosed unit within a pipeline (in-line), or configured within an open channel. UV lamps are either:

- Medium pressure (MP)
- Low pressure, high output (LPHO), or
- Low pressure, low intensity (LPLI).

An LPHO, open channel system is shown on **Figure 5**.

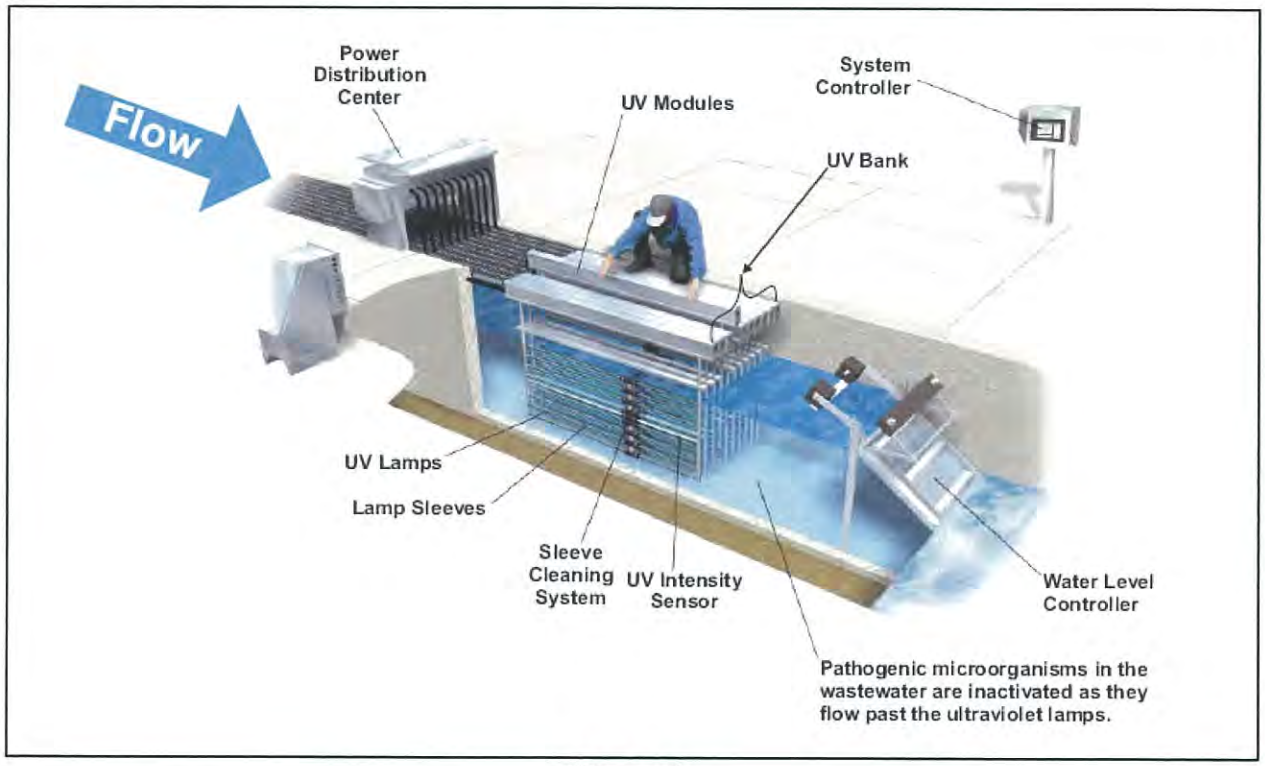


Figure 5
Open Channel UV Process

A UV system must go through a validation and acceptance procedure approved by the California Department of Public Health (CDPH) to verify that the UV system is meeting the disinfection requirements for compliance with the California Recycled Water Criteria of Title 22 of the State Code. The validation process can involve collimated beam experiments, pilot testing (at full or near-full scale) and the development of a dose regression model. Some of the UV systems have already been conditionally accepted by CDPH and are listed in "Treatment Technology Report for Recycled Water" issued by the State of California Department of Public Health, Division of Drinking Water and Environmental Management (2009), these systems may require limited testing.

The LPLI in-channel systems have been in use locally for nearly two decades and represent the first UV technology applied to wastewater disinfection. These systems are composed of racks or banks of UV lamps that consume 88 watts per lamp. They have a limited ability to change the amount of UV radiation emitted: each bank of lamps is either on or off. These systems were not developed with mechanical, self-cleaning features. Given the limited flexibility of these systems, LPLI UV systems are limited to very small facilities (e.g., <1 mgd) and are not considered an option for Tapia.

LPHO open channel UV systems are currently in use in California. This system would consist of mercury lamps, a reactor and the ballasts, which all make up a module. The module would be placed in a channel with flow parallel to the length of the module. The high output system uses lamps of 250 to 500 watt per lamp. The high output system also allow the bulbs to dim to reduce power consumption if there is a drop in flow or an increase in water clarity.

LPHO, in-line UV systems are currently being developed, but have not yet been tested and certified by the CDPH for Title 22 disinfection applications such as at Tapia. Although such in-line systems offer the potential for reduced structural costs and improved hydraulics, the necessary modifications to incorporate an in-line system within the existing facilities at Tapia might outweigh these benefits Further, until the CDPH has certified the system and bioassay testing is conducted, there is no definitive basis to design such a system for specific requirements. The status of in-line UV systems, however, should be monitored for application in the future as that technology matures.

Recently a LPHO system was introduced to the market that uses a 1000 watt lamp, rather than the conventional 250 -350 watt lamp. This system would save in construction costs, as well as power consumption. Unfortunately, this system has not been certified by CDPH and is currently undergoing bioassay testing.

MP UV systems are more suitable for water treatment than for recycled water applications because the required UV dose is lower for water treatment disinfection and therefore fewer lamps are required. Several disadvantages make MP UV systems a poor choice for application at Tapia. First, currently only one medium pressure, in-line UV system has been approved for Title 22 regulations, and high costs would be required for getting other system approved. Second, the medium pressure system is not as energy efficient and less operationally cost effective because they operate at higher temperatures. Third, but not the least significant, is that part of the spectrum of wavelengths produced by medium pressure lamps is conducive to the growth of algae that can degrade the effectiveness of UV disinfection. At the doses needed for recycled water production and with the presence of nutrients, algae growth within a medium pressure UV reactor is a chronic problem.

LPHO open-channel UV system represent the most current and applicable UV technology that could be employed at Tapia, and is the recommended technology to compare to other disinfection alternatives for this study.

Ozone

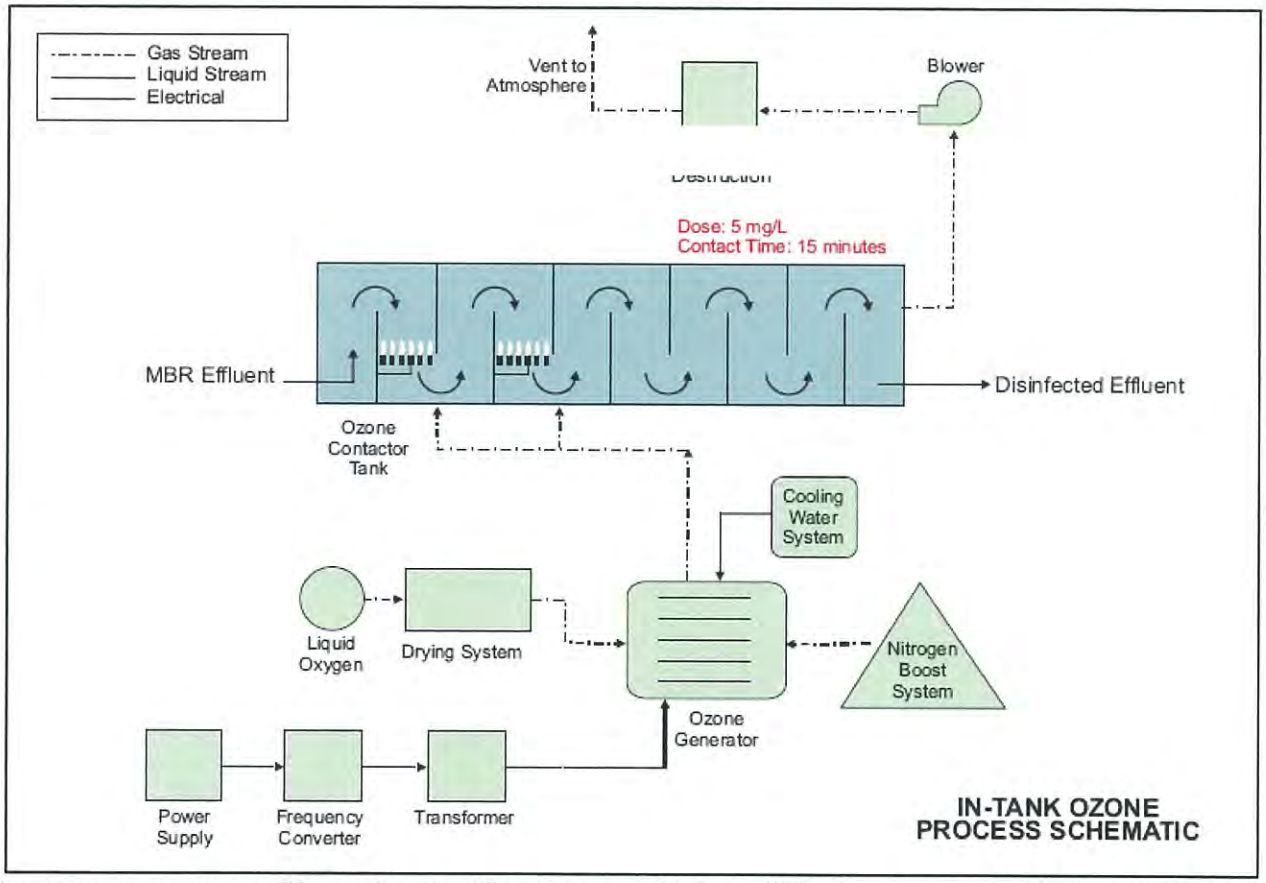
Ozone (O_3) and its associated free radicals, such as the hydroxyl radical, are strong oxidants which can oxidize many organic and inorganic compounds. This results in ozone being an effective oxidant as well as a disinfectant. Ozone is effective against bacteria and viruses, and provides some protection against microbial cysts and eggs. Recent research has also shown that ozone effectively removes a large number endocrine disrupting compounds (EDCs) and pharmaceuticals and personal care products (PPCPs) that are not removed by biological treatment processes. Similar to chlorine disinfection, ozone disinfection depends on the ozone residual and the reaction time. The ability to maintain the dissolved ozone concentration is critical to achieve disinfection and factors that accelerate ozone decomposition are undesirable

because the ozone residual dissipates fasters requiring an increase in ozone dose and therefore increases operating costs. Due to safety concerns it is recommended that ozonation system equipment be isolated in its own room with heating and ventilation system and separate exterior entrances.

Ozone is effective at inactivating bacteria, viruses, parasites and parasite cysts in a relatively short contact time. Other advantages of ozone are; rapid decomposition, no chlorinated disinfection byproduct formation, minimal regrowth of microorganisms, little increase in total dissolved solids (TDS), and the potential to oxidize trace organic pollutants of emerging concern such as PPCPs and EDCs.

An ozone disinfection process requires an oxygen supply system, ozone generators, power supply units, ozone gas concentration monitors, contact tanks, ozone off-gas handling and residual ozone gas destruction system, and the associated monitor ral process flow diagram is shown on **Figure 6**.

Figure 6
Ozone Disinfection Process



An ozone system would require significant area, which is difficult to accommodate on a site as constrained at Tapia. Other disadvantages include: ozone is reactive and corrosive which requires the use of corrosion resistant materials and the treatment of concrete surfaces, no sustainable disinfection residual, and the system is relatively complex to operate and maintain. The use of ozone has the potential to generate disinfection byproducts, such as bromate, which

are potentially harmful to human health and the low ozone dosages may not effectively inactivate some viruses, spores and cysts. Bromate is formed by a reaction between bromide and ozone. If a drinking water source is disinfected using ozone, bromate could be formed. Bromate is reduced in the sewer and if when passed through the water reclamation facility, it is ozonated again the bromate could be reformed. Finally CDPH has not approved ozone as a disinfection technology and there would be considerable costs associated with the testing for CDPH approval.

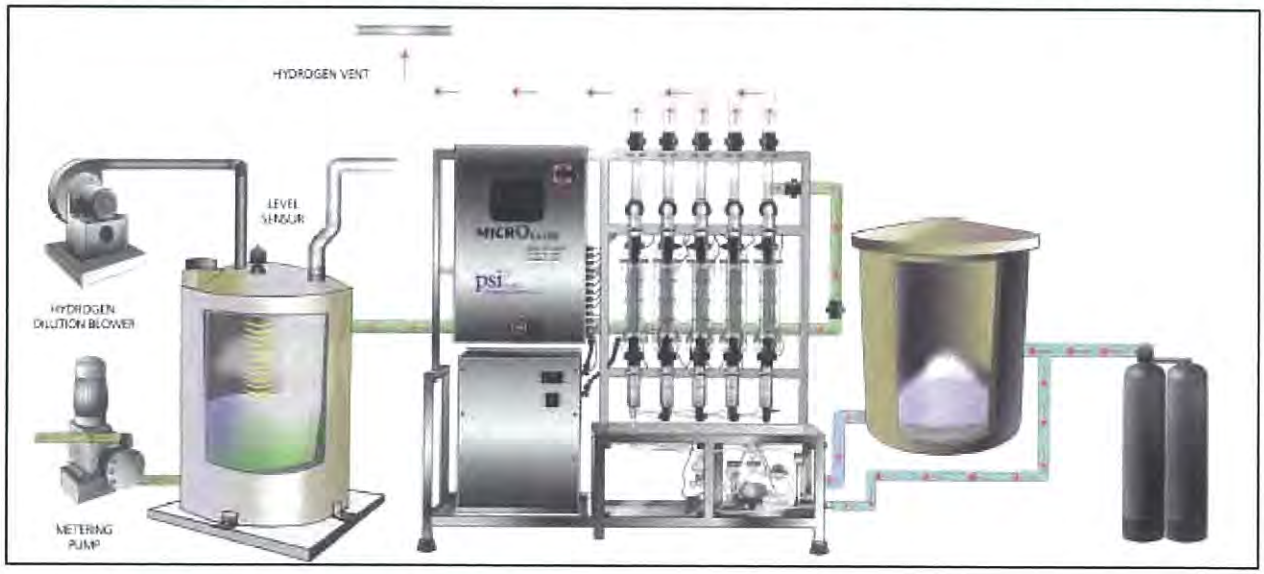
Mixed Oxidants

Mixed oxidants as a disinfection process is one that is similar to the existing chlorination process employed at Tapia, except that in addition to hypochlorite, other constituents, such as ozone, are present in small amounts, hence the term "mixed oxidants."

Sodium hypochlorite can be generated using an electrolytic process with equipment that would be located at Tapia. This is referred to as on-site hypochlorite generation. The process uses high purity, food-grade salt that is dissolved forming brine and fed to hypochlorite generators. The hypochlorite that is produced is at a concentration of 0.8 percent versus the 12 percent hypochlorite solutions available in bulk. Other constituents such as chlorine, chlorine dioxide, hydrogen peroxide, ozone and hydroxyl radicals, are claimed to be present in small amounts, hence the term "mixed oxidants." This system requires a water softener, salt storage/brine tanks, brine feed pumps hypochlorite generators, hypochlorite day tanks, metering pumps, an acid cleaning system and an emergency power system. A general equipment illustration is presented as **Figure 7**.

Figure 7
On-Site Sodium Hypochlorite Generation System

This system would require significant area for salt and brine storage, which is difficult to accommodate on a site as constrained as Tapia. Another disadvantage to this system is that the salt would have to be trucked to Tapia. Testing should be conducted to confirm TTHM reduction



with this approach.

On-site sodium hypochlorite generation was included in the 1998 Alternative Disinfection Evaluation, and at the time, this alternative was assumed to be cost prohibitive when compared to trucking sodium hypochlorite on site.

The Regional Board specifically identified "mixed oxidants" as an option that requires a process change or replacement without substantial construction and permitting activities. Under this option JPA would have been required to submit a work plan to the Regional Board by December 2, 2010. However, given the time frame required by the Regional Board and the amount of equipment that would need to be provided, the use of mixed oxidants is not recommended for further consideration.

Modified Chlorination

The existing disinfection facilities at Tapia consist of bulk sodium hypochlorite storage and feed systems and a chlorine contact tank. Sodium bisulfite is used for dechlorination prior to discharge. THM formation during chlorination is a function of the presence of precursor compounds, the chlorine dose and the contact time. Chlorination in the presence of ammonia produces chloramines. These compounds are disinfectants, but they are less effective than free chlorine. Chloramines do, however, limit the formation of THMs. Currently the Tapia activated sludge process completely nitrifies and without ammonia in the effluent, only free chlorine is present. THM formation can be controlled by limiting the free chlorine dose or contact time, by the introduction of chloramines, or by a combination.

MWH conducted bench tests on secondary effluent from Tapia collected before and after filtration. Tests were conducted with the addition of preformed chloramines to represent a case with minimum TTHM formation. The results, **Figure 8**, represent, from left to right; 1) the addition of 15 mg/L NH_2Cl (as CL_2), 2) chlorine addition prior to filtration with 7.5 mg/L free chlorine, and then the addition of 7.5 mg/L NH_2Cl, and 3) chloramine addition prior to filtration with 7.5 mg/L NH_2Cl, and then 7.5 mg/L free chlorine post filtration.

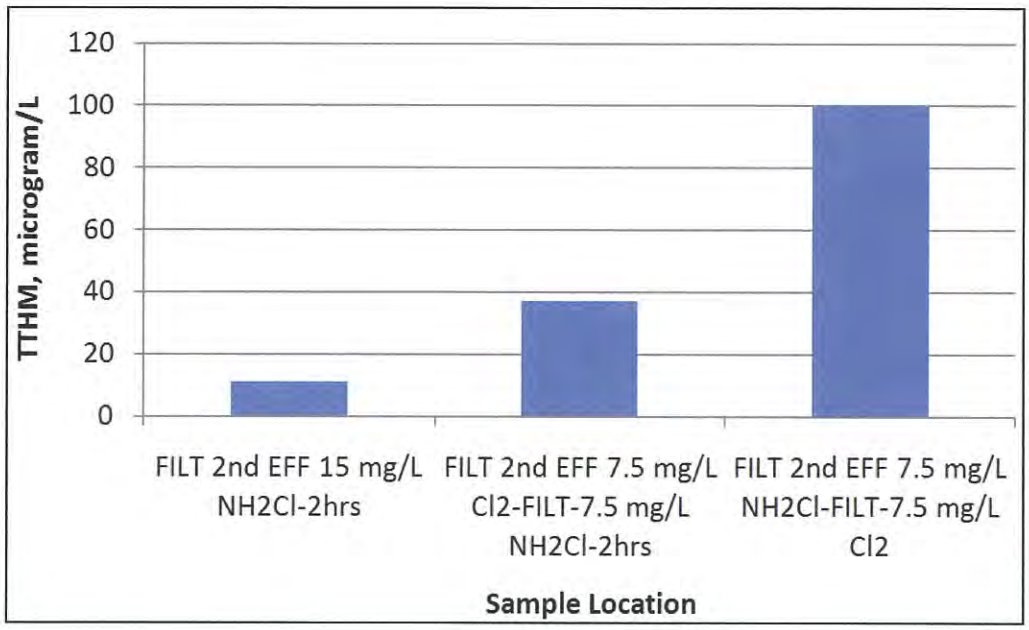


Figure 8
Bench-scale TTHM Formation Results

These results demonstrate that disinfection with only chloramines quite effectively limits the formation of THMs. This is, however, not a viable solution for two primary reasons. First, because chloramines are not as effective as free chlorine, greater contact time or much higher dosage might be required for equivalent bacterial or virus removals compared to free chlorine. Second, when the effluent is dechlorinated prior to discharge, the nitrogen component of chloramines is released as ammonia in the amount of roughly 1 mg/L NH_3 per mg/L NH_2Cl and the effluent ammonia limits would be exceeded.

These data do, however, show that with the sequential addition of free chlorine pre filtration, followed by the addition of chloramine post filtration, TTHM formation was limited to 40 mg/L. This is referred to as modified chlorination, which has brought both the TTHM and DCBM to within the permit limits.

Adding chlorine pre filtration, and chloramines post filtration, is an approach to control disinfection byproducts that is termed "sequential chlorination" by the Los Angeles County Sanitation Districts (LACSD) and is a process to which they hold a recently issued patent. Though patented, it is understood that LACSD's intent is that sequential chlorination can be used by public agencies for the good of the public without the payment of royalties.

Modified chlorination as envisioned for Tapia would allow for chloramines addition either pre or post filtration. The advantages are minimum impact to the existing treatment process, minimum additional equipment required, low cost, and it would allow for a combined-chlorine residual but limit THM formation while not jeopardizing ammonia discharge limitations.

The disadvantages of modified chlorination are that it is weaker than other disinfectants, has the potential to form NDMA, and the addition of ammonia may enhance biofilm growth in

transmission lines. The concern over the addition of ammonia exceeding permit limits may be mitigated by monitoring the ammonia levels in the effluent through the use of an ammonia analyzer. Also, the use of sodium bisulfite will have the following reaction with chloramines: $NaHSO_3 + NH_2Cl + H_2O \Rightarrow Na^+ + SO_4^= + H^+ + Cl^- + NH_4^+$. Adjustments can be made to the dosing location or the amount as the ammonia approaches the permit limits. **Figure 9** presents effluent ammonia data for the past year at Tapia, with the effluent limits and the proposed ammonia dose. With the exceptions of a few spikes, the effluent ammonia concentrations have remained well below the limits.

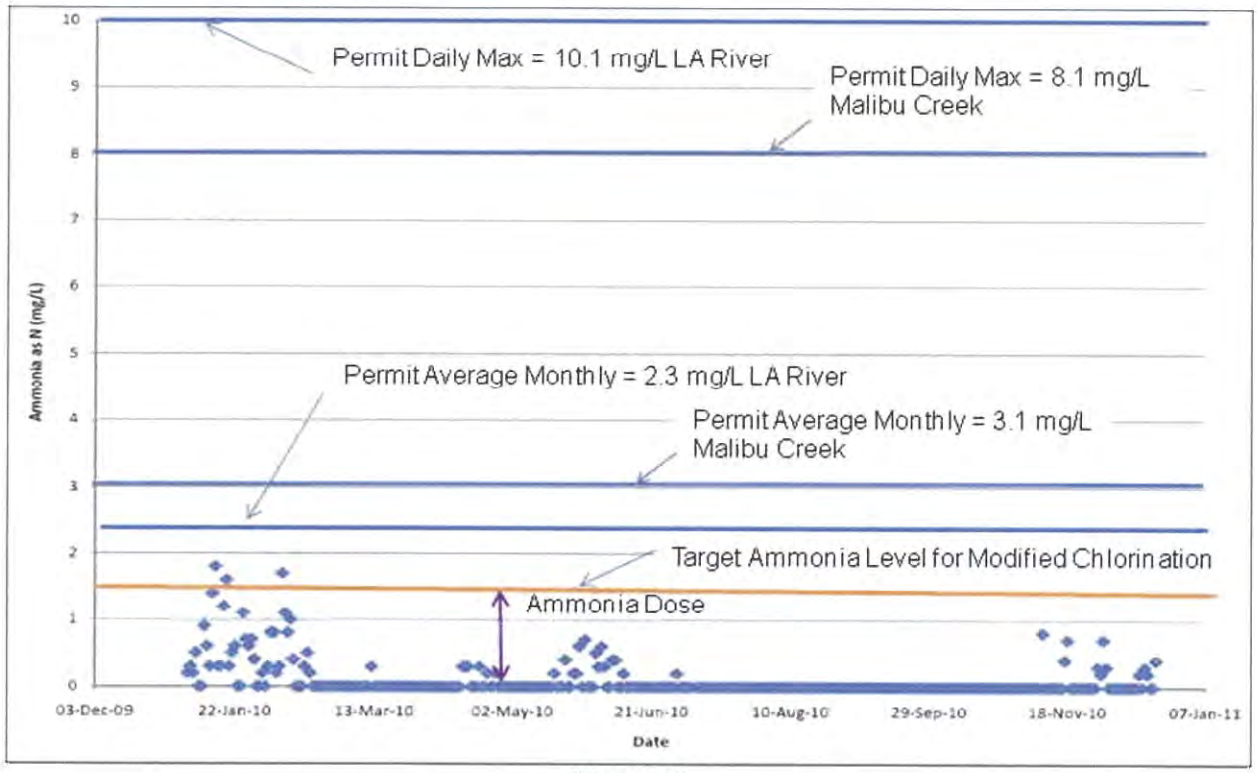


Figure 9
2010 Effluent Ammonia Data

Facilities that would be required for modified chlorination include ammonia storage and feed facilities, on-line analysis instrumentation to achieve stable operation, and adequate mixing at the points of ammonia and chlorine injection. A general layout of the modified chlorination system is illustrated by **Figure 10**.

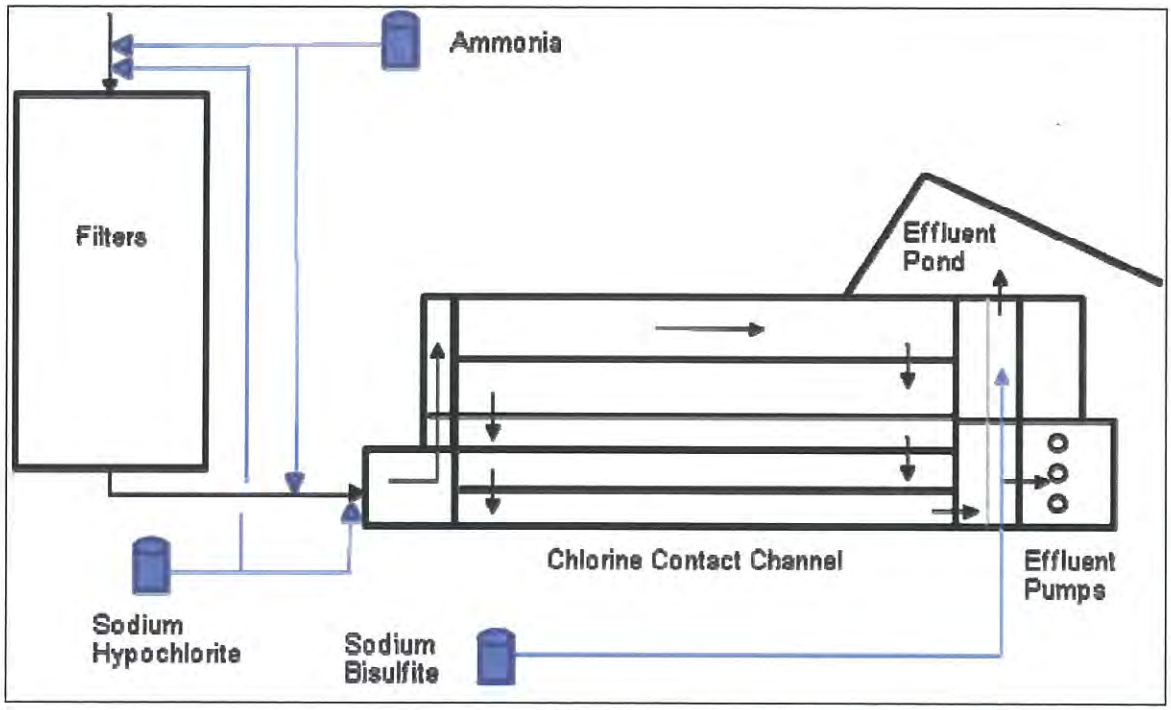


Figure 10
Modified Chlorination Process Flow Diagram

Hybrid UV and Modified Chlorination

During the review of the four alternative disinfection technologies, a fifth option emerged as a combination of two of the disinfection technologies. The hybrid option would combine the use of UV disinfection with modified chlorination. This system would use UV disinfection to treat the typical daily flow and use the modified chlorination to disinfect peak flows. The UV system would be installed in two of the existing chlorine contact channels.

The configuration of the hybrid system is shown as **Figure 11**. The flow split between the UV and the remaining chlorine contact tank may be accomplished through the installation of a weir or a gate. In the event of a peak flow event the base flow would still pass through the UV system, while the additional flow passes through the chlorine contact tank. **Figures 12** and **13** show the percentage of plant flow that the UV will be able to handle, both at current and future flows and which percentage of flow will be treated with modified chlorination. Figure 12 shows that modified chlorination will be need approximately 20 percent of the time when the plant is operating at an average of 9.5 mgd. Figure 13 shows that modified chlorination will be needed approximately 55 percent of the time when the plant is operating at an average of 12 mgd. In both cases, the UV will treat the base flow of the treatment plant. This system also adds redundancy. In the event that the UV system needs to be taken offline for maintenance purposes, the chlorine contact tank could disinfect the plant effluent with minimal interruption to the treatment process.

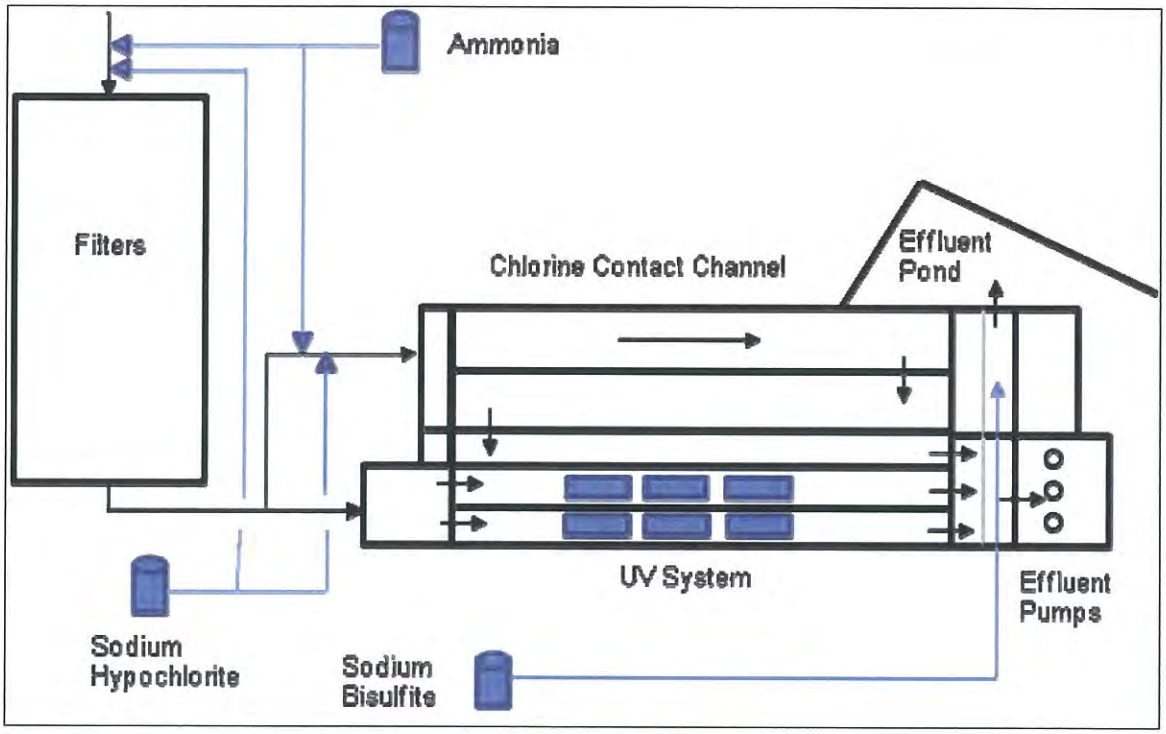


Figure 11
UV and Modified Chlorination Process Flow Diagram

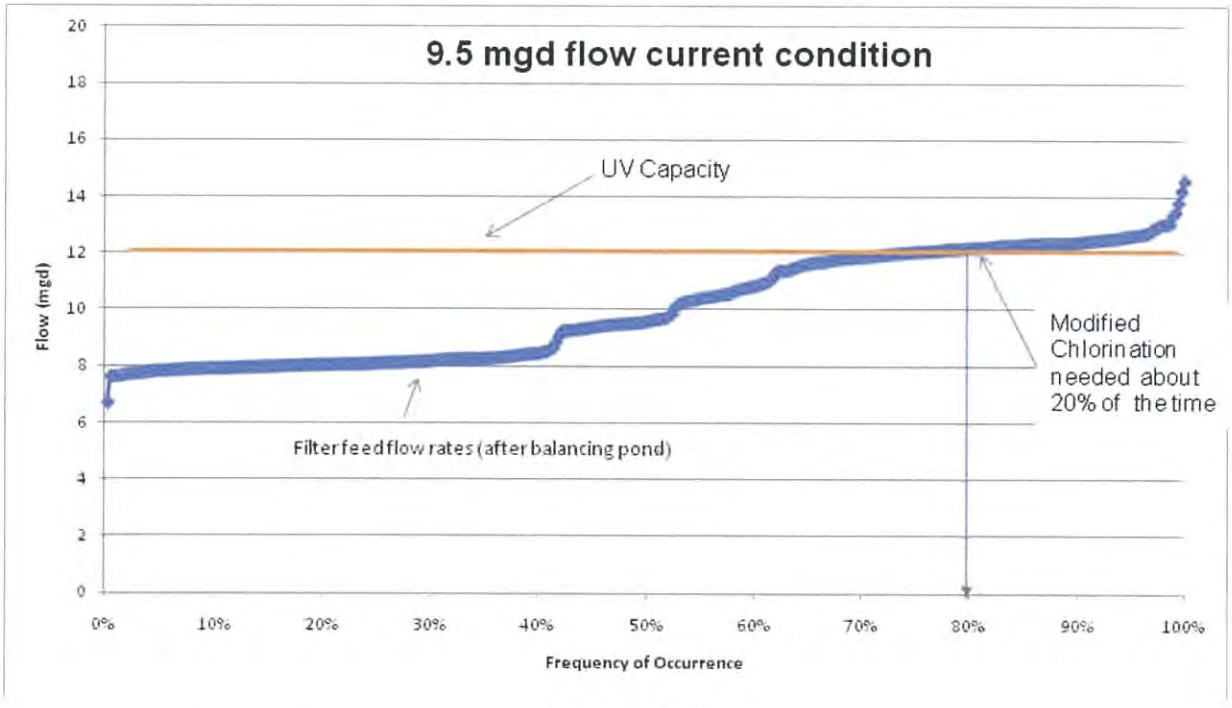


Figure 12
Percent of Time Modified Chlorination Used at Current Conditions

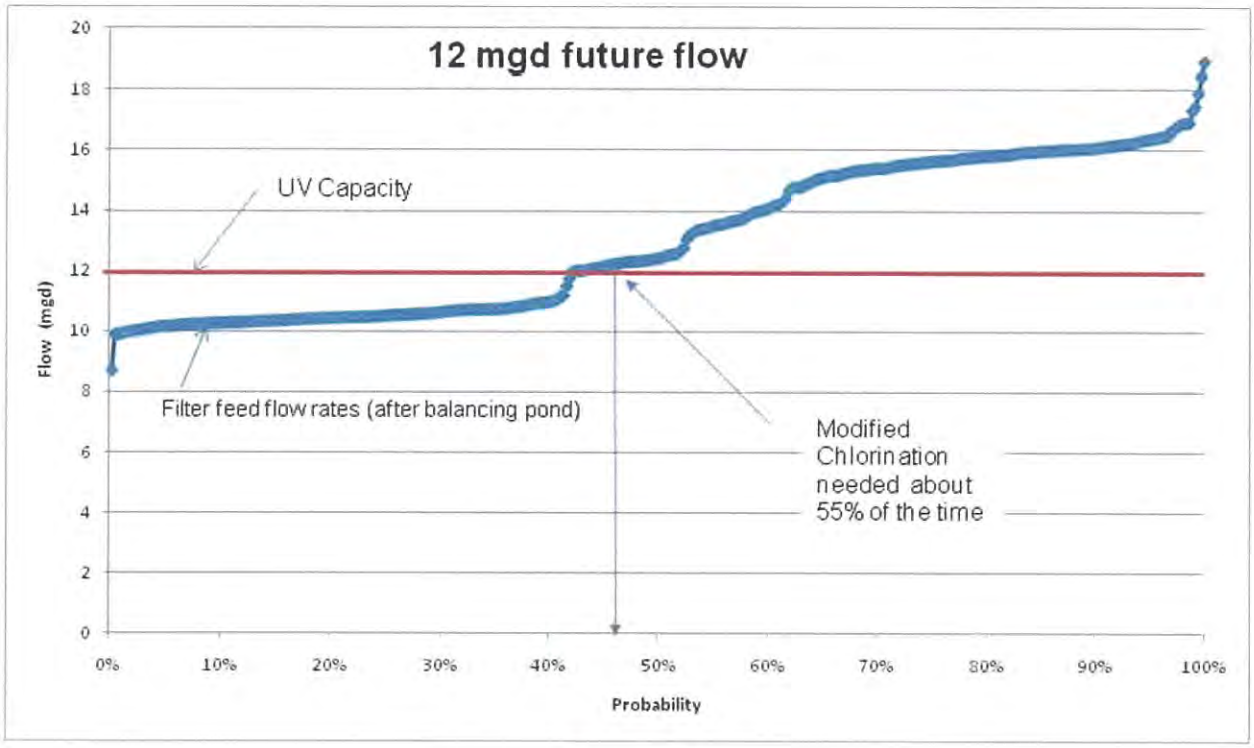


Figure 13
Percent of Time Modified Chlorination Used at Future Conditions

OPINION OF PROBABLE CONSTRUCTION COST (OPCC)

An OPCC was developed for each of the alternative disinfection technologies, as well as the hybrid option. This OPCC was developed using previous cost estimates for Tapia as well as information from other disinfection systems that would be similar if they were applied to Tapia. The operation and maintenance costs were calculated based on a flow of 9 mgd. These costs are summarized in **Table 2** below. These estimated costs are detailed in subsequent memorandum.

