HYPERION WATER RECLAMATION DEMONSTRATION PROJECT

WaterSMART
Water Reclamation Research Title XVI
Water Reclamation and Reuse Program

Funding Opportunity Announcement No: R16-FOA-DO-011

April 2016

environment LASANITATION
CITY OF LOS ANGELES

CONTENTS

FIGURES

TABLES

LIST OF ACRONYMS

ADWF – Average Dry-Weather Flow

AOP – Advanced Oxidation Process

ASP – Activated Sludge Process

AWPF – Advanced Water Purification Facility

AWT – Advanced Water Treatment

BNR – Biological Nutrient Removal

CEC – Constituents of Emerging Concern

CDPH – California Department of Public Health

CWCB – Central and West Coast Basin

DBP – Disinfection Byproduct

DCTWRP – Donald C. Tillman Water Reclamation Plant

DDW – Division of Drinking Water

DPR – Direct Potable Reuse

FAT – Full Advanced Treatment

GRRR – Groundwater Replenishment Reuse Regulations

GWR – Groundwater Replenishment

H_2O_2 – Hydrogen Peroxide

HSA – Hyperion Service Area

HPOAS – High Purity Oxygen Activated Sludge

HWRP – Hyperion Water Reclamation Plant

IAP – Independent Advisory Panel

IPR – Indirect Potable Reuse

LASAN – Los Angeles Sanitation

LADWP – Los Angeles Department of Water and Power

LAGWRP – Los Angeles-Glendale Water Reclamation Plant

MCL – Maximum Contaminant Level

MBR – Membrane Bioreactor

MGD – Million Gallons per Day

MLSS – Mixed Liquor Suspended Solids

MWD – Metropolitan Water District

NDMA - N-Nitrosodimethylamine

NL – Notification Level

NPDES – National Pollution Discharge Elimination System

NOAA – National Oceanographic and Atmospheric Administration

O&M – Operation and Maintenance

OCWD – Orange County Water District

OTE – Oxygen Transfer Efficiency

RO – Reverse Osmosis

RWMP – Recycled Water Master Plan

RWQCB – Regional Water Quality Control Board

SDWA - Safe Drinking Water Act

SRT – Solids Retention Time

SWPPP – Stormwater Pollution Prevention Plan

TDS – Total Dissolved Solids

TIWRP – Terminal Island Water Reclamation Plant

TOC – Total Organic Carbon

UV - Ultraviolet

VFD – Variable Frequency Drive

WBWMD – West Basin Municipal Water District

EXECUTIVE SUMMARY

Applicant Name: City of Los Angeles, Bureau of Sanitation
City: City of Los Angeles
County: Los Angeles County
State: California
Date: April 2016

As part of an ongoing regional effort to expand water reclamation at Hyperion Water Reclamation Plant (HWRP), Los Angeles Sanitation (LASAN), Los Angeles Department of Water and Power (LADWP) and West Basin Municipal Water District (WBMWD) have entered into an agreement to collaboratively conduct a demonstration project.

