City of Los Angeles

Recycled Water Master Planning

Los Angeles Department of Water and Power
and
Department of Public Works

Long-Term Concepts Report

Prepared by:

RMC in association with CDM Smith

Volume 2 of 2: Appendices A-K

March 2012

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Appendix A

Treatment Plant Review TM

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Summary of Modifications to the Wastewater Treatment TM since Initial Publication on November 2, 2009

The Recycled Water Master Planning (RWMP) effort has spanned three years (April 2009 – March 2012). As is the nature of a planning project, assumptions are typically modified and refined as a project is further developed. The most recent assumptions related to the Long-Term Concepts master planning effort are presented in the Draft Long-Term Concepts Report (January 2012). Assumptions and conclusions presented in this report supersede assumptions included in this technical memorandum (TM). The following table summarizes the modifications applicable to all RWMP TMs and those specifically applicable to this TM are described following the table.

Assumption	Modified	Original
Applicable to all RWMP TMs		
Recycled Water Goal	59,000 AFY by 2035 This goal reflects the 2010 LADWP Urban Water Management Plan that was adopted in early 2011, after the original RWMP goals were drafted	50,000 AFY by 2019
Introduction Section	Ignore this section and refer to the Introduction Section of the RWMP Report.	This section was included in all initial TMs but the terms described have been replaced by the Introduction Section for each RWMP report.
NPR Projects Terminology	To avoid confusion related to LADWP's water rate structure, the terms "Tier 1" and "Tier 2" are superseded with the terms "planned" and "potential," respectively. Both planned and potential projects would be considered for implementation by 2035.	"Tier 1" for NPR projects that were originally planned for design and construction by the year 2015. "Tier 2" for NPR projects that were being originally evaluated in the NPR Master Planning Report for potential future implementation after the year 2015.
Name for MF/RO/AOP treatment plant	Advanced water purification facility (AWPF)	Advanced water treatment facility (AWTF)
Name for water produced by AWPF	Purified recycled water	Advanced treated recycled water, highly purified recycled water, etc.
Treatment Plant Acronyms	DCTWRP LAGWRP	DCT LAG

The following modifications are specific to this TM.

Universal

All references to "Recycled Water Master Plan" should be replaced with "Recycled Water Master Planning".

All references to the TM title "Wastewater Treatment TM Admin Draft" should be replaced with "Treatment Plant Review TM Draft".

TM References

Throughout this TM there are references to preliminary TMs that were prepared at the onset of the RWMP effort. Relevant information from these TMs has been updated and incorporated into the three RWMP documents: GWR MPR, NPR MPR, and LTCR.

Page 11, Section 1.4

In the footnote of Table 1-1 – Summary of Findings, reference to "West Basin Water Reclamation Plant" should be replaced with "Edward C. Little WRF".

Page 28, Section 2.3.1

In Table 2-5 - HTP Main Process Facilities, the capacities of the Primary Clarifiers are:

- Battery A – Capacity is 7.7 MG (total)
- Battery B – Capacity is 11.7 MG (total)
- Battery C – Capacity is 9.7 MG (total)
- Battery D – Capacity is 7.1 MG (total)

Page 33, Section 2.4.4

Replace Section Title with "Summary of Current Under-utilized Space On-site".

Replace first sentence with "**Figure 2-10** shows the locations of current under-utilized space on the HTP site, as identified by BOS staff."

Page 53, Section 3.3.1

Table 3-7 should be replaced with the following:

Process	Description	
Headworks	**Screens**	
	Type	Mechanically Raked Climber
	Number	2 (1 duty, 1 standby)
	Design Capacity	30 mgd (each)
	Grit Pumps	
	Number	1
	Capacity	300 gpm
	Influent Pumps	
	Type	Centrifugal, non-clog
	Number	3 (1 duty, 2 standby)
	Capacity, each	25 mgd
	Flow Meters	
	Type	Magnetic
	Number	1
	Capacity, each	40 mgd
Primary Clarifiers	Total Capacity	20.8 mgd

Process	Description	
	Number	8
	Area	140 ft x 20 ft
	Water Depth	10.6 ft
	Surface Overflow Rate	940 gpd/ft^2
	Capacity, each	2.6 mgd
Aeration Tanks/ Centrifugal Blowers	**Aeration Tanks**	
	Number	6 (5 duty, 1 offline)
	Area	240 ft x 32 ft
	Average Water Depth	16 ft
	Centrifugal Blowers	
	Number	3
	Type	Centrifugal
	Capacity, each	20,000 scfm
Final Clarifiers	Number	10
	Area	170 ft x 20 ft
	Side Water Depth	9.6 ft
	Surface Area per Clarifier	3.400 ft^2
Filter Pumping	Type	Variable-Speed Filter feed pumps
	Number	3 (2 duty, 1 standby)
	Power	150 hp (each)
	Capacity	15,000 gpm (each)
Coagulation Process	Chemical	Aluminum Sulfate
	Volume of Storage Tank	7,500 gallons
Filtration	**Dual Media Filters**	
	Number	3
	Type	Sand/Anthracite Coal
	Diameter	40 ft
	Water Depth	3 ft
	Media depth – Sand	12 in
	Media depth – Anthracite Coal	12 in
	Filtration Rate	3.7 gpm/ ft^2
	Deep Bed Rectangular Filters	
	Number	5
	Media	Sand
	Media Depth	6 ft
	Support Layer	Gravel
	Support Layer Depth	1.5 ft
	Area	42 ft x 10 ft
	Filtration Rate	3.3 gpm/ ft^2
	Total Units (Dual Media plus Deep Bed)	7 duty, 1 offline
Chlorine Contact Basins	Number	2
	Tank 1 Area	177 ft x 65 ft

Process	Description	
	Tank 1 Ave Water Depth	14 ft
	Tank 2 Area	215 ft x 66 ft
	Tank 2 Avenue Water Depth	14 ft
	Detention Period at 20 mgd	3 hours
Dechlorination	**Chemical Storage Tanks**	
	Chemical	Sodium bisulfite
	Number	2
	Capacity	7,000 gal
	Chemical Metering Pumps	
	Chemical	Sodium bisulfite
	Number	4
	Capacities	68 gph per pump

Page 57, Section 3.4.3

Replace Section Title with "Summary of Current Under-utilized Space On-site".

Replace first sentence with "**Figure 3-9** shows the locations of current under-utilized space on the LAG site, as identified by BOS staff."

Page 72, Section 4.2.5

Table 4-9 - TIWRP Advanced Tertiary Effluent Quality March 2008 through July 2009 should be replaced with the following:

Parameters	Units	Average
Nitrate as N	mg/L	1.1
TN	mg/L	6.0
TDS – Average	mg/L	243
Maximum	mg/L	290
Turbidity	NTU	0.05
Temperature	°F	75.2
Total Chlorine Residual	mg/L	3.0
pH		7.4

Page 76-77, Section 4.4.2

Second sub bullet third sentence should be replaced with:

"A consultant study commissioned by BOE evaluated the potential for deep well injection of concentrate below the TIWRP site at depths ranging from 1,500 feet to 3,000 feet. "

Page 77, Section 4.4.3

Replace Section Title with "Summary of Current Under-utilized Space On-site".

Replace first sentence with "**Figure 3-9** shows the locations of current under-utilized space on the TIWRP site, as identified by BOS staff."

Page 78, Section 4.4.3

Table 4-11 - TIWRP Potential Locations for Future Treatment Infrastructure should be replaced with:

Location	Estimated Area	
	acres	ft^2
Truck Scale	0.53	23,100
Construction Material and Hazardous Waste Storage	0.87	37,900
North of Microfiltration Membranes	0.58	25,200
East of RO	0.11	4,900
Between Secondary Clarifiers and Tertiary Filters	0.32	14,100
North of Maintenance Building	0.17	7,500
Future Process Stacking above Primaries	0.57	25,000
Total	**3.15**	**137,700**

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Technical Memorandum

Title:	Wastewater Treatment TM
Version:	Administrative Draft
Prepared For:	John Hinds, Project Manager & Task 4a Lead, LADWP Doug Walters, Project Manager, BOS Lenise Marrero, Task 4a Co-Lead, BOS
Prepared by:	John Thayer, RMC Steve Clary, Task 4 Lead, RMC Miluska Propersi, RMC Javier De La Cruz, RMC
Reviewed by:	Tom Richardson, Project Manager, RMC Heather Boyle VanMeter, Deputy Project Manager, CDM Brian Dietrick, Task 4 Project Engineer, RMC Marilyn Bailey, RMC Rachael Wark, RMC
Date:	November 2, 2009
Reference:	Task 4a: Concept Report for Maximizing Reuse Task 4.1: Basic Research Task 4.1.1: Treatment Plant Review

Tables

Figures

Appendices

1. Introduction

With imported water supplies becoming ever more unpredictable, the Los Angeles Department of Water and Power (LADWP) adopted the Mayor's vision of Securing LA's Water Supply in May 2008, calling for 50,000 acre-feet per year (AFY) of potable supplies to be replaced by recycled water by 2019. To meet this near-term challenge and plan for expanding reuse in the future, LADWP has partnered with the Department of Public Works to develop the Recycled Water Master Plan (RWMP). The RWMP includes seven major tasks: 1 Groundwater Replenishment (GWR) Master Plan, 2 Non-Potable Reuse (NPR) Master Plan, 3 GWR Treatment Pilot Study, 4 Max Reuse Concept Report, 5 Satellite Feasibility Concept Report,6 Existing System Reliability Concept Report, and 7 Training.

The importance of additional water supply options for Los Angeles has become increasingly apparent with continuation of drought conditions, building contention for limited available water supplies both statewide and across the Southwest, and growing awareness of the critical nexus between quality of life/economic stability and available supplies of quality water. Significant attention has focused on the importance of indirect potable reuse given the multiple associated benefits, among them: local control; drought-resistant supplies; beneficial use of a critical, limited resource; sustained availability for future generations; existing infrastructure; lower investment and less environmental impact than other supply options; and demonstrated success nearby, across the nation and throughout the world.

This technical memorandum (TM) is a deliverable under Task 4a: Concept Report for Maximizing Reuse.

1.1 Task 4 Overview

The purpose of Task 4 is to research and identify projects that have the potential to maximize the beneficial reuse of effluent produced, or potentially produced, at three of the City of Los Angeles' (City's) existing treatment plants: Hyperion Treatment Plant (HTP), Los Angeles-Glendale Water Reclamation Plant (LAG), and Terminal Island Water Reclamation Plant (TIWRP) (**Figure 1-1**). Specifically, Task 4 will identify potential reuse opportunities beyond those already identified in projects to achieve 50,000 AFY by 2019.

Task 1 will investigate reuse opportunities at the Donald C. Tillman Water Reclamation Plant (DCT) in Van Nuys. Treatment plant facilities, operational data, and potential future reuse projects for DCT will be described in TMs prepared under Task 1.

Task 4a will identify potentially feasible projects that provide a mechanism for maximizing recycled water production and use associated with HTP, LAG, and TIWRP. Task 4b will further identify, evaluate, and develop to a concept level each potentially feasible project.

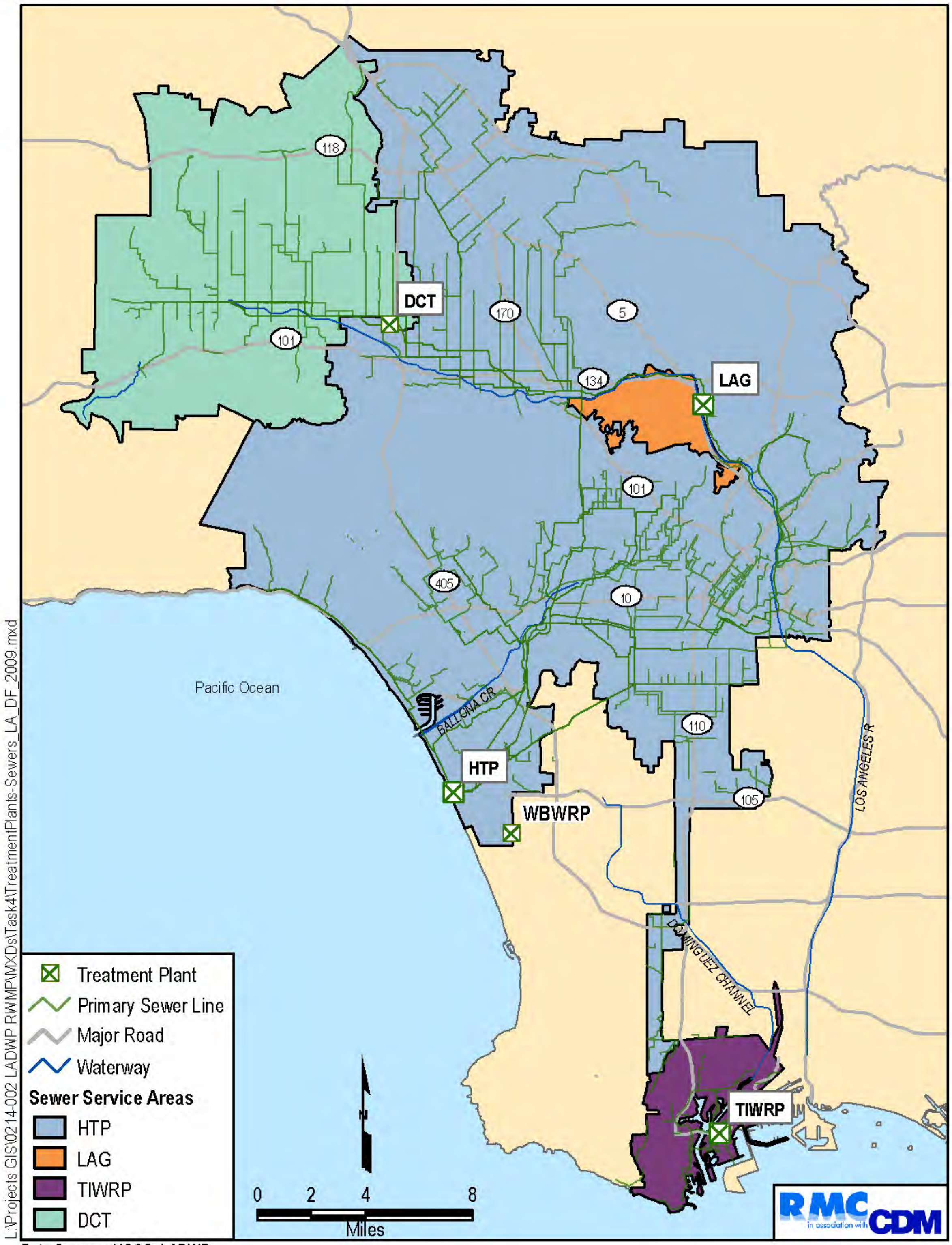
Task 4a is subdivided into the following standalone tasks:

- 4.1.1 Basic Research/Treatment Plant Review
- 4.1.2 Basic Research/Overview of Regional Recycled Water Systems
- 4.1.3 Basic Research/Regional Groundwater Assessment

- 4.1.4 Basic Research/LA River Assessment
- 4.1.5 Basic Research/Semi- and Direct Potable Reuse Special Issues
- 4.2.1 Identification of Projects/LAG Opportunities
- 4.2.2 Identification of Projects/TIWRP Opportunities
- 4.2.3 Identification of Projects/HTP Opportunities
- 4.3 Preliminary Project Screening

This TM is for Task 4.1.1 – Basic Research/ Treatment Plant Review.

Figure 1-1: Vicinity Map of Wastewater Infrastructure



Data Sources: USGS, LADWP

1.2 TM Purpose

The purpose of this Wastewater Treatment TM is to provide a summary of the existing plant infrastructure and operations for HTP, LAG, and TIWRP, including treatment plant flows and quality, current and planned treatment plant infrastructure, under-utilized space on the plant sites, and plant operational issues and trends. This TM will serve as a basis of initial information for identifying future recycled water production and delivery opportunities for each treatment plant. Those opportunities will be summarized in subsequent TMs to be developed as part of Task 4.2.

1.3 Related Technical Memoranda

Other related technical memoranda summarizing basic research for the Maximizing Reuse Concept Report include the following:

- Regional Recycled Water System TM (Task 4.1.2)
- Regional Groundwater Assessment TM (Task 4.1.3)
- LA River Flow Assessment TM (Task 4.1.4)
- Semi- and Direct Potable Reuse TM (Task 4.1.5)
- LAG Opportunities TM (Task 4.2.1)
- TIWRP Opportunities TM (Task 4.2.2)
- HTP Opportunities TM (Task 4.2.3)

The Opportunities TMs will identify potential reuse expansion projects for each treatment plant, either on the existing plant sites or at off-site locations near the treatment plants. Projects will consider increases in influent flow, flow equalization, seasonal storage of recycled water, and tertiary facilities expansion. For each potential project, RMC will identify associated facilities, capacities, increases in annual flow/production, key issues, and order of magnitude cost estimates.

The tributary sewersheds to LAG, HTP and TIWRP and their wastewater collection system are summarized in Task 5, Satellite Feasibility Concept Report, in the following TMs: the Wastewater Flow Projection TM (RMC/CDM, 2009a) and the Wastewater Collection System TM (RMC/CDM, 2009b).

1.4 Summary of Findings

The following findings from this TM will influence the type, size, and location of alternatives to maximize recycled water production at the HTP, LAG, and TIWRP treatment plant sites. Specific alternatives for expanding recycling at these sites will be developed as part of the Opportunities TMs in Task 4.2.

- **All three plants have significant site areas available for production of recyclable water.**
    - HTP could potentially site up to 200 mgd of advanced wastewater treatment (Microfiltration (MF)/Reverse Osmosis (RO)/Advanced Oxidation Process (AOP)), assuming double deck construction over the primary clarifiers and in areas currently occupied by Digester Batteries B and C. This capacity is approximately 63 percent of

the plant's 2008 average daily influent flow of 320 mgd. (As discussed below, the need for flow equalization could diminish this production potential.)

  - LAG could potentially site 45 mgd of advanced wastewater treatment, assuming single level construction in the pond and lawn area. This potential capacity also assumes the use of membrane treatment (i.e. Membrane Bioreactor (MBR)) to provide increased secondary treatment capacity, as well as, the MF step in the overall MF/RO/AOP process.

  - TIWRP could potentially site on the order of 10 mgd of additional advanced wastewater treatment assuming single level construction.

[Note: the above are preliminary conceptual estimates that will be further assessed in Task 4.2 Identification of Projects.]

- **Minimum diurnal flow rates will influence need for flow equalization.** Flow equalization may be needed at each plant to maximize the volume of water recycled while minimizing the cost of the advanced treatment facilities. Siting of such facilities will 'compete' for land space with the advanced treatment facilities and could reduce the potential advanced treatment capacities stated above. Listed below are the minimum diurnal influent flows to the three plants surveyed herein. The need to guarantee recycled water at flows greater than the minimum diurnal flows cited below will probably trigger the need for flow equalization.

  - At HTP minimum diurnal flows have been as low as 60 mgd during the past two years. Operation of Tillman and LAG plants at higher capacities than current operations have the potential to reduce this minimum diurnal flowrate.

  - At LAG minimum diurnal influent flows are less than 16 mgd.

  - At TIWRP minimum diurnal influent flows are approximately 8 mgd.

- **Optimization of secondary settling performance at HTP could allow flow equalization with 'redundant' clarifiers.** City of Los Angeles Bureau of Sanitation (BOS) and City of Los Angeles Bureau of Engineering (BOE) are experimenting with process improvements to the oxygenation process to improve settleability of secondary effluent. These improvements have the promise of reducing the number of secondary clarifiers needed to meet discharge limits by more than 20 percent. Such a performance improvement could allow 7 clarifiers (with a total volume of 11 million gallons) to be used as flow equalization basins. (West Basin Municipal Water District (WBMWD) is funding a study to add ferric chloride to the secondary clarifiers to enhance settling, which also has the potential of reducing the number of secondary clarifiers needed.)

- **Increased recycling via upstream satellite plants will impact cost of treatment at HTP.** Increased upstream recycling will decrease flows to HTP, which in turn may trigger the need for flow equalization at HTP to meet minimum recycle flowrates to customers supplied via HTP. Use of upstream membrane treatment with discharge of brine streams to the sewer will increase the TDS at HTP and associated membrane treatment costs at HTP (and at WBMWD facilities). For example, influent TDS at HTP has been 880 mg/L in the first six months of 2009, and could increase to 1000 mg/L under circumstances where a total of 45 mgd of upstream membrane treatment is implemented with brine discharge to the sewer.

- **Significant operational issues at TIWRP need to be addressed.** Several operational issues at this plant have impacted the quality of the recycled effluent, the quantity of recycled effluent available, and the reliability of effluent supply to customers. These issues include:
    - Lime system issues have resulted in particulate lime in the recycled effluent, impacting its acceptability by power plant and industrial users. (BOS is investigating use of calcium chloride as an alternative to lime.)
    - Many of the RO membranes are nearing the end of their life and need to be replaced.
    - Operational issues with the MF process have caused this system to be the flow limiting process in the advanced treatment system. (BOS has a study underway to resolve these issues.)
    - Momentary power supply interruptions can cause a 4 to 6 hour interruption to the production and supply of recycled water to customers.
- **Long-term planning issues need resolution at TIWRP.** RWQCB Order R4-2005-0024 requires that the plant cease discharge via its Harbor outfall by 2020. Although a study has been completed assessing and ranking alternatives that would comply with the order, final recommendations have not been made. Final recommendations are needed in order to optimize the plant for maximum reuse and for disposal of brine from membrane treatment processes. A strategic direction is needed to know whether the plant must rely on 100 percent effluent reuse to comply with the Order, or whether a non-Harbor outfall discharge will be used.

Other TM findings that may influence the amount and type of future recycling from each of these plants are summarized in **Table 1-1**.

Table 1-1: Summary of Findings

	HTP	LAG	TIWRP
Permitted Capacity (mgd)	450	20	30
Observed Actual Process Capacity (mgd)	350	20	30
2008 ADWF (mgd)	320	17	15
2008 Average Annual Reuse (mgd)	31[1]	3.9	3.3
Total Site (acres)	144	18	22
Potentially Underutilized Space on Treatment	17	5.7	3.1

	HTP	LAG	TIWRP
Plant Site (acres)			
Percentage of Site Potentially Underutilized	12%	31%	14%
Current Total Suspended Solids (TSS) Loading as Percentage of Design Capacity	74%	321%[2]	31%
Current Biochemical Oxygen Demand (BOD) Loading as Percentage of Design Capacity	57%	419%[2]	39%
Average Influent Total Dissolved Solids (TDS) – (mg/L)	776	726[3]	2,684

1 Secondary effluent delivered to West Basin Water Reclamation Plant.
2 High influent BOD and TSS at LAG is not representative of the BOD and TSS in the adjacent collection system. The new splitter structure built in Summer 2008 scalps wastewater from the North Outfall Sewer (NOS) in a manner that directs underflow containing high particulates to the LAG Headworks.
3 TDS value for LAG is the 2008 average effluent TDS.

Alternatives for expanding recycling at HTP, LAG, and TIWRP are discussed will be developed as part of the Opportunities TMs in Task 4.2.

2. Hyperion Treatment Plant

2.1 Background

2.1.1 General

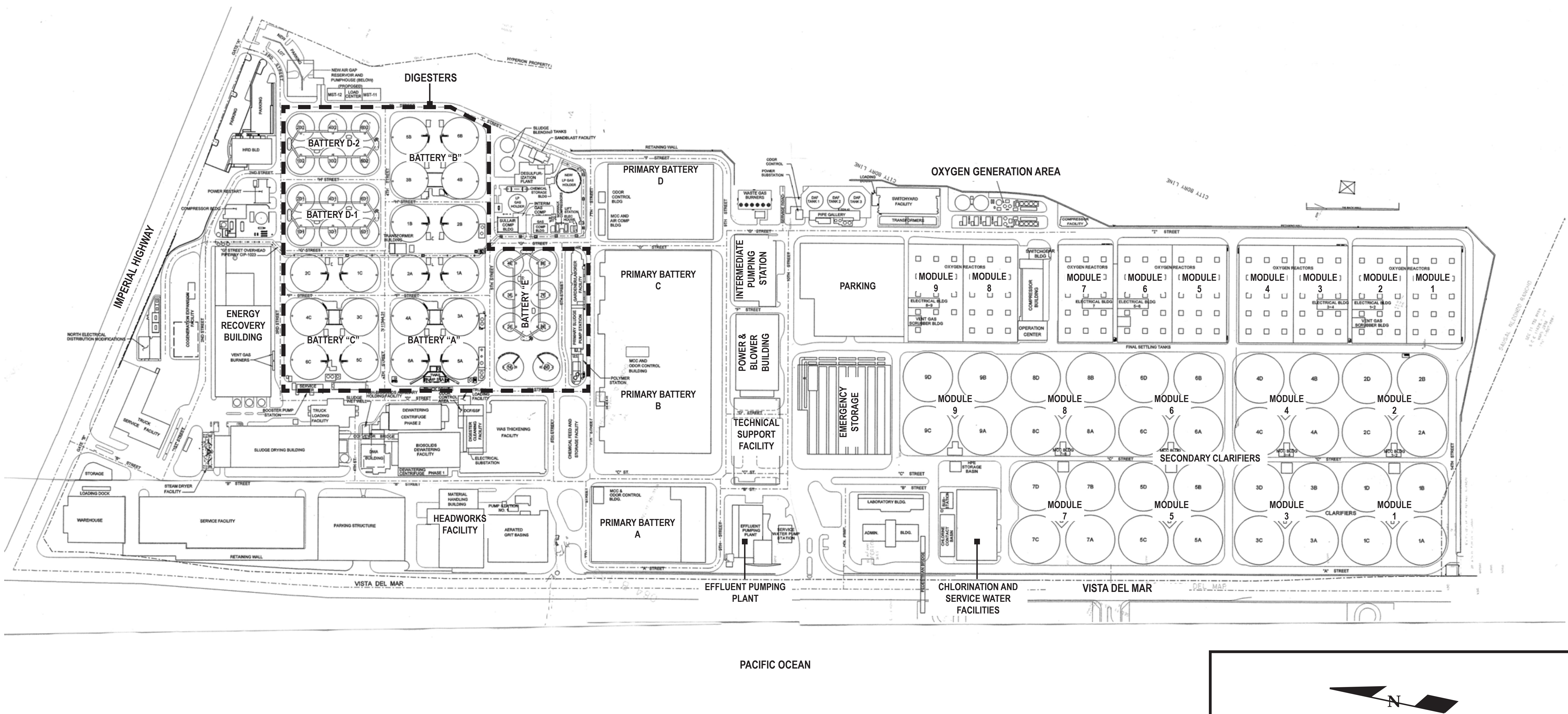
The Hyperion Treatment Plant (HTP) is located on a 144-acre site within the City of Los Angeles in the beach community of Playa Del Rey, just south of the Los Angeles International Airport (see **Figure 2-1**). It is the largest wastewater treatment plant owned by City of Los Angeles. HTP has a permitted average dry weather (ADWF) capacity of 450 million gallons per day (mgd) and the average influent flows from January through August of 2009 were 307 mgd. HTP treats raw sewage from the City of Los Angeles and other adjacent communities to secondary effluent quality standards. HTP discharges on a continuous basis through its permitted ocean outfall, which empties into Santa Monica Bay at the submerged diffuser outlets 5 miles offshore.

Figure 2-2 is an overall site plan of HTP.

Figure 2-1: HTP Site Location

Source: Google Earth Pro, 2009

Hyperion Treatment Plant
Site Plan
Figure No. 2-2



City of Los Angeles
Recycled Water Master Plan

RMC in association with CDM

Source: HTP Site Plan Obtained from BOS, August 2009

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2.1.2 Source of Influent

The HTP is located in the Hyperion Service Area (HSA) and treats wastewater from a tributary area of approximately 515 square miles, about 420 square miles of which are within the Los Angeles City limits. Located in the south portion of the HSA, HTP serves many communities as well as 27 non-City agencies which are contracted for wastewater services. The HSA is shown in Figure 1-1.

There are two additional water reclamation plants within the HSA: the Donald C. Tillman Water Reclamation Plant (DCT) in Van Nuys and the Los Angeles-Glendale Water Reclamation Plant (LAG) in the Griffith Park Area north of downtown Los Angeles. DCT and LAG are hydraulic satellite treatment plants that divert raw wastewater from the wastewater collection system and return solids back into the sewer system. The system terminates at HTP, the end-of-the-line ocean-discharge treatment facility.

The influent to HTP is approximately 90% municipal sewage and 10% industrial sewage (Communications with BOS, 2009). The HTP influent also includes solids from DCT and LAG. HTP also receives sludge from the Burbank WRP and a small wastewater treatment plant at the LA Zoo. The solids removed from the primary and secondary treatment processes at these two plants is discharged back into the collection system and is conveyed to HTP as part of the plant's influent flow.

With the current sewershed configuration, HTP acts as the buffer which allows the upstream reclamation plants to be taken off-line for maintenance or construction activities. This is one of the key features that sets HTP apart from the two upstream plants. HTP needs to have excess "standby" capacity available to accommodate increased flow in case one of the reclamation plants is off-line and HTP has to treat the raw sewage flows that would have otherwise gone to the satellite plant.

HTP also has the responsibility of processing solids for the entire HSA. Primary and secondary sludge from DCT and LAG are discharged directly to the wastewater collection system within the HTP sewershed and become part of the raw sewage influent stream at HTP. The main solids handling processes at HTP are thickening, thermophilic anaerobic digestion, and centrifuge dewatering. Dewatered solids meet EPA Class A EQ Biosolids requirements for land application and are trucked off-site to Kern County for land application. Digester methane is piped to the adjacent Scattergood Generating Station (SGS) for energy recovery. Steam from SGS is returned to HTP and used to heat the HTP digesters. SGS is a principal source of power for the DWP grid, which provides electricity for HTP.

2.1.3 Discharge Locations and Quantity

Following treatment, plant effluent is discharged to two locations as follows:

- **Ocean Discharge.** On an annual average basis, approximately 90% of the plant effluent ends up being treated and discharged as secondary effluent through an ocean outfall. Undisinfected secondary effluent is discharged through a five-mile-long, 12-feet-diameter outfall pipe ("5-Mile") extending from the treatment plant in a westward direction out into Santa Monica Bay and the Pacific Ocean. The end of the five-mile outfall has a Y-shaped diffuser section that contains approximately 1,300 discharge ports. There is a separate "one-mile" outfall pipe, but according to BOS staff, the "one-mile" outfall has not been used in recent memory, except during an inspection of the 5-mile. There is also an abandoned seven-mile outfall that was once used for ocean disposal of digested sludge.

- **West Basin Municipal Water District Water Reclamation Plant (WBWRP).** Undisinfected secondary effluent that is not discharged to the ocean is pumped to the WBWRP, which is owned and operated by West Basin Municipal Water District (WBMWD). The location of the WBWRP is shown in Figure 2-1. WBMWD also owns and operates a secondary effluent pump station on HTP property at the southwest corner of the HTP site. The West Basin Pump Station (WBPS) pumps an average of 31 mgd[1] of secondary effluent flow to the WBWRP, where it is treated to several different grades of recycled water that is distributed within the WBMWD service area. The main grades of recycled water produced by WBMWD at the WBWRP are as follows:

    - Tertiary Water (Title 22) for industrial and irrigation uses
    - Nitrified water for industrial cooling towers
    - Softened reverse osmosis water: Secondary treated wastewater purified by micro-filtration (MF), followed by reverse osmosis (RO), and advanced oxidation (peroxide plus ultraviolet light) for injection to the West Coast Seawater Intrusion Barrier
    - Single-pass reverse osmosis water for refinery low-pressure boiler feed water
    - Double-pass reverse osmosis water for refinery high-pressure boiler feed water

WBMWD is currently the principal supplier of recycled water on the Westside. Its system includes effluent from the Carson Regional Water Recycling Treatment Facility. WBMWD supplies boiler feed water to Exxon-Mobil and nitrified water to Chevron-Texaco, Exxon-Mobil, and BP-Arco.

WBMWD's recycled water distribution system extends onto the HTP site. A significant portion of the landscaped area along HTP's eastern property line is irrigated using Title 22 irrigation water supplied by WBMWD. Title 22 water from WBMWD is also used on the HTP site for toilets in the Pregerson Technical Services Facility. The maximum monthly summertime usage of WBMWD recycled water at HTP is approximately 2.6 MG per month.

There has been discussion amongst various City departments regarding the potential use of HTP effluent for cooling water at the adjacent SGS, which is located just south of the HTP site. Currently HTP does not send any of its effluent to SGS. However, HTP does use secondary effluent for cooling water at HTP's on-site cryogenic pure-oxygen production plant. This cooling water is microscreened prior to use at the cryogenic plant. The use of secondary effluent for cooling water at SGS will be discussed in more detail in the Task 4.2.3 TM – HTP Opportunities.

2.1.4 Permitted Effluent Constituent Limits

HTP operates under NPDES Permit No. CA0109991, which was promulgated by California Regional Water Quality Control Board (RWQCB) Order No. R4-2005-0020 dated September 21, 2004 (revision date April 7, 2005). The effluent discharge limits are contained in an attachment to this

[1] Average pumping rate July 2008 to June 2009.

order entitled "Fact Sheet". HTP is required by the RWQCB to renew their permit prior to May 2010 when the current permit expires. BOS staff is beginning as of September 2009 to prepare the initial submittals to the RWQCB for renewal of the permit.

Table 2-1 is a summary of the effluent constituent limits from the HTP NPDES Permit.

Table 2-1: HTP NPDES Effluent Constituent Limits

Constituent	Units	Monthly Average	Weekly Average	Daily Maximum
$BOD_5(20^0C)$	mg/L	30	45	
	Lbs/day	113,000	169,000	
Oil & Grease	mg/L	25	40	75
	Lbs/day	93,800	150,000	
pH	Units	Within limit of 6.0 to 9.0		
Settleable Solids	mL/L	1.0	1.5	3.0
Suspended Solids	mg/L	30	45	
	Lbs/day	113,000	169,000	
Temperature	°F	< 100 °F at all times		
Turbidity	NTU	75	100	225
Chronic Toxicity	TUc	--	--	84
Acute Toxicity	TUa	--	--	2.8
Radioactivity				
Gross Alpha	PCi/L	--	--	15
Gross Beta	PCi/L	--	--	50
Combined Radium-226 & Radium-228	PCi/L	--	--	5.0
Strontium-90	PCi/L	--	--	8.0
Tritium	PCi/L	--	--	20,000
Uranium	PCi/L	--	--	20

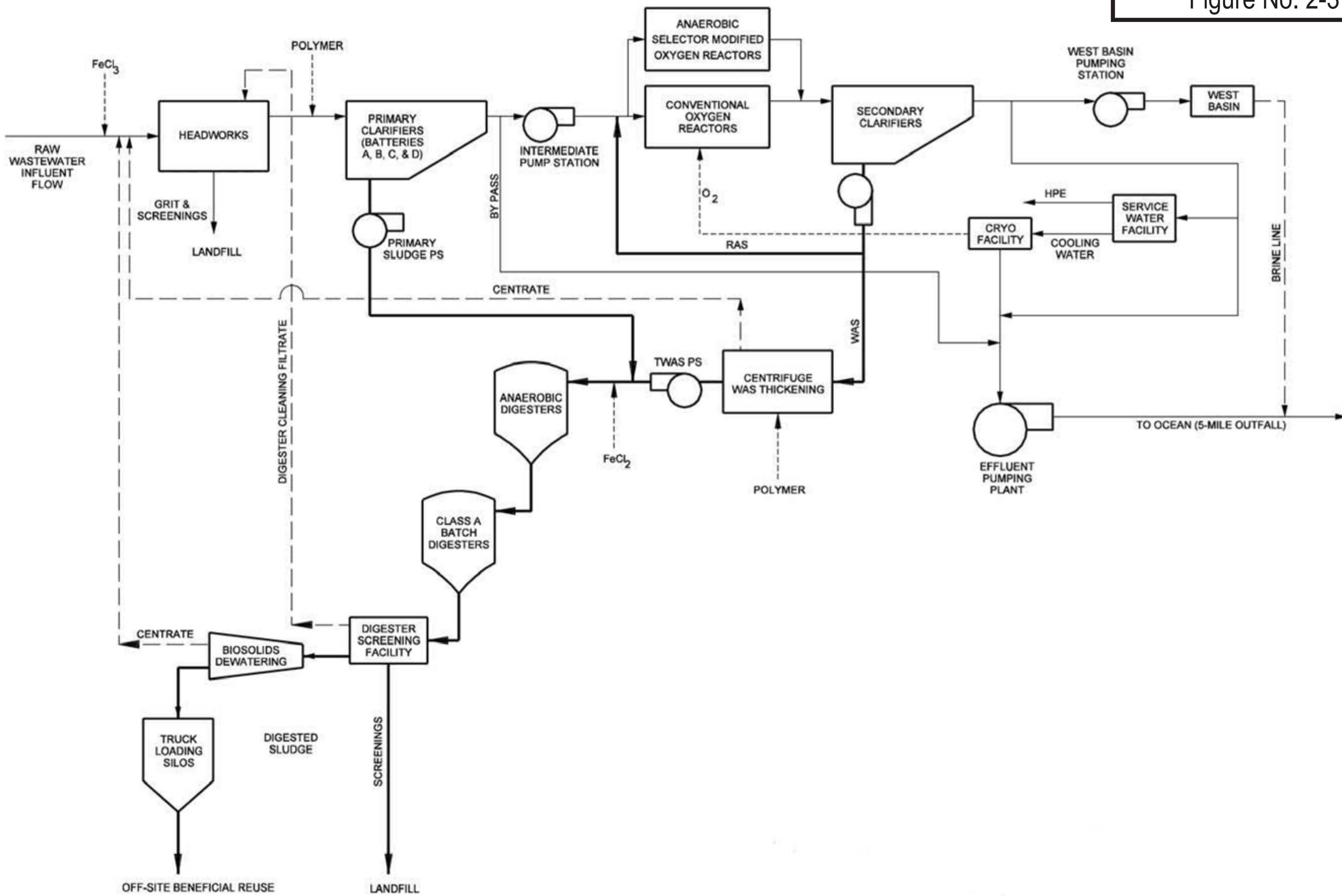
Source: Fact Sheet for Waste Discharge Requirements for HTP, rev. 4/7/05
Note: Additional HTP effluent constituent limits for human health toxicants and 303(d) listed constituents are shown in Appendix A. Values shown in Table 2-1 apply to the 5-mile outfall.

2.2 Current Flows and Quality

2.2.1 Flow Schematic and Hydraulic Profile

Figure 2-3 shows a generalized flow schematic of HTP and **Figure 2-4** shows a generalized hydraulic profile of HTP.

Hyperion Treatment Plant
Figure No. 2-3

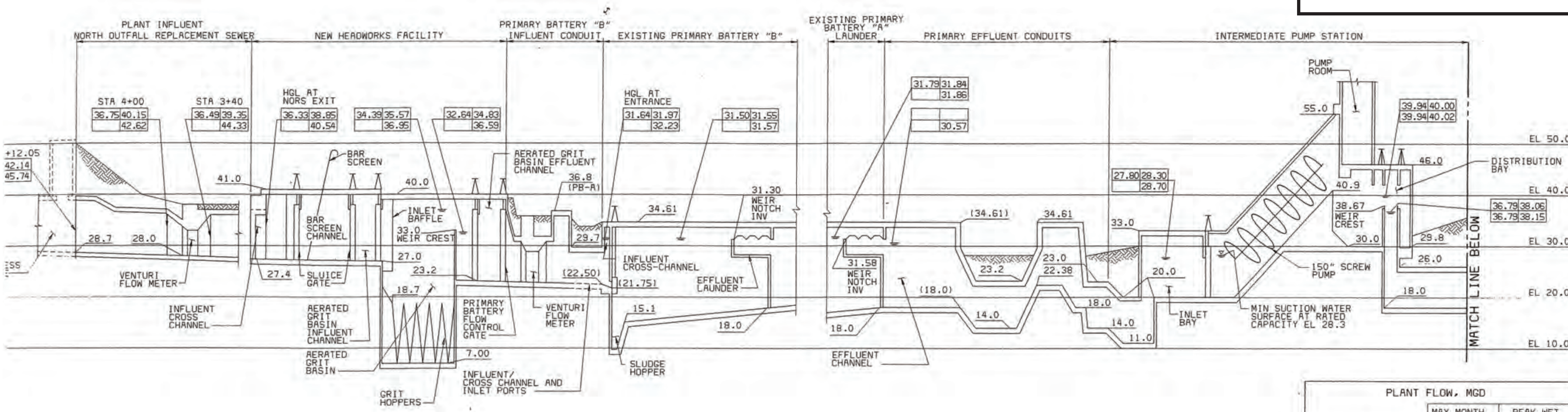


City of Los Angeles
Recycled Water Master Plan

RMC in association with CDM

Source: City of Los Angeles Integrated Resource Plan (IRP), 2005

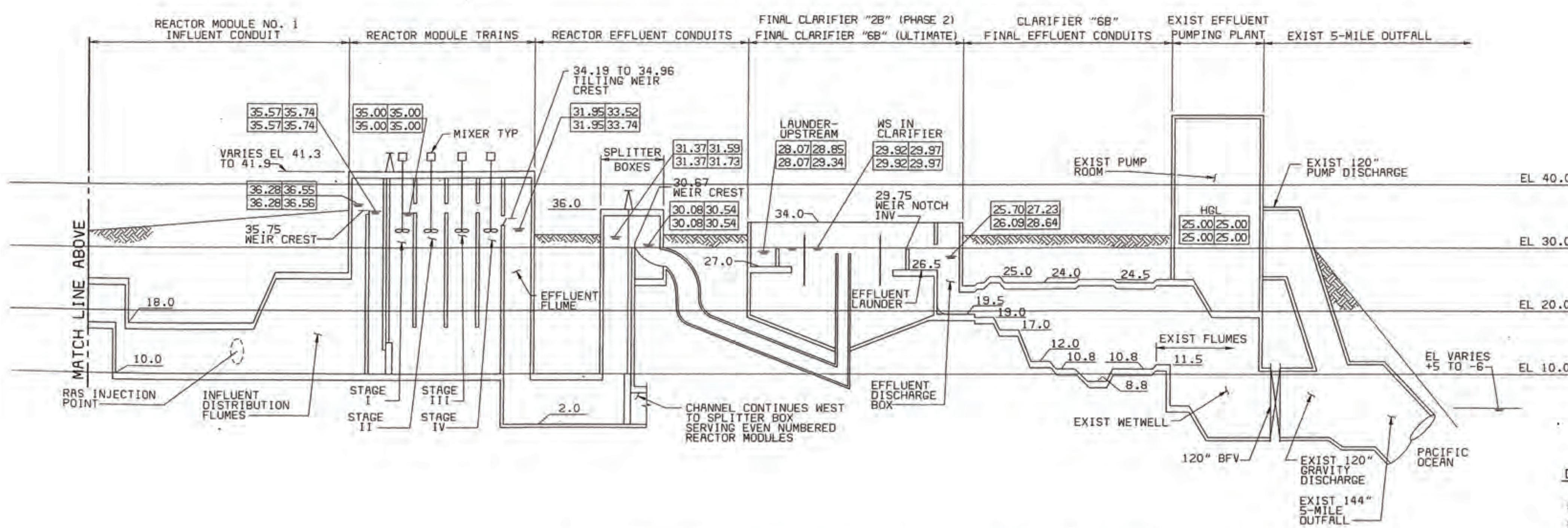
Hyperion Treatment Plant
Hydraulic Profile
Figure No. 2-4



PLANT FLOW, MGD	MAX MONTH DESIGN	PEAK WET WEATHER
9 REACTOR MODULES 36 CLARIFIERS (DESIGN YEAR)	450	800
11 REACTOR MODULES 44 FINAL CLARIFIERS (ULTIMATE)	550	1000

SYMBOLS

- WATER SURFACE ELEVATIONS (HGL) FOR THE PLANT FLOWS INDICATED ABOVE
- SLUICE GATE
- SLIDE GATE



HYPERION TREATMENT-PLANT - FULL SECONDARY HYDRAULIC PROFILE
VERT 1"=10'-0"
HORIZ NO SCALE

NOTES:

THE HYDRAULIC PROFILE REPRESENTS FLOW PATHS INCURRING LARGEST ENERGY LOSSES AND ASSUMES THE FOLLOWING:

- AN EFFLUENT PUMPING PLANT WATER SURFACE ELEVATION OF 25.00 FOR ALL FLOWS
- 19 PRIMARY SETTLING BASINS IN SERVICE (INCLUDES 6 BASINS IN PB-B AND 5 BASINS IN PB-C)
- PB-B'S INLET CHANNEL AND PORTS HAVE BEEN MODIFIED AND ARE SIMILAR TO THOSE OF PB-D
- INTERIOR OF REACTORS PRESSURIZED TO 6" OF WATER COLUMN
- ALL FLOW FROM THE NOS SEWER DIVERTED TO THE NORS
- RAS FLOW RATES AS FOLLOW:

DESIGN YEAR	PLANT FLOW (MGD)	RAS (MGD)
MAX MONTH	450	225
PEAK WET WEATHER	800	450
ULTIMATE		
MAX MONTH	550	275
PEAK WET WEATHER	1000	550

Not to Scale

RMC in association with CDM

City of Los Angeles
Recycled Water Master Plan

Source: As Built D30824, 1994

The HTP hydraulic profile includes two supplementary pump stations. The first is the Intermediate Pump Station (IPS) consisting of ten Archimedes screw pumps, which lift effluent from the primary clarifiers into the influent end of the oxygen reactors. Typically only 4 or 5 of these pumps operate at any given time. The second supplementary pump station is the Effluent Pumping Plant (EPP), which pumps secondary effluent out the ocean outfall on a part-time basis. When the outfall flow and ocean tides are low enough, effluent pumping is not required and secondary effluent is conveyed through the ocean outfall by gravity. BOS reports that the EPP operates on average about 30% of the time, during periods of higher tide and higher plant flow. During extended periods of lower tides, the EPP can remain off for as much as two weeks at a time.

The EPP consists of five vertical turbine pumps. The estimated pumped capacity of the five-mile outfall is 720 mgd with four out of five pumps in operation. This is for a tide level of +4.2 feet Mean Sea Level (MSL) with an EPP wet well water depth of 27.0 feet.

In the event the EPP fails to operate and the flows and/or tides are too high to convey flow by gravity through the main outfall, primary effluent or secondary effluent can be conveyed in an emergency by gravity through the standby one-mile outfall. Currently the one-mile outfall is only used for shutdowns of the main 5-mile outfall.

HTP was designed to provide full secondary treatment for a maximum-month flow of 450 mgd, which corresponds to an average dry weather flow (ADWF) of 413 mgd (IRP, 2005). The NPDES permit lists the permitted capacity as 450 mgd. In terms of currently observed capacity, BOS estimates that the secondary clarifiers are process-limited to a capacity somewhere between 350 mgd and 400 mgd, to stay within permit limits for secondary effluent turbidity, settleable solids, and suspended solids. Because of the process limitations of the secondary clarifiers, a conservative estimate of the observed treatment capacity of HTP is approximately 350 mgd.

To improve clarifier capacity, BOS and BOE are experimenting with a number of process improvements to the oxygen reactor-clarifier modules. These improvements, which are described in Section 2.2.3 of this TM, are intended to improve clarifier solids removal by reducing the occurrence of filamentous bacteria, while maintaining trace amounts of filaments to optimize settling. BOE and BOS are in the process of conducting full-scale testing of these improvements, with the long-term goal of increasing clarifier capacity. BOE has suggested that the improvements could result in a future combined clarifier capacity of well over 450 mgd and possibly as much as 500 to 550 mgd.

2.2.2 Influent Flows and Quality

Table 2-2 shows current influent flows for the 2 year period between July 1, 2007 and June 31, 2009. Weather data was obtained from January 1, 2007 to June 30, 2009. Precipitation was measured at Los Angeles International Airport with peak rain event of (1.8”) occurring on December 15, 2008 (Weather Underground, 2009). Peak hourly dry weather flow (DWF) is from March 1 to October 30, 2008 which was a dry period according to the above weather source.

Table 2-2: HTP Flow Summary
July 2007 through June 2009

Parameters	MGD
Design Secondary Treatment Capacity (ADWF)	413
Design Maximum-Month Flow	450
Observed Treatment Capacity (Approximate)	350
Influent Flows (MGD)	
Average Daily Flow	318
Max Daily	452
Min Daily	265
Peak Recorded Hourly Wet Weather Flow (12/15/08)	527
Peak Recorded Hourly Dry Weather Flow (8/1/2008)	579
Minimum Known Hourly Night-time Flow (4/21/2008)[1]	59

Source: BOS, August 2009
Note: 1. Minimum known hourly night time is the minimum of minimum daily flow (7/1/07-6/30/09); excludes July 2008 due to very low readings (15 mgd) during this month, which are attributed to metering issues.

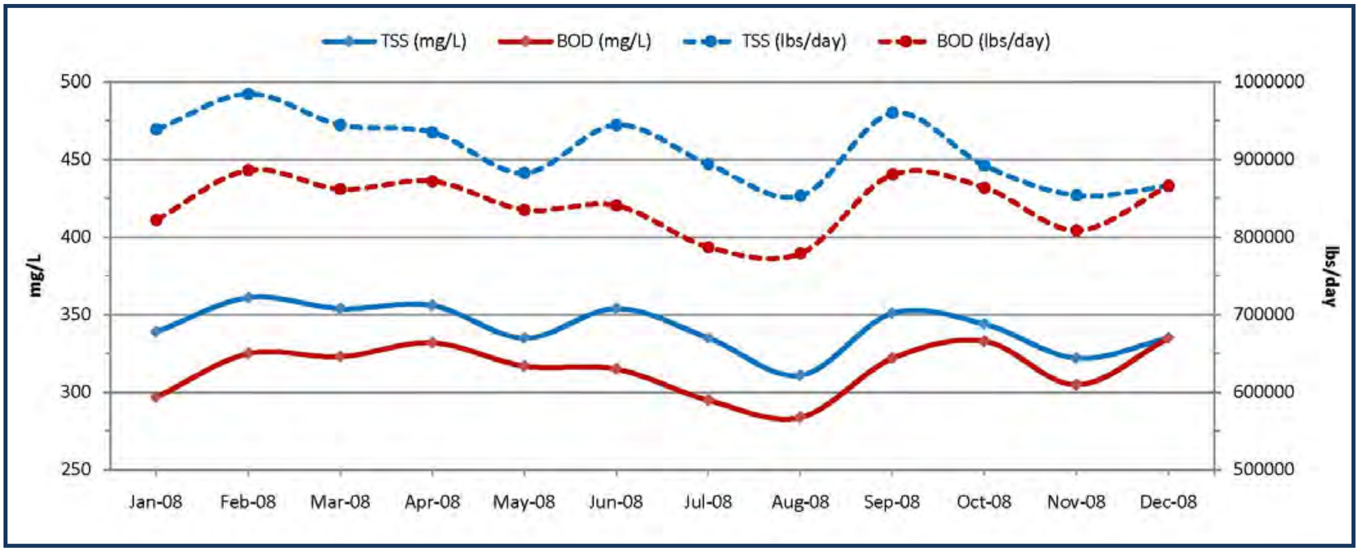
Table 2-3 shows influent Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), and pH data for the 12-month period between January 2008 and December 2008. Although the annual average influent Total Dissolved Solids (TDS) for HTP was 776 milligrams per liter (mg/L) in 2008, the average annual influent TDS for the first six months of 2009 was 883 mg/L.

Table 2-3: HTP Influent Quality
January 2008 through December 2008

Parameters	Units	Average	Maximum Daily
BOD	mg/L	315	461
TSS	mg/L	341	629
BOD loading	lbs/day	842,100	1,195,714
TSS loading	lbs/day	912,560	1,626,217
pH		7.45	7.8
TDS	mg/L	776	unknown

Source: Hyperion Treatment Plant 2008 RWQCB Annual Monitoring Report

Figure 2-5: HTP Influent Quality
January 2008 through December 2008
BOD and TSS Monthly Averages



Source: Hyperion Treatment Plant 2008 RWQCB Annual Monitoring Report

Figure 2-5 shows monthly average influent quality trends for biochemical oxygen demand (BOD) and total suspended solids (TSS) over the 12-month period between January 2008 and December 2008. The data is presented in both mg/L and lbs/day. The design BOD loading capacity of the plant is approximately 1,470,000 lbs/day (IRP, 2005). The average BOD loading in 2008 was 842,100 lbs/day and the maximum daily BOD loading was 1,195,700 lbs/day; both well below the design loading capacity. The design TSS loading capacity of the plant is approximately 1,240,000 lbs/day (IRP, 2005). The average TSS loading in 2008 was 912,560 lbs/day which is well below the design loading capacity. The maximum daily TSS loading in 2008 was 1,626,220 lbs/day which exceeded the design capacity.

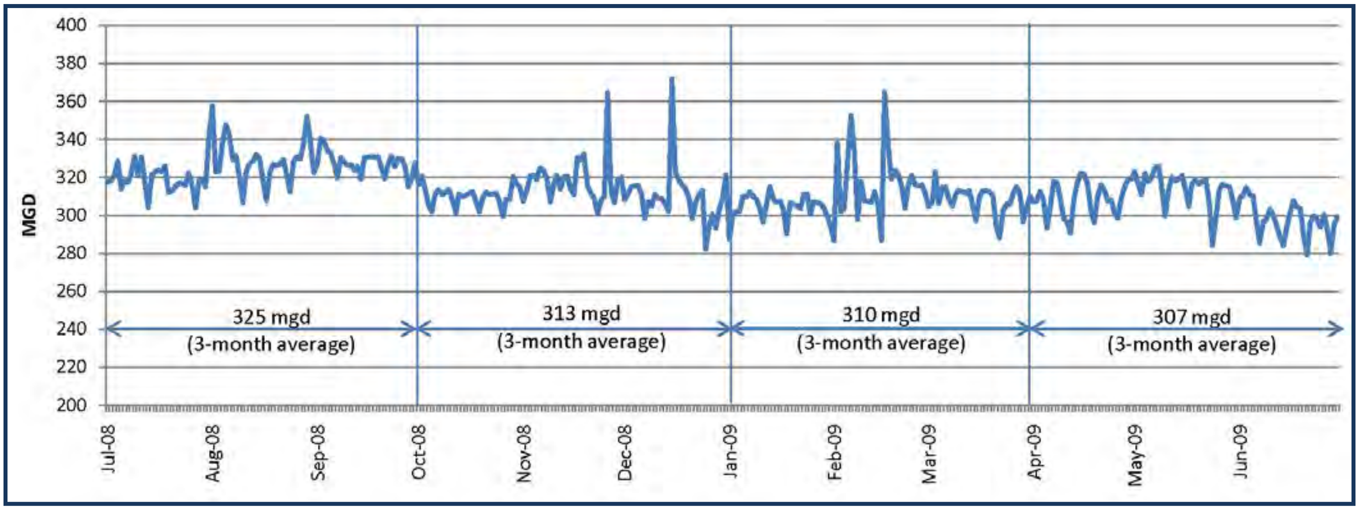
Primary sludge and waste activated sludge entering the sewer system at DCT and LAG have the effect of increasing the TSS and BOD at the HTP Headworks. The magnitude of this increase will be further analyzed in the Task 4.2 Opportunities TM.

HTP receives influent from several trunk sewers which converge on the HTP Headworks. The Coastal Interceptor Sewer (CIS), which extends from the north from the Venice Beach area, has the highest salt load of all the HTP influent sewers due to its proximity to the ocean. HTP has a highly segregated flow pattern through the treatment processes; as such the higher-TDS flow stream from the CIS flows to Primary Battery A and downstream treatment Reactor Modules 1 and 2. As a result, WBMWD diverts secondary effluent from Modules 7 and 8 which have lower TDS since they are hydraulically the furthest removed from Modules 1 and 2. Module numbering is shown in Figure 2-2.

Seasonal and Long-term Influent Flows Trends

Figure 2-6 shows daily average influent flows at HTP for the 12-month period between July 2008 and June 2009. To better quantify the gradual overall decrease in influent flow currently occurring at HTP, the graph was divided into four three-month periods. This data shows that the influent flowrate at HTP has dropped from 325 mgd to 307 mgd in only one year's time. In 2001 and 2002, the influent flowrate was approximately 340 mgd. It may be inferred from this data that the decrease in influent flowrate has recently accelerated largely because of mandatory water use restrictions implemented area-wide by most water retail agencies in the greater Los Angeles Area in 2008 and 2009.

Figure 2-6: HTP Daily Average Influent Flows
July 2008 through June 2009



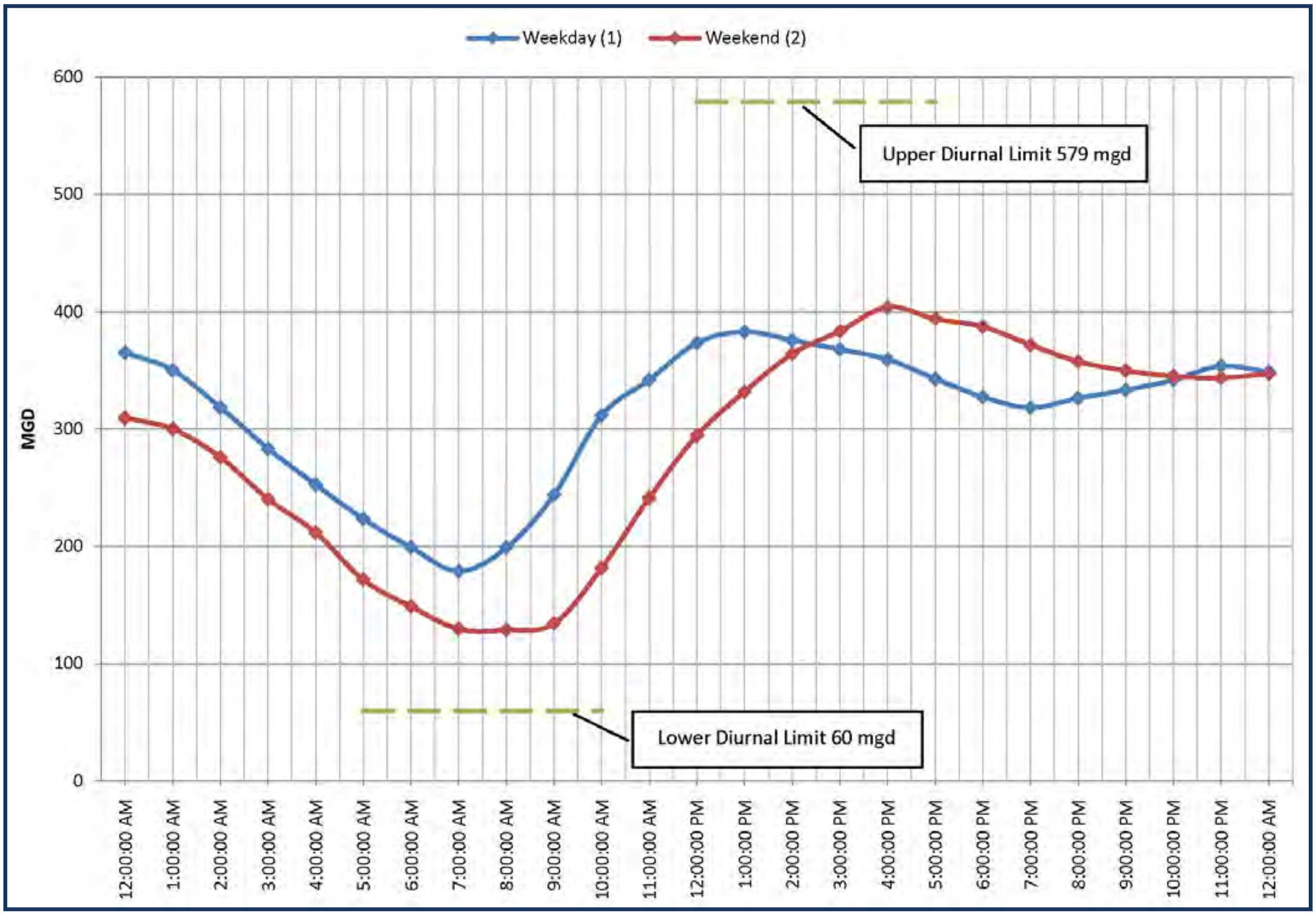
Source: BOS, August 2009

Diurnal Influent Flows

The daily fluctuation in hourly influent flows at HTP follows two general patterns: a typical weekday diurnal flow pattern and a typical weekend diurnal flow pattern. Both of these generalized diurnal curves are shown in **Figure 2-7**. Weekends typically showed the most diurnal variation. Minimum hourly flows for the month of June 2009 occurred on a weekend; a typical minimum hourly flow for June 2009 is 130 mgd. Maximum hourly flows for the month of June 2009 also occurred on the weekend; a typical maximum hourly flow for June 2009 is 400 mgd. Over the last two years, the minimum readings for nighttime hourly flow have been approximately 60 mgd, with one excursion down to 15 mgd on July 20, 2008. However, in looking at the data it appears that excursions below 60 mgd are so infrequent that influent flow values below 60 mgd may result from issues or inconsistencies in metering or data recording. An influent flow of 60 mgd is an approximate lower limit for minimum instantaneous nighttime hourly flow.

Measured peak wet weather flows at the plant have occasionally exceeded 850 mgd. The nominal design peak wet weather capacity of the plant is 800 mgd. The peak influent metering capacity is 850 mgd, which has been exceeded on rare occasions. In the last two years, the maximum peak wet weather influent flow was about 530 mgd, according to conversations with BOS staff. As with any wastewater treatment plants influenced by sewer infiltration and inflow, the magnitude of the peak wet weather flow depends on the time of day and the intensity of the peak rainfall event.