Table 2
Opinion of Probable Costs

	UV	Ozone	Mixed Oxidants	Modified Chlorination	Hybrid
Capital Cost	$ 6,130,000	$ 10,210,000	$ 4,650,000	$ 800,000	$ 4,350,000
O&M Cost	$ 311,130	$ 427,320	$ 376,370	$ 482,820	$ 390,560

The present worth of each alternative was calculated for a 20 year period at an interest rate of 5 percent. The interest rate was assumed to cover the potential escalation of power and chemicals as well. This present worth was calculated assuming that the flow for the treatment plant would increase from 9 mgd to 12 mgd over the 20 year period. These costs are summarized in **Table 3**.

Table 3
Present Worth Analysis for 12 mgd Future Flows

Alternative	UV	Ozone	Mixed Oxidants	Modified Chlorination	Hybrid
20 yr Present Worth	$ 10,518,100	$ 16,236,800	$ 9,958,210	$ 7,609,940	$ 9,858,270

The present worth for each disinfection alternative was also calculated assuming that the flow at Tapia increased to 10 mgd in 20 years, rather than 12 mgd in 20 years. These results are summarized in **Table 4**. The calculation assumed an interest rate of 5 percent. The results show that the alternatives are not sensitive to the amount of flow that is being treated and their relative costs remain unchanged.

Table 4
Difference in Present Worth 10 mgd vs 12 mgd Future Flows

Alternative	UV	Ozone	Mixed Oxidants	Modified Chlorination	Hybrid
12 mgd	$ 10,518,100	$ 16,236,800	$ 9,958,210	$ 7,609,940	$ 9,858,270
10 mgd	$ 10,177,600	$ 15,769,180	$ 9,546,340	$ 7,081,140	$ 9,430,880
Difference	$ 340,500	$467,620	$ 411,870	$528,800	$ 427,390

EVALUATION OF ALTERNATIVES

Each of the alternative disinfection technologies were evaluated against a set of screening criteria, which included non-economic factors as well as costs. These criteria are described in greater detail below.

Facility Modifications –accounts for the extent of modifications or construction that would be required to implement the disinfection alternative at Tapia.

Future Regulations – accounts for the ability or flexibility of the disinfection alternative to address compounds that may become regulated in the future, such as NDMA, PPCP or EDCs.

Water Quality Impacts – accounts for ability of the disinfection alternative technology to disinfect the effluent without forming other disinfection by-products.

Operation Impacts - accounts for the change in the operation of the facility once the disinfection alternative has been installed, for example additional samples to be taken, analyzers to monitor, or additional reporting costs.

Reliability – accounts for the ability of the alternative disinfection technology to disinfect to the appropriate level in the event of a power outage or a peak flow event.

Capital Cost – accounts for the relative capital cost of the disinfection alternatives.

O & M Cost – accounts for the relative annual operation and maintenance cost of the disinfection alternatives.

These criteria were assessed for each disinfection alternative and quantified in **Table 5** using a positive or negative sign. A positive sign if a technology required less modifications or a negative sign if a technology had a significant capital cost, as examples.

Table 5
Screening Criteria Summary

Criteria	UV	Ozone	Mixed Oxidants	Modified Chlorination	Hybrid
Facility Modifications	+	-	-	+	+
Future Regulations	+	+	-	-	+
Water Quality Impacts	+	+	-	-	+
Operation Impacts	+	-	-	+	+
Reliability	+	-	-	+	+
Capital Cost	-	-	-	+	+
O & M Cost	-	-	-	+	+

+ = Positive Comparative Result
- = Negative Comparative Result

Based on the above, neither ozone nor mixed oxidants appear to be an appropriate fit for implementation at Tapia. UV, modified chlorination and the combined hybrid option appear to be a suitable solution for disinfection at Tapia. Some additional parameters were reviewed for these three alternatives in comparison to the existing operation. First, the amount of TDS in effluent was reviewed for these alternatives and compared to the existing effluent TDS. The results are summarized in **Table 6** and show that the use of UV or the hybrid of UV and modified chlorination will result in a lower TDS in the effluent. This is due to a reduction in the amount of chemicals added to the treatment process.

Second, the operations cost for these three alternatives were compared to the existing cost. The results are summarized in **Table 7**. The results show that the use of UV will lower the operations costs at Tapia, this is due to a reduction in the chemicals that will be added to the treatment process.

Table 6
Screening Criteria Summary

Technology	Chlorine, Sodium Bisulfite and Ammonia Dose (mg/L)	Total Effluent TDS (mg/L)	Difference in Annual TDS (mg/L)
Existing	22	37	---
Modified Chlorination	30	52	15
Hybrid	13.2	23	(14)
UV	13	22	(15)

Table 7
O&M Comparison

Alternative	O&M Costs	Difference in O&M Cost with Respect to Existing
Existing	$ 374,400	$ 0
UV	$ 311,130	($ 63,270)
Modified Chlorination	$ 427,820	$ 53,420
Hybrid	$ 390,560	$ 16,160

CONCLUSION

UV and modified chlorination are both viable options that will achieve the THM requirements set forth by the Regional Board. Of the alternative disinfection technologies evaluated, modified chlorination has the lowest present worth. The combined hybrid option of the UV and modified chlorination has a similar present worth to the modified chlorination option but has the overall best attributes. It allows the JPA to reduce the amount of chemicals to treat the base flow of the treatment plant, while offering the flexibility to treat peak flows. Alternatively, the hybrid alternative allows the JPA to proceed with a phased approach, installing the modified chlorination equipment now and the UV system at a later date. It is recommended the hybrid alternative combining UV with modified chlorination be considered further for implementation to achieve permit compliance.

Appendix 2: Risk Management Plan (CalARP)

Tapia Water Reclamation Facility

Risk Management Plan

December 2011

Prepared For:

Las Virgenes Municipal Water District
4232 Las Virgenes Road
Calabasas, California 91302
(818) 251-2142
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TABLE OF CONTENTS

Appendices

LIST OF TABLES

LIST OF FIGURES

1. EXECUTIVE SUMMARY

1.1 Accidental Release Prevention and Emergency Response Policies

The Tapia Water Reclamation Facility (WRF) accidental release prevention policy involves a unified approach that integrates proven technology, staff fully trained in safe operation and maintenance practices, and tested management system practices. All applicable procedures of the State of California and U.S. Environmental Protection Agency (EPA) Prevention Program are adhered to, including key elements such as training, systems management, and emergency response procedures. The facility has security fencing in place to prevent unauthorized access to equipment and chemicals. In addition, delivery ports on all chemical tanks are kept locked when not in use. The facilities are inspected daily for maintenance and repairs and repairs can be made immediately based on urgency of repair. The two ammonia tanks are to be constructed in a containment area sized to provide a minimum containment of 110 percent of the volume of the largest tank to prevent the release of ammonia to the environment in the event of an accident.

1.2 General Description of the Stationary Source and Regulated Substance

Aqueous ammonia will be stored as a pressurized liquid in two connected and adjacent 2,800-gallon tanks. The tanks contain 19.3 percent ammonia, which is approximately 5,566 pounds of ammonia. The Tapia WRF is subject to Program Level 1 requirements based on the determination that the toxic endpoint for a worst-case release is not within the vicinity of public receptors and that off-site impacts have not occurred due to a release of a regulated substance from the process at the facility, as discussed below.

1.3 Off-Site Consequence Analysis Results

Program Level 1 requires facilities to conduct an off-site consequence analysis for a worst-case release scenario. The worst-case release scenario was modeled using the U.S. EPA software, RMP*Comp, Version 1.07. According to RMP*Comp, the toxic endpoint (TE) distance for this release is less than 0.1 mile. The TE distance represents the distance at which the concentration would fall below the point that serious injuries from exposures are no longer likely. The RMP*Comp program states that TE distances of less than 0.1 mile should be reported as 0.1 mile. Therefore, this analysis uses 0.1 mile as the TE distance. The TE distance does not extend to public receptors and would not include a residential population or other sensitive population. The TE distance extends to portions of the Malibu Creek State Park to the south, which is considered an environmental receptor.

1.4 Summary of the General Accidental Release Prevention Program and Chemical-Specific Prevention Steps

Tapia WRF is in full compliance with federal and state requirements. Chemical-specific prevention steps include availability of water bath and safety shower and eyewash facilities. The water bath is essentially a 55-gallon drum full of water; the purpose of this water bath is to scrub any fumes that may be released from the ammonia storage tank during filling or in an emergency. The safety shower and eyewash facilities are located such that they are easily accessible and are not blocked by operating equipment or other objects. Employees are made aware of the hazardous and toxic properties of ammonia. Operating manuals and procedures are in place for all equipment and processes. Employees are trained and rotated through each of the three sections of the facility annually so employees are trained on all plant operations.

Tapia WRF's accidental release prevention program is based on the following key elements:

- Detailed management system and clear levels of responsibilities and team member roles
- Comprehensive safety process information that is readily available to staff, emergency responders, and contractors
- Comprehensive preventive maintenance program
- Completed process-hazard analysis of equipment and procedures, with operation and maintenance staff participation and review
- Use of state-of-the-art process and safety equipment
- Use of accurate and effective operating procedures, written with operations and maintenance staff participation
- High level of training of operators and maintenance staff
- Implementation of an incident investigation, inspection, and auditing program using qualified staff

1.5 Summary of the Five-Year Accident History

The Tapia WRF has not had an accidental or near-accidental release of a regulated substance during the past five-years.

1.6 Summary of the Emergency Response Program

The Tapia WRF has coordinated with the County of Los Angeles Fire Department, which is a member of the Local Emergency Response Planning Committee (LEPC). The facility has an evacuation plan in the

event of an emergency. Employees are directed to exit the facility and gather at predetermined assembly areas. The Plant Supervisor serves as the emergency contact and is responsible for emergency response drills and evaluations. In the event of an emergency, the Plant Supervisor is responsible for taking roll call at the assembly areas and for contacting the County of Los Angeles Fire Department.

1.7 Planned Changes to Improve Safety

As new technology and new regulations develop, facilities using chemicals as part of their processes have opportunity to further improve safety. The facility will continue to coordinate with the County of Los Angeles Fire Department if any future changes are recommended to improve safety.

2. INTRODUCTION

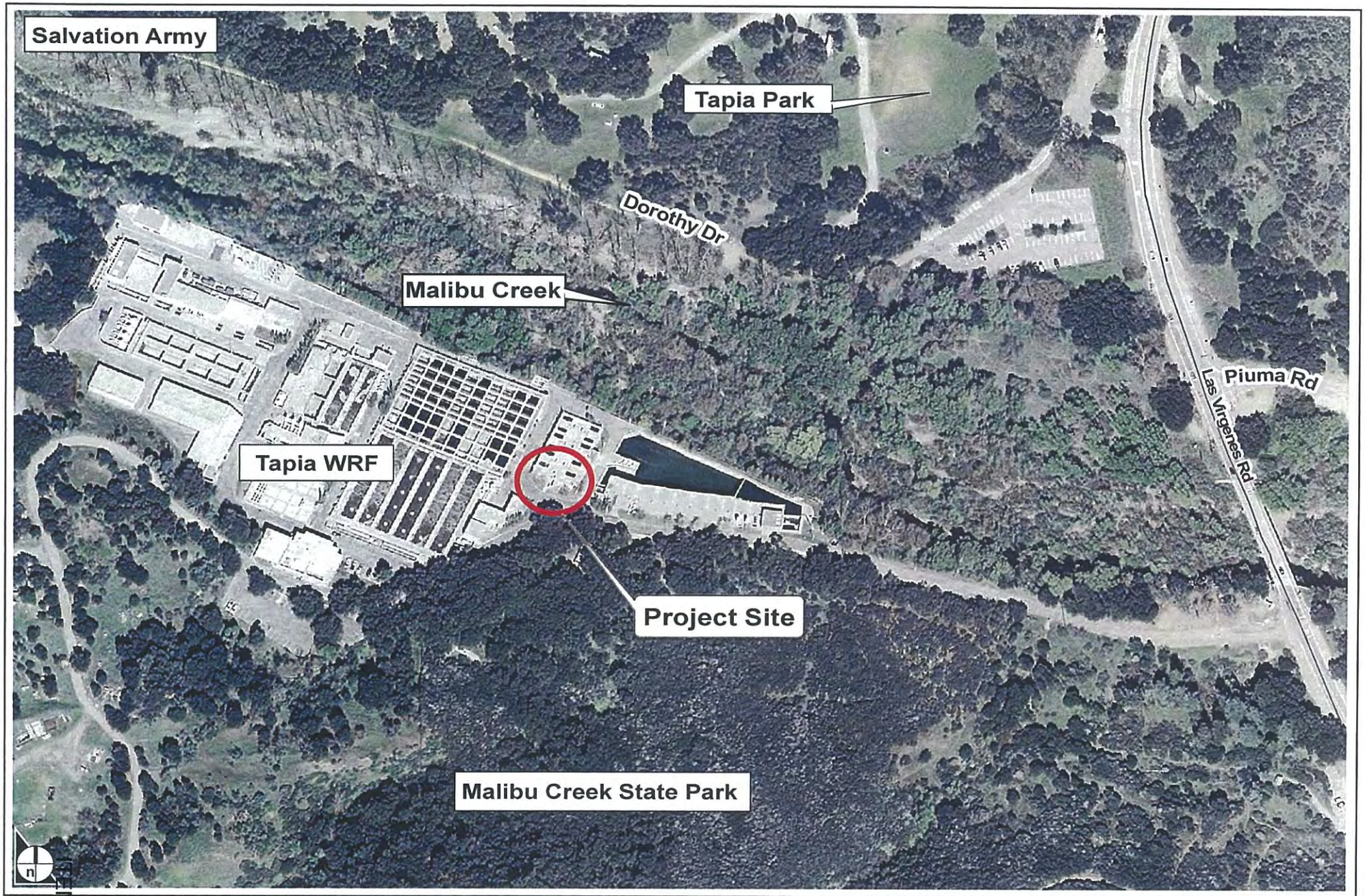
2.1 Purpose

This Risk Management Plan ("RMP" or "Plan") has been prepared for Tapia WRF, which is owned and operated by a joint powers authority (JPA) of the Las Virgenes Municipal Water District (LVMWD) and the Triunfo Sanitation District. This Plan has been developed in accordance with the U.S. EPA regulations Title 40 Code of Federal Regulations (CFR) Part 68, "Chemical Accident Prevention Provisions," and California Code of Regulations (CCR) Title 19, Division 2, Chapter 4.5, "California Accidental Release Prevention (CalARP) Program." The purpose of this RMP is to assist with the prevention of accidental releases of toxic substances that can cause harm to the public, facility employees, and to the environment.

This RMP has been developed by Impact Sciences, Inc., on behalf of Tapia WRF specifically to prevent and mitigate accidental releases associated with the storage and use of aqueous ammonia at the facility. As noted in specific sections, portions of this Plan, including technical details associated with aqueous ammonia operations, were prepared by the engineering firm, MWH Global, Inc., located in Arcadia, California. This Plan was developed to meet the requirements of the RMP regulations and is available to the Administering Agency (AA), other government agencies, and the public for review. The Administering Agency is the County of Los Angeles Fire Department, which is a member of the LEPC.

2.2 Operations

The Tapia WRF is a tertiary wastewater treatment plant that treats municipal wastewater from domestic, commercial, and industrial sources. The facility is located at 731 Malibu Canyon Road, Calabasas, California 91302, as shown in **Figure 1, Project Site Location**. The location of the aqueous ammonia storage tanks are also shown in **Figure 1**.



SOURCE: Las Virgenes Municipal Water District - September 2011

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FIGURE 1

Project Site Location

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The Tapia WRF uses the following treatment process sequence for municipal wastewater: coarse screening, grit removal, primary sedimentation, secondary treatment, tertiary treatment, chlorination, and dechlorination. For secondary treatment, the Tapia WRF employs an activated sludge process with nitrification and denitrification, followed by secondary clarification. Tertiary treatment includes coagulation, flocculation and filtration through anthracite media. Sodium hypochlorite solution is added for effluent disinfection, and sodium bisulfate is added for dechlorination.

The Tapia WRF received a Time Schedule Order from the Los Angeles Regional Water Quality Control Board (Los Angeles RWQCB) regarding total trihalomethanes discharged at the Los Angeles River outfall (005), and a Cease and Desist Order regarding dichlorobromomethane discharged at the Malibu Creek outfall (001). The JPA implemented an alternate disinfection process to bring the Tapia WRF into compliance with thresholds set by the Los Angeles RWQCB. The alternate disinfection process included the installation of a modified chlorination system to the tertiary treatment system.

The modified chlorination system requires the addition of aqueous ammonia storage tanks. The ammonia storage tanks consist of two stainless steel pressure vessels. Each tank has a diameter of approximately 6.5 feet and a height of 11 feet, which provides a volume of 2,800 gallons per tank, or a total volume of 5,600 gallons. The two ammonia tanks are constructed in a containment area sized to provide a minimum containment of 110 percent of the volume of the largest tank. The tank area has an ammonia water bath and safety shower and eyewash facilities. The water bath is essentially a 55-gallon drum full of water; the purpose of this water bath is to scrub any fumes that may be released from the ammonia storage tank during filling or in an emergency. The safety shower and eyewash facilities are located such that they are easily accessible and are not blocked by operating equipment or other objects. Heated water is not supplied for the shower and eyewash; however, the pipes leading to the shower and eyewash will be insulated.

Operating manuals and procedures are in place for all equipment and processes. Employees are trained and rotated through each of the three sections of the facility annually so employees are trained on all plant operations. The Plant Supervisor provides semi-annual or annual training and tests for promotion.

The facility has security fencing in place to prevent unauthorized access to equipment and chemicals. In addition, delivery ports on all chemical tanks are kept locked when not in use. The facilities are inspected daily for maintenance and repairs. If repairs are required, repairs can be made immediately by LVMWD staff based on urgency of repair. Contractors may be used to make some repairs.

2.3 Applicability

According to technical information provided by MWH Global, aqueous ammonia will be stored as a pressurized liquid in two connected and adjacent 2,800-gallon tanks. Refer to **Appendix A** for the Final Preliminary Design Report provided by MWH Global. Two connected vessels that contain the same regulated substance are considered to be a single process. The tanks would contain 19.3 percent ammonia. The presence of approximately 5,566 pounds of ammonia within the solution requires compliance with CalARP rules because it exceeds the threshold quantity listed in Table 3 of Section 2770.5 of the CalARP Program regulations (i.e., 500 pounds for aqueous ammonia [concentration 1 percent or greater]).[1] Since Table 3 is unique to the CalARP Program, facilities in this category are not required to comply with the Federal Accidental Release Prevention Program (FedARP), only the CalARP Program elements. However, all of the federal requirements are incorporated into the CalARP Program.

The Tapia WRF is subject to Program Level 1 requirements based on the determination that the toxic endpoint for a worst-case release of aqueous ammonia is not within the vicinity of public receptors and that off-site impacts have not occurred due to a release of a regulated substance from the process at the facility, as discussed below. Program Level 1 covers processes that pose comparatively low risks to the public.

2.4 Regulated Substance Information

The following information has been provided in **Appendix B** of this Plan to identify the hazards of aqueous ammonia:

- Material Safety Data Sheet (MSDS) for Ammonium Hydroxide (10 to 35 percent Ammonia), which contains the following information:
  - Hazards Identification
  - First Aid Measures
  - Fire Fighting Measures
  - Accidental Release Measures
  - Handling and Storage
  - Exposure Control and Personal Protection

---

1 U.S. EPA, "Applicability Questions from RMP Frequently Asked Question," Revised May 2004, Question II. 22. The document is available online at http://www.epa.gov/reg5sfun/sfd/cepps/rmp/pdf/applicability-faq.pdf. As stated, "For regulated toxic substances, you must consider only the weight of the regulated substance in the solution/mixture towards the threshold quantity."

- Physical and Chemical Properties
- Stability and Reactivity
- Toxicological Information
- Ecological Information

3. OFF-SITE CONSEQUENCE ANALYSIS

The Tapia WRF is subject to Program Level 1 requirements as discussed above and has therefore been required to complete an off-site consequence analysis provided below. An off-site consequence analysis was completed in order to provide information to the public and to government agencies about the potential consequences of an accidental release of aqueous ammonia at the Tapia WRF. The off-site consequence analysis was completed by Impact Sciences and consists of a worst-case release scenario. An alternative release scenario is not required for facilities subject to Program Level 1 requirements.

3.1 Worst-Case Release Scenario

3.1.1 Release Scenario Description and Release Parameters

The Tapia WRF includes the installation of the modified chlorination system to the tertiary treatment system. The modified chlorination facilities require aqueous ammonia storage tanks. The worst-case release scenario assumes the release of all aqueous ammonia in the storage tanks.

The Tapia WRF has two ammonia storage tanks, which are stainless steel pressure vessels at 30 pounds per square inch (psi). Pressurization is needed to prevent gradual loss of ammonia due to vaporization. Each tank would have a diameter of approximately 6.5 feet and a height of 11 feet, which provides a volume of 2,800 gallon per tank, or a total volume of 5,600 gallons for two tanks. The concentration of ammonia is 19.3 percent. At 5.15 pounds per gallon for ammonia at 60° Fahrenheit (F), the maximum amount of ammonia is approximately 5,566 pounds. The two ammonia tanks would be constructed in a containment area sized to provide a minimum containment of 110 percent of the volume of the largest tank. To provide the required volume, the perimeter wall around the tanks would be constructed to be 3 feet tall and an area of approximately 137 square feet. The containment area would be sloped to one corner and would contain a sump that would be connected to the waste washwater wet well. The waste washwater wet well returns to the plant headworks.

3.1.2 *Methodology*

The worst-case release scenario was modeled using the U.S. Environmental Protection Agency (EPA) software, RMP*Comp, Version 1.07, which is program that can be used to complete the off-site consequence analyses required under the Risk Management Program rule. The program eliminates the need to makes calculations by hand and guides the user through the process of making an off-site consequence analysis.

3.1.3 *Results*

According to the RMP*Comp program, the TE distance for this release is less than 0.1 mile. The TE distance represents the distance at which the concentration would fall below the point that serious injuries from exposures are no longer likely. The RMP*Comp program states that TE distances of less than 0.1 mile should be reported as 0.1 mile. Therefore, this analysis uses 0.1 mile as the TE distance, as documented in **Table 1, Worst-Case Release Scenario Analysis (RMP*Comp, Version 1.07)**. The RMP*Comp program results are also included in **Appendix C.**

Table 1
Worst-Case Release Scenario Analysis (RMP*Comp, Version 1.07)

Parameter	Value
Chemical	Ammonia (water solution) 20%
Chemical Abstract Service (CAS) #	7664-41-7
Category	Toxic Liquid
Scenario	Worst-Case
Quantity Released	5,566.12 pounds
Liquid Temperature	77°F
Mitigation Measures	Diked area: 137.25 feet; Diked height: 3 feet
Release Rate to Outside Air	2.88 pounds per minute
Topography	Urban surroundings (many obstacles in the immediate area)
Toxic Endpoint (TE)	0.14 mg/L; basis: ERPG-2
Estimated Distance to TE	< 0.1 mile (< 0.16 kilometers); report as 0.1 mile
Assumptions about this Scenario:	
Wind Speed	1.5 meters per second (3.4 miles per hour)
Stability Class	F
Air Temperature	77°F (25°C)

*Sources: Impact Sciences, Inc.; U.S. EPA, RMP*Comp, Version 1.07.*
Model results are provided in Appendix C.

The 0.1-mile radius from the site of the spill is shown in **Figure 2, Worst-Case Release Toxic Endpoint Distance.** The Tapia WRF is located in unincorporated western Los Angeles County, California in Malibu Canyon approximately 4 miles south of the US 101 (Ventura Freeway) along Malibu Canyon Road. The facility is located adjacent to the south of Malibu Creek and surrounded by Los Angeles County parkland (Tapia Park) to the north, the Salvation Army recreation camp to the west and state parkland (Malibu Creek State Park) to the south and east, as shown in **Figure 1.** There are no residences or other sensitive public receptors, such as schools, hospitals, childcare, and assisted living facilities, in the immediate vicinity of the Tapia WRF.

As shown in **Figure 2,** the TE distance does not extend to public receptors and does not include a residential population or other sensitive population. The TE distance extends to portions of the Malibu Creek State Park to the south, which is considered an environmental receptor.

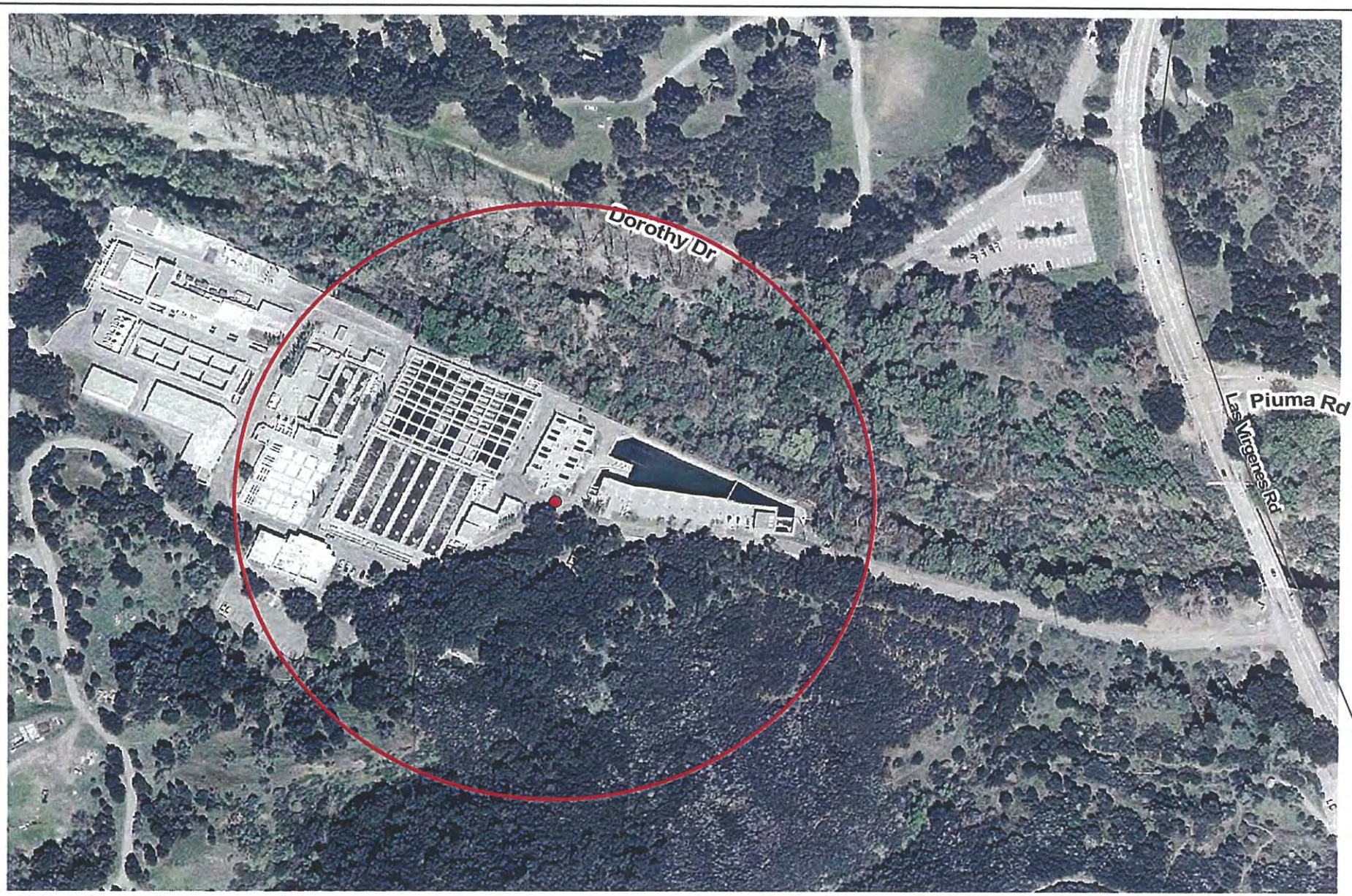
If there were an accidental release from the ammonia tanks, the ammonia would enter the facility's drainage system and drain to the plant balancing pond and be captured. In accordance with the Tapia WRF Stormwater Pollution Prevention Plan (SWPPP), the stormwater valve at the balancing pond is normally kept open to capture rainfall runoff and is only closed when:

- At least 1 inch of rain has been collected in the Tapia rain gauge over the last 24 hour period;
- The additional flow from stormwater runoff affects the treatment process negatively;
- Oils, floatables, odors and suspended solids are detected by observation and/or a laboratory analysis of a sample is conducted;
- Permission from the operations supervisor is given to send stormwater to Malibu Creek.

The first flush (at least 1 inch in 24-hours) of stormwater runoff is captured and treated at the Tapia WRF. The ammonia tanks would drain to the balancing pond and not migrate off-site unless an unavoidable rupture occurs during a heavy rainstorm after the first flush, in which case it would drain to Malibu Creek.

4. FIVE-YEAR ACCIDENT HISTORY

The Tapia WRF has not had an accidental or near-accidental release of a regulated substance during the past five-years that resulted in deaths, injuries, or significant property damage on-site, or known off-site deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage.



SOURCE: Impact Sciences, Inc. - November 2011, U.S. Environmental Protection Agency, RMP*Comp, Version 1.07

ITEM 9C

FIGURE 2

Worst-Case Release Scenario - Toxic Endpoint Distance

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5. EMERGENCY RESPONSE PROGRAM

5.1 Emergency Response (ER) Plan

In accordance with CalARP regulations, Section 2735.5(d)(3), a facility with a Program Level 1 process shall ensure that response actions have been coordinated with local emergency planning and response agencies.

The Tapia WRF has coordinated with the County of Los Angeles Fire Department, which is a member of the LEPC. This program includes an emergency response notification plan. Emergency response drills and drill evaluations are conducted every 12 months; emergency operation and response procedures are also reviewed at that time. In the event of an emergency, communitywide notification systems are in place and the County of Los Angeles Fire Department coordinates the response actions. The facility has an evacuation plan in the event of an emergency. Employees are directed to exit the facility and gather at predetermined assembly areas. The evacuation plan is included in **Appendix D**. The Plant Supervisor serves as the emergency contact and is responsible for emergency response drills and evaluations. In the event of an emergency, the Plant Supervisor is responsible for taking roll call at the assembly areas and for contacting the County of Los Angeles Fire Department.

- Agency Name: L.A. County Fire Department, Station # 67
- Agency Phone Number: (818) 222-1099

In accordance with CalARP regulations, Section 2745.8, the following information is provided:

- Community Plan (Is facility included in written community emergency response plan?): Yes
- Facility Plan (Does facility have its own written emergency response plan?): No
- Response Actions (Does ER plan include specific actions to be taken in response to accidental releases of regulated substance(s)?): No
- Public Information (Does ER plan include procedures for informing the public and local agencies responding to accidental release?): No
- Healthcare (Does facility's ER plan include information on emergency health care?): No

1.1 Other Federal or State Emergency Plan Requirements

- OSHA Regulations at 29 CFR 1910.38: Yes
- OSHA Regulations at 29 CFR 1910.120: No
- Clean Water Regulations at 40 CFR 112: No

- RCRA Regulations at CFR 264, 265, and 279.52: No
- OPA 90 Regulations at 40 CFR 112, 33 CFR 154, 49 CFR 194, or 30 CFR 254: No
- Emergency Planning and Notification at 40 CFR 355: Yes
- State EPCRA Rules or Laws: No
- Other (Specify):

6. CERTIFICATION

For Program 1 processes, the owner or operator shall submit in the RMP the following certification statement provided in Section 2735.5(d)(4):

> Based on the criteria in Section 2735.4 of Title 19 of CCR, the distance to the specified endpoint for the worst-case accidental release scenario for the following process(es) is less than the distance to the nearest public receptor: two aqueous ammonia storage tanks. Within the past five years, the process(es) has (have) had no accidental release that caused off-site impacts provided in the risk management program Section 2735.4 (c)(1). No additional measures are necessary to prevent off-site impacts from accidental releases. In the event of fire, explosion, or a release of a regulated substance from the process(es), entry within the distance to the specified endpoints may pose a danger to public emergency responders. Therefore, public emergency responders should not enter this area except as arranged with the emergency contact indicated in the RMP. The undersigned certifies that, to the best of my knowledge, information, and belief, formed after reasonable inquiry, the information submitted is true, accurate, and complete.
>
> Name: David R. Lippman Title: Director of Facilities and Operations
>
> Signature: _____ Date: _____

7. REGISTRATION

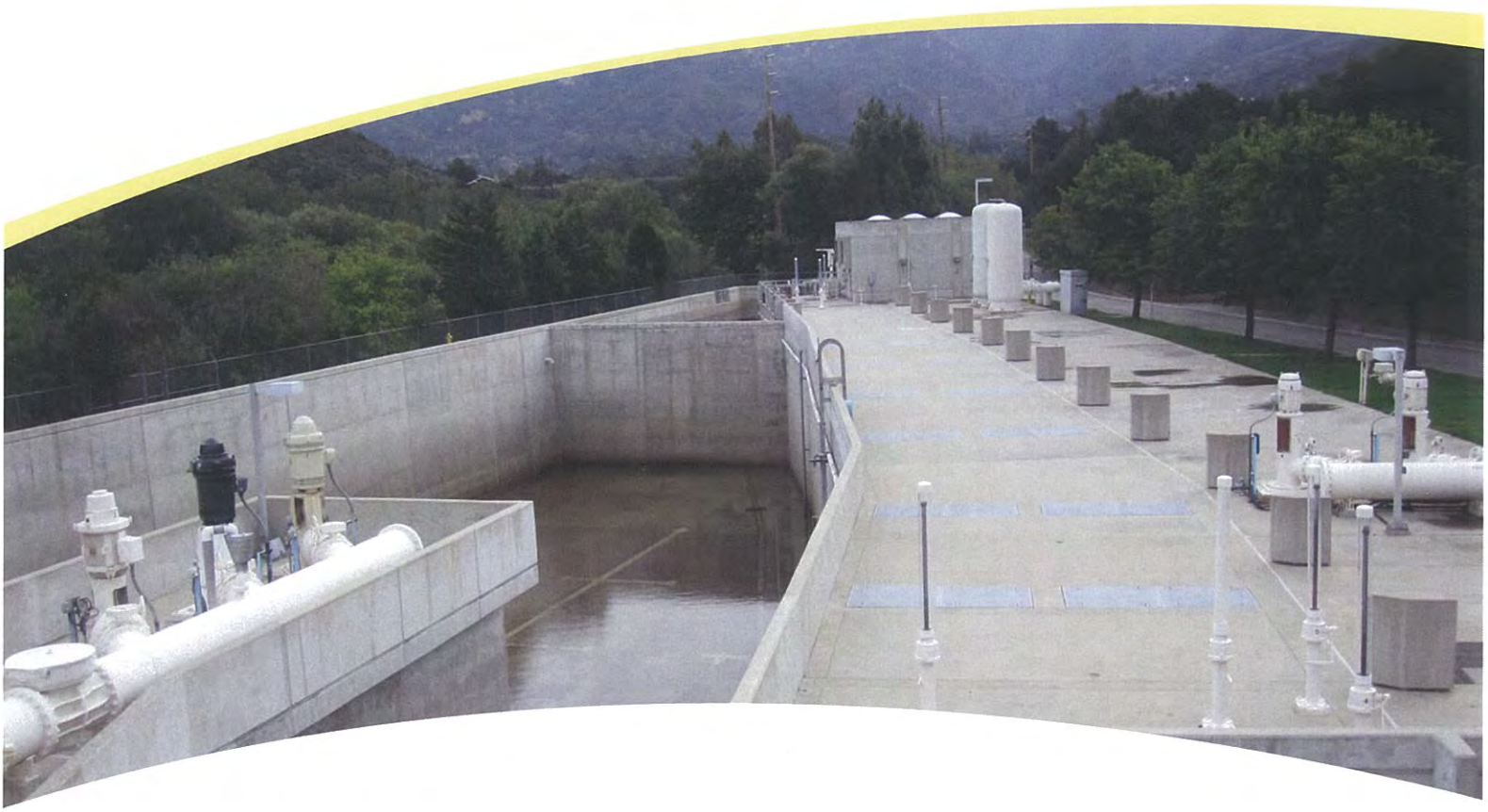
In accordance with CalARP Regulations Section 2735.4(a)(2) and Section 2740.1(b) and (d), the following registration information is provided to the AA in this RMP:

Facility Name and Address:	Tapia Water Reclamation Facility 731 Malibu Canyon Road Calabasas, California 91302
Facility Latitude and Longitude and Method:	34° 04′ 55.0″ (Decimal: 34.081944) -118° 42′ 23.0″ (Decimal: -118.706389) Interpolation – Digital map source (TIGER) Center of Facility
Facility Dun and Bradstreet Number:	None
Parent Company Name:	Las Virgenes Municipal Water District
Parent Company Dun and Bradstreet Number:	None
Owner/Operator, Mailing Address, and Telephone Number:	Las Virgenes Municipal Water District 4232 Las Virgenes Road Calabasas, California 91302 Telephone: (818) 251-2100
Name and Title of person or position with overall responsibility for RMP elements and implementation:	Ed Cuaresma, Plant Supervisor 731 Malibu Canyon Road Calabasas, California 91302 Telephone: (818) 251-2324
Emergency contact name, title, telephone number, 24-hour telephone number, and e-mail address:	Ed Cuaresma, Plant Supervisor 731 Malibu Canyon Road Calabasas, California 91302 Telephone: (818) 251-2324 24-Hour Telephone (818)-292-2669 E-mail: ecuaresma@lvmwd.com
Name and CAS number of regulated substance held above the threshold quantity:	Ammonia, CAS # 7664-41-7
Maximum quantity of regulated substance:	5,566 pounds
Process NAICS Code:	22132 (Utilities, Sewage Treatment Facility)
RMP Program Level:	1
Facility U.S. EPA identifier:	1000 0014 8459
Number of full-time employees:	18
Subject to Section 5189 of Title 8 of CCR:	No
Subject to Part 355 of Title 40 of CFR:	Yes
Federal Clean Air Act Title V Operating Permit Number:	None
Name and Date of last safety inspection by a federal, state, or local government agency:	Agency Name: L.A. County Fire Health/Hazmat Date: 11/17/2011 Agency Name: OSHA Date: 08/05/2011
Contractor who prepared the RMP:	Impact Sciences, Inc. 803 Camarillo Springs Road, Suite A Camarillo, California 93012 Telephone: (805) 437-1900
Local Emergency Planning Committee (LEPC):	California Region 1 LEPC
Type of and reason for any changes being made to a previously submitted RMP:	None

PREPARED FOR
LVMWD/TSD JOINT
POWERS AUTHORITY

Tapia Water Reclamation Facility Alternative Disinfection Study

July 2011



REPORT

MWH®

BUILDING A BETTER WORLD

ITEM 9C

ITEM 9C

Las Virgenes Municipal Water District/ Triunfo Sanitation District

Joint Powers Authority

Preliminary Design Report for Alternative Disinfection at Tapia WRF

July 2011

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July 27, 2011

Las Virgenes Municipal Water District/
Triunfo Sanitation District Joint Power Authority
4232 Las Virgenes Road
Calabasas, CA 91302

Attention: Mr. David Lippman

Subject: Tapia Water Reclamation Facility Alternative Disinfection Study

Dear Mr. Lippman:

MWH is pleased to submit this Final Report for the Tapia Water Reclamation Facility Alternative Disinfection Study. The report contains a series of technical memoranda, starting with the conceptual level evaluation, development of a recommended technology and progressing through a preliminary design effort. The preliminary design effort consists of a recommended site for the facilities, opinion of probable construction costs, and preliminary drawings.