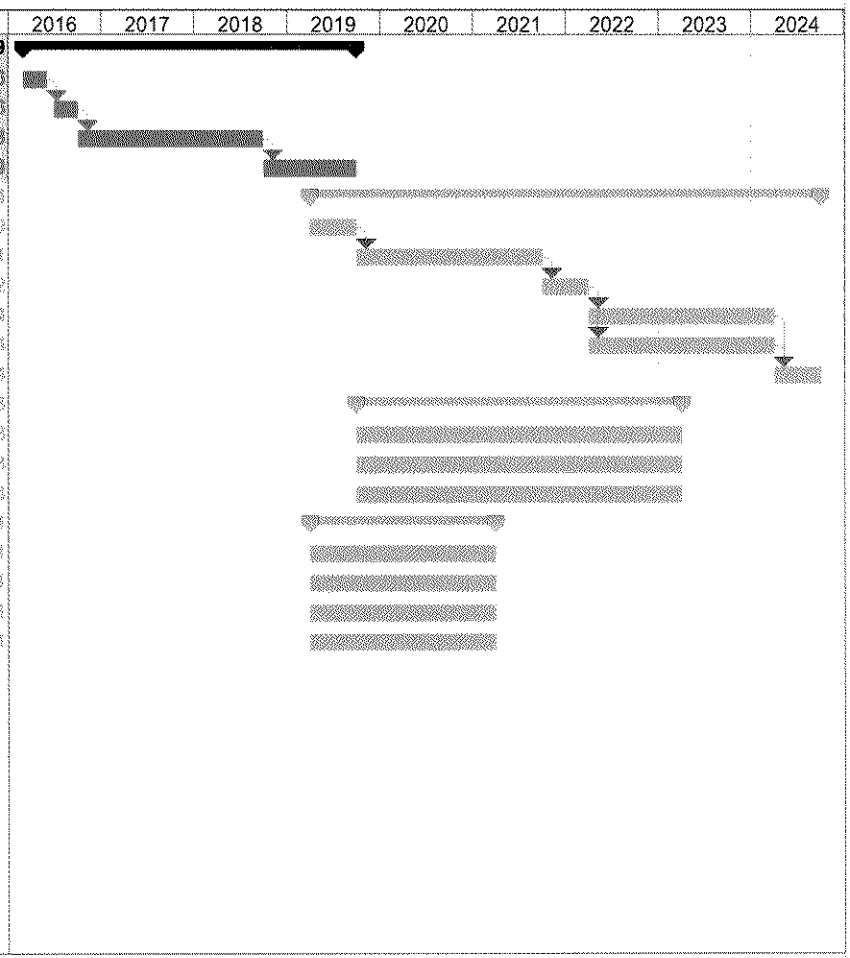
The HWRP Demonstration Facility will be designed to produce 1 Million Gallons per Day (MGD) of nitrified-denitrified, reclaimed water using Advanced Water Treatment (AWT). The AWT process will be comprised of the following stages: Membrane Bioreactors (MBR), Reverse Osmosis (RO) and Advanced Oxidation Process (AOP). Assessments will be made on various treatment components and alternative process trains based on effectiveness, reliability, operational requirements, design criteria and cost. The 1 MGD demonstration facility will form the basis of design for a future, full-scale 70 MGD water reclamation facility on the HWRP site by the year 2025.

The design phase of the HWRP Demonstration Facility will begin in October of 2016, will be commissioned in October 2018, and will undergo testing for one year. Figure 1 indicates the implementation schedule for HWRP Demonstration Facility.

Figure 1-HWRP Demonstration Project Schedule

April 2016

ID	Task Name	Duration	Start	Finish
1	**HWRP 1-MGD AWT Demonstration Project**	**936 days**	**Tue 3/1/16**	**Mon 9/30/19**
2	**1-MGD Demo Project Concept Report**	**66 days**	**Tue 3/1/16**	**Tue 5/31/16**
3	**Issue & Award TOS**	**66 days**	**Fri 7/1/16**	**Fri 9/30/16**
4	**Design/Build 1-MGD Demo Project**	**520 days**	**Mon 10/3/16**	**Fri 9/28/18**
5	**Pilot Test**	**261 days**	**Mon 10/1/18**	**Mon 9/30/19**
6	HWRP/WBMWD 70-MGD NdN/AWT Project	1437 days	Mon 4/1/19	Mon 9/30/24
7	Predesign	131 days	Mon 4/1/19	Mon 9/30/19
8	Design	523 days	Tue 10/1/19	Thu 9/30/21
9	Bid & Award	130 days	Fri 10/1/21	Thu 3/31/22
10	70-MGD MBR at HWRP	523 days	Fri 4/1/22	Mon 4/1/24
11	40-MGD RO-AOP at HWRP	523 days	Fri 4/1/22	Mon 4/1/24
12	Start-up & Commissioning	130 days	Tue 4/2/24	Mon 9/30/24
13	Conveyance Pipelines	916 days	Tue 10/1/19	Mon 4/3/23
14	HWRP 40-MGD AWT Connection to WBMWD (PS&PL)	916 days	Tue 10/1/19	Mon 4/3/23
15	Prairie Ave Pipeline	916 days	Tue 10/1/19	Mon 4/3/23
16	Pipeline from CRWRF to LADWP Pipeline	916 days	Tue 10/1/19	Mon 4/3/23
17	Permitting/EIR	523 days	Mon 4/1/19	Wed 3/31/21
18	Water Recycling Project EIR	523 days	Mon 4/1/19	Wed 3/31/21
19	HWRP Connection to WBMWD Pipeline EIR	523 days	Mon 4/1/19	Wed 3/31/21
20	Prairie Ave Pipeline EIR	523 days	Mon 4/1/19	Wed 3/31/21
21	LADWP Pipeline Expansion EIR	523 days	Mon 4/1/19	Wed 3/31/21