Figure 2-7: HTP Diurnal Dry Weather Influent Flows



Source: BOS, August 2009
Note: (1) Weekday: Wednesday, June 2, 2009
(2) Weekend: Sunday, June 7, 2009

2.2.3 Secondary Effluent Flows and Quality

Because the in-plant uses are mostly pass-through rather than consumptive, the secondary effluent flow is only slightly less than the influent flow. Losses through the plant are small, with the exception of Waste-activated Sludge (WAS) solids removal which averages 10 mgd. The main in-plant uses consist of chemical dilution water and cryogenic cooling water.

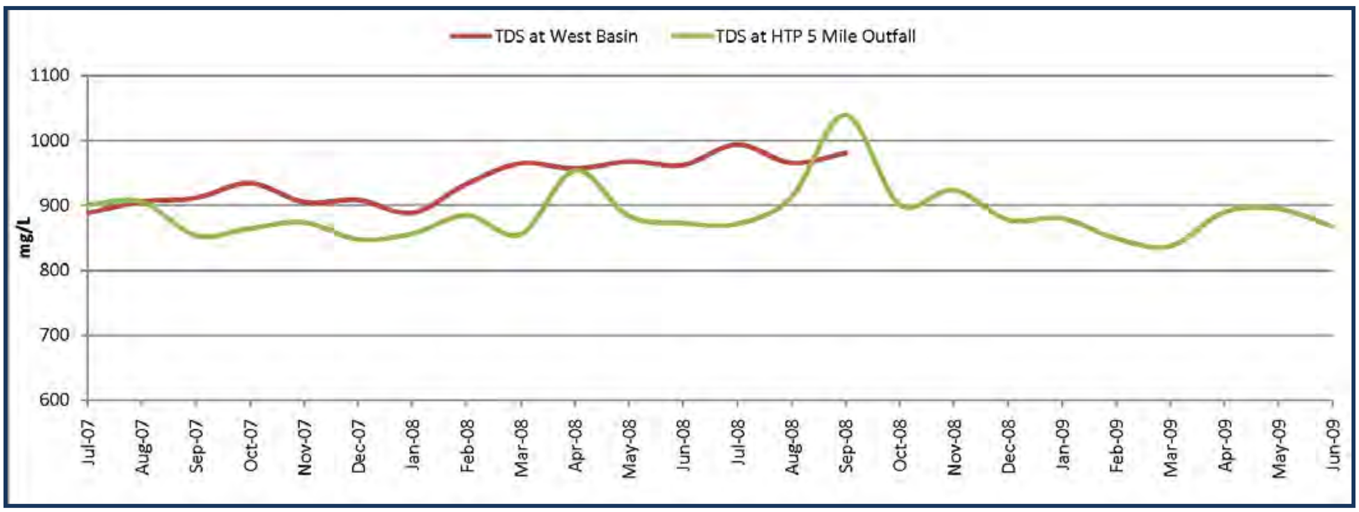
Table 2-4 shows secondary effluent quality data for the 12-month period between January 2008 and December 2008. This table also shows the corresponding effluent limit from the current NPDES permit. An expanded water quality table for HTP can be found in Appendix B. **Figure 2-8** shows secondary effluent TDS data for WBWRP influent and combined HTP secondary effluent. Even though HTP flowpath is segregated into higher-TDS and lower-TDS modules, TDS values for WBWRP influent are increasing. WBMWD diverts secondary effluent from Modules 7 and 8 which have lower TDS since they are hydraulically the furthest removed from Modules 1 and 2.

Table 2-4: HTP Secondary Effluent Quality
January 2008 through December 2008

Parameters	Units	Average Effluent Quality	NPDES Effluent Constituent Limit Monthly Average
BOD	mg/L	18	30
TSS	mg/L	19	30
Nitrate as N	mg/L	ND	No Limit
Ammonia Nitrogen	mg/L	38.5	[Performance Goal for Daily Maximum of 36.3 mg/L]
Total Phosphorus	mg/L	2.75	No Limit
Turbidity	NTU	8.8	75
Temperature	°F	80.4	<100
Settleable solids	ML/L	< 0.1	1.0
pH		6.81	6.0-9.0

Source: Hyperion Treatment Plant 2008 RWQCB Annual Monitoring Report.

Figure 2-8: HTP Average Secondary Effluent TDS



Source: West Basin, 2009 and BOS, August 2009

Ocean Outfall Flow

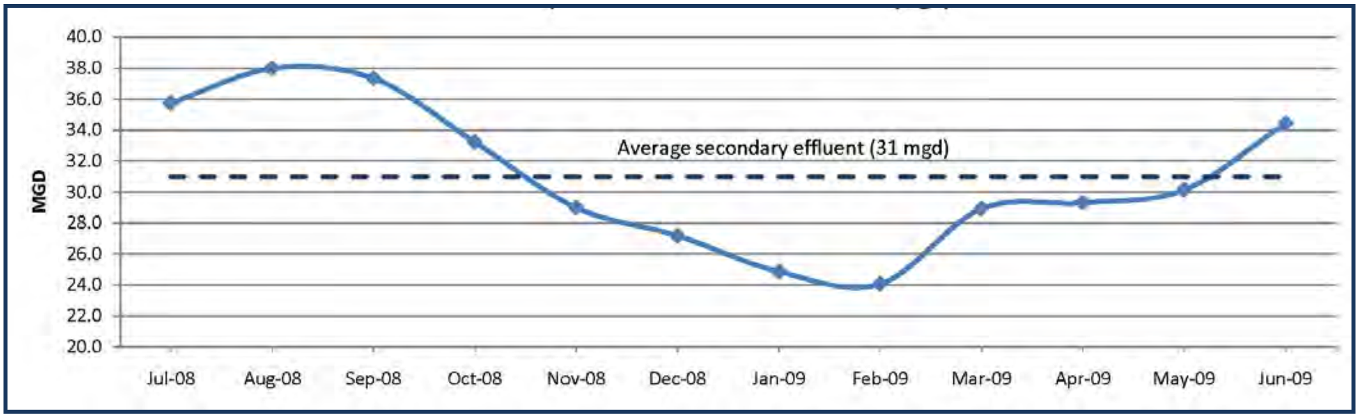
The daily volume of flow discharged to the outfall simply consists of the average plant influent flow minus the secondary effluent pumped to WBMWD each day, minus sludge withdrawal and a very small amount of service water consumptive use. The average daily outfall flow for the period of July 2008 through June 2009 is 277 mgd. The EPP pumps effluent to the outfall approximately 30% of the time; the outfall flows by gravity the remaining 70% of the time.

Secondary Effluent Flow to WBMWD

Figure 2-9 shows the average monthly secondary effluent flow pumped to WBMWD from the period of July 2008 to June 2009. The average secondary effluent flowrate pumped to the WBWRP for this period is 31 mgd.

Figure 2-9: HTP Secondary Effluent Flow Delivered to WBMWD

July 2008 through June 2009



Source: BOS, August 2009

2.2.4 In-plant Flows

HTP has a service water treatment facility that provides supplementary polishing treatment and pumping of secondary effluent for in-plant uses. The facility can currently polish up to 14 mgd of water for in-plant reuse. The average amount of secondary effluent currently delivered to in-plant uses is 11-12 mgd. The service water treatment facility is not a Title 22-permitted facility, but it does provide post-secondary treatment. The in-plant water is used primarily for the following:

- Approximately 60% of the in-plant water is pass-through cooling water for the on-site cryogenic system which extracts pure oxygen for process use from ambient air. Following circulation through the cryogenic system, the cooling water is returned to the ocean outfall as secondary effluent for ocean discharge. Drum microscreening is the only supplementary post-secondary treatment step used for the cryogenic cooling water.
- Approximately 40% of the in-plant water is high-pressure effluent (HPE) process water for the treatment processes, primarily chemical dilution water to attain the required dilution ratios for the treatment chemical solutions. HPE is also used for on-site hose-down and wash-down water. Secondary effluent used for HPE process water undergoes the post-secondary treatment steps of drum micro-screening and pressure sand filtration.

HTP is in the process of upgrading its service water treatment facility by expanding its capacity from 14 mgd to 21 mgd and by adding more filters. Existing disk filters currently located at DCT in Van Nuys will be moved by BOS to HTP and installed inside the service water facility at HTP.

If the Scattergood-Hyperion Alternative Renewable Energy (SHARE) Power Generation Project (discussed in Section 2.4.2) is implemented, the in-plant water use would increase to an estimated 35 mgd total, with approximately 20 mgd allocated for SHARE.

2.3 Current and Planned Infrastructure

The initial raw sewage discharge facilities were built in the 1890s. Since then there have been numerous plant expansions and upgrades. In the 1990s, the plant was upgraded from an advanced primary/partial secondary plant to full secondary treatment. Construction of this upgrade was completed in 1999.

2.3.1 Main Process Facilities

Table 2-5 is a summary of the main process facilities for HTP. The table contains basic information on quantity, size, and design criteria of the process facilities.

Table 2-5: HTP Main Process Facilities

Process	Description	
Headworks	**Screenings Removal**	
	Type	Mechanically Raked
	Number	8 (2 slots for future)
	Width	10 ft
	Design Capacity	100 mgd (each barscreen) 800 mgd total peak wet weather flow Historic high 1,100 mgd
	Grit Basins	
	Capacity	1,000 mgd
	Type	Aerated
	Number	6
	Volume, each	22.5 ft x 150 ft x 15 ft deep
Primary Clarifiers	**Treatment Type**	Enhanced with ferric chloride and polymer addition
	Battery A	
	Number	4
	Area	56.5 ft x 300 ft
	Water Depth	15.1 ft
	Capacity	
	Battery B	
	Number	4
	Area	56.5 ft x 300 ft
	Depth	15.1 ft
	Number	2
	Area	60 ft x 300 ft
	Depth	15.1 ft

Process	Description	
	Capacity	
	Battery C	
	Number	4
	Area	56.5 ft x 300 ft
	Depth	15.1 ft
	Number	1
	Area	60 ft x 300 ft
	Depth	15.1 ft
	Capacity	
	Battery D	
	Number	12
	Area	17.5 ft x 300 ft
	Depth	15 ft
	Capacity	
Intermediate Pump Station	Type	Screw pump
	Number	8 duty, 1 standby, 1 maintenance
	Diameter	150 inch
	Capacity	100 mgd (each)
Conventional Oxygen Reactors/Selector Modified Oxygen Reactors	**Conventional Oxygen Reactors**	
	Type	High Purity Oxygen
	Number of Modules	9
	Number of Trains per Module	3
	Number of Mixing Cells per Train	5
	Size of Mixing Cells	54 ft x 54 ft x 25 ft
	Aerators per Train	5 conventional, 3 selector
Secondary Clarifiers	Modules	9
	# of Clarifiers/Module	4
	Number	36
	Diameter	150 ft
	Side Wall Depth	12 ft
	Surface Area per Clarifier	17,670 ft^2
Effluent Pumping Plant Facilities	Number of Pumps	5 (3 duty, 2 standby)
	Type	Variable Speed Centrifugal
	Motor Horsepower, each	2,500 HP
	Capacity	180 mgd (Maximum Capacity @ 64 ft TDH for each)
Sludge Thickening	**Sludge Thickening**	
	Capacity	2,500 lbs/hr each
	Type	Centrifuge
	Capacity	40,000 gallons Storage Capacity
	Number	8 duty, 3 standby, 1 maintenance
	Feed Rate	300 to 1,000 gpm
	Power	300 hp each

Process	Description	
	Chemical Conditioning	Cationic Polymer
	Storage Tank Capacity	40,000 gal
Anaerobic Digestion	**Battery A, B, and C**	
	Capacity	2.3 MG, each
	Type	Cylindrical Shape, Fixed Cover, Gas Mixing
	Number of Digesters	18
	Operating Status	Currently off-line
	Diameter	110 ft
	Battery D1, D2, and E	
	Capacity	2.5 MG, each
	Type	Modified Egg, Mechanical Mixing, Pump Recirculation System
	Number of Digesters	18 (20 with the 2 blend tanks at Battery E)
	Configuration	3 batteries with 6 digesters each
	Operating Status	Thermophilic, batch mode
	Feed Mode Digesters	16
	Batch Mode Digesters	4
	Diameter at Belt	85 ft
	Center Depth	110 ft

Source: IRP, 2005

2.3.2 Recently Completed Upgrades or Improvement Projects

The following recent plant upgrades have been implemented at HTP:

- Primary Clarifier Batteries A, B, and C have been refurbished. As of October 2009, the refurbishment of Batteries A and B is complete, and the refurbishment of Battery C is nearing completion. The primary refurbishment activity has been the replacement of the top half of the concrete walls in the primary clarifiers, which have exhibited significant concrete corrosion due to the presence of hydrogen sulfide and other corrosive gases. Primary Battery D is newer than Batteries A through C and does not require a concrete upgrade.
- Three primary solids thickening centrifuges have been installed.

2.3.3 Planned Capital Projects

The following near-term capital projects are planned for HTP:

- Creation of the Environmental Learning Center (ELC), an interpretive center which will provide public education about how urban activities affect the environment, with exhibits on the City's water, stormwater, wastewater, recycled water, and solid waste/recycling programs. The ELC will be housed inside the former Administration Building, which is located just southeast of the main plant entrance on Vista del Mar and Hyperion Way. The ELC will also include a wetland demonstration exhibit, which will occupy the existing outdoor gravel area located just east of main plant entrance. The ELC is currently in construction.

- Expansion of the service water facility to add 7 mgd of capacity, which will increase the overall treatment capacity of the facility from 14 mgd to approximately 21 mgd. The main component of the expansion is the transfer and installation of some existing disk filters from DCT. Additional service water treatment capacity is required to provide cooling water for the SHARE Project. BOS projects that the facility will need to be expanded to a screening capacity of about 35 mgd to provide enough cooling water to the SHARE Project while maintaining in-plant uses.
- Biofilter/odor control project near the digesters
- Replacement of the EPP discharge header
- Replacement of the Distributed Control System
- Digester gas handling improvements
- New grit and screenings handling facilities

2.4 Operational Issues

2.4.1 Population Projections and Influent Flow Estimate

HTP is experiencing a decrease in the average annual influent flowrate which has amounted to approximately 33 mgd over the seven-year period between 2002 and 2009. BOS attributes this decrease to three factors:

- The increase in effectiveness and coverage of increasingly stringent municipal water conservation efforts and water use restrictions in the City of Los Angeles.
- Gradual recent reductions in industrial water use which BOS attributes to intentional cost-saving measures by private-sector industries that rely heavily on water use.
- Decrease in inflow and infiltration (I/I) during wet weather events, as the result of collection system improvements.

Wastewater flow projections through 2040 for the entire HSA, including individual projections for DCT, LAG, and HTP, can be found in Task 5.1.1 Wastewater Flow Projection Draft TM (RMC/CDM, 2009a). For the Year 2040, the predicted population of the HSA tributary to HTP is 4,167,000 inhabitants. The projected 2040 ADWF for HTP is 301 mgd.

2.4.2 Issues with Age/Condition of Existing Infrastructure

There are no major issues with condition or obsolescence of the main process facilities at HTP. There are issues with the condition of the old circular-style digesters. Of these eighteen digesters, six (Battery A) have been converted to emergency storage of digested sludge, and the other twelve are abandoned. The Battery A digesters provide about one week of emergency storage of digested sludge. HTP has no immediate plans to perform any major improvements or upgrades to the twelve abandoned circular digesters; however, the footprint occupied by the Battery C digesters has been considered for long-term future installation of additional egg-shaped digesters. According to BOS, new egg-shaped digesters will not be required for quite some time, especially since the plant currently has adequate digester capacity and a declining influent flowrate. HTP processes all the sludge generated within the HSA, so additional digesters will only become necessary as the population grows.

There are also two existing abandoned processes at HTP:

- Carver-Greenfield: The Carver-Greenfield sludge dewatering and incineration facilities which are no longer in service. There are no plans to return these facilities to service and no expressed interest in doing so.
- Electrical Recovery Building: The electrical generation facilities within the Energy Recovery Building. These facilities are abandoned in place, but there is a plan to install new gas turbine generation facilities within the same building as part of the SHARE project. The purpose of the SHARE project is to use the onsite digester methane as a fuel source to provide annual electricity production matching the average HTP power consumption of 21 MW. It is estimated that to achieve the 21 MW average power production, the methane source will need to be supplemented with natural gas at an approximate ratio of 3 parts methane to 1 part natural gas. Currently, the methane from the HTP digesters is piped offsite to the SGS to heat boilers that produce steam for the generation of electricity.

2.4.3 Optimization of Oxygenation and Secondary Clarifier Performance

HTP has occasional permit limit exceedances for turbidity, settleable solids, and suspended solids in the secondary effluent. There have been very recent violations (Summer 2009) for effluent settleable solids. The following measures have recently been enacted to improve solids removal in the secondary clarifiers:

- Adding cationic polymer to the return-activated sludge (RAS) in Modules 7 and 8.
- Partitioning the oxygen reactors in Modules 3, 5, and 7 to add anoxic pre-selector tanks for the purpose of reducing filamentous bacteria for better secondary clarifier performance. An unanticipated result of this modification has been that the lack of filaments increases the effluent turbidity. The shortage of filaments has hindered the formation of floc. To correct this problem, BOS staff has been doing full-scale testing of selected individual oxygen reactors in an attempt to produce at least a small amount of filamentous bacteria and enhance floc formation. This full-scale testing has included a “microaeration” project which is intended to create small amounts of filaments by bleeding oxygen into the pre-selector tanks. The testing has also included bypassing a percentage of the reactor influent directly into the main oxic zone of the reactors. The intent of this partial bypass is to produce trace amounts of filaments in the downstream clarifiers to promote better settling.
- Installing 36 individual secondary effluent flow meters, one on each of the 36 secondary clarifiers. The purpose of these meters is to regulate the flow to individual clarifiers.
- WBMWD is beginning a pilot project that will measure the effectiveness of adding ferric chloride to the Module 7 & 8 secondary clarifiers for the purpose of reducing secondary effluent turbidity.

HTP's permit has been revised to include a water quality performance goal of 36.3 mg/L for ammonia nitrogen. The performance goal is not an enforced effluent limit. The current HTP secondary process provides very little nitrification; consequently, most of the influent ammonia ends up unconverted in the secondary effluent. The only way to lower effluent ammonia would be to nitrify by raising the Mixed-Liquor Suspended Solids (MLSS) in the oxygen reactors and increase oxygen input to the oxygen reactors. It is also possible that additional oxygen reactors would need to be put into service. Currently less than half of the available oxygen reactors are actually operating.

WBMWD has engaged in collaborative planning with BOS and BOE to improve solids removal at HTP. WBMWD has a vested interest in lowering turbidity and TDS in the HTP effluent to maximize the effectiveness of its own treatment process at WBWRP. This collaborative planning effort includes enactment of the following measures:

- Developing a water quality specification with constituent requirements for secondary effluent used for recycled water production.
- Experimenting with the number of oxygen reactors in service at HTP. WBMWD is in ongoing discussions with BOS and BOE to identify the optimum number of oxygen reactors. Currently, only 12 reactors out of 27 are in service.
- Adding ferric chloride to the clarifiers in Modules 7 and 8. These two modules contain four clarifiers that provide the majority of the secondary effluent to WBMWD. This design-build project recently got underway and is being funded by WBMWD.
- Automating HTP sluice gates to lower the TDS of secondary effluent entering the West Basin Pump Station. Automation allows gates installed in the primary tanks to divert higher salt loads into Primary Battery A, so that higher-TDS flow is directed away from Modules 7 and 8 and into the ocean outfall.

WBMWD is also considering implementing ozonation at WBWRP. The current study underway evaluates the addition of ozone just upstream of the MF membranes, many of which are operating at 50% flux. The purpose of the ozonation would be to enhance removal of organics which contribute to a reduction in membrane flux.

2.4.4 Summary of Under-Utilized Space On-site

Figure 2-10 shows the locations of under-utilized space on the HTP site, as identified by BOS staff. The figure also shows portions of the site that represent main utility corridors. The following potential locations for future treatment infrastructure have been discussed (see Table 2-6):

- **Power and Blower Building (PBB):** This building is located just east of the Technical Support Facility (the Technical Support Facility is the main administrative office building for City staff at HTP). Currently the PBB is used only for mechanical/maintenance shopwork and storage, but BOS staff has indicated that it could be used for future process equipment, because none of the current uses are considered critical (approximate area: 33,200 ft^2, 0.76 acres). In the past BOS has discussed the possibility of replacing this building with a parking structure.

- **Parking Lot:** This lot is located north of the oxygen reactors and south of the Intermediate Pump Station (IPS) (approximate area: 106,600 ft^2, 2.45 acres). Because the capacity-limiting process at HTP is secondary clarification, it is conceivable that this parking lot could be used for future secondary clarifiers. However, BOS staff is hopeful that current process improvements and operational experimentation to improve clarifier effluent turbidity, along with declining influent flowrate, will render additional secondary clarifiers unnecessary. As such, there is the possibility that this parking lot could be used for future treatment facilities.
- **Older Circular Digesters:** This area is occupied by the twelve existing unused circular digesters located at the north end of the HTP site (approximate area: 236,800 ft^2, 5.43 acres). There are a total of eighteen digesters of this variety, but six of these digesters (Battery A) were recently converted to emergency storage of digested sludge. Although BOS has mentioned the possibility of future egg-shaped digesters replacing Battery C, this is considered a long-term future project, especially given the fact that the influent flowrate is declining.
- **Carver-Greenfield Building:** This area contains the buildings housing the now-defunct Carver-Greenfield process equipment and energy recovery equipment (approximate area: 43,200 ft^2, 0.99 acres). The Energy Recovery Building has a designated near-term future use for the SHARE project, discussed in Section 2.4.2 of this TM. The Old Dewatering Building, which contains the unused Carver-Greenfield drying and incineration equipment, also contains dewatered sludge cake storage which is not used, but could be used if the storage tanks were upgraded and insulated. BOS sees a potential need to upgrade the cake storage facilities, since there has been regularly occurring bacterial re-growth in the Class A sludge following thermophilic digestion. If the existing cake storage tanks are upgraded and insulated to allow stored cake to retain heat, then bacterial re-growth would be reduced.
- **Future Process Stacking above Primaries**: BOS suggested that for future treatment facilities, stacking process membranes or process equipment on top of the existing primary clarifiers is a possibility. If future treatment at HTP is implemented on a large scale using multi-level process stacking, BOS considers the existing primary clarifiers to be much more viable for this purpose than the existing oxygen reactors (approximate area: 310,600 ft^2, 7.13 acres).

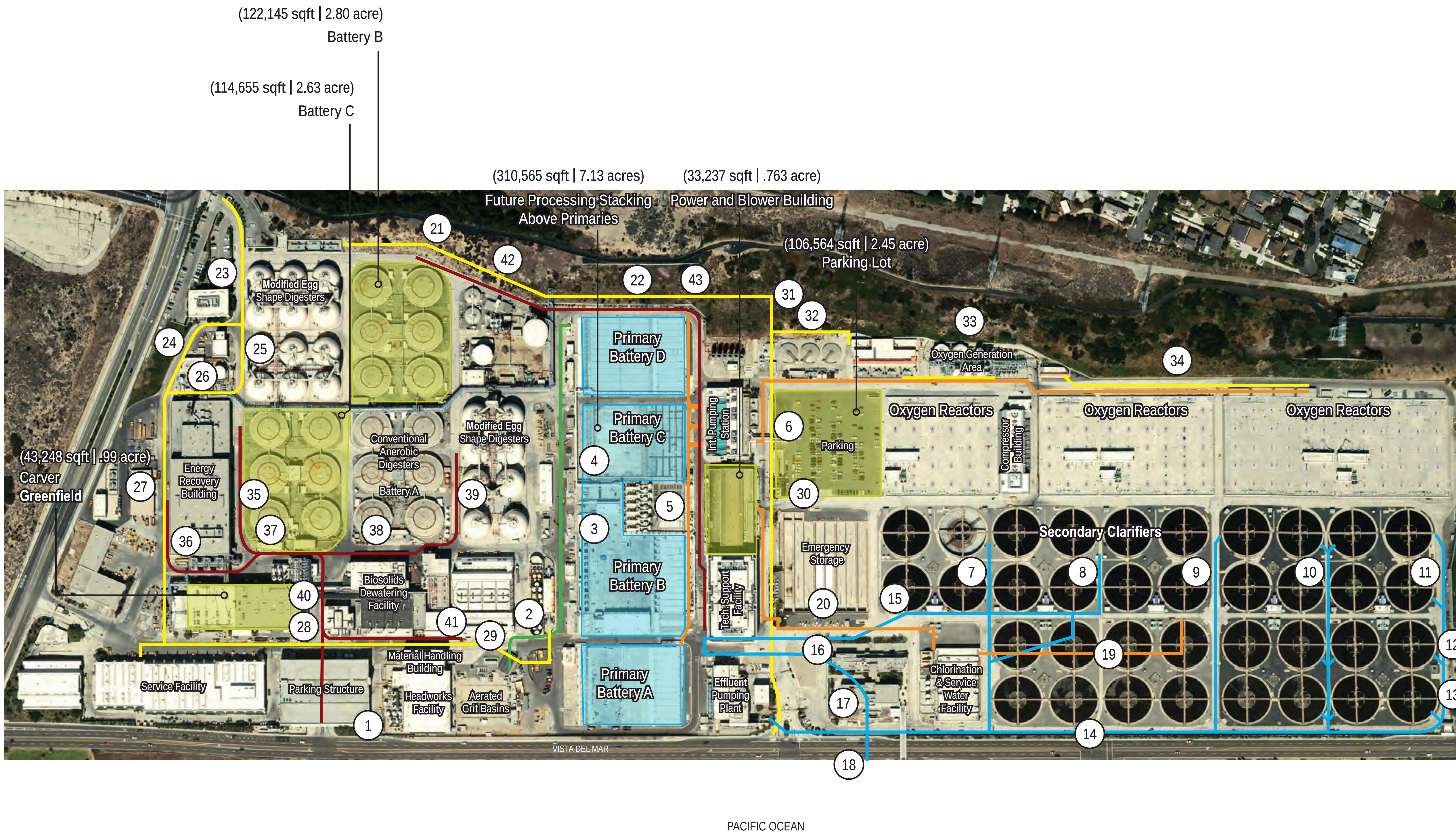
  HTP currently operates with only about 50% of its oxygen reactors in service. There are 27 oxygen reactors, and the plant typically operates with 12 in service. However, BOS prefers not to use the space occupied by unused oxygen reactors for future treatment facilities. Additional oxygen reactors would need to be put back in service if HTP ever converts to full nitrification, a possibility if more stringent ammonia or nitrogen effluent limits are imposed.

Table 2-6: HTP Potential Locations for Future Treatment Infrastructure

Location	Estimated Area	
	acres	ft^2
Power and Blower Building	0.76	33,200
Parking Lot	2.45	106,600
Digesters Batteries B and C	5.43	236,800
Carver-Greenfield	0.99	42,200
Future Processing Stacking above Primaries	7.13	310,600
Total	**16.76**	**729,400**

Assuming that area for Digester Batteries B and C and the area above the Primary sedimentation tanks are used for the siting advanced wastewater treatment facilities (MF/RO/AOP), approximately 12 acres of space is available. Using the double deck (stacked) layouts for this process train developed in the Site Assessment TM in Task 1.5 (for DCT), approximately 200 mgd of additional advanced treatment could be installed, assuming a single level of construction. [This is a preliminary, order of magnitude estimate that requires further assessment in Task 4.2 Identification of Projects.]

Hyperion Treatment Plant
Utilities Corridor
Figure No. 2-10



LEGEND

1. 72" RCP (Influent)
2. Influent Primary Basin Channel (C&D)
3. Influent Primary Basin C&D Basin
4. 12'-0" x 8'-0" Primary Channel (Clarifier D)
5. Primary Effluent Channel
6. Primary Effluent Channel
7. 60" RCP (Secondary Effluent)
8. 60" RCP (Secondary Effluent)
9. 60" RCP (Secondary Effluent)
10. 60" RCP (Secondary Effluent)
11. 48" RCP (Secondary Effluent)
12. 60" RCP (Secondary Effluent)
13. 72" RCP (Secondary Effluent)
14. Tertiary Effluent Channel
15. 10'-0" x 12'-0" RC Channel (Tertiary Effluent)
16. 108" RCP (Tertiary Effluent)
17. Diversion Structure
18. 144" PC 1 mile outfall (Tertiary Effluent)
19. 2'-20" WAS
20. 2'-20" WAS
21. 36" ED
22. 33" x 63" ED
23. 24" x 30" ED
24. 24" x 30" ED
25. 24" x 30" ED
26. 24" x 30" ED
27. 36" x 36" ED
28. 24" ED
29. 24" x 20" ED
30. 4' x D ED
31. 27'W x 27"D ED
32. 36'W x 36"D ED
33. 24" ED
34. 2' x 4' ED
35. 24" SD
36. 24" SD
37. 27" SD
38. 30" SD
39. 27" SD
40. 42" SD
41. 42" RCP SD
42. 24" x 24" Conc. SD
43. 30"W x D Conc. SD

- Influent
- Storm Drain
- Electrical Duct Bank
- Secondary Effluent
- Primary Effluent
- Under-utilized Space/ Potential Future Tertiary (Ground level)
- Under-utilized Space/ Potential Future Tertiary (Process Stacking)

N

0 125' 250' 500'

City of Los Angeles
Recycled Water Master Plan

RMC in association with CDM

Source: Google Earth Pro, 2009, As Built D30824, 1994

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2.4.5 Potential Future Operational Storage/Equalization Needs

Future treatment production at HTP may require equalization (EQ), either secondary EQ, tertiary EQ, advanced tertiary EQ, or some combination thereof.

Secondary EQ may be needed if future treatment facilities exceed 60 mgd in capacity. Because the nighttime minimum hourly influent flow is about 60 mgd, running AWT facilities at a flow greater than 60 mgd would require day-time EQ storage of secondary effluent, when HTP hourly flows exceed treatment capacity. The potential need for tertiary or advanced tertiary EQ would be dependent on the specific size and timing of future recycled water demands. This will be investigated in Task 4b.

HTP currently has emergency storage consisting of large 10 MG below-grade, open-top rectangular concrete basins. BOS staff report that this basin has been used only once in recent memory, when the IPS failed to pump. On this occasion, primary effluent was diverted to the emergency storage basin. BOS staff estimates that the usage interval of the emergency storage is "about once every ten years". Implementing future treatment at HTP will not create a need for additional influent EQ or emergency storage.

2.4.6 Means of Failsafe Disposal and Relationship to Future AWT Facilities

Every wastewater treatment plant must have a means of failsafe disposal, which is defined as the reliable means by which the facility can dispose of its influent under all anticipated circumstances including rainfall events, power outages, and peak flows. The failsafe disposal method for HTP is treatment of the influent and subsequent disposal of secondary effluent through the ocean outfall. The plant also has the capability of discharging primary effluent to the ocean, but this has not taken place at all in the last seven years. Because ocean discharge of secondary effluent periodically requires effluent pumping, the EPP is on standby power.

Future treatment facilities, whether they are conventional facilities, membrane facilities, or a combination of both, will most likely not be a means of failsafe disposal for the plant because of the need to dispose of very high flow rates during peak wet weather events. The ocean outfall and EPP have a combined discharge capacity of approximately 720 mgd. Peak wet weather flows in excess of 720 mgd are intended to be discharged using the one-mile outfall and/or equalized with the existing emergency storage. If future treatment facilities are implemented at HTP, the outfall will still be needed for peak flow disposal and for discharge secondary effluent when the AWT facilities are not in operation.

3. Los Angeles Glendale Water Reclamation Plant

3.1 Background

3.1.1 General

The Los Angeles-Glendale Water Reclamation Plant (LAG) began operation in 1976. In 1986, the plant began full-capacity operation at or near its rated average dry weather capacity of 20 mgd.

LAG is located in the City of Los Angeles approximately 8.5 miles north of the downtown business center, just east of Griffith Park (see **Figure 3-1**). The cities of Los Angeles and Glendale are each 50% owners of the facility. The City of Los Angeles operates LAG. Each of these two cities is entitled to 50% of the plant capacity. The City of Pasadena has purchased the right to 60% of Glendale's capacity (30% of total plant capacity), though these rights are not currently exercised.

The 18.3-acre LAG site is bounded on the western edge by the Los Angeles River. LAG is a satellite plant that was originally built as a "hydraulic relief" plant to decrease sewer flow in the downstream collection system, thereby decreasing sewer flow to HTP. LAG has a permitted capacity of 20 mgd and is currently operating at an average influent flowrate of 17.6 mgd (January 2008 through December 2008). Tertiary effluent from LAG is sent to the Los Angeles River and to two recycled water distribution systems, one belonging to LADWP and the other belonging to Glendale.

Although LAG was originally constructed as a hydraulic relief plant, continuous declines in overall collection system flowrates and construction of new large diameter sewers no longer require it to operate as a hydraulic relief plant. BOS staff has stated that if the plant were shut down, the downstream sewer leading to HTP would most likely not have any bottleneck issues at current collection system flowrates. BOS describes LAG as being driven by reclamation needs, both existing and future.

Figure 3-1 shows the general location of the LAG site.

Figure 3-1: LAG Site Location

Source: Google Earth Pro, 2009

3.1.2 Source of Influent

LAG has a service area of approximately 32.9 square miles. LAG serves the cities of Glendale and Burbank and the unincorporated areas of Los Angeles County which are connected to the City of Glendale sewer system, including portions of La Crescenta and Montrose. Influent sewage from the San Fernando Valley is also received from the North Outfall Sewer, which passes in close proximity to LAG on its downstream run to HTP. The influent at LAG is approximately 80% municipal sewage and 20% industrial sewage.

3.1.3 Discharge Locations and Quantity

LAG produces tertiary effluent compliant with Title 22 standards for disinfected tertiary recycled water, in addition to meeting numerous other effluent constituent limits in LAG's NPDES permit. LAG effluent is discharged to two locations:

- The recycled water distribution systems belonging to LADWP and City of Glendale. There are two separate recycled water pump stations on the treatment plant site. One is operated by LADWP and feeds the LADWP recycled water distribution system; the other is operated by City of Glendale and feeds the Glendale recycled water distribution system. The current maximum monthly recycled water usage from LAG is about 6 mgd, with maximum daily recycled water use at about 9 mgd.
- Effluent that is not pumped to the recycled water distribution system or recirculated for in-plant uses is discharged by gravity to the Los Angeles River. The effluent discharged to the river has the same quality as the effluent sent to the recycled water distribution system, except that the river effluent undergoes dechlorination prior to river discharge. Daily river discharge fluctuates based on recycled water demand and ranges from a daily flow of 11.2 mgd to a daily flow of 19.8 mgd.

All primary and secondary sludge generated at LAG is piped by gravity back to the sewer, which conveys the sludge downstream to HTP.

3.1.4 Main Permitted Effluent Constituent Limits

LAG operates under NPDES Permit No. CA0053953, which was promulgated by California Regional Water Quality Control Board (CARWQCB) Order No. R4-2006-0092 dated September 28, 2006 (revision dates November 27, 2006 and December 14, 2006). This Board Order lists the permitted capacity as 20 mgd. The effluent discharge limits are contained in an attachment to this order entitled "Fact Sheet".

Table 3-1 is a summary of the effluent constituent limits from the LAG NPDES Permit.

Table 3-1: LAG NPDES Effluent Constituents Limits

Constituent	Units	Monthly Average	Weekly Average	Daily Maximum
Ammonia Nitrogen	mg/L	2.2	--	7.8
BOD	mg/L	20	30	45
	lbs/day	3,340	5,000	7,510
Chloride	mg/L	190	--	--
	lbs/day	31,700	--	--
Fluoride	mg/L	2.0	--	--
	lbs/day	334	--	--
MBAS	mg/L	0.5	--	--
	lbs/day	85	--	--
Nitrite (as N)	mg/L	0.9	--	--

Constituent	Units	Monthly Average	Weekly Average	Daily Maximum
Nitrate (as N)	mg/L	7.2	--	--
Oil & Grease	mg/L	10	--	15
	lbs/day	1,670	--	2,500
pH		Within limit of 6.5 to 8.5		
Settleable solids	ml/L	0.1	--	0.3
Sulfate	mg/L	300	--	--
	lbs/day	50,040	--	--
Suspended Solids	mg/L	15	40	45
	lbs/day	2,500	6,680	7,510
Temperature	°F	68 °F - 86 °F		
Total Dissolved Solids	mg/L	950	--	--
	lbs/day	158,500	--	--
Total inorganic nitrogen	mg/L	7.2	--	--
Total Residual chlorine	mg/L	--	--	0.1
Turbidity[1]	NTU	--	--	2

[1]The turbidity shall not exceed a daily average of 2 NTU and 5 NTU more than 5% of the time (72 minutes) during any 24 hour period (pg F-43)
Source: Fact Sheet for Waste Discharge Requirements for LAG, rev 12/14/06; Additional LAG Effluent constituents are shown in Appendix C.

3.2 Current Flows and Quality

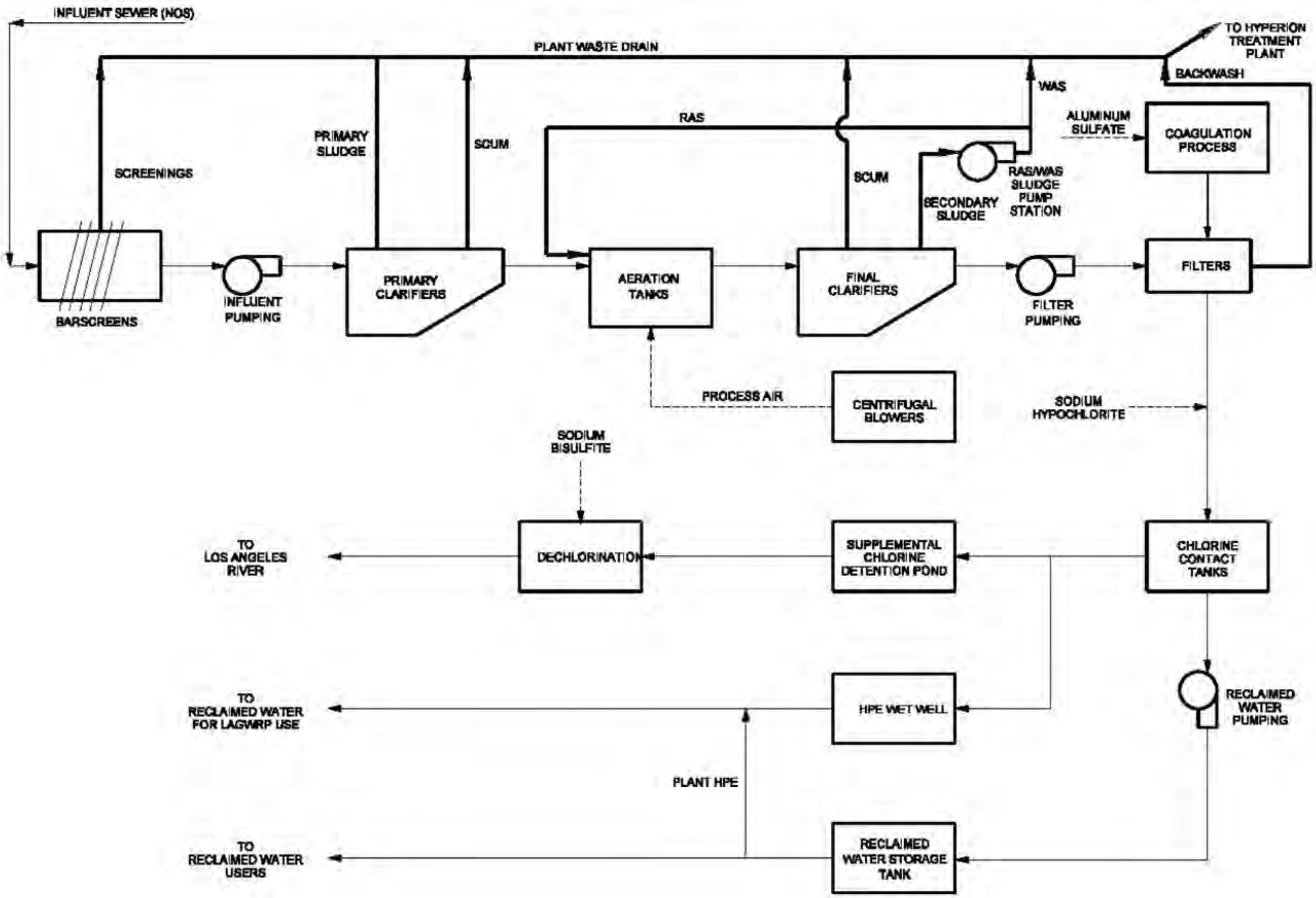
3.2.1 Flow Schematic and Hydraulic Profile

Figure 3-2 shows a generalized flow schematic of LAG.

Figure 3-3 shows a generalized hydraulic profile of LAG. As shown in the profile, the plant has three pumping locations: the influent pumps which lift raw sewage into the primary clarifiers, the filter pump station which pumps secondary effluent to the tertiary filters, and the recycled water distribution pumps which convey tertiary effluent to the distribution systems operated by Glendale and LADWP. Flow through the remainder of the plant processes is by gravity, including a gravity discharge to the Los Angeles River.

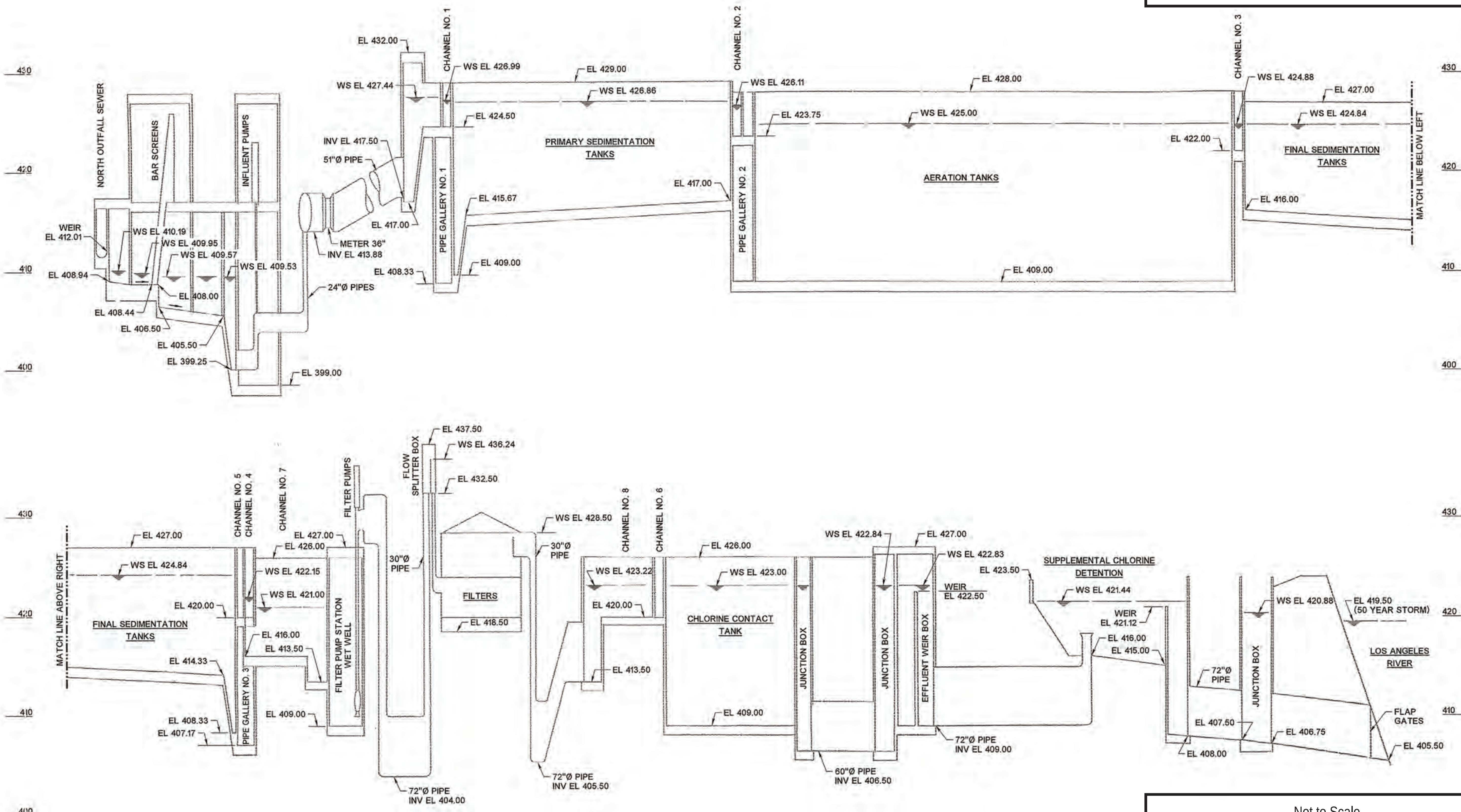
LAG has a permitted ADWF capacity of 20 mgd. BOS considers the limiting factor on capacity to be the secondary clarifiers. However, unlike HTP there have not been any recent effluent violations at LAG that result from poor secondary clarifier performance.

Los Angeles-Glendale
Water Reclamation Plant
Figure No. 3-2



Source: City of Los Angeles Integrated Resource Plan (IRP), 2005

Los Angeles-Glendale Water Reclamation Plant
Hydraulic Profile
Figure No. 3-3



Not to Scale

City of Los Angeles
Recycled Water Master Plan

RMC in association with CDM

Source: As Built LAG, 2008

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3.2.2 Influent Flows and Quality

Table 3-3 shows current influent monthly flows for the 2.5 year period between January 1, 2007 and July 31, 2009. Weather data was obtained from January 1, 2007 to June 30, 2009.

Table 3-2: LAG Influent Flows
January 2007 through July 2009

Parameters	MGD
Permitted Tertiary Treatment Capacity (ADWF)	20
Average Daily	17.7
ADWF[1]	16.8
Peak Recorded Hourly Wet Weather Flow (November 2007)	25.1
Peak Recorded Hourly Dry Weather Flow (11/16/2008)	22.2
Minimum Known Hourly Night-time Flow (Multiple Days)	0.1

Source: BOS, August 2009
[1] ADWF is from March 1, 2008 through October 31, 2008

Table 3-3 shows influent quality data for the 12-month period between September 2008 and August 2009.

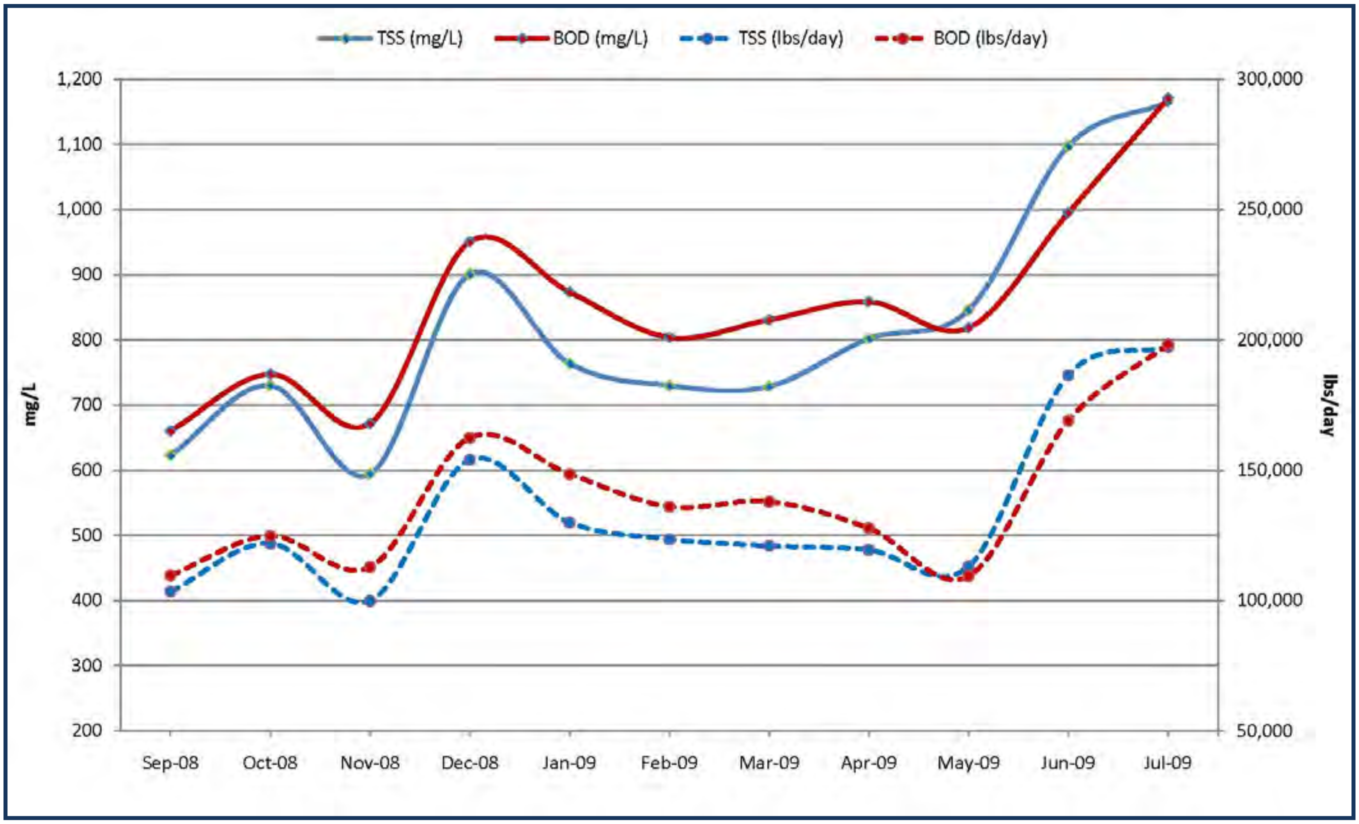
Table 3-3: LAG Influent Quality
September 2008 through August 2009

Parameters	Units	Average	Maximum Daily
BOD	mg/L	854	2,420
TSS	mg/L	818	3,500
BOD loading	lbs/day	139,894	411,112
TSS loading	lbs/day	133,834	467,880

Source: BOS, August 2009

Figure 3-4 shows influent quality trends for BOD and TSS over the 11-month period between September 2008 and July 2009. The design criteria for the influent BOD and TSS concentrations are 200 mg/L and 250 mg/L, respectively (IRP, 2005). The data is presented in both mg/L and lbs/day. BOD loading appears to peak at approximately 411,112 lbs/day, and the design BOD loading capacity for the current plant is approximately 33,360 lbs/day. TSS loading peaks at approximately 467,880 lbs/day, and the design TSS loading capacity for the current plant is approximately 41,700 lbs/day. The plant is operating significantly above its nominal BOD and TSS solids loading capacities.

Figure 3-4: LAG Influent Quality
Monthly Averages for BOD and TSS
September 2008 through July 2009



Source: BOS, August 2009

This data shows that BOD and TSS loading far exceed the plant's design loading capacity. However, conversations with BOS indicate that a significant percentage of the influent BOD is settable and is removed in the primaries. In fact, so much BOD is removed in the primary clarifiers that the primary effluent BOD is only about 190 mg/L on average. The plant actually takes primary clarifiers out of service to provide a sufficient, minimum level of BOD for operation of the denitrification process which is needed for compliance with the effluent limit of 7.2 mg/L for nitrate.

The high particulate matter in the plant influent stream is attributable to a new gate structure completed in September 2008 which pulls underflow from the North Outfall Sewer. The underflow has already undergone a degree of settling and solids concentration in the pipeline prior to the diversion to LAG.

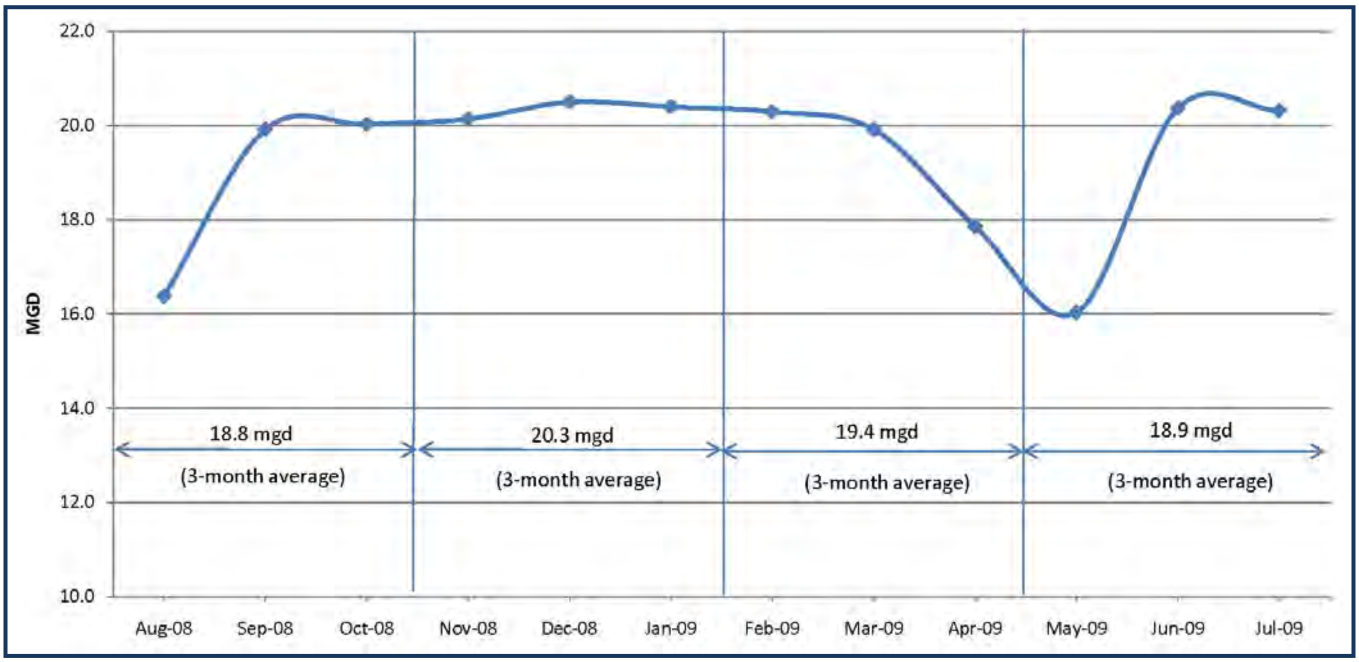
A matter of some speculation on the part of BOS staff is the degree to which the discharge of primary and secondary sludge from DCT increases the BOD and TSS of the LAG influent. BOS speculates that there is limited influence, since the majority of the DCT waste activated sludge goes to the La Cienega San Fernando Valley Relief Sewer, bypassing LAG on its way to HTP.

The plant is not currently experiencing any issues with process upsets due to industrial waste in the plant influent. However, in the past the plant had a recurring process upset involving ethanol from a pharmaceutical company. This problem has been corrected by constructing a new bypass sewer for this discharger. Currently sewage from this discharger is bypassed to the downstream sewer and HTP.

Seasonal Influent Flows

Figure 3-5 shows daily average influent flows at LAG for the 12-month period between August 2008 and July 2009.

Figure 3-5: LAG Monthly Average Influent Flows
August 2008 through July 2009



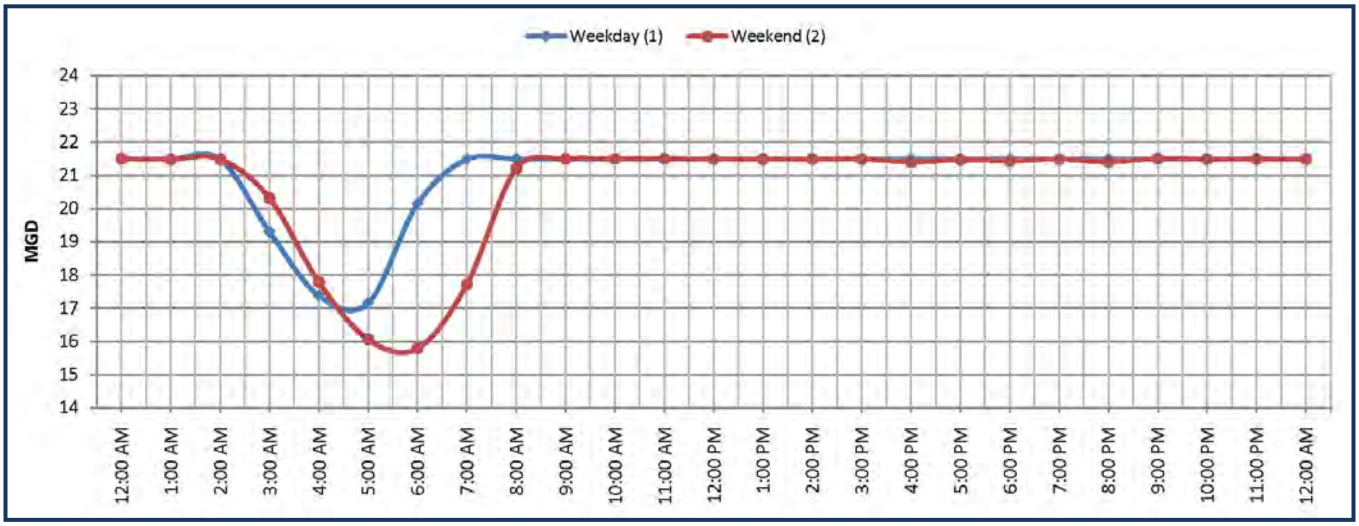
Source: BOS, August 2009

Diurnal Influent Flows

LAG is a hydraulic satellite plant that attempts to maintain a relatively constant "base load" flowrate. Typical diurnal data from July 2009, **Figure 3-6**, reflects a constant influent flow rate of approximately 21 mgd, with lower flows experienced during the early morning hours of approximately 2:00 am to 7:00 am. For the majority of the day, the influent pumps are meeting a constant flow setpoint. The early-morning drop in flow begins when the influent pumps switch to level control, after the declining flow in the North Outfall Sewer causes the wet well operating level to drop. During these hours, the variable-speed influent pumps turn down to maintain a minimum wetwell level.

Measured historical peak wet weather flow at the plant is approximately 30 mgd.

Figure 3-6: LAG Diurnal Dry Weather Influent Flows



Source: BOS, August 2009
(1) Weekday: Wednesday, July 29, 2009
(2) Weekend: Sunday, July 26, 2009

3.2.3 Secondary Effluent Flows and Quality

Because LAG does not have a secondary effluent discharge, there is a limited quantity of secondary effluent quality data available. **Table 3-4** is a summary of the available secondary effluent quality data for LAG.

Table 3-4: LAG Secondary Effluent Quality September 2008 through July 2009

Parameters	Units	Average	NPDES Effluent Constituent Limits Monthly Average
BOD	mg/L	4.1	20
TSS	mg/L	5.2	15
Nitrate as N	mg/L	5.4	7.2
Ammonia Nitrogen	mg/L	0.1	2.2
Total Phosphorus	mg/L	2.0	No Limit
Turbidity	NTU	2.4	2

Source: BOS, August 2009

3.2.4 Tertiary Effluent Flows and Quality

Table 3-3 shows current tertiary effluent flows for the 12-month period between September 2008 and August 2009.

Table 3-5: LAG Flow Summary
January 2008 through December 2008

Parameters	MGD
Permitted Title 22 Tertiary Capacity (MGD)	20
Average Daily Influent Flow	17.6
Average Flows to LA River	12.8
Max Daily Flow to LA River	19.8
Min Daily Flow to LA River	5.6
Flows to Recycled Water Uses	
Average Daily	3.8
Max Daily	8.8
Min Daily	1.0

Source: BOS, August 2009

Table 3-6 is a summary of the principal permitted constituents for the tertiary effluent. These quality results pertain to both plant discharges: pumped recycled water and LA River discharge. The only measurable difference in quality between the two discharges is chlorine residual. The LA River discharge is dechlorinated before discharge to eliminate the chlorine residual. An expanded water quality table for LAG can be found in Appendix D.