MWH appreciates all the assistance and input you and your staff provided during the preparation of this report. Please let us know if we can provide any additional information or if we can be of further assistance.

Sincerely,

Roger Stephenson, PhD, P.E.
Project Manager

Sarah Munger, P.E.
Project Engineer

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Suite 200
Arcadia, CA 91007

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FAX 626 568 6101
www.mwhglobal.com

ITEM 9C

TABLE OF CONTENTS

- END OF TABLE OF CONTENTS -

ITEM 9C

TECHNICAL MEMORANDUM

MWH

BUILDING A BETTER WORLD

To:	Brett Dingman	**Date:**	March 17, 2011
From:	Roger Stephenson Sarah Munger Jamal Awad	**Reference:**	1010371
Subject:	Concept-Level Evaluation of Disinfection Alternatives for Tapia FINAL	**Client:**	Las Virgenes Municipal Water District/Triunfo Sanitation District Joint Powers Authority

INTRODUCTION

The Las Virgenes Municipal Water District/Triunfo Sanitation District Joint Powers Authority (JPA) operates the Tapia Water Reclamation Facility (Tapia). In September 2010, a new National Pollutant Discharge Elimination System (NPDES) permit for Tapia was adopted. The new NPDES permit includes a cease and desist order (CDO) for the discharge of Dichlorobromomethane (DCBM) to the Los Angeles River and Malibu Creek and a Time Schedule Order (TSO) for Total Trihalomethanes (TTHMs) for discharged to the Los Angeles River. The JPA has entered into a contract with MWH to investigate alternative disinfection technologies that may be implemented to reduce the DCBM and TTHMs in Tapia's treated effluent. The purpose of this Technical Memorandum is to document the investigation into the four alternative disinfection technologies that may be implemented at Tapia namely mixed oxidants, ultraviolet light (UV), ozone and chloramination.

BACKGROUND

Tapia uses the following treatment processes: coarse screening, grit removal, primary sedimentation, activated sludge secondary treatment, filtration, chlorination, and dechlorination. Tapia uses an activated sludge process with nitrification and denitrification (NDN) with secondary clarification. The tertiary treatment process consists of filtration through anthracite media. Chlorination and dechlorination are accomplished through the use of sodium hypochlorite and sodium bisulfite. A general process flow diagram for the treatment plant is shown on **Figure 1**. The filtration and disinfection facilities are illustrated in more detail on **Figure 2**.

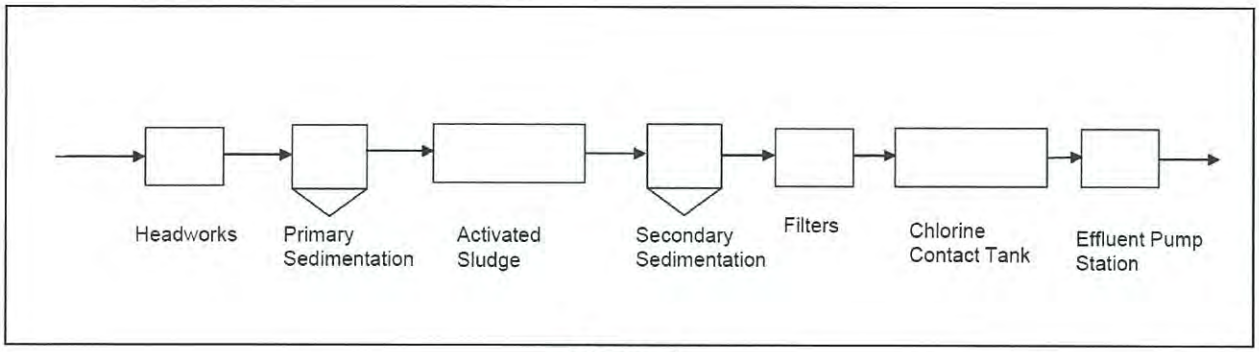


Figure 1
Tapia Process Flow Diagram

Tapia currently treats approximately 9.5 mgd, which is reused or discharged to the Los Angeles River (outfall 005) or Malibu Creek (outfall 001). Reuse of 60 percent of the tertiary effluent produced annually is achieved through an extensive recycled water system. Although the facility is rated at 16.1 mgd, nutrient removal planning efforts over the last 10 years have considered 12 mgd as the necessary maximum capacity for the foreseeable future. Non-recycled effluent is disposed of by discharging to the Los Angeles River (outfall 005), Malibu Creek (outfall 001) or by the use of JPA operated spray fields. The Malibu Creek discharge is only allowed from November 15th to April 15th each year. Discharge to Malibu Creek and the Los Angeles River are regulated under a NPDES permit issued by the Los Angeles Regional Water Quality Control Board (Regional Board).

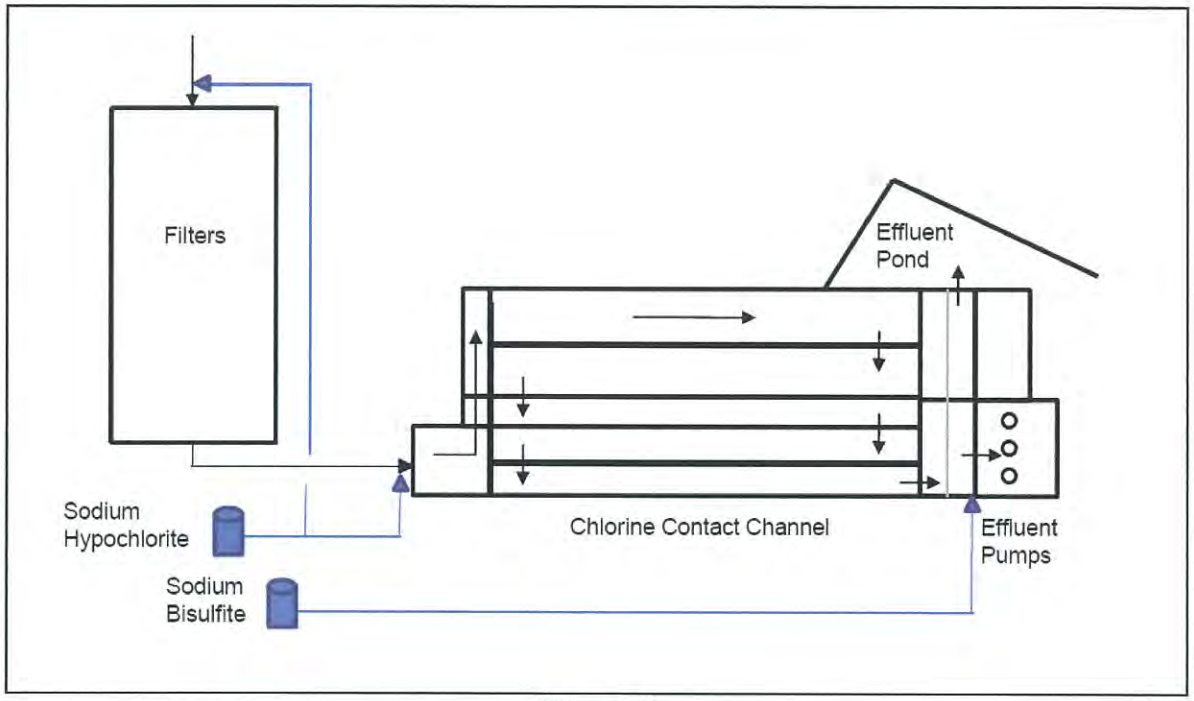


Figure 2
Tertiary Process Flow Diagram

When chlorine is added to wastewater it oxidizes organic matter and this results in the formation of disinfection by-products that include THMs. There are four trihalomethane (THM)

compounds that are regulated under the NPDES permit: Dichlorobromomethane (DCBM), dibromochloromethane (DBCM), chloroform, and bromoform. The TTHM limit set forth in the NPDES permit is the sum of these four THMs.

The Regional Water Quality Control Board adopted an NPDES permit for the Tapia WRF in 2005 that included an interim average monthly effluent limit for DCBM of 62 μg/l and a final limit of 46 μg/l. DCBM levels were in compliance with both the interim and final limit and trending downward until April of 2008 when construction of the BNR upgrades at Tapia WRF and Rancho Las Virgenes Composting Facility began. New BNR facilities were placed into service in August and September of 2009 and construction was completed in October 2009. DCBM levels have remained at elevated levels since the completion of BNR construction. As a part of the 2010 NPDES permit issued by the RWQCB, a Cease and Desist Order for DCBM and a Time Schedule Order for TTHM were issued. TTHM limits only apply to L.A. River Discharge while DCBM limits apply to all discharge points. **Figure 3** and **4** present DCBM and TTHM concentrations, respectively, from 2005 to the present.

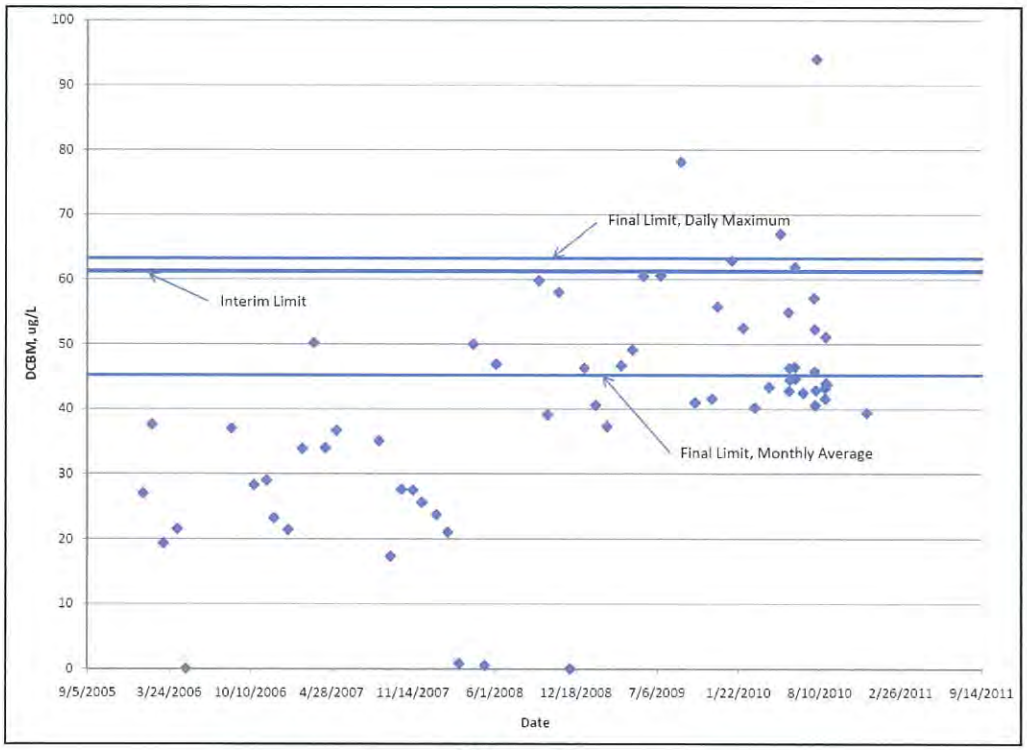


Figure 3
Plant Effluent Data for DCBM

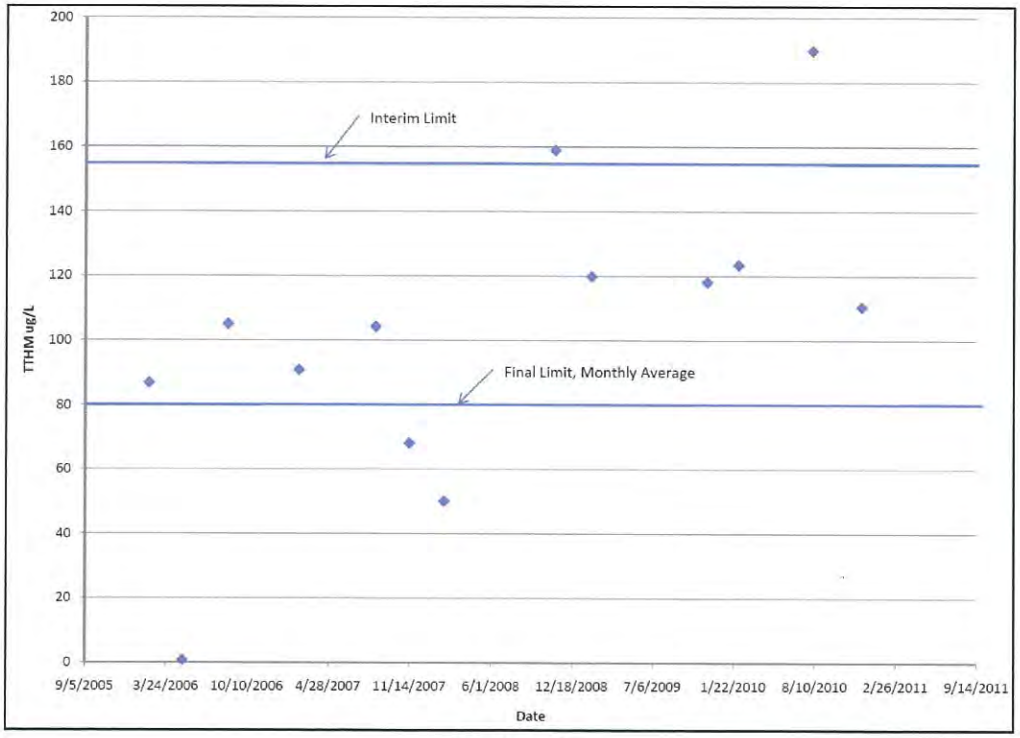


Figure 4
Plant Effluent Data for TTHM

The interim and final limits of the 2010 permit are tabulated in **Table 1** below. The final limit for discharge of TTHM to the Los Angeles River is the current drinking water standard for that parameter. TTHMs in drinking water are regulated by the EPA through the Stage 1 Disinfectants and Disinfection Byproducts Rule.

Table 1
Tapia Discharge Limits for DCBM and TTHM

Discharge	Interim Limit, µg/L	Final Limit, Monthly Average, µg/L	Final Limit, Daily Maximum, µg/L
Los Angeles River			
DCBM	62	46	64
TTHM	154	80*	N/A
Malibu Creek			
DCBM	62	46	64
TTHM	N/A	N/A	N/A

*80 µg/L = Drinking Water Standard

Both the CDO and the TSO have common schedules for compliance with options based upon the technology selected. Easy-to-implement technologies, which require a process change or replacement without substantial construction and permitting, such as mixed oxidants as specifically indicated in Regional Board documentation, would have required a work plan to be submitted for approval by December 2, 2010. That work plan was to have included a schedule to optimize and evaluate the performance of the technology by March 2, 2012.

Technologies that require design, construction, permitting, and other substantial activities, require a work plan to be submitted for approval by February 2, 2011 and include a schedule to optimize and evaluate the performance of the technology by September 2, 2014.

The JPA has considered the use of UV disinfection in the past and that was the purpose of two prior studies, one conducted in 1994 and the other in 1998. The 1994 study recommended a low pressure, low intensity system. That study recommended that the UV disinfection system be installed in the chlorine contact channels. In 1998, disinfection alternatives were further evaluated. That study recommended that a medium pressure UV system be installed in the chlorine contact channels. Based on visits to local installations by JPA staff, medium pressure technology was eliminated as a viable option. That resulted in the conversion from the then gaseous chlorine and sulfur dioxide system to the use of bulk liquid sodium hypochlorite and sodium bisulfite.

The purpose of this Technical Memorandum is to document the current investigation into four alternative disinfection technologies that may be implemented to reduce the DCBM and TTHM: mixed oxidants, UV, ozone and chloramination. A fifth alternative that results from combining UV disinfection with continued use of the existing disinfection system is also presented.

DISINFECTION TECHNOLOGIES

There are two basic methods that can be used to reduce effluent THMs at Tapia: (1) implement an alternative disinfection technology, or (2) modify the existing chlorination practice. Alternative disinfection technologies that will be considered are UV and ozone. The use of mixed oxidants and chloramination are both modifications to the existing practices at Tapia. The Regional Board specifically indicated the use of "mixed oxidants", as an example alternative. The generation of mixed oxidants is achieved through the electrolytic generation of chlorine and, therefore, is a modification to the existing chlorination practice. These four alternatives are presented and discussed below with an assessment of their positive and negative attributes.

UV Disinfection

UV disinfection uses UV light radiation to penetrate the cell wall of the organism and destroy the cell's ability to reproduce. The source of UV radiation is either a medium-pressure or low-pressure mercury arc lamp with low or high output. There are various configurations for UV systems that are characterized by the type of UV lamp employed, and whether the UV reactor is an enclosed unit within a pipeline (in-line), or configured within an open channel. UV lamps are either:

- Medium pressure (MP)
- Low pressure, high output (LPHO), or
- Low pressure, low intensity (LPLI).

An LPHO, open channel system is shown on **Figure 5**.

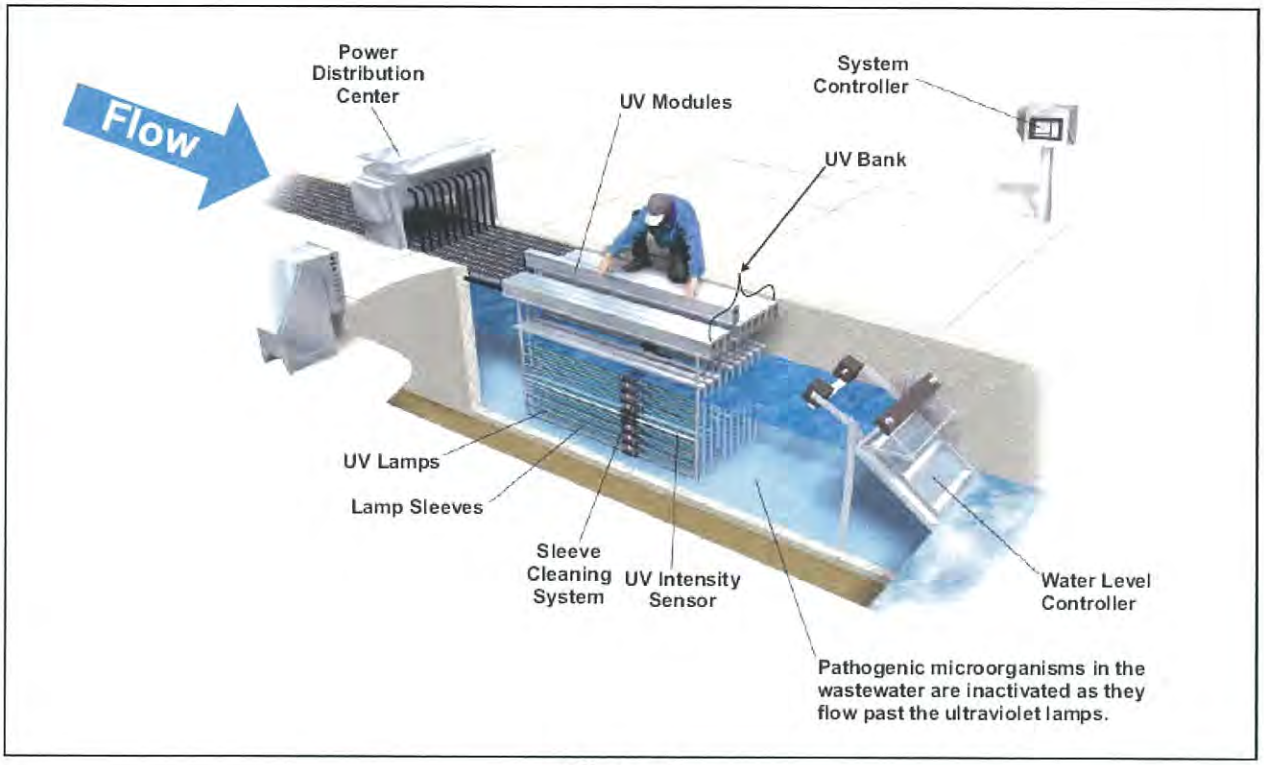


Figure 5
Open Channel UV Process

A UV system must go through a validation and acceptance procedure approved by the California Department of Public Health (CDPH) to verify that the UV system is meeting the disinfection requirements for compliance with the California Recycled Water Criteria of Title 22 of the State Code. The validation process can involve collimated beam experiments, pilot testing (at full or near-full scale) and the development of a dose regression model. Some of the UV systems have already been conditionally accepted by CDPH and are listed in "Treatment Technology Report for Recycled Water" issued by the State of California Department of Public Health, Division of Drinking Water and Environmental Management (2009), these systems may require limited testing.

The LPLI in-channel systems have been in use locally for nearly two decades and represent the first UV technology applied to wastewater disinfection. These systems are composed of racks or banks of UV lamps that consume 88 watts per lamp. They have a limited ability to change the amount of UV radiation emitted: each bank of lamps is either on or off. These systems were not developed with mechanical, self-cleaning features. Given the limited flexibility of these systems, LPLI UV systems are limited to very small facilities (e.g., <1 mgd) and are not considered an option for Tapia.

LPHO open channel UV systems are currently in use in California. This system would consist of mercury lamps, a reactor and the ballasts, which all make up a module. The module would be placed in a channel with flow parallel to the length of the module. The high output system uses lamps of 250 to 500 watt per lamp. The high output system also allow the bulbs to dim to reduce power consumption if there is a drop in flow or an increase in water clarity.

LPHO, in-line UV systems are currently being developed, but have not yet been tested and certified by the CDPH for Title 22 disinfection applications such as at Tapia. Although such in-line systems offer the potential for reduced structural costs and improved hydraulics, the necessary modifications to incorporate an in-line system within the existing facilities at Tapia might outweigh these benefits Further, until the CDPH has certified the system and bioassay testing is conducted, there is no definitive basis to design such a system for specific requirements. The status of in-line UV systems, however, should be monitored for application in the future as that technology matures.

Recently a LPHO system was introduced to the market that uses a 1000 watt lamp, rather than the conventional 250 -350 watt lamp. This system would save in construction costs, as well as power consumption. Unfortunately, this system has not been certified by CDPH and is currently undergoing bioassay testing.

MP UV systems are more suitable for water treatment than for recycled water applications because the required UV dose is lower for water treatment disinfection and therefore fewer lamps are required. Several disadvantages make MP UV systems a poor choice for application at Tapia. First, currently only one medium pressure, in-line UV system has been approved for Title 22 regulations, and high costs would be required for getting other system approved. Second, the medium pressure system is not as energy efficient and less operationally cost effective because they operate at higher temperatures. Third, but not the least significant, is that part of the spectrum of wavelengths produced by medium pressure lamps is conducive to the growth of algae that can degrade the effectiveness of UV disinfection. At the doses needed for recycled water production and with the presence of nutrients, algae growth within a medium pressure UV reactor is a chronic problem.

LPHO open-channel UV system represent the most current and applicable UV technology that could be employed at Tapia, and is the recommended technology to compare to other disinfection alternatives for this study.

Ozone

Ozone (O_3) and its associated free radicals, such as the hydroxyl radical, are strong oxidants which can oxidize many organic and inorganic compounds. This results in ozone being an effective oxidant as well as a disinfectant. Ozone is effective against bacteria and viruses, and provides some protection against microbial cysts and eggs. Recent research has also shown that ozone effectively removes a large number endocrine disrupting compounds (EDCs) and pharmaceuticals and personal care products (PPCPs) that are not removed by biological treatment processes. Similar to chlorine disinfection, ozone disinfection depends on the ozone residual and the reaction time. The ability to maintain the dissolved ozone concentration is critical to achieve disinfection and factors that accelerate ozone decomposition are undesirable

because the ozone residual dissipates fasters requiring an increase in ozone dose and therefore increases operating costs. Due to safety concerns it is recommended that ozonation system equipment be isolated in its own room with heating and ventilation system and separate exterior entrances.

Ozone is effective at inactivating bacteria, viruses, parasites and parasite cysts in a relatively short contact time. Other advantages of ozone are; rapid decomposition, no chlorinated disinfection byproduct formation, minimal regrowth of microorganisms, little increase in total dissolved solids (TDS), and the potential to oxidize trace organic pollutants of emerging concern such as PPCPs and EDCs.

An ozone disinfection process requires an oxygen supply system, ozone generators, power supply units, ozone gas concentration monitors, contact tanks, ozone off-gas handling and residual ozone gas destruction system, and the associated monitoring equipment. A general process flow diagram is shown on **Figure 6**.

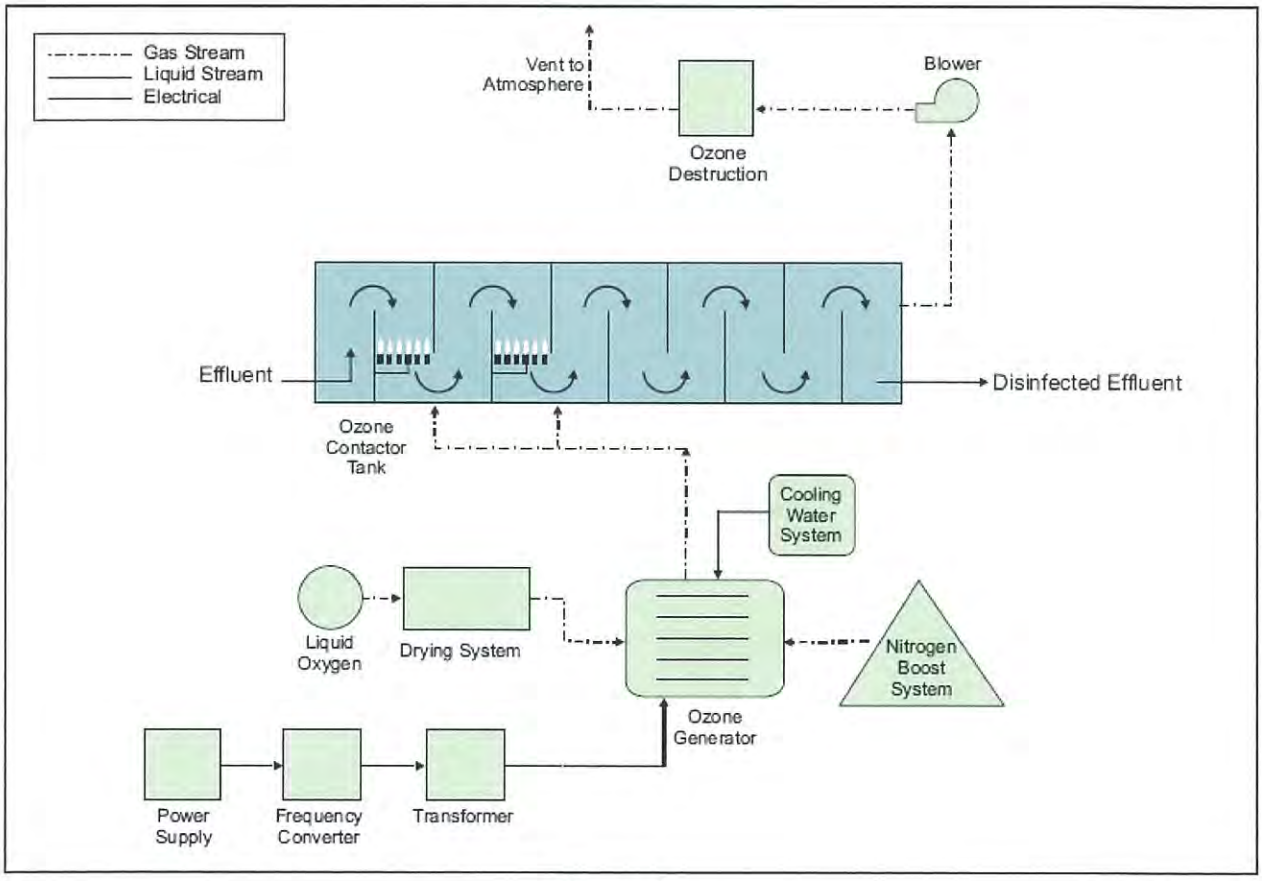


Figure 6
Ozone Disinfection Process

An ozone system would require significant area, which is difficult to accommodate on a site as constrained at Tapia. Other disadvantages include: ozone is reactive and corrosive which requires the use of corrosion resistant materials and the treatment of concrete surfaces, no sustainable disinfection residual, and the system is relatively complex to operate and maintain.

The use of ozone has the potential to generate disinfection byproducts, such as bromate, which are potentially harmful to human health and the low ozone dosages may not effectively inactivate some viruses, spores and cysts. Bromate is formed by a reaction between bromide and ozone. If a drinking water source is disinfected using ozone, bromate could be formed. Bromate is reduced in the sewer and if when passed through the water reclamation facility, it is ozonated again the bromate could be reformed. Finally CDPH has not approved ozone as a disinfection technology and there would be considerable costs associated with the testing for CDPH approval.

Mixed Oxidants

Mixed oxidants as a disinfection process is one that is similar to the existing chlorination process employed at Tapia, except that in addition to hypochlorite, other constituents, such as ozone, are present in small amounts, hence the term "mixed oxidants."

Sodium hypochlorite can be generated using an electrolytic process with equipment that would be located at Tapia. This is referred to as on-site hypochlorite generation. The process uses high purity, food-grade salt that is dissolved forming brine and fed to hypochlorite generators. The hypochlorite that is produced is at a concentration of 0.8 percent versus the 12 percent hypochlorite solutions available in bulk. Other constituents such as chlorine, chlorine dioxide, hydrogen peroxide, ozone and hydroxyl radicals, are claimed to be present in small amounts, hence the term "mixed oxidants." This system requires a water softener, salt storage/brine tanks, brine feed pumps hypochlorite generators, hypochlorite day tanks, metering pumps, an acid cleaning system and an emergency power system. A general equipment illustration is presented as **Figure 7**.

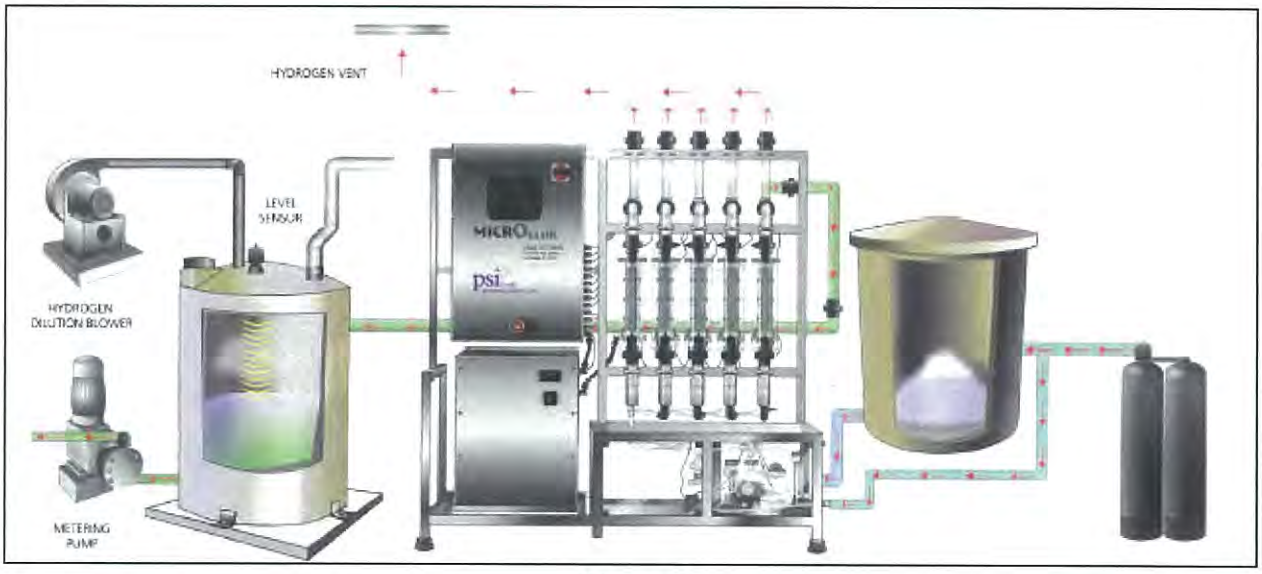


Figure 7
On-Site Sodium Hypochlorite Generation System

This system would require significant area for salt and brine storage, which is difficult to accommodate on a site as constrained as Tapia. Another disadvantage to this system is that the

salt would have to be trucked to Tapia. Testing should be conducted to confirm TTHM reduction with this approach.

On-site sodium hypochlorite generation was included in the 1998 Alternative Disinfection Evaluation, and at the time, this alternative was assumed to be cost prohibitive when compared to trucking sodium hypochlorite on site.

The Regional Board specifically identified "mixed oxidants" as an option that requires a process change or replacement without substantial construction and permitting activities. Under this option JPA would have been required to submit a work plan to the Regional Board by December 2, 2010. However, given the time frame required by the Regional Board and the amount of equipment that would need to be provided, the use of mixed oxidants is not recommended for further consideration.

Modified Chlorination

The existing disinfection facilities at Tapia consist of bulk sodium hypochlorite storage and feed systems and a chlorine contact tank. Sodium bisulfite is used for dechlorination prior to discharge. THM formation during chlorination is a function of the presence of precursor compounds, the chlorine dose and the contact time. Chlorination in the presence of ammonia produces chloramines. These compounds are disinfectants, but they are less effective than free chlorine. Chloramines do, however, limit the formation of THMs. Currently the Tapia activated sludge process completely nitrifies and without ammonia in the effluent, only free chlorine is present. THM formation can be controlled by limiting the free chlorine dose or contact time, by the introduction of chloramines, or by a combination.

MWH conducted bench tests on secondary effluent from Tapia collected before and after filtration. Tests were conducted with the addition of preformed chloramines to represent a case with minimum TTHM formation. The results, **Figure 8**, represent, from left to right; 1) the addition of 15 mg/L NH_2Cl (as CL_2), 2) chlorine addition prior to filtration with 7.5 mg/L free chlorine, and then the addition of 7.5 mg/L NH_2Cl, and 3) chloramine addition prior to filtration with 7.5 mg/L NH_2Cl, and then 7.5 mg/L free chlorine post filtration.

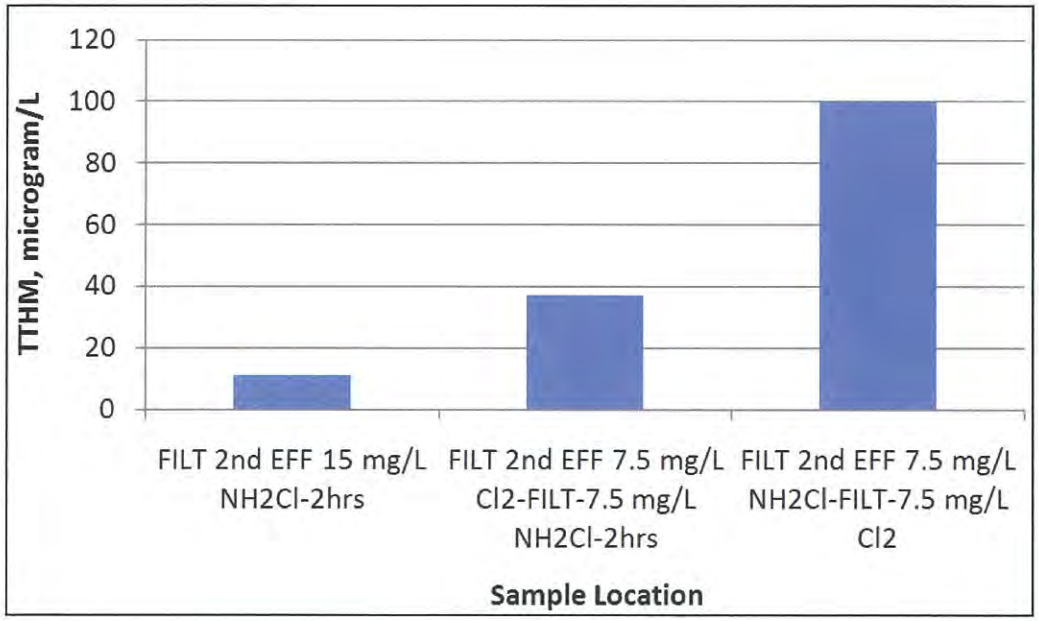


Figure 8
Bench-scale TTHM Formation Results

These results demonstrate that disinfection with only chloramines quite effectively limits the formation of THMs. This is, however, not a viable solution for two primary reasons. First, because chloramines are not as effective as free chlorine, greater contact time or much higher dosage might be required for equivalent bacterial or virus removals compared to free chlorine. Second, when the effluent is dechlorinated prior to discharge, the nitrogen component of chloramines is released as ammonia in the amount of roughly 1 mg/L NH_3 per mg/L NH_2Cl and the effluent ammonia limits would be exceeded.