INTRODUCTION

California is experiencing its worst droughts on record with four consecutive dry years and the record low snowpack of 2015. Drought conditions may continue for a fifth straight year as National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center forecast indicates that the strong El Niño of 2015/16 is on the decline. Furthermore, it is likely that conditions will transition to neutral by early summer, with about a 50% chance of La Niña by the fall.

There is broad agreement that the state's water management system is unable to satisfactorily meet ecological and human needs and is inadequate in addressing water scarcity induced by climate change and population growth.

Mayor Garcetti has consistently stressed City of Los Angeles commitment to establish a more prominent presence in regional water reclamation plans as part of a comprehensive framework of sustainability in an effort to put California's water resources on a safer, more sustainable path.

As part of an ongoing regional effort to expand water reclamation at Hyperion Water Reclamation Plant (HWRP), Los Angeles Sanitation (LASAN), Los Angeles Department of Water and Power (LADWP) and West Basin Municipal Water District (WBMWD) have entered into an agreement to collaboratively conduct a demonstration project to identify preferred alternative treatment trains, based on reliability, effectiveness, operational requirements and cost.

The demonstration facility will produce 1 Million Gallon per Day (MGD) of nitrified-denitrified, reclaimed water using an Advanced Water Treatment (AWT) train comprised of Membrane Bioreactors (MBR), Reverse Osmosis (RO) and Advanced Oxidation Process (AOP). It will provide performance data needed to evaluate alternative treatment components, design criteria, operational data, and future permitting for potential water reuse applications. Additionally, the demonstration facility will provide an opportunity for public education/outreach on water reclamation.

BACKGROUND

In 2009, the Los Angeles Recycled Water Master Plan (RWMP), a comprehensive effort between the Los Angeles Department of Water and Power (LADWP) and LASAN, explored water reclamation opportunities in City of Los Angeles. In 2014, LASAN conducted a study (Hyperion Regional Water Reuse Study) to identify a strategy to expand the current reuse of HWRP water within the context of a regional reuse plan. The plan couples the end use of HWRP's water with appropriate water treatment technology, defines key agencies, and describes technical, legal, and financial obstacles to overcome.

The Hyperion Regional Water Reuse Study explored various water reclamation alternatives including implementation of a Biological Nutrient Removal facility to produce 70 MGD of nitrified-denitrified reclaimed water using Primary Effluent followed by a 40-MGD AWT train for current and future regional water reuse applications such as industrial, groundwater recharge, sea water barriers, agricultural, Indirect Potable Reuse (IPR), Direct Potable Reuse (DPR), etc.

The study recommended implementing a 1-MGD water reclamation demonstration project comprised of MBR for Biological Nutrient Removal (BNR), RO and AOP trains.

The HWRP Demonstration Facility will lay the ground work for the future 70-MGD water reclamation by assessing various treatment components and alternative trains, based on reliability, effectiveness, operational requirements, performance data, design criteria and cost.

HWRP EXISTING EFFLUENT CONDITION

Located adjacent to Los Angeles World Airport in the beach community of Playa Del Rey, HWRP is the City's oldest and largest wastewater treatment facility, and has been operating since the early 1890's. Initially built as a raw sewage discharge point into the Santa Monica Bay, it has been upgraded over the years to primary/partial secondary treatment (1950), and most recently to full secondary treatment (1998). The HWRP is located on a 144-acre site adjacent to the Pacific Ocean. The Hyperion Service Area (HAS) covers about 600-square miles total, including contract agencies outside of the City.