Table 3-6: LAG Tertiary Effluent Quality
January 2008 through December 2008

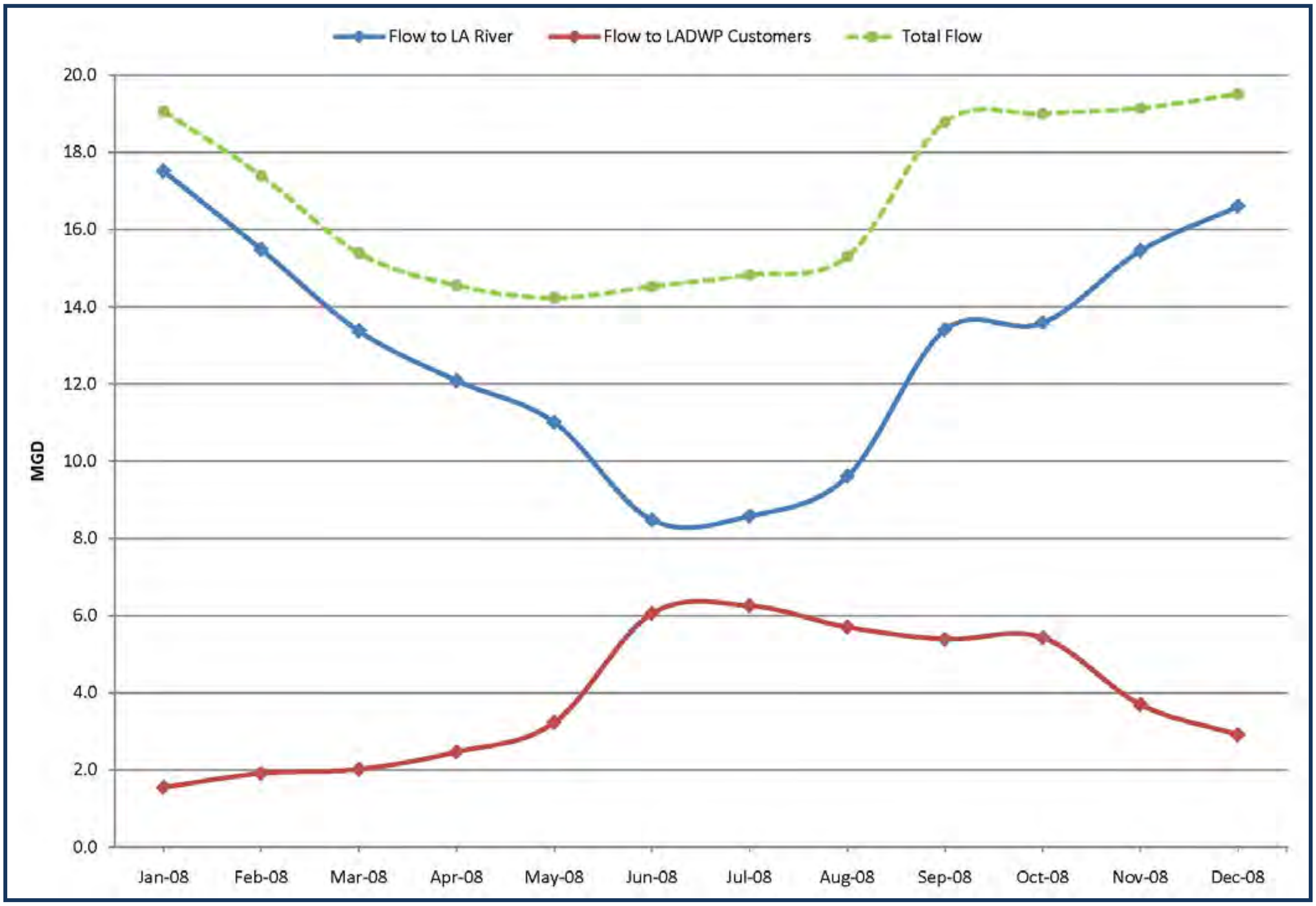
Parameters	Units	Average
BOD	mg/L	<3
TSS	mg/L	1.4
Nitrate as N	mg/L	5.8
Total Phosphorus	mg/L	1.8[1]
TDS – Average	mg/L	720
Maximum	mg/L	832
Turbidity	NTU	1.0
Temperature	°F	76[1]
Total Fecal Coliform	MPN/100 mL	3.6[1]
Total Chlorine Residual	mg/L	5.1[2]
pH		7.2

Source: Los Angeles-Glendale 2008 RWQCB Annual Monitoring Report
Notes: [1]Data from September 2008 through August 2009 (BOS, August 2009)
[2]Recycled water only

Los Angeles River Discharge Flows

Figure 3-7 shows the monthly average flows to the river for the 12-month period between January 2008 and December 2008. Daily discharge to the LA River ranges from 5.6 mgd to 19.8 mgd. Monthly average discharge to the LA River ranges from 8.5 mgd to 17.5 mgd.

Figure 3-7: LAG Tertiary Effluent Deliveries
January 2008 through December 2008



Source: BOS, August 2009

Recycled Water Distribution Flows

Figure 3-7 also shows the monthly average recycled water flows delivered to the recycled water distribution system and in-plant uses for the 12-month period between January 2008 and December 2008. The maximum seasonal distribution system flows occur during the summer when irrigation demand is the highest.

3.2.5 In-plant Flows

LAG uses a daily average 1.05 mgd of chlorinated tertiary effluent for in-plant uses including chemical dilution, on-site irrigation, and spraydown/washdown. The pressure for this in-plant system is provided by an on-site booster station that pulls suction from the main process flow just downstream of the chlorine contact basin. The in-plant high-pressure effluent system also has a back-up feed from the recycled water distribution zone served by the Griffith Park 2.0 MG recycled water tank. There is very little seasonal fluctuation in the in-plant demands; the average monthly demand for 2008 ranged from 0.96 mgd to 1.12 mgd.

3.3 Current and Planned Infrastructure

The initial plant facilities went into service in 1976. Most of the main plant facilities date back to the original plant construction in 1976.

3.3.1 Main Process Facilities

Table 3-7 summarizes LAG's main process facilities.

Table 3-7: LAG Main Process Facilities

Process	Description	
Headworks	**Screens**	
	Type	Mechanically Raked Climber
	Number	2 (1 duty, 1 standby)
	Design Capacity	30 mgd (each)
	Grit Pumps	
	Number	1
	Capacity	300 gpm
	Influent Pumps	
	Type	Centrifugal, non-clog
	Number	3 (1 duty, 2 standby)
	Capacity, each	25 mgd
	Flow Meters	
	Type	Magnetic
	Number	1
	Capacity, each	40 mgd
Primary Clarifiers	Total Capacity	74 mgd
	Number	18 (16 duty, 2-off line)
	Area	200 ft x 20 ft
	Water Depth	12 ft
	Surface Overflow Rate	1,150 gpd/ft^2
	Detention Period @ ADF	1.9 hours
	Capacity, each	4.6 mgd
Aeration Tanks/ Centrifugal Blowers	**Aeration Tanks**	
	Number	6 (5 duty, 1 offline)
	Area	240 ft x 32 ft
	Average Water Depth	16 ft
	Centrifugal Blowers	
	Number	3
	Type	Centrifugal
	Capacity, each	20,000 scfm
Final Clarifiers	Number	44 (22 each phase)
	Area	150 ft x 20 ft
	Side Water Depth	12 ft
	Surface Area per Clarifier	17,670 ft^2

Process	Description	
	Phase I	Conventional Steel Chain and Sprockets with Redwood Flights
	Phase II	Plastic Chain and Sprockets, with Fiberglass Flights
Filter Pumping	Type	Variable-Speed Filter feed pumps
	Number	3 (2 duty, 1 standby)
	Power	150 hp (each)
	Capacity	15,000 gpm (each)
Coagulation Process	Chemical	Aluminum Sulfate
	Volume of Storage Tank	7,500 gallons
Filtration	**Dual Media Filters**	
	Number	3
	Type	Sand/Anthracite Coal
	Diameter	40 ft
	Water Depth	3 ft
	Media depth – Sand	12 in
	Media depth – Anthracite Coal	12 in
	Filtration Rate	3.7 gpm/ ft^2
	Deep Bed Rectangular Filters	
	Number	5
	Media	Sand
	Media Depth	6 ft
	Support Layer	Gravel
	Support Layer Depth	1.5 ft
	Area	42 ft x 10 ft
	Filtration Rate	3.3 gpm/ ft^2
	Total Units (Dual Media plus Deep Bed)	7 duty, 1 offline
Chlorine Contact Basins	Number	2
	Tank 1 Area	177 ft x 65 ft
	Tank 1 Ave Water Depth	14 ft
	Tank 2 Area	215 ft x 66 ft
	Tank 2 Avenue Water Depth	14 ft
	Detention Period at 20 mgd	3 hours
Dechlorination	**Chemical Storage Tanks**	
	Chemical	Sodium bisulfite
	Number	2
	Capacity	7,000 gal
	Chemical Metering Pumps	
	Chemical	Sodium bisulfite
	Number	4
	Capacities	68 gph per pump

Source: IRP, 2005

3.3.2 Recently Completed Upgrades or Improvement Projects

The following significant process upgrades or improvements have been implemented recently at LAG:

- The aeration basins were converted to nitrification-denitrification (NdN) in April 2007. During this upgrade the aeration system was converted to a Modified Ludzack-Ettinger (MLE) process whereby the aeration basins were subdivided into oxic (high dissolved oxygen) and anoxic (low dissolved oxygen) zones to comply with a new RWQCB effluent limit for nitrogen. The new requirements are 7.2 mg/L for Nitrite, 0.9 mg/L for Nitrate, and 2.2 mg/L for Ammonia Nitrogen (monthly averages).
- An automated diversion gate structure on the NOS was constructed and put into service in September 2008. The high particulate matter in the plant influent is attributable to the fact that the gate structure pulls underflow from the North Outfall Sewer which has already undergone a degree of settling and solids concentration in the pipeline prior to diversion to the LAG Headworks.

3.3.3 Planned Capital Projects

According to BOS, there are no near-term capital projects planned for LAG. However, LADWP has performed some site investigation for possible consideration of a new recycled water tank just south of the existing LAG site on property belonging to City of Los Angeles Department of Recreation and Parks, shown on Figure 3-8. The tank would be located at the northwest corner of the Recreation and Parks property.

Additionally, the Glendale-Burbank Interceptor Sewer (GBIS), which will run within close proximity of the LAG site, is under design, and it may be possible to use this new trunk sewer as a future source of influent for an expanded treatment capacity above 20 mgd.

Figure 3-8: LAG Potential Recycled Water Storage Location

Source: Google Earth Pro, 2009

3.4 Operational Issues

3.4.1 Projected Influent Flow Estimate

Wastewater flow projections for LAG can be found in Task 5.1.1 Wastewater Flow Projection TM, which predicts the change in collection system flowrates between now and 2040 (RMC/CDM, 2009a). For 2040, the projected ADWF for LAG is 32 mgd.

3.4.2 Issues with Age/Condition of Existing Infrastructure

BOS staff reports no significant degradation of existing structures or process equipment.

3.4.3 Summary of Under-utilized Space On-site

Figure 3-9 shows the locations of under-utilized space on the LAG site, as identified by BOS staff. The figure also shows portions of the site that represent main utility corridors. Potential locations for future tertiary treatment infrastructure include the following:

- **Pond and lawn**: (approximate area: 216,400 ft^2, 4.96 acres). This area is currently occupied by grassy area and a 5 MG decorative pond which is formally known as a "chlorine detention pond". While the pond does provide some reduction in the chlorine residual prior to river discharge, it serves no significant process purpose. This area has been designated by BOS staff as space for the future build-out of the existing processes to 40 mgd. BOS emphasized that they are open to utilizing a portion of this area for future advanced treatment facilities for groundwater replenishment, but that expanding the existing process to provide tertiary reclamation up to 40 mgd for irrigation purposes is a key priority from the BOS perspective. Furthermore, BOS has suggested the possibility of replacing the secondary clarifiers with microfiltration membranes as a potential space-saving measure.
- **Parking lot at the northeast corner of the site:** This area is currently occupied by an existing electrical substation (approximate area: 15,000 ft^2, 0.34 acres). BOS suggested this area with the caveat that it contains significant buried underground electrical utilities in certain locations.
- **Future process stacking above primaries**: (approximate area: 18,000 ft^2, 0.41 acres).

Table 3-8: LAG Potential Locations for Future Treatment Infrastructure

Location	Estimated Area	
	acres	ft^2
Pond and Lawn	4.96	216,400
Parking Lot	0.34	15,000
Future Processing Stacking above Primaries	0.41	18,000
Total	**5.71**	**249,400**

Assuming that the Pond and Lawn area are used for the siting advanced wastewater treatment facilities (MF/RO/AOP), approximately 5 acres of land is available. Using the layouts for this process train developed in the Site Assessment TM in Task 1.5 (for DCT), approximately 45 mgd of additional advanced treatment could be installed, assuming a single level of construction. [This is a preliminary, order of magnitude estimate that will be further assessed in Task 4.2 Identification of Projects.]

LAG Utilities Corridor
Figure 3-9

1. 51” Steel (Influent)
2. 18” VCP Plant Waste Drain
3. 36” VCP Plant Waste Drain
4. 36” VCP Plant Waste Drain
5. 30” CML & C Pipe (Tertiary Effluent)
6. 72” RCP (Tertiary Effluent)
7. 3-66” CMP (Tertiary Effluent)
8. 72” RCP
9. 14” (SCUM)
10. 3 - 27”W x 15”H Electrical Ductbank
11. 21”W x 21”H Electrical Ductbank
12. 21”W x 21”H Electrical Ductbank
13. 21”W x 15”H Electrical Ductbank
14. 7’ x 7” RCB SD

LEGEND

- Influent
- Tertiary Effluent
- Sludge
- Storm Drain
- Electrical Feeders
- Under-utilized Space/ Potential Future Tertiary (Ground Level)
- Under-utilized Space/ Potential Future Tertiary (Process Stacking)

N

0’ 125’ 250’

City of Los Angeles
Recycled Water Master Plan

RMC in association with CDM

Source: Google Earth Pro, 2009, As Built LAG 2008

3.4.4 Potential Future Operational Storage/Equalization Needs

The existing chlorine detention pond is not intended for flow equalization, and the existing plant does not rely on this pond for either process purposes or flow equalization purposes. Any flow equalization that may occur in the pond is unnecessary from an operational standpoint.

LAG is a satellite plant that maximizes production up to its capacity except when flow in the North Outfall Sewer is limited in the early morning hours. Addition of future equalization would serve a useful purpose only in the following scenarios:

- **Expansion of LAG above 20 mgd:** In-plant operational storage of tertiary effluent would be needed if LAG is expanded beyond its capacity of 20 mgd and if an advanced tertiary process is added with a capacity exceeding the night-time minimum hourly available sewer flows. This equalization would allow the new advanced tertiary process to run constantly at capacity.
- **Hourly recycled water demand fluctuation:** Distribution system storage of tertiary treated effluent could be required to meet hourly demand fluctuations for irrigation and industrial uses. The amount of storage provided on-site needs to be coordinated with the amount of storage provided off-site. While there is no amount of tertiary storage absolutely required at the point of treatment, the LAG site is one of several possible locations within the distribution system to provide operational storage. BOS reports that there is a significant lack of existing operational storage to serve existing summertime recycled water demands in the areas irrigated by LAG effluent.
- **Groundwater recharge/injection demand fluctuations:** Storage of advanced tertiary product water could be required to meet hourly demand fluctuation for groundwater recharge/injection uses. The fluctuation in hourly demands for groundwater uses is anticipated to be much less than for irrigation and industrial uses. Depending on the characteristics of the recharge/injection facilities, there may actually be no hourly demand fluctuation whatsoever.
- **Seasonal storage:** Seasonal storage of recycled water for irrigation uses could be provided using injection/recovery wells in local aquifers receiving LAG effluent.

3.4.5 Means of Failsafe Disposal and Relationship to Future Tertiary Facilities

It is anticipated that the LA River discharge will continue to function as the failsafe disposal method for LAG. If the LA River discharge can be increased to 40 mgd, there will be little anticipated need for an alternate means of failsafe disposal, and any future advanced tertiary processes will not need to function as failsafe disposal.

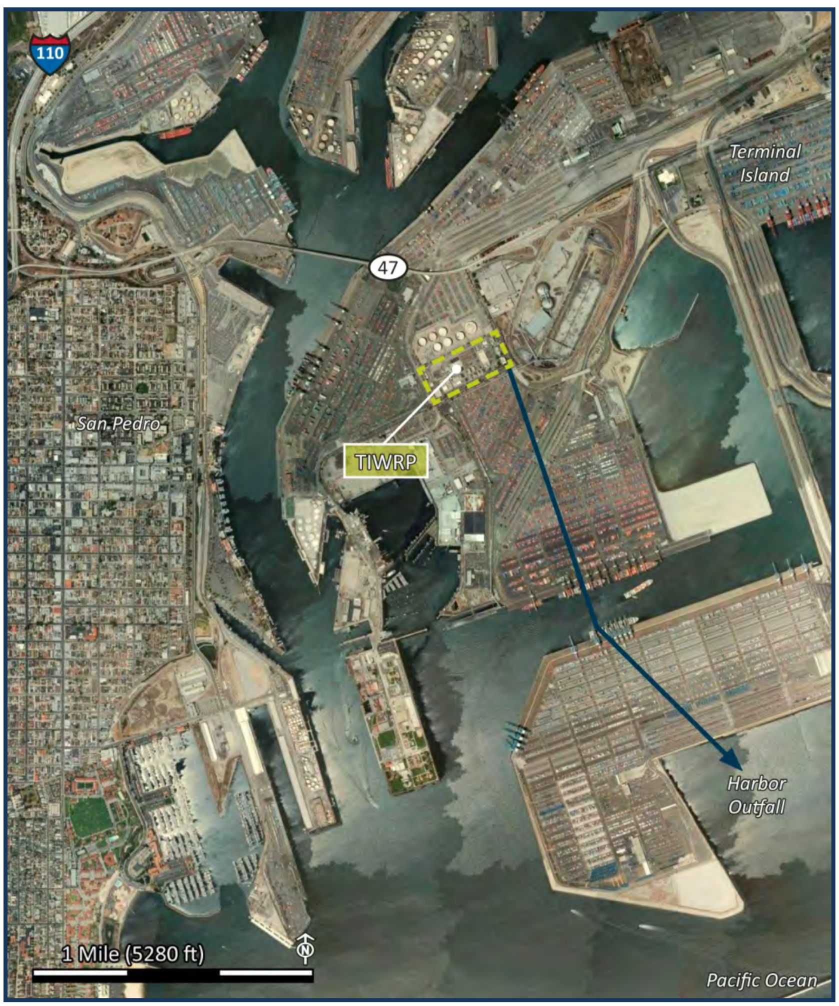
4. Terminal Island Water Reclamation Plant

4.1 Background

4.1.1 General

Terminal Island Water Reclamation Plant (TIWRP) is located on a 22-acre site on Terminal Island in the port area of San Pedro, within the City of Los Angeles, near the entrance to the Los Angeles Harbor (see **Figure 4-1**). TIWRP has a permitted ADWF capacity of 30 mgd and is currently operating at an average influent flowrate of 15.1 mgd for April through June of 2009. TIWRP treats raw sewage from the Terminal Island Service Area (TISA). The treatment plant discharges undisinfected tertiary effluent on a continuous basis through its permitted harbor outfall into the Los Angeles Harbor, which is hydraulically connected by the harbor entrance to the Pacific Ocean. TIWRP also has a 5.0 mgd capacity Advanced Wastewater Treatment Facility (AWTF), which consists of microfiltration membranes, reverse osmosis membranes, and disinfection.

Figure 4-1: TIWRP Site Location



Source: Google Earth Pro, 2009

4.1.2 Source of Influent

TIWRP's service area includes the Los Angeles communities of Wilmington, San Pedro, Terminal Island, and a part of Harbor City. The influent to TIWRP is approximately 50% municipal sewage and 50% industrial sewage. The industrial component consists of waste from fish processing, petroleum, and docking/storage facilities. BOS reports an ongoing gradual decline in the amount of influent from industrial sources. This is partially attributed to the fact that many of the canneries have gradually gone out of business. TIWRP receives its influent from four incoming sewer force mains.

4.1.3 Discharge Locations and Quantity

Undisinfected tertiary effluent from TIWRP is discharged through the Harbor Outfall. The average daily outfall discharge of conventional tertiary effluent is approximately 11.6 mgd, not including brine disposal and advanced treated product water returned to the outfall. There is no clear seasonal pattern to fluctuation in the ocean outfall discharge, since the AWTF flows in the last two years have experienced a gradual decline resulting from operational issues and not from seasonal demand fluctuation.

Advanced treated product water from the AWTF is pumped to injection wells that introduce the water into the Dominguez Gap Seawater Intrusion Barrier and irrigation uses at the Harbor Generating Station (HGS). Prior to injection, the advanced treated recycled water is blended with potable water to meet the blending ratio requirements of the Title 22 permit. Excess RO product water is dechlorinated and returned to the Harbor Outfall.

The main solids handling processes at TIWRP are thickening, thermophilic anaerobic digestion, and dewatering. Dewatered solids meeting EPA Class A Biosolids requirements for land application are trucked off-site to Kern County. A portion of the biosolids are pumped into 5,000-feet-deep injection wells directly below the TIWRP site, as part of the Terminal Island Renewable Energy (TIRE) Project, which is described further in Section 4.3.2 of this TM.

4.1.4 Main Permitted Effluent Constituent Limits

Table 4-1 is a summary of the principal effluent constituent limits from the TIWRP NPDES Permit for discharge to the Harbor Outfall. Table 4-2 shows additional constituent limits from Regional Board Order R4-2003-0025 for the advanced treated product water.

Table 4-1: TIWRP NPDES Effluent Constituents Limits

Constituent	Units	Monthly Average	Weekly Average	Daily Maximum
Total Ammonia - Summer	mg/L	0.71	--	4.7
Total Ammonia - Winter	mg/L	1.3	--	8.4
BOD	mg/L	15	30	40
	lbs/day	3,800	7,500	10,000
MBAS	mg/L	0.5		
	lbs/day	130	--	--

Constituent	Units	Monthly Average	Weekly Average	Daily Maximum
Oil & Grease	mg/L	10	--	15
	lbs/day	2,500	--	3,800
pH		Within limit of 6.5 to 8.5		
Settleable solids	ml/L	0.1	--	0.3
Suspended Solids	mg/L	15	30	40
	lbs/day	3,800	7,500	10,000
Temperature	°F	< 100 °F at all times		
Total Residual chlorine	mg/L	0.5	--	0.1
Turbidity	NTU	--	--	2

Source: Fact Sheet for Waste Discharge Requirements for TIWRP, rev. 4/7/05
Note: The turbidity shall not exceed a daily average of 2 NTU and 5 NTU more than 5% of the time (72 minutes) during any 24 hour period. Additional TIWRP Effluent constituents are shown in Appendix E.

Table 4-2: TIWRP Recycled Water Constituents Limits

Constituent	Units	Monthly Average	Daily Maximum
Oil & Grease	mg/L	10	15
Total Dissolved Solids	mg/L		800
Chloride	mg/L		250
Sulfate	mg/L		250
Boron	mg/L		1.5
Total Nitrogen[1]	mg/L		10

Source: RWQCB No. R4-2003-0025; Water Recycling Requirements for Harbor Water Recycling Project, rev. 1/30/03
[1]Total nitrogen is sum of nitrite-N, nitrate-N, NH_3-N, and organic-N.

In addition to the constituent limits above, the advanced treated product water must meet the following requirements:

- Turbidity prior to disinfection shall not exceed 0.2 NTU more than 5 percent of the time within a 24-hour period and 0.5 NTU at any time.
- Disinfection concentration time shall be at least 450 milligram-minutes per liter with a modal contact time of at least 90 minutes.
- Total coliform bacteria shall not exceed a 7-day median of 2.2 Most Probable Number (MPN) per 100 mL or 23 MPN for any individual sample.
- pH must remain between 6.5 and 8.5.
- Maximum contaminant levels and maximum action levels for California Department of Public Health (CDPH) drinking water standards cannot be exceeded.
- The recycled water must not contain taste or odor-producing substances that affect the groundwater beneficial reuse.
- The recycled water shall not cause a measurable increase in organic chemical contaminants in the groundwater.

4.2 Current Flows and Quality

4.2.1 Flow Schematic and Hydraulic Profile

Figure 4-2 shows a generalized flow schematic of TIWRP.

Figure 4-3 shows a generalized hydraulic profile of TIWRP. Supplementary pumping is provided at the Filter Influent Pump Station, the Effluent Pumping Plant (EPP), the Microfiltration Feed Pump Station, and the Product Water Pump Station. The EPP operates about 2 to 3 hours per day during the highest hourly plant flows; the remainder of the time the outfall flows by gravity. The Product Water Pump Station, located at the downstream end of the advanced tertiary process, delivers advanced treated water to downstream uses including irrigation and the Dominguez Gap Barrier injection wells.

4.2.2 Influent Flows and Quality

Table 4-3 shows current influent flows for the 12 month period between January 1, 2008 and December 31, 2008. Weather data indicated a peak rainfall event in downtown LA during this period was 1.8 inches occurring on December 15, 2008 (Weather Underground, 2009).

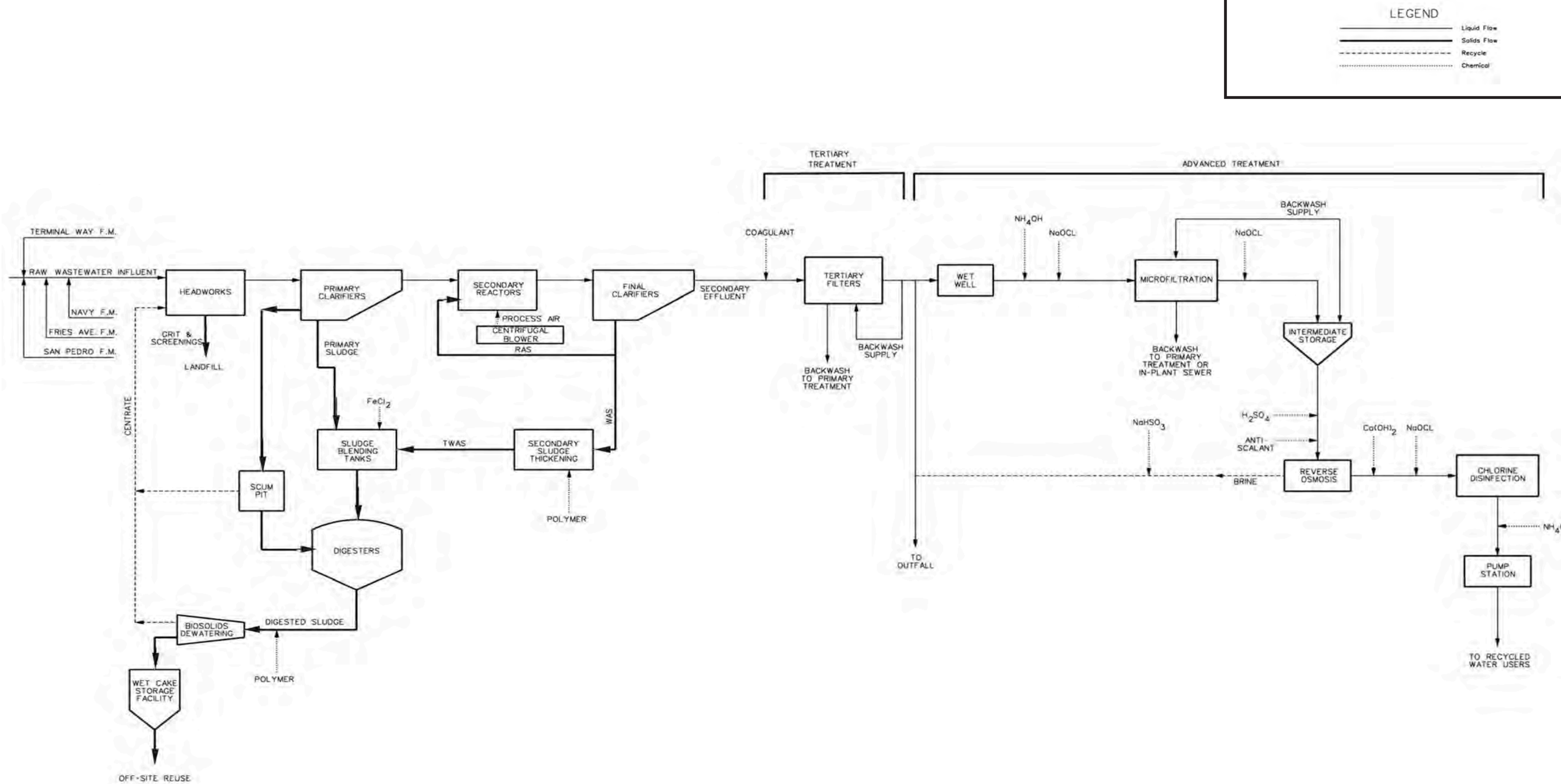
Table 4-3: TIWRP Capacity and Influent Flows
January 2008 through December 2008

Parameters	MGD
Permitted Tertiary Treatment Capacity (ADWF)	30
Current Influent Flows (MGD)	
Average Daily	15.7
Max Daily	24.1
Min Daily	7.0
Peak Recorded Hourly Wet Weather (12/15/08)	32.6
Peak Recorded Hourly Dry Weather (9/9/2008)	29.5
Minimum Known Hourly Night-time (Multiple Days)	0.0[1]

Source: BOS, TIWRP Operations Daily Log, Summary of Overall Treatment
[1]Minimum flow is 0.0 because all of the plant influent sewers are pumped force mains.

Terminal Island Treatment Plant

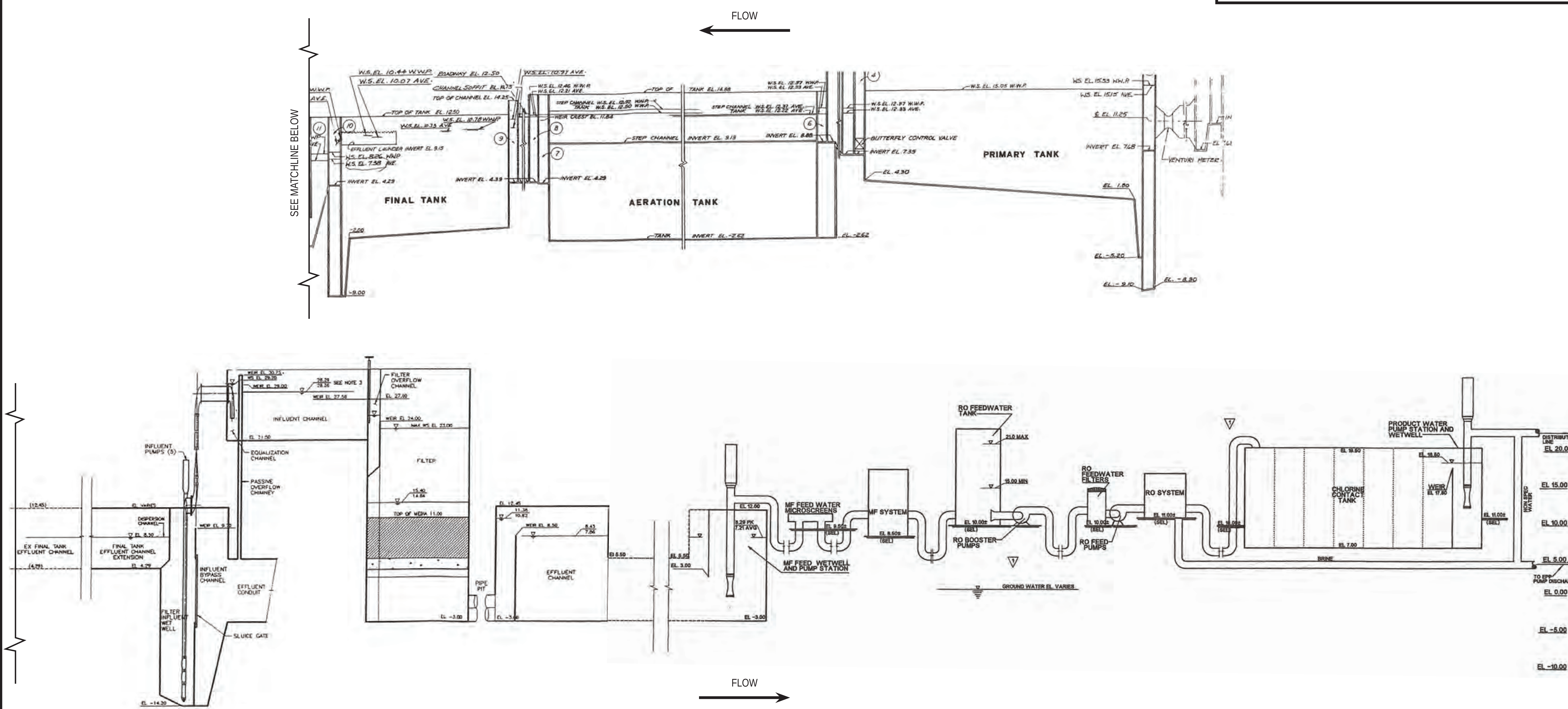
Figure No. 4-2



RMC in association with CDM

Source: City of Los Angeles Integrated Resource Plan (IRP), 2005

Terminal Island Treatment Plant
Hydraulic Profile
Figure No. 4-3



Not to Scale

City of Los Angeles
Recycled Water Master Plan

Source: 1) City As-built No. D31528, BOE/Montgomery Watson: Terminal Island Treatment Plant AWTF Hydraulic Profile, 03/1999, Dwg No. 5110 O-C-2. 2) BOE: Terminal Island Treatment Plant Filter Facility Ph. 1 Hydraulic Profiles, Draft dated 1/18/94. 3) BOE, Terminal Island Unit 1 Dwgs: Terminal Island Flow Diagram, sht 6/504, 4/22/72.

Table 4-4 shows influent quality data for the 12-month period between January 2008 and December 2008.

Table 4-4: TIWRP Influent Quality
January 2008 through December 2008

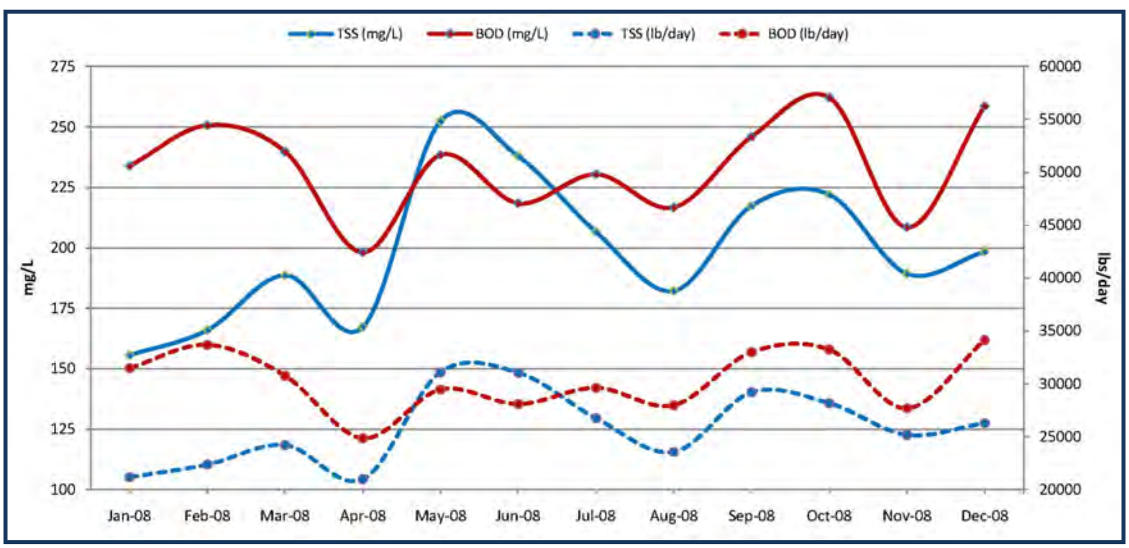
Parameters	Units	Average	Maximum Daily
BOD[2]	mg/L	234	516
TSS[2]	mg/L	200	912
TDS[1]	mg/L	2,684	3,537
Ammonia Nitrogen[2]	mg/L	28.1	86.8
BOD loading[2]	lbs/day	30,345	67,770
TSS loading[2]	lbs/day	25,853	122,359

Source: BOS, TIWRP Operations Daily Log, Summary of Overall Treatment
[1] TDS is calculated based on influent conductivity measurement using the following conversion
TDS (mg/L) = 0.65 Conductivity (ammo/cm).
[2]Max BOD mg/l & tons/day (10/5/08), Max TSS mg/l and tons/day (9/30/08), Max Ammonia Nitrogen (5/4/08)

Figure 4-4 shows influent quality trends for BOD and TSS over the 12-month period from January 2008 to December 2008. The data is presented in both mg/L and lbs/day. BOD loading appears to peak at a maximum monthly average of about 34,000 lbs/day, and the design capacity for the current plant is approximately 78,000 lbs/day (IRP, 2005). TSS loading peaks at a maximum monthly average of about 31,000 lbs/day, and the design capacity for the current plant is approximately 84,000 lbs/day (IRP, 2005).

Influent TDS averages 2,684 mg/L, which is much higher than the other wastewater plants owned by the City. One possible reason for this unusually high TDS is that the influent force mains in the Harbor area pass below the groundwater table and may be experiencing inflow and infiltration of salt water. The reverse osmosis system is currently providing about 95% removal of TDS (influent average of 2,684 mg/L to product water average of 141 mg/L).

Figure 4-4: TIWRP Influent Quality Monthly Averages
January 2008 through December 2008



Source: BOS, TIWRP Operations Daily Log, Summary of Overall Treatment

Seasonal Influent Flows

Figure 4-5 shows daily average influent flows at TIWRP for the 12-month period between July 2008 and June 2009. To better quantify the overall influent flow trend at TIWRP, the graph was divided into four three-month periods. This data shows that the influent flowrate at TIWRP appears to be holding steady or declining very slightly. The three month averages over the 12-month period are all within a narrow range between 15.1 mgd and 15.7 mgd.

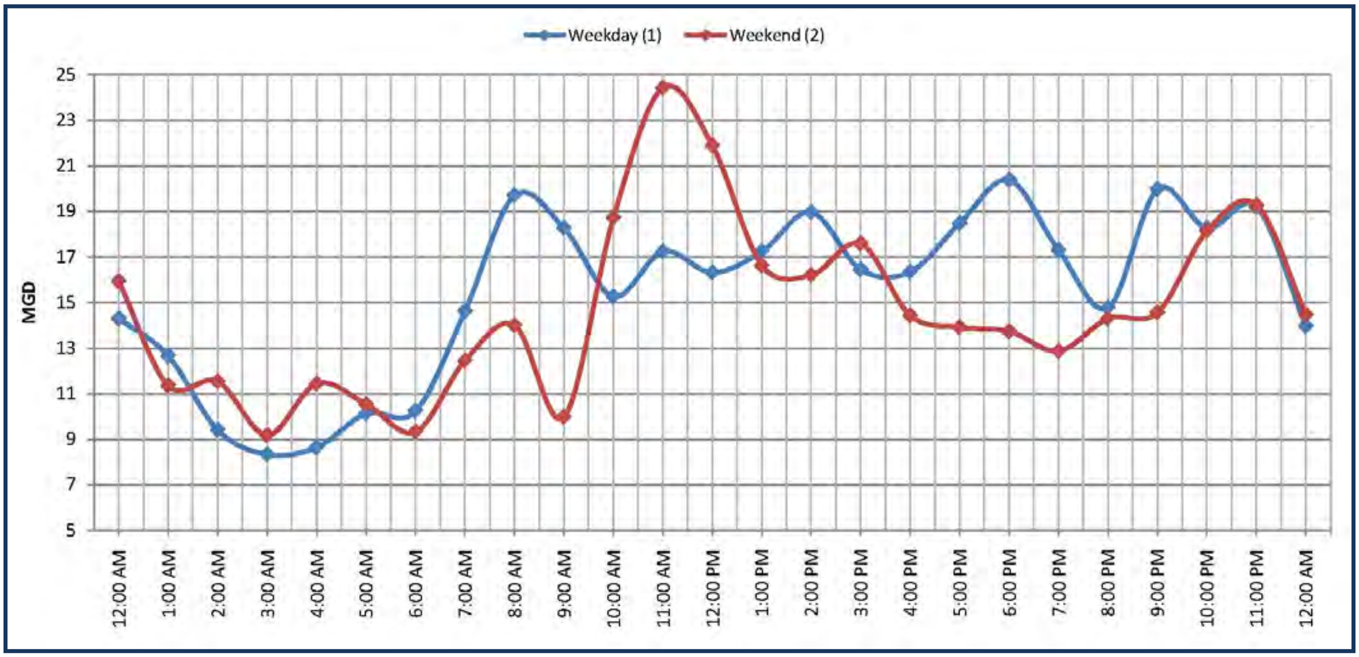
Figure 4-5: TIWRP Daily Average Influent Flows
July 2008 through June 2009

Source: BOS, TIWRP Operations Daily Log, Summary of Overall Treatment

Diurnal Influent Flows

The daily fluctuation in hourly influent flows at TIWRP follows two general patterns: a typical weekday diurnal flow pattern and a typical weekend diurnal flow pattern. Because all of the influent enters the plant through pumped force mains, the diurnal variations are influenced by pump station operations. Both of the generalized diurnal curves are shown in **Figure 4-6**. Minimum hourly flows for the months of June and July 2009 occurred on weekdays; a typical minimum hourly flow for June and July 2009 is 8.3 mgd. Maximum hourly flows for the months of June and July 2009 occurred on weekends; a typical maximum hourly flow for June and July 2009 is 24.4 mgd.

Figure 4-6: TIWRP Diurnal Dry Weather Influent Flows



Source: BOS, TIWRP Operations Daily Log, Summary of Overall Treatment

(1) Weekday: Wednesday, June 10, 2009
(2) Weekend: Sunday, July 19, 2009

4.2.3 Secondary Effluent Flows and Quality

Table 4-5 is a summary of the available secondary effluent data for the principal secondary effluent water quality parameters measured at TIWRP.

Table 4-5: TIWRP Secondary Average Effluent Quality January 2008 through December 2008

Parameters	Units	Average
BOD	mg/L	7
TSS	mg/L	12
Temperature	°F	80.7
pH		7.4

Source: BOS, TIWRP Operations Daily Log, AWTF Operations Report

4.2.4 Tertiary Effluent Flows and Quality

Table 4-6 shows current tertiary effluent flows for the 31-month period between January 2007 and July 2009.

Table 4-6: TIWRP Tertiary Effluent Flows
May 2008 through July 2009

Parameters	MGD
Permitted Tertiary Capacity (MGD)	30
Average Daily Plant Flow	15.4
Max Daily	17.1
Min Daily	8.2
Average Daily Flow to Harbor Outfall	11.6
Average Daily Flow to Advanced Tertiary	3.8
Average Daily RO Product Water Flow	3.2

Source: BOS, TIWRP Operations Daily Log, Summary of Overall Treatment, monthly data

Table 4-7 is a summary of the available tertiary effluent data for the principal tertiary water quality parameters measured at TIWRP.

Table 4-7: TIWRP Tertiary Effluent Quality
January 2007 through July 2009

Parameters	Units	Average
BOD	mg/L	4.0
TSS	mg/L	2.0
Nitrate as N	mg/L	8.5
TN	mg/L	10.2
TP	mg/L	NA
TDS – Average	mg/L	2,868
Maximum	mg/L	3,910
Turbidity	NTU	0.7
Temperature	°F	80.7
Total Fecal Coliform	MPN/ 100 mL	NA
Total Chlorine Residual	mg/L	NA
pH		7.4

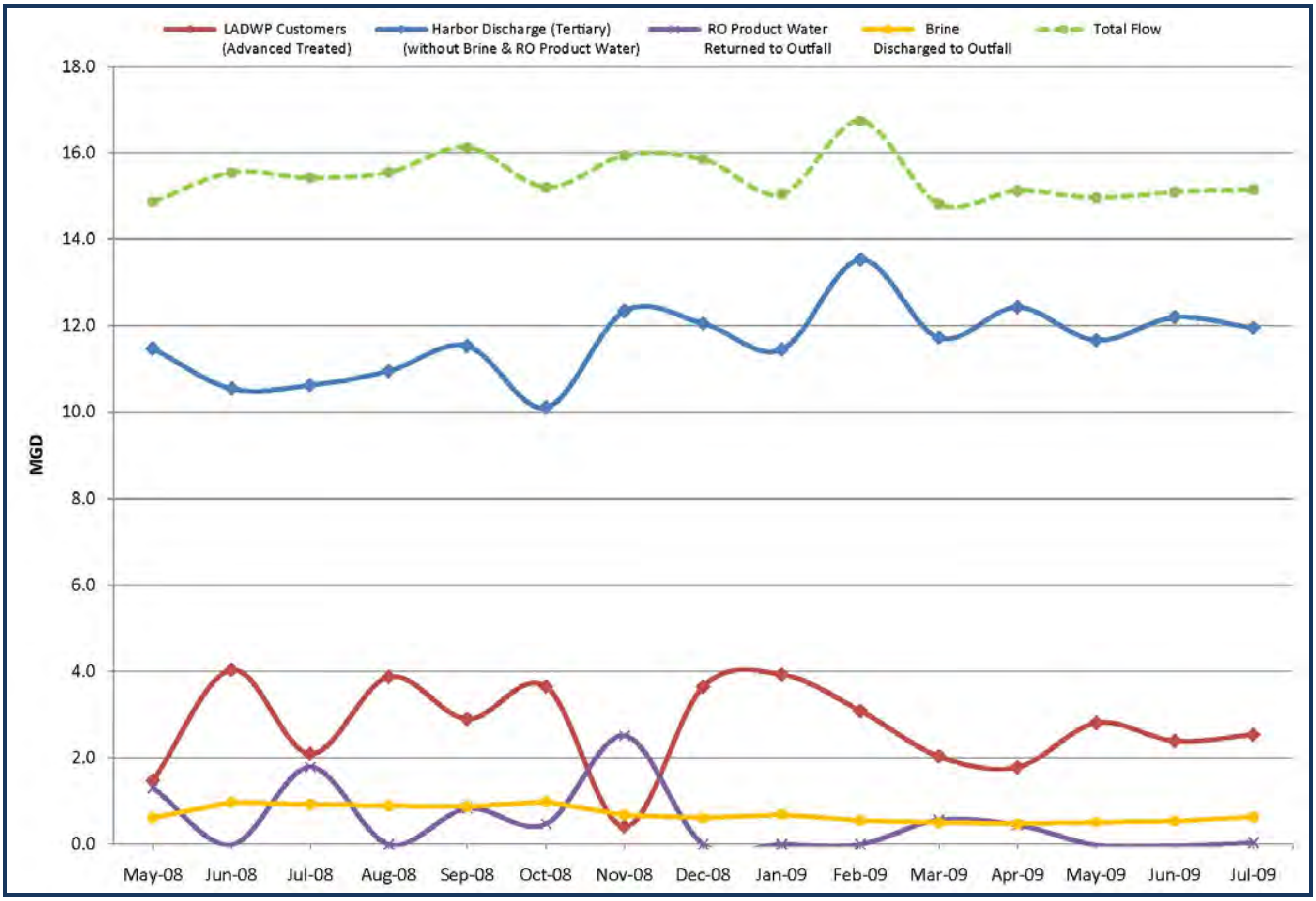
Source: BOS, TIWRP Operations Daily Log, Tertiary Effluent, AWTF Operations Report

Harbor Outfall Flows

The daily volume of flow discharged to the outfall consists of the tertiary effluent flow, minus the amount of tertiary effluent flow pumped by the MF Feed Pump Station to the advanced tertiary process, plus the brine discharged from the reverse osmosis membranes, plus a percentage of the advanced treated product water which is wasted back to the outfall for operational reasons. The average daily outfall flow is approximately 11.6 mgd, not including brine discharge and RO product water that is returned to the outfall.

Figure 4-7 shows the monthly average flow discharged into the Harbor outfall for the 14-month period between May 2008 and July 2009.

Figure 4-7: TIWRP Harbor Discharge and Recycled Water Distribution May 2008 through July 2009



Source: BOS, TIWRP Operations Daily Log, Summary of Overall Treatment

4.2.5 AWTF Effluent Flows and Quality

Table 4-8 shows current advanced tertiary effluent flows for the 17-month period between March 2008 and July 2009.

Table 4-8: TIWRP Advanced Tertiary Effluent Flows May 2008 through July 2009

Parameters	MGD
Permitted Title 22 Advanced Tertiary Capacity (MGD)	5.0
Current Title 22 Advanced Tertiary Production (MGD)	
Average Daily	3.2
Max Daily	5.3
Min Daily	0.0
Average Flow to RW Customers	2.7

Source: BOS, TIWRP Operations Daily Log, AWTF Operations Report

Table 4-9 is a summary of the available advanced tertiary effluent data for the principal advanced tertiary water quality parameters measured at TIWRP. An expanded water quality table for TIWRP can be found in Appendix F.

Table 4-9: TIWRP Advanced Tertiary Effluent Quality March 2008 through July 2009

Parameters	Units	Average
Nitrate as N	mg/L	1.1
TN	mg/L	6.0
TDS – Average	mg/L	127.9
Maximum	mg/L	266.5
Turbidity	NTU	0.05
Temperature	°F	75.2
Total Chlorine Residual	mg/L	3.0
pH		7.4

Source: BOS, TIWRP Operations Daily Log, Tertiary Effluent, AWTF Operations Report

Recycled Water Distribution Flows

Figure 4-7 also shows the monthly average recycled water flows delivered to the recycled water distribution system for the 14-month period between May 2008 and July 2009.

4.2.6 In-plant Flows

In-plant use of effluent at TIWRP is limited to spray-down water, tank cleaning water, and foam control for the aeration basins. None of these uses are continuous.

4.3 Current and Planned Infrastructure

The initial raw sewage discharge facilities were built in the 1930s. Since then there have been numerous plant expansions and upgrades. In 1996, the plant was upgraded from full secondary treatment to tertiary treatment. Construction of a 5.0 mgd advanced tertiary treatment facility was completed in 2001.

4.3.1 Main Process Facilities

Table 4-10 summarizes TIWRP's main process facilities.

Table 4-10: TIWRP Main Process Facilities

Process	Description	
Headworks	**Screenings Removal**	
	Type	Mechanically Raked Climber
	Number	2 (1 duty, 1 standby)
	Design Capacity	30 mgd (each)
	Grit Chamber	
	Type	Aerated
	Number	3
	Area	10 ft x 61 ft x 10 ft
	Overflow Rate (2 Chambers)	45,100 gpd/ft^2
	Detention Time (3 chambers)	3.14 min
Primary Clarifiers	Number	6
	Area	20 ft x 250 ft
	Water Depth	11.9 ft
	Surface Overflow Rate	1,000 gpd/ft^2
	Detention Period @ ADF	2.14 hours
	Capacity	30 mgd
	Type	Plastic Chain and Sprockets, with Fiberglass Flights
Secondary Reactors/ Centrifugal Process	**Aeration Tanks**	
	Type	Conventional, 3 pass
	Number	9
	Area	30 ft x 300 ft
	Average Water Depth	15 ft
	Sludge Retention Time	5.5 hours
	Design Capacity	30 mgd
	Process Air Blowers	
	Type	Centrifugal
	Number	3
	Capacity	36,600 scfm (each)
Final Clarifiers	Number	18
	Area	20 ft x 150 ft
	Side Water Depth	12 ft
	Surface Overflow Rate	555 gpd/ft^2
	Detention Time	2.9 hours
	Design Capacity	30 mgd
Filtration System (Tertiary Treatment)	Type	Multi-media Deep Filter Beds
	Number	16

Process	Description	
	Filter Media	Anthracite, Silica Sand, High Density San
	Loading Rate	5 gpm/ ft^2 (max.), 2.3 gpm/ ft^2 (avg)
	Design Capacity, ADWF	30 mgd (w/one filter out-of-service)
	Design Capacity, PWWF	65 mgd (w/one filter out-of-service)
Advanced Treatment (Reverse Osmosis)	Type	Thin Film, Spiral Wound, Cross Flow Membrane
	Number	2
	Feed Water, Total Capacity	7.6 mgd
	Product Water, Total Capacity	5.0 mgd
Effluent Pumping Plant	**Effluent Pumps**	
	Capacity	52,000 gpm, each
	Type	Centrifugal, Variable Speed
	Number	2
	Ocean Outfall	
	Capacity	66 mgd
	Pipe Size	5,875 ft
	Length	5,875 ft
Sludge Recovery	**Anaerobic Digesters**	
	Type	Egg Shaped Anaerobic Digesters
	Number	4
	Hydraulic Detention Time	15 days
	Hydraulic Capacity	1.38 MG
	WAS Thickener	
	Capacity	83,000 gallons
	Type	Circular Dissolved Air Floatation Tank
	Number of Tanks	1
	Loading Rate	1.27 lbs/hr/ ft^2
	Sludge Dewatering	
	Capacity	2@90 gpm, 1@250 gpm
	Type	Centrifuges
	Number	4
	% Solids in Wetcake	2@22%, 1@25%

Source: IRP, 2005

4.3.2 Recently Completed Upgrades or Improvement Projects

TIWRP has a total of 4 egg-shaped anaerobic thermophilic digesters. The only recent plant upgrade was the refurbishment of digesters 3 & 4 about 6-7 years ago.

TIWRP also recently began injecting a fraction of its biosolids to the Terminal Island Renewable Energy (TIRE) Project, which involves deep well injection of up to 400 pounds per day of biosolids with high pressure progressive cavity pumps to depths of about 5,000 feet below the site. The TIRE facilities are located in a 0.5-acre area at the northwest corner of the TIWRP site.

4.3.3 Planned Capital Projects

The following are planned capital improvement projects for TIWRP reported by BOS staff:

- There is a plan in place to refurbish the maintenance building, but this has been deferred indefinitely for budget reasons.
- There is a renovation of the headworks currently under design.
- There are new sludge dewatering centrifuges being installed. This project is currently under construction.
- There is a plan in place to replace the tertiary feed pumps.
- There is a long-term need to refurbish Digesters 1 and 2, but this project has not yet been funded or scheduled.
- There is a long-term plan to replace the air blowers with higher-efficiency blowers.

4.4 Operational Issues

4.4.1 Population Projections and Influent Flow Estimate

Wastewater flow projections for the entire Terminal Island Service Area (TISA) can be found in the Wastewater Flow Projection TM, which predicts the change in collection system flowrates between now and 2040. For the Year 2040, the predicted population of the TISA is 197,000 inhabitants. For 2040 the projected ADWF for TIWRP is 16.2 mgd.

4.4.2 Issues with Age/Condition of Existing Infrastructure

TIWRP is experiencing the following operational issues:

- **AWTF Operational Issues.** The AWTF facilities have been the source of a number of operational issues since they began operation in 2002. These issues have been the subject of several studies to evaluate the condition of the AWTF and analyses to improve its reliability. Two studies[2] have identified the following AWTF operational issues:
  - The lime slurry injection system is malfunctioning. The process purpose of the lime system is to stabilize (raise) the pH of the advanced treated recycled product water following reverse osmosis. The two chief concerns appear to be caking in the lime feed system and effluent turbidity exceedences resulting from lime particulates in the product water. BOS has already completed full-scale testing of calcium chloride as an alternative to lime.
  - Many of the RO membranes are nearing the end of their factory life and need to be replaced.

[2] Terminal Island Advanced Wastewater Treatment Facility Membrane Optimization Study, Water Quality and Membrane Performance Evaluation, Draft Report, Carollo Engineers, July 2009.
Terminal Island Treatment Plant Advanced Wastewater Treatment Facility Equipment, Processes, and Procedures Evaluation Report, CH2MHill, Summer 2006.

- It has been challenging to balance the Langlier Saturation Index (LSI)[3] with the Modified Fouling Index (MFI), a measure of the propensity of the water to plug the pores of membranes.
- In spite of the issues with the RO membranes, BOS staff considers the microfiltration (MF) membranes to be the flow-limiting factor in the AWTF process. There is a consultant study underway that has made some initial recommendations to resolve operational issues with the membranes. As of September 2009, the study is not finalized, but initial recommendations include the following:
    - Microfiltration Recommendations
        - Replace backwash valves
        - Replace selected O-rings
        - Increase frequency of low-pH chemical cleanings to remove inorganic constituents
        - Avoid re-use of chemical cleaning solutions
    - Reverse Osmosis Recommendations
        - Replace PVC concentrate valves with higher pressure rating
        - Perform "audit" to assess condition of all seals
        - Replace gaskets in interstage flowmeters; repair interstage flowmeters
        - Record feedwater temperature (affects membrane fouling/scale)
        - Develop calibration schedule for chemical feed pumps and chemical feed instrumentation.

- One of the principal operational issues affecting TIWRP in the coming years is compliance with Order R4-2005-0024, which requires eliminating discharge into the Harbor outfall by 2020. Selection of another disposal method for the plant effluent will depend heavily on the following two issues:
    - Recommended disposal method for the tertiary effluent. A consultant study by Montgomery Watson Harza (MWH)[4] considers the alternatives of extending the existing TIWRP harbor outfall to the open ocean, connecting to a future new outfall that LACSD has been considering in its long-term planning, discharging effluent to the Los Angeles River, and other alternatives. This study did not identify a preferred alternative, but it did rank alternatives. Connection to the future LACSD outfall received the highest ranking.
    - Recommended brine disposal method. TIWRP has an understanding with the RWQCB that brine discharges to the outfall will be discontinued. A

[3] The LSI provides an indicator of the degree of saturation of water with respect to calcium carbonate. The LSI is another measure of the propensity of the membrane feed water to cause membrane scaling.
[4] Terminal Island Treatment Plant, Future Utilization Concept Report – Volume I, Montgomery Watson Harza, July 2007.

consultant study commissioned by LADWP[5] evaluated the potential for deep well injection of brine below the TIWRP site at depths ranging from 1,500 feet to 3,000 feet. The concept is to inject the brine above the injection point for the TIRE biosolids, which are injected directly below the TIWRP site at depths ranging between 3,800 and 5,300 feet.

- TIWRP has frequent voltage sags which can be attributed to the fact that the facility is located at the end of the electrical grid. The primary, secondary, and tertiary facilities (excluding advanced tertiary) are on standby power, but currently the standby power is configured for manual initiation and manual re-start. The voltage sags have the effect of disabling motors throughout the plant. After a voltage sag lasting only a few seconds, it can take 4 to 6 hours to put the AWTF back on line. The voltage sags also shut down motors in the primary, secondary, and conventional tertiary facilities.
- The HGS, citing concerns about water quality, is not using AWTF effluent for evaporative cooling and boiler makeup feed as originally intended. Currently HGS only uses the effluent for landscape irrigation.

4.4.3 Summary of Under-utilized Space On-site

Figure 4-8 shows the locations of under-utilized space on the TIWRP site, as identified by BOS staff. The figure also shows portions of the site that represent main utility corridors. Potential locations for future expansion of tertiary treatment infrastructure include the following:

- **Truck Scale:** There is an existing truck scale facility at the southeastern corner of the site, situated in a large open area of asphalt (approximate area: 23,100 ft^2, 0.53 acres). BOS staff report that this mobile scale facility could be relocated on site to make room for future process tankage and/or equipment.
- **Construction Material and Hazardous Waste Storage Area:** This area is at the northwest corner of the site (approximate area: 37,900 ft^2, 0.87 acres).
- **North of Existing Microfiltration Facility** (approximate area: 25,200 ft^2, 0.58 acres): During design of the AWTF, this area was designated for future expansion of the microfiltration system.
- **East of Reverse Osmosis Facility** (approximate area: 4,900 ft^2, 0.11 acres): During design of the AWTF, this area was designated for future expansion of the reverse osmosis system.
- **Between Secondary Clarifiers and Tertiary Filters** (approximate area: 14,000 ft^2, 0.32 acres).
- **North of Maintenance Building** (approximate area: 7,480 ft^2, 0.17 acres).
- **Future Process Stacking Above Primaries** (approximate area: 25,000 ft^2, 0.57 acres)

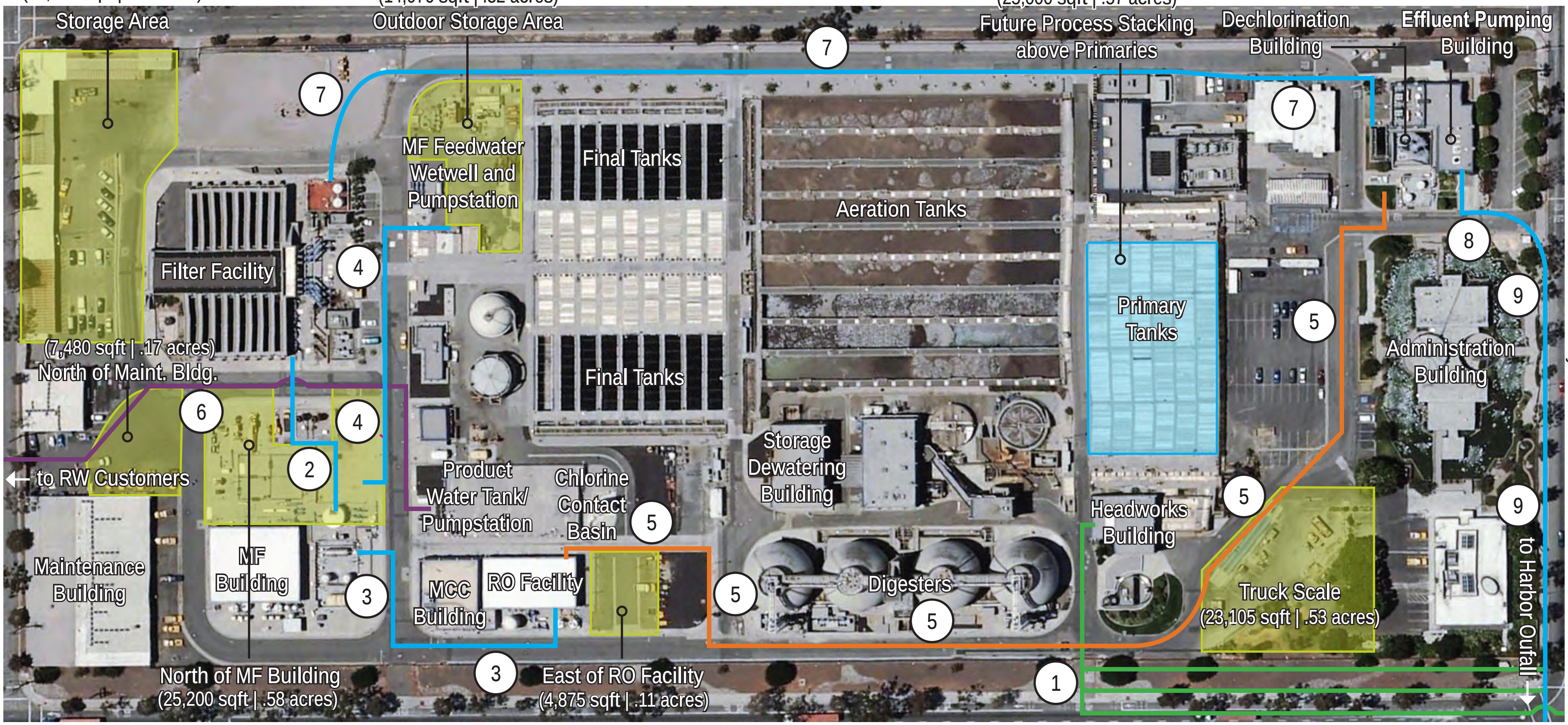
[5] Terminal Island Water Reclamation Plant Brine Well Injection Feasibility Study, Draft Report, AECOM, January 2009.