These data do, however, show that with the sequential addition of free chlorine pre filtration, followed by the addition of chloramine post filtration, TTHM formation was limited to 40 mg/L. This is referred to as modified chlorination, which has brought both the TTHM and DCBM to within the permit limits.

Adding chlorine pre filtration, and chloramines post filtration, is an approach to control disinfection byproducts that is termed "sequential chlorination" by the Los Angeles County Sanitation Districts (LACSD) and is a process to which they hold a recently issued patent. Though patented, it is understood that LACSD's intent is that sequential chlorination can be used by public agencies for the good of the public without the payment of royalties.

Modified chlorination as envisioned for Tapia would allow for chloramines addition either pre or post filtration. The advantages are minimum impact to the existing treatment process, minimum additional equipment required, low cost, and it would allow for a combined-chlorine residual but limit THM formation while not jeopardizing ammonia discharge limitations.

The disadvantages of modified chlorination are that it is weaker than other disinfectants, has the potential to form NDMA, and the addition of ammonia may enhance biofilm growth in

transmission lines. The concern over the addition of ammonia exceeding permit limits may be mitigated by monitoring the ammonia levels in the effluent through the use of an ammonia analyzer. Also, the use of sodium bisulfite will have the following reaction with chloramines: $NaHSO_3 + NH_2Cl + H_2O \Rightarrow Na^+ + SO_4^= + H^+ + Cl^- + NH_4^+$. Adjustments can be made to the dosing location or the amount as the ammonia approaches the permit limits. **Figure 9** presents effluent ammonia data for the past year at Tapia, with the effluent limits and the proposed ammonia dose. With the exceptions of a few spikes, the effluent ammonia concentrations have remained well below the limits.

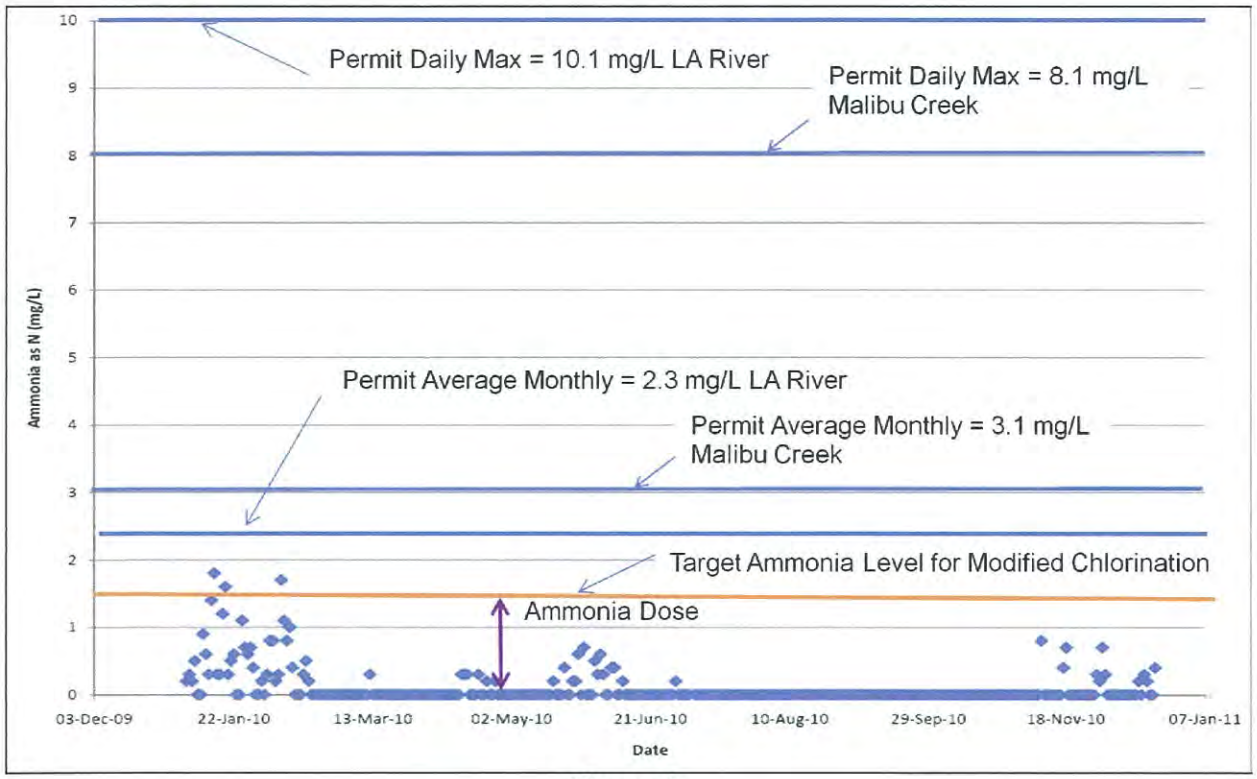


Figure 9
2010 Effluent Ammonia Data

Facilities that would be required for modified chlorination include ammonia storage and feed facilities, on-line analysis instrumentation to achieve stable operation, and adequate mixing at the points of ammonia and chlorine injection. A general layout of the modified chlorination system is illustrated by **Figure 10**.

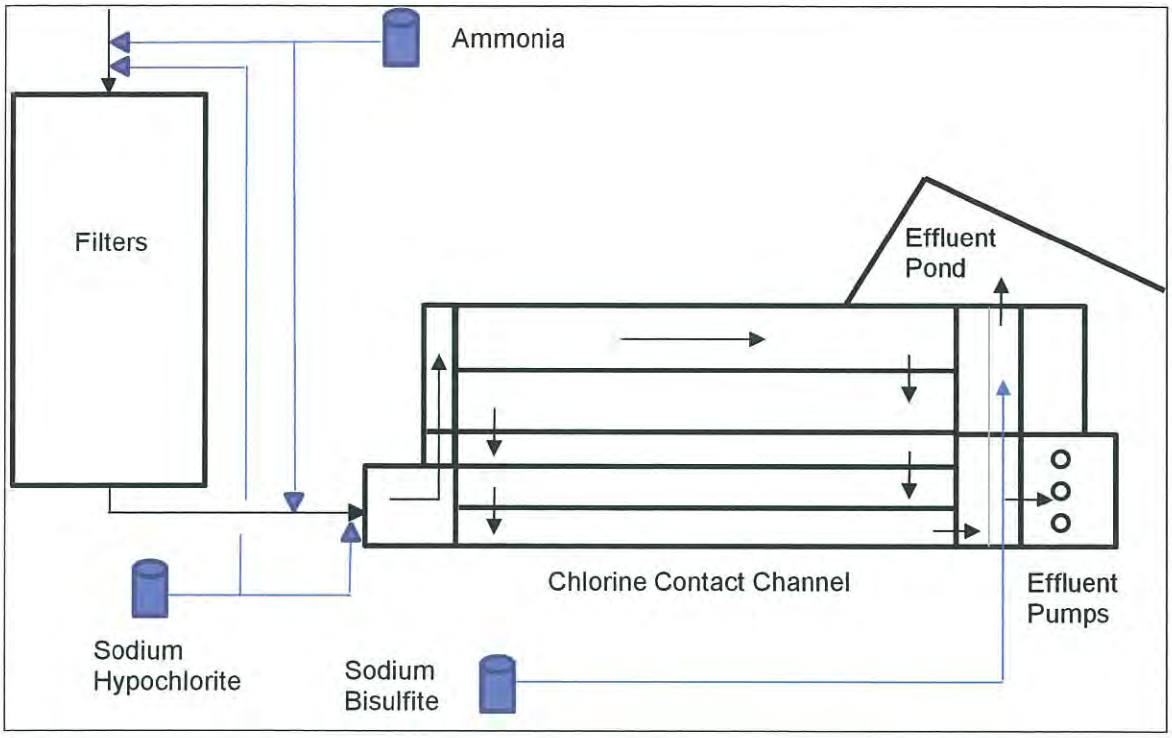


Figure 10
Modified Chlorination Process Flow Diagram

Hybrid UV and Modified Chlorination

During the review of the four alternative disinfection technologies, a fifth option emerged as a combination of two of the disinfection technologies. The hybrid option would combine the use of UV disinfection with modified chlorination. This system would use UV disinfection to treat the typical daily flow and use the modified chlorination to disinfect peak flows. The UV system would be installed in two of the existing chlorine contact channels.

The configuration of the hybrid system is shown as **Figure 11**. The flow split between the UV and the remaining chlorine contact tank may be accomplished through the installation of a weir or a gate. In the event of a peak flow event the base flow would still pass through the UV system, while the additional flow passes through the chlorine contact tank. **Figures 12** and **13** show the percentage of plant flow that the UV will be able to handle, both at current and future flows and which percentage of flow will be treated with modified chlorination. Figure 12 shows that modified chlorination will be need approximately 20 percent of the time when the plant is operating at an average of 9.5 mgd. Figure 13 shows that modified chlorination will be needed approximately 55 percent of the time when the plant is operating at an average of 12 mgd. In both cases, the UV will treat the base flow of the treatment plant. This system also adds redundancy. In the event that the UV system needs to be taken offline for maintenance purposes, the chlorine contact tank could disinfect the plant effluent with minimal interruption to the treatment process.

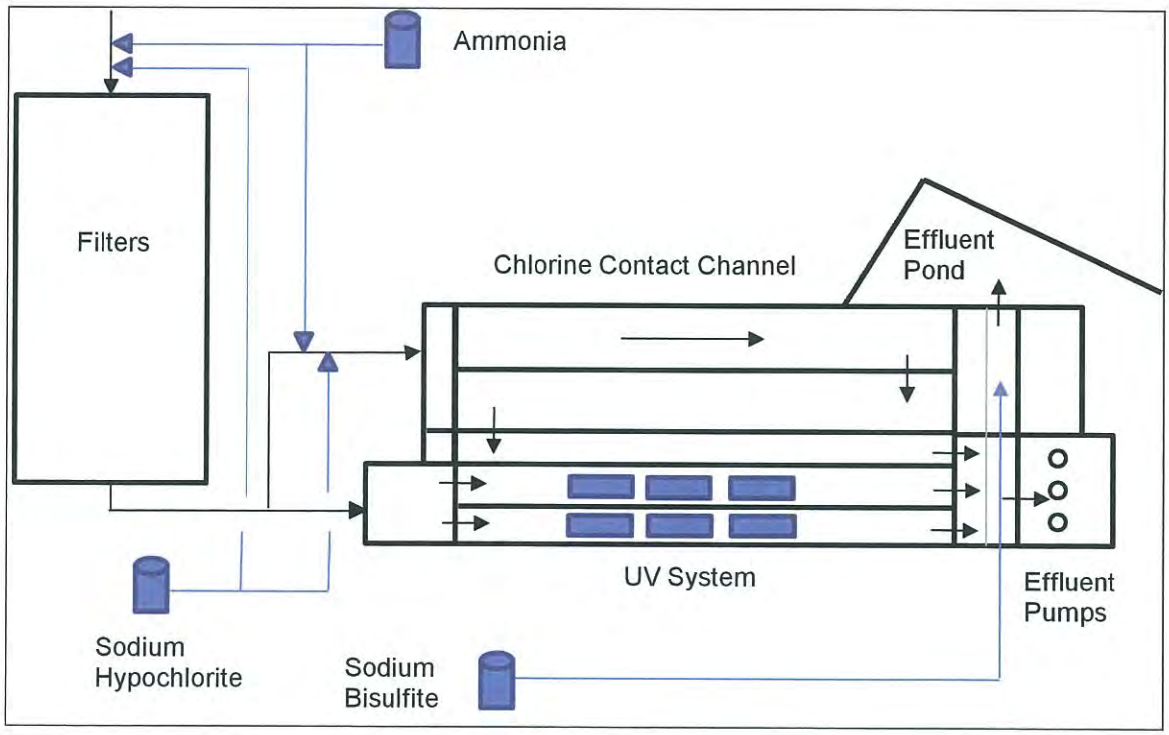


Figure 11
UV and Modified Chlorination Process Flow Diagram

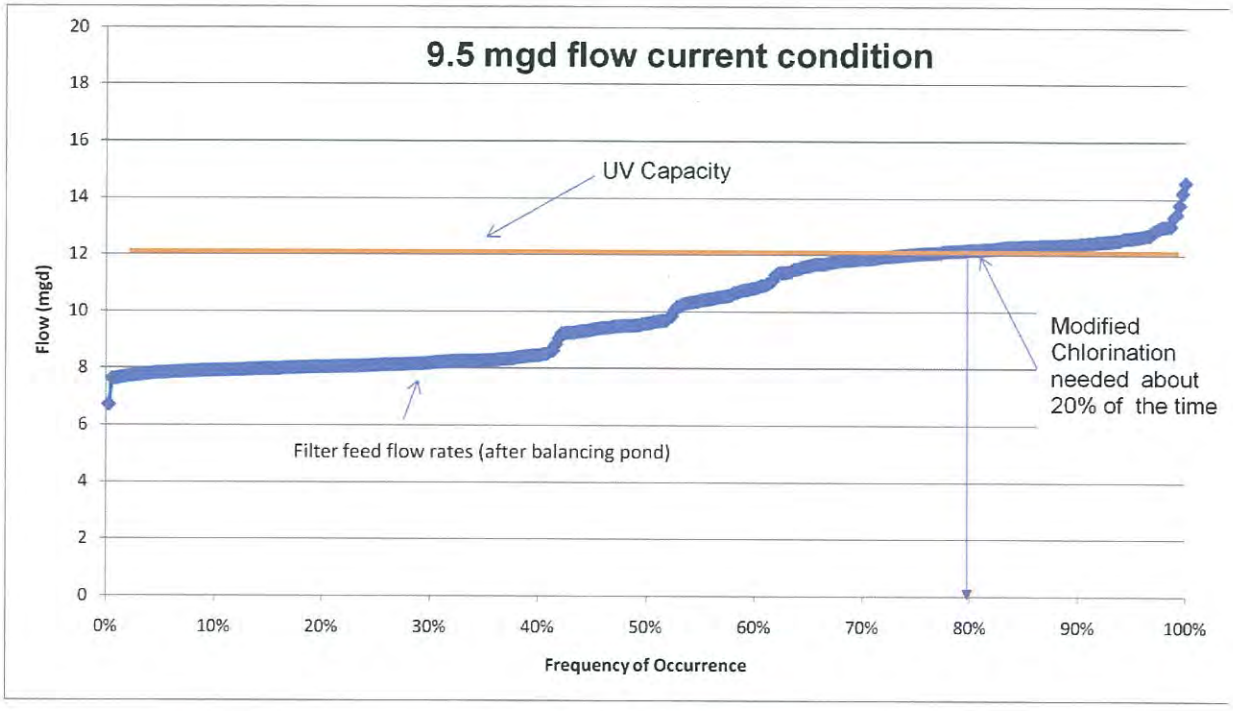


Figure 12
Percent of Time Modified Chlorination Used at Current Conditions

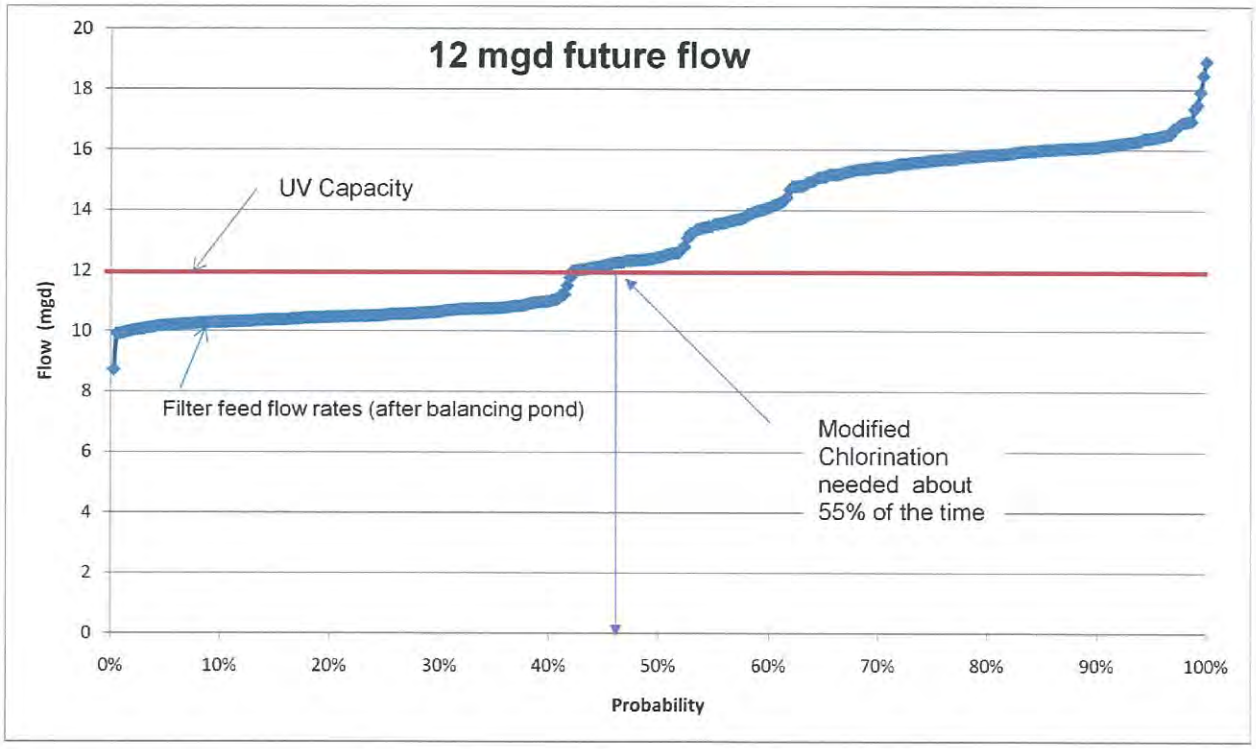


Figure 13
Percent of Time Modified Chlorination Used at Future Conditions

OPINION OF PROBABLE CONSTRUCTION COST (OPCC)

An OPCC was developed for each of the alternative disinfection technologies, as well as the hybrid option. This OPCC was developed using previous cost estimates for Tapia as well as information from other disinfection systems that would be similar if they were applied to Tapia. The operation and maintenance costs were calculated based on a flow of 9 mgd. These costs are summarized in **Table 2** below. These estimated costs are detailed in subsequent memorandum.

Table 2
Opinion of Probable Costs

	UV	Ozone	Mixed Oxidants	Modified Chlorination	Hybrid
Capital Cost	$ 6,130,000	$ 10,210,000	$ 4,650,000	$ 800,000	$ 4,350,000
O&M Cost	$ 311,130	$ 427,320	$ 376,370	$ 482,820	$ 390,560

The present worth of each alternative was calculated for a 20 year period at an interest rate of 5 percent. The interest rate was assumed to cover the potential escalation of power and chemicals as well. This present worth was calculated assuming that the flow for the treatment plant would increase from 9 mgd to 12 mgd over the 20 year period. These costs are summarized in **Table 3**.

Table 3
Present Worth Analysis for 12 mgd Future Flows

Alternative	UV	Ozone	Mixed Oxidants	Modified Chlorination	Hybrid
20 yr Present Worth	$ 10,518,100	$ 16,236,800	$ 9,958,210	$ 7,609,940	$ 9,858,270

The present worth for each disinfection alternative was also calculated assuming that the flow at Tapia increased to 10 mgd in 20 years, rather than 12 mgd in 20 years. These results are summarized in **Table 4**. The calculation assumed an interest rate of 5 percent. The results show that the alternatives are not sensitive to the amount of flow that is being treated and their relative costs remain unchanged.

Table 4
Difference in Present Worth 10 mgd vs 12 mgd Future Flows

Alternative	UV	Ozone	Mixed Oxidants	Modified Chlorination	Hybrid
12 mgd	$ 10,518,100	$ 16,236,800	$ 9,958,210	$ 7,609,940	$ 9,858,270
10 mgd	$ 10,177,600	$ 15,769,180	$ 9,546,340	$ 7,081,140	$ 9,430,880
Difference	$ 340,500	$467,620	$ 411,870	$528,800	$ 427,390

EVALUATION OF ALTERNATIVES

Each of the alternative disinfection technologies were evaluated against a set of screening criteria, which included non-economic factors as well as costs. These criteria are described in greater detail below.

Facility Modifications –accounts for the extent of modifications or construction that would be required to implement the disinfection alternative at Tapia.

Future Regulations – accounts for the ability or flexibility of the disinfection alternative to address compounds that may become regulated in the future, such as NDMA, PPCP or EDCs.

Water Quality Impacts – accounts for ability of the disinfection alternative technology to disinfect the effluent without forming other disinfection by-products.

Operation Impacts - accounts for the change in the operation of the facility once the disinfection alternative has been installed, for example additional samples to be taken, analyzers to monitor, or additional reporting costs.

Reliability – accounts for the ability of the alternative disinfection technology to disinfect to the appropriate level in the event of a power outage or a peak flow event.

Capital Cost – accounts for the relative capital cost of the disinfection alternatives.

O & M Cost – accounts for the relative annual operation and maintenance cost of the disinfection alternatives.

These criteria were assessed for each disinfection alternative and quantified in **Table 5** using a positive or negative sign. A positive sign if a technology required less modifications or a negative sign if a technology had a significant capital cost, as examples.

Table 5
Screening Criteria Summary

Criteria	UV	Ozone	Mixed Oxidants	Modified Chlorination	Hybrid
Facility Modifications	+	-	-	+	+
Future Regulations	+	+	-	-	+
Water Quality Impacts	+	+	-	-	+
Operation Impacts	+	-	-	+	+
Reliability	+	-	-	+	+
Capital Cost	-	-	-	+	+
O & M Cost	-	-	-	+	+
+ = Positive Comparative Result - = Negative Comparative Result					

Based on the above, neither ozone nor mixed oxidants appear to be an appropriate fit for implementation at Tapia. UV, modified chlorination and the combined hybrid option appear to be a suitable solution for disinfection at Tapia. Some additional parameters were reviewed for these three alternatives in comparison to the existing operation. First, the amount of TDS in effluent was reviewed for these alternatives and compared to the existing effluent TDS. The results are summarized in **Table 6** and show that the use of UV or the hybrid of UV and modified chlorination will result in a lower TDS in the effluent. This is due to a reduction in the amount of chemicals added to the treatment process.

Second, the operations cost for these three alternatives were compared to the existing cost. The results are summarized in **Table 7**. The results show that the use of UV will lower the operations costs at Tapia, this is due to a reduction in the chemicals that will be added to the treatment process.

Table 6
Screening Criteria Summary

Technology	Chlorine, Sodium Bisulfite and Ammonia Dose (mg/L)	Total Effluent TDS (mg/L)	Difference in Annual TDS (mg/L)
Existing	22	37	---
Modified Chlorination	30	52	15
Hybrid	13.2	23	(14)
UV	13	22	(15)

Table 7
O&M Comparison

Alternative	O&M Costs	Difference in O&M Cost with Respect to Existing
Existing	$ 374,400	$ 0
UV	$ 311,130	($ 63,270)
Modified Chlorination	$ 427,820	$ 53,420
Hybrid	$ 390,560	$ 16,160

CONCLUSION

UV and modified chlorination are both viable options that will achieve the THM requirements set forth by the Regional Board. Of the alternative disinfection technologies evaluated, modified chlorination has the lowest present worth. The combined hybrid option of the UV and modified chlorination has a similar present worth to the modified chlorination option but has the overall best attributes. It allows the JPA to reduce the amount of chemicals to treat the base flow of the treatment plant, while offering the flexibility to treat peak flows. Alternatively, the hybrid alternative allows the JPA to proceed with a phased approach, installing the modified chlorination equipment now and the UV system at a later date. It is recommended the hybrid alternative combining UV with modified chlorination be considered further for implementation to achieve permit compliance.

TECHNICAL MEMORANDUM

MWH

BUILDING A BETTER WORLD

To:	Brett Dingman	**Date:**	July 25, 2011
From:	Sarah Munger Roger Stephenson Jamal Awad Ian Mackenzie	**Reference:**	1010371
Subject:	Preliminary Design for Alternative Disinfection for Tapia FINAL	**Client:**	Las Virgenes Municipal Water District/Triunfo Sanitation District Joint Powers Authority

INTRODUCTION

The Las Virgenes - Triunfo Sanitation District Joint Powers Authority operates the Tapia Water Reclamation Facility (Tapia). In September 2010, a new National Pollutant Discharge Elimination System (NPDES) permit for Tapia was adopted. The new NPDES permit includes a cease and desist order (CDO) for the discharge of Dichlorobromomethane (DCBM) to the Los Angeles River and Malibu Creek and a Time Schedule Order (TSO) for Total Trihalomethanes (TTHMs) for discharge to the Los Angeles River. The Las Virgenes - Triunfo Sanitation District Joint Powers Authority has entered into a contract with MWH to investigate alternative disinfection technologies that may be implemented to reduce the DCBM and TTHMs in Tapia's treated effluent. This study investigated four alternative disinfection technologies that may be implemented at Tapia, namely mixed oxidants, ultraviolet light (UV), ozone and modified chlorination. During the course of this study a fifth alternative was investigated and ultimately recommended for further investigation. This fifth alternative was a hybrid between the modified chlorination and UV alternatives. The Las Virgenes - Triunfo Sanitation District Joint Powers Authority voted on February 7, 2011, to proceed with a phased approach of the hybrid alternative, starting with the modified chlorination facilities and installing the UV facilities at a later date.

BACKGROUND

The treatment process at Tapia may be divided into preliminary, primary, secondary tertiary and disinfection phases. The proposed alternative disinfection system will require modifications to the current disinfection phase and will also have some impact on the tertiary phase. It will not affect the preliminary, primary and secondary phases. The tertiary treatment process consists of filtration through anthracite media. Disinfection consists of chlorination and dechlorination

using of sodium hypochlorite and sodium bisulfite. The filtration and disinfection facilities are illustrated in more detail on **Figure 1**.

Tapia currently treats approximately 9.5 mgd, which is reused or discharged to the Los Angeles River (outfall 005) or Malibu Creek (outfall 001). Reuse of 60 percent of the tertiary effluent produced annually is achieved through an extensive recycled water system. Although the facility is rated at 16.1 mgd, nutrient removal planning efforts over the last 10 years have considered 12 mgd as the necessary maximum capacity for the foreseeable future. Non-recycled effluent is disposed of by discharging to the Los Angeles River (outfall 005), Malibu Creek (outfall 001) or by the use of Las Virgenes - Triunfo Sanitation District Joint Powers Authority operated spray fields. The Malibu Creek discharge is only allowed from November 15th to April 15th each year. Discharge to Malibu Creek and the Los Angeles River are regulated under a NPDES permit issued by the Los Angeles Regional Water Quality Control Board (Regional Board).

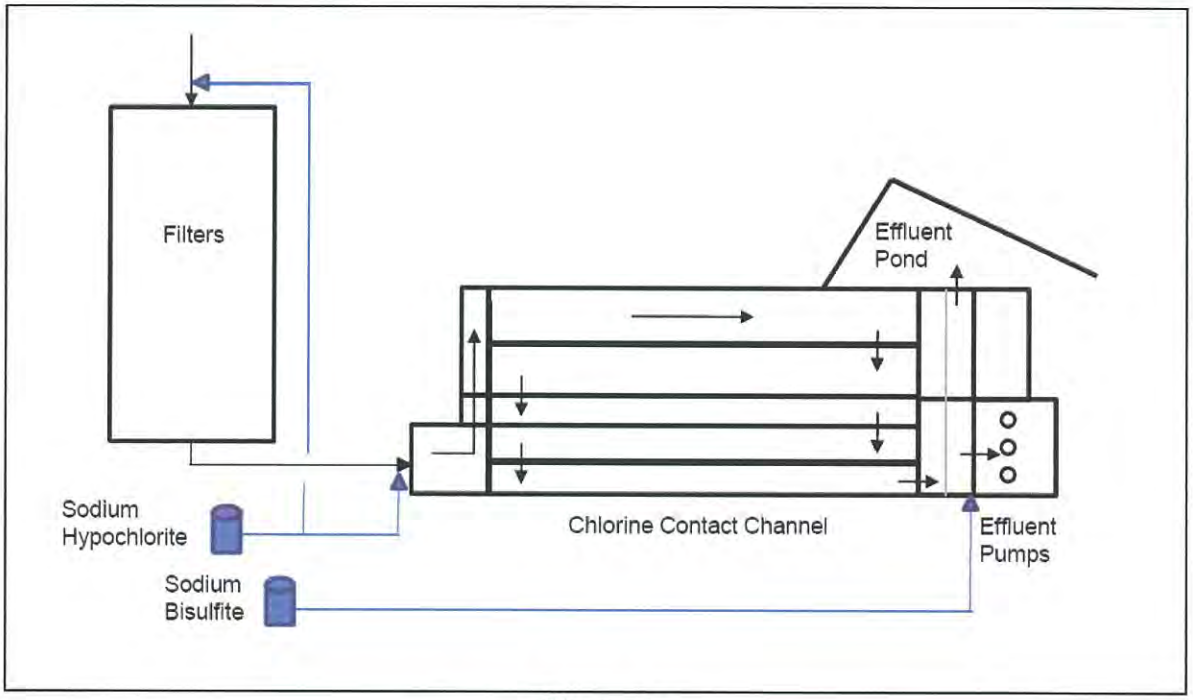


Figure 1
Tertiary Process Flow Diagram

Hybrid UV and Modified Chlorination

The hybrid option was recommended for further investigation and combines the use of UV disinfection with modified chlorination. This system would use UV disinfection to treat the typical daily flow and use the modified chlorination to disinfect peak flows. The UV system would be installed in two of the existing chlorine contact channels.

The general configuration of the hybrid system is shown as **Figure 2**. The flow split between the UV and the remaining chlorine contact tank will be accomplished through the installation of a weir. In the event of a peak flow event the base flow would still pass through the UV system, while the additional flow would passover the weir and through the chlorine contact tank. The UV

facilities would require the concrete cover of the chlorine contact tank to be removed, the filter backwash pumps to be relocated, the floors of the channel to be raised and the installation of a motorized weir gate. A hole would also need to be cut in the northeast end of the chlorine contact channel to drain residual flow into the balancing pond after a storm event has passed. In the event that the UV system needs to be taken offline for maintenance purposes, the chlorine contact tank could disinfect the plant effluent with minimal interruption to the treatment process.

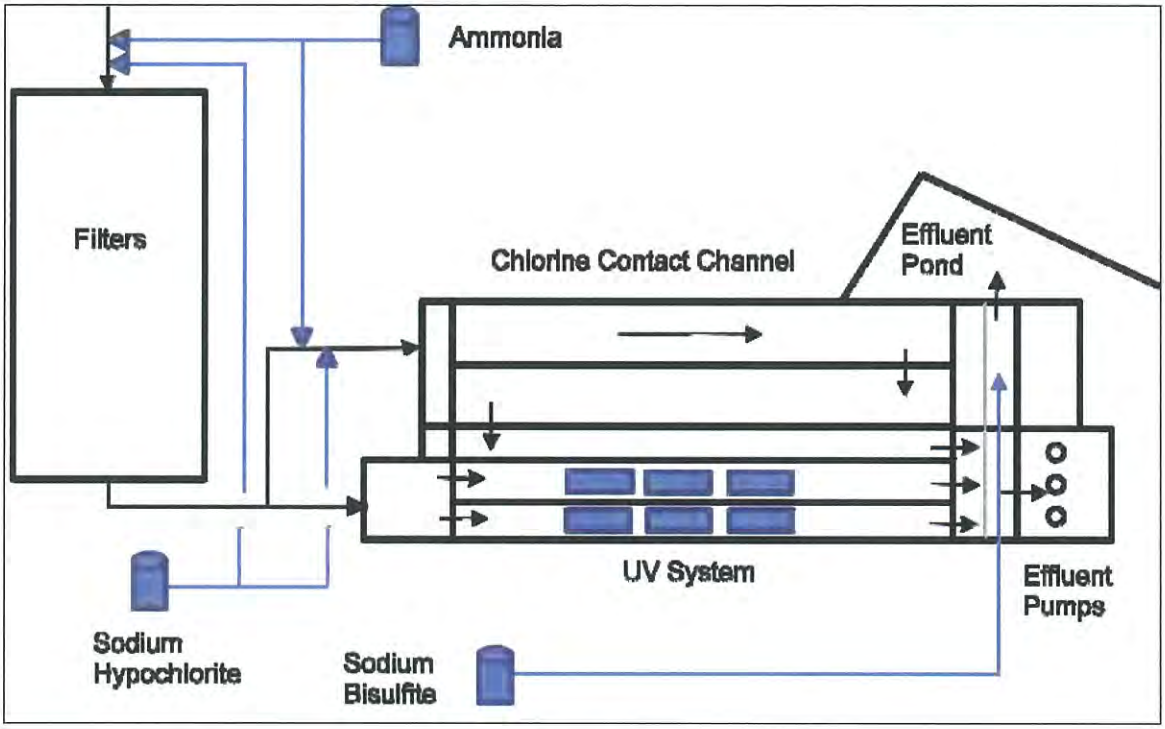


Figure 2
UV and Modified Chlorination Process Flow Diagram

The modified chlorination facilities would require the addition of ammonia storage and feed facilities, and on-line analysis instrumentation. The addition of the ammonia would occur in two places, the filter influent box and upstream of the chlorine contact tank.

Design Criteria

Based on the existing plant data, the quantity of ammonia required was calculated for an ultimate flow of 12 mgd. It was assumed that the ammonia dose that would be required at average flow conditions is 1.5 mg/L. **Table 1** presents the flows, ammonia dose, and other criteria used for determining the storage volume required. If ammonia solution is stored at atmospheric pressure, there will be a gradual loss of ammonia due to vaporization ("off-gassing"). This would require a larger dose of ammonia solution to achieve the same result. To prevent this, the ammonia should be stored under pressure. The required pressure is approximately 30 psi, which is a common storage tank pressure. The additional cost of storing ammonia under pressure is not large and will be offset by the reduction in losses due to off-gassing.

Table 1
Ammonia Storage and Feed Facilities Design Criteria

Parameter	Unit	Value
Plant Flow		
Present Average Flow	mgd	9
Ultimate Average Flow	mgd	12
Ammonia		
Ammonia Dose, Minimum	mg/L	0.5
Ammonia Dose, Average	mg/L	1.5
Concentration	%	19.3
Ammonia Required, Present Average flow	gal/hour	3.1
Ammonia Required, Present Peak flow	gal/hour	7.2
Ammonia Required, Ultimate Average flow	gal/hour	4.1
Ammonia Required, Ultimate Peak flow	gal/hour	9.3

AMMONIA STORAGE AND FEED FACILITIES

Storage Tanks

The storage tanks will be stainless steel pressure vessels. Pressure vessels can be either horizontal or vertical in orientation, however due to the space constraints at Tapia, it is recommended that a vertical tank be used. The tanks will be equipped with a ladder access to the top of the tank and a manway access on the side. The two tanks will be sized to store a minimum of one truck load of ammonia, 4,500 gallons. Each tank will have a diameter of 6.5 feet and a height of 11 feet, which provides a volume of 2,800 gallon per tank or a total volume of 5,600 gallons. **Table 2** summarizes the days of storage at each flow rate.

Table 2
Ammonia Storage

Parameter	Unit	Value
No. of Tanks	----	2
Tank Diameter	Ft	6.5
Tank Height	Ft	11
Volume per Tank	Gallons	2800
Total Volume	Gallons	5600
Storage at Present Average Conditions	Days	75
Storage at Present Peak Conditions	Days	32
Storage at Ultimate Average Conditions	Days	56
Storage at Ultimate Peak Conditions	Days	25

The two ammonia tanks will be constructed in a containment area sized to provide a minimum containment of 110 percent of the volume of the largest tank. In order to provide the required

volume, the perimeter wall around the tanks will need to be 3 feet tall. The containment area will be constructed such that the top of the perimeter wall is at grade and the entire containment area will be covered with a fiberglass grating. This will allow the operations staff to access the tanks without having to enter to the containment area. The containment area will be sloped to one corner which will contain a sump. This sump will be connected to the plant drain system.

Also required in this storage area are an ammonia water bath and a safety shower and eyewash facilities. The water bath is essentially a 55 gallon drum full of water; the purpose of this water bath is to scrub any fumes that may be released from the ammonia storage tank during filling or in an emergency. The pressure release valves on the top of the tanks will connect to the overflow lines which will run to the bottom of the water bath. Operations staff will need to periodically top-off the water level in the drum. The water level control could be automated with a float that fills the drum when the water level drops below a set point. Early research has indicated that a permit from the SCAQMD is not required, but this will be confirmed during final design.

Another option to a water bath within the storage containment area would be to run the overflow line directly into one of the process units. An example of this would be the chlorine contact tank or the filter influent diversion box. If the line were to run to the chlorine contact tank, there is a risk of ammonia flowing into the creek if there is a spill because there is no opportunity to intercept the flow. If the overflow were to run to the filter influent diversion box an ammonia analyzer located downstream could alert the operations staff of a spill and allow them time to react.

The safety shower and eyewash facilities should be located such that they are easily accessible and not blocked by operating equipment or other objects. Heated water will not be supplied for the shower and eyewash, however the pipes leading to the shower and eyewash will be insulated.

A general layout of the ammonia storage is shown on **Figure 3**.

Feed Pumps

Two positive displacement peristaltic pumps, with a capacity of 10 gph, will be provided in a 1+1 arrangement. The pumps will have a turn down ratio of 12. To minimize the footprint of the containment around the storage tanks, the feed pumps will not be included within the containment area. A small containment area will be placed around the pumps to catch any spills that may occur. There are two options for the location of the feed pumps, option 1 is located in the existing chemical building and option 2 is located southwest of the filters. Both locations are shown on **Figure 4**.