HWRP has a design treatment capacity of 450 million gallons per day (MGD), with peak wet weather capacity of 850 MGD. HWRP utilizes a High Purity Oxygen Activated Sludge (HPOAS) secondary treatment process treating an Average Dry-Weather Flow (ADWF) of 270 Million Gallons per Day (MGD) of wastewater.

Currently, 40 MGD of HWRP's secondary effluent is conveyed to West Basin Municipal Water District for further treatment and distribution to various reclaimed water customers. The remaining secondary effluent (230 MGD) is discharged into the Santa Monica Bay through a 12-ft diameter 5-Mile Outfall.

HWRP's secondary treatment process facilities include high-purity oxygen treatment units arranged in nine treatment modules. Each treatment module consists of an individual influent channel, three high-purity oxygen activated sludge bioreactor trains (oxygen reactors) and four circular secondary clarifiers. Because the current HWRP treatment process does not include biological nutrients removal, the effluent is high in nutrients concentration levels.

OBJECTIVES

The following are the primary objectives of the HWRP Water Reclamation Demonstration Project:

- Demonstrate the ability of advanced treatment technologies (MBR+RO+AOP) to produce reclaimed water using HWRP primary effluent in achieving the Title 22 water quality standards for various end-use application including Indirect Potable Reuse (IPR)
- Characterize primary effluent entering the demonstration facility
- Characterize water quality from individual treatment processes
- Optimize process performance of treatment trains
- Simulate full-scale (70 MGD) water reclamation at HWRP
- Determine the log reduction of pathogenic microorganisms and removal efficiency of nitrogen, phosphorous, Disinfection Byproducts (DBPs), Constituents of Emerging Concern (CECs).
- Determine the energy efficiency of various treatment trains

WATER QUALITY GOALS

Title 22 of the California Code of Regulations (Title 22) governs recycled water and drinking water quality. The water quality objective of HWRP Demonstration project is to meet the requirements of the Title 22 of the California Code of Regulations.

A project sponsor is required to validate each of the treatment processes and provide evidence of the treatment process's ability to reliably and consistently achieve the log reduction to meet the requirements of Pathogenic Microorganisms pursuant to Title 22 of the California Code of Regulations.

In June 2014, the State Water Resources Control Board's Division of Drinking Water (DDW) promulgated the Groundwater Replenishment Reuse Regulations (GRRR), defining the requirements for groundwater replenishment applications. The combination of MBR/RO/AOP is one of the prescribed treatment alternatives, now known as Full Advanced Treatment (FAT), and is required for direct injection applications. The DDW is currently preparing regulations for reservoir augmentation, and as part of this effort, will draw opinions on the feasibility of direct potable reuse. Population growth, continued drought conditions, climate change, and other factors are leading the City to investigate further into potable reuse as a major component of its drinking water portfolio.

The HWRP Demonstration Facility utilizes an AWT process consisting of MBR/RO/AOP to validate its ability to achieve pathogenic microorganisms credited log reduction and will include an Operation/Optimization and a Monitoring Plan required pursuant to Title 22 of the California Code of Regulations.

DEMONSTRATION FACILITY DESCRIPTION

GENERAL ARRANGEMENTS

The HWRP Water Reclamation Demonstration Facility will be located adjacent to the primary effluent pump station on the east side of the Hyperion for the ease of supplying the primary effluent feed to the facility as shown in Figure 2.

Primary effluent will be pumped through a 2-mm fine screens into the MBR train. The nitrified-denitrified MBR effluent will be conveyed to the RO train for the reduction of Total Dissolved Solids (TDS) and nitrogen compounds. The RO effluent will be transferred to AOP for the pathogenic microorganisms log reduction and destruction of CECs and DBPs.

The demonstration facility will be operated 24/7 for a duration of one year. LASAN will be responsible for implementation, operation and maintenance (O&M), processes parameter monitoring, sample collection and analysis. Figure 3 illustrates the proposed MBR/RO/AOP demonstration process scheme at HWRP.