Table 4-11: TIWRP Potential Locations for Future Treatment Infrastructure

Location	Estimated Area	
	acres	ft^2
Truck Scale	0.53	23,100
Construction Material and Hazardous Waste Storage	0.87	37,900
North of Microfiltration Membranes	0.58	25,200
East of RO	0.11	4,900
Between Secondary Clarifiers and Tertiary Filters	0.32	14,100
North of Maintenance Building	0.17	7,500
Future Process Stacking above Primaries	0.57	25,000
Total	**8.15**	**137,700**

Assuming that the Construction Material and Hazardous Waste Storage area and the area North of Microfiltration Membranes are used for the siting advanced wastewater treatment facilities (MF/RO/AOP), approximately 1.45 acres of land is available. Using the layouts for this process train developed in the Site Assessment TM in Task 1.5 (for DCT), approximately 10 mgd of additional advanced treatment could be installed. [This is a preliminary, order of magnitude estimate that will be further assessed in Task 4.2 Identification of Projects.]

Terminal Island Treatment Plant Utilities Corridor
Figure No. 4-8



LEGEND

① 54" Pretensioned Concrete Cylinder and Multiple Influent Forcemains
②③ 16" Microfiltration Filtrate
④ 24" Microfiltration Feed (Effluent)
⑤ 16" Reverse Osmosis Brine
⑥ 24" Product Water
⑦ Effluent Box Conduit
⑧ 48" Final Effluent Force Main Outfall
⑨ 30" Final Effluent

Note: Electrical Underground Utilities Not Shown

Influent
Tertiary Effluent
Advanced Treated Effluent
Brine
Under-utilized Space/Potential Future Tertiary (Ground Level)
Under-utilized Space/ Potential Future Tertiary (Process Stacking)

0 75' 150' 300'

City of Los Angeles
Recycled Water Master Plan

RMC in association with CDM

Source: Google Earth Pro, 2009

4.4.4 Potential Future Operational Storage/Equalization Needs

Although TIWRP does not currently have any on-site equalization storage, equalization storage may be required in the future for two reasons:

- *Maximizing Advanced Tertiary Production*: The future capacity of the AWTF facilities may exceed the minimum hourly night-time flows. Currently, the night-time influent flows are enough to supply the 5.0 mgd capacity of the AWTF, but if the AWTF is expanded, equalization may be necessary to store tertiary effluent during the day so that the AWTF facilities have the capability of operating at capacity 24 hours per day.
- *Failsafe Disposal for the Zero-Discharge Scenario:* There is a regulatory mandate from the RWQCB to discontinue effluent discharge and brine discharge into the harbor. If BOS decides not to replace this outfall capacity by constructing a new ocean outfall or piping plant effluent to another agency's outfall, then enough advanced treated capacity must be provided to treat 100% of the plant flow, 365 days per year, and failsafe disposal of all the recycled water produced at the AWTF must be guaranteed. Tertiary equalization would store hourly daytime flows in excess of the AWTF capacity.

BOS has indicated that the existing parking lot next to the Administration Building could potentially be used for a future equalization basin.

4.4.5 Means of Failsafe Disposal and Relationship to Future Tertiary Facilities

If an expanded advanced tertiary system becomes the plant failsafe disposal method, then new tertiary on-site equalization storage would be required. Furthermore, the advanced tertiary system and product water pumps would need to be connected to standby power to ensure continuous operation. There would need to be redundant membrane modules and an analysis confirming that the Dominguez Gap injection wells can accept product water for the full anticipated plant volume 365 days per year. Sufficient redundancy would need to be built into the membrane system to operate it continuously year-round.

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<u>Hyperion Treatment Plant</u>

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Appendix A - HTP Effluent Constituent Limits for Human Health Toxicants and 303(d) Constituents

propose daily maximum acute toxicity effluent limits and testing protocols consistent with the 2001 Ocean Plan. Using the new objective of 0.3 TUa for the daily maximum and 10% of the dilution ratio (as the acute toxicity mixing zone), the daily maximum acute toxicity limits are calculated as follows:

$$Ce = Ca + (0.1)\ Dm\ (Ca)$$

where
- Ce = the effluent daily maximum limit for acute toxicity.
- Ca = the concentration (water quality objective) to be met at the edge of the acute mixing zone.
- Dm = minimum probable initial dilution expressed as parts seawater per part wastewater (84:1 and 13:1 for Outfall Nos. 002 and 001, respectively). (This equation applies only when Dm > 24)

For Discharge Serial No. 002, the Acute Toxicity Units (TUa) is expressed as follows:

Acute Toxicity Units (TUa) = 100/LC50

where:

Lethal Concentration, 50 Percent (LC50) is expressed as the estimate of the percent effluent concentration that causes death in 50% of the test population, in the time period prescribed by the toxicity test, as required by this permit

Radioactivity Limit – Regional Board and USEPA staff used Best Professional Judgements to establish radioactivity limits for the effluent using Maximum Contaminant Levels (MCLs) for the drinking water specified in Title 22, California Code of Regulations.

b. **Human Health Toxicants – Noncarcinogens**

i. Discharge Serial No. 002

There is one constituent (tributyltin) that exhibited reasonable potential to exceed an Ocean Plan objective. Therefore, an effluent limit is prescribed for this constituent.

Constituent	Unit	Discharge Limitations Monthly Average	Rationale/ Basis
Tributyltin	µg/L	120	Ocean Plan
	lbs/day	0.42	

ii. Discharge Serial No. 001

There is two constituents (2,4-Dinitrophenol and tributyltin) that exhibited reasonable potential to exceed an Ocean Plan objective. Therefore, effluent limits are prescribed for these constituents.

Constituent	Unit	Discharge Limitations Monthly Average	Rationale/ Basis
2,4-Dinitrophenol	μg/L	56	Ocean Plan
Tributyltin	μg/L	20	Ocean Plan

c. **Human Health Toxicants – Carcinogens**

i. Discharge Serial No. 002

The following constituents exhibited reasonable potential to exceed an Ocean Plan objective. Therefore, effluent limits are prescribed for these constituents.

Constituent	Unit	Discharge Limitations Monthly Average	Rationale/ Basis
Chlordane	μg/L	0.0019	Ocean Plan
	Lbs/day	0.0067	
DDT	μg/L	0.014	Ocean Plan
	Lbs/day	0.049	
PAHs	μg/L	0.748	Ocean Plan
	Lbs/day	2.62	
PCBs	μg/L	0.002	Ocean Plan
	Lbs/day	0.007	
TCDD equivalents	pg/L	0.33	Ocean Plan
	Lbs/day	1.2×10^{-6}	

ii. Discharge Serial No. 001

The following constituents exhibited reasonable potential to exceed an Ocean Plan objective. Therefore, effluent limits are prescribed for these constituents.

Constituent	Unit	Discharge Limitations Monthly Average	Rationale/ Basis
Acrylonitrile	μg/L	1.4	Ocean Plan
Beryllium	μg/L	0.46	Ocean Plan
Bis(2-chloroethyl) ether	μg/L	0.63	Ocean Plan
Bis(2-ethylhexyl) phthalate	μg/L	49	Ocean Plan

Constituent	Unit	Discharge Limitations Monthly Average	Rationale/ Basis
Chlordane	ng/L	0.3	Ocean Plan
DDT, total	ng/L	2.4	Ocean Plan
N-Nitrosodi-n-propylamine	µg/L	5.3	Ocean Plan
PAHs	ng/L	123	Ocean Plan
PCBs	ng/L	0.3	Ocean Plan
TCDD equivalents	pg/L	0.055	Ocean Plan
Tetrachloroethylene	µg/L	28	Ocean Plan
2,4,6-Trichloroethane	µg/L	4.1	Ocean Plan

d. 303(d) Listed Constituents and Discharge Limitations

At various locations in Santa Monica Bay, DDT and chlordane, PCBs and PAHs are found in sediments at levels that can be harmful to marine organisms. In addition, DDT and PCBs are found in certain Bay-captured seafood species at levels posing potential health risks to humans. A brief description of these pollutants and their occurrence in Santa Monica Bay is given below.

In the U.S., DDT and chlordane, both organochlorine insecticides, were widely used in agricultural and urban settings until they were banned in 1973 and 1988, respectively. PCBs, a large group of industrial and commercial chemicals, were widely used as coolants and lubricants in transformers, capacitors and other electronic equipment until the late 1970s when their manufacture was banned. Because of their stable properties, DDT, chlordane and PCBs persist in the environment, the result of historical uses which no longer occur. They have low water solubility and are generally found in sediments and fish tissue. PAHs are trace organic contaminants that occur naturally in crude oil, coal and other hydrocarbons. Anthropogenic sources include the combustion of hydrocarbons and their presence in fossil fuel products, such as coal-tar pitch and asphalt. PAHs are slightly soluble in water. Binding to particulate matter, they tend to accumulate in sediments and concentrate in biota. When present in sufficient quantity, PAHs are toxic to aquatic life and carcinogenic to humans.

Bight '98 surveys included efforts to assess the spatial extent of anthropogenic contaminant accumulation in benthic sediments and their effects on marine biota in the Southern California Bight. These surveys showed that while elevated levels of DDT, chlordane and PCBs continue to be measured in sediments near Hyperion Treatment Plant's 5-mile outfall, much of this is reflective of historical deposition and not the levels of contaminants associated with recent discharges. These surveys also concluded that DDT and PCBs in sediments are a dominant source of contaminant exposure levels in bottom living fish. DDT continues to be found in fish tissue at levels of concern throughout the Bight, although these levels are declining over time. Elevated levels of PAHs continue to be measured in offshore sediments near Hyperion's 7-mile outfall, decommissioned in November 1987, and are primarily reflective of historical deposition associated with the discharge of sewage sludge. PAHs are also found in shallow water offshore sediments associated with urban stormwater runoff from Ballona Creek. (Bay et al., 2003.) Monitoring data show that effluent levels of DDT, chlordane, PCBs and PAHs discharged from the 5-mile outfall remain at non-detect concentrations.

As described in Section X.G., nearshore and offshore waters of Santa Monica Bay are on California's 2002 CWA 303(d) list of water quality limited segments for DDT (sediment and tissue, centered on Palos Verdes Shelf); chlordane (sediment); PCBs (sediment and tissue); and PAHs (sediment). TMDLs for DDT, PCBs and PAHs have not been scheduled. A TMDL for chlordane is scheduled for 2006. As TMDLs for these four constituents have not been completed, the draft permit proposes to continue forward mass emission and concentration WQBELs contained in the 1994 permit. These limits are based on Ocean Plan water quality objectives and permit limit calculation procedures, and, for Discharge Serial No. 002, the average design flow rate (420 mgd) of the Hyperion Treatment Plant in 1994. Current performance for DDT, chlordane, PCBs and PAHs in the Hyperion Treatment Plant effluent are at non-detect concentrations.

i. Discharge Serial No. 002

Constituent	Units	Discharge Limitations Monthly Average
Chlordane	ug/L lbs/day	0.0019 0.007
DDT	ug/L lbs/day	0.014 0.05
PAHs	ug/L lbs/day	0.748 2.62
PCBs	ug/L lbs/day	0.002 0.007

ii. Discharge Serial No. 001

Constituent	Units	Discharge Limitations Monthly Average
Chlordane	ng/L	0.3
DDT	ng/L	2.4
PAHs	ng/L	123
PCBs	ng/L	0.3

Appendix B - HTP Effluent Water Quality

Hyperion Treatment Plant (HTP)[1]- Effluent Water Quality to the 5-Mile Outfall								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Highest Average Level in LADWP Water (2004-2006)[2]
pH	pH units	Monthly Average	6.8	Monthly Average	7.1	Monthly Average	6.6	-	-	
SETTLEABLE SOLIDS	CFU/100 ML			-	-					
SUSPENDED SOLIDS	mg/L	Monthly Average	19.0	Monthly Average	22.0	Monthly Average	21.0			
TOTAL BOD (5-DAY)	mg/L	Monthly Average	18.0	Monthly Average	21.0	Monthly Average	15.0			
OIL AND GREASE	mg/L	-	ND	-	ND	-	ND			
TOTAL DISSOLVED SOLIDS	mg/L								Recommended - 500 Upper - 1,000 Short Term - 1,500	
CHLORIDE	mg/L								Recommended - 250 Upper - 500 Short Term - 600	
BORON	mg/L									
SULFATE	mg/L								Recommended - 250 Upper - 500 Short Term - 600	
MBAS	mg/L									
N03-N	mg/L								45	
N02-N	mg/L								10	
COPPER	µg/L								1300	802
MERCURY	ug/L								2	
ZINC	ug/L	Monthly Average	17.0	Monthly Average	30.0	Monthly Average	20.0		5000	
FLUORIDE	mg/l								2.0	
CADMIUM	ug/l								5.0	
CYANIDE	mg/l	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND		150.0	
ALUMINUM	µg/L								1000	
ANTIMONY	µg/L	Monthly Average	DNQ	Monthly Average	1.3	Monthly Average	ND		6	
ARSENIC	µg/L	Monthly Average	2.4	Monthly Average	3.4	Monthly Average	1.5		10	3.3
BARIUM	µg/L								1000	
BERYLLIUM	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND		4	
CADMIIUM	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND		5	
MERCURY	µg/L								2.0	
NICKEL	µg/L	Monthly Average	DNQ	Monthly Average	21.8	Monthly Average	ND		0.1	
SELENIUM	µg/L	Monthly Average	DNQ	Monthly Average	1.5	Monthly Average	1.0		50.0	
THALLIUM	µg/L	Monthly Average	DNQ	Monthly Average	DNQ	Monthly Average	DNQ		2.0	
FLUORIDE	mg/l								2.0	
ASBESTOS	MFL								7.0	
CYANIDE	µg/L									
CHROMIUM (TOTAL)'	µg/L	Monthly Average	DNQ	Monthly Average	DNQ	Monthly Average	DNQ			
ALUMINUM	µg/L								200	
COPPER	µg/L								1000	
MBAS	mg/L								500	
IRON	µg/L								300	
MANGANESE	µg/L								50	
SILVER	µg/L								100	
ZINC	µg/L								5000	

Hyperion Treatment Plant (HTP)[1]- Effluent Water Quality to the 5-Mile Outfall								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Highest Average Level in LADWP Water (2004-2006)[2]
THIOBENCARB	µg/L								1	
CORROSIVITY @ 20C	-									
CORROSIVITY @ 60C	-									
MTBE	µg/L	3-Month Average	DNQ	3-Month Average	DNQ	3-Month Average	DNQ		13	
THRESHOLD ODOR	T.O.N									
TURBIDITY	NTU	Monthly Average	9.0	Monthly Maxium	19.0	Monthly Average	8.0			
BENZENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND	µg/L	1	
CARBON TETRACHLORIDE	µg/L	3-Month Average	ND	3-Month Average	2.6	3-Month Average	ND	µg/L	0.5	
1,2-DICHLOROBENZENE VOC	µg/L							µg/L	600	
1,4-DICHLOROBENZENE VOC	µg/L							µg/L	5	
1,1-DICHLOROETHANE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND	µg/L	5	
1,2-DICHLOROETHANE	µg/L							µg/L	0.5	
1,1-DICHLOROETHENE	µg/L							µg/L	6	
CIS-1 ,2-DICHLOROETHENE	µg/L							µg/L	6	
TRANS-1,2-DICHLOROETHYLENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND	µg/L	10	
METHYLENE CHLORIDE	µg/L	3-Month Average	DNQ	3-Month Average	2.5	3-Month Average	DNQ			
1,2-DICHLOROPROPANE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
CIS-1,3·DICHLOROPROPENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
TRANS-1,3-DICHLOROPROPENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
ETHYLBENZENE	µg/L	3-Month Average	ND	3-Month Average	DNQ	3-Month Average	ND			
MTBE	µg/L									
CHLOROBENZENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
STYRENE	µg/L							µg/L	100	
1,1,2,2-TETRACHLOROETHANE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND	µg/L	1	
TETRACHLOROETHYLENE	µg/L	3-Month Average	DNQ	3-Month Average	6.1	3-Month Average	ND			
TOLUENE	µg/L	3-Month Average	DNQ	3-Month Average	2.6	3-Month Average	ND	µg/L	150	
1,2,4-TRICHLOROBENZENE VOC	µg/L							µg/L	5	
1,1,1-TRICHLOROETHANE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND	µg/L	200	
1,1,2-TRICHLOROETHANE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND	µg/L	5	
TRICHLOROETHENE	µg/L	3-Month Average	DNQ	3-Month Average	DNQ	3-Month Average	DNQ			
TRICHLOROFLUOROMETHANE	µg/L							µg/L	150	
1,1 ,2-TRICHLORO-1 ,2,2-TRIFLUOROETHANE	µg/L							µg/L	1200	
VINYL CHLORIDE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND	µg/L	0.5	
XYLENE (M,P)	µg/L							µg/L	1750	
ALACHLOR	µg/L							µg/L	2	
ATRAZINE	µg/L							µg/L	1	
BENTAZON	µg/L							µg/L	18	
BENZO(A)PYRENE	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND	µg/L	0.2	
CHLORDANE	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND	µg/L	0.1	
2,4-D	µg/L							µg/L	70	
DALAPON	µg/L							µg/L	200	
BIS-(2-ETHYLHEXYL)ADIPATE	µg/L							µg/L	400	
BIS.(2.ETHYLHEXYL)PHTHALATE	µg/L							µg/L	4	
DINOSEB	µg/L							µg/L	7	
DIQUAT	µg/L							µg/L	20	

Hyperion Treatment Plant (HTP)[1]- Effluent Water Quality to the 5-Mile Outfall								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Highest Average Level in LADWP Water (2004-2006)[2]
ENDOTHALL	µg/L							µg/L	100	
ENDRIN	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND	µg/L	2	
GLYPHOSATE	µg/L							µg/L	6	
HEPTACHLOR	µg/L							µg/L	0.01	
HEPTACHLOR EPOXIDE	µg/L							µg/L	0.01	
HEXACHLOROBENZENE	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND	µg/L	0.05	
HEXACHLOROCYCLOPENTADIENE	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND	µg/L	0.025	
GAMMA-BHC	µg/L									
METHOXYCHLOR	µg/L							µg/L	30	
MOLINATE	µg/L							µg/L	20	
PENTACHLOROPHENOL	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND	µg/L	1	
PICLORAM	µg/L							µg/L	500	
PCB 1016	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
PCB 1221	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
PCB 1232	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
PCB 1242	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
PCB 1248	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
PCB 1254	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
PCB 1260	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
SIMAZINE	µg/L							µg/L	4	
THIOBENCARB	µg/L							µg/L	70	
TOXAPHENE	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND	µg/L	3	
2,3,7,8-TCDD TEQ	pg/L	Monthly Average	0.0	Monthly Average	0.0	Monthly Average	0.0	pg/L	30	
2,4,5-TP (SILVEX)	µg/L							µg/L	50	
CARBOFURAN	µg/L							µg/L	18	
1,2-DIBROMO-3-CHLOROPROPANE	µg/L									
1,2-DIBROMOETHANE	µg/L									
OXAMYL	µg/L									
BROMODICHLOROMETHANE	µg/L	3-Month Average	2.1	3-Month Average	3.4	3-Month Average	2.0			
BROMOFORM	µg/L	3-Month Average	DNQ	3-Month Average	DNQ	3-Month Average	DNQ			
CHLOROFORM	µg/L	3-Month Average	6.0	3-Month Average	7.2	3-Month Average	3.7			
DIBROMOCHLOROMETHANE	µg/L	3-Month Average	2.9	3-Month Average	3.7	3-Month Average	2.5			
TOTAL TRIHALOMETHANES (TTHM)	µg/L							mg/L	0.08	
MONOCHLOROACETIC ACID	µg/L									
DICHLOROACETIC ACID	µg/L									
TRICHLOROACETIC ACID	µg/L									
MONOBROMOACETIC ACID	µg/L									
DIBROMOACETIC ACID	µg/L									
HALOACETIC ACID (FIVE) (HAAS)	µg/L							mg/L	0.06	
ALDRIN	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
DIELDRIN	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
P,P'-DDT	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
P,P'-DDE	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
P,P'-DDD	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
ENDOSULFANI	µg/L									

Hyperion Treatment Plant (HTP)[1]- Effluent Water Quality to the 5-Mile Outfall								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Highest Average Level in LADWP Water (2004-2006)[2]
ENDOSULFAN II	µg/L									
ENDOSULFAN II SULFATE	µg/L									
ENDRIN ALDEHYDE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
ALPHA-SHC	µg/L									
BETA-SHC	µg/L									
DELTA-SHC	µg/L									
ACROLEIN	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
ACRYLONITRILE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
CHLOROBENZENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
CHLOROETHANE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
1,1·DICHLOROETHENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
CHLOROMETHANE	µg/L	3-Month Average	ND	3-Month Average	DNQ	3-Month Average	ND			
BROMOMETHANE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
1,3·DICHLOROBENZENE VOC	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
2·CHLOROETHYL VINYL ETHER	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
NAPHTHALENE VOC	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
ACENAPHTHENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
BENZIDINE	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
HEXACHLOROETHANE	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
BIS-(2-CHLOROETHYL)ETHER	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
2-CHLORONAPHTHALENE	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
3,3'-DICHLOROBENZIDINE	µg/L	Monthly Average	ND	Monthly Average	ND	Monthly Average	ND			
2,4-DINITROTOLUENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
2,6-DINITROTOLUENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
AZOBENZENEA	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
FLUORANTHENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
4-CHLOROPHENYL PHENYL ETHER	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
4-BROMOPHENYL PHENYL ETHER	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
BIS-(2-CHLOROISOPROPYLIETHER	µg/L									
BIS-(2-CHLOROETHOXYlMETHANE	µg/L									
HEXACHLOROBUTADIENE BNA	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
ISOPHORONE	µg/L	3-Month Average	ND	3-Month Average	DNQ	3-Month Average	ND			
NITROBENZENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
N-NITROSODIMETHYLAMINE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
N-NITROSO-DI-N-PROPYLAMINE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
N·NITROSODIPHENYLAMINE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
BIS-(2.ETHYLHEXYL)PHTHALATE	µg/L	3-Month Average	9.2	3-Month Average	17.1	3-Month Average	5.3			
BUTYLBENZYLPHTHALATE	µg/L	3-Month Average	ND	3-Month Average	NDQ	3-Month Average	ND			
DI·N-BUTYLPHTHALATE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
DI-N-OCTYLPHTHALATE	µg/L	3-Month Average	ND	3-Month Average	NDQ	3-Month Average	ND			
DIETHYLPHTHALATE	µg/L	3-Month Average	ND	3-Month Average	4.0	3-Month Average	2.1			
DIMETHYLPHTHALATE	µg/L	3-Month Average	ND	3-Month Average	DNQ	3-Month Average	ND			
BENZO(A)ANTHRACENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
BENZO(B)FLUORANTHENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
BENZO(K)FLUORANTHENE	µg/L	3-Month Average	ND	3-Month Average	DNQ	3-Month Average	ND			

Hyperion Treatment Plant (HTP)[1]- Effluent Water Quality to the 5-Mile Outfall								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Highest Average Level in LADWP Water (2004-2006)[2]
CHRYSENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
ACENAPHTHYLENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
ANTHRACENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
BENZO(G,H,I)PERYLENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
FLUORENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
PHENANTHRENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
DIBENZO(A,H)ANTHRACENE	µg/L	3-Month Average	ND	3-Month Average	DNQ	3-Month Average	ND			
INDENO(1,2,3-CD)PYRENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
PYRENE	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
2,4,6-TRICHLOROPHENOL	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
4-CHLORO·3·METHYLPHENOL	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
2-CHLOROPHENOL	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
2,4-DICHLOROPHENOL	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
2,4-DIMETHYLPHENOL	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
2-NITROPHENOL	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
4·NITROPHENOL	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
2,4.DINITROPHENOL	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
4,6-DINITRO·2·METHYLPHENOL	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
PHENOL	µg/L	3-Month Average	ND	3-Month Average	ND	3-Month Average	ND			
CHLORATE	µg/L									
DIAZINON	µg/L									
1A-DIOXANE	µg/L									
ETHYLENE GLYCOL	µg/L									
N-NITROSODIETHYLAMINE	µg/L									
N·NITROSODIMETHYLAMINE	µg/L									
MANGANESE	µg/L									
VANADIUM	µg/L									
PERCHLORATE	µg/L							µg/L	6	6
N·BUTYLBENZENE	µg/L									
BUTYLBENZENE	µg/L									
TERT·BUTYLBENZENE	µg/L									
CARBON DISULFIDE	µg/L									
2·CHLOROTOLUENE	µg/L									
4·CHLOROTOLUENE	µg/L									
DICHLORODIFLUOROMETHANE	µg/L									
FORMALDEHYDE	µg/L									
ISOPROPYLBENZENE	µg/L									
4-METHYL-2·PENTANONE	µg/L									
NAPHTHALENE VOC	µg/L									
N-PROPYLBENZENE	µg/L									
TERT-BUTYL ALCOHOL	µg/L									
1,2,3-TRICHLOROPROPANE	µg/L									
1,2,4-TRIMETHYLBENZENE	µg/L									
1,3,5-TRIMETHYLBENZENE	µg/L									
ALPHA RADIOACTIVITY	pCi/L	Monthly Average	4.1	Monthly Average	8.2	Monthly Average	1.9	pCi/L	15	4.8

Hyperion Treatment Plant (HTP)[1]- Effluent Water Quality to the 5-Mile Outfall									Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Highest Average Level in LADWP Water (2004-2006)[2]
BETA RADIOACTIVITY	pCi/L	Monthly Average	10.1	Monthly Average	27.5	Monthly Average	1.1	pCi/L	4 millirem/year annual dose equivalent to the total body or any internal organ	5.4

Footnotes

1. Data Obtain from RWRCB 2008 Annual Monitoring Report

2. Data Obtain from City of Los Angeles Drinking Water Public Health Goals Report 2007

ND - Not Detected

DNQ - Detected but not Quantifiable

Appendix C - LAG Effluent Constituent Limits for Priority Pollutants

D. Final Limits for priority pollutants discharged through Discharge Serial No. 001, to the Los Angeles River:

CTR # [18]	Constituent	Units	Discharge Limitations	
			Monthly Average	Daily Maximum
4	Cadmium[19]	µg/L	4.6[20,21]	9.2[20,21]
		lbs/day[22]	0.77[20,21,23]	1.5[20,21,23]
6	Copper[19]	µg/L	22[24, ✯]	40[24, ✯]
		lbs/day[22]	3.7[24]	6.7[24]
7	Lead[19]	µg/L	8.8[20,21,25]	22[20,21,25]
		lbs/day[22]	1.5[20,21,23,25]	3.7[20,21,23,25]
8	Mercury[19]	µg/L	0.051[24]	0.13[24]
		lbs/day[22]	0.0085[24]	0.022[24]
13	Zinc[19]	µg/L	217[20,21]	288[20,21]
		lbs/day[22]	36[20,21,23]	48[20,21,23]

18 This number corresponds to the compound number found in Table 1 of CTR. It is simply the order in which the 126 priority pollutants were listed 40 CFR part 131.38 (b)(1).

19 Concentration expressed as total recoverable.

20 This is the **wet weather** waste load allocation (WLA), according to Resolution No. R05-006, ***Amendment to the Water Quality Control Plan for the Los Angeles Region to Incorporate a Total Maximum Daily Load for Metals for the Los Angeles River and its Tributaries*** (***LA River Metals TMDL***), adopted by the Regional Board on June 2, 2005. The Metals TMDL was approved by the State Board, with the adoption of Resolution No. 2005-0077. On December 9, 2005 and December 22, 2005, respectively, OAL and USEPA approved the ***LA River Metals TMDL***. It went into effect on January 11, 2006. According to the LA River Metals TMDL, wet weather is "when the maximum daily flow in the River is greater than 500 cfs."

21 This effluent limitation will not be in effect until January 11, 2011, five years after the Metals TMDL effective data, according to the LA River Metals TMDL Implementation Section.

22 The mass emission rates are based on the existing plant design flow rate of 20 mgd, and are calculated as follows: Flow(mgd) x Concentration (µg/L) x 0.00834 (conversion factor) = lbs/day. During wet-weather storm events in which the flow exceeds the design capacity, the mass discharge rate limitations shall not apply, and concentration limitations will provide the only applicable effluent limitations.

23 According to LA River Metals TMDL, the mass-based limits for cadmium, lead, and zinc will not apply during wet weather.

24 This effluent limitation will not be in effect until May 17, 2010. Until that time, the Discharger shall comply with the interim limits established in Section I.1.I.a. of the accompanying NPDES Order No. R4-2006-XXXX.

✯ This is consistent with the SIP and metals TMDL implementation procedures. The monthly average and daily maximum were derived using the Site-Specific Translators of 0.80 (chronic), 0.89 (acute), respectively. Detailed discussions are found in the Fact Sheet, section VII.17.D.

25 This is the **dry weather** waste load allocation (WLA), according to Resolution No. R05-006, ***Amendment to the Water Quality Control Plan for the Los Angeles Region to Incorporate a Total Maximum Daily Load for Metals for the Los Angeles River and its Tributaries*** (***LA River Metals TMDL***), adopted by the Regional Board on June 2, 2005. The Metals TMDL was approved by the State Board, with the adoption of Resolution No. 2005-0077. On December 9, 2005 and December 22, 2005, respectively, OAL and USEPA approved the ***LA River Metals TMDL***. It went into effect on January 11, 2006. According to the LA River Metals TMDL, dry weather is "when the maximum daily flow in the River is less than 500 cfs."

CTR # [18]	Constituent	Units	Discharge Limitations	
			Monthly Average	Daily Maximum
14	Cyanide	µg/L	3.4[24]	9.6[24]
		lbs/day[22]	0.57[24]	1.6[24]
38	Tetrachloroethylene	µg/L	5	No limit
		lbs/day[22]	0.83	No limit
60	Benzo(a)anthracene	µg/L	0.049[24]	0.12[24]
		lbs/day[22]	0.0082[24]	0.02[24]
68	Bis(2-ethylhexyl)phthalate	µg/L	4[24]	16[24]
		lbs/day[22]	0.67[24]	2.7[24]
73	Chrysene	µg/L	0.049[24]	0.11[24]
		lbs/day[22]	0.0082[24]	0.018[24]
74	Dibenzo(a,h)Anthracene	µg/L	0.049[24]	0.11[24]
		lbs/day[22]	0.0082[24]	0.018[24]
97	N-Nitrosodi-n-propylamine	µg/L	1.4	3.3
		lbs/day[22]	0.23	0.55

E. Basis for priority pollutants:

Mixing zones, dilution credits, and attenuation factors are not used in the accompanying Order and would be inappropriate to grant at this time.

Allowance of a mixing zone is in the Regional Board's discretion under Section 1.4.2 of the SIP and under the Basin Plan (Basin Plan Chapter 4, page 30). If the Discharger subsequently conducts appropriate mixing zone and dilution credit studies, the Regional Board can evaluate the propriety of granting a mixing zone or establishing dilution credits.

F. Example calculation of a CTR-based limit: Cyanide

Is a limit required? What is RPA?

- From Table R, ***Reasonable Potential & Limit Derivation***, we determined that Reasonable potential analysis (RPA) = Yes, therefore a limit is required.

Step 1 – Identify applicable water quality criteria.
From California Toxics Rule (CTR), we can obtain the Criterion Maximum Concentration (CMC) and the Criterion Continuous Concentration (CCC).
Freshwater Aquatic Life Criteria:
CMC = 22 (CTR page 31712, column B1) and
CCC = 5.2 (CTR page 31712, column B2

Human Health Criteria for Organisms only = 220,000 µg/L.

Step 2 – Calculate effluent concentration allowance (ECA)
ECA = Criteria in CTR, since no dilution is allowed.

Step 3 – Determine long-term average (LTA) discharge condition

Appendix D -LAG Effluent Water Quality

Los Angeles-Glendale Water Reclamation Plant (LAG)[1]								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Highest Average Level in LADWP Water (2004-2006)[2]
pH	pH units		-	Daily	7.6	Daily	6.3	-	-	
SETTLEABLE SOLIDS	CFU/100 ML	Max 30-Day Average	<1	-	-	Max 30-Day Average	<1			
SUSPENDED SOLIDS	mg/L	Max 30-Day Average	2.8	Monthly	2.1	Max 30-Day Average	<1			
TOTAL BOD (5-DAY)	mg/L	Max 30-Day Average	<3	-	-	Daily Max	<3			
OIL AND GREASE	mg/L	Monthly Sample	<3	Daily	ND	-	ND			
TOTAL DISSOLVED SOLIDS	mg/L	Monthly Sample	726.3	Monthly Sample	832.0	Monthly Sample	639.0	mg/L	Recommended - 500 Upper - 1,000 Short Term - 1,500	
CHLORIDE	mg/L	Monthly Sample	163.3	Monthly Sample	187.0	Monthly Sample	146.0	mg/L	Recommended - 250 Upper - 500 Short Term - 600	
BORON	mg/L	Monthly Sample	0.4	Monthly Sample	0.5	Monthly Sample	0.2			
SULFATE	mg/L	Monthly Sample	174.1	Monthly Sample	293.0	Monthly Sample	127.0	mg/L	Recommended - 250 Upper - 500 Short Term - 600	
MBAS	mg/L	Monthly Sample	4.2	Monthly Sample	25.0	Monthly Sample	0.1			
N03-N	mg/L	Monthly Sample	5.8	Monthly Sample	6.7	Monthly Sample	4.4	mg/L	45	
N02-N	mg/L	Monthly Sample	0.2	Monthly Sample	ND	Monthly Sample	ND	mg/L	10	
COPPER	µg/L	Monthly Sample	9.9	Monthly Sample	15.5	Monthly Sample	6.5	µg/L	1300	802
MERCURY	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	2	
ZINC	µg/L	Monthly Sample	56.5	Monthly Sample	68.0	Monthly Sample	44.0	µg/L	5000	
FLUORIDE	mg/l	Monthly Sample	0.6	Monthly Sample	0.8	Monthly Sample	0.3	mg/L	2.0	
CADMIUM	ug/l	Monthly Sample	ND	Monthly Sample	0.7	Monthly Sample	ND	µg/L	5.0	
CYANIDE	mg/l	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	150.0	
INORGANIC CHEMICALS WITH PRIMARY MCl										
ALUMINUM	µg/L	Monthly Sample	DNQ	Monthly Sample	60.0	Monthly Sample	DNQ	µg/L	1000	
ANTIMONY	µg/L	Monthly Sample	DNQ	Monthly Sample	DNQ	Monthly Sample	DNQ	µg/L	6	
ARSENIC	µg/L	Monthly Sample	1.5	Monthly Sample	1.7	Monthly Sample	1.2	µg/L	10	3.3
BARIUM	µg/L	Monthly Sample	57.5	Monthly Sample	72.6	Monthly Sample	44.2	µg/L	1000	
BERYLLIUM	µg/L	Monthly Sample	ND	Monthly Sample	DNQ	Monthly Sample	ND	µg/L	4	
CADMIIUM	µg/L	Monthly Sample	DNQ	Monthly Sample	0.7	Monthly Sample	DNQ	µg/L	5	
MERCURY	µg/L	Monthly Sample	ND	Monthly Sample	DNQ	Monthly Sample	DNQ	µg/L	2.0	
NICKEL	µg/L	Monthly Sample	4.0	Monthly Sample	5.7	Monthly Sample	2.9	mg/L	0.1	
SELENIUM	µg/L	Monthly Sample	0.8	Monthly Sample	1.7	Monthly Sample	0.7	µg/L	50.0	
THALLIUM	µg/L	Monthly Sample	DNQ	Monthly Sample	DNQ	Monthly Sample	DNQ	µg/L	2.0	
FLUORIDE	mg/l	Monthly Sample	0.6	Monthly Sample	0.7	Monthly Sample	0.3	mg/L	2.0	
ASBESTOS	MFL	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	MFL	7.0	
CYANIDE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	150		
CHROMIUM (TOTAL)	µg/L	Monthly Sample	DNQ	Monthly Sample	DNQ	Monthly Sample	DNQ	50		
CONSTITUENTS WITH SECONDARY MCL										
ALUMINUM	µg/L	Monthly Sample	ND	Monthly Sample	15.5	Monthly Sample	ND	µg/L	200	
COPPER	µg/L	Monthly Sample	9.9	Monthly Sample	15.5	Monthly Sample	6.5	µg/L	1000	
MBAS	mg/L	Monthly Sample	0.1	Monthly Sample	0.2	Monthly Sample	0.1	µg/L	500	
IRON	µg/L	Monthly Sample	64.5	Monthly Sample	89.0	Monthly Sample	52.0	µg/L	300	
MANGANESE	µg/L	Monthly Sample	DNQ	Monthly Sample	DNQ	Monthly Sample	DNQ	µg/L	50	

Los Angeles-Glendale Water Reclamation Plant (LAG)[1]								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Highest Average Level in LADWP Water (2004-2006)[2]
SILVER	µg/L	Monthly Sample	DNQ	Monthly Sample	DNQ	Monthly Sample	DNQ	µg/L	100	
ZINC	µg/L	Monthly Sample	59.6	Monthly Sample	65.7	Monthly Sample	52.7	µg/L	5000	
THIOBENCARB	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	1	
CORROSIVITY @ 20C	-	Monthly Sample	ND	Monthly Sample	0.1	Monthly Sample	ND			
CORROSIVITY @ 6OC	-	Monthly Sample	0.5	Monthly Sample	0.6	Monthly Sample	0.4			
MTBE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	13	
THRESHOLD ODOR	T.O.N	Monthly Sample	117.6	Monthly Sample	200.0	Monthly Sample	8.0			
TURBIDITY	NTU	Monthly Sample	1.0	Monthly Sample	1.3	Monthly Sample	0.6			
VOLATILE ORGANIC CHEMICALS WITH MCL										
BENZENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	1	
CARBON TETRACHLORIDE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	0.5	
1,2-DICHLOROBENZENE VOC	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	600	
1,4-DICHLOROBENZENE VOC	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	5	
1,1-DICHLOROETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	5	
1,2-DICHLOROETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	0.5	
1,1-DICHLOROETHENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	6	
CIS-1 ,2-DICHLOROETHENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	6	
TRANS-1,2-DICHLOROETHENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	10	
METHYLENE CHLORIDE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
1,2-DICHLOROPROPANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
CIS-1,3·DICHLOROPROPENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
TRANS-1,3-DICHLOROPROPENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
ETHYLBENZENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
MTBE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
CHLOROBENZENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
STYRENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	100	
1,1,2,2-TETRACHLOROETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	1	
TETRACHLOROETHEN	µg/L	Monthly Sample	ND	Monthly Sample	0.9	Monthly Sample	ND			
TOLUENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	150	
1,2,4-TRICHLOROBENZENE VOC	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	5	
1,1,1-TRICHLOROETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	200	
1,1,2-TRICHLOROETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	5	
TRICHLOROETHENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
TRICHLOROFLUOROMETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	150	
1,1 ,2-TRICHLORO-1 ,2,2-TRIFLUOROETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	1200	
VINYL CHLORIDE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	0.5	
XYLENE (M,P)	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	1750	
NON-VOLATILE SYNTHETIC ORGANIC CHEMICALS WITH MCL										
ALACHLOR	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	2	
ATRAZINE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	1	
BENTAZON	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	18	
BENZO(A)PYRENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	0.2	
CHLORDANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	0.1	
2,4-D	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	70	
DALAPON	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	200	

Los Angeles-Glendale Water Reclamation Plant (LAG)[1]								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Highest Average Level in LADWP Water (2004-2006)[2]
BIS-(2-ETHYLHEXYL)ADIPATE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	400	
BIS.(2.ETHYLHEXYL)PHTHALATE	µg/L	Monthly Sample	6.7	Monthly Sample	9.4	Monthly Sample	4.4	µg/L	4	
DINOSEB	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	7	
DIQUAT	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	20	
ENDOTHALL	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	100	
ENDRIN	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	2	
GLYPHOSATE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	6	
HEPTACHLOR	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	0.01	
HEPTACHLOR EPOXIDE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	0.01	
HEXACHLOROBENZENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	0.05	
HEXACHLOROCYCLOPENTADIENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	0.025	
GAMMA-BHC	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
METHOXYCHLOR	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	30	
MOLINATE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	20	
PENTACHLOROPHENOL	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	1	
PICLORAM	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	500	
PCB 1016	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
PCB 1221	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
PCB 1232	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
PCB 1242	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
PCB 1248	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
PCB 1254	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
PCB 1260	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
SIMAZINE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	4	
THIOBENCARB	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	70	
TOXAPHENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	3	
2,3,7,8·TCDD TEQ	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	pg/L	30	
2,4,5-TP (SILVEX)	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	50	
CARBOFURAN	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	µg/L	18	
1,2-DIBROMO-3-CHLOROPROPANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
1,2-DIBROMOETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
OXAMYL	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
DISINFECTION BYPRODUCTS WITH PRIMARY MCL										
BROMODICHLOROMETHANE	µg/L	Monthly Sample	4.3	Monthly Sample	5.3	Monthly Sample	3.1			
BROMOFORM	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
CHLOROFORM	µg/L	Monthly Sample	8.9	Monthly Sample	11.0	Monthly Sample	5.8			
DIBROMOCHLOROMETHANE	µg/L	Monthly Sample	1.4	Monthly Sample	1.9	Monthly Sample	0.7			
TOTAL TRIHALOMETHANES (TTHM)	µg/L	Monthly Sample	14.5	Monthly Sample	17.9	Monthly Sample	12.1	mg/L	0.08	
MONOCHLOROACETIC ACID	µg/L	Monthly Sample	ND	Monthly Sample	6.2	Monthly Sample	ND			
DICHLOROACETIC ACID	µg/L	Monthly Sample	11.3	Monthly Sample	13.0	Monthly Sample	10.0			
TRICHLOROACETIC ACID	µg/L	Monthly Sample	6.5	Monthly Sample	9.1	Monthly Sample	4.9			
MONOBROMOACETIC ACID	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
DIBROMOACETIC ACID	µg/L	Monthly Sample	ND	Monthly Sample	1.3	Monthly Sample	ND			
HALOACETIC ACID (FIVE) (HAAS)	µg/L	Monthly Sample	19.7	Monthly Sample	23.4	Monthly Sample	16.2	mg/L	0.06	
REMAINING PRIORITY POLLUTANTS (PESTICIDES)										

Los Angeles-Glendale Water Reclamation Plant (LAG)[1]								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Highest Average Level in LADWP Water (2004-2006)[2]
ALDRIN	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
DIELDRIN	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
P,P'·DDT	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
P,P'·DDE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
P,P'·DDD	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
ENDOSULFANI	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
ENDOSULFAN II	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
ENDOSULFAN II SULFATE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
ENDRIN ALDEHYDE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
ALPHA-SHC	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
BETA-SHC	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
DELTA-SHC	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
REMAINING PRIORITY POLLUTANTS (VOC)										
ACROLEIN	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
ACRYLONITRILE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
CHLOROBENZENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
CHLOROETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
1,1·DICHLOROETHENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
CHLOROMETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
BROMOMETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
1,3·DICHLOROBENZENE VOC	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
2·CHLOROETHYL VINYL ETHER	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
NAPHTHALENE VOC	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
REMAINING PRIORITY POLLUTANTS (BASE-NEUTRAL)										
ACENAPHTHENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
BENZIDINE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
HEXACHLOROETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
BIS-(2-CHLOROETHYL)ETHER	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
2-CHLORONAPHTHALENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
3,3'-DICHLOROBENZIDINE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
2,4-DINITROTOLUENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
2,6-DINITROTOLUENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
AZOBENZENEA	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
FLUORANTHENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
4-CHLOROPHENYL PHENYL ETHER	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
4-BROMOPHENYL PHENYL ETHER	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
BIS-(2-CHLOROISOPROPYLlETHER	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
BIS-(2-CHLOROETHOXYlMETHANE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
HEXACHLOROBUTADIENE BNA	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
ISOPHORONE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
NITROBENZENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
N-NITROSODIMETHYLAMINE	µg/L	Monthly Sample	0.2	Monthly Sample	0.2	Monthly Sample	0.2			
N-NITROSO-DI-N-PROPYLAMINE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
N·NITROSODIPHENYLAMINE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
BIS-(2.ETHYLHEXYL)PHTHALATE	µg/L	Monthly Sample	6.8	Monthly Sample	9.4	Monthly Sample	4.4			

Los Angeles-Glendale Water Reclamation Plant (LAG)[1]								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Highest Average Level in LADWP Water (2004-2006)[2]
BUTYLBENZYLPHTHALATE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
DI·N-BUTYLPHTHALATE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
DI-N-OCTYLPHTHALATE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
DIETHYLPHTHALATE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
DIMETHYLPHTHALATE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
BENZO(A)ANTHRACENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
BENZO(B)FLUORANTHENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
BENZO(K)FLUORANTHENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
CHRYSENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
ACENAPHTHYLENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
ANTHRACENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
BENZO(G,H,I)PERYLENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
FLUORENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
PHENANTHRENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
DIBENZO(A,H)ANTHRACENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
INDENO(1,2,3-CD)PYRENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
PYRENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
REMAINING PRIORITY POLLUTANTS (ACID EXTRACTABLE)										
2,4,6-TRICHLOROPHENOL	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
4-CHLORO·3·METHYLPHENOL	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
2-CHLOROPHENOL	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
2,4-DICHLOROPHENOL	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
2,4-DIMETHYLPHENOL	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
2-NITROPHENOL	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
4·NITROPHENOL	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
2,4.DINITROPHENOL	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
4,6-DINITRO·2·METHYLPHENOL	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
PHENOL	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
CHEMICALS WITH NOTIFICATION LEVELS										
CHLORATE	μg/L	Monthly Sample	ND	Monthly Sample	300.0	Monthly Sample	87.0			
DIAZINON	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
1A-DIOXANE	μg/L	Monthly Sample	ND	Monthly Sample	2.7	Monthly Sample	1.3			
ETHYLENE GLYCOL	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
N-NITROSODIETHYLAMINE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
N·NITROSODIMETHYLAMINE	μg/L	Monthly Sample	0.2	Monthly Sample	0.2	Monthly Sample	0.2			
MANGANESE'	μg/L	Monthly Sample	DNQ	Monthly Sample	DNQ	Monthly Sample	DNQ			
VANADIUM'	μg/L	Monthly Sample	DNQ	Monthly Sample	1.5	Monthly Sample	DNQ			
PERCHLORATE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND	μg/L	6	6
N·BUTYLBENZENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
BUTYLBENZENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
TERT·BUTYLBENZENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
CARBON DISULFIDE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
2·CHLOROTOLUENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
4·CHLOROTOLUENE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
DICHLORODIFLUOROMETHANE	μg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			

Los Angeles-Glendale Water Reclamation Plant (LAG)[1]									Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Highest Average Level in LADWP Water (2004-2006)[2]
FORMALDEHYDE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
ISOPROPYLBENZENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
4-METHYL-2-PENTANONE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
NAPHTHALENE VOC	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
N-PROPYLBENZENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
TERT-BUTYL ALCOHOL	µg/L	Monthly Sample	ND	Monthly Sample	2.3	Monthly Sample	ND			
1,2,3-TRICHLOROPROPANE	µg/L	Monthly Sample	DNQ	Monthly Sample	DNQ	Monthly Sample	DNQ			
1,2,4-TRIMETHYLBENZENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
1,3,5-TRIMETHYLBENZENE	µg/L	Monthly Sample	ND	Monthly Sample	ND	Monthly Sample	ND			
RADIOACTIVITY WITH MCL										
ALPHA RADIOACTIVITY	pCi/L	Monthly Sample	3.7	Monthly Sample	4.7	Monthly Sample	2.8	pCi/L	15	4.8
BETA RADIOACTIVITY	pCi/L	Monthly Sample	8.1	Monthly Sample	9.1	Monthly Sample	7.2	pCi/L	4 millirem/year annual dose equivalent to the total body or any internal organ	5.4

Footnotes

1. Data Obtain from RWRCB 2008 Annual Monitoring Report

2. Data Obtain from City of Los Angeles Drinking Water Public Health Goals Report 2007

ND - Not Detected

DNQ - Detected but not Quantifiable

Appendix E - TIWRP Effluent Constituent Limits for Priority Pollutants

iv. Chronic Toxicity Limitations – See XI.6.D.a.iv. of this Fact Sheet. If the Discharger can demonstrate that there are no violations of effluent chronic toxicity limitations, then the Discharger can waive the TRE in the receiving water.

E. Limits for priority pollutants on Discharge Serial No. 001:

CTR # [1]	Constituent	Units	Discharge Limitations	
			Monthly Average[2]	Daily Maximum
6	Copper[3, 4, 5]	ì g/L	2.1	5.8
		lbs/day[6]	0.53	1.46
7	Lead[3, 4, 5]	ì g/L	6.6	15
		lbs/day[6]	1.7	3.8
8	Mercury[3, 4, 5]	ì g/L	0.051	0.094
		lbs/day[6]	0.013	0.024
9	Nickel[3, 4, 7]	ì g/L[8]	120	250
		lbs/day[6]	30	63
11	Silver[3, 4, 5]	ì g/L	0.81	2.2
		lbs/day[6]	0.20	0.55
14	Cyanide[4, 9]	ì g/L	0.50	1.0
		lbs/day[6]	0.13	0.25
68	Bis(2-ethylhexyl)phthalate[3, 4, 7]	ì g/L[8]	190	560
		lbs/day[6]	48	140
111	Dieldrin[4, 9]	ì g/L	0.00014	0.00028
		lbs/day[6]	0.000035	0.000070

Footnotes to discharge limitations:

[1]. This number corresponds to the compound number found in Table 1 of CTR. It is simply the order in which the 126 priority pollutants were listed 40 CFR section 131.38 (b)(1).

[2]. The daily maximum effluent concentration limit shall apply to flow weighted 24-hour composite samples and grab samples It may apply to grab samples if the collection of composite samples for those constituents is not appropriate because of instability of the constituents.

[3]. Concentration expressed as total recoverable.

[4] This constituent shows reasonable potential.

[5]. This constituent concentration in receiving water is higher than water quality criteria of this constituent. Therefore, dilution credit is not applicable for this constituent.

[6]. The mass emission rates are calculated as follows: 30 (mgd) x Concentration (µg/L) x 0.008366 (conversion factor) = lbs/day. During wet-weather storm events

Appendix F - TIWRP Effluent Water Quality

Terminal Island Water Reclamation Plant (TIWRP)[1] -Tertiary Effluent Monitoring								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Range in LADWP Water 2008[2]
pH	pH units	Monthly Average	7.4	Monthly Maximum	7.7	Monthly Minimum	6.9	-	-	8.0-8.2
SETTLEABLE SOLIDS	CFU/100 ML	Monthly Average	<0.03	Monthly Maximum	0.1	Monthly Average	<0.03			
SUSPENDED SOLIDS	mg/L	Monthly Average	1.0	Monthly Maximum	3.0	Monthly Average	<1			
TOTAL BOD (5-DAY)	mg/L	Monthly Average	2.0	Monthly Maximum	21.0	Monthly Average	<2			
OIL AND GREASE	mg/L	DNQ	DNQ	DNQ	DNQ	DNQ	DNQ			
TOTAL DISSOLVED SOLIDS	mg/L							mg/L	Recommended - 500 Upper - 1,000 Short Term - 1,500	505-668
CHLORIDE	mg/L	Daily Maximum	<.01	Daily Maximum	<.01	Daily Maximum	<.01	mg/L	Recommended - 250 Upper - 500 Short Term - 600	92-103
BORON	mg/L									
SULFATE	mg/L							mg/L	Recommended - 250 Upper - 500 Short Term - 600	170-272
MBAS	mg/L	Monthly Average	0.3	Monthly Average	0.5	Monthly Average	0.1			
N03-N	mg/L	Monthly Average	9.1	Monthly Average	11.3	Monthly Average	5.5	mg/L	45	<2.0-2.7
N02-N	mg/L	ND	ND	DNQ	DNQ	ND	DN	mg/L	10	<0.4-0.6
COPPER	µg/L	DNQ	DNQ	DNQ	DNQ	DNQ	DNQ	µg/L	1300	-
MERCURY	µg/L	ND	ND	DNQ	DNQ	DNQ	DNQ	µg/L	2	
ZINC	µg/L	Quartly Average	21.0	Quartly Average	26.0	Quartly Average	DNQ	µg/L	5000	<50
FLUORIDE	mg/l							mg/L	2.0	0.14-1.20
CADMIUM	ug/l							µg/L	5.0	
CYANIDE	mg/l							µg/L	150.0	
INORGANIC CHEMICALS WITH PRIMARY MCl										
ALUMINUM	µg/L							µg/L	1000	78-280
ANTIMONY	µg/L	Quartly Average	DNQ	Quartly Average	DNQ	Quarterly Average	DNQ	µg/L	6	
ARSENIC	µg/L	Quartly Average	3.3	Quartly Average	5.5	Quartly Average	2.6	µg/L	10	<2.0-2.9
BARIUM	µg/L							µg/L	1000	111-123
BERYLLIUM	µg/L	ND	ND	ND	ND	ND	ND	µg/L	4	
CADMIIUM	µg/L	ND	ND	ND	ND	ND	ND	µg/L	5	
MERCURY	µg/L							µg/L	2.0	
NICKEL	µg/L	DNQ	DNQ	DNQ	DNQ	DNQ	DNQ	mg/L	0.1	
SELENIUM	µg/L	Quartly Average	9.4	Quartly Average	10.4	Quartly Average	8.0	µg/L	50.0	
THALLIUM	µg/L	DNQ	DNQ	DNQ	DNQ	DNQ	DNQ	µg/L	2.0	
FLUORIDE	mg/l							mg/L	2.0	
ASBESTOS	MFL							MFL	7.0	
CYANIDE	µg/L	ND	ND	Monthly Average	11.0	ND	ND	150		
CHROMIUM (TOTAL)	µg/L	DNQ	DNQ	DNQ	DNQ	DNQ	DNQ	50		
CONSTITUENTS WITH SECONDARY MCL										
ALUMINUM	µg/L							µg/L	200	
COPPER	µg/L							µg/L	1000	

Terminal Island Water Reclamation Plant (TIWRP)[1] -Tertiary Effluent Monitoring								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Range in LADWP Water 2008[2]
MBAS	mg/L							µg/L	500	
IRON	µg/L							µg/L	300	
MANGANESE	µg/L							µg/L	50	
SILVER	µg/L	ND	ND	DNQ	DNQ	DNQ	DNQ	µg/L	100	
ZINC	µg/L							µg/L	5000	
THIOBENCARB	µg/L							µg/L	1	
CORROSIVITY @ 20C	-									
CORROSIVITY @ 6OC	-									
MTBE	µg/L							µg/L	13	
THRESHOLD ODOR	T.O.N									
TURBIDITY	NTU									
VOLATILE ORGANIC CHEMICALS WITH MCL										
BENZENE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	1	
CARBON TETRACHLORIDE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	0.5	
1,2-DICHLOROBENZENE VOC	µg/L	ND	ND	ND	ND	ND	ND	µg/L	600	
1,4-DICHLOROBENZENE VOC	µg/L	ND	ND	ND	ND	ND	ND	µg/L	5	
1,1-DICHLOROETHANE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	5	
1,2-DICHLOROETHANE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	0.5	
1,1-DICHLOROETHYLENE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	6	
CIS-1 ,2-DICHLOROETHENE	µg/L							µg/L	6	
TRANS-1,2-DICHLOROETHYLENE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	10	
METHYLENE CHLORIDE	µg/L	ND	ND	ND	ND	ND	ND			
1,2-DICHLOROPROPANE	µg/L	ND	ND	ND	ND	ND	ND			
CIS-1,3·DICHLOROPROPENE	µg/L	ND	ND	ND	ND	ND	ND			
TRANS-1,3-DICHLOROPROPENE	µg/L	ND	ND	ND	ND	ND	ND			
ETHYLBENZENE	µg/L	ND	ND	ND	ND	ND	ND			
MTBE	µg/L									
CHLOROBENZENE	µg/L	ND	ND	ND	ND	ND	ND			
STYRENE	µg/L							µg/L	100	
1,1,2,2-TETRACHLOROETHANE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	1	
TETRACHLOROETHYLENE	µg/L	ND	ND	ND	ND	ND	ND			<0.5
TOLUENE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	150	
1,2,4-TRICHLOROBENZENE VOC	µg/L	ND	ND	ND	ND	ND	ND	µg/L	5	
1,1,1-TRICHLOROETHANE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	200	
1,1,2-TRICHLOROETHANE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	5	
TRICHLOROETHYLENE	µg/L	ND	ND	ND	ND	ND	ND			
TRICHLOROFLUOROMETHANE	µg/L							µg/L	150	
1,1 ,2-TRICHLORO-1 ,2,2-TRIFLUOROETHANE	µg/L							µg/L	1200	
VINYL CHLORIDE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	0.5	
XYLENE (M,P)	µg/L							µg/L	1750	
NON-VOLATILE SYNTHETIC ORGANIC CHEMICALS WITH MCL										
ALACHLOR	µg/L							µg/L	2	

Terminal Island Water Reclamation Plant (TIWRP)[1] -Tertiary Effluent Monitoring								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Range in LADWP Water 2008[2]
ATRAZINE	µg/L							µg/L	1	
BENTAZON	µg/L							µg/L	18	
BENZO(A)PYRENE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	0.2	
CHLORDANE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	0.1	
2,4-D	µg/L							µg/L	70	
DALAPON	µg/L							µg/L	200	
BIS-(2-ETHYLHEXYL)ADIPATE	µg/L							µg/L	400	
BIS.(2.ETHYLHEXYL)PHTHALATE	µg/L							µg/L	4	
DINOSEB	µg/L							µg/L	7	
DIQUAT	µg/L							µg/L	20	
ENDOTHALL	µg/L							µg/L	100	
ENDRIN	µg/L	ND	ND	ND	ND	ND	ND	µg/L	2	
GLYPHOSATE	µg/L							µg/L	6	
HEPTACHLOR	µg/L	ND	ND	ND	ND	ND	ND	µg/L	0.01	
HEPTACHLOR EPOXIDE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	0.01	
HEXACHLOROBENZENE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	0.05	
HEXACHLOROCYCLOPENTADIENE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	0.025	
GAMMA-BHC	µg/L	ND	ND	ND	ND	ND	ND			
METHOXYCHLOR	µg/L	ND	ND	ND	ND	ND	ND	µg/L	30	
MOLINATE	µg/L							µg/L	20	
PENTACHLOROPHENOL	µg/L	ND	ND	ND	ND	ND	ND	µg/L	1	
PICLORAM	µg/L							µg/L	500	
PCB 1016	µg/L	ND	ND	ND	ND	ND	ND			
PCB 1221	µg/L	ND	ND	ND	ND	ND	ND			
PCB 1232	µg/L	ND	ND	ND	ND	ND	ND			
PCB 1242	µg/L	ND	ND	ND	ND	ND	ND			
PCB 1248	µg/L	ND	ND	ND	ND	ND	ND			
PCB 1254	µg/L	ND	ND	ND	ND	ND	ND			
PCB 1260	µg/L	ND	ND	ND	ND	ND	ND			
SIMAZINE	µg/L							µg/L	4	
THIOBENCARB	µg/L							µg/L	70	
TOXAPHENE	µg/L	ND	ND	ND	ND	ND	ND	µg/L	3	
2,3,7,8-TCDD TEQ	pg/L	Quarterly Average	0.0	Quarterly Average	0.0	Quarterly Average	0.0	pg/L	30	
2,4,5-TP (SILVEX)	µg/L							µg/L	50	
CARBOFURAN	µg/L							µg/L	18	
1,2-DIBROMO-3-CHLOROPROPANE	µg/L									
1,2-DIBROMOETHANE	µg/L									
OXAMYL	µg/L									
DISINFECTION BYPRODUCTS WITH PRIMARY MCL										
BROMODICHLOROMETHANE	µg/L	ND	ND	DNQ	DNQ	ND	ND			
BROMOFORM	µg/L	ND	DN	DN	DN	DN	DN			2.8-12
CHLOROFORM	µg/L	DNQ	DNQ	DNQ	DNQ	DNQ	DNQ			4.2-26