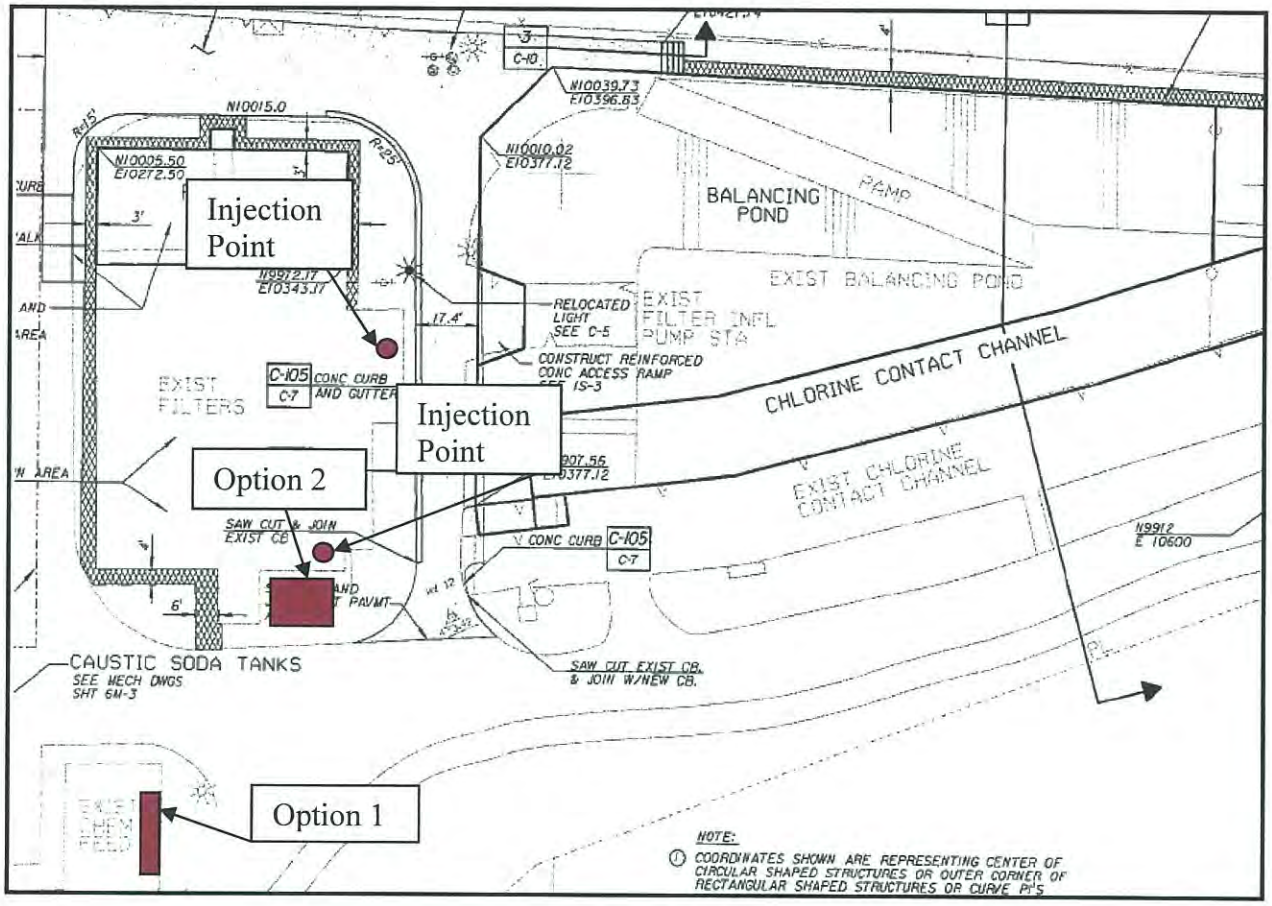


Figure 4
Ammonia Feed Pump Location Options

Option 1 - Under this option the feed pumps would be located in the existing chemical building, in an area currently occupied by a polymer system which is no longer in use. The polymer system would need to be demolished to make space for the dosing pumps. The location of these pumps and the equipment that will require demolition is shown on **Figure 5**. The existing chemical containment within this location could be rehabbed to accommodate to the two ammonia feed pumps. Since the pumps would be located within the building, the appropriate sensors and alarms would need to be added to alert staff to a leak. This option puts the feed pumps the furthest away from the injection points.

Option 2 – The feed pumps under this option would be located southeast of the filters. This location is constrained to the north by the filter effluent box and to the south by the existing road. Currently, this plot of land is open with the exception of a tree. If additional space is required the retaining wall to the west could be removed. A small canopy or cover will be added protect the pumps and operators from direct sunlight and the rain. This option puts the feed pumps the closest to the injection points.

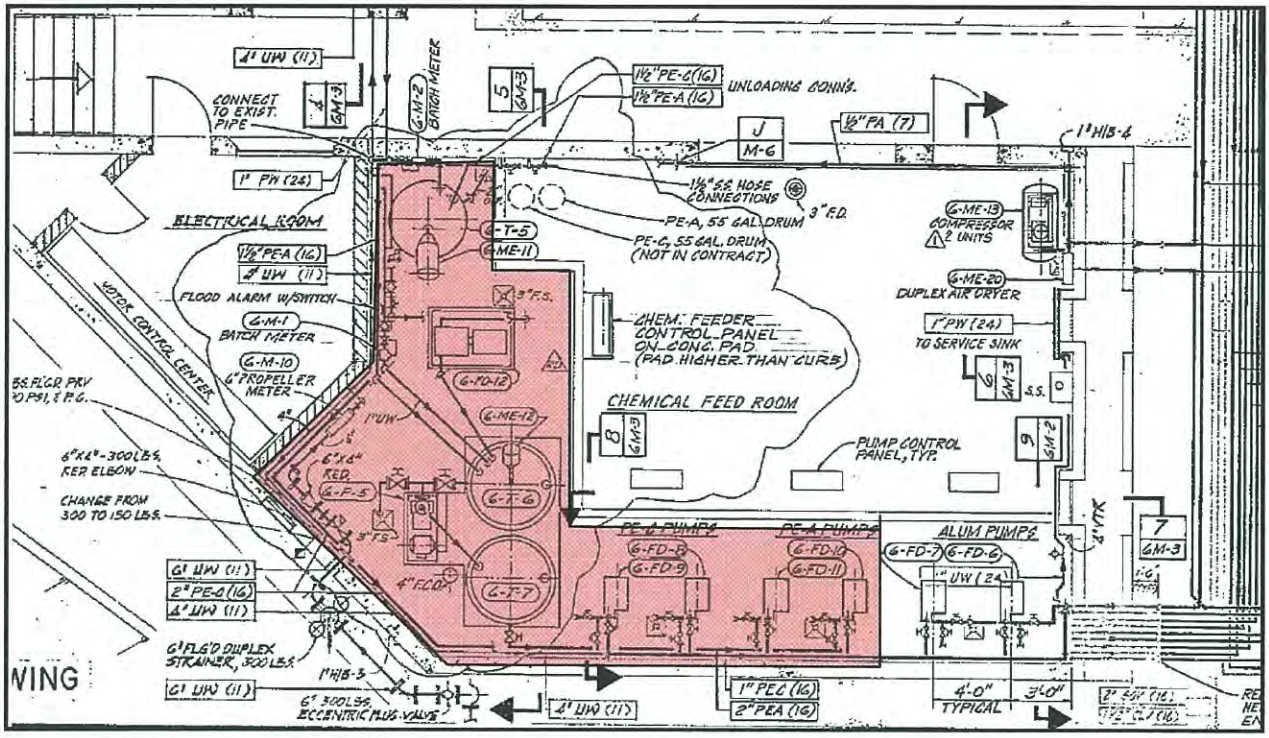


Figure 5
Demolition Area for the Ammonia Feed Pumps

Due to space limitations at Tapia, there are limited options for the location of the ammonia storage vessels. There are three options for the storage location that are practical, given the location of the feed pumps and the injection points of the ammonia.

Option 1 – The option involves storing the ammonia to the south side of the filters, as shown on **Figure 6**. The construction of the containment area with this option would require an offset from the filter effluent box as well as the removal of the retaining wall on the west side. The fill location is easily accessible for trucks however the footprint of the containment area would require a portion to be located within the existing road. This may impede the flow of traffic within the plant. This option would only be feasible if the feed pumps are housed within the existing chemical building. Overall this option would require approximately 175 linear feet of pipe. This option may require the relocation of some existing chemical pipes as indicated on **Figure 7**. It should be noted that only the liquid alum pipeline is still in use.

Option 2 – This option involves storing the ammonia at that southwest corner of the chlorine contact tank, as shown on **Figure 6**. This option would require demolition of the west vault including the relocation of a recycled water meter, the demolition/relocation of fire hydrant, access driveway and street light. This storage location will work with either the feed pump location. If the feed pumps are located southeast of the filters, the amount of piping would be minimized to approximately 140 linear feet of pipe. If the feed pumps are located in the existing chemical building the option would require approximately 230 linear feet of pipe. This option may also require the relocation of some existing pipes as indicated on **Figure 7**. These pipelines

are a natural gas, sodium hypochlorite, reclaimed water, and a sample line. It should also be noted that there is an electrical duct bank in the area.

Option 3 – The option involves storing the ammonia to the south side of the filters, as shown on **Figure 6**. This location is similar to option 1 except that this location would require the relocation of the stairs. The existing sidewalk will be maintained to allow access to the back of the storage tanks and to the filter gallery. The fill location is easily accessible for trucks without disrupting the flow of traffic around the treatment plant. This option allows for the feed pumps to be located in either the existing chemical building or southeast of the filters. If the feed pumps are located southeast of the filters, the amount of piping would be minimized to approximately 100 linear feet of pipe. If the feed pumps are located in the existing chemical building the option would require approximately 140 linear feet of pipe. This option may require the relocation of some existing chemical pipes as indicated on **Figure 7**. It should be noted that only the liquid alum pipeline is still in use.

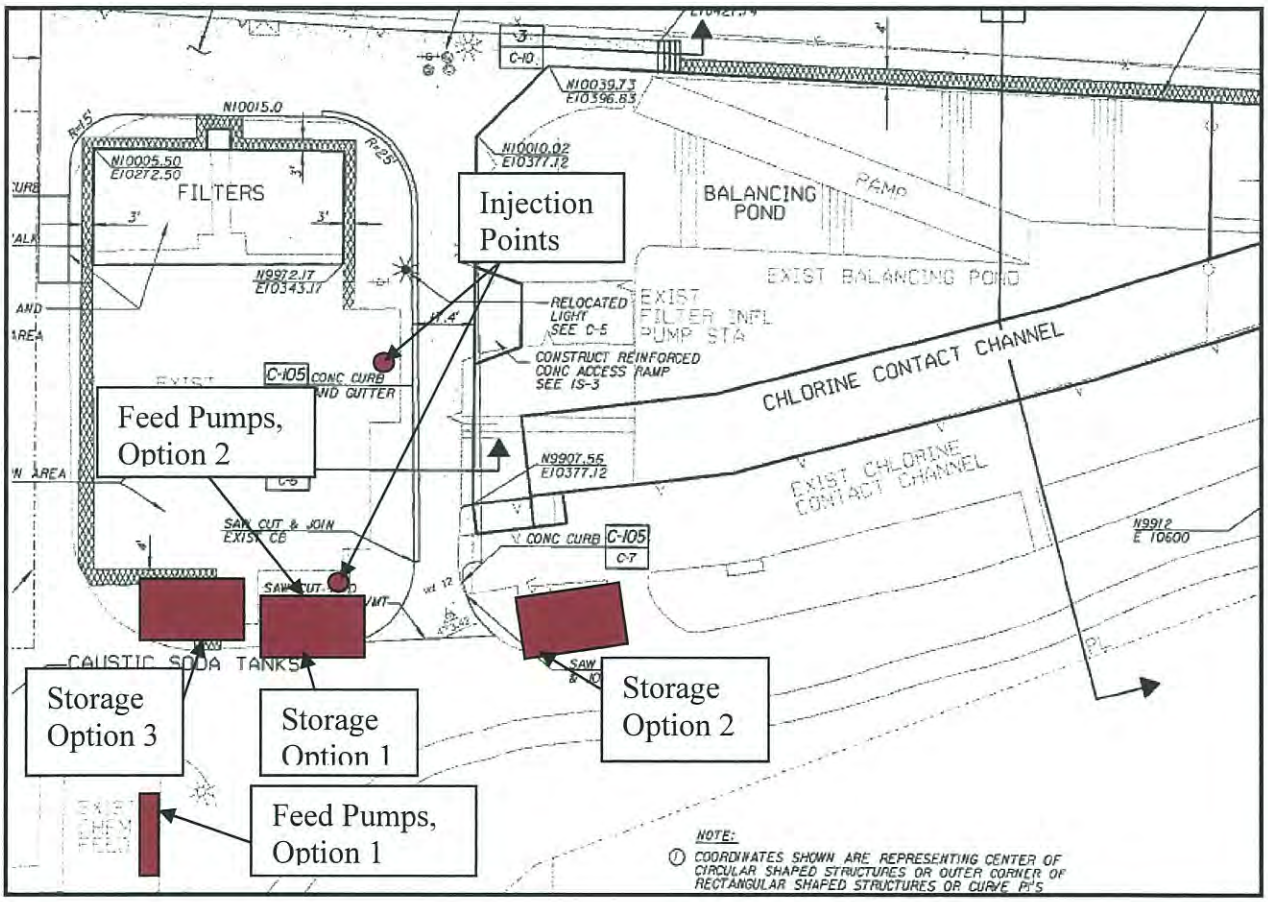


Figure 6
Ammonia Storage Options

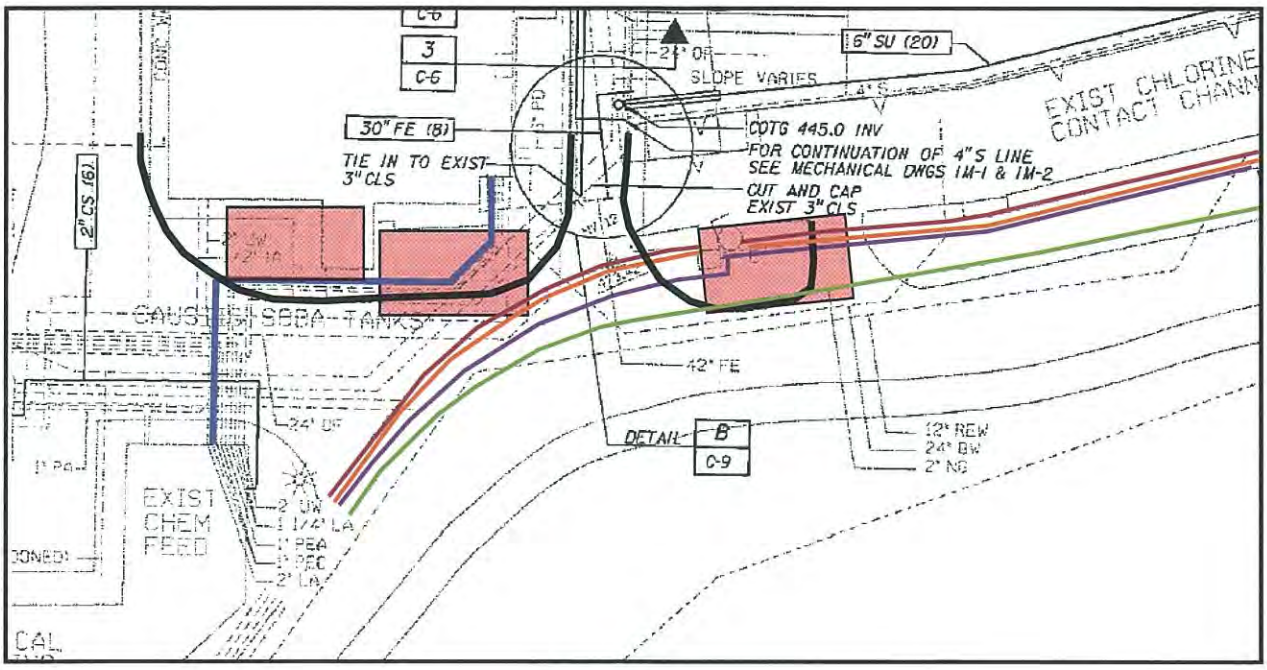


Figure 7
Piping Interferences with Storage Options

Solution Piping

The piping both to the pumps and the injection location will need to be buried due to the road crossings. Carbon steel, aluminum, or stainless steel may be used for pipe material. Aluminum and stainless steel are recommended if there is a high purity requirement for the ammonia, but carbon steel is the most commonly used. A double containment piping arrangement should be adopted with the inner carrier pipe being carbon steel and the outer containment pipe being PVC Schedule 80. The piping should be arranged such that, if there is a leak, it will flow back into the storage sump. A leak detection tape will also be provided in the secondary containment piping.

Ammonia Analyzers

Ammonia analyzers will be installed at the ammonia injection points both upstream and downstream of the filters. The upstream injection point would be at the filter influent diversion box upstream of the sodium hypochlorite injection point. The downstream injection point would be at the filter effluent box.

There are three methods of measuring ammonia online; colorimetric, ion selective electrodes (ISE), and UV absorbance. Each technology uses a different analytical method to determine the ammonia concentration but all require the addition of chemical reagent to the sample. Colorimetric ammonia analyzers use a colorimeter to measure the color intensity of sample solutions. The colorimeter compares the intensity of the sample against a reference sample. The ISE analyzer is a probe type analyzer that uses ammonia ISE and a reference electrode. The ISE ammonia analyzer consists of the single ammonia ISE probe and an electronics module. The ammonia analyzer electronics module uses sensitive input electronics and a microprocessor to

analyze the input signals from the sensors and calculate the free ammonia concentration. The ISE ammonia analyzer electronics module usually is remotely mounted and can be connected to a control and automation system. The UV absorbance analyzer operates on the same basic principal as the colorimetric analyzer. This analyzer measures the absorbance of the UV light waves that pass through the sample. Given the ease and accuracy of the ISE analyzer , it is recommended that this type of analyzer be installed at Tapia. There are several manufacturers that make this type of analyzer; Hach is one of the more common.

Control System

The injected ammonia will combine with sodium hypochlorite forming a chloramine residual for disinfection. The ammonia system shall consist of tanks, feed pumps, flow meters, analyzers and associated piping, appurtenance, instrumentation and controls. Automatic operation of the processes associated with the ammonia system shall be controlled by the PLC located in the control room. A local control panel shall be provided adjacent to the ammonia dosing pumps to allow for local manual control. Preliminary P&IDs for the ammonia system are shown on **Figures 8** and **9**.

Instrumentation and Control Elements

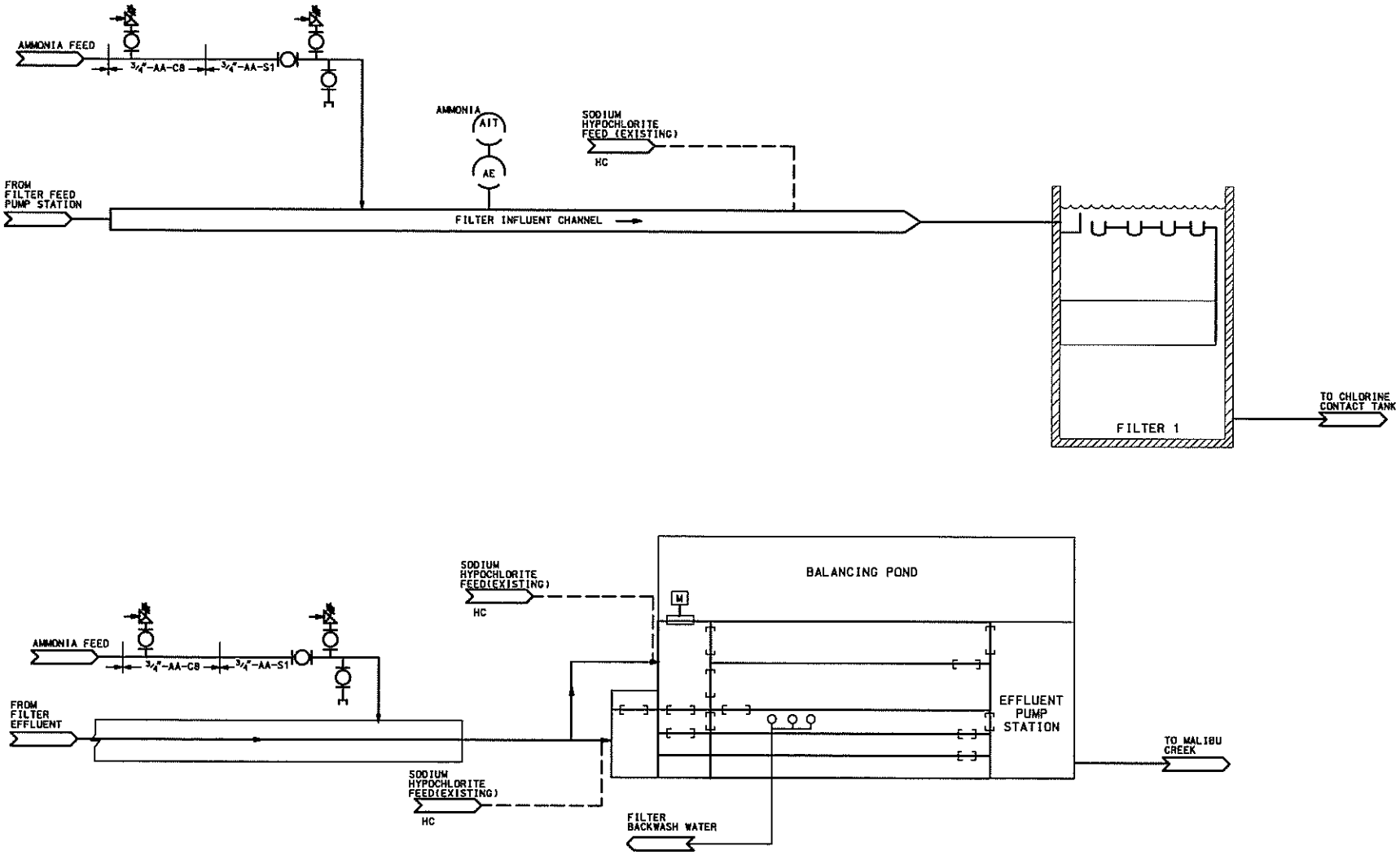
Ammonia Storage Tanks - Level transmitters shall transmit signals proportional to the levels in the tanks to the PLC. If the level in the tank reaches an operator-specified low, high, low-low and high-high level, an alarm will be generated at the PLC. Level gauges shall be provided for local indications of level in the tanks.

Pressure transmitter alarms shall transmit signals proportional to the pressure in the tank and initiate alarms when pressure exceeds an operator specified pressure. Measurements shall be indicated at the operator interface. The supply line from each tank will have an isolation valve that has a limit switch whose positions shall be indicated locally and remotely at the operator interface.

Feed Pumps - Feed pumps shall be peristaltic, positive displacement pumps with adjustable speed control capable of supplying a continuously adjustable flow rate in response to a 4-20 mA signal. The feed pumps shall be controlled by selector switches and speed indicators shall be provided.

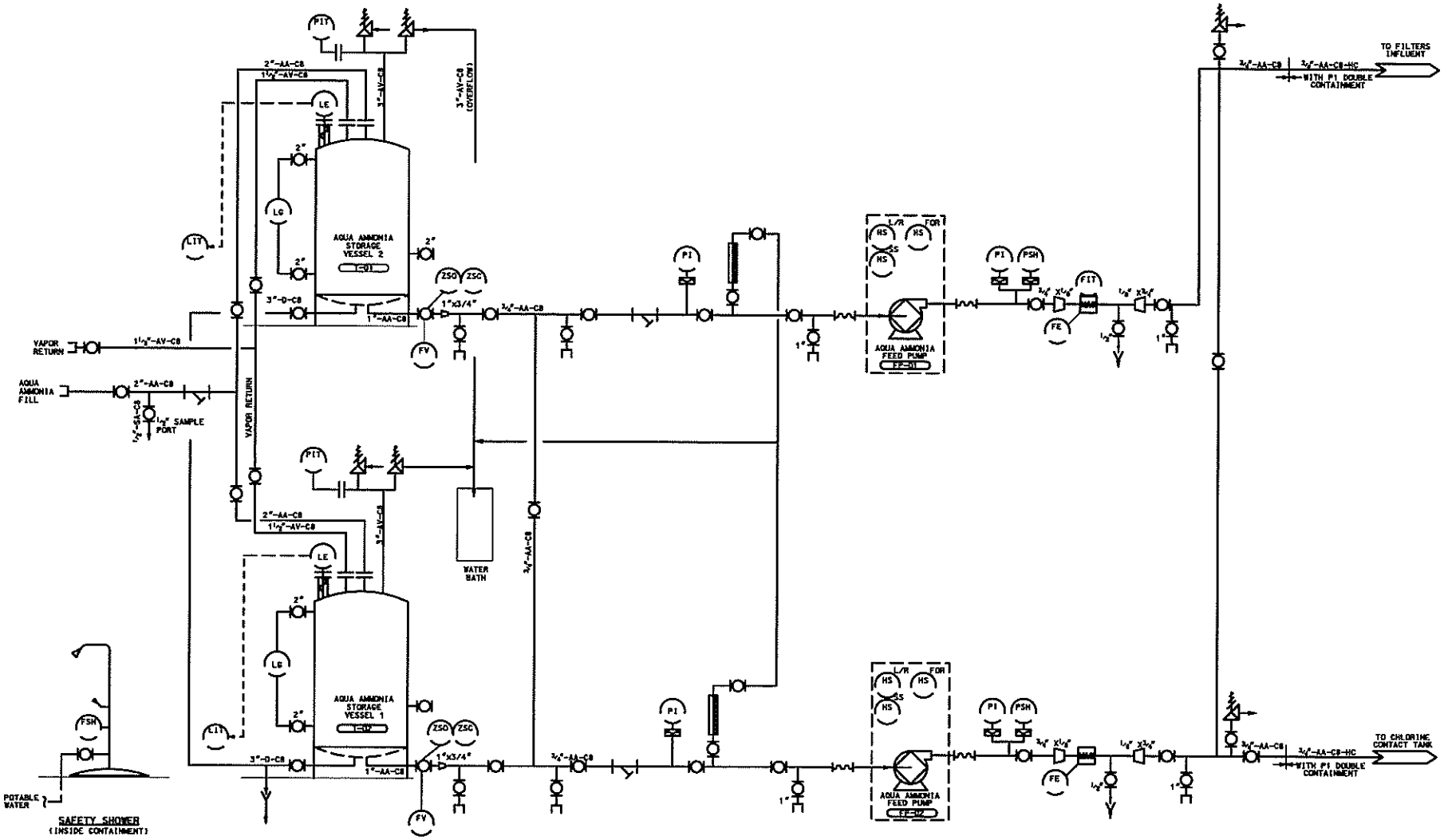
Pressure indicators shall provide local pressure indication in the suction and discharge lines of feed pumps. Temperature and pressure switches shall initiate alarms and shut down the respective pump if the pressure in the discharge line of the feed pumps or the temperature reaches the set point of the respective switch.

Flow meters - Flow meters shall transmit signals proportional to ammonia flow pumped from feed pumps. Flows shall be totalized by the PLC. An alarm will be annunciated for respective flow meter at the PLC if the ammonia flow from the duty feed pump is lower than the calculated flow. Alarms shall be annunciated for the respective ammonia feed pump when reverse flow is detected by the respective flow meters.



ITEM 9C

SCALE			DRAWING
NTS	MWH Arcadia California	Tapia Water Reclamation Facility Preliminary Design Report	AMMONIA INJECTION POINTS	28 209



ITEM 9C

SCALE			DRAWING
NTS	MWH Arcadia California	Tapia Water Reclamation Facility Preliminary Design Report	AMMONIA FEED SYSTEM	210 9

Ammonia Analyzers - Secondary effluent ammonia analyzer analyzes secondary effluent and transmits an ammonia concentration value to the PLC for display. Filter influent ammonia analyzer will analyze the filter influent and transmit an ammonia concentration value to the PLC for display. An alarm will be generated by the PLC when an ammonia concentration at either location is higher than 1.5 mg/L is measured.

Ammonia Control Modes

The ammonia system shall have the ability to operate in either automatic control or in local manual control. In automatic control the ammonia feed system shall be by either by a residual controller or flow paced controller. In the event of failure of the lead feed pump, while in automatic control, the failed pump shall be automatically replaced with the standby pump. Upon restoration of power, after a power outage, the ammonia feed system shall automatically come online in the same mode and with the same operating set points as prior to the loss of power.

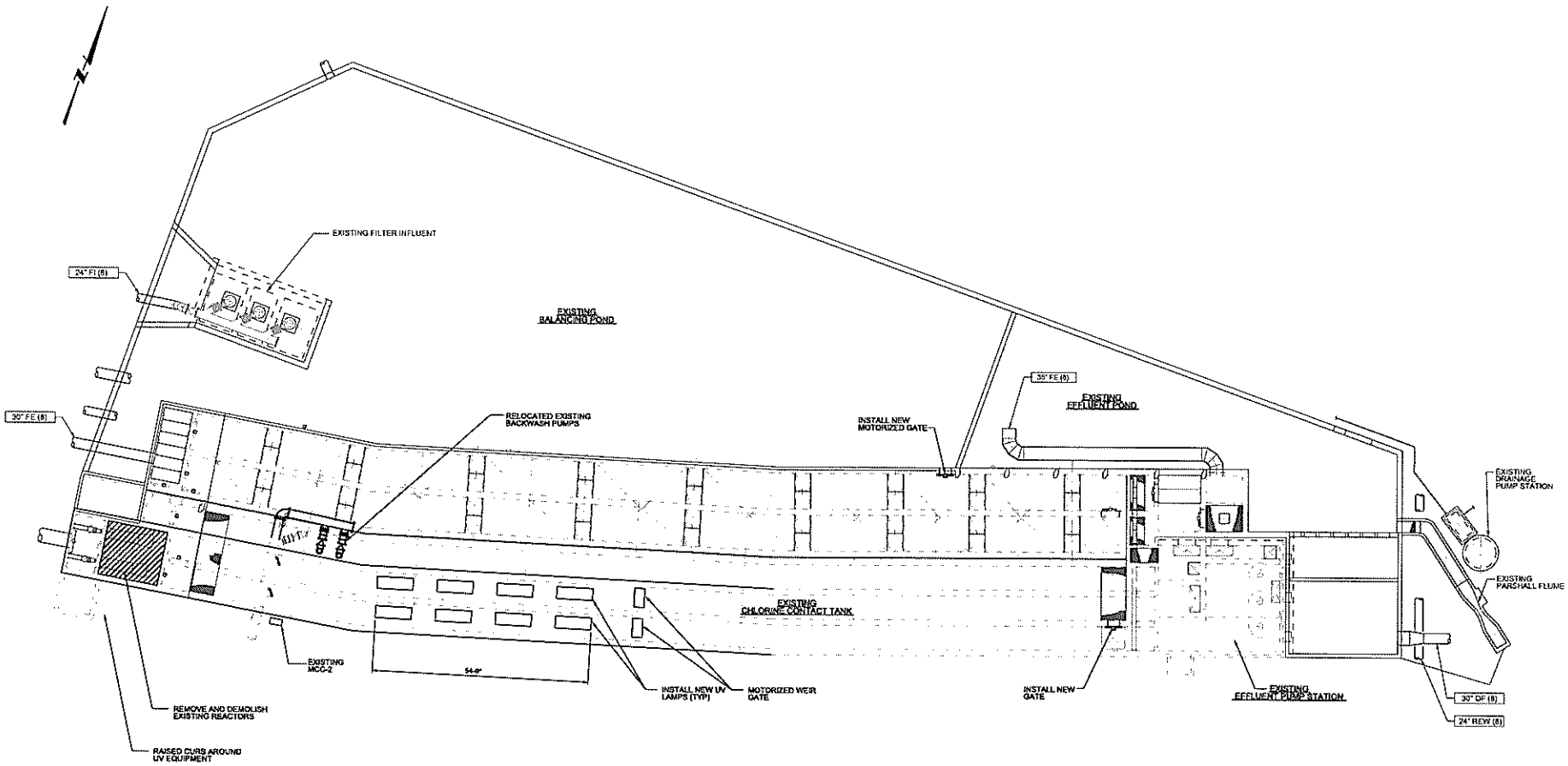
While in local manual control, to limit violations, a high level alarm shall be annunciated when the measured ammonia concentration exceeds the Operator selected ammonia limit. When the alarm is annunciated, the PLC shall reduce the ammonia feed rate until the measured ammonia concentration is lower than the selected limit. The operator shall have the ability to override the PLC control.

To compensate for inaccuracies in the ammonia analyzer, the PLC shall compare the ammonia mass feed rate with ammonia mass flow rate. The ammonia mass feed rate shall be calculated by multiplying the measured ammonia feed rate by the concentration of ammonia in the storage vessel. The mass flow rate shall be calculated by multiplying the filter feed flow rate with the ammonia concentration measured by the ammonia analyzer. If the difference between the mass feed rate and mass flow rate exceeds an operator established ammonia feed rate deviation range, an alarm shall be annunciated and the PLC shall automatically override the signals to the feed pump and adjust the chemical flow rate to stay within the error range established.

UV System Lamp Configuration

The UV system will be installed at a later date, but the general requirements of the system are discussed below. There are two basic lamp configurations for the in channel UV system, horizontal and vertical. Both configurations would require the floor of the existing chlorine contact tank to be raised. Currently there is only one manufacturer that makes the vertical lamp. These lamps require a power supply unit located a maximum of 100 feet from the lamp. There are three manufacturers for the horizontal lamp system. One horizontal unit has the power supply units integrated into each bank of lamps. To treat an average flow of 12 mgd the UV manufacturer recommends four banks of lamps with a 3 plus 1 configuration. The amount of area required in the channel will be 60 inches in width, 62 inches in depth and 54 feet in length. On the downstream side of the UV equipment a motorized weir gate or a flap gate shall be installed to maintain a constant water depth over the lamps.

Structural Requirements



PLAN
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ITEM 9C

SCALE 1:25	MWH Arcadia California	Tapia Water Reclamation Facility Preliminary Design Report	CHLORINE CONTACT TANK PLAN UV SYSTEM MODIFICATIONS	DRAWING 212 10

The structural requirements for the modified chlorination portion of the work are fairly minor, aside from the construction of the ammonia storage area, the only structural modification that would be required is the installation of the ammonia injection point and analyzers. The installation of the injection point and analyzer downstream of the filter effluent would require cutting a hole in the filter effluent box.

The structural requirements for the installation of the UV system are much more extensive. The UV equipment will be installed in the first two passes of the original chlorine contact tank. This will require the concrete cover of the chlorine contact tank to be removed, demolish the existing reactors, the floor of the two channels to be raised and the walls increased in thickness, installation of two motorized weir gates, relocation of the existing filter backwash pumps, and the installation of new gates to modify the flow pattern.

The roof on the original chlorine contact tank also serves to provide lateral stability to the walls, to avoid compromising this stability, the roof will have to be removed in stages. The first stage will consist of isolating and draining the southernmost channel, saw cutting the roof and installing a support for the wall that parallels the road. While the channel is empty the floor of the channel will be raised by installing backfill covered with a 12-inch slab of concrete, The channel walls would be thickened to accommodate the UV system and the motorized weir gate for this UV system will also be installed at this point. The second stage would require that both the second and third channels be drained. While the two channels are drained the second channel would have the roof removed, floor raised, walls thickened and the motorized weir gates installed. The third channel would have a 12 inch concrete slab added to accommodate the relocation of the filter backwash pumps. It should be noted that the floor would not have to be raised for the entire length of the chlorine contact channel, just the portion where the UV equipment would be installed, approximately 60 feet in length.

The flow pattern through the chlorine contact tank will be modified through the installation of gates. This will require holes to be cut in the east end of passes 1 and 2 of the original chlorine contact tank, as well as one at the west end of pass 3. Also a gate will need to be cut in the northeast corner of the chlorine contact tank to allow residual flow to drain into the balancing pond after a storm has passed.

Hydraulic Profile

The hydraulic profile was analyzed for two scenarios; the first scenario was 12 mgd going through the UV reactors and the second scenario was a peak flow of 36 mgd with 12 mgd flowing through the UV reactors and the remaining 24 mgd flowing through the remaining channels of the chlorine contact basin. Under both scenarios, the amount of freeboard at the influent portion of the UV channels is not sufficient; therefore it is recommended that a 12 inch curb be added around the influent channel and the UV equipment.

New gates would need to be added to accommodate the new flow pattern. Under average conditions, a gate would be added to the west end of pass 3 and it would remain closed. Pass 3

would essentially act as a wet well for the filter backwash pumps. Under high flow conditions the gate would be opened and allowed to act as part of the chlorine contact basin.

Under high flow conditions, flow over 12 mgd would spill over a weir and into the chlorine contact basin. The high flow would begin a serpentine pattern in northernmost channel with pass 3 being the last pass before joining the flow from the UV system in the effluent pump station. A hole will be cut in the northeastern corner of the chlorine contact basin to drain water into the balancing pond. This is to minimize the chance of an undisinfected slug of water being discharged to the creek should another storm occur.

Conveyance System

Over time the UV lamps will foul due to scaling from the effluent, however technology has progressed with the UV systems that the lamps have a self cleaning mechanism. However, the lamps will still require replacing and the operations staff may wish to pull the UV modules out of the channel from time to time. To move the UV modules out of the channel a hoisting and conveyance system would be required. The choices that are the most applicable to Tapia are a gantry crane, monorail or a bridge crane. Due to the structural requirements and cost estimating purposes, a monorail system has been assumed. The following is a discussion of the advantages and disadvantages of each system:

Gantry Crane – A gantry crane is a horizontal bar supported by an A-frame with wheels on either end. For this application the A-frame would be wheeled east to west over the channel along tracks and a hoist on the crane would be used to lift the UV module out of the channel. The gantry crane is not practical for this application due to the small amount of space between the UV channels. There is not enough room for the track that the crane would be wheeled on.