Figure 2- General Arrangement of HWRP Water Reclamation Facility

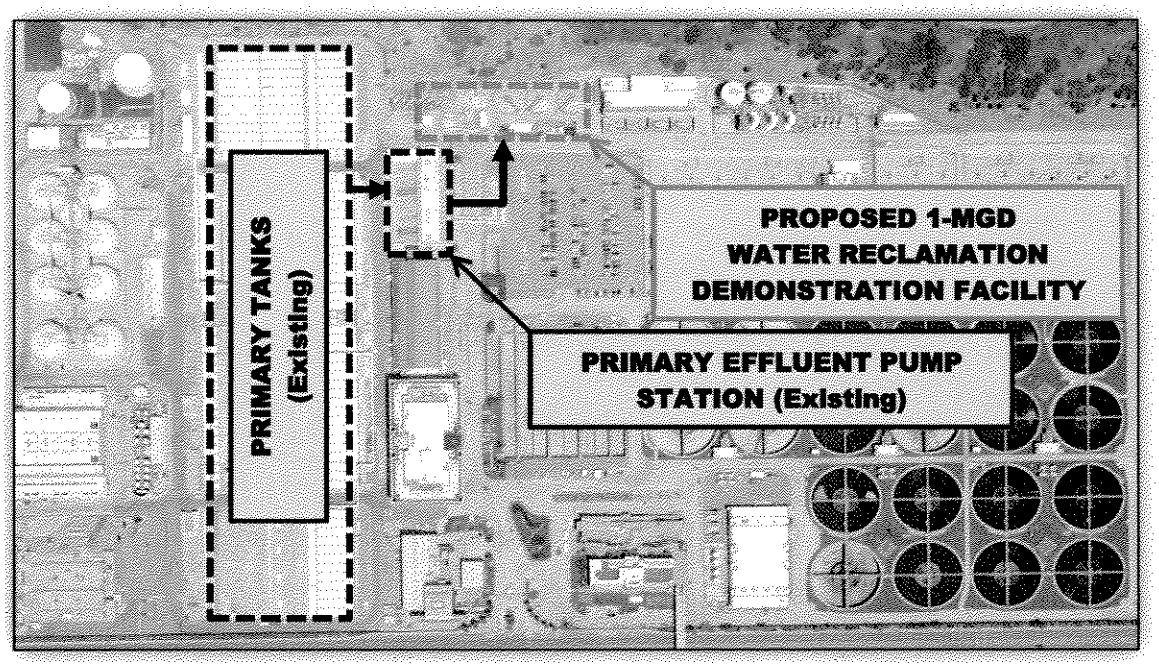
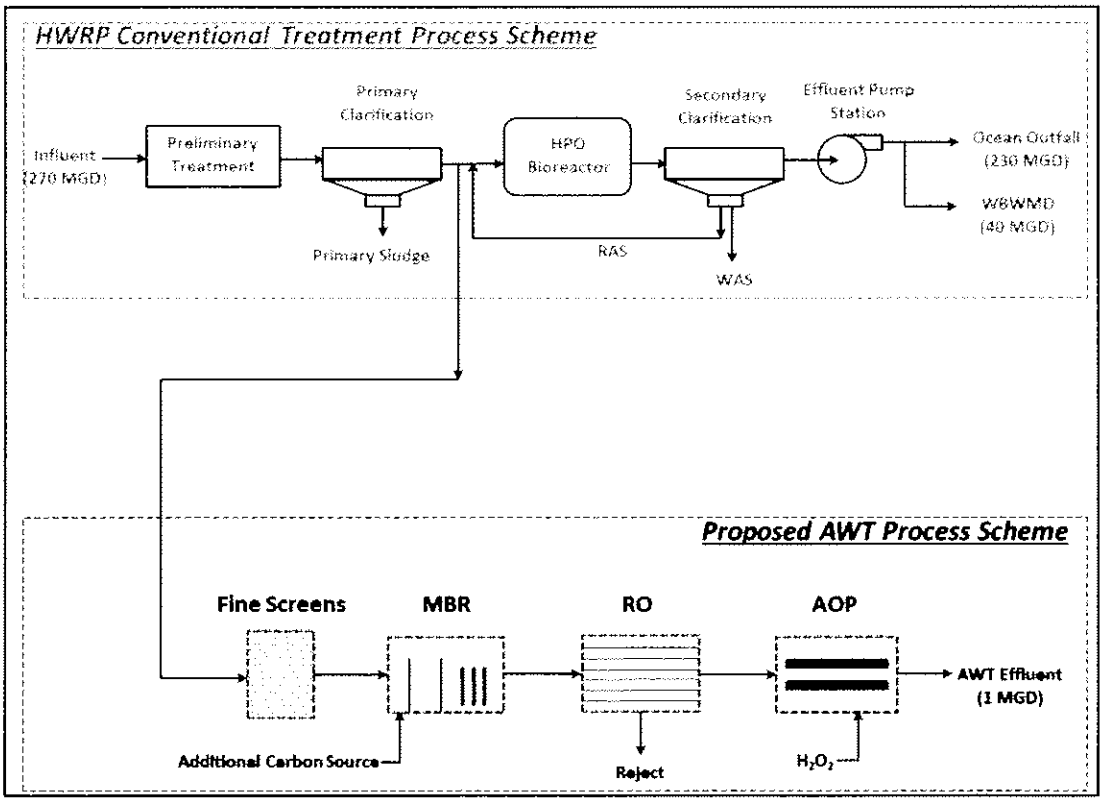