Terminal Island Water Reclamation Plant (TIWRP)[1] -Tertiary Effluent Monitoring								Drinking Water Standards		
Constituent	**Units**	**Average**		**Max**		**Min.**		**Units**	**Maximum Contaminant Level (MCL)**	**Range in LADWP Water 2008[2]**
DIBROMOCHLOROMETHANE	µg/L	ND	ND	DNQ	DNQ	ND	ND			
TOTAL TRIHALOMETHANES (TTHM)	µg/L							mg/L	0.08	
MONOCHLOROACETIC ACID	µg/L									<1.0-18
DICHLOROACETIC ACID	µg/L									2.6-21
TRICHLOROACETIC ACID	µg/L									1.7-9.3
MONOBROMOACETIC ACID	µg/L									<1.0-3.1
DIBROMOACETIC ACID	µg/L									3.2-15
HALOACETIC ACID (FIVE) (HAAS)	µg/L							mg/L	0.06	
REMAINING PRIORITY POLLUTANTS (PESTICIDES)										
ALDRIN	µg/L	ND	ND	ND	ND	ND	ND			
DIELDRIN	µg/L	ND	ND	ND	ND	ND	ND			
P,P'·DDT	µg/L	ND	ND	ND	ND	ND	ND			
P,P'·DDE	µg/L	ND	ND	ND	ND	ND	ND			
P,P'·DDD	µg/L	ND	ND	ND	ND	ND	ND			
ENDOSULFANI	µg/L									
ENDOSULFAN II	µg/L									
ENDOSULFAN II SULFATE	µg/L	ND	ND	ND	ND	ND	ND			
ENDRIN ALDEHYDE	µg/L	ND	ND	ND	ND	ND	ND			
ALPHA-SHC	µg/L	ND	ND	ND	ND	ND	ND			
BETA-SHC	µg/L	ND	ND	ND	ND	ND	ND			
DELTA-SHC	µg/L	ND	ND	ND	ND	ND	ND			
REMAINING PRIORITY POLLUTANTS (VOC)										
	µg/L									
ACRYLONITRILE	µg/L	ND	ND	ND	ND	ND	ND			
CHLOROBENZENE	µg/L									
CHLOROETHANE	µg/L	ND	ND	ND	ND	ND	ND			
1,1·DICHLOROETHENE	µg/L									
CHLOROMETHANE	µg/L	ND	ND	ND	ND	ND	ND			
BROMOMETHANE	µg/L	ND	ND	ND	ND	ND	ND			
1,3·DICHLOROBENZENE VOC	µg/L	ND	ND	ND	ND	ND	ND			
2·CHLOROETHYL VINYL ETHER	µg/L	ND	ND	ND	ND	ND	ND			
NAPHTHALENE VOC	µg/L									
REMAINING PRIORITY POLLUTANTS (BASE-NEUTRAL)										
ACENAPHTHENE	µg/L	ND	ND	ND	ND	ND	ND			
BENZIDINE	µg/L	ND	ND	ND	ND	ND	ND			
HEXACHLOROETHANE	µg/L	ND	ND	ND	ND	ND	ND			
BIS-(2-CHLOROETHYL)ETHER	µg/L	ND	ND	ND	ND	ND	ND			
2-CHLORONAPHTHALENE	µg/L	ND	ND	ND	ND	ND	ND			
3,3'-DICHLOROBENZIDINE	µg/L	ND	ND	ND	ND	ND	ND			
2,4-DINITROTOLUENE	µg/L	ND	ND	ND	ND	ND	ND			
2,6-DINITROTOLUENE	µg/L	ND	ND	ND	ND	ND	ND			
AZOBENZENEA	µg/L	ND	ND	ND	ND	ND	ND			

Terminal Island Water Reclamation Plant (TIWRP)[1] -Tertiary Effluent Monitoring								Drinking Water Standards		
Constituent	Units	Average		Max		Min.		Units	Maximum Contaminant Level (MCL)	Range in LADWP Water 2008[2]
FLUORANTHENE	μg/L	ND	ND	ND	ND	ND	ND			
4-CHLOROPHENYL PHENYL ETHER	μg/L	ND	ND	ND	ND	ND	ND			
4-BROMOPHENYL PHENYL ETHER	μg/L	ND	ND	ND	ND	ND	ND			
BIS-(2-CHLOROISOPROPYLIETHER	μg/L	ND	ND	ND	ND	ND	ND			
BIS-(2-CHLOROETHOXYIMETHANE	μg/L	ND	ND	ND	ND	ND	ND			
HEXACHLOROBUTADIENE BNA	μg/L	ND	ND	ND	ND	ND	ND			
ISOPHORONE	μg/L	ND	ND	ND	ND	ND	ND			
NITROBENZENE	μg/L	ND	ND	ND	ND	ND	ND			
4	μg/L	ND	ND	ND	ND	ND	ND			
N-NITROSO-DI-N-PROPYLAMINE	μg/L	ND	ND	ND	ND	ND	ND			
N·NITROSODIPHENYLAMINE	μg/L	ND	ND	ND	ND	ND	ND			
BIS-(2.ETHYLHEXYL)PHTHALATE	μg/L	DNQ	DNQ	DNQ	DNQ	DNQ	DNQ			
BUTYLBENZYLPHTHALATE	μg/L	ND	ND	ND	ND	ND	ND			
DI·N-BUTYLPHTHALATE	μg/L	ND	ND	ND	ND	ND	ND			
DI-N-OCTYLPHTHALATE	μg/L	ND	ND	ND	ND	ND	ND			
DIETHYLPHTHALATE	μg/L	ND	ND	ND	ND	ND	ND			
DIMETHYLPHTHALATE	μg/L	ND	ND	ND	ND	ND	ND			
BENZO(A)ANTHRACENE	μg/L	ND	ND	ND	ND	ND	ND			
BENZO(B)FLUORANTHENE	μg/L	ND	ND	ND	ND	ND	ND			
BENZO(K)FLUORANTHENE	μg/L	ND	ND	ND	ND	ND	ND			
CHRYSENE	μg/L	ND	ND	ND	ND	ND	ND			
ACENAPHTHYLENE	μg/L	ND	ND	ND	ND	ND	ND			
ANTHRACENE	μg/L	ND	ND	ND	ND	ND	ND			
BENZO(G,H,I)PERYLENE	μg/L	DNQ	DNQ	ND	ND	ND	ND			
FLUORENE	μg/L	ND	ND	ND	ND	ND	ND			
PHENANTHRENE	μg/L	ND	ND	ND	ND	ND	ND			
DIBENZO(A,H)ANTHRACENE	μg/L	ND	ND	DNQ	DNQ	ND	ND			
INDENO(1,2,3-CD)PYRENE	μg/L	DNQ	DNQ	ND	ND	ND	ND			
PYRENE	μg/L	DNQ	DNQ	ND	ND	ND	ND			
REMAINING PRIORITY POLLUTANTS (ACID EXTRACTABLE)										
2,4,6-TRICHLOROPHENOL	μg/L	ND	ND	DNQ	DNQ	ND	ND			
4-CHLORO·3·METHYLPHENOL	μg/L	ND	ND	ND	ND	ND	ND			
2-CHLOROPHENOL	μg/L	ND	ND	ND	ND	ND	ND			
2,4-DICHLOROPHENOL	μg/L	ND	ND	ND	ND	ND	ND			
2,4-DIMETHYLPHENOL	μg/L	ND	ND	ND	ND	ND	ND			
2-NITROPHENOL	μg/L	ND	ND	ND	ND	ND	ND			
4·NITROPHENOL	μg/L	ND	ND	ND	ND	ND	ND			
2,4.DINITROPHENOL	μg/L	ND	ND	ND	ND	ND	ND			
4,6-DINITRO·2·METHYLPHENOL	μg/L	ND	ND	ND	ND	ND	ND			
PHENOL	μg/L	ND	ND	ND	ND	ND	ND			
CHEMICALS WITH NOTIFICATION LEVELS										
CHLORATE	μg/L									

Terminal Island Water Reclamation Plant (TIWRP)[1] -Tertiary Effluent Monitoring					Drinking Water Standards		
Constituent	**Units**	**Average**	**Max**	**Min.**	**Units**	**Maximum Contaminant Level (MCL)**	**Range in LADWP Water 2008[2]**
DIAZINON	µg/L						
1A-DIOXANE	µg/L						
ETHYLENE GLYCOL	µg/L						
N-NITROSODIETHYLAMINE	µg/L						
N·NITROSODIMETHYLAMINE	µg/L						
MANGANESE'	µg/L						
VANADIUM'	µg/L						
PERCHLORATE	µg/L				µg/L		
N·BUTYLBENZENE	µg/L						
BUTYLBENZENE	µg/L						
TERT·BUTYLBENZENE	µg/L						
CARBON DISULFIDE	µg/L						
2·CHLOROTOLUENE	µg/L						
4·CHLOROTOLUENE	µg/L						
DICHLORODIFLUOROMETHANE	µg/L						
FORMALDEHYDE	µg/L						
ISOPROPYLBENZENE	µg/L						
4-METHYL-2·PENTANONE	µg/L						
NAPHTHALENE VOC	µg/L						
N-PROPYLBENZENE	µg/L						
TERT-BUTYL ALCOHOL	µg/L						
1,2,3-TRICHLOROPROPANE	µg/L						
1,2,4-TRIMETHYLBENZENE	µg/L						
1,3,5-TRIMETHYLBENZENE	µg/L						
RADIOACTIVITY WITH MCL							
ALPHA RADIOACTIVITY	pCi/L	Semi-Annual Maximum 2.1	emi-Annual Maximu 3.6	Semi-Annual Maximum 0.6	pCi/L	15	3.8-9.3
BETA RADIOACTIVITY	pCi/L	Semi-Annual Maximum 14.1	emi-Annual Maximu 21.0	Semi-Annual Maximum 7.2	pCi/L	4 millirem/year annual dose equivalent to the total body or any internal organ	<4.0-6.4

Footnotes

1. Data Obtain from RWRCB 2008 Annual Monitoring Report

2. Data Obtain from City of Los Angeles Drinking Water Public Health Goals Report 2007

ND - Not Detected

DNQ - Detected but not Quantifiable

Appendix G -Flow and Quality Tables

Table 1: Comaprable Flows

Parameters	HTP	LAG	TIWRP
Permitted Secondary Treatment Capacity (ADWF)	413	20	30
Current Influent Flows (MGD)			
Average Daily	318	17.7	15.7
Max Daily	452		24.1
Min Daily	265		7.0
2008 ADWF	320	16.8	15.4
Peak Recorded Hourly Wet Weather	527 (12/15/08, 1.8” rain)	25.1 (November 2007)	32.6 (12/15/08, 1.8” rain)
Peak Recorded Hourly Dry Weather	579 (8/1/2008)	22.2 (11/16/2008)	29.5 (9/9/2008)
Minimum Known Hourly Night-time	59 (4/21/2008)	0.1 (Multiple Days)	0.0 (Multiple Days)
Permitted Title 22 Tertiary Capacity (MGD)	NA	20	30
Current Title 22 Tertiary Production (MGD)	NA		
Average Daily	NA	4.0	15.4
Max Daily	NA	8.8	17.1*
Min Daily	NA	1.0	8.2*
Permitted Advanced Tertiary (MF/RO) Capacity (MGD)	NA	NA	5.0
Current Advanced Tertiary Production (MGD)			
Average Daily	NA	NA	3.2
Max Daily	NA	NA	5.3
Min Daily	NA	NA	0.0
In Plant Use			
Average Daily	11.5	1.1*	
River Discharge			
Average Daily	NA	12.8	NA
Max Daily	NA	19.8	NA
Min Daily		5.6	
Ocean Discharge (MGD)			Harbor
Average Daily	270	NA	11.6
Max Daily	280	NA	
Reuse (including GW reuse)	(West Basin)		
Average Daily	31	3.8	3.8
Max Daily	46	8.8	5.3
Min Daily		1.0	

1. General Notes:
   a. Daily average, maximum and minimum is from July 1, 2007 through June 30, 2009.

   b. Weather data was obtained from www.wunderground.com from January 2007 through June 30, 2009 at USC Campus and LAX. Peak precipitation was measured at USC and at LAX of 1.8 inch occurring on December 15, 2008.
   c. ADWF 2008 and Peak Hourly DWF is from March 2008 through October 2008.
2. HTP flow data:
   a. Minimum known hourly night time is the minimum of minimum daily flow (7/1/07-6/30/09) but excludes July 2008 due to very low readings (15 mgd) during this month.
3. LAG flow data:
   a. Influent monthly flow data from January 2007 through July 2009
   b. Tertiary daily data from September 2008 through August 2009 (obtained from Mike Bell on 8/25/09)
      i. * from LAG 2008 WRR Annual Report
      ii. **Calculated by subtracting RW & River Q from Max Q
4. TIWRP flow data from TIWRP Operations Daily Log, Summary of Overall Treatment
   a. Influent and Secondary daily data from January 1 through December 2008
   b. Tertiary monthly data from Jan 2007 to July 2009
   c. AWTF Daily Flow from March 1, 2008 through July 31, 2009
   d. * Data from March 2008 through December 2008, calculated subtracting AWTF daily flow from daily influent.
5. "Max Daily" means "Max Daily Flow Volume for the Year"

Table 2: Influent Quality

Parameters	Units	HTP[1]		LAG[2]		TIWRP[3]	
		Avg	Max	Avg	Max	Avg	Max
BOD	mg/L	315	461	854	2,420	234	516
TSS	mg/L	341	629	818	3,500	200	912
TKN	mg/L	NA	NA	NA	NA	NA	NA
TDS	mg/L	776	NA	NA	NA	2,684	3,537
Ammonia Nitrogen	mg/L	NA	NA	NA	NA	28.1	86.8
BOD loading	lbs/day	842,100	1,195,714	139,894	411,112	30,345	67,770
TSS loading	lbs/day	912,560	1,626,217	133,834	467,880	25,853	122,359
pH		7.45	7.8				

1. HTP data from 2008 RWQCB Annual Monitoring Report
2. LAG data
   a. Influent daily data from Sept 2008 to Aug 2009 (obtained from Mike Bell on 8/25/09)
3. TIWRP flow data from TIWRP Operations Daily Log, Summary of Overall Treatment
   a. Influent data Jan 1 to Dec 31, 2008
   b. TDS is calculated based on influent conductivity measurement using the following conversion TDS (mg/L) = 0.65 Conductivity (μmho/cm)
   c. Max BOD mg/l & tons/day (10/5/08), Max TSS mg/l and tons/day (9/30/08), Max Ammonia Nitrogen (5/4/08)

Appendix B

Los Angeles Glendale Water Reclamation Plant Opportunities TM

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Summary of Modifications to the Los Angeles-Glendale Water Reclamation Plant Opportunities Technical Memorandum since Initial Publication on February 17, 2010

The Recycled Water Master Planning (RWMP) effort has spanned three years (April 2009 – March 2012). As is the nature of a planning project, assumptions are typically modified and refined as a project is further developed. The most recent assumptions related to the Long-Term Concepts master planning effort are presented in the Draft Long-Term Concepts Report (January 2012). Assumptions and conclusions presented in this report supersede assumptions included in this technical memorandum (TM). The following table summarizes the modifications applicable to all RWMP TMs and those specifically applicable to this TM are described following the table.

Assumption	Modified	Original
Applicable to all RWMP TMs		
Recycled Water Goal	59,000 AFY by 2035 This goal reflects the 2010 LADWP Urban Water Management Plan that was adopted in early 2011, after the original RWMP goals were drafted	50,000 AFY by 2019
Introduction Section	Ignore this section and refer to the Introduction Section of the RWMP Report.	This section was included in all initial TMs but the terms described have been replaced by the Introduction Section for each RWMP report.
NPR Projects Terminology	To avoid confusion related to LADWP's water rate structure, the terms "Tier 1" and "Tier 2" are superseded with the terms "planned" and "potential," respectively. Both planned and potential projects would be considered for implementation by 2035.	"Tier 1" for NPR projects that were originally planned for design and construction by the year 2015. "Tier 2" for NPR projects that were being originally evaluated in the NPR Master Planning Report for potential future implementation after the year 2015.
Name for MF/RO/AOP treatment plant	Advanced water purification facility (AWPF)	Advanced water treatment facility (AWTF)
Name for water produced by AWPF	Purified recycled water	Advanced treated recycled water, highly purified recycled water, etc.
Treatment Plant Acronyms	DCTWRP LAGWRP	DCT LAG

The following modifications are specific to this TM.

Universal

All references to "Recycled Water Master Plan" should be replaced with "Recycled Water Master Planning".

Cost estimates (pages 5, 35 and 36)

The basis for the cost estimates included in this TM was subsequently revised, as documented in the Cost Estimating Basis for Recycling Water Master Planning TM (Appendix G in the LTCR).

This resulted in changes to unit costs for capital and O&M costs, construction contingencies, implementation factors, project financing rates, discount rates, and the Engineering News Record (ENR) Index.

Component	Initial	Updated
Estimated Capital Cost		
Project Option 1	$94M	$45M
Project Option 2	$132M	$76M
Estimated O&M Cost		
Project Option 1	$7.5M/year	$7.7M/year
Project Option 2	$11.3M/year	$11.6M/year
ENR Index	9,764 (December 2009)	10,000 (January 2011)
Equalization Cost	$4/gallon	$1.5/gallon

Table 5-1 - LAG Capital Cost Estimates (page 35) should be replaced with the following table:

Table 5-1 – LAG Capital Cost Estimate

***Cost Basis*:**		
Influent Plant Capacity (mgd)	32	48
Average RW Production Capacity (mgd)	27	40
Influent Plant Capacity Added (mgd)	9	22
EQ/Storage Volume (MG)	5	0
***Cost Estimate*(1)(2)**	**($M)**	**($M)**
Headworks	1.2	2.8
Influent Pump Station	0.9	2.0
Primary Sedimentation Tanks	6.5	12.9
Aeration Tanks and Blowers	14.7	25.8
Secondary Clarifiers	5.7	12.3
Tertiary Media Filters	4.7	11.0
UV Disinfection	3.8	8.8
Equalization(3)	7.5	0
Total	**45.0**	**75.6**
Cost per mgd of Production	**5.0**	**3.4**

(1) Projected capital costs are in January 2011 dollars.
(2) Cost basis is the Novato Treatment Plant engineer's estimate.
(3) Equalization cost basis is $1.5/gallon of storage provided.

Table 5-2 – HTP O&M Annual Cost Estimate (page 36) should be replaced with the following table:

Table 5-2 – LAG O&M Annual Cost Estimate

Item	Option 1 ($M)	Option 2 ($M)
Power	1.9	2.8
Chemicals	1.2	1.9
Labor	2.9	4.3
Compliance Monitoring	0.8	1.2
UV Lamp Replacement	0.7	1.1
Contract Maintenance	0.2	0.3
Total Annual Cost	**7.7**	**11.6**

(1) Based on LAG operating costs

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City of Los Angeles

Recycled Water Master Plan

Task 4

Los Angeles Glendale Water Reclamation Plant Opportunities Technical Memorandum

Prepared For:

Los Angeles Department of Water and Power

City of Los Angeles, Department of Public Works

Prepared By:

RMC in association with CDM

February 17, 2010

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Technical Memorandum

Title:	**Los Angeles-Glendale Water Reclamation Plant Opportunities Technical Memorandum**
Version:	DRAFT
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Date:	February 17, 2010
Reference:	Task Order 4a: Concept Report for Maximizing Reuse Task 4.2 Identification of Projects Task 4.2.1 LAG Opportunities

1. Introduction

With imported water supplies becoming ever more unpredictable, the Los Angeles Department of Water and Power (LADWP) adopted the Mayor's vision of Securing LA's Water Supply in May 2008, calling for 50,000 acre-feet per year (AFY) of potable supplies to be replaced by recycled water by 2019. To meet this near-term challenge and plan for expanding reuse in the future, LADWP has partnered with the Department of Public Works to develop the Recycled Water Master Plan (RWMP). The RWMP includes seven major tasks:

- Groundwater Replenishment (GWR) Master Plan
- Non-Potable Reuse (NPR) Master Plan
- Groundwater Replenishment Treatment Pilot Study
- Max Reuse Concept Report
- Satellite Feasibility Concept Report
- Existing System Reliability Concept Report
- Training

This technical memorandum (TM) is a deliverable under Task 4a: Concept Report for Maximizing Reuse.

1.1 Task 4 Overview

The purpose of Task 4 is to research and identify project options that have the potential to maximize the beneficial reuse of effluent produced, or potentially produced, at three of the City of Los Angeles' (City's) existing treatment plants: Hyperion Treatment Plant (HTP), Los Angeles-Glendale Water Reclamation Plant (LAG), and Terminal Island Water Reclamation Plant (TIWRP). Specifically, Task 4 will identify potential opportunities that would increase the City's reuse beyond the 50,000 AFY goal established in Task 2. Opportunities to maximize reuse from the Donald C. Tillman Water Reclamation Plant (DCT) are covered under Task 1.

Task 4a identifies a wide array of potentially feasible wastewater diversion, flow equalization, and treatment expansion and/or upgrade projects that would maximize recycled water production from the existing treatment plants; identifies local and regional indirect potable reuse opportunities (including interconnections with neighboring agencies) that could provide a mechanism for beneficial reuse of the maximized recycled water; and identifies non-potable reuse projects that could be served by any remaining and expanded recycled water sources including interagency interconnections.

1.2 Purpose of TM

The LAG Opportunities TM identifies potentially feasible project options that would maximize recycled water production from LAG and estimates the potential recycled water production that could occur at the LAG site. It documents projected influent flows, available area for recycled water treatment processes at the LAG site, and previous findings with respect to GWR and NPR market demands in the vicinity of LAG.

The TM also documents the assumed treatment technologies, appropriate process capacities, and the facilities needed to treat influent flows to a tertiary level and return residuals (i.e., filtration reject/backwash flows) to the collection system to be conveyed and treated at HTP. It includes a discussion of flow equalization needs, and recommended site layouts for treatment facilities. The TM concludes with a discussion of special issues, preliminary conveyance routes, and an order of magnitude cost estimate for maximizing recycled water production.

Information developed in this TM will be used in Task 4b of the study to develop integrated system-wide recommendations regarding the amount of recycled water production that should be sited at LAG versus other options including HTP, DCT, potential satellite plants, or other offsite locations.

1.3 Related Technical Memoranda

Other related technical memoranda summarizing basic research for the Maximizing Reuse Concept Report include the following:

- Regulatory Assessment TM (Task 1.1)
- Advanced Water Treatment Technology TM (Task 1.4)
- Existing and Tier 1 Recycled Water Systems TM (Task 2.1.1)
- Tier 2 Target Non-Potable Customers Overview TM (Task 2.2)
- Treatment Plant Review TM (Task 4.1.1)
- Regional Recycled Water System TM (Task 4.1.2)
- Regional Groundwater Assessment TM (Task 4.1.3)
- LA River Flow Assessment TM (Task 4.1.4)
- TIWRP Opportunities TM (Task 4.2.2)
- HTP Opportunities TM (Task 4.2.3)
- Wastewater Collection System (Task 5.1.1)

1.4 Summary of Findings

This TM describes two project options for potential development of recycled water production at LAG. Project Option 1 produces 27 mgd of recycled water by expanding the treatment capacity to 32 mgd (the 2040 projected flow within the current LAG sewershed), and Project Option 2 produces 40 mgd of recycled water by expanding the treatment capacity to 48 mgd (which would be possible if upstream flows from the Valley Spring Lane/Foreman Avenue (VSL/FA) sewershed are diverted to LAG.) Both project options assume that LAG would be expanded with additional tertiary facilities including nitrification/denitrification. **Table 1-1** summarizes the two options.

The production estimates are based on the following findings and assumptions:

1. Maximum 2040 sewer flow in the LAG sewershed as it is currently configured is 32 mgd. If flows from the VSL/FA sewershed were diverted to LAG, the potential 2040 influent flow could be as high as 56 mgd.

2. Treatment capacity is limited to some extent by available area for treatment and equalization facilities. The site has enough area to provide treatment capacity for the 32 mgd

of future influent flow from the LAG sewershed, including area set aside for an equalization basin (which allows the plant to operate with constant flow rates to the filters). The site also has enough area for a maximum capacity of 48 mgd without equalization. The LAG site does not have sufficient available space to build treatment capacity for the entire 56 mgd of potential influent flow from the LAG and VSL/FA sewersheds.

3. LAG will continue to provide recycled water to LADWP and the City of Glendale under the current agreement. This agreement states that the cities of Los Angeles and Glendale are each 50% owners of LAG, and that each of these two cities is entitled to 50% of the plant capacity and product water. The City of Pasadena has purchased the right to 60% of Glendale's product water (30% of total product water), though this right is not currently exercised.

4. The level of treatment would be Title 22 tertiary with nitrification/denitrification (NdN) and ultraviolet disinfection because the anticipated uses for recycled water from LAG are irrigation and industrial applications. Continued NdN treatment would be required to maintain a failsafe discharge option to the Los Angeles River. Groundwater replenishment projects that may use tertiary effluent from LAG will require additional advanced treatment.

5. LAG will not receive flows from the DCT sewershed.

6. Upstream flows in the LAG and VSL/FA sewersheds will not be routed to a satellite treatment plant.

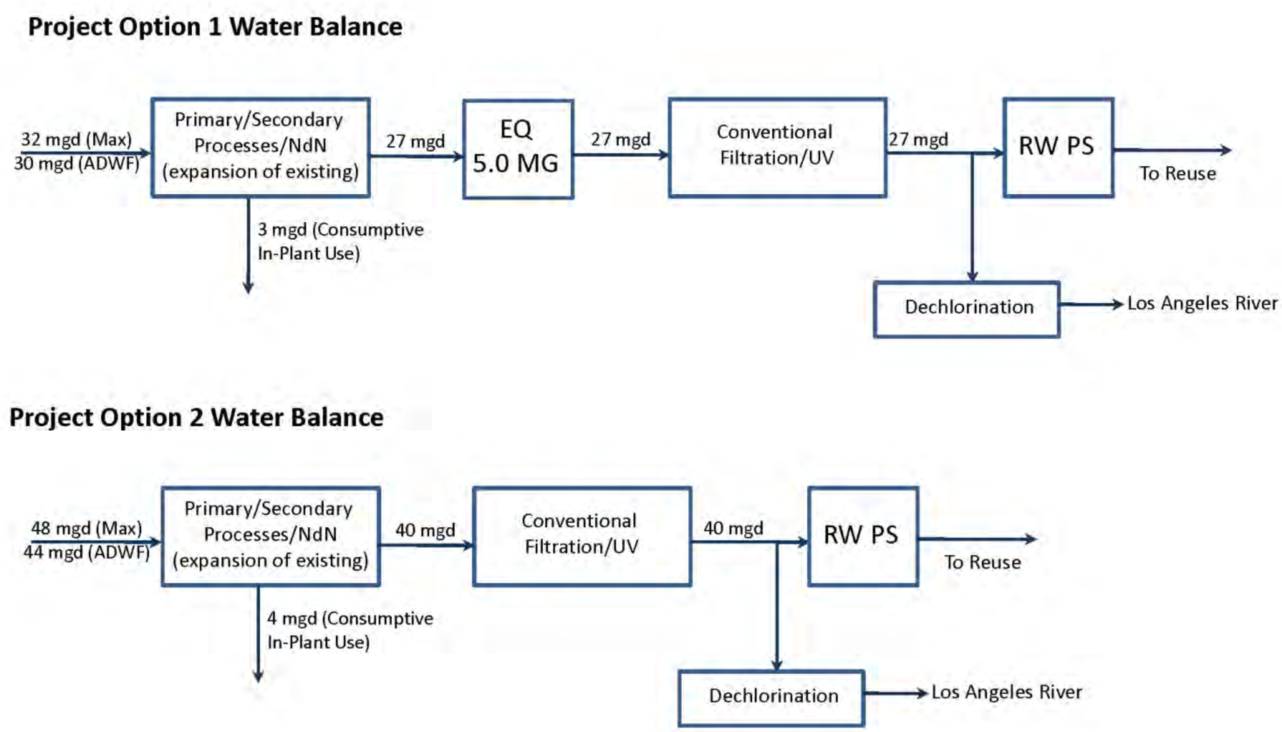
Table 1-1: Recycled Water Production Potential

Description	Project Option 1 With Equalization (less space for treat. capacity)	Project Option 2 Without Equalization (more space for treat. capacity)
Water Quality Produced	Disinfected Tertiary	Disinfected Tertiary
Source of Influent Flows (sewershed)	LAG	LAG + diversions from VSL/FA
Plant Capacity & Max Hourly Influent Flow, mgd(1)	32	48
Average Daily Influent Flow, mgd(2)	30	44
Average Daily RW Production, mgd(3)	27	40
Total Volume RW Produced, AFY	30,000	45,000
Total Equalization Volume Provided, MG	5	0
Estimated Capital Cost (4)	$94 million	$132 million
Estimated O&M Cost(5)	$7.5 million/year	$11.2 million/year

(1) For LAG, max hourly influent flow will not exceed plant capacity (primary/secondary processes are designed for no peaking).
(2) LAG runs at plant capacity approximately 18 hours per day. During the remaining six hours, the influent flow dips to match available sewer flows, therefore the average daily influent flow is less than plant capacity.
(3) Assumes plant losses of 1 mgd per 10 mgd of average daily influent flow.
(4) Estimated capital costs do not include pumping or conveyance. Presented in December 2009 dollars.
(5) O&M costs include power, chemicals, labor, compliance monitoring, plant refurbishment, and contract maintenance.

Water balances for Project Option 1 and 2, including failsafe discharge options to the Los Angeles River, are shown in **Figure 1-1**.

Figure 1-1: LAG Project Option 1 and 2 Water Balances



Other findings include:

- Available on-site areas for treatment expansion include the existing chlorine detention pond and lawn area, the existing parking lot at the northeast corner of the LAG site, and space above the existing primary tanks for potential process stacking.
- Recycled water production capacity exceeds the potential non-potable reuse demands in the vicinity of LAG. However, off-site AWT facilities could be provided in the future by LADWP (or another entity) so that tertiary effluent from LAG could be further treated and used to supply groundwater replenishment projects.
- To maximize the reuse of recycled water from LAG, seasonal variations in demand would need to be accommodated with some combination of groundwater replenishment projects and/or seasonal storage.
- A preliminary analysis of existing contracts indicates that LADWP cannot exercise a right of first refusal for Glendale's allotment of flows from LAG. LADWP could propose a modification to Agreement No. 42257 for access to the remaining 2.4 mgd of recycled water in Glendale's allotment; however, at this time Glendale plans to use the entire amount during high-demand summer months.

- Conveyance alignments are identified along the Los Angeles River eastern bank, parallel to the existing LADWP pipeline to Griffith Park, and east on Goodwin Avenue with continuing pipe segments on W. San Fernando Road. The conveyance route that runs north along the Los Angeles River eastern bank could potentially be extended to provide a recycled water intertie with DCT.

- The LAG National Pollutant Discharge Elimination System (NPDES) permit (Order No. R4-2007-0006) does not establish a minimum flow to the Los Angeles River, but LAG may be subject to review of any proposed changes to the discharge location under the California Water Code, Sections 1210 and 1211.

2. Summary of Background Information

2.1 Water Balance

The Los Angeles-Glendale Water Reclamation Plant (LAG), operated by the City of Los Angeles, is located approximately 8.5 miles north of downtown Los Angeles, east of Griffith Park. LAG began operation in 1976 as a satellite plant intended to provide a "hydraulic relief" for sewers in the downstream interceptor system. Since that time, the focus of the plant has shifted to recycled water production. LAG has a permitted capacity of 20 mgd and is currently operating at an average influent flow rate of 19.4 mgd (September 2008 through July 2009). All wastewater at LAG is treated to a tertiary level, and the tertiary effluent is delivered to LADWP's and the City of Glendale's recycled water distribution systems or discharged to the Los Angeles River.

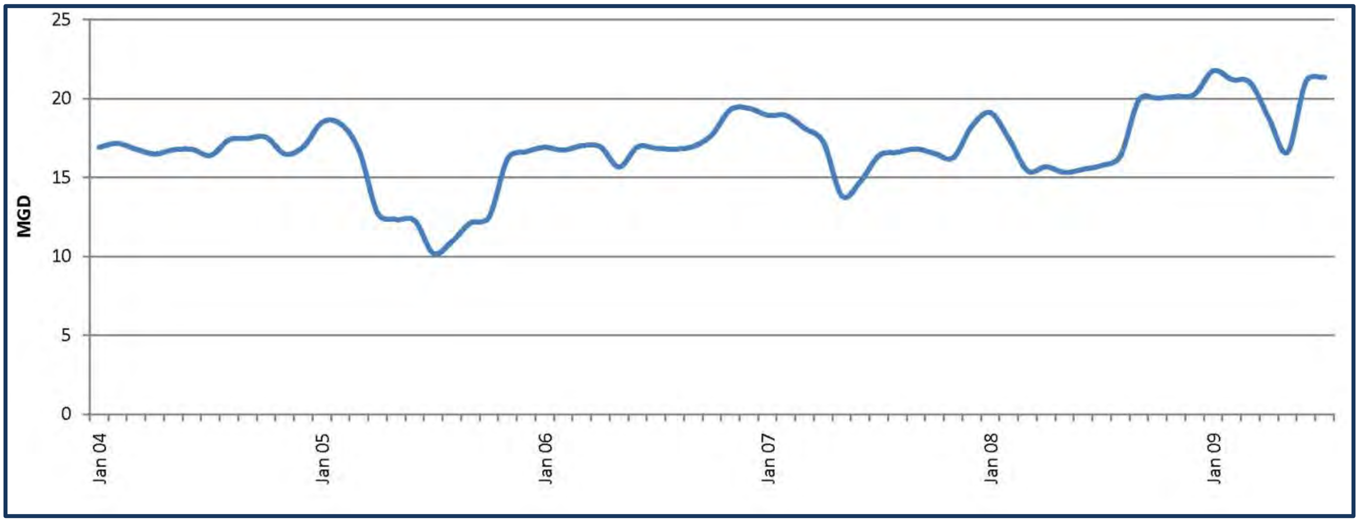
The cities of Los Angeles and Glendale are each 50% owners of the facility and are each entitled to 50% of the plant capacity and product water. In 1993, the City of Pasadena purchased the right to 60% of Glendale's product water (30% of total product water), though this right is not currently exercised.

2.1.1 Historic and Current Flows

Historic Influent Flows Trends

LAG is a hydraulic satellite plant that attempts to maintain a relatively constant "base load" flow rate. The average influent flow rate from January 2004 through July 2009 was 16.9 mgd as shown in **Figure 2-1**.

Figure 2-1: LAG Monthly Average Influent Flows from January 2004 through July 2009

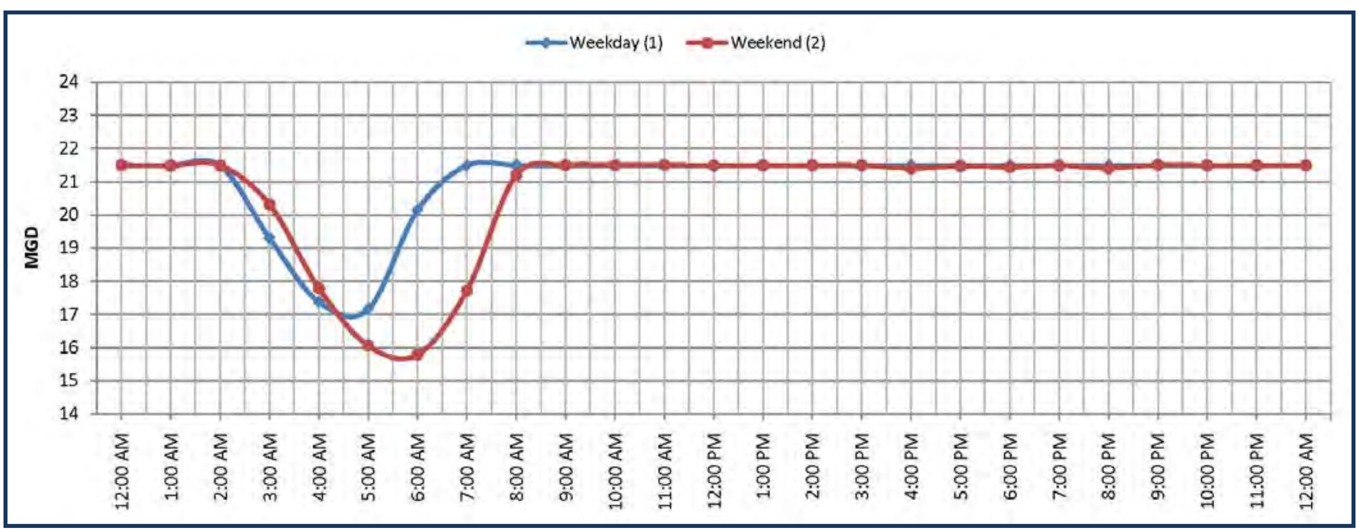


Source: BOS, 2009

Current Diurnal Influent Flows

LAG does not experience a "true"diurnal fluctuation of influent flows. Typical diurnal data from July 2009 reflect a constant hourly influent flow rate of approximately 21 mgd, except for lower flows experienced during the early morning hours of approximately 2:00 am to 7:00 am (**Figure 2-2**) when the flow in the sewer is low. The flows from August 2008 through July 2009 flows are somewhat higher than the five-year average cited in previous section. LAG is currently operating to maximize their process units at their capacity. For the majority of the day, the influent pumps are meeting a constant flow set point. Measured historical peak wet weather flow at the plant is approximately 30 mgd (BOS, 2009).

Figure 2-2: LAG Diurnal Dry Weather Influent Flows for July 2009



Source: BOS, 2009

(1) Weekday: Wednesday, July 29, 2009
(2) Weekend: Sunday, July 26, 2009

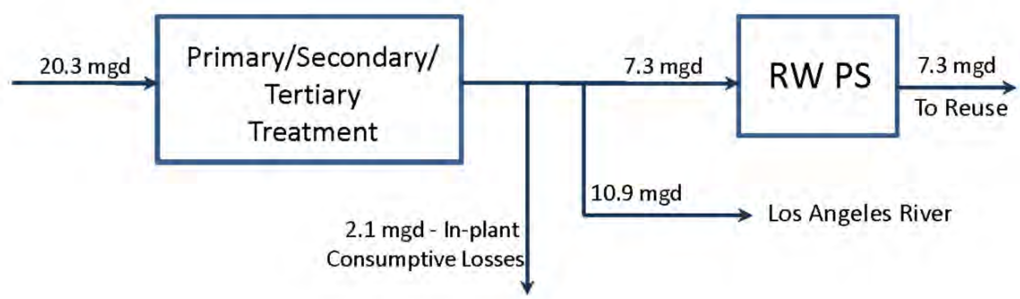
In-Plant Use

For July 2009, the total average plant losses were 2.1 mgd. These losses are composed of 0.76 mgd of primary and waste activated sludge plus 1.34 mgd of other losses, including on-site irrigation, filter backwash, primary scum, screenings washwater, and evaporation. Sludge, filter backwash, primary scum, and screenings washwater are conveyed back to the sewer for conveyance and treatment at HTP. There is very little seasonal fluctuation in plant losses.

Effluent Flows and Current Water Balance

Figure 2-3 shows a water balance for LAG during a typical, recent summer month (July 2009). The annual average flow of recycled water delivered to LADWP's and Glendale's distribution systems was 7.3 mgd, with daily averages ranging from 4.4 mgd to 8.8 mgd. The maximum seasonal distribution system flows occur during the summer when irrigation demand is the highest. The Los Angeles River annual average discharge was 10.9 mgd, with daily averages ranging from 8.5 mgd to 13.4 mgd.

Figure 2-3: LAG Summer Month Water Balance (July 2009)



2.1.2 Anticipated 2040 Flows

Influent Flows

Wastewater flow projections through 2040 for the entire HTP Service Area (including DCT and LAG) can be found in the 5.1.1 Wastewater Flow Projection TM. For the Year 2040, the total projected flow rate for the Hyperion Service Area is 413 mgd, including flows tributary to DCT and LAG.

This TM assumes two influent flow scenarios for LAG. The first assumes that only flows generated in the LAG sewershed, a total of 32 mgd, will be routed to LAG for treatment. The second scenario assumes that additional flows could be treated by the LAG plant from some or all of the flows generated in the VSL/FA sewershed. The second scenario would result in up to 24.4 mgd of additional flow for a total potential influent flow of 56.4 mgd. Flows from the VSL/FA sewershed would be routed in the existing North Outfall Sewer (NOS) and in the planned Glendale-Burbank Interceptor Sewer (GBIS) that will pass in close proximity to LAG. The GBIS will be constructed relatively deep, making connection to the sewer costly but still feasible. The second scenario is included because even if deep excavation and large pumping lifts are required to transfer flows from the GBIS to LAG, it may be advantageous to do so compared to the cost of pumping recycled water from HTP back up to end users in the LAG service area (a distance of over 20 miles).

It is possible that LAG could receive flows from the DCT sewershed depending on the extent to which DCT is expanded and utilized. It is also possible that LAG influent flows could be reduced by one or more upstream satellite plants that are being developed under the Task 5 – Satellite Feasibility Concept Report. For long-term planning purposes, this TM assumes that LAG does not receive flows from the DCT sewershed and that upstream flows from the LAG and VSL/FA sewersheds will not be routed to a satellite treatment plant. Using these assumptions, and depending on the routing of upstream collection system flows, potential influent flows of either 32 mgd or 56.4 mgd will be available at LAG in the year 2040[1].

2.2 Space Available for New Recycled Water Facilities

2.2.1 Background

The 18.3-acre LAG site is located in a suburban area southwest of Glendale in the City of Los Angeles, bounded by the Los Angeles River on the west, Colorado Boulevard on the north, North San Fernando Road on the east, and Chevy Chase Drive on the south.

The LAG site does not have room to expand in any direction onto adjacent parcels, but the site itself has space available for treatment expansion. The Consultant team worked with the City of Los Angeles, Bureau of Sanitation (BOS) and the City of Los Angeles, Bureau of Engineering (BOE) staff to determine locations of "under-utilized" areas at LAG which are defined as currently-utilized spaces on which tertiary facilities could be built above grade and/or equalization facilities could be built below-grade.

2.2.2 Available On-Site Areas

Figure 2-4 shows the locations of under-utilized space on the LAG site, as identified by BOS staff. The figure also shows portions of the site that represent main utility corridors. At a January 19, 2010 meeting attended by numerous representatives of LADWP, BOE, BOS, and the Consultant team, these areas were specifically earmarked by BOS and BOE as strong candidates for siting future recycled water treatment infrastructure. **Table 2-1** summarizes these locations, which are described in more detail below:

- *Pond and lawn* (approximate area: 216,400 ft^2, 5.0 acres): This area is located at western side of LAG. It is currently occupied by a grassy area and a 5 MG decorative pond which is formally known as a "chlorine detention pond." While the pond does provide some reduction in the chlorine residual prior to river discharge, it serves no significant process purpose. This area has been designated by BOS staff as the site for expansion of primary, secondary and tertiary processes. BOS emphasized that they are open to utilizing a portion of this area for future advanced treatment facilities for groundwater replenishment, but that expanding the existing process to provide tertiary reclamation for irrigation purposes is a

[1] Space constraints at LAG make it impossible to develop tertiary treatment capacity for all 56.4 mgd of potential influent flow as discussed in Section 3.

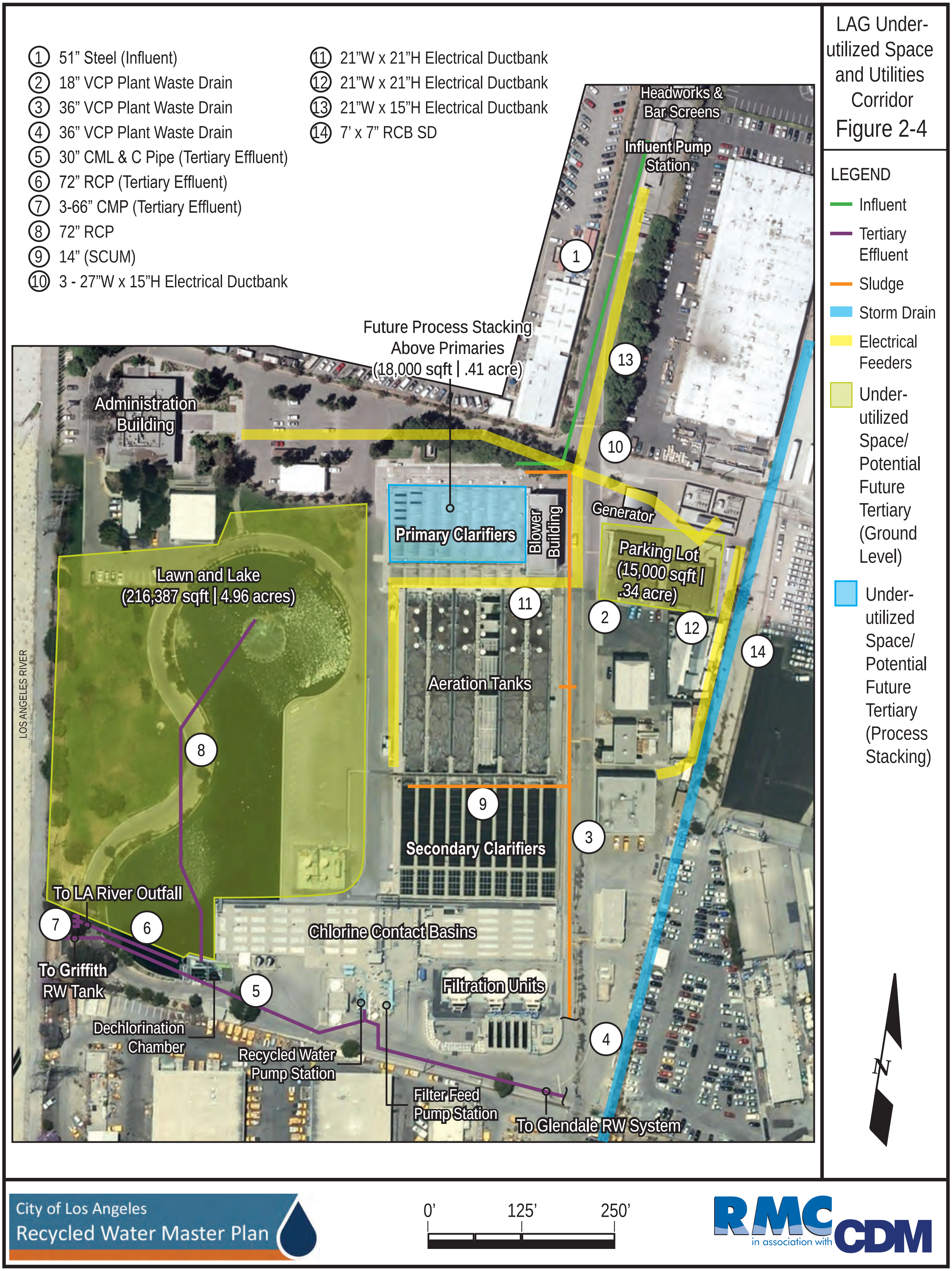
key priority from the BOS perspective. BOS also suggested the possibility of replacing the secondary clarifiers with microfiltration membranes as a potential space-savings measure.

- *Parking lot at the northeast corner of the site* (approximate area: 15,000 ft^2, 0.3 acres): This area is located at the north-eastern section of LAG. It is currently occupied by an existing electrical substation. BOS suggested this area with the caveat that it contains significant buried underground electrical utilities in certain locations.
- *Future process stacking above primaries* (approximate area: 18,000 ft^2, 0.4 acres): This area is located in the northern part of LAG between the two existing parking lots. Although this TM assumes that membrane processes would not be installed at LAG, this area above the primaries could be used should future reuse planning identify the need for membrane processes at LAG.

The various on-site available areas are summarized in **Table 2-1**. As shown in the table below, approximately 5.7 acres are available.

Table 2-1: LAG Potential Locations for Future Treatment Infrastructure

Location	Estimated Area	
	acres	ft^2
Pond and Lawn	5.0	216,400
Parking Lot	0.3	15,000
Future Processing Stacking above Primaries	0.4	18,000
Total	**5.7**	**249,400**



Source: Google Earth Pro, 2009, As Built LAG 2008

2.3 Potential Demands for Recycled Water from LAG

Currently, the recycled water demand from LAG is approximately 4,500 AFY (includes Glendale's distribution system), and the identified Tier 1 demand for LADWP is approximately 3,000 AFY (RMC/CDM, 2009a). During summer months, the combined existing and Tier 1 demands will exceed LADWP's allotment of LAG treatment capacity (10 mgd)[2].

Potential future market demands for recycled water were identified in the Task 4.1.3 Regional Groundwater Assessment TM and the Task 2.2 Tier 2 Target Non-Potable Customers Overview. The total recycled water demand in the vicinity of LAG could potentially reach up to approximately 58,000 AFY (52 mgd expressed as annual average recycled water production). These demands are summarized in **Table 2-2** and are based on the following assumptions:

- The City of Pasadena will utilize 6,000 AFY of treated tertiary from LAG per a contractual agreement with Glendale (see Section 4.2).
- Glendale Water and Power (GWP) will expand recycled water use to approximately 2,500 AFY from the current 1,600 AFY, placing additional demands of 900 AFY on LAG (RMC/CDM, 2009c).
- LADWP could potentially expand recycled water use to serve the entire Metro Area[3], which has identified future demands of approximately 3,070 AFY for Tier 1 (RMC/CDM, 2009e) and 4,000 AFY for Tier 2 (RMC/CDM, 2010d).
- LADWP could potentially expand recycled water production at LAG to serve GWR projects in the LA Forebay (RMC/CDM, 2009g). Additional treatment (i.e., MF/RO) would have to be provided to make the recycled water suitable for GWR applications.

Table 2-2: Potential Future Demands for Recycled Water from LAG

Project	Potential Demand (AFY)	Annual Average RW Production (mgd)
Tertiary Demands		
Existing (LADWP + GWP)	4,500	4.0
LADWP Tier 1 Metro Area	3,000	2.7
LADWP Tier 2 Metro Area	4,000	3.6
GWP Future Expansion	900	0.8
Pasadena Contractual Entitlement	6,000	5.4
Subtotal	18,400	16.5
Additional Demands Requiring AWT		
Groundwater Replenishment	40,000	35.7
Total	**58,000**	**52**

[2] The cities of Los Angeles and Glendale are each 50% owners of LAG. Each of these two cities is entitled to 50% of the existing plant capacity (20 mgd) and product water. The City of Pasadena has purchased the right to 60% of Glendale's product water (30% of total product water), though this right is not currently exercised.
[3] It is also possible that recycled water from LAG could be used to supply customers in the San Fernando Valley area.

In addition to the potential demands listed in Table 2-2, expanded recycled water production capacity at LAG may be used to provide additional effluent flows to the Los Angeles River. These additional flows could potentially offset increased recycled water reuse at DCT that effectively reduces upstream effluent flows to the river.

3. Project Options Descriptions

This TM develops two project options to maximize recycled water production at LAG:

- *Project Option 1*: This option provides treatment for all the projected flows within the current LAG sewershed (32 mgd) and produces 27 mgd of recycled water.
- *Project Option 2*: This option assumes that additional influent flows from the VSL/FA sewershed will be diverted to LAG and provides treatment for the maximum amount of influent flow given space constraints at the existing plant site (48 mgd). This option produces 40 mgd of recycled water.

3.1 Project Option 1

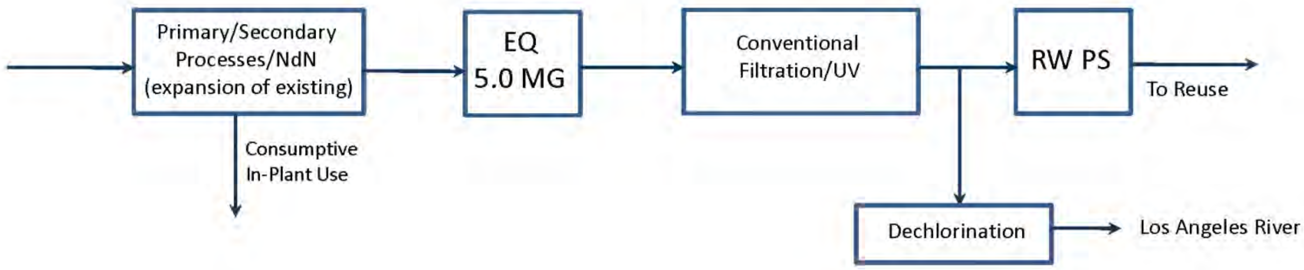
This section describes the assumed level of treatment, treatment facilities, site layout, and equalization requirements to treat the projected 2040 flow within the LAG sewershed (32 mgd).

3.1.1 Assumed Level of Treatment

Based on preliminary planning completed for Tasks 2 and 4, the recycled water produced at LAG would likely be used for irrigation and industrial applications. Therefore, this TM assumes a level of treatment at LAG that would allow Title 22 uses for recycled water. Groundwater recharge projects could potentially use recycled water from LAG as source water, but the advanced treatment facilities required for direct injection (MF/RO) would be constructed and operated at sites closer to the injection wells by LADWP or another entity (e.g., Metro area satellite plant, City of Pasadena).

The process train would include a conventional secondary treatment process consisting of headworks, primary treatment, secondary aeration with NdN, and secondary clarifiers. Nitrogen removal (NdN) would be required to maintain a failsafe discharge option to the Los Angeles River. The recycled water processes would include equalization of the secondary effluent, filtration and ultraviolet (UV) disinfection. The proposed Title 22 tertiary treatment process flow sheet is shown in **Figure 3-1**. Figure 3-1 indicates that equalization will be placed downstream from the secondary clarifiers; however, equalization could potentially be placed downstream of the primary tanks to achieve base loading of influent flows to the secondary aeration tanks.

Figure 3-1: Tertiary Treatment Flow Diagram



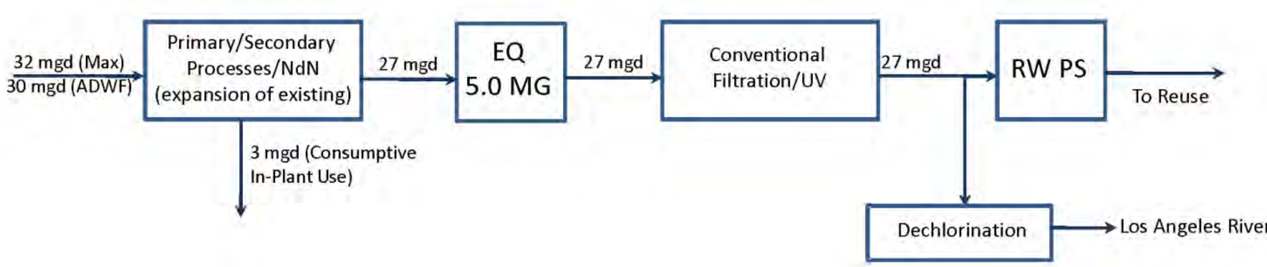
3.1.2 Treatment Facilities

Project Option 1 assumes that the available area at LAG will be used to build tertiary treatment capacity with equalization for 2040 flows from the LAG sewershed. The design treatment capacity for the expanded facilities is 32 mgd. **Figure 3-2** shows the treatment process flow for Project Option 1, including 5 MG of equalization and some discharge to the Los Angeles River. As recycled water uses develop in the vicinity of LAG, the Los Angeles River may be maintained as a failsafe discharge option for any surplus effluent (or effluent that does not meet customer specifications).

This TM assumes that typical LAG daily average plant losses are approximately 2 mgd (see Section 2.1.1). The 2 mgd estimate does not include the negligible amount of filter backwash. This equals approximately 1 mgd of plant losses for every 10 mgd of average daily influent flow; so for an ADWF of 30 mgd, losses would be approximately 3 mgd.

Existing processes for primary sedimentation, aeration, secondary clarification, and filtration, would be replicated with new tankage and equipment closely matching the existing facilities. The existing dechlorination facilities would be used to dechlorinate any water that is discharged to the Los Angeles River. For the additional tertiary effluent produced by the new treatment facilities (after in-plant losses), 7 mgd of UV disinfection would be installed to supplement the existing 20 mgd in chlorine contact capacity. Space would be reserved on-site for a build-out capacity of the UV facilities to 27 mgd should this be desired at a future date. The design RW production of 27 mgd (after in-plant losses) is equivalent to approximately 30,000 AFY of recycled water that is suitable for irrigation and select industrial uses.

Figure 3-2: Project Option 1 Water Balance (32 mgd treatment capacity)



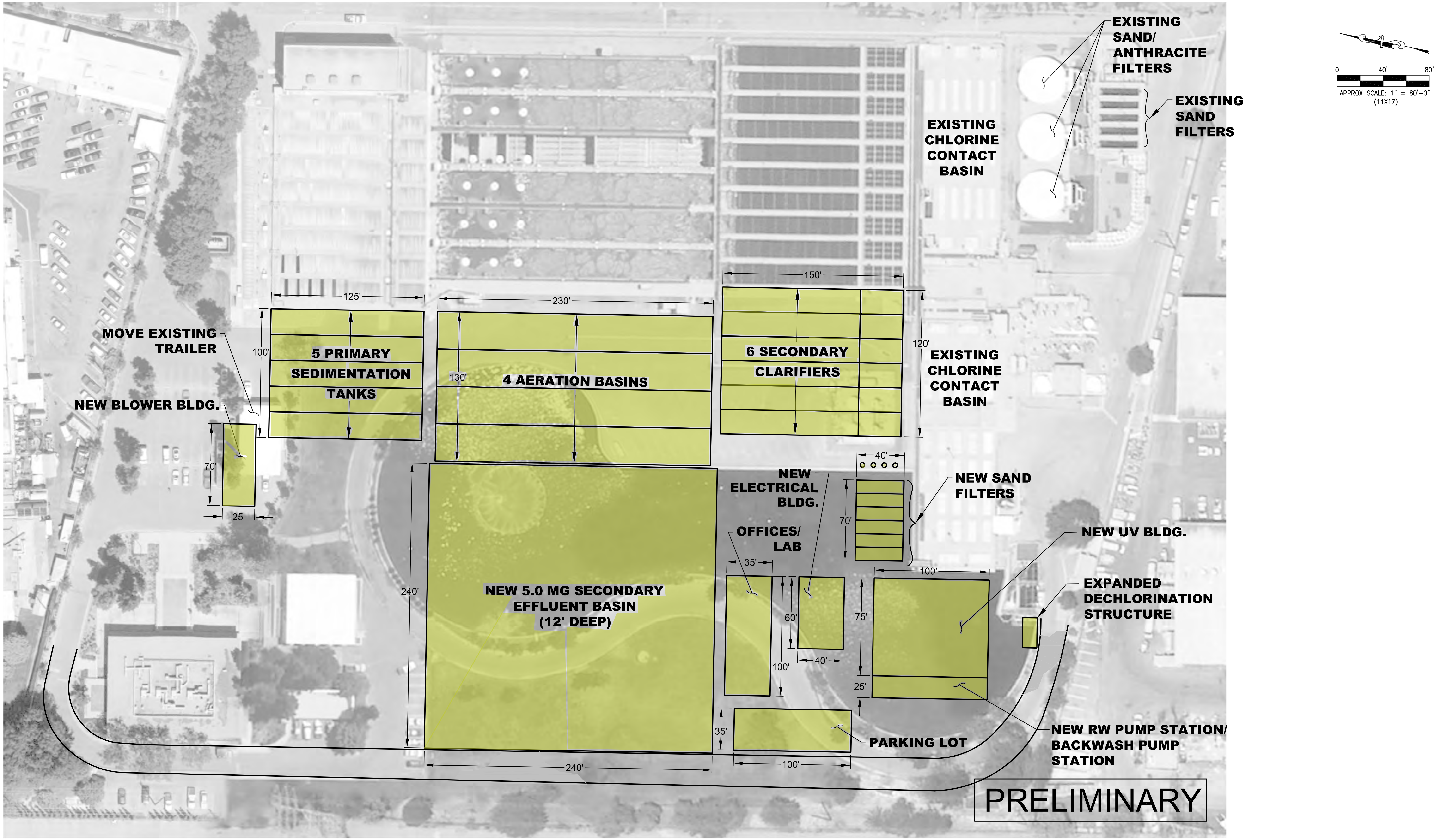
3.1.3 Site Layout

Figure 3-3 shows a preliminary conceptual layout for future Title 22 disinfected tertiary treatment facilities to expand LAG from its existing capacity of 20 mgd to a capacity of 32 mgd. The conventional tertiary layout in Figure 3-3 makes use of available space at LAG by expanding the existing primaries, aeration tanks, and secondary facilities to the west. This will require the removal of the existing chlorine detention pond, which currently does not provide a critical process function. Figure 3-3 shows expansion of all processes using tankage and equipment similar to the existing facilities, except that the 12 mgd expansion would utilize UV disinfection instead of chlorination (only 7 mgd of UV capacity required after in-plant losses). However, space would be reserved on site to expand the UV system from 7 mgd to 27 mgd in case the plant staff chooses to change to full UV disinfection in the future.

3.1.4 Equalization

Project Option 1 provides an equalization basin to ensure a constant filter feed flow rate. **Figure 3-4** shows a projected average diurnal secondary effluent flow for the year 2040, the constant filter feed flow rate, and the storage volume required to equalize the available secondary effluent upstream from the tertiary filters. The equalization estimate assumes a diurnal flow pattern similar to the July 2009 diurnal curve in Figure 2-2 (not a “true” diurnal fluctuation of influent flows) and assumes conservatively that morning influent flows will be as low as in July 2009 (i.e., 15 mgd), with secondary effluent flows dropping as low as 12 mgd. Under these conditions, approximately 5 MG of storage volume are required. It should be noted that providing equalization for a satellite plant such as LAG will not increase the recycled water production capacity. Figure 3-3 shows a 5.0 MG rectangular cast-in-place concrete EQ Basin with the top slab at existing grade elevation.

The equalization basin calculation assumes expansion of conventional tertiary treatment to 32 mgd and is constructed between the secondary facilities and the conventional tertiary filters. A secondary equalization basin is not required for 100% capture for reuse. However, a secondary equalization basin will allow the tertiary filters to run at a constant flow rate 24 hours per day thereby easing their operation and the associated chemical feed processes. If an equalization basin is not constructed, recycled water flow production would not change.