Monorail System – A monorail system would consist of I beams that run along the length of the centerline of the UV channel with a support structure on either end. There would be one I beam per channel. The support structure will be located on the north wall of pass 2 and the south wall of pass 1. A trolley and hoist would ride along the I beam and would be powered to avoid manually pushing the UV module the entire length of the channel.

Bridge Crane System – A bridge crane would consist of fixed rails mounted on the outside of each of the channels. A large I beam would ride on these rails to move in the direction of the channel. The trolley and hoist system would be mounted on the I beam to lift the UV module and move laterally across the channels.

It should also be noted that if needed an individual bank of lamps could be removed. These are approximately 85 pounds and could be done with a small jib crane.

Electrical Requirements

The maximum power draw of the UV system is 135 kVA. Based on current electrical loads it appears that MCC 2M and 1M could have enough capacity to feed the UV system. These MCC are located east of the filter backwash pumps, along the existing chlorine contact basin. A further

review of electrical loads should be made when the UV system is implemented to check that MCC 2M and 1M still have adequate capacity to supply the system.

OPINION OF PROBABLE CONSTRUCTION COST (OPCC)

An OPCC was developed for each phase of the hybrid option, starting with the installation of the ammonia system and followed by the UV system. The OPCC was developed using previous cost estimates and information from other disinfection system that would be similar if applied to Tapia. The annual O&M was estimated using a base flow of 9 mgd. Once the UV system is installed the 9 mgd would be treated as a base flow and the peaks would be treated with the ammonia system. The present worth of each system was calculated for a 20 year period at an interest rate of 5%. The interest rate was assumed to cover the potential escalation of power and chemicals and assumed that the flow would increase to 12 mgd over the 20 year period.

Table 3
Opinion of Probable Cost

	Modified Chlorination	**UV**
Capital Cost	$0.7 M	$4.2 M
O&M Cost	$0.48 M	$0.31 M
20 yr Present Worth	$7.4 M	$8.6 M

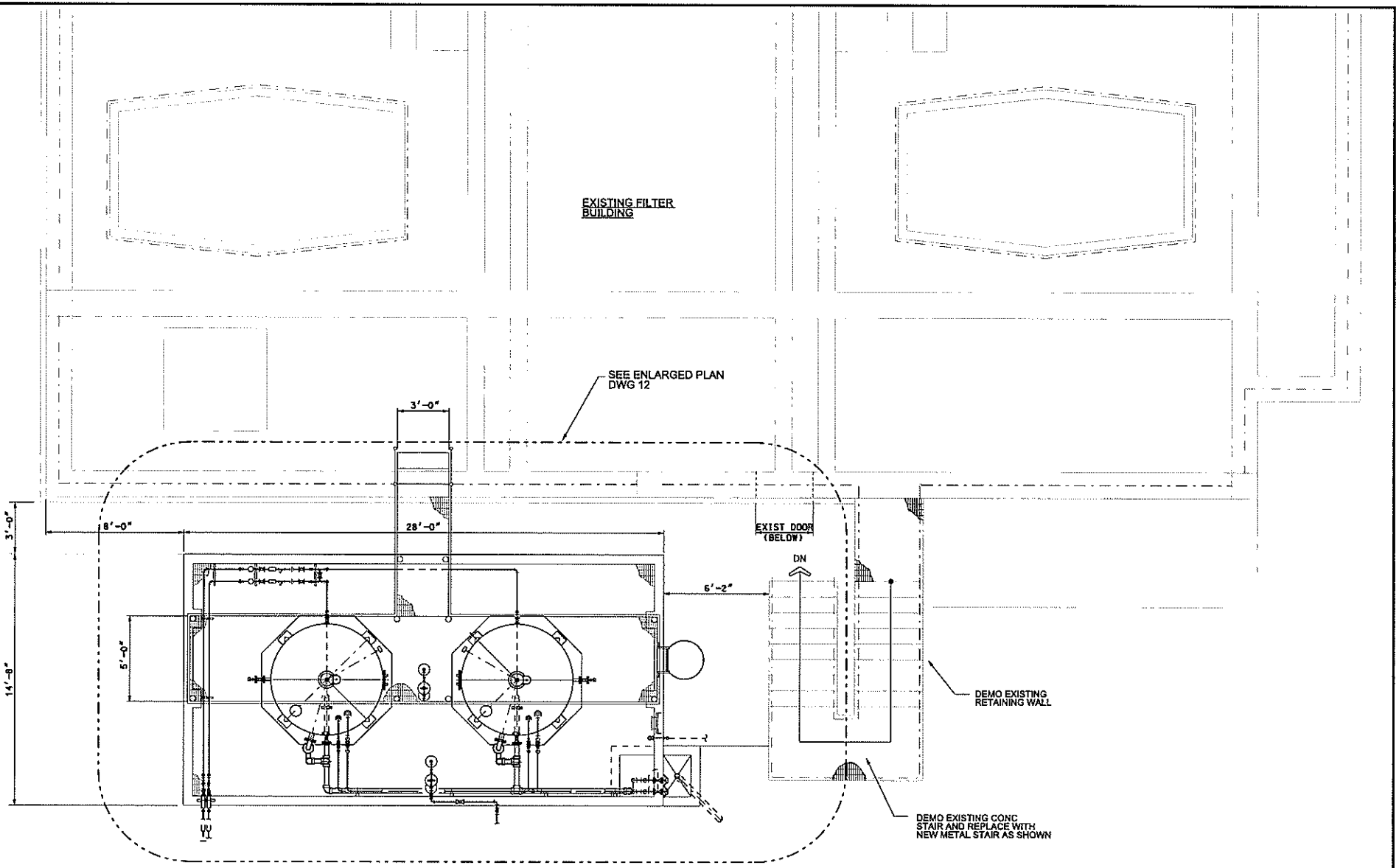
RECOMMENDED OPTION

The recommended options for the ammonia storage location and the feed pump location are storage Option 3 and feed pump Option 2. The location of these two options allows for the minimum distance between the storage tanks and the pumps as well as the pumps and the injection points. To construct in these two areas, two trees would have to be removed, the existing stairs to the filter deck would be relocated and the retaining wall would be demolished. The walkway that runs along the south side of the filter would be retained and a new walkway would be installed from the street to the door of the filter gallery. By retaining the walkway that runs along the south side of the filter gallery, operations staff can access the back of the storage tanks from ground level. This will allow the containment area width to be reduced by one foot. Also due to the proximity of the storage tanks to the filter, the top of the tanks can be accessed from the filter deck through the use of a platform, thereby eliminating the need for individual ladders on each tank. Finally, the overflow line will be fed to the filter influent box. This way, in the event of breach of the tank there will be ammonia detection points between the tank and the discharge of the treatment plant. Details of the storage tank layout are shown on **Figures 11**, **12** and **13**. The OPCC was revised to accommodate the platform on the top of the tanks, the demolition and relocation of the stairs and a smaller containment area. The revised OPCC is listed in **Table 4**. In the future the UV system will be installed to treat the base flow and the use of the ammonia system would be reduced to treating peak flows. The revised cost for the hybrid system in also listed in **Table 4**.

Table 4
Opinion of Probable Cost – Recommended Option

	Modified Chlorination	Hybrid
Capital Cost	$0.7 M	$4.8 M
O&M Cost	$0.48 M	$0.48 M - $0.31 M *
20 yr Present Worth	$7.4 M	$8.6 M

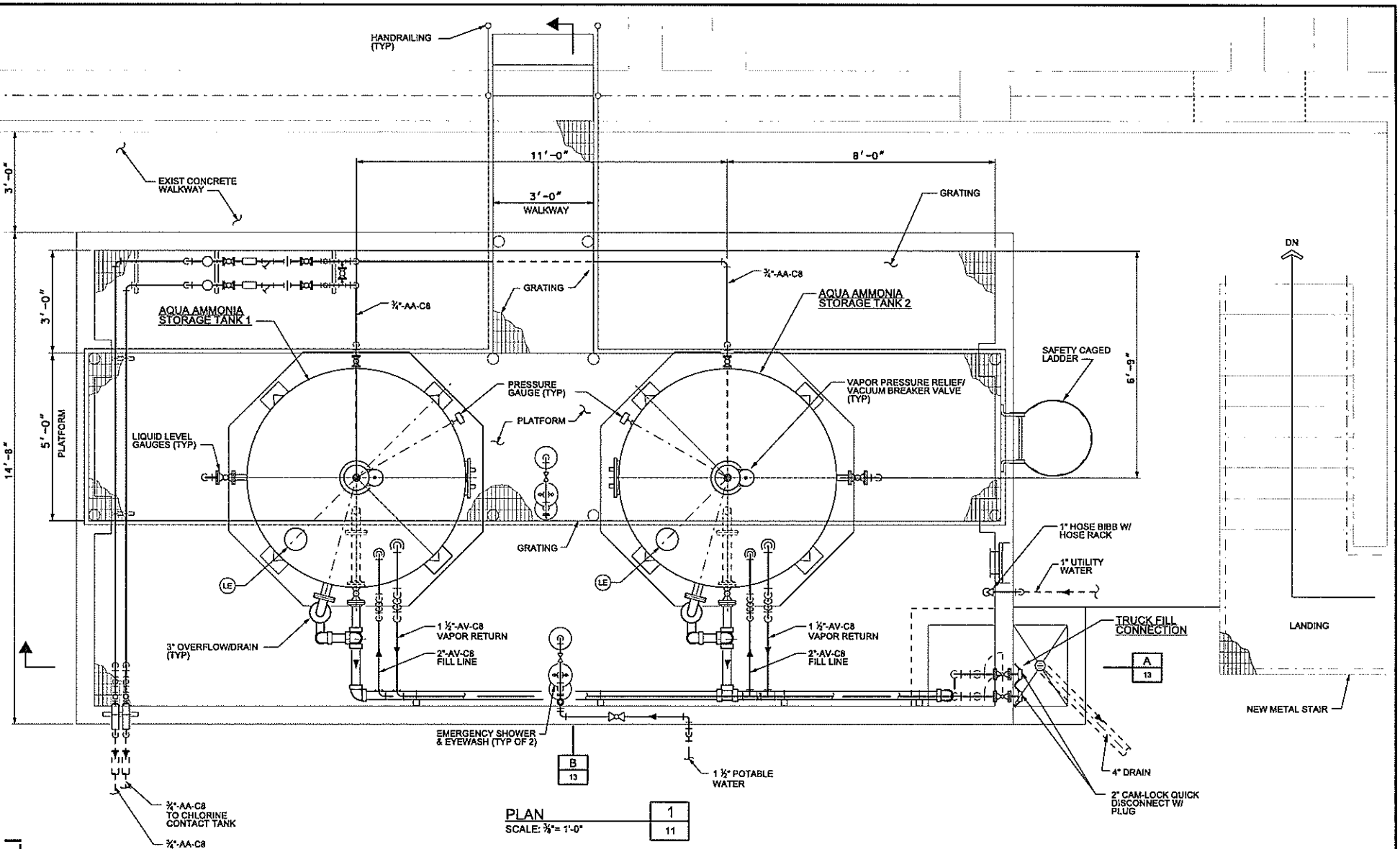
* O&M Costs will decrease when Phase 2 of the Hybrid system is installed due to the reduction in chemical usage



PLAN
SCALE: 3/16"= 1'-0"

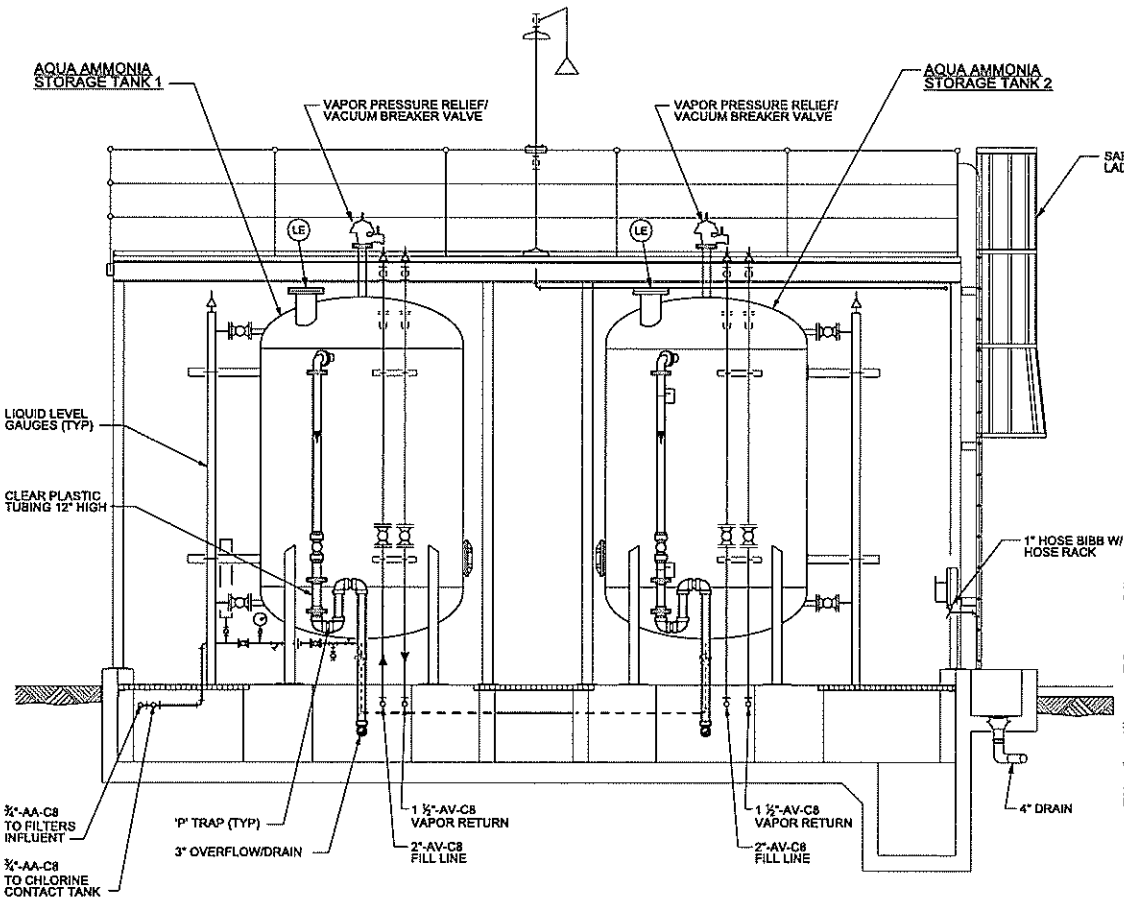
SCALE	MWH Arcadia California	LAS VIRGENES MWD/TRIUNFO CSD Tapia Water reclamation Facility Preliminary Design Report	AMMONIA STATION PLAN	DRAWING E17

ITEM 90

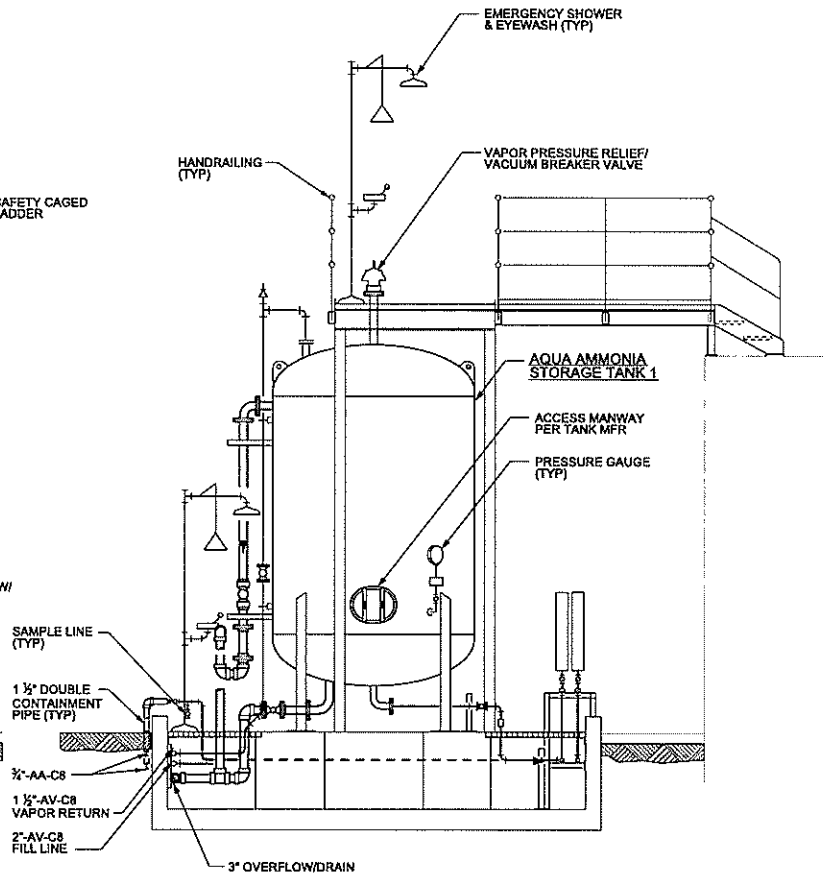


ITEM 90

SCALE			DRAWING
	MWH Arcadia California	LAS VIRGENES MWD/TRIUNFO CSD Tapia Water reclamation Facility Preliminary Design Report	AMMONIA STATION ENLARGED PLAN	12 of 90



SECTION A
SCALE: ¼"= 1'-0"
12



SECTION B
SCALE: ¼"= 1'-0"
12

ITEM 9C

SCALE			
	MWH Arcadia California	LAS VIRGENES MWD/TRIUNFO CSD Tapia Water reclamation Facility Preliminary Design Report	AMMONIA STATION SECTIONS

DRAWING 13 of 19

File: Ammonia dwg_13.dgn Model: Default ColorTable: bw.stb DesignScript: mwh_iplot_pentable_v99.pen PlotScale: 0.083333=1 User: Rendijo L. Largo Plot Date: 01-JUN-2011 15:38

ITEM 9C

TECHNICAL MEMORANDUM

MWH

BUILDING A BETTER WORLD

To:	Brett Dingman	**Date:**	July 21, 2011
From:	Roger Stephenson Sarah Munger Ian Mackenzie	**Reference:**	1010371
Subject:	Concept-Level Evaluation of Chemical Dosing Pump Relocation FINAL	**Client:**	Las Virgenes Municipal Water District/Triunfo Sanitation District Joint Powers Authority

INTRODUCTION

This Technical Memorandum (TM) examines the potential for relocating sodium hypochlorite and sodium bisulfite dosing facilities at the Tapia Water Reclamation Facility (Tapia). These facilities are currently located in a room that is somewhat undersized for this purpose. This has led to some difficulties in operating and maintaining these facilities.

BACKGROUND

The chemical storage facilities at the Tapia Water Reclamation Facility (Tapia) have been modified numerous times since the facility was originally built. These modifications have arisen because the treatment process has evolved over time leading to changes in the types of chemicals used. Currently the eastern half of the facility contains storage tanks, dosing pumps and piping for three chemicals: alum, sodium hypochlorite and sodium bisulfite. There are also make up tanks and dosing pumps for polymers but these are no longer used.

The basic arrangement of the facilities is illustrated in Figure 1. The existing hypochlorite and bisulfite pumps are located in the room at the northeast corner of the chemical building. This room contains two sodium bisulfite dosing pumps and five sodium hypochlorite dosing pumps. Incoming chemical feed is from two sodium bisulfite tanks located north of the building and three sodium hypochlorite tanks located in other rooms in the building. The pump room is approximately 20' x 11' and is rather cramped with seven pumps plus associated control panels and piping.

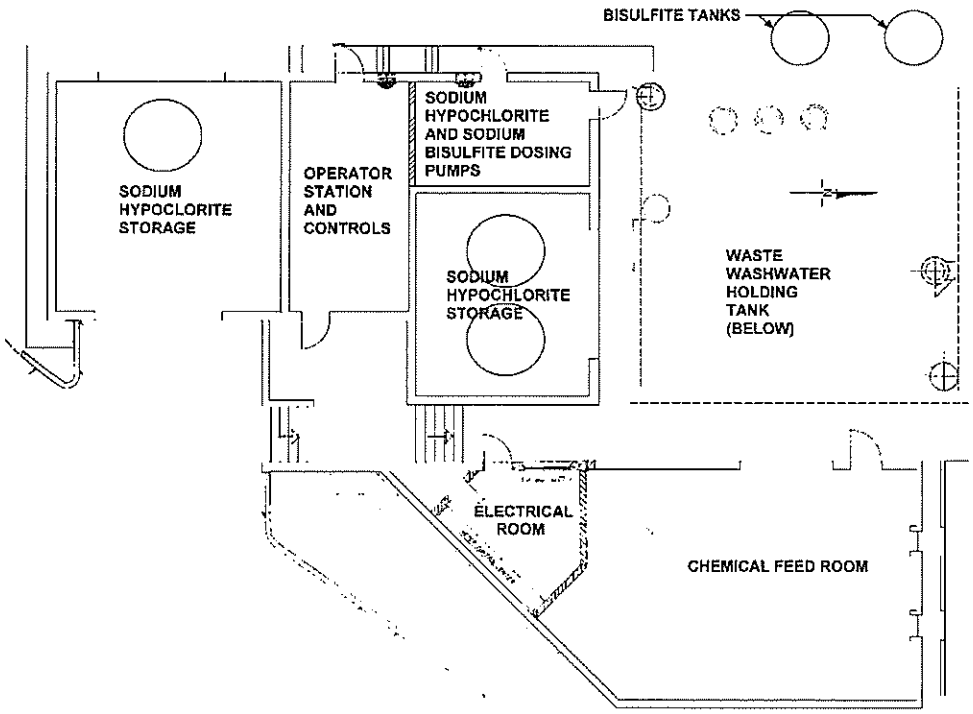


Figure 1
Current Layout of Chemical Building

The chemical feed room contains alum dosing pumps plus polymer makeup and dosing equipment. This room also contains an air compressor. In addition this room is also used by maintenance personnel and contains a workbench, tool chests and related tools and parts. It is also currently being used to store carboys of ammonium hydroxide which are being used for chloramination at the filters until the alternative disinfection arrangements are complete.

The polymer system is no longer used. Removal of this equipment would leave room for the installation of new hypochlorite and bisulfite dosing pumps. Given the space available it would be undesirable to install the hypochlorite dosing pumps into this room without removing the polymer dosing equipment as this would result in a cramped layout which would complicate maintenance.

Once the polymer make up and dosing equipment is removed there is ample room for both the hypochlorite and bisulfite dosing pumps. Moving all of these pumps will leave the present Bisulfite and Hypochlorite room vacant so it can be used for another purpose if desired.

If it is decided to resume polymer dosing in future it will be necessary to find another location for the polymer dosing and makeup equipment. Depending on the scale of equipment adopted, it might be possible to locate this in the vacated Bisulfite and Hypochlorite room, possibly also making use of space in the room currently used as an operator station.

Piping

Sodium bisulfite piping enters the pump room through the west wall. The dosing pipe (tubing within the carrier pipe) leave through the same wall. Both pipes would be intercepted and routed in front of the building on the north side. A pipe trench could be constructed underneath the existing footpath. This same trench could also be used to contain the new sodium hypochlorite piping (see below) along the north wall of the building through a pipe trench until they reached the chemical feed room. The pipes would enter the feed room through new penetrations and would be routed along the interior wall to the new dosing pumps.

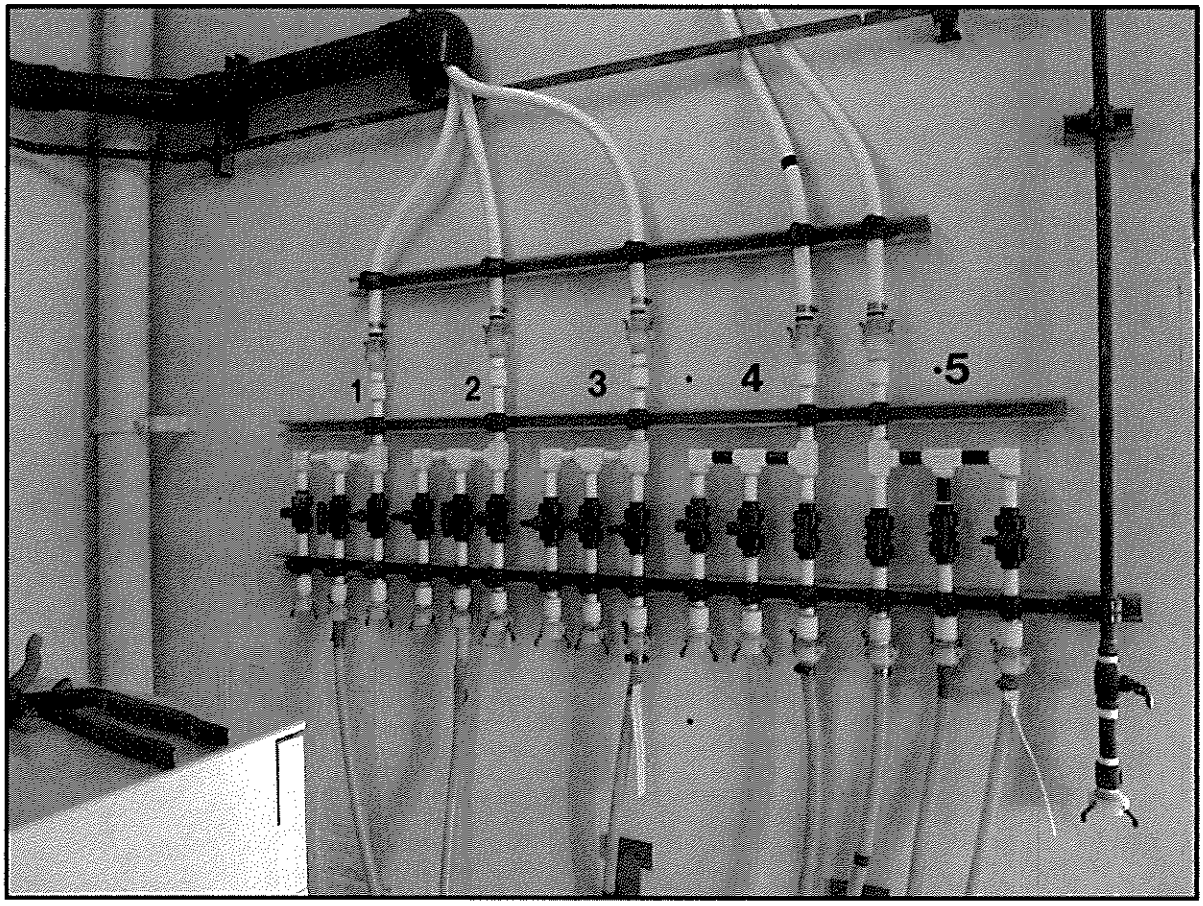


Figure 2
Hypochlorite Dosing Manifold

Sodium hypochlorite enters the room through the east wall from the adjacent sodium hypochlorite storage room. It leaves the room following the same route as the bisulfite piping. As illustrated in Figure 2, there is a manifold on the interior west wall of the pump room that allows the connections between the dosing pumps and the various dosing pipes to be interchanged.

The piping connection to the relocated pumps could be made by connecting to the existing common feed pipe inside the sodium hypochlorite storage room. This pipe could be extended to through north wall via a new penetration. Once outside the containment area, the pipe could be

routed below ground level through the same pipe trench used for the sodium bisulfite piping. This route is illustrated in Figure 3.

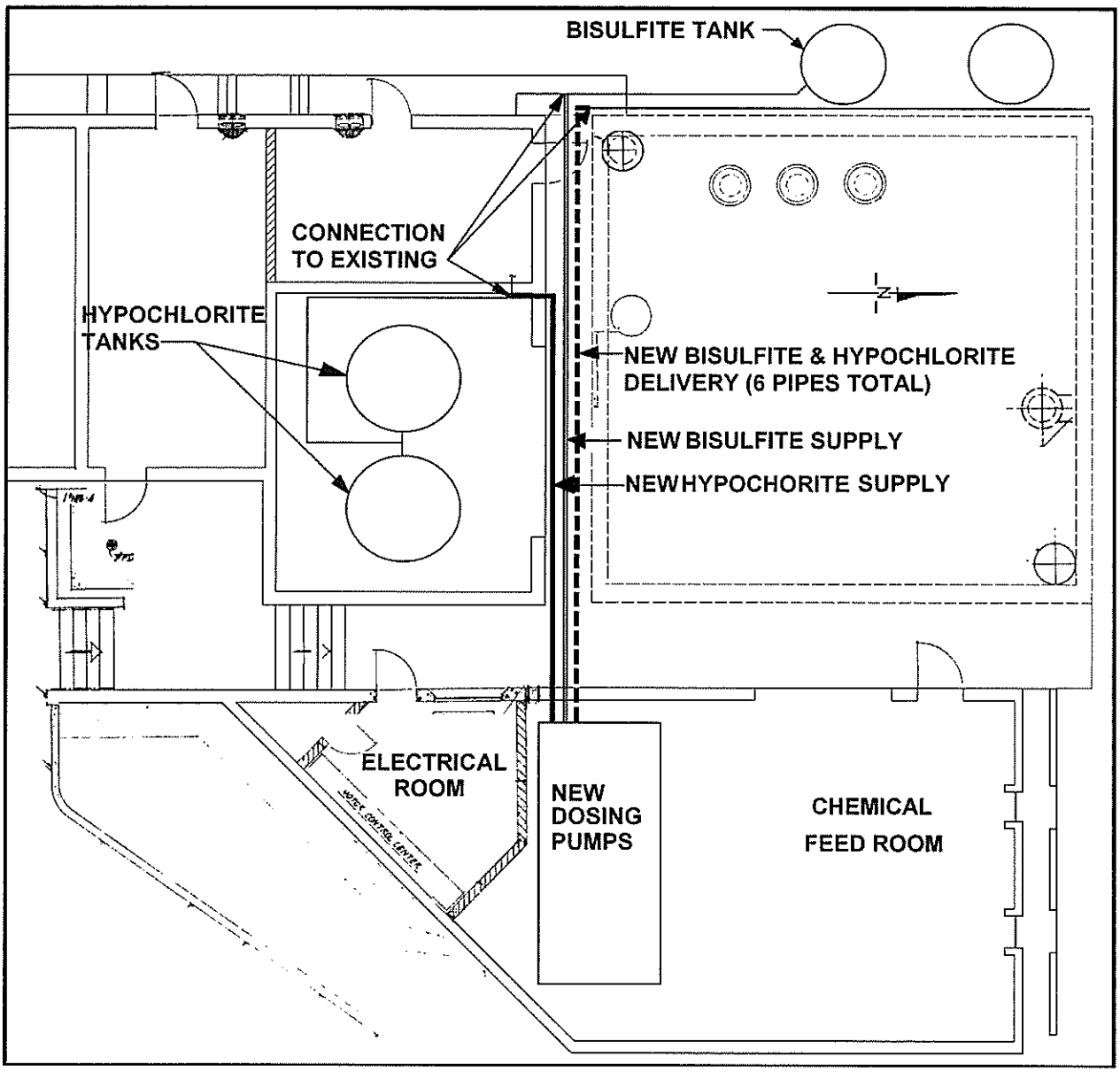


Figure 3
Pipe Routes

Pumps

There are five sodium hypochlorite dosing pumps and two sodium bisulfite dosing pumps. The pumps are Pulsa diaphragm metering pumps made by Pulsafeeder. The hypochlorite pumps are Pulsa series 7120 while the bisulfite pumps are Pulsa Series 880.

To simplify the transition between pump locations it is desirable to purchase new pumps as part of the project. The new pumps can then be installed and tested in the new location while the old pumps remain in operation. This will minimize the interruption of hypochlorite and bisulfite dosing which are critical plant processes.

The current pumps have chronic problems with both the pumps and the related electrical and control equipment. The head of the pumps and the associated piping are prone to leakage which requires frequent repairs. The VFD's for these pumps are prone to failures and there is a long lead time for repairs. The VFD's are also labor intensive to reprogram after repairs.

The new pumps could be alternative types of chemical dosing pumps such as peristaltic (hose) pumps or progressive cavity pumps. The type and duty of pump should be selected during the detailed design stage of the project.

A possible layout for the new pumps is shown in Figure 4. The new hypochlorite pumps would occupy the space previously occupied by the polymer makeup equipment while the bisulfite pumps would occupy the space formerly occupied by the polymer pumps. This layout can be refined or modified during detailed design. One potential modification would be to leave the sodium bisulfite pumps in the current location and only relocated the sodium hypochlorite pumps.

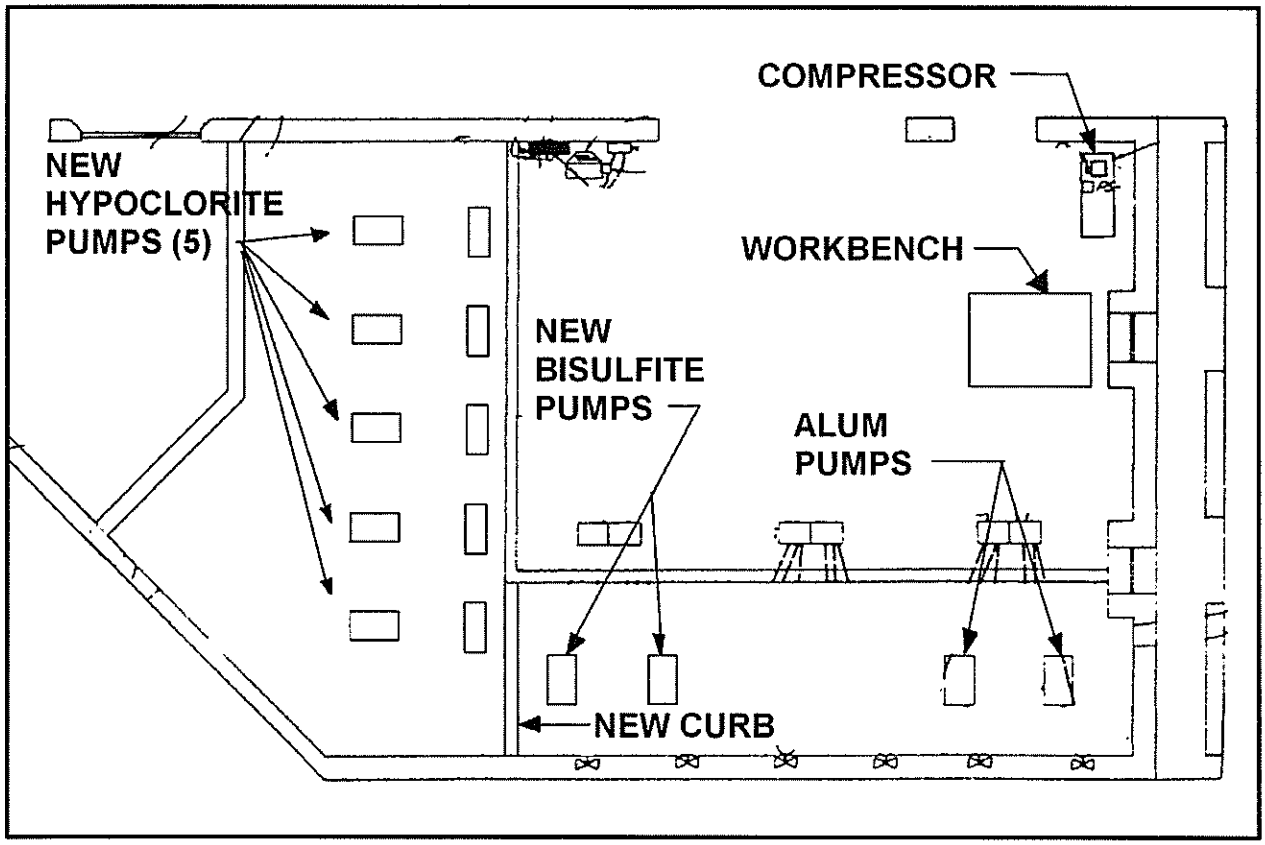


Figure 4
Pump Layout in Chemical Feed Room

Power

The dosing pumps are currently fed from a 480 V panel in the electrical room. There are empty spaces in this panel. Additional breakers could be installed on this panel to allow the new dosing pumps to be installed. There are existing underground conduits running from the electrical room to the chemical feed room which were used to route power to the polymer system. It may be possible to reuse these conduits to supply power to the new pumps. If this is not feasible, the alternative would be to route new above ground conduits through the common wall between these two rooms.

Controls

It is understood that the dosing system is controlled by PLC 25 which is located in cabinet LCB 3000 in the former chlorinator room. The relocated pumps could also be connected to LCB 3000. Conduits will need to be routed from the chemical feed room to the former chlorinator room. One alternative is to route the conduits at high level via the electrical room and then across the roof to the chlorinator room. A second alternative is to route the conduits underground in the new pipe trench and then through the feed pump room. These two routes are illustrated in Figure 5.