Figure 3- Proposed MBR/RO/AOP Scheme for HWRP Demonstration Project



FINE SCREENING

Fine screening is crucial to protect the downstream MBR train from physical damage and clogging. Appropriate selection and sizing, along with proper O&M is vital in sustaining steady operation of a fine screen train and for protecting the downstream MBR train.
The primary goal of fine screen testing is to select a best-fit design to minimize the screen cleaning frequency and maintaining high removal efficiency to extend MBR membrane durability.

MEMBRANE BIOREACTOR (MBR)

The primary goal of the MBR process is to demonstrate removal of biological nitrogen and phosphorus and to identify operational and design criteria.

The MBR membrane will be operated at various Mixed Liquor Suspended Solids (MLSS) concentrations, Solids Retention Time (SRTs) and flux rates. Highest achievable nitrogen and phosphorus removal efficiencies will be tested using methanol and alum.

Various membranes will be tested to determine operating criteria and design limits, such as flux, fouling, and chemical consumption, etc. for full-scale implementation, based on performance life cycle and cost analysis.

REVERSE OSMOSIS

The RO scheme receives chemically treated nitrified-denitrified MBR effluent. A two-stage RO system will be utilized to maximize the permeate recovery. Reject water flow from the first stage will serve as the feed flow to the second stage. The total RO permeate will consist of permeate flow from the two stages. A Variable Frequency Drive (VFD) will be used to deliver the desired water flux. The concentrate control valve will control the RO system recovery rate.

Various RO membranes will be tested to determine the operating criteria and design limits, such as flux, fouling, and chemical consumption, etc. for full scale implementation, based on performance life cycle and cost analysis.

RO permeate water quality will be characterized by collecting samples and analyzing for pH, alkalinity, TOC, nitrogen compounds, etc.

ADVANCED OXIDATION PROCESS

Following the two-stage RO process, an AOP (UV/H_2O_2) demonstration scheme will be tested to assess the treatability of micro-constituents such as NDMA, 1, 4-dioxane, etc. in compliance with the California Code of Regulations.

UV transmittance will be monitored using a spectrophotometer. Background hydroxyl radical scavenging demand will be determined. The capacity of other constituents to scavenge hydroxyl radicals, thereby diverting oxidative action from the target contaminants will be determined.

Optimal operating conditions will be determined by varying key AOP parameters such as hydrogen peroxide dosage, UV dose (mJ/cm2), UV contact time, wavelength (nm) and power demand (kWh/kgal).

TEST PROTOCOL

A detailed test protocol will be developed to identify constituents for analysis as well as test methodologies. The draft protocol will be provided for review and comment to other project stakeholders, including an Independent Advisory Panel (IAP). Stakeholder and regulatory comments will be incorporated into the final testing protocol.