PLAN
APPROX SCALE: 1" = 80'-0"

0" 1" VERIFY SCALES BAR IS ONE INCH LONG ON FULL SIZE DRAWING. IF NOT ONE INCH LONG ON THIS DRAWING, ADJUST SCALES ACCORDINGLY	RMC Water & Environment	REV / DATE / BY / APVD / DESCRIPTION	DESIGNED / DRAWN / CHECKED	SUBMITTED: RMC PROJ ENGR C____ APPROVED: RMC ENGR C____

Figure 3-3

LAG Conventional Disinfected Tertiary
Site Layout (32 MGD)

DWG NO	
SHEET NO	1 OF 1
PROJ NO	0000-000
DATE	February 2010

C:\RMC\(0214) LADWP\214-002 TASK 4-SUBTASK 2\LAG\LAG-SITE PLAN.DWG
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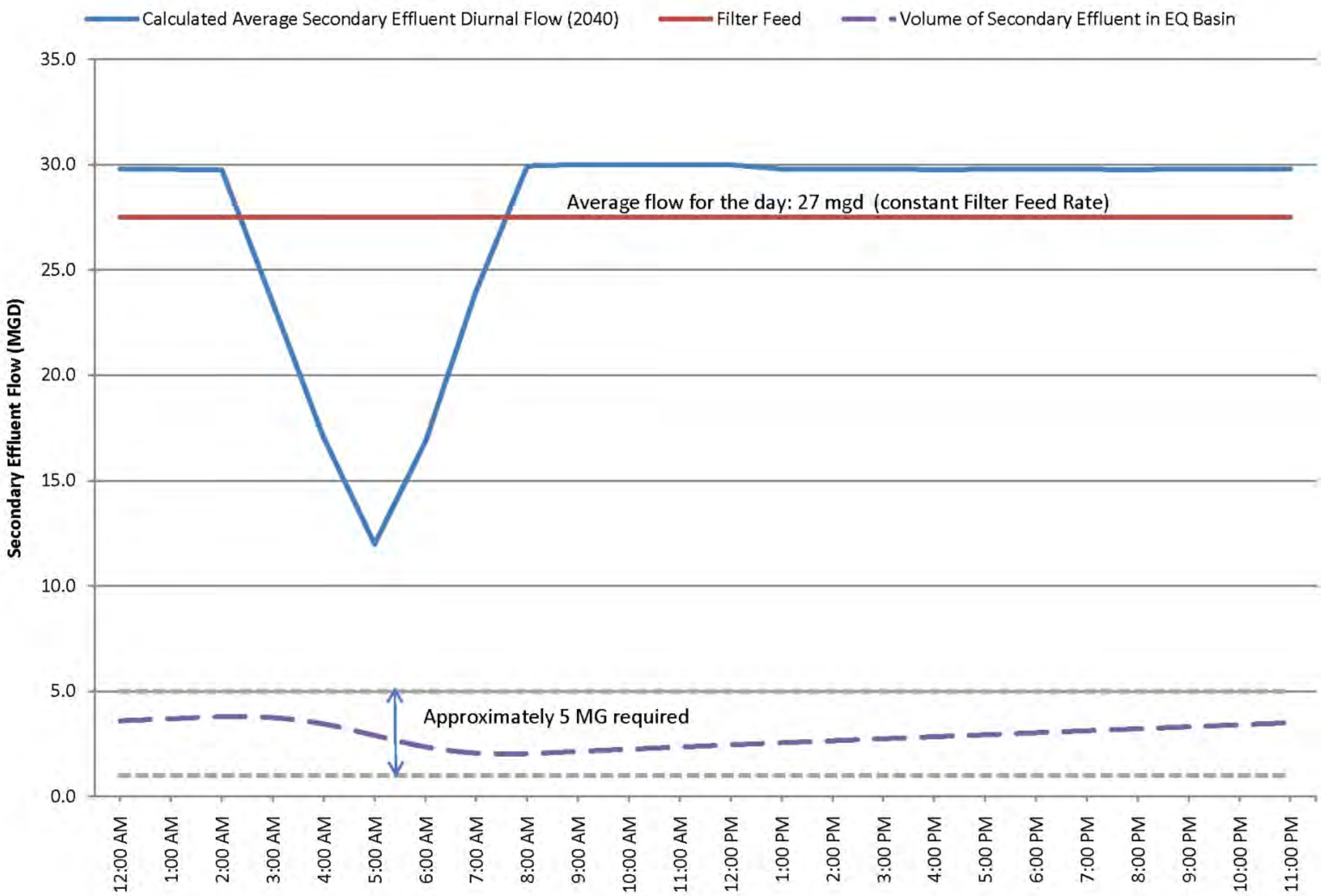
Figure 3-4: LAG Secondary Effluent Equalization Storage Calculation



Note: Based on two weeks of data from July 2009, scaled to projected 2040 secondary effluent flows.

3.2 Project Option 2

This section describes the assumed level of treatment, treatment facilities, site layout, and equalization requirements to treat up to 48 mgd of influent flows (i.e., the maximum flow that can be treated on site assuming additional flow is diverted from the VSL/FA sewershed).

3.2.1 Assumed Level of Treatment

Project Option 2 assumes the same level of treatment as Project Option 1 (i.e., secondary treatment with NdN and tertiary treatment sufficient for Title 22 approved uses, see Section 3.2.1). This treatment level would not be sufficient for groundwater replenishment projects.

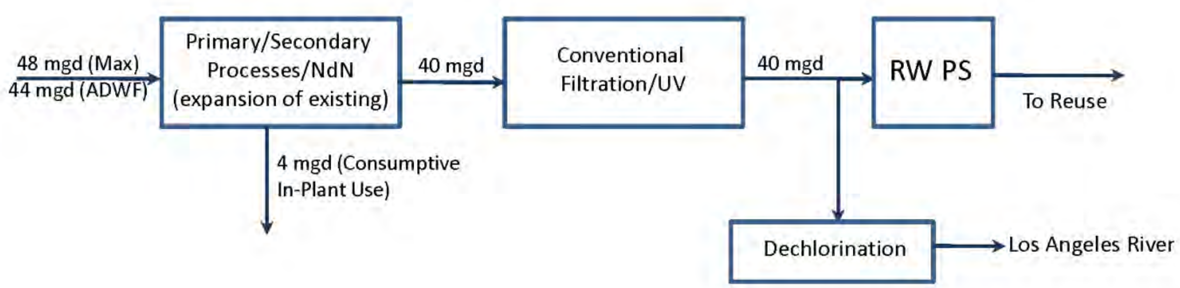
3.2.2 Treatment Facilities

Project Option 2 assumes that equalization is not required and that the available area at LAG will be used for expanded tertiary treatment capacity only. The design treatment capacity for the expanded facilities is 48 mgd. **Figure 3-5** shows the treatment process flow for Project Option 2, including some discharge to the Los Angeles River. As recycled water uses develop in the vicinity of LAG, the Los Angeles River may be maintained as a failsafe discharge option for any surplus effluent (or effluent that does not meet customer specifications).

Assuming 1 mgd of losses for every 10 mgd of average daily influent flow, Project Option 2 would have approximately 4 mgd in losses (see Section 2.1.1).

Existing processes for primary sedimentation, aeration, secondary clarification, and filtration, would be replicated with new tankage and equipment closely matching the existing facilities. For the 28 mgd of additional capacity, UV disinfection would be installed to supplement the existing 20 mgd in chlorine contact capacity. The existing dechlorination facilities would be used to dechlorinate water that is discharged to the Los Angeles River. Space would be reserved on site for a build-out capacity of the UV facilities to 40 mgd (after plant losses). The design recycled water production capacity of 40 mgd (after plant losses) is equivalent to approximately 45,000 AFY of recycled water suitable for irrigation and select industrial uses.

Figure 3-5: Project Option 2 Water Balance (48 mgd)

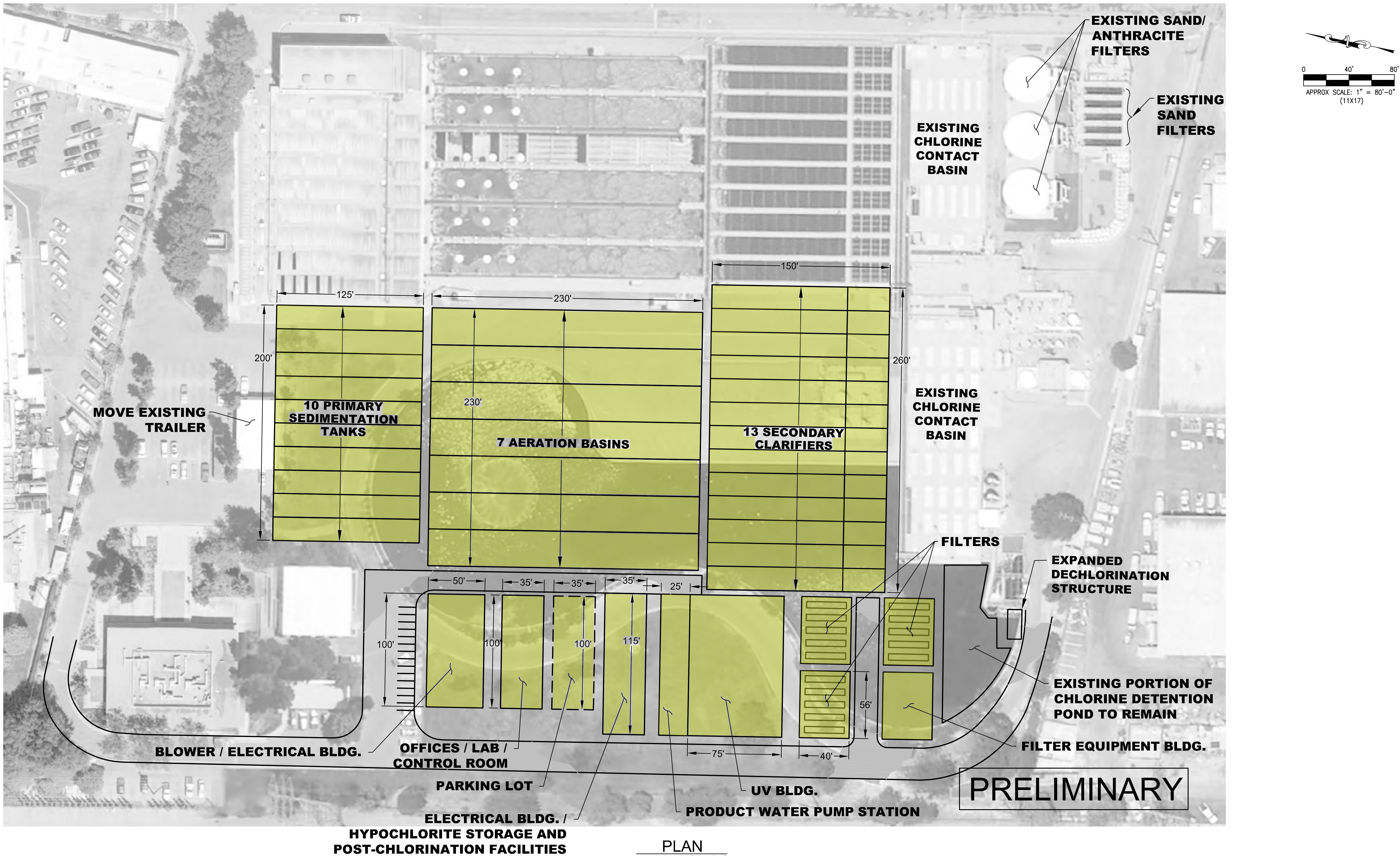


3.2.3 Site Layout

Figure 3-6 shows a preliminary conceptual layout for future Title 22 disinfected tertiary treatment facilities to expand LAG from its existing treatment capacity of 20 mgd to a capacity of 48 mgd. The conventional tertiary layout in Figure 3-6 makes use of available space at LAG by expanding the existing primaries, aeration tanks, and secondary facilities to the west. This will require the removal of the existing chlorine detention pond, which currently does not provide a critical process function. Figure 3-6 shows expansion of all processes using tankage and equipment similar to the existing facilities, except that the 28 mgd treatment capacity expansion would utilize UV disinfection instead of chlorine contact. The UV system would only need to provide an additional 20 mgd of disinfection capacity after plant losses. However, space could be reserved on site to expand the UV system from 20 mgd to 40 mgd (the full recycled water production capacity) in case the plant staff chooses to provide full UV disinfection in the future.

Equalization

Secondary effluent equalization is not provided in Project Option 2.



PLAN
APPROX SCALE: 1" = 80'-0"

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0" 1"
VERIFY SCALES
BAR IS ONE INCH LONG ON FULL SIZE DRAWING. IF NOT ONE INCH LONG ON THIS DRAWING, ADJUST SCALES ACCORDINGLY

RMC
Water & Environment

REV	DATE	BY	APVD	DESCRIPTION

DESIGNED
DRAWN
CHECKED

SUBMITTED: RMC PROJ ENGR C____
APPROVED: RMC ENGR C____

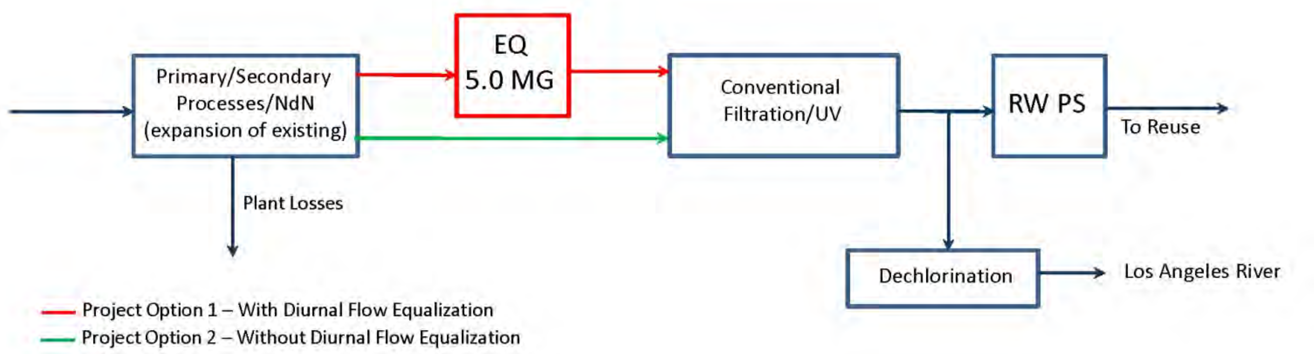
Figure 3-6
LAG Conventional Disinfected Tertiary
Site Layout (48 MGD)

DWG NO
SHEET NO 1 OF 1
PROJ NO 0000-000
DATE February 2010

3.3 Summary of Projects

Figure 3-7 shows the treatment process schematic for maximizing recycled water production at LAG. Project Option 1 would expand the existing treatment processes to an influent capacity of 32 mgd (recycled water production of 27 mgd), which is the projected 2040 influent flow for the LAG sewershed. Project Option 2 would expand the capacity to 48 mgd (recycled water production capacity of 40 mgd) if up to 16 mgd of additional projected 2040 flow is diverted from the VSL/FA sewershed. Both project options can be accommodated within the LAG site.

Figure 3-7: LAG Projected (2040) Process Schematic



A summary of the two project options is shown in **Table 3-1**.

Table 3-1: Project Options for LAG

	Project Option 1	Project Option 2
Description	**With Equalization** **(less space for treat. capacity)**	**Without Equalization** **(more space for treat. capacity)**
Water Quality Produced	Disinfected Tertiary	Disinfected Tertiary
Source of Influent Flows (sewershed)	LAG	LAG + diversions from VSL/FA
Plant Capacity & Max Hourly Influent Flow, mgd(1)	32	48
Average Daily Influent Flow, mgd(2)	30	44
Average Daily RW Production, mgd(3)	27	40
Total Volume RW Produced, AFY	30,000	45,000
Total Equalization Volume Provided, MG	5	0

(1) For LAG, max hourly influent flow will not exceed plant capacity (primary/secondary processes are designed for no peaking).
(2) LAG runs at plant capacity approximately 18 hours per day. During the remaining six hours, the influent flow dips to match available sewer flows, therefore the average daily influent flow is less than plant capacity.
(3) Assumes plant losses of 1 mgd per 10 mgd of average daily influent flow.

3.4 Phasing of Production Capacity

Equalization and treatment capacity at LAG may be developed in phases to accommodate the gradual emergence of recycled water end uses. The treatment components are modular and can be divided into multiple phases for implementation. Project Option 1 could be implemented in phases of 4 mgd or 8 mgd of treatment capacity.

Project Option 2 could also be implemented in several phases of 4 mgd or 8 mgd of treatment capacity. NdN facilities allow treatment capacity to be constructed in advance of developing recycled water end uses, with the excess recycled water being discharged to the Los Angeles River under the existing NPDES permit.

3.5 Preliminary Conveyance Alignments

This section identifies preliminary conveyance alignments to serve non-potable customers and/or groundwater replenishment projects in the vicinity of LAG. The potential pipelines have been sized and aligned with major transportation corridors. Specific review of alignments will be conducted in Task 4b. Non-potable distribution systems will be identified as part of Task 2b.

Potential conveyance routes for recycled water from LAG are shown in **Figure 3-8**. The figure highlights an area with a 0.5-mile radius from the center of the treatment plant and indicates existing LADWP and Metropolitan Water District (MWD) potable pipelines, BOS existing and abandoned sewer pipelines, LADWP and City of Glendale recycled water pipelines, and Los Angeles County Department of Public Works (LACDPW) storm drains. Only pipelines greater than 8 inches in diameter are shown.

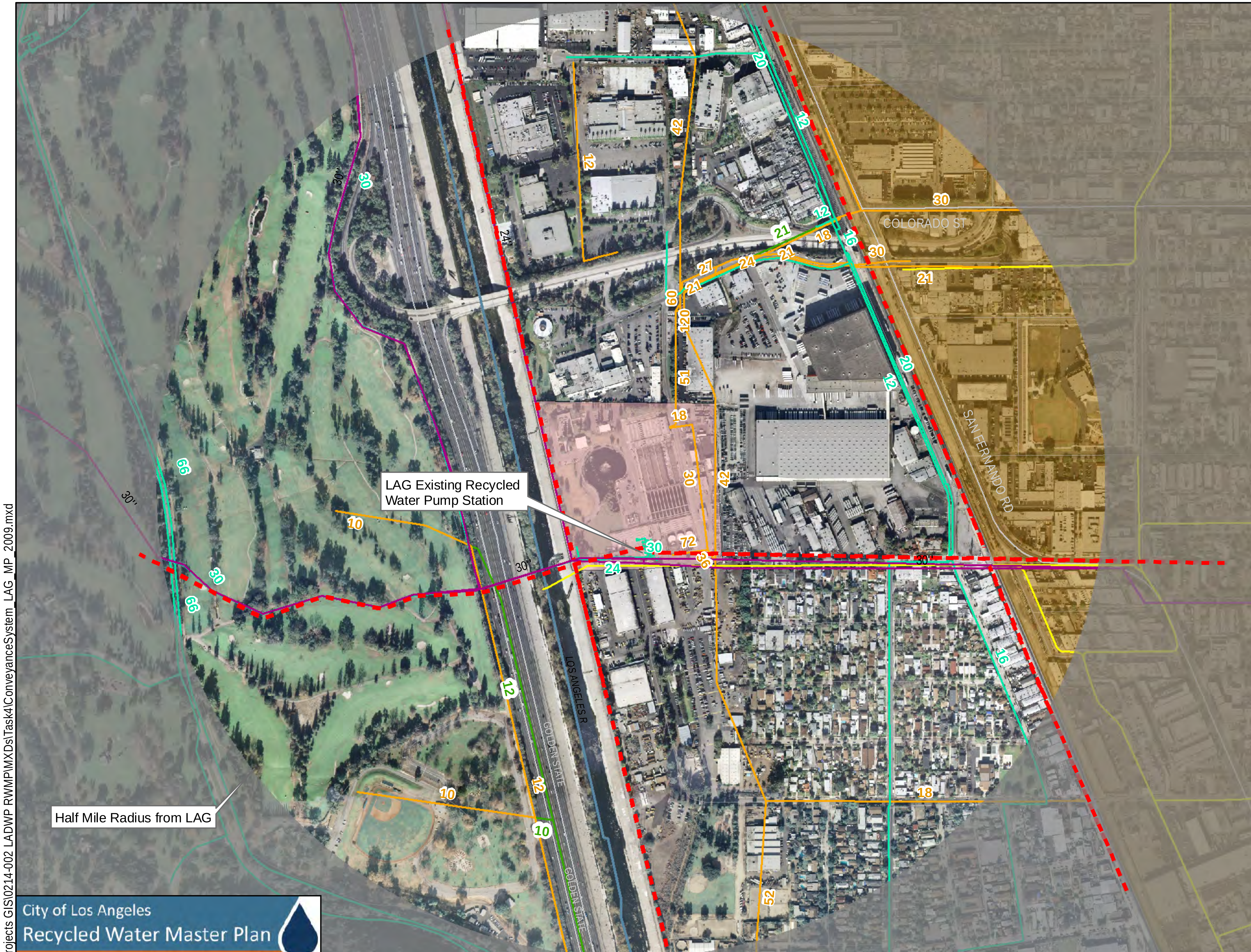
There are six potential corridors:

- North along the LA River eastern bank. This alignment could potentially be extended to provide a recycled water intertie with DCT.
- West across the LA River and parallel to the existing 30-inch diameter LADWP recycled water pipeline towards Griffith Park
- South along the LA River eastern bank
- East on Goodwin Avenue, then north on W. San Fernando Road
- East on Goodwin Avenue and then continuing east parallel to City of Glendale’s 30-inch diameter recycled water pipeline
- East on Goodwin Avenue, then south on W. San Fernando Road

LAG expansion could produce up to 40 mgd of recycled water. To convey this amount of recycled water from LAG, a 48-inch diameter pipe would be sufficient if a single pipeline were used.

Los Angeles Glendale
Water Reclamation Plant
Potential Conveyance Routes

Figure 3-8



Potential Conveyance Routes

Existing Facilities

- LADWP Potable System > 8"
- LABOS Sewer System > 8"
- Abandoned Sewer Pipes >8"
- MWD Potable System >8"
- Recycled Water System
- Storm Drains
- 12 Denotes Pipeline Diameter

Other Features

- Major Road
- Waterway
- LAG Boundary
- City of Glendale

0 250 500 1,000
Feet

RMC in association with CDM

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Data Sources: RMC, USGS, LADWP

4. LAG Special Issues

This section discusses specific recycled water issues considered as part of the evaluation of maximizing production capacity at LAG, including seasonal storage needs, LAG contractual allotments, and minimum surface flow requirements.

4.1 Seasonal Storage of Recycled Water

Seasonal storage may be provided to accommodate fluctuating demands for recycled water between winter and summer months. It typically applies to irrigation customers.

LAG is located in a suburban area of Los Angeles and has the potential to supply recycled water to both irrigation and industrial customers. According to the Task 2.1.1 Existing and Tier 1 Recycled Water Systems TM, over 97 percent of the existing and Tier 1 demands for LAG recycled water are irrigation customers (RMC/CDM, 2009e). According to the Task 2.2 Tier 2 Target Non-Potable Customers Overview TM, approximately 33 percent of Tier 2 demands in the Metro Area are irrigation customers (RMC/CDM, 2010d). The total demand for existing, Tier 1, and Tier 2 irrigation customers is approximately 5,800 AFY (or 5.2 mgd expressed as average annual recycled water production).

Other identified potential demands should not have seasonal variations because they are contractual (Pasadena) or because they are GWR projects (LA Forebay). The estimate assumes that all the Tier 1 and Tier 2 irrigation customers in the Metro Area are supplied by LAG, although some demands could be supplied by satellite plants proposed under Task 5 or by recycled water exchanges with neighboring agencies. It is also possible that LAG could supply recycled water to customers in the San Fernando Valley.

Assuming a summer peak month demand of two times the annual average recycled water production (i.e., 10.4 mgd), the recycled water production capacity at LAG (i.e., 27 mgd or 40 mgd) would likely be more than adequate to supply irrigation demands in the LAG and Metro Areas, even when constant flows of 5.4 mgd to Pasadena are subtracted.

If LAG supplies GWR projects, which typically have facilities that are capable of accepting a wide variety of flow rates throughout the year, recycled water supplies to the replenishment projects can easily be coordinated with irrigation customers. Seasonal storage at LAG may not be necessary to maximize reuse in this case. However, if GWR projects are not developed and other NPR customers are identified in the future, it may be necessary to provide seasonal storage to maximize reuse.

In the event that seasonal storage facilities are needed, two potential sites for reservoirs were identified using GIS. These sites are summarized in Table 4-1 and shown in **Figure 4-1**:

- *Ivanhoe and Silver Lake Reservoir*: This 820 MG reservoir is located about 2.5 miles south of LAG, across the LA River and is operated by LADWP. Currently the reservoir provides water to communities in South Los Angeles but is in the process of being decommissioned to comply with the State and Federal water quality regulations. The reservoir water resources will be replaced by an underground 110 MG, north of Forest Lawn Cemetery, while the existing lake will be converted to recreational use and maintained with non-potable water.

- *Hollywood Reservoir*: The Hollywood Reservoir is located about 6.2 miles east of LAG. The reservoir is maintained by LADWP and currently holds 2.5 billion gallons of water for recreational use only.

Table 4-1: LAG Potential Seasonal Storage Sites

Potential Site	Owner	Distance (miles)	Area (acres)	Potential Volume (MG)	Days of Storage[3]
Ivanhoe and Silver Lake Reservoir	LADWP	2.5	96	820	30.4
Hollywood Reservoir	LADWP	6.2	71	2,500	92.6

1. RAP – Department of Recreation and Parks
2. Assumes 10 feet of depth
3. Assumes 27 mgd (100% On-site Reuse)

Los Angeles Glendale
Water Reclamation Plant
Potential Sites for
Seasonal Storage

Figure 4-1

Potential Pipeline Alignment
Potential Storage
LAG Boundary
Non City of LA

N

0 1,500 3,000 6,000
Feet

RMC in association with CDM

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Data Sources: RMC, USGS, LADWP

4.2 LAG Contractual Allotment Review

The rules governing recycled water from LAG have been established by a series of agreements dating back to 1964. These agreements involve the City of Los Angeles, LADWP, the City of Glendale, the Los Angeles Department of Recreation and Parks (LARAP), LADPW, and the City of Pasadena. The details of these agreements are summarized in **Table 4-2** below.

Agreement No. 32272 was the first document to define rights to reclaimed water from LAG. It established joint ownership of treated wastewaters, specified that rights to reclaimed water and treatment capacity are held separately, and established that rights may be separately conveyed in title. The agreement also limits the transfer of reclaimed water rights to the parties involved.

Agreement No. 42257 further developed these rights. The agreement entitles each party (LA and Glendale) to an influent plant capacity of up to 10 mgd and established that each party has a right to a corresponding percentage of recycled water based on the influent capacity used. It also states that modifications can be agreed to in writing but terminate at the end of each fiscal year.

The City of Los Angeles currently reuses approximately 1.8 mgd of its 10 mgd entitlement and has plans to expand to approximately 3.6 mgd (RMC/CDM, 2009d). The City of Glendale currently reuses approximately 1.4 mgd of its 10 mgd entitlement and has plans to expand to approximately 2.2 mgd inside its service area (RMC/CDM, 2009c). In addition, the City of Pasadena has an entitlement for up to 5.4 mgd of Glendale's recycled water from LAG (see Agreement No. 15,075 in Table 3-3). The City of Pasadena is currently in the process of developing a recycled water master plan based on the Central Los Angeles County Regional Recycled Water Project (CeLAC) Study that identified up to 6.3 mgd of demand in the Pasadena service area, which exceeds the 5.4 mgd amount contracted for from Glendale (RMC/CDM, 2009c). Adding Pasadena's 5.4 mgd entitlement and Glendale's planned 2.2 mgd of future recycled water use leaves approximately 2.4 mgd of available recycled water from the Glendale allotment.

According to this preliminary analysis, LADWP cannot exercise a right of first refusal. LADWP could propose a modification to Agreement No. 42257 for access to the remaining 2.4 mgd of recycled water in Glendale's allotment (possibly requiring annual renewal); however, at this time Glendale plans to use the entire amount during high-demand summer months. LADWP could also propose to modify Agreement No. 15,075 with Pasadena to make up to 5.4 mgd of additional recycled water available, but this may be in conflict with Pasadena's plans to develop local recycled water reuse.

Table 4-2: Summary of Agreements Related to Recycled Water from LAG

Agmt. No	Year	Parties	Purpose	Key Elements
NA	1964	Los Angeles, Glendale	Governs sewer transportation, treatment, and disposal	• Established Glendale's contractual capacity in LA sewer system (this capacity was reached several years later, which led to the idea of a joint water reclamation plant)
NA	1968	Los Angeles, Glendale	Forms JPA to conduct feasibility study for joint WRP	• Study recommended Stage 1, 20 mgd WRP (in operation) • Also recommended 3-module, 50 mgd WRP (not constructed)
32272	1970	Los Angeles, Glendale	Forms JPA to share cost of plans and specs for Stage 1, 20 mgd WRP	• Established joint share of costs for physical plant, consulting services, and land • Established joint ownership of inflow capacity and outflow of treated wastewaters • Established that rights to reclaimed water and treatment capacity are held separately, and that rights may be separately conveyed in title[4] • Replaced "Paragraph C" in 1964 Agreement to limit transfer of rights to the parties involved[5]
42257	NA	Los Angeles, Glendale	Forms JPA to share costs of operation and maintenance for LAG	• Sets indefinite term • Defines influent permitted flows: Glendale – 10 mgd (15 mgd peak) plant capacity or 50 %; Los Angeles – 10 mgd (15 mgd peak) plant capacity or 50 % • Establishes Glendale's right to discharge into NOS and HTP

[4] Language from Agreement No. 32272: "Each City will have rights to one-half (1/2) of the reclaimed water before lawful discharge into the Los Angeles River. These rights are held to be separate and independent of the rights to wastewater treatment capacity and may be separately conveyed in title."

[5] Language from Agreement No. 32272, Paragraph C: "Neither party hereto shall transfer in any manner, whether by operation of law or otherwise, its Permitted Flows or any part thereof other than to the other party, in which latter event such transfer will be made by an amendment to this agreement embodying such terms and conditions as are mutually agreeable to the parties except that it is hereby agreed that at such time as the first module of the proposed Glendale-Los Angeles Water Reclamation Plant is constructed and in operation or until January 1, 1975, whichever is sooner, Los Angeles shall then be obligated to purchase from Glendale at the latter's option from time to time any or all of Glendale's Permitted Flows provided for in this Agreement. This paragraph applies only to Permitted Flows which are allocated to Glendale in the Hyperion Treatment Plant or the Los Angeles Connecting Sewers and the Permitted Flows allocated to Los Angeles in the Glendale Connecting Sewers."

Agmt. No	Year	Parties	Purpose	Key Elements
				• Establishes that % of RW for each party will be equal to % of influent; modifications can be agreed to in writing but terminate at the end of each fiscal year
10943	1991	LADWP, LARAP, LADPW, Glendale	Establishes responsibilities for Glendale City Water Reclamation Pipeline	• Pipeline from LAG to Forest Lawn • Provides extra capacity
15,075	1993	Glendale, Pasadena	Establishes Pasadena's participation in enlargement of Glendale RW pipeline	• Based on Glendale pipeline to School Canyon Landfill that is located near Pasadena border • Includes long term commitment for Glendale to provide RW to Pasadena • Terminates 2017; Pasadena has right to extend 25 years • Pasadena has right to connect • Pasadena has right to 6,000 AFY at instantaneous max. of 6,255 gpm • Glendale has right to use unused portion at negotiated rate • If RW amount is insufficient, parties will share equally

NA = "not available"

4.3 Minimum Surface Flow

LAG may be subject to review of any proposed changes to the discharge location to the Los Angeles River under the California Water Code, Sections 1210 and 1211.

California Water Code (CWC) section 1211 requires approval prior to making any change in the point of discharge, place of use, or purpose of use of the treated wastewater. Per CWC section 1211, the State Water Resources Control Board (SWRCB) shall "review such changes pursuant to the provisions of Chapter 10..." of the CWC (sections 1700-1707). Proposed changes are to be reviewed in the same manner as the SWRCB would review a proposed change to an appropriative water right. CWC section 1702 provides that before granting permission to make a change, the SWRCB must find "that the change will not operate to the injury of any legal user of the water involved."

CWC section 1210 provides that the owner of a wastewater treatment plant has the exclusive right to the treated wastewater as opposed to entities that have supplied the water to the treatment plant, except as otherwise provided by agreement. But CWC section 1210 expressly provides that this provision does not affect the treatment plant owner's obligations to any legal user of the recycled water.

As both CWC sections 1210 and 1211 make clear, however, the Legislature did not intend to affect any rights that downstream users may have to the recycled water discharged under the common law regarding return flow. Return flow is water that flows back into a stream, lake, or other body of water after it has been appropriated and used. Consistent with CWC sections 1211 and 1702 and the no injury rule, recycled water discharged into a given stream should be treated as return flow from native water if the source of the recycled water is surface water or percolating groundwater that under natural conditions would reach the stream. Thus, for agencies that seek to transfer recycled water previously discharged to a stream to an off-site reclamation project, downstream water right holders could claim injury depending on whether the source of the recycled water originated within the watershed or was foreign water. For the proposed project, this means that it would be necessary to go through the CWC section 1211 process for any recycled water diversions.

In addition, the SWRCB must take into account the impacts to fish, wildlife, and other in-stream beneficial uses of the receiving water when considering whether to approve change petitions. These changes have the potential to adversely affect such uses, which may constitute "legal uses" of water, and thus must be protected. Such impacts can be mitigated by the requirement that a discharger maintain a certain level of recycled water discharge or minimum in-stream flow. This level of flow would have to be approved by the SWRCB and presumably fish and wildlife agencies.

Article VI of the City Charter establishes provisions for the sale and lease of the Los Angeles River and recycled water in Sections 673 and 677. With regard to return flows and the "no injury" rule, the City has kept the entire rights for the waters of the Los Angeles River, except for the sale and distribution of recycled water. The right to sell and distribute recycled water is under the purview of the City of Los Angeles Board of Water and Power Commissioners. Thus, the only potential issue is the impact on in-stream beneficial uses of the Los Angeles River should recycled water be diverted for a reuse project. These impacts would have to be addressed through the CWC section 1211 process. Mitigation could require that the City maintain a minimum in-stream flow that would require approval by the SWRCB and the Department of Fish and Game (RMC/CDM, 2009f).

5. Cost Estimates

5.1 Cost of Project Options

This section presents order of magnitude cost estimates for Project Options 1 and 2 described in Section 3 above. These cost estimates are preliminary and will be updated as part of the integrated alternatives analysis in Task 4b.

5.2 Capital Costs

This section estimates the total capital costs for Title 22 tertiary and equalization facilities at LAG. Preliminary construction cost estimates were developed based on the design summaries discussed in Section 3. Cost values are based on the engineer estimate for the Novato Treatment Plant, expected to begin operating in June 2010. The estimates follow a traditional contracting approach (design-bid-build) and include all taxes, fees, bonds, insurance, overhead and profit, planning, design services, bid services, permitting, construction management, and a construction contingency of 30%. Costs are expressed in December 2009 dollars, since an approximate construction date is not known. Once an approximate construction date is known, costs should be escalated to the construction mid-point date using an annual cost escalation in order to more accurately estimate costs at the time of construction. A capital cost breakdown is summarized in **Table 5-1**.

Table 5-1 – LAG Capital Cost Estimate

Item	Option 1	Option 2
***Cost Basis*:**		
Influent Plant Capacity (mgd)	32	48
Average RW Production Capacity (mgd)	27	40
Influent Plant Capacity Added (mgd)	12	28
EQ/Storage Volume (MG)	5	0
Cost Estimate [(1)(2)]	**($M)**	**($M)**
Headworks	1.5	3.5
Influent Pump Station	1.1	2.6
Primary Sedimentation Tanks	8.2	16.4
Aeration Tanks and Blowers	18.7	32.7
Secondary Clarifiers	7.2	15.6
Tertiary Media Filters	6	14
UV Disinfection	4.8	11.2
Recycled Water Pump Station	2.5	5.8
Equalization[(3)]	22.5	0
Subtotal	72.5	101.8
Contingency (30% of Subtotal)	21.8	31
Total	**94**	**132**
Cost per mgd of Production	**3.4**	**3.1**

(1) Projected capital costs are in December 2009 dollars.
(2) Cost basis is the Novato Treatment Plant engineer's estimate.
(3) Equalization cost basis is $4.5/gallon of storage provided.

The total construction estimate is $94 million for Project Option 1 and $132 million for Project Option 2. The estimate does not include off-site pumping, conveyance, or seasonal storage facilities.

5.3 O & M Costs

This section estimates O&M costs for Title 22 tertiary and EQ facilities at LAG using August 2008 – July 2009 reported costs for LAG. Estimated O&M costs are summarized in **Table 5-2**.

Table 5-2 – HTP O&M Annual Cost Estimate

Item	Option 1 ($M)	Option 2 ($M)
Power	1.8	2.7
Chemicals	1.2	1.8
Labor	2.8	4.2
Compliance Monitoring	0.8	1.2
UV Lamp Replacement	0.7	1.1
Contract Maintenance	0.2	0.3
Total Annual Cost	**7.5**	**11.3**

(1) Based on August 2008 – July 2009 reported O&M costs for LAG.

Based on Table 5-2, the estimated annual O&M cost for LAG is $7.5 million per year for 27 mgd of recycled water production capacity, or approximately $11.3 million per year for 40 mgd of recycled water production capacity.

6. Next Steps

Information developed in this TM will be used in Task 4b of the study to develop integrated system-wide recommendations regarding the amount of recycled water production that should be sited at LAG versus other options including DCT, HTP, potential satellite plants, or other offsite locations.

References

BOS, 2009: Monthly Performance Report, HTP, TIWRP, DCT, LAG, Wastewater Collection Systems, Division, City of Los Angeles Department of Public Works Bureau of Sanitation, August 2009

RMC/CDM, 2009a: Draft Wastewater Treatment Technical Memorandum, Task 4a Concept Report for Maximizing Reuse, RMC/CDM, November 2, 2009

RMC/CDM, 2009b: Draft Wastewater Flow Projections Technical Memorandum, Task 5a Satellite Feasibility Concept Report, RMC/CDM, September 30, 2009

RMC/CDM, 2009c: Draft Regional Recycled Water Systems Technical Memorandum, Task 4a Concept Report for Maximizing Reuse, RMC/CDM, October 20, 2009

RMC/CDM, 2010d: Draft Tier 2 Target Non-Potable Customers Overview Technical Memorandum, Task 2a Non-Potable Reuse Master Plan, RMC/CDM, January 19, 2010

RMC/CDM, 2009e: Draft Existing and Tier 1 Recycled Water Systems Technical Memorandum, Task 2a Non-Potable Reuse Master Plan, RMC/CDM, December 14, 2009

RMC/CDM, 2009f: Draft Regulatory Assessment Technical Memorandum, Task 1a Indirect Potable Reuse Master Plan, RMC/CDM, September 14, 2009

RMC/CDM, 2009g: Draft Regional Groundwater Assessment Technical Memorandum, Task 4a Concept Report for Maximizing Reuse, RMC/CDM, November 25, 2009

RMC Meeting, 2009: Task 4.1.2 Meeting with City of Glendale Water and Power, LADWP and BOS, August 20, 2009

Appendix C

Hyperion Treatment Plant Opportunities TM

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Summary of Modifications to the Hyperion Treatment Plant Opportunities Technical Memorandum since Initial Publication on February 5, 2010

The Recycled Water Master Planning (RWMP) effort has spanned three years (April 2009 – March 2012). As is the nature of a planning project, assumptions are typically modified and refined as a project is further developed. The most recent assumptions related to the Long-Term Concepts master planning effort are presented in the Draft Long-Term Concepts Report (January 2012). Assumptions and conclusions presented in this report supersede assumptions included in this technical memorandum (TM). The following table summarizes the modifications applicable to all RWMP TMs and those specifically applicable to this TM are described following the table.

Assumption	Modified	Original
Applicable to all RWMP TMs		
Recycled Water Goal	59,000 AFY by 2035 This goal reflects the 2010 LADWP Urban Water Management Plan that was adopted in early 2011, after the original RWMP goals were drafted	50,000 AFY by 2019
Introduction Section	Ignore this section and refer to the Introduction Section of the RWMP Report.	This section was included in all initial TMs but the terms described have been replaced by the Introduction Section for each RWMP report.
NPR Projects Terminology	To avoid confusion related to LADWP's water rate structure, the terms "Tier 1" and "Tier 2" are superseded with the terms "planned" and "potential," respectively. Both planned and potential projects would be considered for implementation by 2035.	"Tier 1" for NPR projects that were originally planned for design and construction by the year 2015. "Tier 2" for NPR projects that were originally being evaluated in the NPR Master Planning Report for potential future implementation after the year 2015.
Name for MF/RO/AOP treatment plant	Advanced water purification facility (AWPF)	Advanced water treatment facility (AWTF)
Name for water produced by AWPF	Purified recycled water	Advanced treated recycled water, highly purified recycled water, etc.
Treatment Plant Acronyms	DCTWRP LAGWRP	DCT LAG

The following modifications are specific to this TM.

Universal

All references to "Recycled Water Master Plan" should be replaced with "Recycled Water Master Planning".

Cost estimates (pages 5, 6, 41, 42)

The basis for the cost estimates included in this TM was subsequently revised, as documented in the Cost Estimating Basis for Recycling Water Master Planning TM (Appendix G in the LTCR).

This resulted in changes to unit costs for capital and O&M costs, construction contingencies, implementation factors, project financing rates, discount rates, and the Engineering News Record (ENR) Index.

Component	Initial	Updated
Estimated Capital Cost	-	
Phase 1	$364M	$285M
Phase 2	$251M	$150M
Phase 3	$377M	$296M
Phase 4	$268M	$191M
Estimated O&M Cost		
Phase 1	$26.5M	$27.0M
Phase 2	$37.5M	$38.3M
Phase 3	$67.5M	$69.0M
Phase 4	$84.2M	$86.3M
ENR Index	9,764 (December 2009)	10,000 (January 2011)
Equalization Cost	$4/gallon	$1.5/gallon

Table 4-1 – HTP Capital Cost Estimates should be replaced with:

Table 4-1: HTP Capital Cost Estimate

Item	Phase 1	Phase 2	Phase 3	Phase 4
***Cost Basis*:**				
Total RW Production Capacity (mgd)	50	71	128	160
RW Production Capacity Added (mgd)	50	21	57	32
New Installed EQ Volume (MG)	0	15	0	6
New Installed Multi-Story Bldg. (ft^2)	270,000	104,000	210,000	173,000
New Installed Parking Levels (ft^2)	0	104,000	0	0
***Cost Estimate*[(1)]**	**($M)**	**($M)**	**($M)**	**($M)**
Membranes, Equipment, Above-Grade Valves, Above-Grade Piping	122.4	51.4	139.5	78.3
Site Work, Buried Piping and Buried Valves (includ. mobilization, demobilization, contractor permits)	28.0	11.8	32.0	17.9
Buildings, Structural, Architectural, Excavation/Backfill/Compaction for Buildings & Structures (excluding new Equalization Storage)	81.0	41.6	63.0	51.9
Electrical, Instrumentation, Controls (includ. buried electrical)	51.0	21.4	58.1	32.6
Painting and Coating	2.6	1.1	2.9	1.6
Equalization Storage	0	22.5	0	9.0
Total	**285.0**	**149.8**	**295.5**	**191.3**

(1) Projected capital costs are in January 2011 dollars.
(2) Cost basis was the GWR System treatment facility construction cost of $305 million inflated from June 2006 dollars to January 2011 dollars, with cost adders for multi-story construction.

Table 4-2: HTP O&M Cost Estimate should be replaced with:

Table 4-2: HTP O&M Cost Estimate

Item	% of Total O&M Cost[(1)]	Phase 1 ($M)	Phase 2 ($M)	Phase 3 ($M)	Phase 4 ($M)
Power	50	13.5	19.1	34.5	43.1
Chemicals	18	4.9	6.9	12.4	15.5
Labor	12	3.2	4.6	8.3	10.4
Membrane Replacement	9	2.4	3.4	6.2	7.8
Compliance Monitoring	5	1.3	1.9	3.5	4.3
Plant Refurbishment	4	1.1	1.5	2.8	3.5
UV Lamp Replacement	1	0.3	0.4	0.7	0.9
Contract Maintenance	1	0.3	0.4	0.7	0.9
Total		**27.0**	**38.3**	**69.0**	**86.3**

(1) Costs are based on 2008 reported O&M costs for GWR System.
(2) Reported power costs are consistent with projected electrical draw in MW and $0.12/kWh cost of power.

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Table 3-2 - Maximum Allowable Recycled Water Production Based on NPDES Discharge Constituents should be replaced with:

Const ituent	Unit	NPDES Permit Limit	2008 Monthly Average	Maximum RW Production (mgd) before permit limit is violated
TSS	mg/L	30	19	105
	lbs/day	113,000	45,030	
Copper	µg/L	39	17	170
	lbs/yr	41,100	22,167	
Lead	µg/L	3	0	>160
	lbs/yr	2,700	0	
Silver	µg/L	5	0.25	>160
	lbs/yr	5,500	324	
Zinc	µg/L	56	17	>160
	lbs/yr	59,100	22,037	

City of Los Angeles

Recycled Water Master Plan

Task 4

Hyperion Treatment Plant Opportunities Technical Memorandum

Prepared For:

Los Angeles Department of Water and Power

City of Los Angeles, Department of Public Works

Prepared By:

RMC in association with CDM

February 5, 2010

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Technical Memorandum

Title:	**HTP Opportunities Technical Memorandum**
Version:	DRAFT
Prepared For:	John Hinds, Project Manager & Task 4a Lead, LADWP Doug Walters, Project Manager, BOS Lenise Marrero, Task 4a Co-Lead, BOS
Prepared by:	Brian Dietrick, Task 4 Project Engineer, RMC Marilyn Bailey, RMC John Thayer, RMC Miluska Propersi, RMC
Reviewed by:	Steve Clary, Task 4 Lead Tom Richardson, Project Manager, RMC Heather Boyle VanMeter, Deputy Project Manager, CDM Rachael Wark, RMC
Date:	February 5, 2010
Reference:	Task Order 4a: Concept Report for Maximizing Reuse Task 4.2 Identification of Projects Task 4.2.3 HTP Opportunities

1. Introduction

With imported water supplies becoming ever more unpredictable, the Los Angeles Department of Water and Power (LADWP) adopted the Mayor's vision of Securing LA's Water Supply in May 2008, calling for 50,000 acre-feet per year (AFY) of potable supplies to be replaced by recycled water by 2019. To meet this near-term challenge and plan for expanding reuse in the future, LADWP has partnered with the Department of Public Works to develop the Recycled Water Master Plan (RWMP). The RWMP includes seven major tasks:

- Groundwater Replenishment (GWR) Master Plan
- Non-Potable Reuse (NPR) Master Plan
- Groundwater Replenishment Treatment Pilot Study
- Max Reuse Concept Report
- Satellite Feasibility Concept Report
- Existing System Reliability Concept Report
- Training

The importance of additional water supply options for Los Angeles has become increasingly apparent with continuation of drought conditions, building contention for limited available water supplies both statewide and across the Southwest, and growing awareness of the critical nexus between quality of life/economic stability and available supplies of quality water.

This technical memorandum (TM) is a deliverable under Task 4a: Concept Report for Maximizing Reuse.

1.1 Task 4 Overview

The purpose of Task 4 is to research and identify project options that have the potential to maximize the beneficial reuse of effluent produced, or potentially produced, at three of the City of Los Angeles' (City's) existing treatment plants: Hyperion Treatment Plant (HTP), Los Angeles-Glendale Water Reclamation Plant (LAG), and Terminal Island Water Reclamation Plant (TIWRP). Specifically, Task 4 will identify potential opportunities that would increase the City's reuse beyond the 50,000 AFY goal established in Task 2. Opportunities to maximize reuse from the Donald C. Tillman Water Reclamation Plant (DCT) are covered under Task 1.

Task 4a identifies a wide array of potentially feasible wastewater diversion, flow equalization, and treatment expansion and/or upgrade projects that would maximize recycled water production from the existing treatment plants; identifies local and regional indirect potable reuse opportunities (including interconnection with neighboring agencies) that could provide a mechanism for beneficial reuse of the maximized recycled water; and identifies non-potable reuse projects that could be served by any remaining and expanded recycled water sources including interagency interconnections.

1.2 Purpose of TM

The HTP Opportunities TM identifies potentially feasible project options that would maximize recycled water production from HTP and estimates the potential recycled water production that could occur at, and near, the HTP site up to the year 2040. It documents projected influent flows, available area for recycled water treatment processes at the HTP site, and previous findings with respect to GWR and NPR market demands in the vicinity of HTP.

Using a phased approach, the TM also documents the assumed treatment technologies, appropriate process capacities, and the facilities needed to deliver secondary effluent to the recycled water treatment process and return residuals (i.e., brine and filtration reject/backwash flows) to HTP. It includes a discussion of flow equalization needs, and recommended site layouts for treatment facilities, both on and off the HTP property. The TM concludes with a discussion of special issues, preliminary conveyance routes, and an order of magnitude cost estimate.

Information developed in this TM will be used in Task 4b of the study to develop integrated system-wide recommendations regarding the amount of recycled water production that should be sited at HTP versus other options including DCT, LAG, potential satellite plants, or other offsite locations.

1.3 Related Technical Memoranda

Other related technical memoranda summarizing basic research for the Maximizing Reuse Concept Report include the following:

- Advanced Water Treatment Technology TM (Task 1.4)
- Tier 2 Target Non-Potable Customers Overview TM (Task 2.2)
- Treatment Plant Review TM (Task 4.1.1)
- Regional Recycled Water System TM (Task 4.1.2)
- Regional Groundwater Assessment TM (Task 4.1.3)
- LA River Flow Assessment TM (Task 4.1.4)
- LAG Opportunities TM (Task 4.2.1)
- TIWRP Opportunities TM (Task 4.2.2)
- Wastewater Flow Projection TM (Task 5.1.1)
- SHARE/SGS/HTP Working Draft TM (4.6.1)

1.4 Summary of Findings

This TM describes the development of 160 mgd of recycled water production capacity at HTP occurring in four distinct implementation phases. This includes a production capacity of 128 mgd within the HTP site (Phase 1 through 3) and an additional 32 mgd of production capacity using nearby off-site areas (Phase 4). A phased approach is suggested so that the recycled water production can be implemented to match incremental increases in recycled water demands from now until 2040. However, there is nothing to preclude simultaneous construction of any of the phases. The actual timing and degree to which project phases are implemented will be recommended after the integrated analysis in Task 4b.

In order to efficiently use areas on the HTP site for equalization and production capacity, this TM proposes that the first 50 mgd of production be located above the existing Emergency Storage Basin for Phase 1 (including conversion of the Emergency Storage Basin to equalization storage), followed by a 21 mgd expansion into the adjacent parking lot for Phase 2 (including additional below-grade equalization), followed by a 57 mgd expansion into the area of Oxygen Reactor No. 9 for Phase 3. Lastly, a 32 mgd expansion onto nearby offsite areas for Phase 4 could occur if more recycling and equalization capacity were needed. An alternative construction sequence would be to construct Phase 4 as the first step in recycled water implementation at HTP if a decision were made not to use on-site areas at HTP.

These production estimates are based on the following findings and assumptions:

1. Influent flows at HTP will not change appreciably between 2009 and 2040 due to the opposing effects of population growth, water conservation measures, and expansion of reuse capacity at the upstream DCT and LAG treatment plants. Consistent with this assumption, the average annual influent flows at HTP are projected to be approximately 301 mgd between 2009 and 2040. With in-plant consumptive uses totaling 6 mgd, secondary flows of approximately 295 mgd would be available.

2. Up to 70 mgd of secondary effluent flow will be delivered at a constant flow rate to West Basin Municipal Water District (WBMWD) in accordance with a preliminary agreement discussed between LADWP and WBMWD in 2009.

3. Recycled water produced is treated with microfiltration (MF), reverse osmosis (RO), and advanced oxidation processes (AOP), collectively advanced water treatment (AWT), to meet the regulatory requirements for direct injection to a groundwater aquifer.

4. The maximum anticipated flow of brine and MF residuals delivered to the outfall, not including WBMWD's contribution, is approximately 65 mgd for facilities producing 160 mgd of recycled water (Phase 4).

Other findings in this TM include:

- On-Site available areas for equalization and AWT facilities include the existing Emergency Storage Basin, the existing parking lot, Oxygen Reactor No. 9, the abandoned dissolved air flotation (DAF) Unit area, and the Power and Blower Building. Other areas previously discussed in the 4.1.1 Treatment Plant Review TM are no longer considered available.
- Maximum use of on-site available space for treatment facilities will require multi-story construction and phasing of the equalization and MF/RO facilities.
- As recycled water production flow rates increase above approximately 105 mgd reduced flows to the HTP ocean outfall may impact the ability to comply with NPDES permit limits for TSS, copper, and potentially other constituents.
- Reduced flows to the HTP ocean outfall are not likely to impact the operation of the outfall itself unless flows to the outfall are reduced to approximately 20 mgd.
- Four preliminary conveyance alignments are identified that would provide sufficient opportunities to convey the recycled water production flow rates discussed herein: (1) north on Vista Del Mar, (2) east on Imperial Highway, (3) south on Vista Del Mar, and (4) east on El Segundo Boulevard.

Table 1-1 provides a summary of the phases. The estimated capital cost of building all four phases for a total recycled water production capacity of 160 mgd is $1.3 billion in December 2009 dollars.

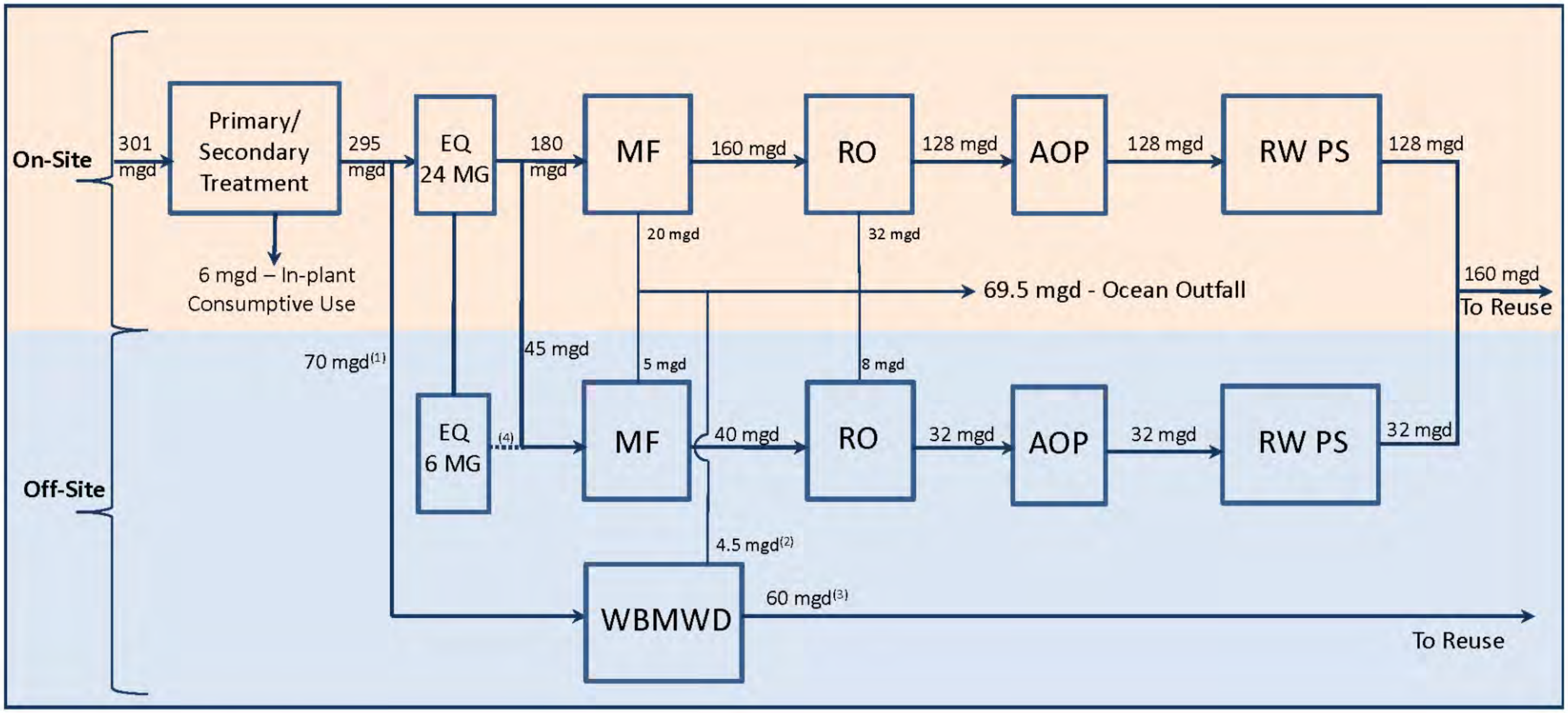
Table 1-1: Recycled Water Production Potential

	Phase 1	Phase 2	Phase 3	Phase 4
Description	**Existing Emergency Storage Basin Area**	**Existing Parking Lot Area**	**Existing Oxygen Reactor No. 9 Area**	**Nearby Off-Site Area**
Secondary Effluent Flow, mgd	295	295	295	295
Secondary Effluent Flow to WBMWD, mgd	70	70	70	70
Subtotal available	225	225	225	225
Total MF/RO Feed Flow Rate, mgd	70	100(1)	180(1)	225(1)
Total RW Production, mgd	50	71(1)	128(1)	160(1)
Total Volume RW Produced, AFY	56,000	79,500(1)	143,400(1)	179,200(1)
Total Equalization Volume Provided, MG(2)	9	24(1)	24(1)	30(1)
Estimated Capital Cost (3)	**$364M**	**$251M**	**$377M**	**$268M**
Estimated O&M Cost(4)	**$26.5M**	**$37.5M**	**$67.5M**	**$84.2M**

(1) Totals are cumulative across phases
(2) Design considerations dictate that equalization volumes provided for Phases 1 and 2 exceed the actual volumes required for operation.
(3) Estimated capital costs do not include pumping or conveyance.
(4) Includes power, chemicals, labor, membrane replacement, compliance monitoring, plant refurbishment, UV lamp replacement, and contract maintenance

A schematic diagram of the projected water balance at HTP, assuming construction of Phases 1 – 4, is shown in **Figure 1-1**.

Figure 1-1: HTP Projected (2009-2040) Water Balance with On-Site and Off-Site Construction



(1) Based on WBMWD CIP for FY 25-30
(2) The WBMWD NPDES permit limits brine discharges to the HTP outfall to 4.5 mgd
(3) 86% Recycled Water Production is assumed
(4) Interconnection for EQ undetermined

2. Summary of Background Information

2.1 Water Balance

HTP, located south of the Los Angeles International Airport (LAX), is the largest wastewater treatment plant owned by City and has a permitted average dry weather capacity of 450 mgd. All wastewater is treated to a secondary level and the majority is discharged through a 5-mile ocean outfall. The following sections provide additional detail on current and projected flows.

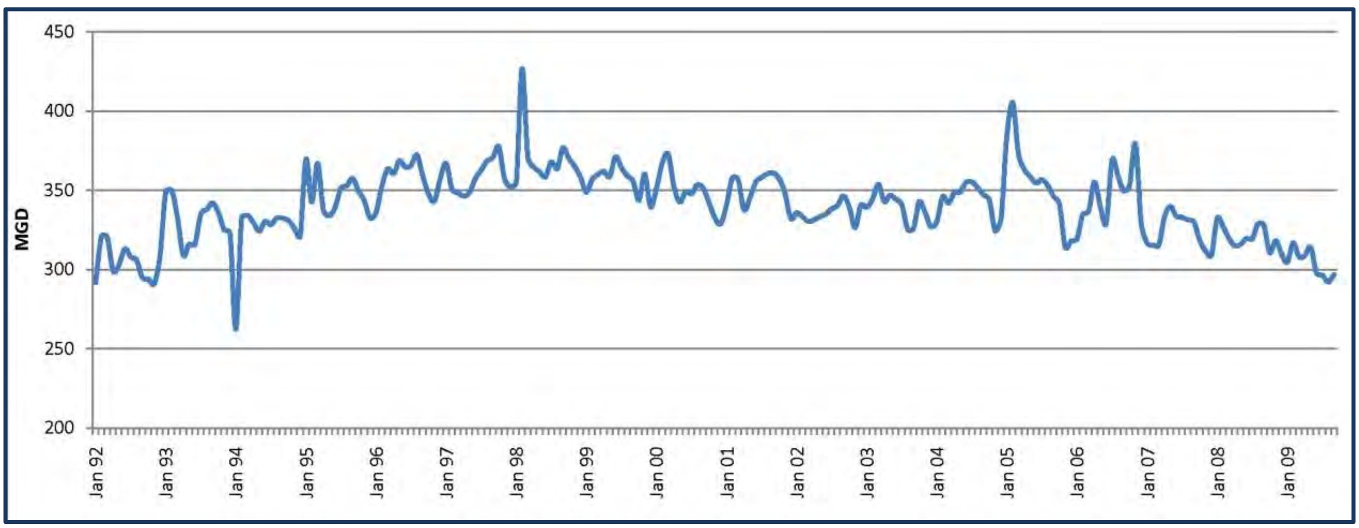
2.1.1 Historic and Current Flows

Historic Influent Flow Trends

Figure 2-1 shows the monthly average influent flows at HTP from 1992 through 2009. As noted on the graph, wastewater flows gradually increased from 1992 to 1998 (mainly due to population growth), but then flows gradually declined between 1998 and 2009.

The average annual influent flow rate has declined approximately 33 mgd over the seven-year period between 2002 and 2009, from 340 mgd to 307 mgd. This trend has recently accelerated and may be due to mandatory water use restrictions implemented by water retail agencies in the greater Los Angeles Area in 2008 and 2009 (RMC/CDM, 2009a).