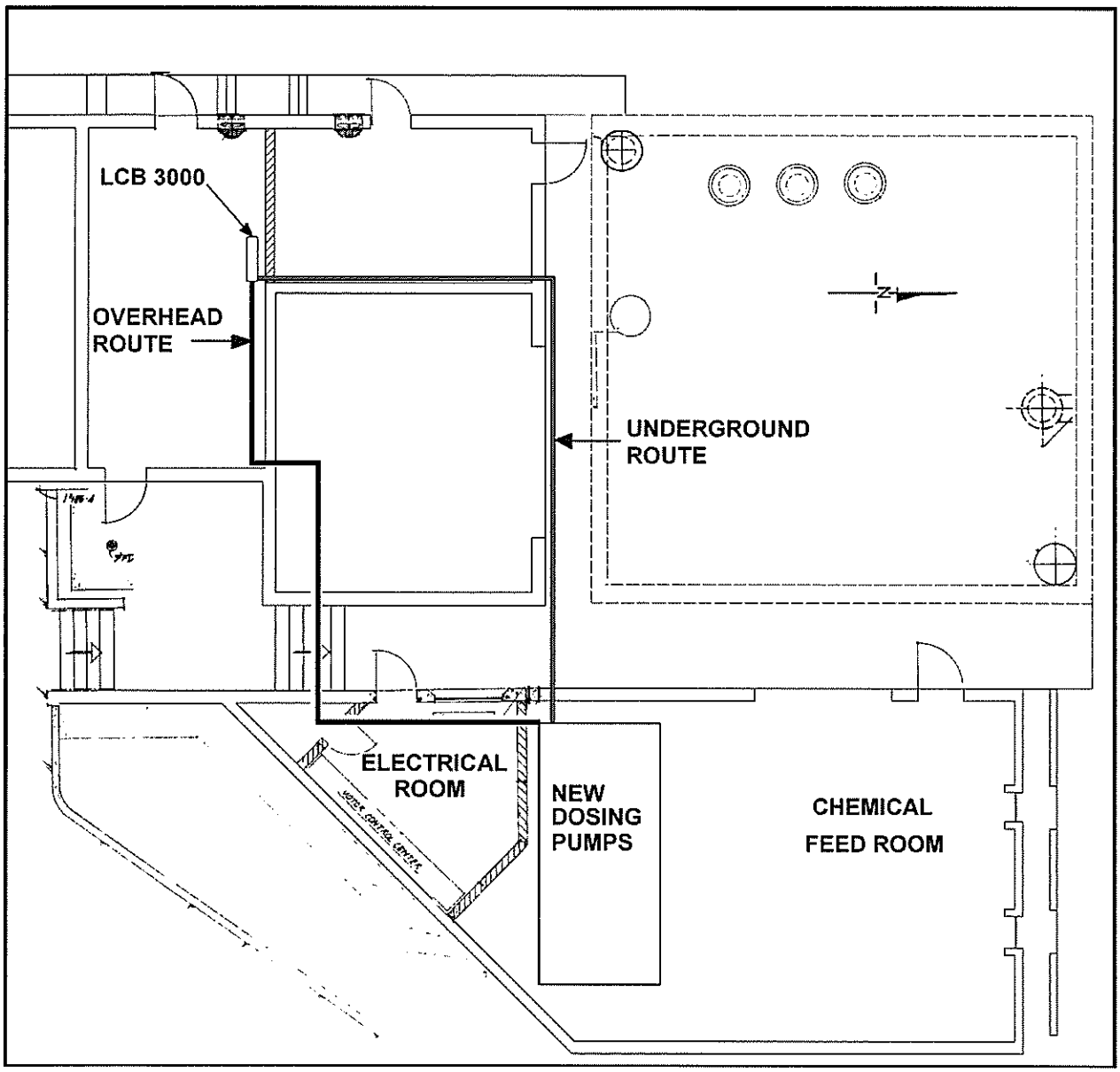


Figure 5
Conduit Routes

Other equipment in the chemical feed room

Currently in the chemical feed room, in addition to the polymer equipment, there are alum dosing pumps, air compressor, workbench, tool chest and various spares and tools. The polymer equipment will be removed under the project and the tool chest will need to be relocated. The other equipment should not be affected by the installation of the new dosing pumps.

Construction arrangements

In the first stage of construction, the existing polymer dosing equipment can be demolished to create space for the new pumps. The new pumps can then be installed in this room and connected

to the power and control system. The pipe trench can be constructed and the new piping installed. After the new pumps are connected to the power and control systems, the final tie-ins to the existing piping can be made and the new system put on line. Once the new system is operating satisfactorily, the existing pumps and associated equipment can be removed.

OPINION OF PROBABLE CONSTRUCTION COST (OPCC)

An OPCC was developed for the relocation of the dosing pumps. This OPCC includes costs for the following elements of the project:

- Replacing five existing sodium hypochlorite pumps and two existing sodium bisulfite pumps,
- Associated valves, pulsation dampers and meters,
- Replacing the existing sodium hypochlorite manifold,
- Supply pipe and dosing pipe for sodium hypochlorite and sodium bisulfite, threaded PFTE piping will be used at the manifolds,
- New power and control cabling and conduits,
- Constructing a new pipe trench outside the chemical building,
- New pump pedestals for the new dosing pumps, wall penetrations for the new piping and cabling,
- Demolishing the existing polymer makeup and dosing equipment,
- Demolishing the existing sodium hypochlorite and sodium bisulfite dosing pumps and associated appurtenances.

The OPCC does not include operating and maintenance costs. These are not expected to change significantly under the new arrangements.

This OPCC is a class 4 estimate and therefore is subject to variation of from -15% to -30% on the low side and +20% to 50% on the high side percent. The expected range of costs from this project would be between $300,000 and $ 510,000. Details of the OPCC is given in Attachment A.

CONCLUSION

Relocation of the sodium hypochlorite and sodium bisulfite dosing pumps to the Chemical Feed Room is a viable option. The new system will offer more space for operating and maintaining the pumps and will not significantly affect operating costs. There will be some minor loss of storage space for tools and parts in the chemical feed room; this could be made up for by utilizing the space that will be vacated in the existing pump room.

APPENDIX B

Material Safety Data Sheet
Ammonium Hydroxide

ITEM 9C

MSDS **Material Safety Data Sheet**

From: Vinquiry, Inc.
7795 Bell Road
Windsor, CA 95492

VINQUIRY

24 hour Emergency Telephone:
Chemtrec: 1-800-424-9300

Outside U.S. and Canada Chemtrec: 202-483-7616

NOTE: CHEMTREC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All Non-emergency questions should be directed to Customer Service (1-707-838-6312) for assistance.

AMMONIUM HYDROXIDE (10 - 35% NH3)

MSDS Number: AH011 --- *Effective Date: 01/01/01*

1. Product Identification

Synonyms: Ammonium hydroxide solutions; ammonia aqueous; ammonia solutions
CAS No.: 1336-21-6
Molecular Weight: 35.05
Chemical Formula: NH4OH in H2O
Vinquiry Product Codes: 10-011-0000, 10-011-0118, 10-011-0473

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Ammonium Hydroxide	1336-21-6	21 - 72%	Yes
Water	7732-18-5	28 - 79%	No

Contains between 10 and 35% ammonia.

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED OR INHALED. MIST AND VAPOR CAUSE BURNS TO EVERY AREA OF CONTACT.

VINQUIRY INC. SAFETY DATA Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 1 - Slight
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER

ITEM 9C

5. Fire Fighting Measures

Fire:
Autoignition temperature: 651C (1204F)
Flammable limits in air % by volume:
lel: 16; uel: 25
Explosion:
Flammable vapors may accumulate in confined spaces.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Use water spray to blanket fire, cool fire exposed containers, and to flush non-ignited spills or vapors away from fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

NEUTRACIT(R)-2 or BuCAIM(R) caustic neutralizers are recommended for spills of this product.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Separate from incompatibilities. Store below 25C. Protect from direct sunlight. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
50 ppm (NH3)
-ACGIH Threshold Limit Value (TLV):
25 ppm (NH3) (TWA) 35 ppm (STEL)

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Burning may produce ammonia, nitrogen oxides.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Acids, acrolein, dimethyl sulfate, halogens, silver nitrate, propylene oxide, nitromethane, silver oxide, silver permanganate, oleum, beta-propiolactone. Most common metals.
Conditions to Avoid:
Heat, sunlight, incompatibles, sources of ignition.

11. Toxicological Information

For ammonium hydroxide:
oral rat LD50: 350 mg/kg; eye, rabbit, standard Draize, 250 ug; severe, investigated as a mutagen.
For ammonia:
inhalation rat LC50: 2000 ppm/4-hr; investigated as a tumorigen, mutagen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Ammonium Hydroxide (1336-21-6)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
This material is not expected to significantly bioaccumulate.
Environmental Toxicity:
This material is expected to be very toxic to aquatic life. The LC50/96-hour values for fish are less than 1 mg/l. The EC50/48-hour values for daphnia are less than 1 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

Australian Hazchem Code: 2P
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: **Health:** 3 **Flammability:** 1 **Reactivity:** 0
Label Hazard Warning:
POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED OR INHALED. MIST AND VAPOR CAUSE BURNS TO EVERY AREA OF CONTACT.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. IMMEDIATE ACTION IS ESSENTIAL FOR EYE EXPOSURES. In all cases call a physician immediately.
Product Use:
Laboratory Reagent.
Revision Information:

Disclaimer

APPENDIX C

Off-Site Consequence Analysis
Worst-Case Release Scenario (RMP*Comp, Version 1.07)

ITEM 9C

Chemical: Ammonia (water solution) 20%
CAS #: 7664-41-7
Category: Toxic Liquid
Scenario: Worst-case
Quantity Released: 5566.12 pounds
Liquid Temperature: 77 F

Mitigation Measures:
Diked area: 137.25 square feet
Dike height: 3.00 feet

Release Rate to Outside Air: 2.88 pounds per minute
Topography: Urban surroundings (many obstacles in the immediate area)
Toxic Endpoint: 0.14 mg/L; basis: ERPG-2
Estimated Distance to Toxic Endpoint: <0.1 miles (<0.16 kilometers); report as 0.1 mile

--------Assumptions About This Scenario---------
Wind Speed: 1.5 meters/second (3.4 miles/hour)
Stability Class: F
Air Temperature: 77 degrees F (25 degrees C)

APPENDIX D

Tapia Water Reclamation Facility
Evacuation Plan

ITEM 9C

Tapia Control Building
Upper Level

EXIT LOCATION

EXIT DIRECTIONS

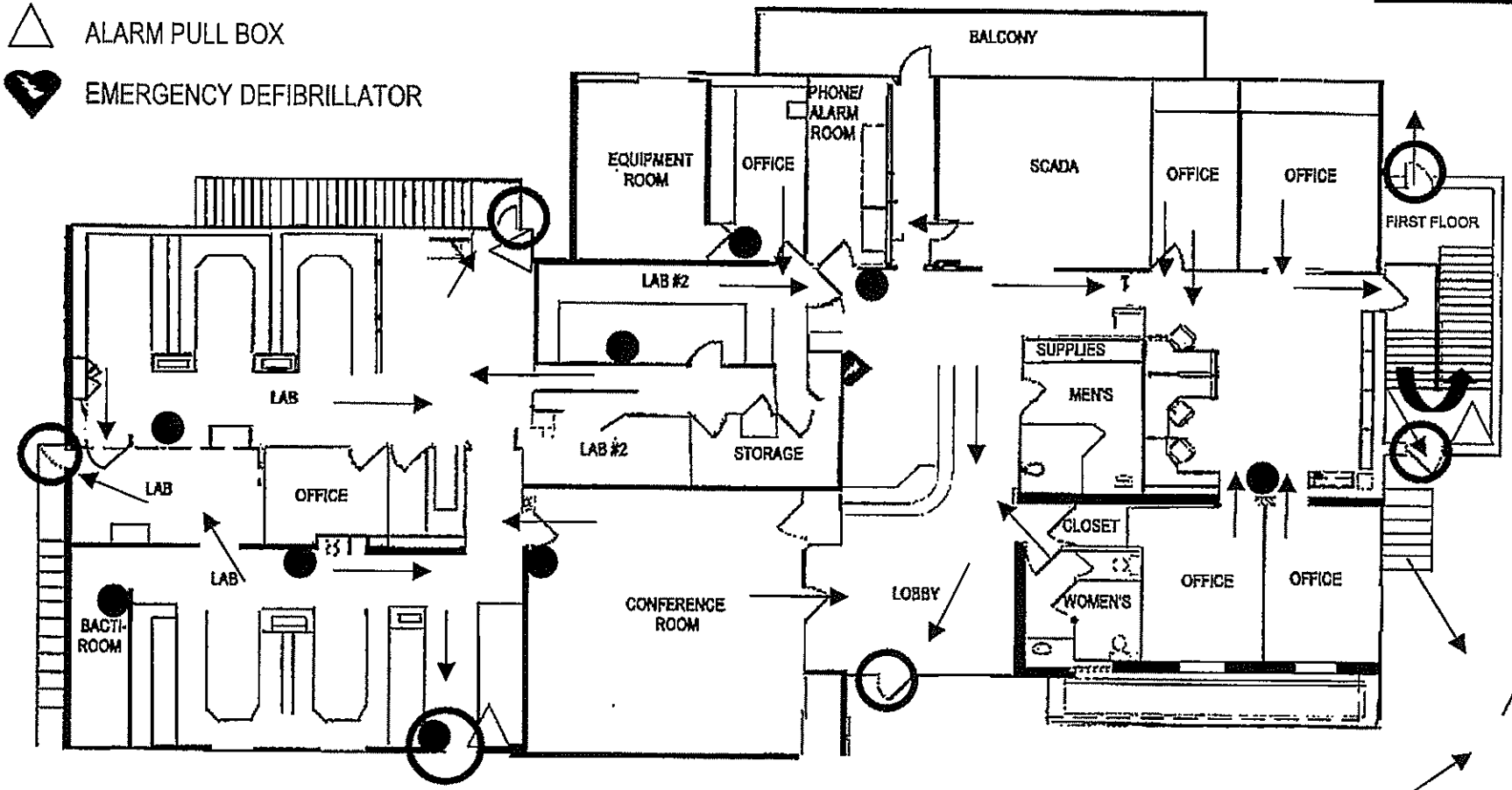
STAIRS TO LOWER LEVEL

FIRE EXTINGUISHER

ALARM PULL BOX

EMERGENCY DEFIBRILLATOR

ALTERNATE ASSEMBLY AREA



ASSEMBLY AREA

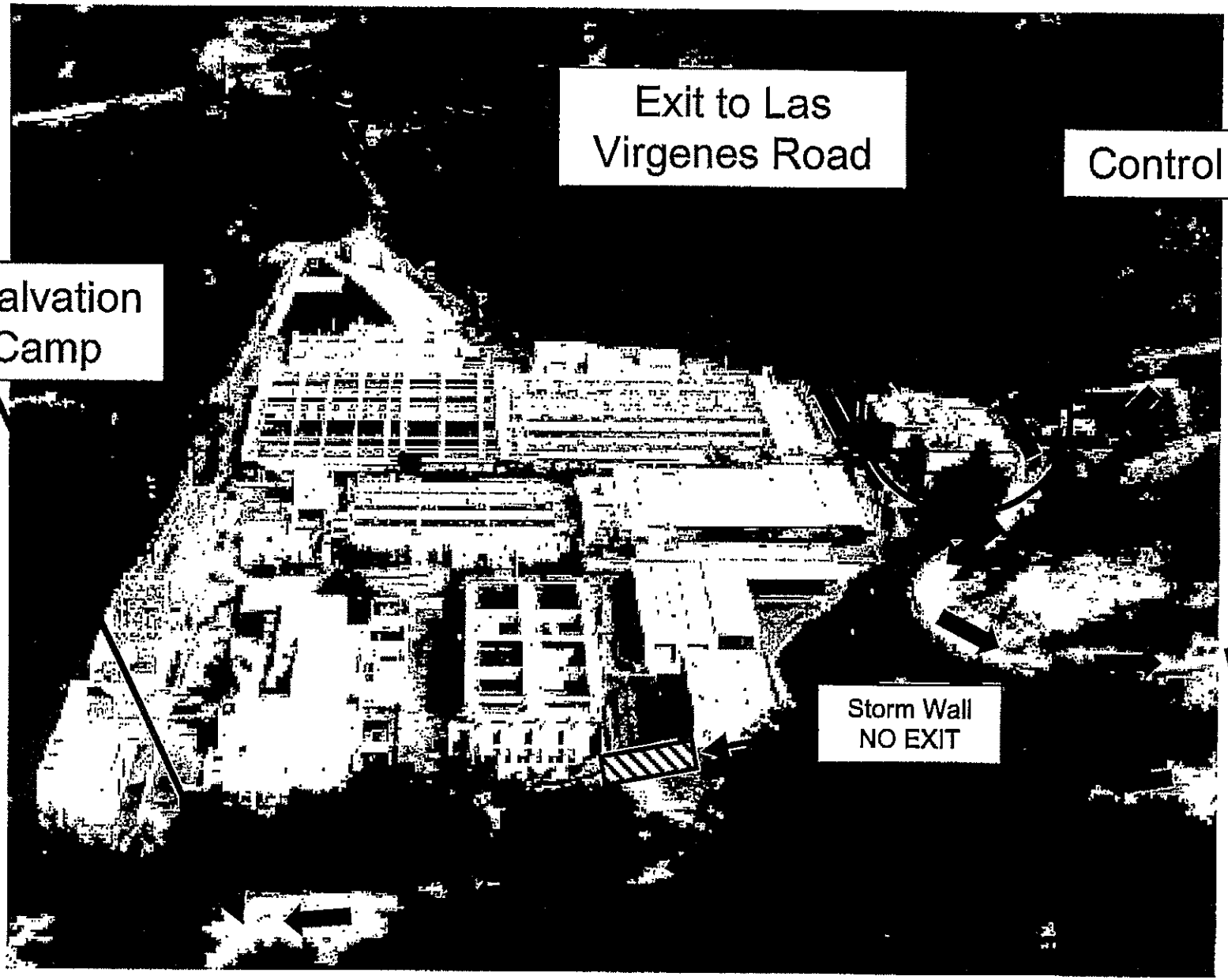
NORTH

ITEM 9C

237

Revised 3/21/05

Tapia Facility
Vehicle Evacuation Route



ITEM 9C

Revised 3/21/05

Appendix 3: Data

Table 1 - Tapia DCBM Compliance Testing Data 1/2010 – 6/2014

Date	Tapia Effluent Monthly Average Compliance Samples (μ/L)	Tapia Effluent Monthly Average Limit (μ/L)
January-10	62.9	62
February-10	52.5	62
March-10	40.2	62
April-10	43.4	62
May-10	51.1	46
June-10	48.9	46
July-10	47.7	46
October-10	49.1	46
November-10	56.3	46
December-10	43.2	46
January-11	33.7	46
February-11	28.9	46
March-11	14.8	46
April-11	31.9	46
May-11	30	46
June-11	36.7	46
October-11	36	46
November-11	40.7	46
December-11	22.4	46
January-12	25.4	46
February-12	23.1	46
March-12	40.2	46
April-12	37.2	46
November-12	30.3	46
December-12	31.9	46
January-13	38.4	46
February-13	35.2	46
March-13	32	46
April-13	37	46
May-13	44	46
June-13	36	46
July-13	34	46
August-13	45	46
September-13	40	46
October-13	45.3	46
November-13	47.8	46
December-13	31	46
January-14	45	46
February-14	42	46
March-14	33	46
April-14	27	46
June-14	38	46

Table 2 - Tapia DCBM Testing Data 1/2010 – 6/2014 (including non-compliance samples)

Analyte	Date	Tapia Effluent Compliance Samples (µ/L)	Monthly Average Result (µ/L)	Violation	Daily Average Limit (µ/L)	Daily Maximum Limit (µ/L)	Process Performance Samples (Not Used For Compliance) (µ/L)*
Dichlorobromomethane	6-Jan-10	62.9	62.9	Yes	62	64	
Dichlorobromomethane	3-Feb-10	52.5	52.5	No	62	64	
Dichlorobromomethane	3-Mar-10	40.2	40.2	No	62	64	
Dichlorobromomethane	7-Apr-10	43.4	43.4	No	62	64	
Dichlorobromomethane	5-May-10	67					
Dichlorobromomethane	25-May-10	54.9					
Dichlorobromomethane	26-May-10	42.8	51.106	Yes	46	64	
Dichlorobromomethane	27-May-10	46.33					
Dichlorobromomethane	28-May-10	44.5					
Dichlorobromomethane	9-Jun-10	46.5					
Dichlorobromomethane	10-Jun-10	61.9	48.9	Yes	46	64	
Dichlorobromomethane	11-Jun-10	44.7					
Dichlorobromomethane	30-Jun-10	42.5					
Dichlorobromomethane	27-Jul-10	57.1					
Dichlorobromomethane	28-Jul-10	45.8					
Dichlorobromomethane	29-Jul-10	52.3	47.74	Yes	46	64	
Dichlorobromomethane	30-Jul-10	40.6					
Dichlorobromomethane	31-Jul-10	42.9					
Dichlorobromomethane	3-Aug-10		No Discharge				94
Dichlorobromomethane	23-Aug-10						43.2
Dichlorobromomethane	24-Aug-10						41.6
Dichlorobromomethane	25-Aug-10						51.1
Dichlorobromomethane	26-Aug-10						44
Dichlorobromomethane	27-Aug-10						43.7
Dichlorobromomethane	5-Oct-10	53.7					
Dichlorobromomethane	22-Oct-10	43.5					
Dichlorobromomethane	23-Oct-10	50.1	49.08	Yes	46	77	
Dichlorobromomethane	24-Oct-10	50.7					
Dichlorobromomethane	25-Oct-10	47.4					
Dichlorobromomethane	6-Nov-10	87.3					
Dichlorobromomethane	7-Nov-10						52.1
Dichlorobromomethane	8-Nov-10	49.8	56.275	Yes	46	77	
Dichlorobromomethane	8-Nov-10						51.6
Dichlorobromomethane	9-Nov-10						52.4

Analyte	Date	Tapia Effluent Compliance Samples (µ/L)	Monthly Average Result (µ/L)	Violation	Daily Average Limit (µ/L)	Daily Maximum Limit (µ/L)	Performance Samples (Not Used For Compliance) (µ/L)*
Dichlorobromomethane	10-Nov-10						43.3
Dichlorobromomethane	11-Nov-10						39.3
Dichlorobromomethane	12-Nov-10						37.5
Dichlorobromomethane	13-Nov-10						38.1
Dichlorobromomethane	14-Nov-10						40.7
Dichlorobromomethane	15-Nov-10						37.8
Dichlorobromomethane	16-Nov-10	42.2					
Dichlorobromomethane	17-Nov-10						38.6
Dichlorobromomethane	18-Nov-10						38.6
Dichlorobromomethane	19-Nov-10						36
Dichlorobromomethane	20-Nov-10						58.7
Dichlorobromomethane	21-Nov-10	45.8					
Dichlorobromomethane	22-Nov-10						47.6
Dichlorobromomethane	4-Dec-10	20.9	43.15	No	46	77	
Dichlorobromomethane	29-Dec-10	65.4					
Dichlorobromomethane	4-Jan-11	33.7	33.7	No	46	77	
Dichlorobromomethane	27-Jan-11						68.3
Dichlorobromomethane	1-Feb-11		28.9	No	46	77	56.9
Dichlorobromomethane	8-Feb-11						39.2
Dichlorobromomethane	11-Feb-11						27.7
Dichlorobromomethane	14-Feb-11	29					
Dichlorobromomethane	16-Feb-11						30
Dichlorobromomethane	19-Feb-11						28.6
Dichlorobromomethane	22-Feb-11	28.8					
Dichlorobromomethane	23-Feb-11						35
Dichlorobromomethane	7-Mar-11	14.8	14.8	No	46	77	
Dichlorobromomethane	10-Mar-11						32.4
Dichlorobromomethane	11-Mar-11						31.2
Dichlorobromomethane	12-Mar-11						48.4
Dichlorobromomethane	13-Mar-11						29.7
Dichlorobromomethane	17-Mar-11						32
Dichlorobromomethane	18-Mar-11						31.2
Dichlorobromomethane	19-Mar-11						32.1
Dichlorobromomethane	5-Apr-11	31.9	31.9	No	46	77	
Dichlorobromomethane	14-Apr-11						35.9
Dichlorobromomethane	15-Apr-11						53.7
Dichlorobromomethane	16-Apr-11						31.0

Analyte	Date	Tapia Effluent Compliance Samples (µ/L)	Monthly Average Result (µ/L)	Violation	Daily Average Limit (µ/L)	Daily Maximum Limit (µ/L)	Performance Samples (Not Used For Compliance) (µ/L)*
Dichlorobromomethane	17-Apr-11						30.4
Dichlorobromomethane	2-May-11	30.0					
Dichlorobromomethane	23-May-11						40.0
Dichlorobromomethane	24-May-11		30	No	46	77	41.0
Dichlorobromomethane	25-May-11						39.3
Dichlorobromomethane	26-May-11						77.2
Dichlorobromomethane	6-Jun-11	36.7					
Dichlorobromomethane	10-Jun-11						29.3
Dichlorobromomethane	11-Jun-11		36.7	No	46	77	35.3
Dichlorobromomethane	12-Jun-11						31.4
Dichlorobromomethane	13-Jun-11						32.5
Dichlorobromomethane	1-Oct-11						60.0
Dichlorobromomethane	2-Oct-11		36.0	No	46.0	77.0	48.0
Dichlorobromomethane	12-Oct-11						
Dichlorobromomethane 005 outfall	8-Nov-11	40.0	40.0	No	46.0	77.0	
Dichlorobromomethane	16-Nov-11	40.7	40.7	No	46.0	77.0	
Dichlorobromomethane	6-Dec-11	22.4	22.4	No	46.0	77.0	
Dichlorobromomethane	10-Jan-12	14.7					
Dichlorobromomethane	23-Jan-12						33.2
Dichlorobromomethane	24-Jan-12						31.5
Dichlorobromomethane	25-Jan-12		25.4	No	46.0	77.0	33.9
Dichlorobromomethane	26-Jan-12	36.0					
Dichlorobromomethane	27-Jan-12						42.6
Dichlorobromomethane	28-Jan-12						43.6
Dichlorobromomethane	7-Feb-12	23.1					
Dichlorobromomethane	14-Feb-12						35.8
Dichlorobromomethane	15-Feb-12						38.7
Dichlorobromomethane	16-Feb-12		23.1	No	46.0	77.0	38.1
Dichlorobromomethane	22-Feb-12						42.7
Dichlorobromomethane	23-Feb-12						41.2
Dichlorobromomethane	24-Feb-12						39.0
Dichlorobromomethane	6-Mar-12	40.2	40.2	No	46.0	77.0	
Dichlorobromomethane	4-Apr-12	37.2	37.2	No	46.0	77.0	
Dichlorobromomethane	19-Nov-12	30.3	30.3	No	46.0	77.0	
Dichlorobromomethane	10-Dec-12	31.9	31.9	No	46.0	77.0	
Dichlorobromomethane	8-Jan-13	38.4	38.4	No	46.0	77.0	

Analyte	Date	Tapia Effluent Compliance Samples (µ/L)	Monthly Average Result (µ/L)	Violation	Daily Average Limit (µ/L)	Daily Maximum Limit (µ/L)	Performance Samples (Not Used For Compliance) (µ/L)*
Dichlorobromomethane	5-Feb-13	35.2	35.2	No	46.0	77.0	
Dichlorobromomethane	5-Mar-13	32.0	32.0	No	46.0	77.0	
Dichlorobromomethane	2-Apr-13	37.0	37.0	No	46.0	77.0	
Dichlorobromomethane	29-May-13	44.0	44.0	No	46.0	77.0	
Dichlorobromomethane	19-Jun-13	36.0	36.0	No	46.0	77.0	
Dichlorobromomethane	9-Jul-13	34.0	34.0	No	46.0	77.0	
Dichlorobromomethane	6-Aug-13	45.0	45.0	No	46.0	77.0	
Dichlorobromomethane	26-Aug-13						47.0
Dichlorobromomethane	3-Sep-13		40.0	No	46.0	77.0	44.0
Dichlorobromomethane	10-Sep-13						46.0
Dichlorobromomethane	17-Sep-13	40.0					
Dichlorobromomethane	8-Oct-13	61.0	45.3	No	46.0	77.0	
Dichlorobromomethane	21-Oct-13	43.0					
Dichlorobromomethane	23-Oct-13	38.0					
Dichlorobromomethane	28-Oct-13	39.0					
Dichlorobromomethane	13-Nov-13	57.0	47.8	Yes	46.0	77.0	
Dichlorobromomethane	27-Nov-13	44.0					
Dichlorobromomethane	28-Nov-13	41.0					
Dichlorobromomethane	29-Nov-13	49.0					
Dichlorobromomethane	3-Dec-13	31.0	31.0	No	46.0	77.0	
Dichlorobromomethane	7-Jan-14	63.0	45.0	No	46.0	77.0	
Dichlorobromomethane	15-Jan-14	43.0					
Dichlorobromomethane	22-Jan-14	34.0					
Dichlorobromomethane	23-Jan-14	40.0					
Dichlorobromomethane	4-Feb-14	42.0	42.0	No	46.0	77.0	
Dichlorobromomethane	11-Mar-14	33.0	33.0	No	46.0	77.0	
Dichlorobromomethane	2-Apr-14	27.0	27.0	No	46.0	77.0	
Dichlorobromomethane	17-Jun-14	38.0	38.0	No	46.0	77.0	

*Process performance sample data is provided as a reference. These samples were pulled and analyzed to determine the effectiveness of ammonia addition upon DCBM level and are not used for compliance.

Table 3 – 005 Outfall DCBM Testing Data 1/2010 – 6/2014

Analyte	Date	DCBM (µg/l)
Dichlorobromomethane ug/l	1/5/10	No Discharge
Dichlorobromomethane ug/l	1/5/10	No Discharge
Dichlorobromomethane ug/l	1/5/10	No Discharge
Dichlorobromomethane ug/l	1/5/10	No Discharge
Dichlorobromomethane ug/l	1/5/10	No Discharge
Dichlorobromomethane ug/l	1/6/10	No Discharge
Dichlorobromomethane ug/l	1/6/10	No Discharge
Dichlorobromomethane ug/l	1/6/10	No Discharge
Dichlorobromomethane ug/l	2/2/10	No Discharge
Dichlorobromomethane ug/l	2/2/10	No Discharge
Dichlorobromomethane ug/l	2/2/10	No Discharge
Dichlorobromomethane ug/l	2/2/10	No Discharge
Dichlorobromomethane ug/l	2/3/10	No Discharge
Dichlorobromomethane ug/l	2/3/10	No Discharge
Dichlorobromomethane ug/l	2/3/10	No Discharge
Dichlorobromomethane ug/l	2/3/10	No Discharge
Dichlorobromomethane ug/l	2/3/10	No Discharge
Dichlorobromomethane ug/l	3/2/10	No Discharge
Dichlorobromomethane ug/l	3/2/10	No Discharge
Dichlorobromomethane ug/l	3/2/10	No Discharge
Dichlorobromomethane ug/l	3/2/10	No Discharge
Dichlorobromomethane ug/l	3/3/10	No Discharge
Dichlorobromomethane ug/l	3/3/10	No Discharge
Dichlorobromomethane ug/l	3/3/10	No Discharge
Dichlorobromomethane ug/l	3/3/10	No Discharge
Dichlorobromomethane ug/l	4/6/10	No Discharge
Dichlorobromomethane ug/l	4/6/10	No Discharge
Dichlorobromomethane ug/l	4/6/10	No Discharge
Dichlorobromomethane ug/l	4/7/10	No Discharge
Dichlorobromomethane ug/l	4/7/10	No Discharge
Dichlorobromomethane ug/l	4/7/10	No Discharge
Dichlorobromomethane ug/l	4/7/10	No Discharge
Dichlorobromomethane ug/l	4/7/10	No Discharge
Dichlorobromomethane ug/l	4/20/10	No Discharge
Dichlorobromomethane ug/l	5/5/10	No Discharge
Dichlorobromomethane ug/l	5/5/10	No Discharge
Dichlorobromomethane ug/l	5/5/10	No Discharge

Analyte	Date	DCBM (µg/l)
Dichlorobromomethane ug/l	5/5/10	No Discharge
Dichlorobromomethane ug/l	5/5/10	No Discharge
Dichlorobromomethane ug/l	5/5/10	No Discharge
Dichlorobromomethane ug/l	5/25/10	No Discharge
Dichlorobromomethane ug/l	5/26/10	No Discharge
Dichlorobromomethane ug/l	5/27/10	No Discharge
Dichlorobromomethane ug/l	5/28/10	No Discharge
Dichlorobromomethane ug/l	6/9/10	No Discharge
Dichlorobromomethane ug/l	6/9/10	No Discharge
Dichlorobromomethane ug/l	6/10/10	No Discharge
Dichlorobromomethane ug/l	6/11/10	No Discharge
Dichlorobromomethane ug/l	6/30/10	No Discharge
Dichlorobromomethane ug/l	7/27/10	No Discharge
Dichlorobromomethane ug/l	7/28/10	No Discharge
Dichlorobromomethane ug/l	7/29/10	No Discharge
Dichlorobromomethane ug/l	7/30/10	No Discharge
Dichlorobromomethane ug/l	7/31/10	No Discharge
Dichlorobromomethane ug/l	8/3/10	No Discharge
Dichlorobromomethane ug/l	8/23/10	No Discharge
Dichlorobromomethane ug/l	8/24/10	No Discharge
Dichlorobromomethane ug/l	8/25/10	No Discharge
Dichlorobromomethane ug/l	8/26/10	No Discharge
Dichlorobromomethane ug/l	8/27/10	No Discharge
Dichlorobromomethane ug/l	10/5/10	No Discharge
Dichlorobromomethane ug/l	10/18/10	No Discharge
Dichlorobromomethane ug/l	10/22/10	No Discharge
Dichlorobromomethane ug/l	10/23/10	No Discharge
Dichlorobromomethane ug/l	10/24/10	No Discharge
Dichlorobromomethane ug/l	10/25/10	No Discharge
Dichlorobromomethane ug/l	11/6/10	No Discharge
Dichlorobromomethane ug/l	11/7/10	No Discharge
Dichlorobromomethane ug/l	11/8/10	No Discharge
Dichlorobromomethane ug/l	11/8/10	No Discharge
Dichlorobromomethane ug/l	11/8/10	No Discharge
Dichlorobromomethane ug/l	11/9/10	No Discharge
Dichlorobromomethane ug/l	11/10/10	No Discharge
Dichlorobromomethane ug/l	11/11/10	No Discharge
Dichlorobromomethane ug/l	11/12/10	No Discharge
Dichlorobromomethane ug/l	11/13/10	No Discharge

Analyte	Date	DCBM (µg/l)
Dichlorobromomethane ug/l	11/14/10	No Discharge
Dichlorobromomethane ug/l	11/15/10	No Discharge
Dichlorobromomethane ug/l	11/16/10	No Discharge
Dichlorobromomethane ug/l	11/17/10	No Discharge
Dichlorobromomethane ug/l	11/17/10	No Discharge
Dichlorobromomethane ug/l	11/17/10	No Discharge
Dichlorobromomethane ug/l	11/17/10	No Discharge
Dichlorobromomethane ug/l	11/17/10	No Discharge
Dichlorobromomethane ug/l	11/17/10	No Discharge
Dichlorobromomethane ug/l	11/18/10	No Discharge
Dichlorobromomethane ug/l	11/18/10	No Discharge
Dichlorobromomethane ug/l	11/18/10	No Discharge
Dichlorobromomethane ug/l	11/18/10	No Discharge
Dichlorobromomethane ug/l	11/19/10	No Discharge
Dichlorobromomethane ug/l	11/20/10	No Discharge
Dichlorobromomethane ug/l	11/21/10	No Discharge
Dichlorobromomethane ug/l	11/22/10	No Discharge
Dichlorobromomethane ug/l	12/4/10	No Discharge
Dichlorobromomethane ug/l	12/7/10	No Discharge
Dichlorobromomethane ug/l	12/7/10	No Discharge
Dichlorobromomethane ug/l	12/7/10	No Discharge
Dichlorobromomethane ug/l	12/7/10	No Discharge
Dichlorobromomethane ug/l	12/7/10	No Discharge
Dichlorobromomethane ug/l	12/7/10	No Discharge
Dichlorobromomethane ug/l	12/7/10	No Discharge
Dichlorobromomethane ug/l	12/29/10	No Discharge
Dichlorobromomethane ug/l	1/4/11	No Discharge
Dichlorobromomethane ug/l	1/4/11	No Discharge
Dichlorobromomethane ug/l	1/4/11	No Discharge
Dichlorobromomethane ug/l	1/4/11	No Discharge
Dichlorobromomethane ug/l	1/4/11	No Discharge
Dichlorobromomethane ug/l	1/4/11	No Discharge
Dichlorobromomethane ug/l	1/4/11	No Discharge
Dichlorobromomethane ug/l	1/4/11	No Discharge
Dichlorobromomethane ug/l	1/13/11	No Discharge
Dichlorobromomethane ug/l	1/20/11	No Discharge
Dichlorobromomethane ug/l	1/27/11	No Discharge
Dichlorobromomethane ug/l	2/1/11	No Discharge
Dichlorobromomethane ug/l	2/8/11	No Discharge

Analyte	Date	DCBM (µg/l)
Dichlorobromomethane ug/l	2/11/11	No Discharge
Dichlorobromomethane ug/l	2/14/11	No Discharge
Dichlorobromomethane ug/l	2/15/11	No Discharge
Dichlorobromomethane ug/l	2/15/11	No Discharge
Dichlorobromomethane ug/l	2/15/11	No Discharge
Dichlorobromomethane ug/l	2/15/11	No Discharge
Dichlorobromomethane ug/l	2/15/11	No Discharge
Dichlorobromomethane ug/l	2/15/11	No Discharge
Dichlorobromomethane ug/l	2/15/11	No Discharge
Dichlorobromomethane ug/l	2/16/11	No Discharge
Dichlorobromomethane ug/l	2/19/11	No Discharge
Dichlorobromomethane ug/l	2/22/11	No Discharge
Dichlorobromomethane ug/l	2/23/11	No Discharge
Dichlorobromomethane ug/l	3/7/11	No Discharge
Dichlorobromomethane ug/l	3/8/11	No Discharge
Dichlorobromomethane ug/l	3/8/11	No Discharge
Dichlorobromomethane ug/l	3/8/11	No Discharge
Dichlorobromomethane ug/l	3/8/11	No Discharge
Dichlorobromomethane ug/l	3/8/11	No Discharge
Dichlorobromomethane ug/l	3/8/11	No Discharge
Dichlorobromomethane ug/l	3/8/11	No Discharge
Dichlorobromomethane ug/l	3/10/11	No Discharge
Dichlorobromomethane ug/l	3/11/11	No Discharge
Dichlorobromomethane ug/l	3/12/11	No Discharge
Dichlorobromomethane ug/l	3/13/11	No Discharge
Dichlorobromomethane ug/l	3/17/11	No Discharge
Dichlorobromomethane ug/l	3/18/11	No Discharge
Dichlorobromomethane ug/l	3/19/11	No Discharge
Dichlorobromomethane ug/l	4/5/11	No Discharge
Dichlorobromomethane ug/l	4/5/11	No Discharge
Dichlorobromomethane ug/l	4/5/11	No Discharge
Dichlorobromomethane ug/l	4/5/11	No Discharge
Dichlorobromomethane ug/l	4/5/11	No Discharge
Dichlorobromomethane ug/l	4/5/11	No Discharge
Dichlorobromomethane ug/l	4/5/11	No Discharge
Dichlorobromomethane ug/l	4/14/11	No Discharge
Dichlorobromomethane ug/l	4/15/11	No Discharge
Dichlorobromomethane ug/l	4/16/11	No Discharge
Dichlorobromomethane ug/l	4/17/11	No Discharge

Analyte	Date	DCBM (µg/l)
Dichlorobromomethane ug/l	4/19/11	No Discharge
Dichlorobromomethane ug/l	5/2/11	No Discharge
Dichlorobromomethane ug/l	5/3/11	No Discharge
Dichlorobromomethane ug/l	5/23/11	No Discharge
Dichlorobromomethane ug/l	5/24/11	No Discharge
Dichlorobromomethane ug/l	5/25/11	No Discharge
Dichlorobromomethane ug/l	5/26/11	No Discharge
Dichlorobromomethane ug/l	6/6/11	No Discharge
Dichlorobromomethane ug/l	6/7/11	No Discharge
Dichlorobromomethane ug/l	6/10/11	No Discharge
Dichlorobromomethane ug/l	6/11/11	No Discharge
Dichlorobromomethane ug/l	6/12/11	No Discharge
Dichlorobromomethane ug/l	6/13/11	No Discharge
Dichlorobromomethane ug/l	10/1/11	No Discharge
Dichlorobromomethane ug/l	10/2/11	No Discharge
Dichlorobromomethane ug/l	10/12/11	36
Dichlorobromomethane ug/l	10/12/11	No Discharge
Dichlorobromomethane ug/l	10/12/11	No Discharge
Dichlorobromomethane ug/l	11/8/11	35.1
Dichlorobromomethane ug/l	11/8/11	No Discharge
Dichlorobromomethane ug/l	11/8/11	No Discharge
Dichlorobromomethane ug/l	11/15/11	No Discharge
Dichlorobromomethane ug/l	11/15/11	No Discharge
Dichlorobromomethane ug/l	11/15/11	No Discharge
Dichlorobromomethane ug/l	11/15/11	No Discharge
Dichlorobromomethane ug/l	11/15/11	No Discharge
Dichlorobromomethane ug/l	11/16/11	No Discharge
Dichlorobromomethane ug/l	11/16/11	No Discharge
Dichlorobromomethane ug/l	11/16/11	No Discharge
Dichlorobromomethane ug/l	12/6/11	No Discharge
Dichlorobromomethane ug/l	12/6/11	No Discharge
Dichlorobromomethane ug/l	12/6/11	No Discharge
Dichlorobromomethane ug/l	12/6/11	No Discharge
Dichlorobromomethane ug/l	12/6/11	No Discharge
Dichlorobromomethane ug/l	12/6/11	No Discharge
Dichlorobromomethane ug/l	12/6/11	No Discharge
Dichlorobromomethane ug/l	12/7/11	No Discharge
Dichlorobromomethane ug/l	1/10/12	No Discharge
Dichlorobromomethane ug/l	1/10/12	No Discharge

Analyte	Date	DCBM (µg/l)
Dichlorobromomethane ug/l	1/10/12	No Discharge
Dichlorobromomethane ug/l	1/10/12	No Discharge
Dichlorobromomethane ug/l	1/10/12	No Discharge
Dichlorobromomethane ug/l	1/10/12	No Discharge
Dichlorobromomethane ug/l	1/10/12	No Discharge
Dichlorobromomethane ug/l	1/11/12	No Discharge
Dichlorobromomethane ug/l	1/11/12	No Discharge
Dichlorobromomethane ug/l	1/23/12	No Discharge
Dichlorobromomethane ug/l	1/24/12	No Discharge
Dichlorobromomethane ug/l	1/25/12	No Discharge
Dichlorobromomethane ug/l	1/26/12	No Discharge
Dichlorobromomethane ug/l	1/27/12	No Discharge
Dichlorobromomethane ug/l	1/28/12	No Discharge
Dichlorobromomethane ug/l	2/7/12	No Discharge
Dichlorobromomethane ug/l	2/7/12	No Discharge
Dichlorobromomethane ug/l	2/7/12	No Discharge
Dichlorobromomethane ug/l	2/7/12	No Discharge
Dichlorobromomethane ug/l	2/7/12	No Discharge
Dichlorobromomethane ug/l	2/7/12	No Discharge
Dichlorobromomethane ug/l	2/7/12	No Discharge
Dichlorobromomethane ug/l	2/8/12	No Discharge
Dichlorobromomethane ug/l	2/14/12	No Discharge
Dichlorobromomethane ug/l	2/15/12	No Discharge
Dichlorobromomethane ug/l	2/16/12	No Discharge
Dichlorobromomethane ug/l	2/22/12	No Discharge
Dichlorobromomethane ug/l	2/23/12	No Discharge
Dichlorobromomethane ug/l	2/24/12	No Discharge
Dichlorobromomethane ug/l	3/6/12	No Discharge
Dichlorobromomethane ug/l	3/6/12	No Discharge
Dichlorobromomethane ug/l	3/6/12	No Discharge
Dichlorobromomethane ug/l	3/6/12	No Discharge
Dichlorobromomethane ug/l	3/6/12	No Discharge
Dichlorobromomethane ug/l	3/7/12	No Discharge
Dichlorobromomethane ug/l	3/7/12	No Discharge
Dichlorobromomethane ug/l	3/7/12	No Discharge
Dichlorobromomethane ug/l	4/3/12	No Discharge
Dichlorobromomethane ug/l	4/3/12	No Discharge
Dichlorobromomethane ug/l	4/3/12	No Discharge
Dichlorobromomethane ug/l	4/3/12	No Discharge

Analyte	Date	DCBM (µg/l)
Dichlorobromomethane ug/l	4/3/12	No Discharge
Dichlorobromomethane ug/l	4/4/12	No Discharge
Dichlorobromomethane ug/l	4/4/12	No Discharge
Dichlorobromomethane ug/l	4/4/12	No Discharge
Dichlorobromomethane ug/l	4/17/12	No Discharge
Dichlorobromomethane ug/l	4/18/12	37.6
Dichlorobromomethane ug/l	5/8/12	26.6
Dichlorobromomethane ug/l	5/8/12	No Discharge
Dichlorobromomethane ug/l	11/13/12	26.3
Dichlorobromomethane ug/l	11/13/12	No Discharge
Dichlorobromomethane ug/l	11/19/12	No Discharge
Dichlorobromomethane ug/l	11/19/12	No Discharge
Dichlorobromomethane ug/l	11/19/12	No Discharge
Dichlorobromomethane ug/l	11/19/12	No Discharge
Dichlorobromomethane ug/l	11/19/12	No Discharge
Dichlorobromomethane ug/l	11/19/12	No Discharge
Dichlorobromomethane ug/l	11/19/12	No Discharge
Dichlorobromomethane ug/l	11/19/12	No Discharge
Dichlorobromomethane ug/l	11/20/12	No Discharge
Dichlorobromomethane ug/l	12/4/12	No Discharge
Dichlorobromomethane ug/l	12/4/12	No Discharge
Dichlorobromomethane ug/l	12/4/12	No Discharge
Dichlorobromomethane ug/l	12/4/12	No Discharge
Dichlorobromomethane ug/l	12/5/12	No Discharge
Dichlorobromomethane ug/l	12/5/12	No Discharge
Dichlorobromomethane ug/l	12/5/12	No Discharge
Dichlorobromomethane ug/l	12/10/12	No Discharge
Dichlorobromomethane ug/l	1/8/13	No Discharge
Dichlorobromomethane ug/l	1/8/13	No Discharge
Dichlorobromomethane ug/l	1/15/13	No Discharge
Dichlorobromomethane ug/l	1/15/13	No Discharge
Dichlorobromomethane ug/l	1/15/13	No Discharge
Dichlorobromomethane ug/l	1/15/13	No Discharge
Dichlorobromomethane ug/l	1/15/13	No Discharge
Dichlorobromomethane ug/l	1/15/13	No Discharge
Dichlorobromomethane ug/l	1/15/13	No Discharge
Dichlorobromomethane ug/l	2/5/13	No Discharge
Dichlorobromomethane ug/l	2/5/13	No Discharge
Dichlorobromomethane ug/l	2/5/13	No Discharge

Analyte	Date	DCBM (µg/l)
Dichlorobromomethane ug/l	2/5/13	No Discharge
Dichlorobromomethane ug/l	2/5/13	No Discharge
Dichlorobromomethane ug/l	2/5/13	No Discharge
Dichlorobromomethane ug/l	2/5/13	No Discharge
Dichlorobromomethane ug/l	3/5/13	No Discharge
Dichlorobromomethane ug/l	3/5/13	No Discharge
Dichlorobromomethane ug/l	3/5/13	No Discharge
Dichlorobromomethane ug/l	3/5/13	No Discharge
Dichlorobromomethane ug/l	3/5/13	No Discharge
Dichlorobromomethane ug/l	3/5/13	No Discharge
Dichlorobromomethane ug/l	3/5/13	No Discharge
Dichlorobromomethane ug/l	3/5/13	No Discharge
Dichlorobromomethane ug/l	4/2/13	No Discharge
Dichlorobromomethane ug/l	4/2/13	No Discharge
Dichlorobromomethane ug/l	4/2/13	No Discharge
Dichlorobromomethane ug/l	4/2/13	No Discharge
Dichlorobromomethane ug/l	4/2/13	No Discharge
Dichlorobromomethane ug/l	4/2/13	No Discharge
Dichlorobromomethane ug/l	4/2/13	No Discharge
Dichlorobromomethane ug/l	4/16/13	36
Dichlorobromomethane ug/l	4/16/13	No Discharge
Dichlorobromomethane ug/l	5/8/13	38
Dichlorobromomethane ug/l	5/8/13	No Discharge
Dichlorobromomethane ug/l	5/21/13	No Discharge
Dichlorobromomethane ug/l	5/29/13	No Discharge
Dichlorobromomethane ug/l	5/29/13	No Discharge
Dichlorobromomethane ug/l	5/29/13	No Discharge
Dichlorobromomethane ug/l	5/29/13	No Discharge
Dichlorobromomethane ug/l	5/29/13	No Discharge
Dichlorobromomethane ug/l	6/18/13	No Discharge
Dichlorobromomethane ug/l	6/18/13	No Discharge
Dichlorobromomethane ug/l	6/18/13	No Discharge
Dichlorobromomethane ug/l	6/18/13	No Discharge
Dichlorobromomethane ug/l	6/19/13	No Discharge
Dichlorobromomethane ug/l	7/9/13	No Discharge
Dichlorobromomethane ug/l	7/9/13	No Discharge
Dichlorobromomethane ug/l	7/9/13	No Discharge
Dichlorobromomethane ug/l	7/9/13	No Discharge
Dichlorobromomethane ug/l	7/9/13	No Discharge

Analyte	Date	DCBM (µg/l)
Dichlorobromomethane ug/l	7/9/13	No Discharge
Dichlorobromomethane ug/l	8/6/13	No Discharge
Dichlorobromomethane ug/l	8/6/13	No Discharge
Dichlorobromomethane ug/l	8/6/13	No Discharge
Dichlorobromomethane ug/l	8/6/13	No Discharge
Dichlorobromomethane ug/l	8/6/13	No Discharge
Dichlorobromomethane ug/l	8/26/13	No Discharge
Dichlorobromomethane ug/l	9/3/13	No Discharge
Dichlorobromomethane ug/l	9/10/13	No Discharge
Dichlorobromomethane ug/l	9/17/13	No Discharge
Dichlorobromomethane ug/l	9/17/13	No Discharge
Dichlorobromomethane ug/l	9/17/13	No Discharge
Dichlorobromomethane ug/l	9/17/13	No Discharge
Dichlorobromomethane ug/l	9/17/13	No Discharge
Dichlorobromomethane ug/l	10/8/13	No Discharge
Dichlorobromomethane ug/l	10/8/13	No Discharge
Dichlorobromomethane ug/l	10/8/13	No Discharge
Dichlorobromomethane ug/l	10/8/13	No Discharge
Dichlorobromomethane ug/l	10/21/13	No Discharge
Dichlorobromomethane ug/l	10/22/13	No Discharge
Dichlorobromomethane ug/l	10/23/13	No Discharge
Dichlorobromomethane ug/l	10/28/13	No Discharge
Dichlorobromomethane ug/l	11/13/13	No Discharge
Dichlorobromomethane ug/l	11/13/13	No Discharge
Dichlorobromomethane ug/l	11/13/13	No Discharge
Dichlorobromomethane ug/l	11/13/13	No Discharge
Dichlorobromomethane ug/l	11/13/13	No Discharge
Dichlorobromomethane ug/l	11/27/13	No Discharge
Dichlorobromomethane ug/l	11/28/13	No Discharge
Dichlorobromomethane ug/l	11/29/13	No Discharge
Dichlorobromomethane ug/l	12/3/13	No Discharge
Dichlorobromomethane ug/l	12/3/13	No Discharge
Dichlorobromomethane ug/l	12/3/13	No Discharge
Dichlorobromomethane ug/l	12/3/13	No Discharge
Dichlorobromomethane ug/l	12/3/13	No Discharge
Dichlorobromomethane ug/l	12/3/13	No Discharge
Dichlorobromomethane ug/l	1/7/14	No Discharge
Dichlorobromomethane ug/l	1/7/14	No Discharge
Dichlorobromomethane ug/l	1/7/14	No Discharge

Analyte	Date	DCBM (µg/l)
Dichlorobromomethane ug/l	1/7/14	No Discharge
Dichlorobromomethane ug/l	1/7/14	No Discharge
Dichlorobromomethane ug/l	1/7/14	No Discharge
Dichlorobromomethane ug/l	1/7/14	No Discharge
Dichlorobromomethane ug/l	1/15/14	No Discharge
Dichlorobromomethane ug/l	1/15/14	No Discharge
Dichlorobromomethane ug/l	1/22/14	No Discharge
Dichlorobromomethane ug/l	1/23/14	No Discharge
Dichlorobromomethane ug/l	1/29/14	No Discharge
Dichlorobromomethane ug/l	2/4/14	No Discharge
Dichlorobromomethane ug/l	2/4/14	No Discharge
Dichlorobromomethane ug/l	2/4/14	No Discharge
Dichlorobromomethane ug/l	2/4/14	No Discharge
Dichlorobromomethane ug/l	2/4/14	No Discharge
Dichlorobromomethane ug/l	2/4/14	No Discharge
Dichlorobromomethane ug/l	2/13/14	No Discharge
Dichlorobromomethane ug/l	3/11/14	No Discharge
Dichlorobromomethane ug/l	3/11/14	No Discharge
Dichlorobromomethane ug/l	3/11/14	No Discharge
Dichlorobromomethane ug/l	3/11/14	No Discharge
Dichlorobromomethane ug/l	3/11/14	No Discharge
Dichlorobromomethane ug/l	3/11/14	No Discharge
Dichlorobromomethane ug/l	3/11/14	No Discharge
Dichlorobromomethane ug/l	3/11/14	No Discharge
Dichlorobromomethane ug/l	3/13/14	No Discharge
Dichlorobromomethane ug/l	3/13/14	No Discharge
Dichlorobromomethane ug/l	3/14/14	No Discharge
Dichlorobromomethane ug/l	3/14/14	No Discharge
Dichlorobromomethane ug/l	4/2/14	No Discharge
Dichlorobromomethane ug/l	4/2/14	No Discharge
Dichlorobromomethane ug/l	4/2/14	No Discharge
Dichlorobromomethane ug/l	4/2/14	No Discharge
Dichlorobromomethane ug/l	4/2/14	No Discharge
Dichlorobromomethane ug/l	4/2/14	No Discharge
Dichlorobromomethane ug/l	4/2/14	No Discharge
Dichlorobromomethane ug/l	4/2/14	No Discharge

Table 3 - 005 TTHM Testing Data 10/2010 – 4/2014

Analyte	Date	005 Effluent TTHM	Effluent Limit
Total trihalomethanes ug/l	05-Oct-10	No Discharge	154
Total trihalomethanes ug/l	13-Oct-10	No Discharge	154
Total trihalomethanes ug/l	13-Oct-10	No Discharge	154
Total trihalomethanes ug/l	13-Oct-10	No Discharge	154
Total trihalomethanes ug/l	08-Nov-10	No Discharge	154
Total trihalomethanes ug/l	04-Dec-10	No Discharge	154
Total trihalomethanes ug/l	04-Jan-11	No Discharge	154
Total trihalomethanes ug/l	04-Jan-11	No Discharge	154
Total trihalomethanes ug/l	14-Feb-11	No Discharge	154
Total trihalomethanes ug/l	07-Mar-11	No Discharge	154
Total trihalomethanes ug/l	05-Apr-11	No Discharge	154
Total trihalomethanes ug/l	02-May-11	No Discharge	154
Total trihalomethanes ug/l	06-Jun-11	No Discharge	154
Total trihalomethanes ug/l	12-Oct-11	99	154
Total trihalomethanes ug/l	08-Nov-11	100	154
Total trihalomethanes ug/l	16-Nov-11	No Discharge	154
Total trihalomethanes ug/l	16-Nov-11	No Discharge	154
Total trihalomethanes ug/l	06-Dec-11	No Discharge	154
Total trihalomethanes ug/l	10-Jan-12	No Discharge	154
Total trihalomethanes ug/l	10-Jan-12	No Discharge	154
Total trihalomethanes ug/l	07-Feb-12	No Discharge	154
Total trihalomethanes ug/l	06-Mar-12	No Discharge	80
Total trihalomethanes ug/l	04-Apr-12	No Discharge	80
Total trihalomethanes ug/l	18-Apr-12	162	80
Total trihalomethanes ug/l	08-May-12	100	80
Total trihalomethanes ug/l	13-Nov-12	70	80
Total trihalomethanes ug/l	19-Nov-12	No Discharge	80
Total trihalomethanes ug/l	19-Nov-12	No Discharge	80
Total trihalomethanes ug/l	10-Dec-12	No Discharge	80
Total trihalomethanes ug/l	08-Jan-13	No Discharge	80
Total trihalomethanes ug/l	08-Jan-13	No Discharge	80
Total trihalomethanes ug/l	05-Feb-13	No Discharge	80
Total trihalomethanes ug/l	05-Mar-13	No Discharge	80
Total trihalomethanes ug/l	02-Apr-13	No Discharge	80
Total trihalomethanes ug/l	16-Apr-13	110	80
Total trihalomethanes ug/l	08-May-13	110	80

Analyte	Date	005 Effluent TTHM	Effluent Limit
Total trihalomethanes ug/l	29-May-13	No Discharge	80
Total trihalomethanes ug/l	19-Jun-13	No Discharge	80
Total trihalomethanes ug/l	09-Jul-13	No Discharge	80
Total trihalomethanes ug/l	09-Jul-13	No Discharge	80
Total trihalomethanes ug/l	06-Aug-13	No Discharge	80
Total trihalomethanes ug/l	17-Sep-13	No Discharge	80
Total trihalomethanes ug/l	08-Oct-13	No Discharge	80
Total trihalomethanes ug/l	13-Nov-13	No Discharge	80
Total trihalomethanes ug/l	03-Dec-13	No Discharge	80
Total trihalomethanes ug/l	07-Jan-14	No Discharge	80
Total trihalomethanes ug/l	07-Jan-14	No Discharge	80
Total trihalomethanes ug/l	04-Feb-14	No Discharge	80
Total trihalomethanes ug/l	11-Mar-14	No Discharge	80
Total trihalomethanes ug/l	02-Apr-14	No Discharge	80

INFORMATION ONLY

December 1, 2014 JPA Board Meeting

TO: Board of Directors

FROM: Facilities & Operations

Subject: SCADA Communications Upgrade Phase 1: Reject Bids and Authorize Revision of Plans and Specifications and New Call for Bids (Pg. 257)

At its November 25, 2014 Board meeting, the LVMWD Board, acting as Administering Agent for the Las Virgenes-Triunfo Joint Powers Authority (JPA), rejected all bids for the SCADA Communications Upgrade Phase 1 Project; authorized the General Manager to approve a change of scope to MSO Technologies, Inc., in the amount of $11,200, to revise the plans and specifications; and authorized a new Call for Bids for the project based on the revised bid package.

~~SUMMARY~~:

The SCADA Communications Upgrade Phase 1 Project consists of installing a backbone ethernet radio network system for communications between control systems at various field sites and operational facilities throughout the District. On August 26, 2014, the Board approved the plans and specifications prepared by MSO Technologies, Inc. (MSO) for Phase 1 of the overall upgrade effort and approved a Call for Bids. Although three contractors were represented at the mandatory pre-bid meeting and job walk, only the following two bids were received and publicly opened on October 13, 2014:

Miron Electric	$1,127,700.00
Taft Electric	$1,035,310.00

Both bids were significantly higher than the engineer's estimate of $873,725.00 for the work. Staff and MSO performed an evaluation of the bids received and contacted the contractors and suppliers better understand the higher-than-expected bids. The reasons cited for the higher bids included the remoteness of the various sites, challenges related to site access, uncertainty related to the scope of work, large number of sites (20 total) and assumed risk for the project.

Staff and MSO recommend that the plans and specifications be revised to address the issues affecting the bidding environment, particularly to clarify the scope of work for the various sites given the complexity of the project. The revisions should reduce uncertainty associated with the work and encourage a more competitive bidding environment. As a result, staff recommends that the Board reject all bids and authorize revision of the plans and specifications, followed by issuance of a new Call for Bids.

~~FISCAL IMPACT~~:

Yes

~~ITEM BUDGETED~~:

Yes

~~FINANCIAL IMPACT~~:

The cost of the change of scope for MSO Technologies, Inc., to revise the plans and specifications is $11,200. Sufficient funds are available in the adopted Fiscal Year 2014-15 Budget for the work. Five of the 20 total sites are JPA-owned sites for which the costs are allocated 70.6% to LVMWD and 29.4% to Triunfo Sanitation District. The additional cost to revise the plans and specifications will be prorated

between LVMWD-only (75%) and JPA-owned sites (25%).

DISCUSSION:

Following is a summary of the key findings and proposed resolutions for the items identified to have contributed to the higher-than-expected bids.

	Findings	Resolutions
1	Contractors claimed remoteness to sites and lack of access (longer travel time and increased rental equipment usage)	Include a field visit to each site during the job walk, so the contractors have a better understanding of each location and its accessibility.
2	Confusion on the scope of work at sites	Revise the plans and specifications to provide added clarification on the scope of work for each project site, including a detailed description. Provide a presentation at the pre-bid meeting, summarizing the specific work for each project site.
3	Lack of published engineer's estimate	Provide a detailed engineer's estimate and make it available to bidders
4	Lack of provision for local staging	Provide specific locations noted on the plans and specifications for staging of the contractor's equipment and materials.
5	Assumed risk without seeing each site	Include a field visit to each site during the job walk, so the contractors have a better understanding of each location and its accessibility.
6	Lack of Bidders	Reach out to additional qualified contractors and suppliers in an effort to increase bidding participation and competition.

The proposed schedule for re-bid of the project is as follows:

First Advertisement January 05, 2015

Second Advertisement January 12, 2015

Pre-Bid Meeting January 21, 2015

Bid Opening February 11, 2015

Award of Contract February 24, 2015

Prepared By: Eric Schlageter, P.E., Associate Engineer

ATTACHMENTS:

MSO Bid Evaluation and Recommendation Letter

Scope Change MSO

MSO *Technologies, Inc.*

2985 East Hillcrest Drive, Suite 101
Thousand Oaks, CA 91362

Voice (805) 379-8668
Fax (805) 379-8677

November 4, 2014

Eric Schlageter, PE
Las Virgenes Municipal Water District
4232 Las Virgenes Dr.
Calabasas CA.

REF: SCADA Network Upgrade Project Phase 1 Bid Response

Dear Eric,

The current SCADA Network Upgrade Phase 1 project is to install the Ethernet radio network system backbone for the communications for the control systems at various sites and operational centers throughout the District. The project consists of several District facilities, radio repeater sites at certain tank sites, and smaller pump stations, pressure regulating valves, and MWD tie in locations.

Two electrical contracting companies submitted bids for the project. One company, Taft Electric, has done numerous projects for the District over many years. The other contractor, Miron Electric, has done work with other water agencies such as City of Glendale and City of Los Angeles, and power projects for City of Anaheim and City of Burbank. Both companies attended the mandatory job walks and both submitted questions for clarifications on the project documents.

The two bids received were significantly higher than the engineer's estimate. The bidders are required to submit a detailed bid list breakdown which enables us to analyze their bids to determine if, and why, a bid should be rejected. It is our recommendation the District rejects all submitted bids. The following items outline why the District should reject the bids and proceed with the process to solicit new bids for the project.

1) The submitted costs for repeater site bid items had discrepancies between the high and low bidder compared to the engineers estimate. One contractor's bid amounts were almost twice the amount of the engineers estimate. They claimed the remoteness or lack of easy access to the repeater sites required longer travel time and rental equipment usage. However, the other contractor's submitted bid amounts for the repeater sites were similar to the engineers estimate.

2) There was also some confusion on the scope of work at the repeater sites even though there were detailed drawings and work descriptions in the specifications.

3) The bid amounts for the smaller sites varied greatly even though the smaller sites require only minor modifications to existing pump stations. The apparent low bidder's estimate for the smaller sites were three to seven times the engineer's estimate but the high bidder's amount was reasonably close to the engineer's estimate. The materials and labor for the minor modifications should have been about $3,000 for materials and a day

or two of installation labor. It appears one contractor or its subcontractor just "guessed" at what the costs would be for the smaller sites even though the materials and scope of work were clearly documented on the drawings and specifications.

4) Another concern of the contractors was the lack of provision for local staging place for the contractor to store materials and equipment relatively close to the sites. So the contractors added time for material staging and storage at the Contractor's facilities.

5) The engineer's estimate was not published so the bidders had no estimate for each type of site to compare their numbers to. Sometimes, when Contractors do not have the answers, they simply guess to have a safe and profitable number.

Suggestions for Rebid package

1) Provide extremely obvious clarifications of the existing scope of work descriptions at each of the different sites. This should include descriptions of how the work is to be done and what is to be expected in the work.

2) Provide an engineer's estimate for each type of site, utility powered repeater, solar power repeater, and remote site costs so the contractors have a guideline on what to expect for costs.

3) On the drawings and specifications, provide a few locations for the Contractor to have a staging and storage area at certain District locations such as LV2 pump station and Rancho or Tapia.

4) During the mandatory bid walk, review with the bidding contractors, the work at all of the sites using power point presentation of the sites. Then take the bidding contractors to all of the repeater sites, all of the connection facilities, and some of the smaller pump stations.

5) Contact other capable contractors to give them the opportunity to bid on the project after the clarifications to the bid documents have been completed.

In summary, it is our opinion all of the bids should be rejected because the contractors clearly did not understand the scope of the work, material supply, and installation of the equipment. If you have any questions please send me an email at lftrick@msotech.com or call ne at (805) 379-8668 ext. 1002.

Sincerely,

MSO *Technologies*

Lloyd Trick PE

CHANGE IN SCOPE TO PROFESSIONAL SERVICES AGREEMENT # 14986-OJ

Project Title: Phase 1 SCADA Communications Upgrade

Consultant:DD MSO Technologies, Inc.

Nature Of Changes:

The current SCADA Network Upgrade Phase 1 project plan set went out to bid in September and project bids were received in October. These bids were significantly higher than the Engineer's estimate. The change in scope to MSO Technologies Inc. is for revising the plans and specifications and for preparing a Powerpoint presentation to contractors during a mandatory pre-bid meeting in support of re-bidding of the project.

Fee Adjustment		Time Adjustment	
Previous Fee:	$134,660.00	Previous Deadline:	
Increase/~~Decrease~~:	$11,200.00	Additional Time:	
Estimate ☐ Lump Sum ☐ Not to Exceed ☑		New Deadline:	
Revised Fee:	$145,860.00		

Las Virgenes Municipal Water District

Eric Schlageter, P.E.

David W. Pedersen, General Manager

Date:

MSO Technologies, Inc.

2985 East Hillcrest Drive, Suite 101
Thousand Oaks, CA 91362

Voice (805) 379-8668
Fax (805) 379-8677

November 10, 2014

Eric Schlageter, PE
Las Virgenes Municipal Water District
4232 Las Virgenes Dr.
Calabasas CA.

REF: SCADA Network Upgrade Project Phase 1 Design Package Corrections

Dear Eric,

The current SCADA Network Upgrade Phase 1 project plan set went out to bid in September and project bids were received in October. These bids were significantly higher than the Engineer's estimate. A review of the bidders' comments indicates there was some confusion in the scope of work at some of the sites or what was to be provided by the contractor. The other concern was the limited number of bids received.

Project Plan Package Corrections

- Drawing for reservoir repeater sites: provide more detailed Construction Notes or Scope of Work listing every macro component the Contractor is to furnish and install.
- Drawings for reservoir repeater sites: relocate conduits and change conduit installation instructions to remove red slurry to compact with site materials.
- Drawings for all sites: highlight which equipment is NEW and EXISTING and which components are in the SCOPE OF WORK.
- Drawings for main communication connection sites: correct roofing on Rancho to a peaked roof and LV2 to a parapet roof type.
- Specifications: on project scope of work section, correlate site work on drawings to match site work in specification.
- Specifications: on project scope of work section, clarify requirements for antenna aligning and adjustment.
- Specifications: clarify chain link fence specification to be more open and less restrictive on type and materials.
- Specifications: on project scope of work, list sites the contractor can use as staging areas for equipment and materials at District locations such as LV2, and Rancho.

Job Walk Presentation

- Prepare a PowerPoint presentation of work at each site which includes drawings, photographs, and cost estimates.
- Communicate to other viable contractors and control panel shops about the project to get more bids on the project.

Eric Schlageter, PE
Las Virgenes Municipal Water District
SCADA Network Upgrade Project Phase 1 Corrections

The effort for the above corrections should only take a few weeks of drafting and specification rework. The following is a cost breakdown for the work to correct the drawings and specifications as noted above.

Task	Description	Hours	Rate	Extended
1	Drawing corrections	56	$140.00	$7,840.00
2	Specification corrections	12	$140.00	$1,680.00
3	Job walk presentation	12	$140.00	$1,680.00
			Total	**$11,200.00**

If you have any questions please email (lftrick@msotech.com) or call at (805) 379-8668 ext. 1002.

Sincerely,

MSO *Technologies*

Lloyd Trick PE

INFORMATION ONLY

December 1, 2014 JPA Board Meeting

TO: JPA Board of Directors

FROM: Finance & Administration

Subject: Supply and Delivery of Aluminum Sulfate and Sodium Bisulfite: Award of Contracts (Pg. 264)

The LVMWD Board, as the Administering Agent of the Las Virgenes-Triunfo Joint Powers Authority (JPA), recently accepted two annual chemical bids: one for the purchase of aluminum sulfate and the other for sodium bisulfite. The aluminum sulfate bid was awarded by the Administering Agent/General Manager, due to the total dollar amount being below the threshold that requires Board approval, and the sodium bisulfite was awarded by the LVMWD Board.

~~SUMMARY~~:

Contracts for the supply and delivery of aluminum sulfate and sodium bisulfite were recently awarded to ChemTrade and JCI Jones Chemical, Inc., respectively. The two chemicals are used for the various treatment processes at the Tapia Water Reclamation Facility. The unit prices for both chemicals declined, resulting in an overall cost-savings to the JPA.

~~FISCAL IMPACT~~:

Yes

~~ITEM BUDGETED~~:

Yes

~~FINANCIAL IMPACT~~:

Funds for the purchase of both chemicals are available in current Fiscal Year 2014-15 JPA Budget and will be proposed in future year budgets. The unit pricing for aluminum sulfate declined from $1.566 to $0.729 per gallon. The unit pricing for sodium bisulfite declined from $1.36 to $1.33 per gallon.

~~DISCUSSION~~:

Aluminum sulfate is used to enhance the coagulation of solids during the tertiary treatment process at the Tapia Water Reclamation Facility. A formal bid was issued and resulted in a reduced cost, which did not require formal approval by the LVMWD Board for award. The Administering Agent/General Manager executed an agreement for aluminum sulfate with ChemTrade, in the annual amount of $14,798.70, with four one-year renewal options. The bid summary is provided below:

Supplier	Unit Cost ($/gallon)	Total
~~ChemTrade~~	~~$.729~~	~~$14,798.70~~
Thatcher	$1.0548	$21,412.44
Univar & Brentagg		No Bid

Sodium bisulfite is used as a dechlorinating agent to eliminate chlorine residual in treated water prior to discharge from the Tapia Water Reclamation Facility to Malibu Creek and/or the Los Angeles River. A formal bid was issued and three responses were received. The low bid was submitted by the current vendor, JCI Jones Chemical, Inc., and accepted by the LVMWD Board on October 14, 2014. With delegated authority from the LVMWD Board, the Administering Agent/General Manager executed an agreement for sodium bisulfite with JCI Jones Chemical, in the annual amount of $167,580.00, with four one-year renewal options. The bid summary is provided below:

Supplier	Unit Cost ($/gallon)	Total
"JCI" Jones Chemical, Inc.	$1.33	$167,580.00
Brentagg	$1.444	$181,994.00
Univar	$1.349	$169,974.00

Prepared By: Gretchen Bullock, Buyer

INFORMATION ONLY

December 1, 2014 JPA Board Meeting

TO: Board of Directors

FROM: Facilities & Operations

Subject: Tapia Primary Clarifier No. 1 Rehabilitation Project: Final Acceptance (Pg. 266)

The Las Virgenes-Triunfo Joint Powers Authority (JPA) approved funding for this matter in the JPA Budget. At its November 25, 2014 meeting, the LVMWD Board, acting as the Administering Agent for the JPA, waived the liquidated damage related to the 55 days of delays in completing the project; approved the execution of a Notice of Completion by the Secretary of the Board and had the same recorded; and, in the absence of claims from subcontractors and others, released the retention in the amount of $24,140.32 thirty calendar days after filing the Notice of Completion for the Tapia Primary Clarifier No. 1 Rehabilitation Project.

SUMMARY:

On April 22, 2014, a construction contract was awarded to Offshore Construction, Inc., in the amount of $169,500, for the rehabilitation of Tapia Primary Clarifier No. 1. The original completion date was July 23, 2014. The project consisted of concrete repair, installation of protective coating and replacement of corroded aluminum launders and influent diffusers. Two change orders were approved for the project, increasing the contract amount by $71,903.18 and providing a 65-day time extension.

The work was completed on November 21, 2014. Although the completion date is 55 calendar days beyond that allowed for the contract with the time extension, staff does not recommend the application of liquidated damages due to unexpected delays that were outside the control of the contractor. There are no outstanding issues to prevent acceptance of the project. As a result, staff recommends filing a Notice of Completion and release of the retention as stipulated in the contract documents.

FISCAL IMPACT:

Yes

ITEM BUDGETED:

Yes

FINANCIAL IMPACT:

Sufficient funds are available in the adopted Fiscal Year 2014-15 JPA Budget for this project.

DISCUSSION:

The General Manager administratively approved Change Order No. 1 in the amount of $22,565 on July 15, 2014 to increase the stainless steel launder size from 15"x 15" as shown in the construction documents to 24"x 24" as measured in the field. On October 28, 2014, the Board approved Change Order No. 2 in the amount of $49,338.18. Change Order 2 consisted of two items. Item No. 1 was for an increase the interior concrete surface coating area for $59,000. Item No. 2 was for a deductive credit in the amount of $9,661.82 for the cost difference between the specified coating and an alternative coating that was equivalent and approved for use. The net cost of Change Order No. 2 was $49,338.18. Also, Change Order No. 2 included a 65-calendar day extension for delays in obtaining the resized launders associated with Change Order No. 1 and for completion of the additional surface area coating.

Following is a summary of the total construction cost:

Construction Contract: $169,500.00

Change Order No. 1 $22,565.00

Change Order No. 2 $49,338.18

Total Construction Cost: $241,403.18

The contractor experienced a 55-calendar day delay to complete the project beyond the time extension authorized with Change Order No. 2. The longer-than-expected delay was associated with time required for submittal approvals, fabrication and shipment of the larger launders, and installation of the equipment. The delay was outside the control of the contractor and did not negatively impact the operation of the Tapia Water Reclamation Facility. No additional construction management costs were incurred because the project was managed by the District's staff. Also, the contractor was very cooperative with District during construction, minimizing potential impact of the work on operations and soliciting competitive quotes for material changes. As a result, staff recommends that liquidated damages be waived.

Prepared By: John Zhao, P.E., Principal Engineer

INFORMATION ONLY

December 1, 2014 JPA Board Meeting

TO: JPA Board of Directors

FROM: General Manager

Subject: Board Meeting Follow-up Items (Pg. 268)

SUMMARY:

Attached is a list of follow-up items from previous JPA Board meetings. The list provides a brief description of the various items, origination dates, and responsible managers.

FISCAL IMPACT:

No

ITEM BUDGETED:

No

Prepared By: David W. Pedersen, Administering Agent/General Manager

ATTACHMENTS:

Follow-Up Items

BOARD MEETING FOLLOW-UP ITEMS

Item No.	Origination Date	JPA or LVMWD	Description	Responsible Manager
1	07/07/2014	JPA	Report back on the outcome/resolution of the Tapia NPDES Permit Exceedences issue with the RWQCB.	Lippman
2	10/06/2014	JPA	Woodland Hills Country Club Recycled Water Pricing Options: Provide Pro-forma Financial Analysis for Option Nos. 2 and 4.	Lippman
3	11/03/20143	JPA	Schedule and hold a special JPA Board meeting with MWH Global prior to the start of work on the Recycled Water Seasonal Storage Plan of Action.	Pedersen