Figure 2-1: Monthly Average Influent Flows

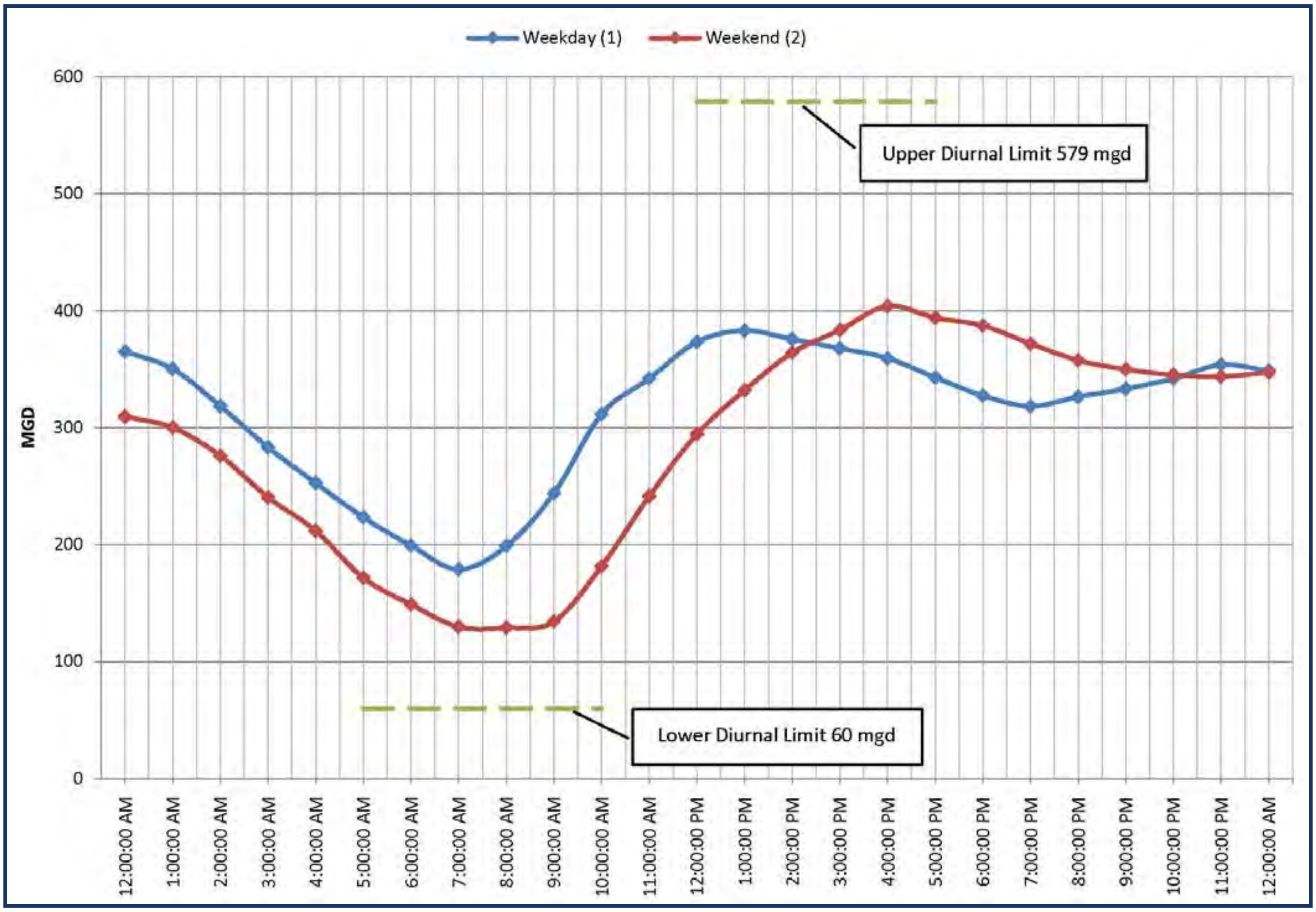


Source: City of Los Angeles, Bureau of Sanitation (BOS), 2009

Diurnal Influent Flows

Daily fluctuations in hourly influent flows (i.e., diurnal curves) are shown in **Figure 2-2** for weekdays and weekends for two weeks in June 2009. Recorded minimum and maximum hourly flows during that period were 130 mgd and 400 mgd, respectively. From July 2007 through June 2009, the minimum readings for nighttime hourly flow included ten measurements below 60 mgd and one excursion down to 15 mgd. However, excursions below 60 mgd are so infrequent that they may be caused by issues or inconsistencies in metering or data recording. This TM assumes that an influent flow of 60 mgd is an approximate lower limit for minimum instantaneous nighttime hourly flow.

Figure 2-2: Diurnal Dry Weather Influent Flows



Source: BOS, 2009
Note: (1) Weekday: Wednesday, June 2, 2009
(2) Weekend: Sunday, June 7, 2009

The nominal design peak wet weather capacity of the plant is 800 mgd. However, measured peak wet weather flows at the plant have occasionally exceeded 850 mgd during severe rainfall events. In the last two years, the maximum measured peak hourly flow rate was 579 mgd[1] which is considered to be the approximate upper limit for maximum hourly flows, precluding severe rainfall events.

Flows to West Basin Municipal Water District

During the period from July 2007 to June 2009, HTP supplied an average of 32 mgd of secondary-treated water to WBMWD. Monthly average supply delivered to WBMWD ranged from 24 mgd to 38 mgd. The secondary effluent flow is treated to Title 22 standards at the WBMWD Edward C. Little Water Reclamation Plant (WBWRP), which has an existing production capacity of 40 mgd for

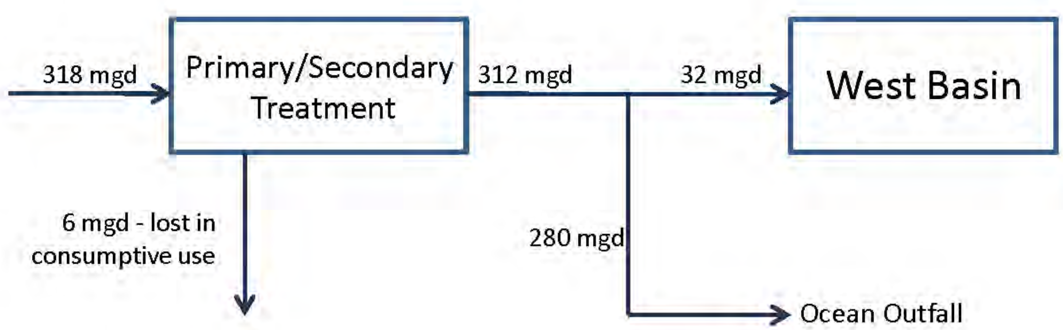
[1] According to data provided by BOS showing daily maximum flows for the two-year period between July 2007 and June 2009.

Title 22 non-potable water, plus additional advanced treatment capacity for five different levels of "designer" water treatment. The recycled water production at WBWRP is at approximately 86% of capacity based on the WBMWD 2009 CIP Master Plan[2]. RO concentrate (brine) from the WBWRP's RO treatment process is discharged into the HTP 5-mile ocean outfall. The brine discharges averaged 2.5 mgd in 2007. Brine discharges to the HTP outfall are currently limited to a maximum of 4.5 mgd by WBMWD's National Pollutant Discharge Elimination System (NPDES) permit (WBMWD, 2009).

Effluent Flows and Current Water Balance

The average daily ocean outfall flow from June 2007 through June 2009 was 280 mgd. The daily volume of flow discharged to the outfall simply consists of the average plant influent flow minus the secondary effluent pumped to WBMWD each day and approximately 6 mgd consumed as in-plant use. **Figure 2-3** shows HTP's existing water balance.

Figure 2-3: HTP Current Water Balance (June 2007 through June 2009)



2.1.2 Anticipated Influent and Effluent Flows

Influent Flows for 2040

Wastewater flow projections through 2040 for the entire HTP Service Area can be found in the Wastewater Flow Projection TM (Task 5.1.1), including flows tributary to the upstream DCT and LAG plants. For the Year 2040, the total projected flow rate for the area tributary to HTP is 413 mgd. This TM assumes that the flows generated in the DCT sewershed (i.e., 80 mgd) will be treated at DCT for reuse or river discharge and that the flows generated in the LAG sewershed (i.e., 32 mgd) will be treated at LAG for reuse or river discharge. (RMC/CDM, 2009b)[3].

Based on the above assumptions regarding DCT and LAG flows, the remaining projected 2040 average daily wastewater flow (ADWF) for HTP is 301 mgd. The TM acknowledges that the value of 301 mgd could increase depending on the amount of brines and other residuals that are

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[2] The WBWRP provides several different levels of treatment, ranging from Title 22 tertiary to AWT with double-pass RO. Some treatment processes produce residuals and some do not. The 86% production capacity is estimated based on this combined level of treatment and on reported recovery rates in WBMWD's 2009 CIP Master Plan.
[3] It is possible that influent flows could be reduced by one or more upstream satellite plants that are being developed under the Task 5 – Satellite Feasibility Concept Report.

discharged to the HTP collection system, but a value of 301 mgd is used in this TM for the year 2040.

Note that HTP will retain a permitted capacity of 450 mgd (i.e., enough capacity to treat all sewer flows in the HTP, DCT, and LAG sewer shed to secondary level) and the ability to discharge the effluent through the ocean outfall.

Influent Flows Are Projected to Remain Constant between 2009 and 2040

The projected flows into HTP under the max reuse scenario are expected to remain relatively constant from 2009 to 2040. Although population is expected to increase during that time period, the per capita flow generation rate is expected to decline as the result of ongoing conservation measures (RMC/CDM, 2009b). This means that the influent flows to HTP have a high likelihood of remaining relatively close to current values. Influent flows may change if the amount of flow treated at DCT and LAG is vastly different than planned, or if a new inland satellite treatment facility goes on line; but for long-range planning purposes, this TM assumes a consistent ADWF of 301 mgd between 2009 and 2040.

Projected Secondary Effluent Flow to West Basin Municipal Water District

WBMWD's 2009 CIP Master Plan for Recycled Water Systems indicates that WBMWD is considering a long-range planning option to take up to 73.4 mgd (82,275 AFY) of secondary effluent from HTP by 2030. The Master Plan mentions other options for supply as well (WBMWD, 2009). Based on recent discussions with WBMWD, LADWP staff gave direction to the Consultant team at a December 8, 2009 meeting to use 70 mgd for HTP planning purposes (RMC Meeting, 2009). Therefore, this TM assumes that 70 mgd is the sustained delivery rate of HTP secondary effluent to WBMWD. This is a simplification for planning purposes and is consistent with the assumption that the project phases could be implemented at any time between 2009 and 2040.

Projected Secondary Effluent Flow at HTP

Taking into consideration the flow diversion to WBMWD and 6 mgd of in-plant consumptive uses for the primary and secondary processes (BOS, 2009), approximately 225 mgd of secondary effluent would be available for additional treatment between 2009 and 2040.

2.2 Area Available for New Recycled Water Facilities

2.2.1 Background

HTP is bounded on the north by Imperial Highway and LAX, to the east by El Segundo (on a hillside), to the south by DWP's Scattergood Generating Station (SGS) and to the west by the Pacific Ocean. With no room to expand in any direction, the City of Los Angeles, Bureau of Sanitation (BOS) and the City of Los Angeles, Bureau of Engineering (BOE) have used the 144-acre site to continue to improve HTP from a small primary treatment plant to its current secondary treatment capacity of 450 mgd. All area is occupied either with current active process facilities, administrative support facilities, maintenance and operational support facilities, or decommissioned (former) process facilities. Therefore, to determine space available for new recycled water facilities, the Consultant team worked with BOS and BOE staff to determine locations of "under-utilized" area at the HTP, which is defined as: (1) space with decommissioned process facilities, (2) currently-utilized space above which AWT facilities could be built, or (3) existing buildings inside of which new facilities could be built. It is important to note the distinction between below-grade available space and above-grade available space. Some areas can feasibly be used for both above and below-grade construction, and some areas are more suitable for only above-grade construction.

2.2.2 On-Site Areas Removed from Consideration

The 4.1.1 Wastewater Treatment TM originally identified under-utilized space at the north end of the HTP site in the abandoned digester batteries and the abandoned Carver-Greenfield Building. However, after that TM was submitted, at a meeting held with LADWP, BOS and BOE on December 8, 2009, the parties determined that these additional areas are not available for construction of treatment facilities for the following reasons (RMC Meeting, 2009):

- *Circular Digester Sites*: BOE indicated the digester batteries are largely unavailable for future recycled water treatment facilities. Battery B is currently being used for liquid sludge storage. Battery C is currently unused, but BOE would prefer to keep this space available for future anaerobic egg digesters. BOE acknowledged that Battery A may have some available space, but a portion of the Battery A site has been designated for future biofilters and potential food waste facilities.
- *Carver-Greenfield Building*: While this building is currently not in service, BOE expressed concerns about using the north end of the plant site for recycled water treatment facilities due to potential problems with construction of new buried large-diameter pipes across the site, given the amount of large diameter piping and other large utilities that already exist.
- *Existing Secondary Clarifiers*: The secondary clarifiers at HTP are currently the unit process with the lowest treatment capacity. BOS and BOE strongly wish to keep all existing secondary clarifiers available.

2.2.3 Available On-Site Areas

Figure 2-4 shows the locations of under-utilized space at the HTP site, as identified by BOS and BOE staff. At the December 8, 2009 meeting attended by numerous representatives of LADWP, BOE, BOS, and the Consultant team, these areas were specifically earmarked by BOS and BOE as potential candidates for siting future recycled water treatment infrastructure. These locations are described in detail below:

- *Emergency Storage Basin* (approximate area: 67,500 ft^2, 1.5 acres): The emergency storage basin is located south east of the Technical Support Facility (the main administrative office building for City staff at HTP) and north of the secondary clarifiers. This 10 MG below-grade basin is currently reserved for emergency storage, but BOS and BOE staff gave direction at the December 8, 2009 meeting that it could be used for equalization storage. This area can also be used for above-ground treatment facilities constructed on top of the existing concrete storage basin.
- *Parking Lot* (approximate area: 82,500 ft^2, 1.9 acres): The parking lot is located east of the emergency storage basin. This area was historically reserved for future secondary clarifier expansion, but BOS and BOE staff confirmed at the December 8, 2009 meeting that future expansion of the clarifiers is no longer planned. Instead, BOE is doing full-scale testing of various treatment enhancement methods to improve solids removal performance in the

existing secondary clarifiers. As the result of this change in approach, BOE and BOS have confirmed that the parking lot is now a potential location for below-grade equalization and for above-grade tertiary treatment facilities devoted to recycled water production. If the parking lot is used for construction, additional parking for HTP employees would have to be incorporated into the design or provided elsewhere.

- *Dissolved-Air Flotation (DAF) Tanks* (approximate area: 22,500 ft^2, 0.5 acres): The abandoned DAF tanks are located east of the parking lot. This area can potentially be used for above-grade treatment facilities. Below–grade facilities are feasible, but they would be particularly expensive to build because of the smaller area available and close proximity to the steep slope along the eastern perimeter of the plant.
- *Oxygen Reactor Module No. 9* (approximate area: 60,000 ft^2, 1.4 acres): Oxygen reactor module No. 9 is located at the north end of the oxygen reactors and south of the existing parking lot. Reactor Module No. 9 is not needed because the plant currently operates with only 50% of its 27 installed oxygen reactors in service. Module No. 9 consists of only three oxygen reactors, and BOS maintains that there will always be an excess in oxygen reactor capacity, even if the RWQCB requires HTP to convert to full nitrification (RMC Meeting, 2009). Oxygen Reactor Module No. 9 can potentially be used for above-grade treatment facilities. For this analysis, it was assumed to be infeasible to construct deep below grade equalization facilities in this area due to its close proximity to the Module No. 8 and the difficulty of such construction.
- *Power and Blower Building* (approximate area: 30,500 ft^2, 0.7 acres): The Power and Blower Building, located east of the Technical Support Facility, is no longer in use. The existing building shell can potentially be used for above-ground facilities. Given the relatively small size of this area and its proximity to other facilities, it was assumed that deep below grade construction (for equalization basins) would be infeasible in this area.

The various on-site available areas are summarized in **Table 2-1**. As shown in the table, approximately 6.0 acres are available, and of that area, approximately 3.4 acres are available for below-grade construction.

Table 2-1: HTP Available Areas for Future Equalization and Treatment Infrastructure

Location	Above-Grade Estimated Area		Below-Grade Estimated Area	
	acres	ft^2	acres	ft^2
Emergency Storage Basin	1.5	67,500	1.5	67,500
Parking Lot	1.9	82,500	1.9	82,500
DAF Tanks	0.5	22,500	0	0
Oxygen Reactor Module No. 9	1.4	60,000	0	0
Power and Blower Building	0.7	30,500	0	0
Total	**6.0**	**263,000**	**3.4**	**150,000**

Source: RMC/CDM, 2009b

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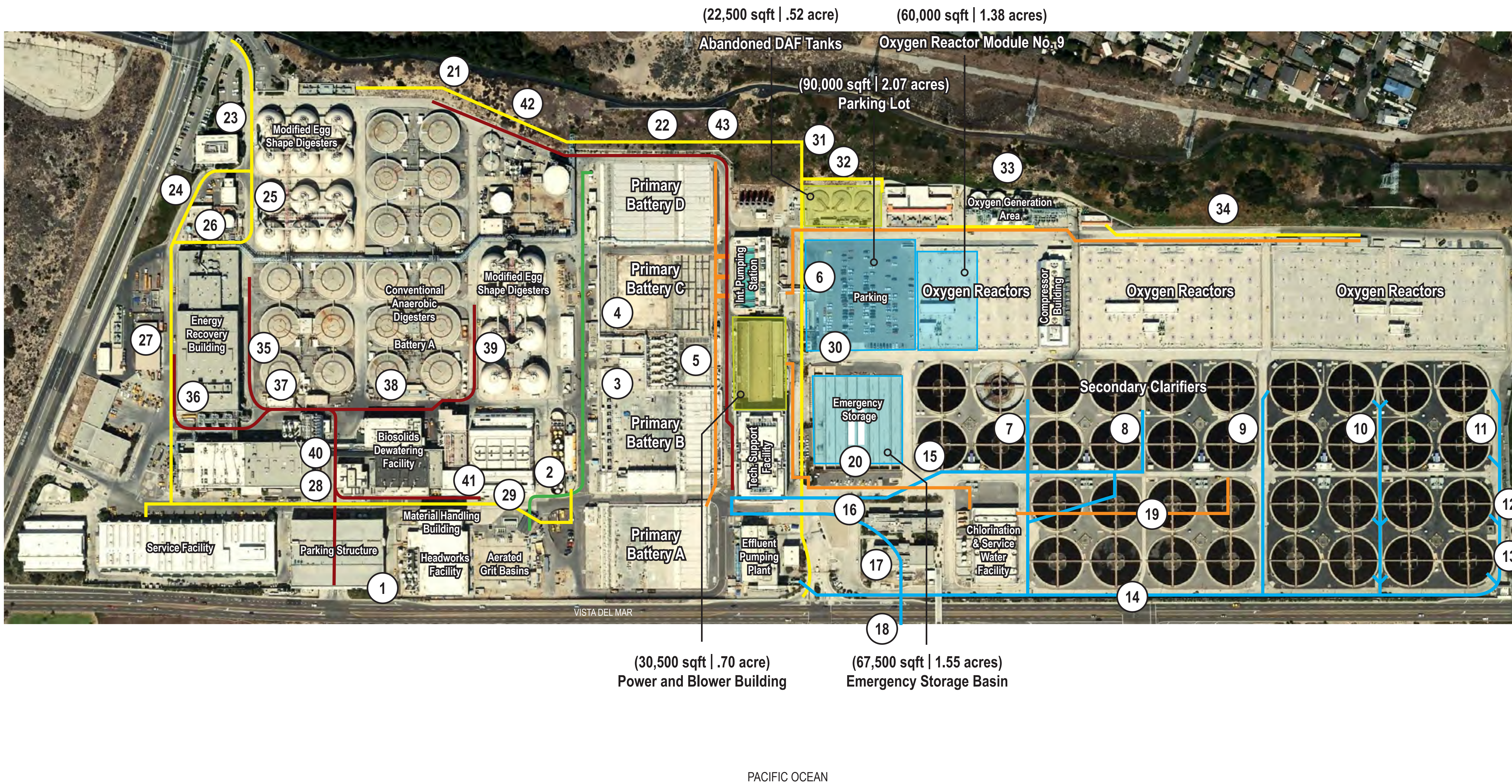
Hyperion Treatment Plant
Utilities Corridor
Figure 2-4



0 125' 250' 500'

N

LEGEND

1. 72" RCP (Influent)
2. Influent Primary Basin Channel (C&D)
3. Influent Primary Basin C&D Basin
4. 12'-0" x 8'-0" Primary Channel (Clarifier D)
5. Primary Effluent Channel
6. Primary Effluent Channel
7. 60" RCP (Secondary Effluent)
8. 60" RCP (Secondary Effluent)
9. 60" RCP (Secondary Effluent)
10. 60" RCP (Secondary Effluent)
11. 48" RCP (Secondary Effluent)
12. 60" RCP (Secondary Effluent)
13. 72" RCP (Secondary Effluent)
14. Tertiary Effluent Channel
15. 10'-0" x 12'-0" RC Channel (Tertiary Effluent)
16. 108" RCP (Tertiary Effluent)
17. Diversion Structure
18. 144" PC 1 mile outfall (Tertiary Effluent)
19. 2'-20" WAS
20. 2'-20" WAS
21. 36" ED
22. 33" x 63" ED
23. 24" x 30" ED
24. 24" x 30" ED
25. 24" x 30" ED
26. 24" x 30" ED
27. 36" x 36" ED
28. 24" ED
29. 24" x 20" ED
30. 4' x D ED
31. 27'W x 27'D ED
32. 36'W x 36'D ED
33. 24" ED
34. 2' x 4' ED
35. 24" SD
36. 24" SD
37. 27" SD
38. 30" SD
39. 27" SD
40. 42" SD
41. 42" RCP SD
42. 24" x 24" Conc. SD
43. 30"W x D Conc. SD

- Influent
- Storm Drain
- Electrical Duct Bank
- Secondary Effluent
- Primary Effluent
- Under-utilized Space/ Potential Future Tertiary (Ground Level)
- Under-utilized Space/ Potential Future Tertiary (Process Stacking)

City of Los Angeles
Recycled Water Master Plan

RMC in association with CDM

Source: Google Earth Pro, 2009, As Built D30824, 1994

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2.3 Potential Demands for Recycled Water from HTP

This section summarizes potential market demands for recycled water in the vicinity of HTP. Potential demands were identified in the Task 4.1.3 Regional Groundwater Assessment TM and the Task 2.2 Tier 2 Target Non-Potable Customers Overview and included groundwater replenishment (GWR) and non-potable reuse (NPR) projects, respectively. Total potential demands in the vicinity of HTP could reach up to 128 mgd as summarized in **Table 2-2**.

Table 2-2: Potential Demands for Recycled Water from HTP

Project	Potential Demand mgd (AFY)
Groundwater Replenishment	121 (136,000)
Non-Potable Reuse	7 (7700)
Total	**128 (144,000)**

These demand estimates could change appreciably as the HTP treatment facilities are developed between 2009 and 2040. It may be necessary to develop additional demands in the vicinity of HTP to fully implement the maximum recycled water production capacity described below in Section 3.

3. Project Description

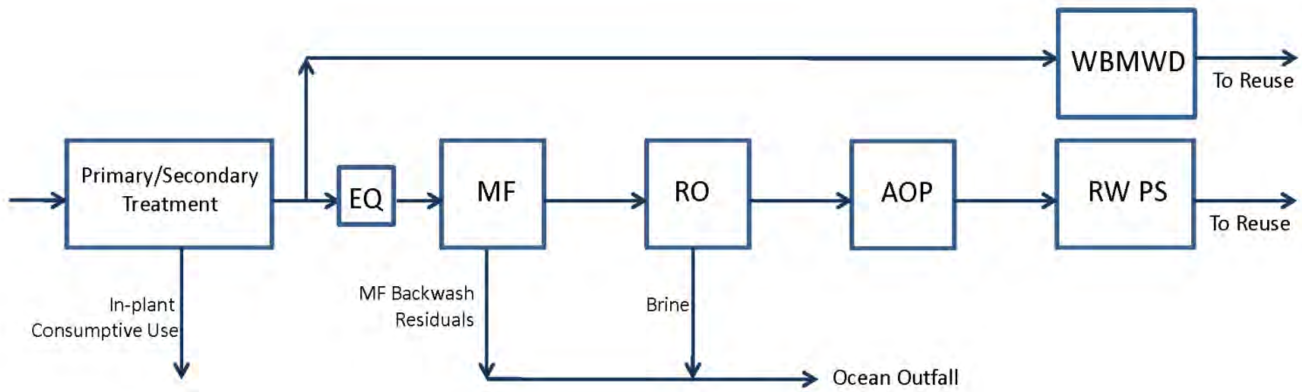
3.1 Level of Treatment

Consistent with a "maximum reuse" scenario, this TM assumes a level of treatment at HTP that would allow ground water direct injection. The nearby WBWRP and Orange County Groundwater Replenishment System (GWR System) facilities serve as the industry standard in Southern California for the production of recycled water suitable for groundwater injection. The process train used at these facilities consists of Microfiltration (MF) to remove turbidity and suspended solids, followed by Reverse Osmosis (RO) to remove dissolved solids, followed by advanced oxidation (AOP) to provide disinfection of bacteria, viruses, and other waterborne pathogens. The MF/RO/AOP process also includes a post-stabilization step intended to raise the pH of the recycled water product water to within acceptable limits. Therefore, in assessing the production potential that could be sited at or near HTP, these processes were assumed. The proposed MF/RO/AOP treatment process flow is shown in **Figure 3-1**.

Even for traditional Title 22 uses, MF/RO treatment would probably be needed at HTP to reduce the TDS content of the secondary effluent. As noted in Task 4.1.1 Treatment Plant Review TM, the influent TDS was 880 mg/l in the first six months of 2009. So, for example, if approximately 45 mgd of RO treatment were installed upstream of HTP at DCT, LAG (or new satellite plant(s)) and the brines were returned to the HTP collection system, the influent TDS would increase to approximately 1,000 mg/l. This TDS level would make tertiary-treated flows difficult to reuse

(Asano and Pettygrove, 1987)[4]. Some level of RO treatment would be needed to reduce TDS to acceptable levels for customers.

Figure 3-1: Advanced Treatment Flow Diagram



3.2 Reason for Phasing

This TM describes implementation of 160 mgd of recycled water production capacity at HTP (225 mgd of AWT feed) in four phases. It includes a production capacity of 128 mgd within the HTP areas on site (Phases 1 through 3) and an additional 32 mgd of production capacity using nearby off-site areas (Phase 4). Approximately 24 million gallons of equalization will be needed to achieve the 128 mgd on-site production capacity. A phased approach is used because it is doubtful that the full on-site production potential of 128 mgd would be undertaken as one construction contract.

In order to efficiently use areas on the HTP site for equalization and production capacity, this TM proposes that the first 50 mgd of production be located above the existing Emergency Storage Basin for Phase 1, followed by expansion into the adjacent parking lot for Phase 2, followed by expansion into the area of Oxygen Reactor No. 9 for Phase 3. Lastly, expansion onto nearby offsite areas for Phase 4 would occur if more recycling capacity were needed. An alternative construction sequence would be to construct Phase 4 as the first step in recycled water implementation at HTP (in the event that a decision was made not to use on-site areas at HTP).

3.3 Need for Flow Equalization

Equalization (EQ) of secondary effluent would provide a constant MF feed flow rate and maximize production of recycled water by capturing daytime diurnal flows that exceed the MF feed capacity.

EQ allows the MF/RO/AOP facility to continue producing recycled water at full capacity during the nighttime hours, when the drop in diurnal flow, combined with the outflow of secondary effluent to WBMWD, decreases the instantaneous supply of secondary effluent available. EQ also

[4] The article states that TDS in the range of 450 to 2000 mg/l there are slight to moderate impacts on the use of recycled water on plants. At greater than 2000 impacts are severe. 1000 is often used as the mid-point of the slight to moderate range.

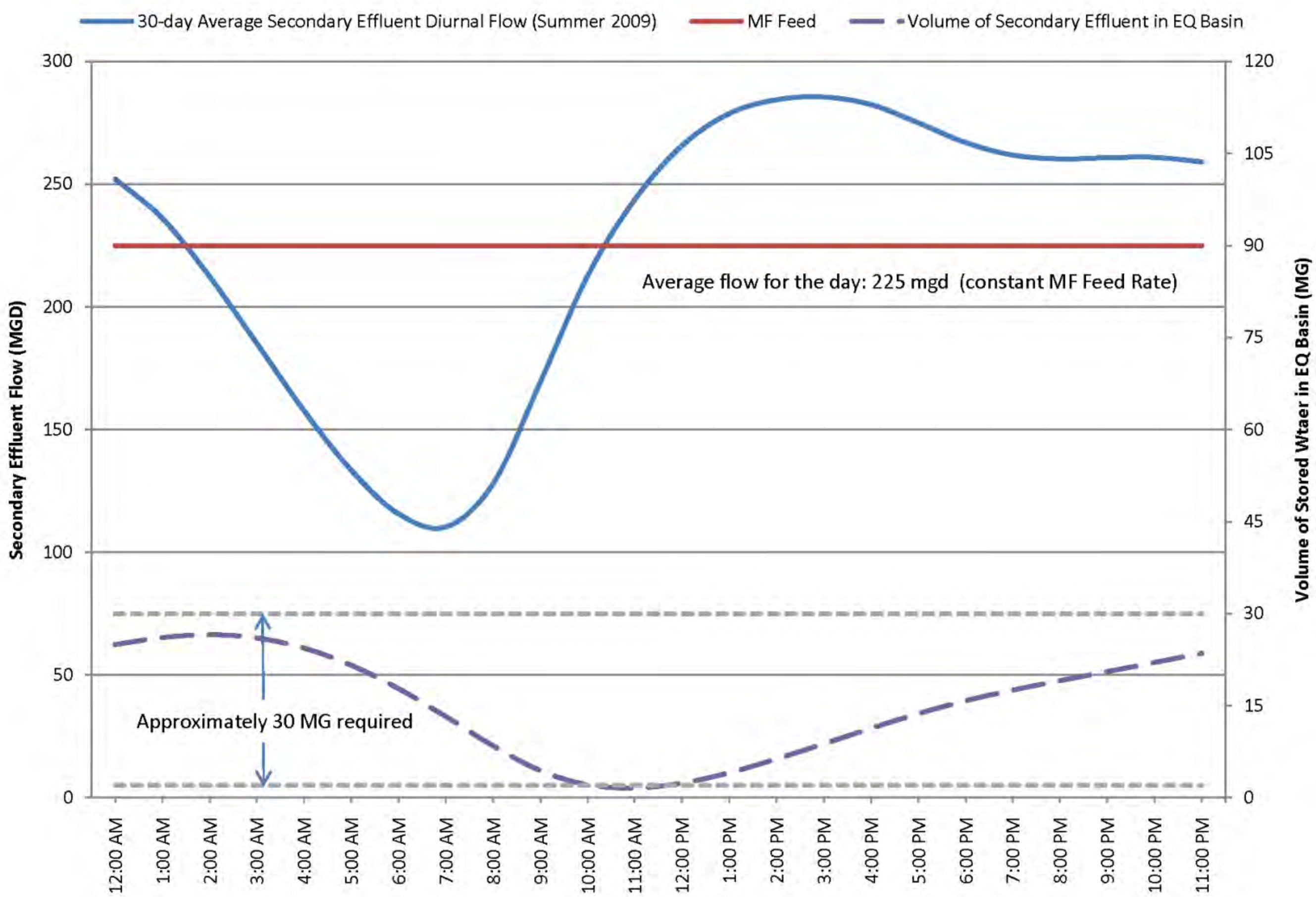
improves the process performance of the membranes by avoiding steep flow turndowns through the MF/RO/AOP facility and preventing the need to take individual membrane trains out of service on a frequent basis.

While it is possible to build MF/RO facilities at HTP without EQ, it is not advisable because of concerns about membrane performance while taking membrane process trains in and out of service because of changing flow rates. A secondary benefit of the EQ is to increase the percentage capture of secondary effluent for reuse. The Orange County GWR System (GWR System) MF/RO/AOP facilities currently operate without secondary effluent EQ, but the owner of that facility intends to provide this functionality during the design of Phase II. The lack of EQ at the existing facility presents operational challenges because of the need for frequent flow turndown through the membranes (Trussell, 2010).

Figure 3-2 shows a 30-day average diurnal secondary effluent flow pattern during June 2009 after 70 mgd is diverted to WBMWD, the design capacity MF feed flow rate, and the EQ storage volume required to capture all of the remaining available secondary effluent. Approximately 30 MG is required at HTP to capture all of the secondary effluent flow for reuse, assuming that (1) the average secondary effluent production of HTP is 295 mgd after in-plant consumptive uses are accounted for, (2) 70 mgd is continuously diverted to WBMWD, and (3) 225 mgd of secondary effluent is equalized to feed MF/RO/AOP facilities.

Even if the installed recycled water production at HTP is lower than full build-out, EQ is still desirable because the nighttime supply of available secondary effluent will occasionally approach zero when WBMWD takes 70 mgd, as indicated by the lower diurnal flow limit of 60 mgd in Figure 2-2 above. The required EQ capacities shown for Phases 1 through 4 reflect the need to provide WBMWD its full allocation of 70 mgd at a constant rate. If WBMWD installs supplemental secondary effluent EQ or if the hourly flow rate to WBMWD could be varied throughout the day, the volume of EQ required at HTP could be reduced.

Figure 3-2: HTP Equalization Storage Calculation



3.4 Description of Project Phases

The project developed in this TM is implemented in four phases. For long-range planning purposes, this TM assumes that each phase will be planned, designed, and constructed separately and in a sequential, cumulative manner. The actual timing and degree to which project phases are implemented will be recommended after the integrated analysis in Task 4b.

The four phases cumulatively develop the HTP site to provide advanced treatment of 100% of the available secondary effluent. Calculations were performed to estimate the floor space requirements for each process component; recycled water production for each available area was maximized based on these calculations.

Because the exact timing of WBMWD's recycled water expansion plans are unknown at this time, the phases assume that WBMWD receives a fixed, allocated volume of secondary effluent from HTP in the amount of 70 mgd. This fixed allocation is assumed for all four phases. The phases also assume that advanced treatment is constructed at HTP as described in Section 3.1 and that advanced treatment continues to be operated at the WBWRP.

This TM assumes an overall recovery/production rate of 71% for MF/RO facilities as described below. It also assumes that the volume of RO brine from the WBWRP discharged to the HTP 5-mile ocean outfall is limited to 4.5 mgd as dictated by their NPDES permit[5]. The phases are based on using available below-grade space for EQ and available above-grade space for treatment facilities. The phases also assume that multi-story construction is feasible, and they assume that maximum reasonable excavation below grade for EQ, without resorting to extreme and costly construction measures, is approximately 40 feet below the ground surface, allowing for concrete slab thickness and over-excavation.

Recovery/Production Rate

The phasing and site planning assumes an overall recycled water recovery of 71% (89% for MF and 80% for RO). This means that of the secondary effluent that is pumped to the MF/RO/AOP system, 71 percent can be reliably recovered as product water. While observed recoveries may prove to be higher, it should be noted that the GWR System Treatment Plant, which is the largest MF/RO/AOP recycled water treatment facility currently operating in California, was designed for an overall worst-case recovery of 71%. The HTP recycled water production capacity of 160 mgd is based on a 71% worst-case recovery. This is similar to the GWR System Buildout Project which also used a worst-case recovery of 71% to establish the 70 mgd recycled water production capacity of the GWR System treatment facilities.

Actual observed recoveries will depend on the generation of membrane technology used, the progression of membrane technology up to the point when HTP facilities are designed, and the water quality of the HTP secondary effluent. The GWR System treatment facilities were constructed between 2005 and 2007, and the facilities went into operation in January 2008. While the GWR System facilities are still relatively new, there have been improvements to MF and RO technology since the GWR System was designed. Task 1 of the RWMP assumes that DCT recoveries for the planned AWTP will be about 79% (93% for MF and 85% for RO), but the DCT AWTP would be treating conventional tertiary effluent, which has a higher quality than the secondary effluent used for source water at HTP (CDM, 2010). The Total Suspended Solids (TSS) of the MF feedwater at HTP will be appreciably higher than for DCT, and the influent Total Dissolved Solids (TDS) of the RO feedwater at HTP will also be higher than for DCT. The lower water quality at HTP will result in a lower overall recovery.

Phase 1

Phase 1 assumes that the most expedient, least costly, and least disruptive first step would be to use the existing emergency storage basin to provide EQ, and to construct AWT facilities in a multi-story building over the emergency storage basin. This phase is limited in production by the available above-grade area over the basin and the height limitation (maximum of four stories) for a structure containing AWT facilities. The height limitation was established during the meeting with BOS and BOE on December 8, 2009 as being less than or equal to the height of the adjacent Technical Support Facility. This building is approximately 80 feet in height (RMC Meeting, 2009).

The Phase 1 facilities would be designed for an AWT feed capacity of 70 mgd (50 mgd recycled water production).

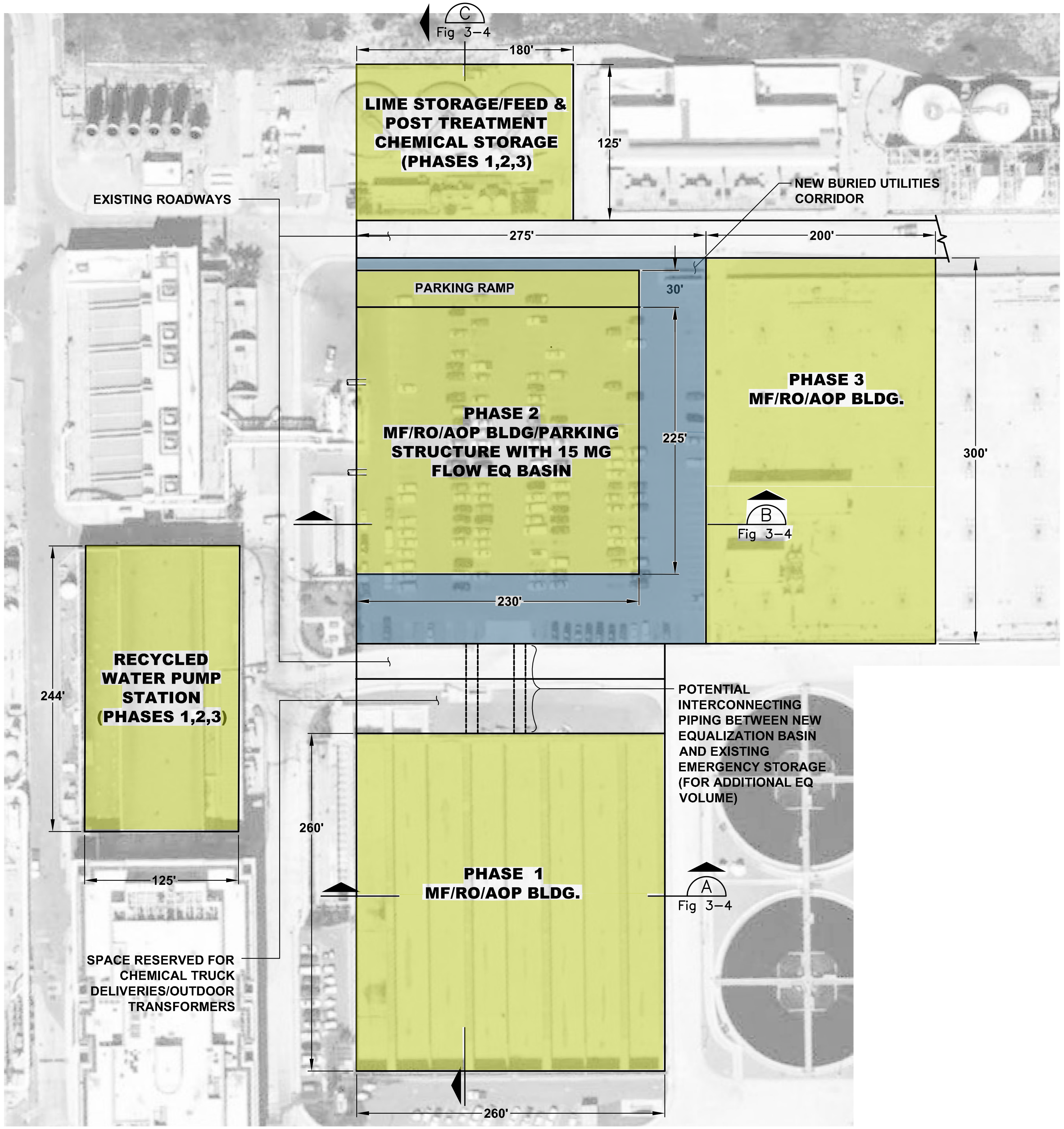
[5] It may be possible to adjust this brine discharge limit for WBMWD if approval can be obtained from the Los Angeles Regional Water Quality Control Board.

Figure 3-3 and **Figure 3-4** show the site layout and building profiles, floor space square footages and conceptual design details for Phases 1 though 3. Available space would be utilized for Phase 1 as follows:

- *Existing Emergency Storage Basin*: This basin already contains 10 MG of storage capacity and has 1.55 acres of above-ground available space for AWT facilities. A four-story MF/RO Building would be constructed atop the existing storage basin. The Phase 1 facilities inside the building would be designed for a feed capacity of 70 mgd (50 mgd recycled water production). The building would contain the following:
    - 9 MG of equalization storage. Only 7 MG is required to operate the Phase 1 treatment facilities, but Phase 1 assumes that 9 MG out of the existing storage volume of 10 MG would be converted to EQ. This allows Phase 1 to make maximum use of the below-grade area (for future EQ needs) without requiring future excavation below the Phase 1 treatment facilities. The remaining 1 MG of existing volume would be converted during to a below-grade MF Screenings Structure and MF Break Tank.
    - Bulk chemical storage on the first floor
    - MF and RO membranes
    - Electrical rooms
    - Offices/storage/control room/laboratory
    - AOP, decarbonation, and post-treatment chemical addition facilities
    - MF Break Tank/RO Feed Pump Station: The southernmost bay of the existing emergency storage basin would be converted to an MF Break Tank with the RO Feed Pumps installed above the Break Tank at existing grade. An adjacent MF Feed Pump Station would be constructed above the same bay. The existing storage basin contains 8 bays with an approximate width of 30 feet per bay.
    - A multi-purpose Conference Center on the fourth floor with a west-facing view of the Pacific Ocean. This area could potentially provide a public outreach/educational function.
- *Existing Abandoned DAF Tanks*: These tanks would be demolished, and the lime silos, saturators, and stabilization chemical feed equipment would be installed here. The use of alternate stabilization chemicals other than lime (e.g., calcium chloride) may be implemented instead. This area will be reserved for stabilization chemical facilities for all four phases of development, but in Phase 1 only enough equipment for 70 mgd of feed (50 mgd recycled water production) would be installed.
- *Existing Power and Blower Building*: This building would be converted to house the Recycled Water Product Water Pump Station. This area will be reserved for pumping facilities for all four phases of development, but in Phase 1 only enough equipment for 50 mgd of recycled water pumping capacity would be installed.

Under this scenario, 155 mgd of secondary effluent, 4.5 mgd of brine from WBMWD, and 20 mgd of HTP brine would be discharged through the ocean outfall for a total of 179.5 mgd.

PRELIMINARY



PLAN
APPROX. SCALE: 1" = 100'-0"

0 50' 100'
APPROX. SCALE: 1" = 100'-0"

HTP Phasing MF/RO/AOP Facilities

Phase	Existing Use	Proposed Use	Design MF Feed (MGD)	Design RW Production (MGD)	Level	Space Allocation
1	10 MG Emergency Storage Basin (1.5 acres)	4-Story Phase 1 MF/RO/AOP Building; above existing emergency storage First Level has high bay -suspended slab floor at existing grade	70	50	1	20,000 SF Chemical Storage 32,000 SF MF Membrane Units 7,500 SF Electrical Room 5,000 SF RO Feed PS (Break Tank Below) 3,000 SF MF Feed PS (Screening Structure Below)
					2	38,000 SF MF Membrane Units 22,000 SF Offices/Storage 7,500 SF Electrical Room
					3	60,000 SF RO Membranes 7,500 SF Electrical Room
					4	31,000 SF Conference Center 16,500 SF Lab/Offices/Control Room 10,000 SF Decarbonators 6,000 SF Ultraviolet Equipment 2,000 SF Chemical Metering Pumps/Day Tanks 2,000 SF Electrical Room
2	Parking Lot (1.9 acres)	11 MG below grade flow EQ Basin with Phase 2 MF/RO/AOP Building and Parking Structure Above	100	71	1	30,000 SF MF Membrane Units 8,600 SF Chemical Storage 5,600 SF Office/Storage 4,900 SF Electrical Equipment 1,500 SF Combined MF Feed/RO Feed PS 1,400 SF MF/RO Break Tank
					2	25,200 SF RO Membranes 13,400 SF Offices/Storage 4,900 SF Electrical Equipment 4,000 SF Decarbonators 2,500 SF Ultraviolet Equipment 2,000 SF Metering Pumps/Day Tank Storage
					3	52,000 SF Parking
					4	52,000 SF Parking
3	Oxygen Reactor Module No. 9 (1.4 acres)	4-Story Phase 3 MF/RO Building	180	128	1	27,000 SF MF Membranes 23,000 SF Chemical Storage 10,000 SF Electrical Equipment
					2	53,000 SF MF Membranes 7,000 SF Electrical Equipment
					3	53,000 SF RO Membranes 7,000 SF Electrical Equipment
					4	14,000 SF RO Membranes 9,300 SF Decarbonators 5,000 SF Ultraviolet Equipment 1,000 SF Electrical Equipment

RMC CDM in association with

REV | DATE | BY | APVD | DESCRIPTION

DESIGNED
DRAWN
CHECKED

SUBMITTED: RMC PROJ ENGR C____
APPROVED: RMC ENGR C____

XXXXXXXXXX
HYPERION TREATMENT PLANT
MF/RO/AOP SITE LAYOUT
FIGURE 3-3

DWG NO
SHEET NO 1 OF 1
PROJ NO 0000-000
DATE FEBRUARY 2010

C:\RMC\(0214) LADWP\214-002 TASK 4-SUBTASK 2\HYPERION\HTP - ZOOMED -EXIST-PROP-FLOOR-SPACE.DWG
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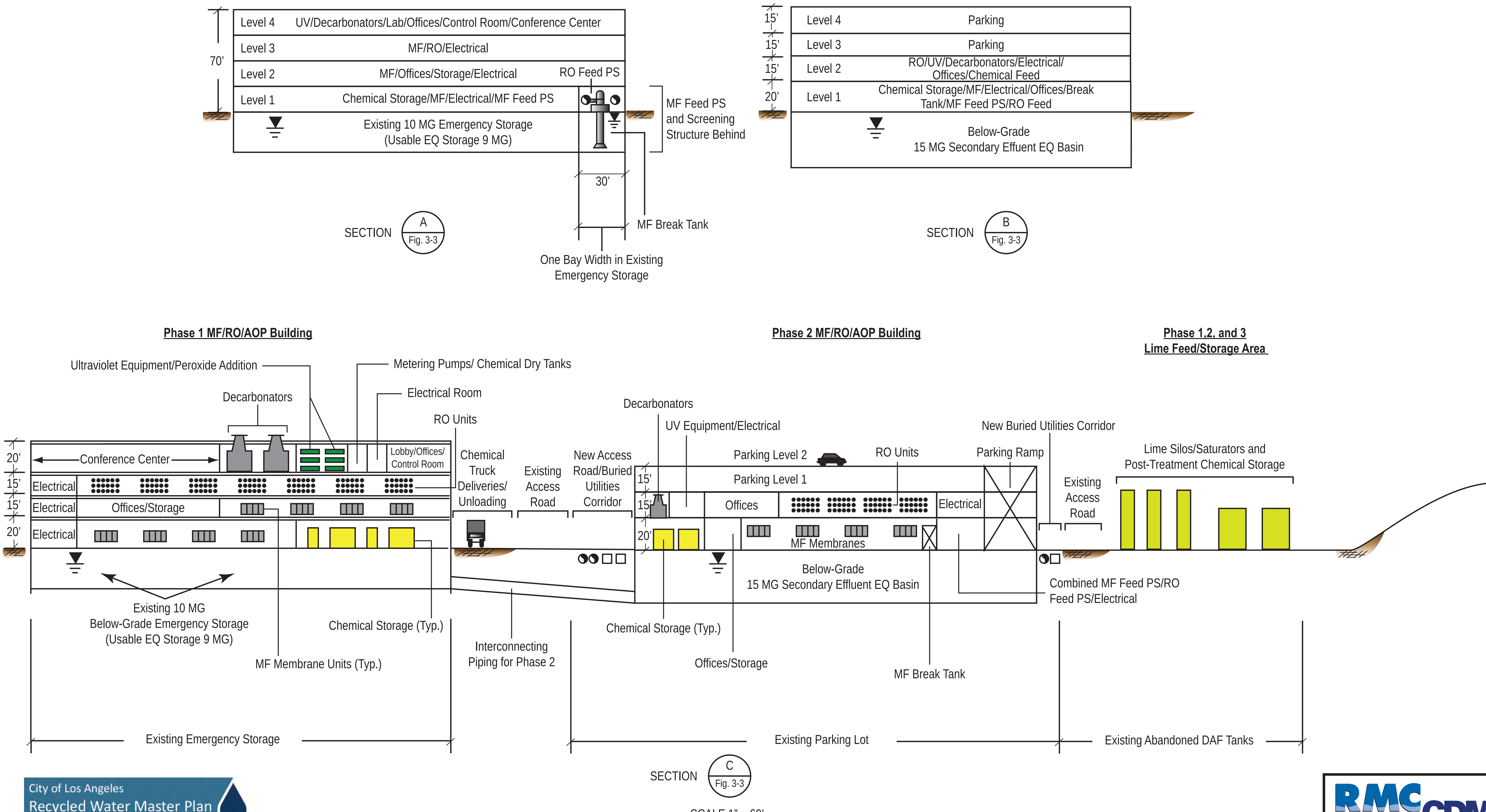
LAST PRINTED: 2/4/2010 11:56 AM

Hyperion Treatment Plant
MF/RO/AOP Site Profile
Figure 3-4



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Phase 2

Phase 2 uses the existing parking lot for development of below grade EQ and above-grade AWT because of its proximity to the facilities in Phase 1, ease of construction, and relatively low level of disruption to HTP activities.

The Phase 1 and Phase 2 facilities combined would be designed for an AWT feed capacity of 100 mgd (71 mgd recycled water production).

Figure 3-3 and Figure 3-4 show the site layout and building profiles for Phases 1 though 3. Available space would be utilized for Phase 2 as follows:

- *Existing Parking Lot* (East of existing Emergency Storage Basin): This area has 2.07 acres that could be used for below-grade and above-grade facilities. A portion of the 2.07 acres would be reserved for new underground utility corridors. The remaining area would be used to construct an MF/RO/AOP Building, two parking levels with an access ramp, and approximately 15 MG of secondary effluent EQ extending to a depth of 40 feet below existing grade. The 15 MG of new EQ volume would be connected to the existing 10 MG EQ Basin (from Phase 1) with underground piping for a total usable EQ volume of 24 MG (9 MG usable volume converted in Phase 1 and 15 MG usable volume constructed in Phase 2).
- *Existing Abandoned DAF Tanks*: These tanks would be demolished in Phase 1, and the lime silos, saturators, and stabilization chemical feed equipment would be installed. The use of alternate stabilization chemicals other than lime (e.g., calcium chloride) may be implemented instead. This area will be reserved for stabilization facilities for all four phases of development, but in Phase 2 only enough equipment for an additional 30 mgd of feed capacity (21 mgd of recycled water production) would be installed.
- *Existing Power and Blower Building*: This area will be reserved for pumping facilities for all four phases of development, but in Phase 2 only enough equipment for an additional 30 mgd of feed capacity (21 mgd of recycled water production) would be installed.

Floor space square footages and conceptual design details are shown on Figure 3-3.

Assuming full build-out of the below-grade area below the existing parking lot, approximately 15 MG of additional EQ can be constructed, while maintaining ample space for new utility corridors and re-routing of existing utilities around the perimeter of the new EQ basin. Phase 2 would not require the combined total of 24 MG of EQ to operate the treatment facilities; but just as in Phase 1, it would allow Phase 2 to make maximum use of the below-grade area without requiring future excavation below the Phase 2 facilities. Under this scenario, 125 mgd of secondary effluent, 4.5 mgd of brine from WBMWD, and 29 mgd of HTP brine would be discharged through the ocean outfall for a total of 158.5 mgd.

Phase 3

Phase 3 uses the area currently occupied by Oxygen Reactor No. 9 for the final phase of on-site recycled water production.

The combined Phase 1 through Phase 3 facilities would be designed for an AWT feed capacity of 180 mgd (128 mgd recycled water production), which is the upper limit for MF/RO/AOP production capacity on-site at HTP.

Figure 3-3 and Figure 3-4 show the site layout for Phases 1 though 3 and select building profiles. Available space would be utilized for Phase 3 as follows:

- *Existing Oxygen Reactor No. 9*: This area has 1.38 acres that could be used for above-grade AWT facilities. A four-story building would be constructed in the area currently occupied by Oxygen Reactor Module No. 9 to contain the MF membranes, RO membranes, AOP, and decarbonation facilities necessary for the Phase 3 expansion.
- *EQ*: The 24 MG of on-site EQ from Phase 2 would be sufficient to equalize the Phase 3 feed capacity. No additional EQ would be required.
- *Existing Abandoned DAF Tanks*: In Phase 3 the stabilization equipment for an additional 80 mgd of feed capacity (57 mgd of recycled water production) would be installed.
- *Existing Power and Blower Building*: In Phase 3 the pumping capacity for an additional 57 mgd of recycled water production would be installed.

Floor space square footages and preliminary design details are shown on Figure 3-3.

Under this scenario, 45 mgd of secondary effluent, 4.5 mgd of brine from WBMWD, and 52 mgd of HTP brine would be discharged through the ocean outfall for a total of 101.5 mgd.

Phase 4

Phase 4 assumes that the next feasible step to develop the HTP site is to build AWT facilities and EQ capacity to treat all available secondary effluent (225 mgd). It requires that additional AWT and EQ be constructed at off-site locations. The combined Phase 1 through Phase 4 facilities would be designed for an AWT feed capacity of 225 mgd (160 mgd recycled water production). Alternatively, the off-site facilities could be installed before completion of the other phases. Construction of the off-site and on-site facilities could also proceed in parallel.

Off-Site space would be required for Phase 4 as follows:

- *Off-Site AWT Facilities*: Approximately 45 mgd of secondary effluent will require off-site AWT facilities. An area of approximately 3-10 acres is required for these facilities, depending on whether multi-story construction is used. This preliminary estimate assumes ten acres would be required for single-level construction and three acres would be required for multi-story construction.
- *Off-Site EQ*: Approximately 6 MG of additional secondary effluent EQ would be required to provide AWT capacity for all available secondary effluent at HTP. This additional 6 MG of storage could be installed underneath the parking lot at Dockweiler State Beach6 if feasible or at another off-site location as discussed below in Section 3.4.1.

Under this scenario, 4.5 mgd of brine from WBMWD and 65 mgd of HTP brine would be discharged through the ocean outfall for a total of 69.5 mgd. There would be no discharge of secondary effluent to the outfall.

[6] Dockweiler State Beach is a California State Park. It is leased to the City of Los Angeles and operated by the County of Los Angeles

3.4.1 Off-Site Available Areas

Figure 3-5 shows potential areas where additional advanced treatment facilities could be located to treat the remaining 45 mgd of secondary effluent from HTP. The figure also includes "sample" 3 and 10-acre squares as a visual representation of the required area size.

Based on Figure 3-5, the following areas are potentially available in the vicinity of Los Angeles International Airport (LAX):

1. *North of HTP, west of LAX and east of the Pacific Ocean*: this area is the undeveloped land between the west end of the LAX runways and the beach.
2. *North of the LAX north runway*: commercial zoning
3. *Adjacent to the western end of the LAX south runway*: Fire Drill and shooting range
4. *Outside the southeast corner of LAX property in the City of El Segundo*: unknown use

According to the Assistant Chief Engineer of Airports, the LAX parcels are owned by Los Angeles World Airports (LAWA) and have limitations on sale or lease of the land due to restrictions imposed by the Federal Aviation Administration (FAA) (LAWA, 2010a). He also said that there is not much LAX land available for non-aviation uses, but he recommended investigating the northern areas (possible commercial development) and the area in the southwest corner of the LAX property, near the existing Fire Drill practice area and shooting range. This area is currently used for construction staging but could potentially be available in the future for treatment facilities.

A subsequent conversation with the Airport Environmental Manager revealed that the area between LAX and the Pacific Ocean (area no. 1 above), specifically north of Imperial Highway, West of Pershing Drive, and south of Westchester Parkway, contains protected habitat for the El Segundo Blue Butterfly. The Blue Butterfly is a Federally-protected endangered species (LAWA, 2010b). Certain parts of this coastal area are also used for airport security purposes by LAX. Use of this land would require approval from the California Coastal Commission, the Federal Aviation Administration, the U.S. Fish and Wildlife Service, California Fish and Game, and the surrounding community (who opposed and defeated a prior attempt to develop a golf course in the area). Furthermore, though LAX is owned by the City of Los Angeles, FAA rules prohibit any contract conditions or sales agreements for LAWA land that include below-market leasing rates or sale prices.

3.4.2 Summary of Phasing

A schematic diagram of the 2009-2040 HTP water balance is presented in **Figure 3-6**, assuming the completion of Phases 1 through 4. These phases are also summarized in **Table 3-1** and **Figure 3-7**, which explain the incremental construction of EQ and AWT capacity, the amount of recycled water produced, the secondary effluent discharged to the ocean outfall, and the brine flows to the ocean outfall.

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Potential Sites for Advanced Water Treatment Facility and Conveyance Route for Secondary Flow from HTP to potential AWTF Site

Figure 3-5

Potential Off-Site AWTF and/or EQ

Potential Off-Site EQ Adjacent to HTP

Potential Pipeline Alignment

Other Features

HTP Boundary

LAX Boundary

Protected Habitat

Other City

3 Acres

10 Acres

(Required for 45 MGD Advanced Treatment Facility)

0 750 1,500 3,000

Feet

RMC in association with CDM

Data Sources: RMC, USGS, LADWP

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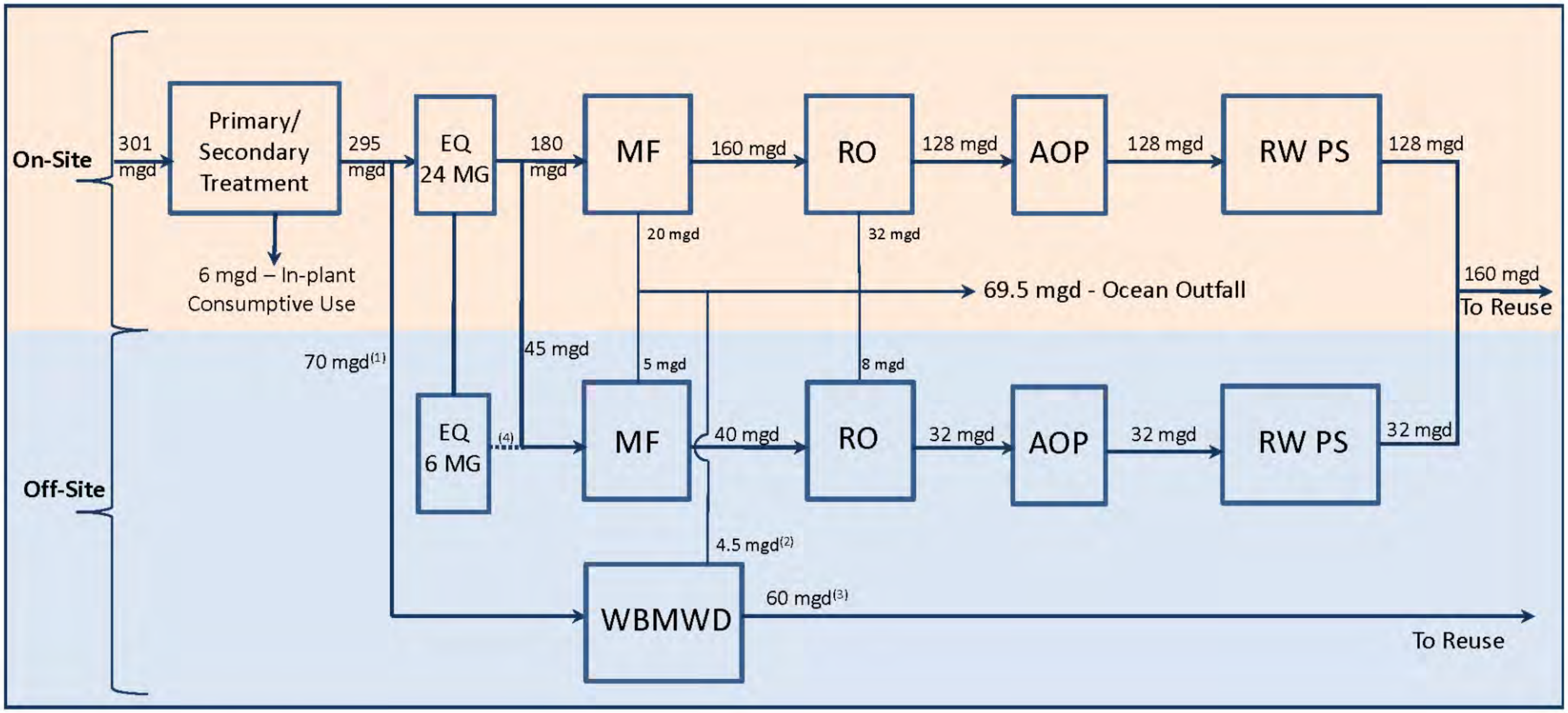
Figure 3-6: HTP Projected (2009-2040) Water Balance with On-Site and Off-Site Construction



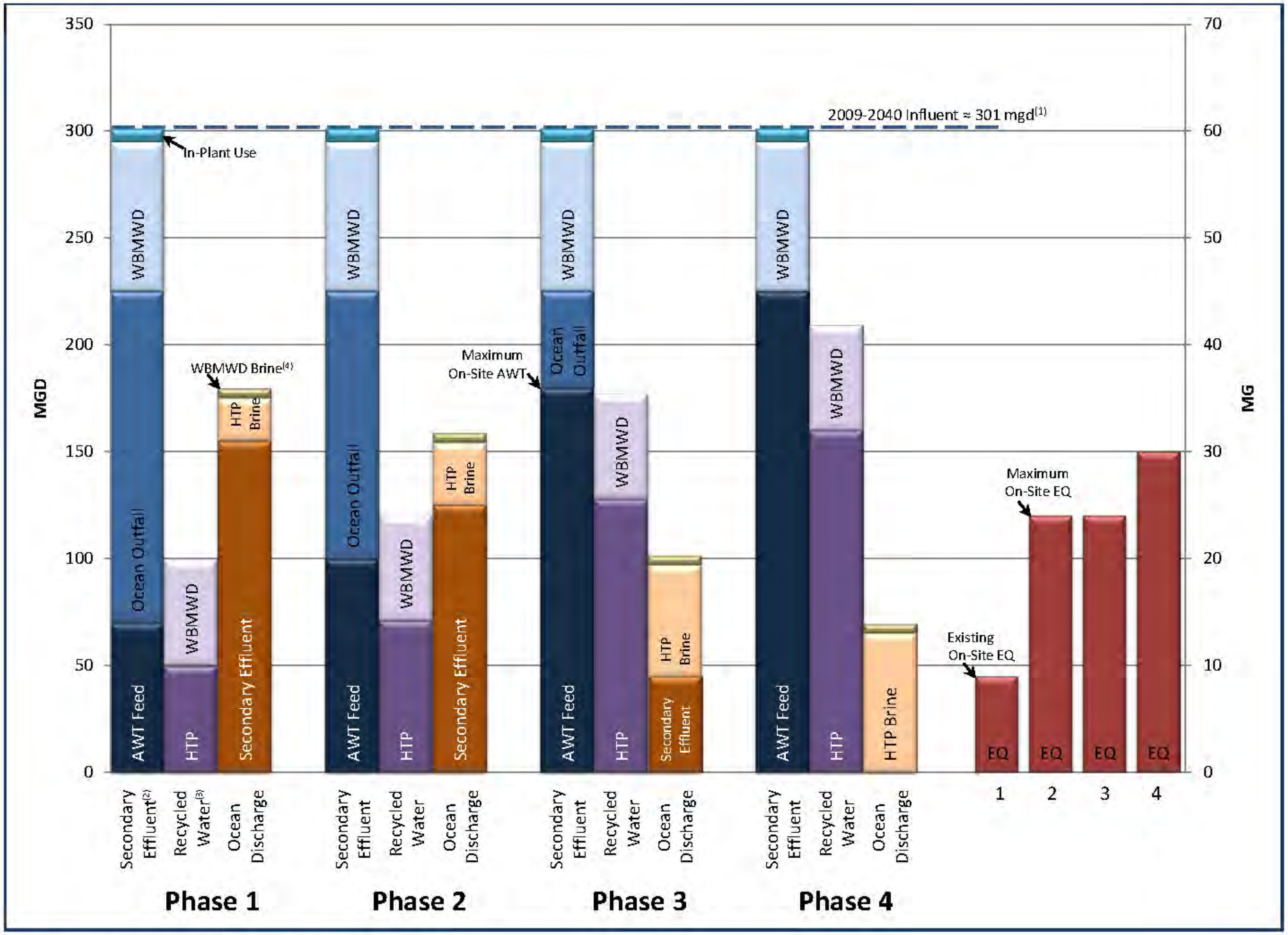
(1) Based on WBMWD CIP for FY 25-30
(2) The WBMWD NPDES permit limits brine discharges to the HTP outfall to 4.5 mgd
(3) 86% Recycled Water Production is assumed
(4) Interconnection for EQ undetermined

Table 3-1: Summary of Phasing for HTP Project

	Phase 1	Phase 2	Phase 3	Phase 4
Description	**AWT w/Existing EQ**	**Maximized On-Site EQ**	**Maximized On-Site AWT**	**100% Reuse**
HTP Influent Q, mgd(1)	301	301	301	301
Secondary Effluent Flow to WBWRF, mgd(2)	70	70	70	70
In-Plant Consumptive Use, mgd(3)	6	6	6	6
Remaining Secondary Effluent, mgd(4)	225	225	225	225
On-Site AWT/Off-Site AWT Feed Capacity, mgd(5)	70/0	100/0	180/0	180/45
On-Site EQ/Off-Site EQ, mgd(6)	9/0	24/0	24/0	24/6
Secondary Effluent to Ocean Outfall, mgd(7)	155	125	45	0
HTP Brine to Ocean Outfall, mgd(8)	20	29	52	65
WBMWD Brine to Ocean Outfall, mgd(9)	4.5	4.5	4.5	4.5
Total RW Production, mgd(10)	50	71	128	160

(1) Influent flows are projected to remain fairly constant between 2009 and 2040 (see Section 2.1.2)
(2) Secondary effluent flows to WBMWD are assumed to remain constant at 70 mgd (see Section 2.1.2)
(3) Based on BOS August 2009 HTP Monthly Performance Report
(4) This is secondary effluent from HTP available for AWT treatment
(5) Design considerations dictate that equalization volumes provided for Phases 1 and 2 exceed the actual volumes required for operation
(6) See Section 3.3
(7) HTP Secondary Effluent equals feed flow minus recycled water production.
(8) HTP brine flows are based on 71% recycled water production (see Section 3.4)
(9) WBMWD brine flows are based on WBMWD NPDES permit (see Section 3.4)
(10) Recycled Water Production totals are cumulative across phases.

Figure 3-7: Conceptual Phasing of AWT and EQ at HTP



(1) HTP Influent is assumed constant between 2009-2040
(2) Assumed secondary flow to WBMWD is 70 mgd
(3) Assumed RW Production Rates: HTP = 70%, WBMWD = 86%
(4) The WBMWD NPDES Permit currently limits brine discharges to the HTP outfall to 4.5 mgd

3.5 HTP Special Issues

This section provides a conceptual-level discussion of the following potential issues that may arise as HTP produces increasing volumes of recycled water:

- NPDES discharge limitations due to increased brine discharge
- Potential use of secondary effluent for cooling water
- Power requirements
- Impacts to ocean outfall

3.5.1 NPDES Discharge Limitations

As treated effluent from HTP is diverted from the ocean outfall to reuse projects, more of the discharge to the outfall will be composed of MF backwash and RO brine. This will cause the concentrations of a number of constituents in the ocean outfall to increase and may trigger the need for revisions to the NPDES permit. Many of the constituents in the existing NPDES permit have both mass loading and concentration limits, but some have concentration limits only (HTP NPDES, 1995).

Assuming an average rejection rate of 97% for permit constituents (RMC, 2009a)[7], and assuming that the MF backwash and RO concentrate go to the ocean outfall, maximum flows may be calculated beyond which NPDES permit limits would be violated. **Table 3-2** lists a series of constituents that are significantly concentrated in backwash and concentrate. It also includes the permit limits for these constituents, the current average concentrations, and the maximum amount of recycled water that may be diverted from the ocean outfall to reuse projects before the limits under the current permit are violated.

A plant influent flow of 301 mgd and the average influent concentrations from HTP's 2008 Annual Monitoring Report were used to determine the maximum recycled water production before the constituent discharge level exceeds the NPDES limit. In NPDES Order No. R4-2005-0020, most constituents did not show reasonable potential to exceed the Ocean Plan objective; therefore, no numerical water quality based effluent limits are prescribed. These constituents were assigned a performance goal only for operational purposes. Currently, HTP is exceeding their ammonia performance limit.

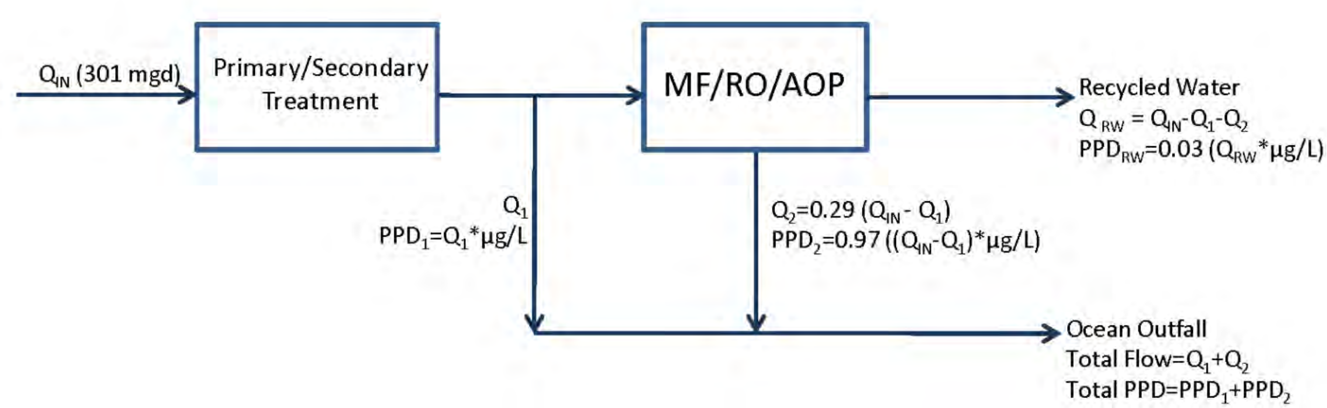
Mass emission caps were applied to four pollutants (copper, lead, silver and zinc) in 1995. These four constituents and TSS were analyzed and compared to NPDES limits as recycled water production flow increases (see schematic diagram in **Figure 3-8**). The results are presented in the table below. As recycled water production increases to approximately 105 mgd, TSS will reach the NPDES permit limit in the ocean outfall. As production increases to approximately 146 mgd, copper will reach the NPDES permit limit.

[7] Rejection rates for specific metals and TSS.

Table 3-2: Maximum Allowable Recycled Water Production Based on NPDES Discharge Constituents

Constituent	Unit	NPDES Permit Limit	2008 Monthly Average	Maximum RW Production (mgd) before permit limit is violated
TSS	mg/L	30	19	105
	lbs/day	113,000	45,030	
Copper	µg/L	39	17	146
	lbs/yr	41,100	22,167	
Lead	µg/L	3	0	>220
	lbs/yr	2,700	0	
Silver	µg/L	5	0.25	>220
	lbs/yr	5,500	324	
Zinc	µg/L	56	17	>220
	lbs/yr	59,100	22,037	

Figure 3-8: Constituents Flow Figure



3.5.2 Use of Secondary Effluent for once-through Cooling

Since mid-2009, various staff members from the LADWP Water Resources, Water Recycling, Engineering Service Division, and Generation groups have held regular meetings with representatives of BOS and BOE to explore the idea of using secondary effluent for once-through cooling at the proposed Scattergood Generating Station (SGS) repowering project that is expected to begin operation in 2013. LADWP is also interested in providing cooling water to the Scattergood Hyperion Alternative Renewable Energy (SHARE) project. The total volume of secondary effluent that would be required for both facilities is approximately 150 mgd, on a continuous 24-hour basis. The water could potentially be returned to HTP or another facility for additional treatment and reuse after it passes through the cooling process.

The EQ volume identified in this TM for MF/RO could potentially be used to equalize secondary effluent flows for delivery to SHARE and/or SGS, followed by return of the once-through cooling water to HTP for advanced treatment and reuse. This would constitute another potential benefit from EQ since Phases 3 and 4 provide enough EQ capacity for AWT feed flows between 180 and 225 mgd of recycled water production (i.e, above the flow range required for cooling at SHARE/SGS). The implementation of these projects and the issues will be discussed further in the forthcoming Task 4.6.1 SHARE/SGS/HTP TM.

3.5.3 Power Requirements

HTP has a current power demand of 21 MW. Additional estimated demands created by the proposed AWT are listed in **Table 3-3.** Additional analysis of the available power supply at HTP will be required to determine the recycled water production rate that will trigger the need for additional power supply.

Table 3-3: HTP Estimated Power Demands for On-site MF/RO/AOP Facilities

	Phase 1 70 mgd Feed	Phase 2 100 mgd Feed	Phase 3 180 mgd Feed	Phase 4 225 mgd Feed
Recycled Water Capacity	**50 mgd RW Production**	**71 mgd RW Production**	**128 mgd RW Production**	**160 mgd RW Production**
Power Demands	**(MW)**	**(MW)**	**(MW)**	**(MW)**
MF	2.7	3.9	7.0	8.7
RO	7.6	10.8	19.4	24.2
UV	0.5	0.7	1.2	1.5
Decarbonation System	0.0	0.1	0.1	0.1
Misc	0.4	0.5	1.0	1.2
Total	**11.2**	**16.0**	**28.7**	**35.7**

Source: RMC, 2010

3.5.4 Low Flow Impacts to Ocean Outfall

As recycling of HTP effluent increases, the amount of effluent discharged via the ocean outfall will decrease. To avoid sea water intrusion into the outfall, minimum outfall flow rates of approximately 20 mgd will be needed throughout the day[8]. This minimum flow rate can be supplied by the discharge of the brine streams from the MF/RO treatment facilities. As shown in Figure 3-6 such brine streams can supply more than 70 mgd of flow for the 100% maximum reuse scenario, assuming a 30 percent rejection rate. The flow schematic in Figure 3-6 assumes a high degree of flow EQ in order to provide the constant flow rate that today's MF/RO facilities require. This, in turn, has the advantage of providing fairly constant brine streams to the outfall throughout the day. Therefore, the need to maintain minimum flow rates in the outfall should not limit the amount of flow that can be recycled at HTP, as long as the brine streams are returned to the outfall and flow equalization is used.

[8] At this flow rate the densimetric Froude number is greater than 1.0 which is considered the threshold to prevent seawater intrusion into a fresh water ocean outfall.

3.6 Preliminary Conveyance Alignments

This section of the TM assesses whether there are sufficient conveyance corridors leaving the HTP site to convey to maximum reuse flows discussed in this TM.

HTP could produce up to 160 mgd of advanced treated recycled water. To convey this amount of recycled water from HTP, one 96-inch diameter pipe, two 66-inch diameter pipes, or four 48-inch diameter pipes would be needed. Potential conveyance routes for recycled water from HTP are shown in **Figure 3-9**. The figure highlights an area with a 1-mile radius from the center of the treatment plant and indicates existing LADWP and MWD potable pipelines, LABOS existing and abandoned sewer pipelines, WBMWD recycled water pipelines, and LACDPW storm drains. Only pipelines greater than 8 inches in diameter are shown, except for LACDPW storm drains which did not have dimensions indicated on existing reference drawings.

There are four potential corridors:

- North along Vista Del Mar, parallel to the existing 126-inch diameter sewer pipe
- North on Vista Del Mar then East on Imperial Highway: A 150-inch diameter sewer pipe and several other pipes are located along the northern edge of HTP. A power line easement is also present along Imperial Highway. An alternative route from HTP to Imperial Highway is the high-voltage power line easement paralleling the eastern boundary of HTP.
- South on Vista Del Mar then Northeast on W. Grand Avenue, parallel to WBMWD's 18-inch diameter pipeline.
- South on Vista Del Mar then East on El Segundo Blvd, parallel to the storm drain.

Conveyance alignments serving non-potable customers and/or groundwater replenishment will be preliminarily sized and aligned with major transportation corridors. Specific review of alignments will be conducted in Task 4b. Non-potable distribution systems will be identified as part of Task 2b.

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Hyperion Treatment Plant
Potential Conveyance Routes

Figure 3-9

Potential Conveyance Routes

Existing Facilities

- LADWP Potable System > 8"
- LABOS Sewer System > 8"
- Abandoned Sewer Pipes >8"
- MWD Potable System >8"
- Recycled Water System
- Storm Drains
- **12** Denotes Pipeline Diameter

Other Features

- Major Road
- City of El Segundo

N

0 250 500 1,000
Feet

RMC in association with CDM

L:\Projects GIS\0214-002 LADWP RWMP\MXDs\Task4\ConveyanceSystem_HTP_MP_2009.mxd

Data Sources: RMC, USGS, LADWP

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4. Cost Estimates

4.1 Cost of Project Option Phases

This section presents order of magnitude cost estimates for the four phases described in Section 3 above. The Orange County GWR System was used as a basis to develop capital and Operations and Maintenance (O & M) cost estimates for advanced treatment facilities at HTP due to the similarities in size, location, and treatment technology.

4.2 Capital Costs

This section estimates the total capital costs for AWT and EQ facilities at HTP. The estimate does not include off-site pumping or conveyance facilities. A capital cost breakdown is summarized in **Table 4-1**.

Table 4-1: HTP Capital Cost Estimate

Item	Phase 1	Phase 2	Phase 3	Phase 4
Cost Basis:				
Total RW Production Capacity (mgd)	50	71	128	160
RW Production Capacity Added (mgd)	50	21	57	32
New Installed EQ Volume (MG)	0	15	0	6
New Installed Multi-Story Bldg. (ft^2)	270,000	104,000	210,000	173,000
New Installed Parking Levels (ft^2)	0	104,000	0	0
Cost Estimate(1)	**($M)**	**($M)**	**($M)**	**($M)**
Membranes, Equipment, Above-Grade Valves, Above-Grade Piping	119.5	50.2	136.2	76.5
Site Work, Buried Piping and Buried Valves (includ. mobilization, demobilization, contractor permits)	27.4	11.5	31.2	17.5
Buildings, Structural, Architectural, Excavation/Backfill/Compaction for Buildings & Structures (excluding new Equalization Storage)	81.0	41.6	63.0	51.9
Electrical, Instrumentation, Controls (includ. buried electrical)	49.8	20.9	56.7	31.9
Painting and Coating	2.5	1.1	2.8	1.6
Equalization Storage	0	67.5	0	27.0
Subtotal	280.2	192.8	289.9	206.4
Contingency (30% of Subtotal)	84.0	57.8	87.0	61.9
Total	**364.2**	**250.6**	**376.9**	**268.3**

(1) Projected capital costs are in December 2009 dollars.
(2) Cost basis was the GWR System treatment facility construction cost of $305 million inflated from June 2006 dollars to December 2009 dollars, with cost adders for below-grade EQ and multi-story construction.

The total construction cost estimate for Phases 1 through 4 is $1.3 billion, or approximately $8.1 million per mgd of recycled water production capacity. These estimated capital costs are comparable to the cost estimates reported in the Task 1.5 Site Assessment TM for an AWTP at the DCT plant with a rated capacity of 33 mgd. The Task 1.5 cost estimate assumes a 33 mgd capacity AWTP facility with a two-story MF/RO building for a total of $223.7 million. This equals $6.8 million/mgd of treatment capacity in 2009 dollars (RMC/CDM, 2009f). This value is lower than the estimated value for HTP because DCT does not have four-story construction and expensive below-grade EQ.

4.3 O & M Costs

This section estimates O&M costs for AWT and EQ facilities at HTP using 2008 reported costs for the GWR System (OCWD, 2008). These O&M costs are assumed to be similar to those that can be expected for the HTP facilities because the process trains will most likely be very similar in terms of chemical types, chemical volumes, electricity consumption, and labor. The GWR cost figures were converted to December 2009 dollars using ENR's CCI Index. Estimated O&M costs are summarized in **Table 4-2**.

Table 4-2: HTP O&M Cost Estimate

Item	% of Total O&M Cost(1)	Phase 1 ($M)	Phase 2 ($M)	Phase 3 ($M)	Phase 4 ($M)
Power	50	13.2	18.7	33.7	42.1
Chemicals	18	4.7	6.7	12.1	15.2
Labor	12	3.2	4.5	8.1	10.1
Membrane Replacement	9	2.4	3.4	6.1	7.6
Compliance Monitoring	5	1.3	1.9	3.4	4.2
Plant Refurbishment	4	1.1	1.5	2.7	3.4
UV Lamp Replacement	1	0.3	0.4	0.7	0.8
Contract Maintenance	1	0.3	0.4	0.7	0.8
Total		**26.5**	**37.5**	**67.5**	**84.2**

(1) Costs are based on 2008 reported O&M costs for GWR System. It is assumed that there has been no significant cost inflation between 2008 and December 2009 based on the ENR BCI and CCI indices.
(2) Reported power costs are consistent with projected electrical draw in MW and $0.12/kWh cost of power.

Based on Table 4-2, the estimated annual O&M cost for HTP is $84.2 million for 160 mgd of recycled water production, or approximately $527,000 per year per mgd, in December 2009 dollars. These estimated O&M costs are comparable to the cost estimates reported in the Task 1.5 Site Assessment TM for an AWTP at the DCT plant with average production of 29 mgd. The Task 1.5 O&M cost estimate includes labor, chemicals, and power usage for the AWTP, administration buildings, ultraviolet disinfection, and recycled water pumping. The average annual O&M cost calculated for five different site alternatives is $18.1 million (RMC/CDM, 2009f). This equals $626,000 per year per mgd of average recycled water production in December 2009 dollars.

5. Next Steps

Information developed in this TM will be used in Task 4b of the RWMP to develop integrated system-wide recommendations regarding the amount of recycled water production that should be sited at HTP versus other options including DCT, LAG, potential satellite plants, or other offsite locations.

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RMC/CDM, 2009b: Wastewater Flow Projections Technical Memorandum, Task 5a Satellite Feasibility Concept Report, RMC/CDM, September 30, 2009

RMC/CDM, 2009c: Existing and Tier 1 Recycled Water Systems Technical Memorandum, Task 2a Non-Potable Reuse Master Plan, RMC/CDM, December 14, 2009

RMC/CDM, 2009d: Tier 2 Target Non-Potable Customers Overview Technical Memorandum, Task 2a Non-Potable Reuse Master Plan, RMC/CDM, January 19, 2010

RMC/CDM, 2009e: Advanced Water Treatment Technology Assessment Technical Memorandum, Task 1a Indirect Potable Reuse Master Plan, RMC/CDM, September 1, 2009

RMC/CDM, 2009f: Site Assessment Technical Memorandum, Task 1a Indirect Potable Reuse Master Plan, RMC/CDM, January 5, 2010

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RMC, 2009b: Emails correspondence with Don Bunts, December 2010

RMC Meeting, 2009: Maximizing Reuse Coordination – HTP Site Planning – Task 4 Meeting Notes, December 8, 2009.

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Addendum Technical Memorandum (Task 4.2.3)

Title:	**HTP Opportunities TM – Phase 3 Expansion Supplement**
Version:	DRAFT
Prepared by:	Kraig Erickson, RMC
Reviewed by:	Steve Clary, Task 4 Lead, RMC Brian Dietrick, Task 4 Project Engineer, RMC
Date:	July 23, 2010
Reference:	Task 4.2.3: HTP Opportunities TM (February 5, 2010)

1. Purpose of TM Addendum

The purpose of this addendum to the subject technical memorandum (TM) is to assess whether additional advanced water treatment (AWT) facilities, consisting of microfiltration, reverse osmosis, and advanced oxidation processes (MF/RO/AOP) can be sited in the area consisting of (1) the existing dissolved air flotation (DAF) facilities and (2) an engineered excavation of the hillside immediately behind the DAFs. This concept is of interest because it has the potential of allowing Phase 4 facilities to be constructed within the Hyperion Treatment Plant (HTP) site rather than offsite as indicated in the subject TM. The concept of using this area was first raised during the 8 December 2009 workshop with the City of Los Angeles, Bureau of Sanitation (BOS), City of Los Angeles, Bureau of Engineering (BOE), and the Los Angeles Department of Water and Power (LADWP) regarding expansion opportunities at HTP.

This addendum uses the cost estimates proposed in the Task 4.2.3 HTP Opportunities TM for Phase 3 AWT facilities and estimates additional costs for expansion into the neighboring hillside. Please refer to the Task 4.2.3 HTP Opportunities TM for supporting documentation and information.

2. Phase 3 and Phase 4 Expansion

The Phase 3 expansion of HTP will require a new four-story building to house the MF/RO components. The footprint proposed in the Task 4.2.3 HTP Opportunities TM is 200-feet by 300-feet; a 1.4-acre footprint. The Phase 3 expansion will allow for an additional 57 million-gallons-per-day (mgd) of AWT product water. The Phase 4 expansion would provide 32 mgd of AWT product water capacity.

It is assumed, based on communications with Michael Sarullo (BOE), that the existing flares (waste gas burners) are currently used for emergency flare off of digester gas and must remain in service.. As a result, the flares site (approximately 0.3 acres) cannot be demolished and use of that site is not included in this addendum.

It is assumed that the DAF tank sites and pipe gallery (approximately 0.7 acres) are available for demolition to site the lime stabilization facilities discussed in the subject TM. BOS and BOE are currently studying the DAF facilities for potential use in treating centrifuge centrate, however no decision has been made on this issue.

See **Appendix A** for a site map of the proposed facilities.

2.1 Hillside Cut & Grade Implementation

It is assumed in this addendum that the soils in this area are low-cohesive sands, therefore cutting and grading of the proposed hillside will require the installation of a secant pile wall. A geotechnical study was not performed to assess the soil conditions. It is recommended that a geotechnical study be performed prior to any planning or design activities. Due to the low cohesive sand, soil nailing is not a plausible option and was not considered further in this addendum.

See **Appendix A** for a topographic map of the proposed hillside expansion.

2.1.1 Neighborhood Mitigation Efforts

In order to implement the construction of a secant pile wall, mitigation efforts will be needed for the City of El Segundo, El Segundo residents, Los Angeles County Department of Beaches and Harbors, and Los Angeles International Airport. In addition, coordination efforts will be needed with LADWP for site access along the hillside and any impacts to the neighboring Scattergood Generating Facility.

Mitigation efforts will include, but are not limited to, the following:

- Seismic monitoring along the hillside throughout construction
- 2-year monitoring of hillside for any movement/settlement
- Regular inspection of El Segundo homes within construction zone (zone TBD) to determine any foundation impacts throughout construction
- Noise control measures and monitoring throughout construction
- Traffic control and implementation measures

2.1.2 Construction Activities

The proposed geotechnical construction activities include, but are not limited to, are the following:

- Site preparation and leveling
    - Clear and grub site
    - Construction and level access ways and pads for pile construction
    - Initial topographic survey

  - Installation of mitigation measures (seismic/vibration sensors)
- Secant pile wall construction
  - Layout and construction of a grade wall for alignment
  - Use of vibro-hammer to install steel casing for primary boreholes
  - Pouring of concrete into primary boreholes and extracting steel casing
  - Drilling of secondary borehole
  - Setting of steel reinforcement in primary borehole and pouring concrete
- Cutting and removal of hillside spoils
- Finish grading and construction of concrete site pad

2.2 Available Area with Hillside Cut and DAF Site

Using a secant pile construction, it is feasible to cut and remove a 68,400 square foot (1.5 acres) portion of the hillside within the HTP site. It is assumed a 26 foot wide fire lane would be required by the Los Angeles County Fire Department. The fire lane would parallel the inside of the secant pile wall. With installation of a fire lane, the usable square footage after removing the hillside would be approximately 48,120 square feet (1.1 acres).

As indicated above, the Phase 3 building footprint requires 1.4 acres, and would not fit in this area. However, the Phase 4 AWT facilities, which would require approximately 0.84 acres with multi-level construction, could fit in this area.

2.3 Hillside Cut & Grade Costs

The following major assumptions were made to calculate the hillside expansion costs:

- Secant pile wall will be set back a minimum of 25 feet from the HTP property line.
- Eight pile sections will be used based on elevation differential
- Secant pile diameter is 18 inches.
- Primary and Secondary borehole overlap is 25 percent of borehole diameter (4 ½ inches).
- "Soft costs" for engineering and geotechnical evaluations are not included.

The estimated construction cost for the geotechnical and earthwork related to the hillside expansion is $24.1-million. This estimate includes a 30 percent contingency. See **Appendix B** for detailed cost information and calculations. This cost does not include treatment facilities (see following section).

2.4 Phase 4 Expansion Costs

For purposes of this addendum, the cost of the treatment facilities for the Phase 4 AWT expansion were prorated at 60 percent of the treatment facility costs developed for Phase 3. This proration assumed that Phase 4 would provide 32 mgd of production capacity as compared to the 57 mgd of production capacity for Phase 3 (32 ÷ 57 = 0.6). A proration of Phase 3 costs was used instead of the Phase 4 costs presented in the original TM because a fourth phase of expansion behind in the DAF area would more closely mimic the type of building assumed for Phase 3, albeit at a smaller increment of capacity. The estimated costs of implementing Phase 4 AWT facilities behind the existing DAFs are summarized in **Table 1** below.

Table 1: HTP – Phase 4 AWT Facilities Implementation Costs

Item			Cost
Hillside Cut & Grade [a]			
Site Preparation		$	321,440
Construction of Guide Wall		$	110,000
Installation of Casing		$	4,063,420
Augering of Primary Borehole		$	3,568,010
Augering of Secondary Borehole		$	6,908,100
Cut and Grade Hillside		$	2,060,410
Finish Grade & Pad		$	437,540
Construction Capital Cost Subtotal		$	17,469,000
City Cost Index Adjustment	108%	$	18,867,000
Construction Contingency	30%	$	5,241,000
Total Capital Cost		**$**	**24,108,000**
Phase 4 AWT Facilities [b]			
Membranes, Equipment, Above-Grade Valves, Above-Grade Piping		$	81,720,000
Site Work, Buried Piping and Buried Valves (include. Mob, demob, permits)		$	18,720,000
Buildings, Structural, Architectural, Excavation/Backfill/Compaction for Buildings & Structures (excluding new Equalization Storage)		$	37,800,000
Electrical, Instrumentation, Controls (include. Buried electrical)		$	34,020,000
Painting and Coating		$	1,680,000
Equalization Storage		$	-
Construction Capital Cost Subtotal		$	173,940,000
Construction Contingency	30%	$	52,182,000
Total Capital Cost		**$**	**226,122,000**
Total Cost		**$**	**250,230,000**

Notes:

a. Hillside Cut & Grades Costs: see **Appendix B** for detailed cost breakdown.
b. Phase 4 AWT Facilities: see HTP Opportunities TM (RMC, February 5, 2010).

2.5 Phase 4 Expansion Conclusions

Using secant pile construction, it is possible to fit Phase 4 AWT facilities in the area behind the DAFs. The costs of installing the secant piles, excavating the area, and preparing it for construction of the AWT facilities would be on the order of $25 million (including 30 percent construction contingency). This would make available a net area of 1.1 acres, which is a unit cost of approximately $23 million per acre.

The cost of 32 mgd of AWT facilities at this site would be approximately $226 million, for a total cost (site development + AWT facilities) of approximately $250 million for Phase 4. This is less than the estimated cost of installing Phase 4 facilities at a new site in the vicinity of the HTP as discussed in the subject TM.

Additional information regarding the implementation of Phase 4 facilities behind the DAFs at the HTP site is included in the following Appendices to this addendum:

- **Appendix A** provides aerial imagery with topography of the proposed hillside location and a site map.
- **Appendix B** provides detailed cost estimation calculations.
- **Appendix C** provides a description of the sequencing of construction activities for a secant pile wall.

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Appendix A – Figures

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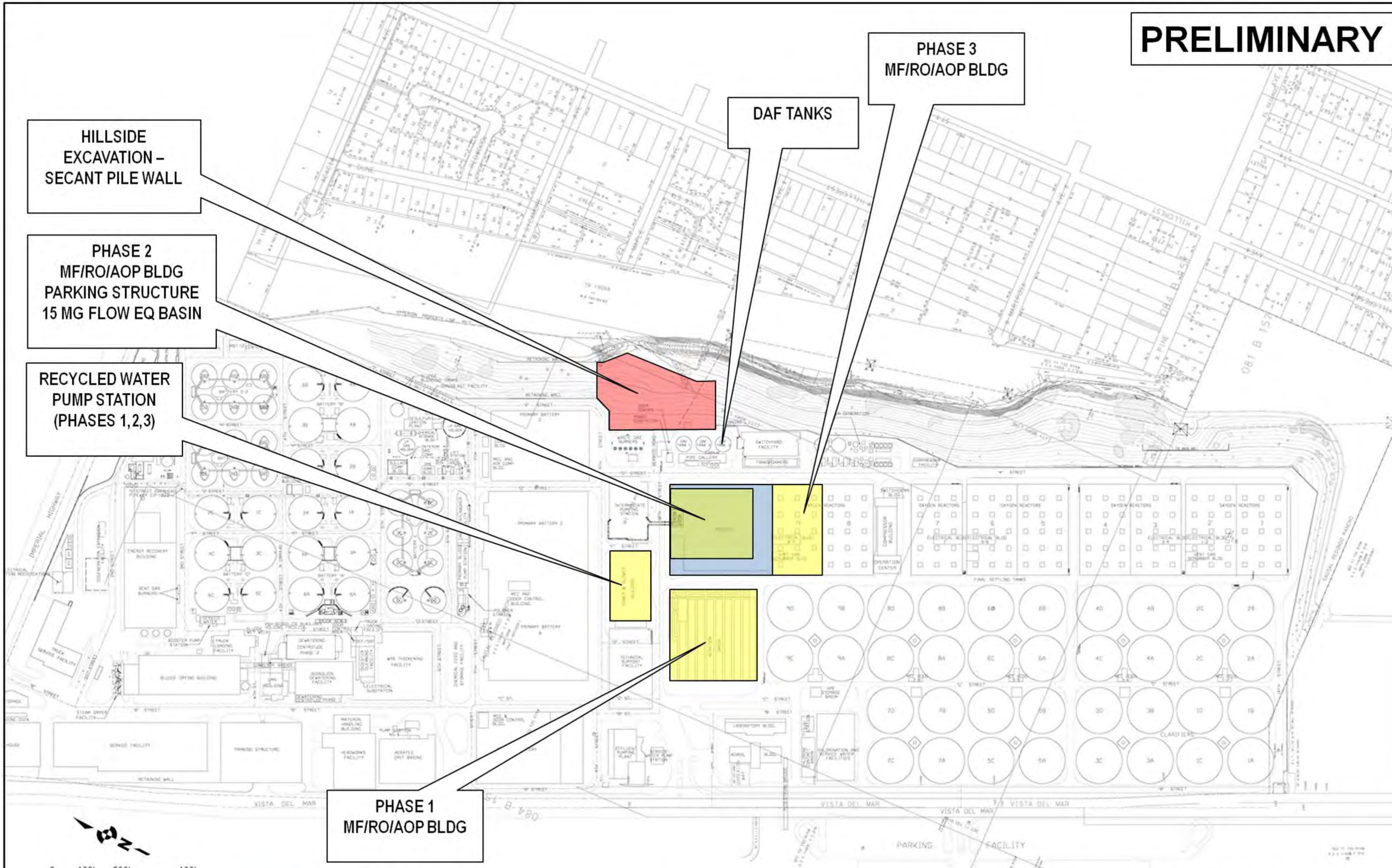

APPROXIMATE SCALE
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RMC CDM

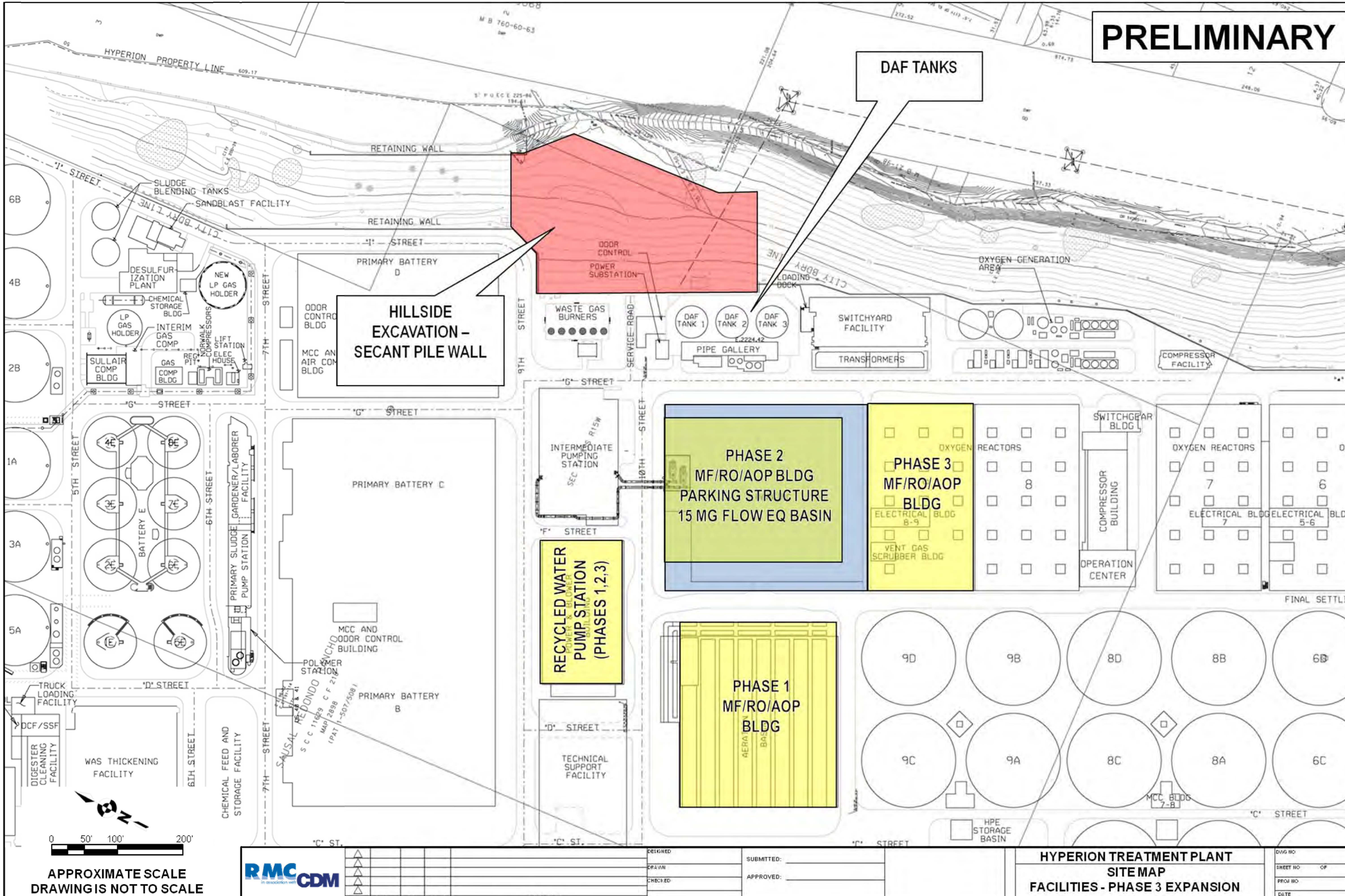
REV	DATE	BY	APVD	DESCRIPTION

DESIGNED
DRAWN
CHECKED

SUBMITTED:
APPROVED:

HYPERION TREATMENT PLANT
SITE MAP
HILLSIDE - PHASE 3 EXPANSION

DWG NO
SHEET NO OF
PROJ NO
DATE


PRELIMINARY
DAF TANKS
HILLSIDE EXCAVATION – SECANT PILE WALL
PHASE 2 MF/RO/AOP BLDG PARKING STRUCTURE 15 MG FLOW EQ BASIN
PHASE 3 MF/RO/AOP BLDG
RECYCLED WATER PUMP STATION (PHASES 1,2,3)
PHASE 1 MF/RO/AOP BLDG
HYPERION PROPERTY LINE
RETAINING WALL
RETAINING WALL
"I" STREET
SLUDGE BLENDING TANKS
SANDBLAST FACILITY
DESULFURIZATION PLANT
NEW LP GAS HOLDER
CHEMICAL STORAGE BLDG
LP GAS HOLDER
INTERIM GAS COMP
LIFT STATION
ELEC HOUSE
SULLAIR COMP BLDG
GAS COMP BLDG
PRIMARY BATTERY D
ODOR CONTROL BLDG
ODOR CONTROL
POWER SUBSTATION
WASTE GAS BURNERS
SERVICE ROAD
DAF TANK 1
DAF TANK 2
DAF TANK 3
PIPE GALLERY
LOADING DOCK
SWITCHYARD FACILITY
TRANSFORMERS
OXYGEN GENERATION AREA
COMPRESSOR FACILITY
"G" STREET
INTERMEDIATE PUMPING STATION
"F" STREET
OXYGEN REACTORS
ELECTRICAL BLDG 8-9
VENT GAS SCRUBBER BLDG
SWITCHGEAR BLDG
COMPRESSOR BUILDING
OPERATION CENTER
ELECTRICAL BLDG 7
ELECTRICAL BLDG 5-6
FINAL SETTLING
PRIMARY BATTERY C
BATTERY E
PRIMARY SLUDGE PUMP STATION
GARDENER/LABORER FACILITY
5TH STREET
6TH STREET
7TH STREET
9TH STREET
10TH STREET
MCC AND ODOR CONTROL BUILDING
POLYMER STATION
PRIMARY BATTERY B
TRUCK LOADING FACILITY
"D" STREET
DCF/SSF
DIGESTER CLEANING FACILITY
WAS THICKENING FACILITY
CHEMICAL FEED AND STORAGE FACILITY
TECHNICAL SUPPORT FACILITY
"C" ST.
"C" STREET
HPE STORAGE BASIN
MCC BLDG 7-8
9D 9B 8D 8B 6D
9C 9A 8C 8A 6C
6B 4B 2B 1A 3A 5A
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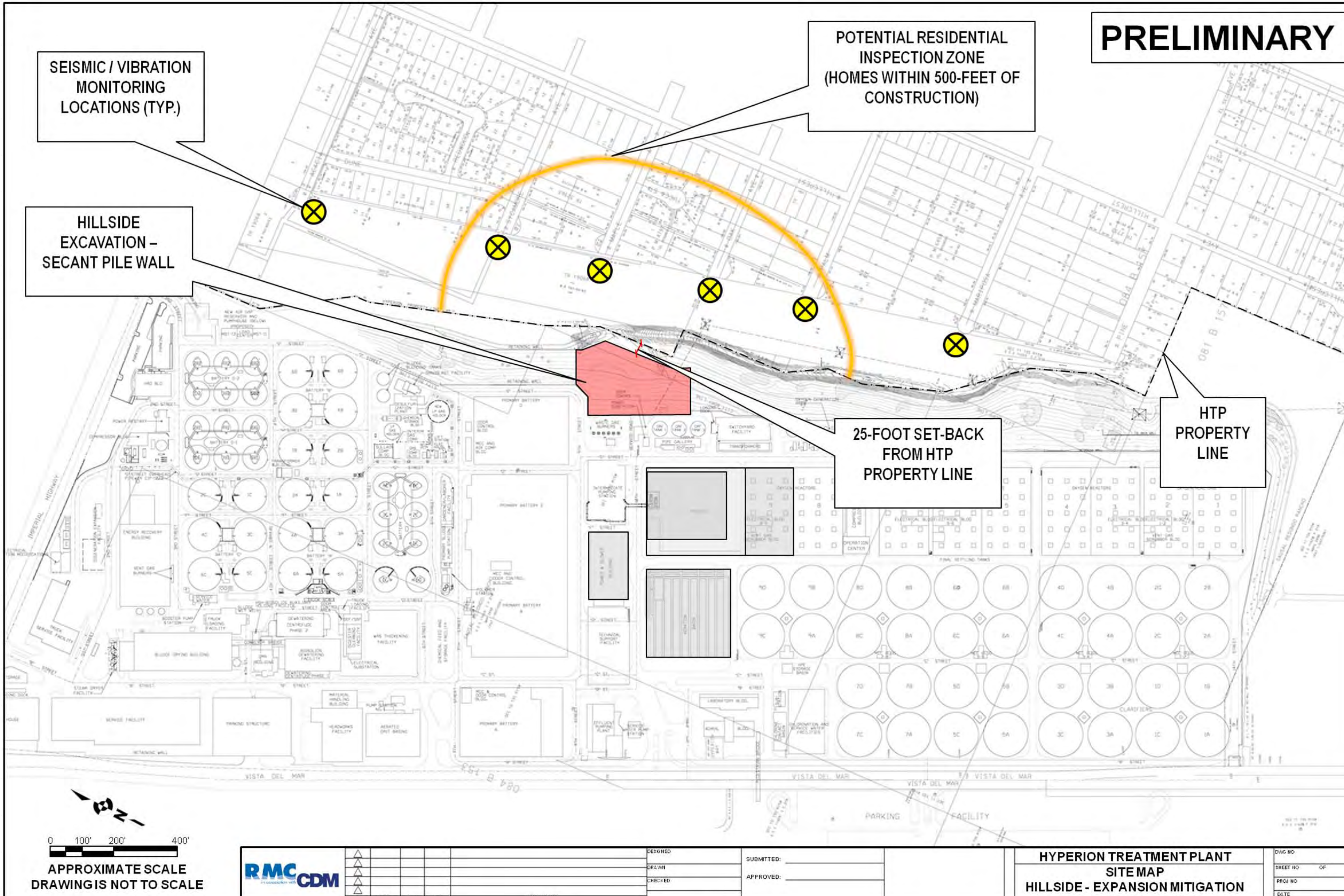
APPROXIMATE SCALE
DRAWING IS NOT TO SCALE
RMC CDM
SUBMITTED:
APPROVED:
REV DATE BY APVD DESCRIPTION
HYPERION TREATMENT PLANT
SITE MAP
FACILITIES - PHASE 3 EXPANSION


PRELIMINARY
SEISMIC / VIBRATION MONITORING LOCATIONS (TYP.)
POTENTIAL RESIDENTIAL INSPECTION ZONE (HOMES WITHIN 500-FEET OF CONSTRUCTION)
HILLSIDE EXCAVATION – SECANT PILE WALL
25-FOOT SET-BACK FROM HTP PROPERTY LINE
HTP PROPERTY LINE
VISTA DEL MAR
PARKING FACILITY
IMPERIAL HIGHWAY
0 100' 200' 400'
APPROXIMATE SCALE
DRAWING IS NOT TO SCALE
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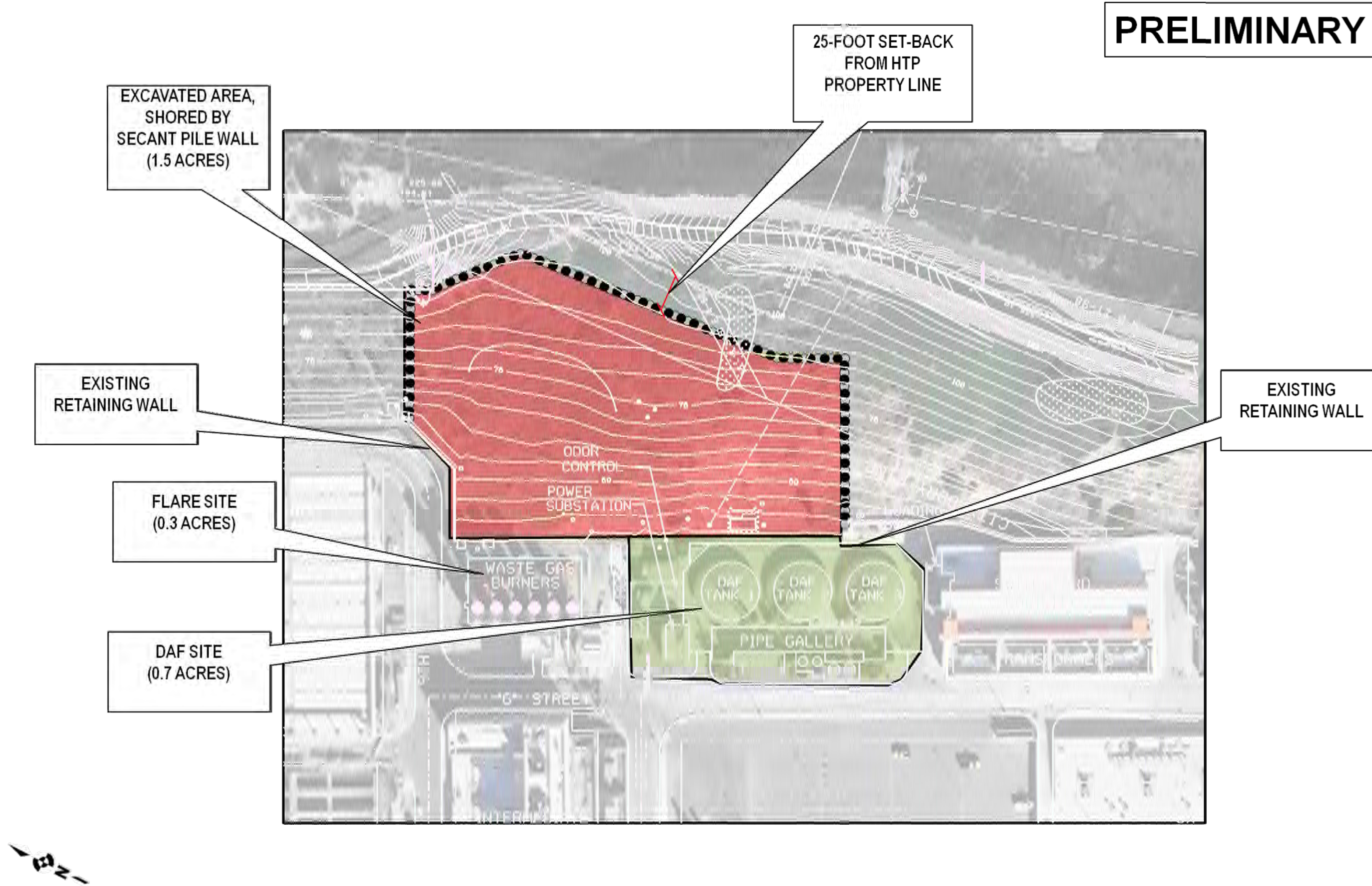
HYPERION TREATMENT PLANT
SITE MAP
HILLSIDE - EXPANSION MITIGATION
DWG NO
SHEET NO OF
PROJ NO
DATE



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RMC CDM

REV	DATE	BY	APVD	DESCRIPTION

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SUBMITTED:
APPROVED:

HYPERION TREATMENT PLANT
SITE MAP
HILLSIDE - TOPOGRAPHY

DWG NO
SHEET NO OF
PROJ NO
DATE

Appendix B – Cost Estimates

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PROJECT: Hyperion Wastewater Treatment Plant

ASPECT: Phase 3 Expansion Costs **DATE:** July 20, 2010

Item			Cost
Hillside Cut & Grade [a]			
Site Preparation		$	321,440
Construction of Guide Wall		$	110,000
Installation of Casing		$	4,063,420
Augering of Primary Borehole		$	3,568,010
Augering of Secondary Borehole		$	6,908,100
Cut and Grade Hillside		$	2,060,410
Finish Grade & Pad		$	437,540
Construction Capital Cost Subtotal		$	17,469,000
City Cost Index Adjustment	108%	$	18,867,000
Construction Contingency	30%	$	5,241,000
Total Capital Cost		**$**	**24,108,000**
Phase 4 AWT Facilities [b]			
Membranes, Equipment, Above-Grade Valves, Above-Grade Piping		$	81,720,000
Site Work, Buried Piping and Buried Valves (include. Mob, demob, permits)		$	18,720,000
Buildings, Structural, Architectural, Excavation/Backfill/Compaction for Buildings & Structures (excluding new Equalization Storage)		$	37,800,000
Electrical, Instrumentation, Controls (include. Buried electrical)		$	34,020,000
Painting and Coating		$	1,680,000
Equalization Storage		$	-
Construction Capital Cost Subtotal		$	173,940,000
Construction Contingency	30%	$	52,182,000
Total Capital Cost		**$**	**226,122,000**
Total Cost		**$**	**250,230,000**

Notes:

a. Hillside Cut & Grades Costs: see Appendix B for detailed cost breakdown.

b. Phase 4 AWT Facilities: see HTP Opportunities TM (RMC, February 5, 2010). Assumes 60% of Phase 3 costs.

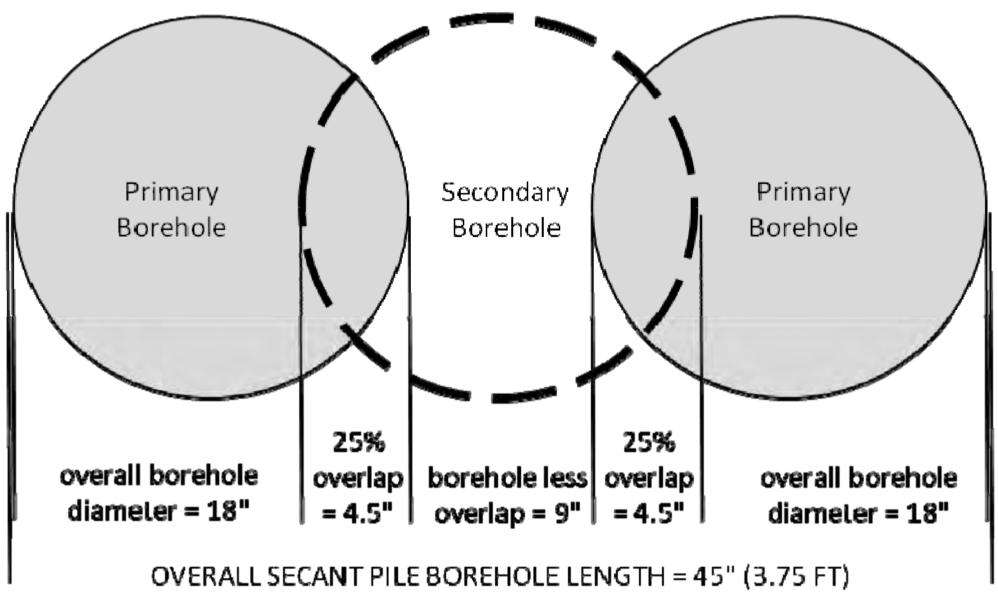
PROJECT:	**Hyperion Wastewater Treatment Plant**					
ASPECT:	**Site prep, hillside leveling, secant piles, and site pad cos**				**DATE:**	**July 20, 2010**

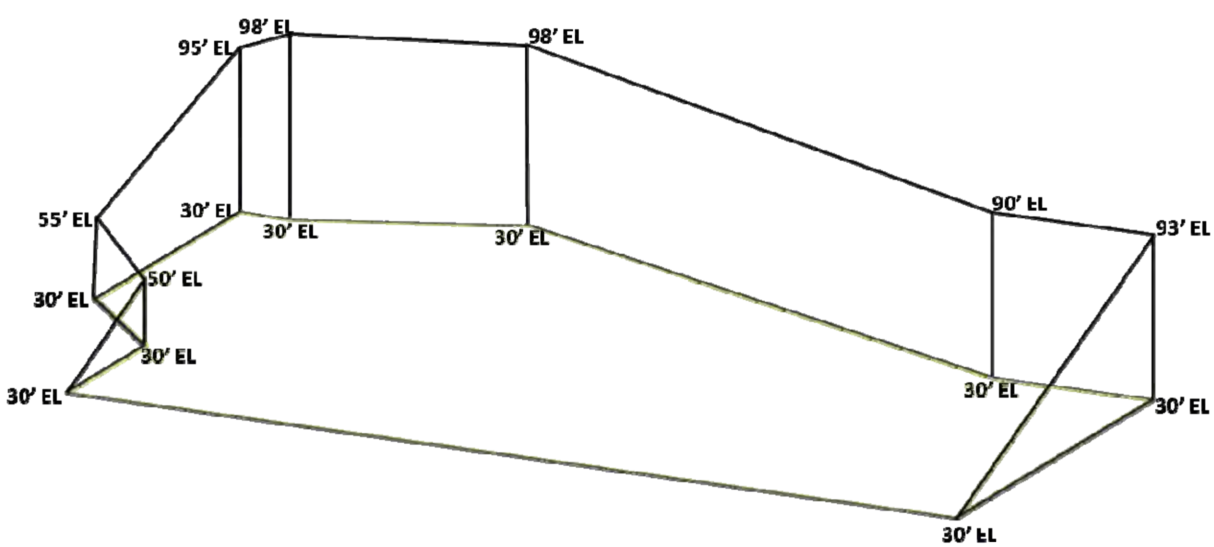
	Item	Size	Qty	Units	Unit Cost	Cost
Capital Costs						
Site Preparation						
Clear and Grub Site	top of hillside, accessways		5	ACRE	$ 4,125	$ 20,630
Survey	Initial Topographical		5	ACRE	$ 3,750	$ 18,750
Mitigation Efforts	Seismic & Vibration Sensors		6	EA	$ 20,000	$ 120,000
Mitigation Efforts	Home Inspections		1	LS	$ 100,000	$ 100,000
Mitigation Efforts	2 year monitoring of hillside		1	LS	$ 50,000	$ 50,000
Site leveling, accessways on hillside	Grading irregular areas		4767	SY	$ 2.53	$ 12,060
Construction of Guide Wall						
Construction of Guide Wall	formwork, layout, survey	18-inch	1100	LF	$ 100	$ 110,000
Installation of Casing						
Vibro-Hammer Mob/Demob		18-inch	418	PILES	$ 239	$ 100,000
Pile driven, no concrete	*Pile Section 1*	18-inch	1620	VLF	$ 80	$ 129,600
Pile driven, no concrete	*Pile Section 2*	18-inch	2520	VLF	$ 80	$ 201,600
Pile driven, no concrete	*Pile Section 3*	18-inch	7200	VLF	$ 80	$ 576,000
Pile driven, no concrete	*Pile Section 4*	18-inch	1592	VLF	$ 80	$ 127,380
Pile driven, no concrete	*Pile Section 5*	18-inch	7938	VLF	$ 80	$ 635,040
Pile driven, no concrete	*Pile Section 6*	18-inch	18048	VLF	$ 80	$ 1,443,840
Pile driven, no concrete	*Pile Section 7*	18-inch	3706	VLF	$ 80	$ 296,460
Pile driven, no concrete	*Pile Section 8*	18-inch	6919	VLF	$ 80	$ 553,500
Augering of Primary Borehole						
Drill Rig Mob/Demob		18-inch	418	PILES	$ 239	$ 100,000
Auger hole	*Pile Section 1*	18-inch	1620	VLF	$ 60	$ 97,200
Auger hole	*Pile Section 2*	18-inch	2520	VLF	$ 60	$ 151,200
Auger hole	*Pile Section 3*	18-inch	7200	VLF	$ 60	$ 432,000
Auger hole	*Pile Section 4*	18-inch	1592	VLF	$ 60	$ 95,540
Auger hole	*Pile Section 5*	18-inch	7938	VLF	$ 60	$ 476,280
Auger hole	*Pile Section 6*	18-inch	18048	VLF	$ 60	$ 1,082,880
Auger hole	*Pile Section 7*	18-inch	3706	VLF	$ 60	$ 222,350
Auger hole	*Pile Section 8*	18-inch	6919	VLF	$ 60	$ 415,130
Concreting Primary Borehole		18-inch	49543	VLF	$ 10	$ 495,430
Augering of Secondary Borehole						
Drill Rig Mob/Demob		18-inch	418	PILE	$ 239	$ 100,000
Drilled steel piles, concrete encased	*Pile Section 1*	18-inch	1560	VLF	$ 100	$ 156,000
Drilled steel piles, concrete encased	*Pile Section 2*	18-inch	2441	VLF	$ 100	$ 244,130
Drilled steel piles, concrete encased	*Pile Section 3*	18-inch	7088	VLF	$ 100	$ 708,750
Drilled steel piles, concrete encased	*Pile Section 4*	18-inch	1448	VLF	$ 100	$ 144,750
Drilled steel piles, concrete encased	*Pile Section 5*	18-inch	7791	VLF	$ 100	$ 779,100
Drilled steel piles, concrete encased	*Pile Section 6*	18-inch	17907	VLF	$ 100	$ 1,790,700
Drilled steel piles, concrete encased	*Pile Section 7*	18-inch	3569	VLF	$ 100	$ 356,850
Drilled steel piles, concrete encased	*Pile Section 8*	18-inch	6827	VLF	$ 100	$ 682,650
Installation of Steel Cage, rebar			48629	VLF	$ 40	$ 1,945,170
Cut and Grade Hillside						
Loader, Excavators Mob/Demob			1	LS	$ 100,000	$ 100,000
Excavation with Loader	restricted loading to trucks		116000	CY	$ 1.11	$ 128,760
Excavation with Excavator	top of hillside	50%	58000	CY	$ 1.43	$ 82,940
Excavation with Scrapper	bottom of leveled hillside	50%	58000	CY	$ 2.42	$ 140,360
Survey	Ongoing during Excavation		5	ACRE	$ 3,750	$ 18,750
Dust Control			180	DAYS	$ 2,000	$ 360,000
Hauling/Disposal of Spoils	8CY truck, 30min wait, 25MPH, 8miles		116000	CY	$ 10.60	$ 1,229,600
Finish Grade & Pad						
Finish grading	area to be paved with grader, small area		7600	SY	$ 4.02	$ 30,560
Subgrade	backfill, dozer, sand/gravel, 12"		7600	SY	$ 0.55	$ 4,180
Concrete pad	conc pavmt, 12" thick		7600	SY	$ 53	$ 402,800
	Construction Cost Estimate Subtotal					$ 17,469,000
	City Cost Index Adjustment		Los Angeles		108.0%	**$ 18,867,000**
	Construction Contingency			Allowance	30%	$ 5,241,000
			Total Capital Cost for Site Prep			**$ 24,108,000**

Costs per RS Means 2010

Pile Section	LENGTH	Units	Primary Boreholes	Secondary Boreholes	Units	Start EL	End EL	VLF	Units
1	50	FT	27	26	EA	30	50	60.0	FT
2	60	FT	32	31	EA	50	55	78.8	FT
3	120	FT	64	63	EA	55	95	112.5	FT
4	20	FT	11	10	EA	95	98	144.8	FT
5	100	FT	54	53	EA	98	98	147.0	FT
6	240	FT	128	127	EA	98	90	141.0	FT
7	50	FT	27	26	EA	90	93	137.3	FT
8	140	FT	75	74	EA	93	30	92.3	FT

3.75	FT	2	1





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