The test protocol will include a review of existing water quality data to identify constituents with likelihood of exceeding Safe Drinking Water Act (SDWA) primary Maximum Contaminant Levels (MCLs), secondary MCLs, Notification Levels (NLs), NPDES permit levels, or other regulated limits.

As required in the GRRR, the test protocol shall include testing for target constituents that would be effective at evaluating and comparing treatment trains that would impact public health. Persistent contaminants with the potential risk of exceeding MCLs or NLs will be closely monitored.

TECHNICAL PROPOSAL: EVALUATION CRITERIA

STATEMENT OF PROBLEMS AND NEEDS

California is experiencing its worst droughts on record with four consecutive dry years and the record low snowpack of 2015. Drought conditions may continue for a fifth straight year as NOAA Climate Prediction Center forecast indicates that the strong El Niño of 2015/16 is on the decline. Furthermore, it is likely that conditions will transition to neutral by early summer, with about a 50% chance of La Niña by the fall.

There is broad agreement that the state's water management system is unable to satisfactorily meet ecological and human needs and is inadequate in addressing water scarcity induced by climate change and population growth.

Mayor Garcetti has consistently stressed the City of Los Angeles' commitment to establish a more prominent presence in regional water reclamation plans. The HWRP Demonstration Facility, with projected completion date of October 2018, will become a part of a comprehensive framework of sustainability in an effort to put California's water resources on a safer, more sustainable path.

WATER RECLAMATION AND REUSE OPPORTUNITIES

HWRP utilizes a High Purity Oxygen Activated Sludge secondary treatment process treating an average dry-weather flow of 270 MGD of wastewater. Currently, 40 MGD of HWRP's secondary effluent is conveyed to West Basin Municipal Water District for further treatment and distribution to various reclaimed water customers.

LASAN has conducted a study (Hyperion Regional Water Reuse Study) to identify a strategy to expand the current reuse of HWRP water within the context of regional reuse plan that couples the end use of HWRP's water with the appropriate water treatment technology, defines key agencies, and describes the critical technical, legal, and financial obstacles to overcome.

The Hyperion Regional Water Reuse Study explored various water reclamation alternatives including implementation of a Biological Nutrient Removal facility to produce 70 MGD of

nitrified-denitrified reclaimed water using Primary Effluent followed by a 40-MGD AWT train for current and future regional water reuse applications such as industrial, groundwater recharge, sea water barriers, agricultural, IPR, DPR, etc.

The study recommended implementing a 1-MGD water reclamation demonstration facility which will consist of Membrane Bioreactors (MBR) for Biological Nutrient Removal (BNR), Reverse Osmosis (RO) and Advanced Oxidation Process (AOP) trains.

The HWRP Demonstration Facility shall pave the road for the future 70-MGD water reclamation by assessing various treatment components and alternative trains, based on reliability, effectiveness, operational requirements, performance data, design criteria and cost. Additionally, the demonstration facility will provide an opportunity for public education/outreach on water reclamation at HWRP.

DESCRIPTION OF POTENTIAL ALTERNATIVES

The ultimate goal of the HWRP Demonstration Project is to assess various BNR/Advanced Water Purification technologies based on reliability, performance, and cost effectiveness for future, full-scale (70-MGD) reuse of Hyperion effluent. The resultant product water will become a plentiful source of recycled water that will be available to serve the entire, regional watershed area. Descriptions of potential alternatives to be studied include the following technologies and water reclamation measures:

- Assessment of BNR, RO and UV/AOP technologies and recommendation for the best-fit option
- Evaluation of long-term process performance
- Assessment of the system's ability to respond to mechanical, chemical, biological or other operational stresses
- Optimization of process set points for maximized operational efficiency
- Evaluation of footprint area and layout of treatment process components
- Determination of key process parameters, such as Solids Retention Time (SRT), carbon demand for denitrification, oxygen transfer efficiency, etc.

With implementation of the HWRP Demonstration Facility, the City of LA strives for innovations to improve efficiency in recycled water treatment. As such, the innovative use of High Purity Oxygen (HPO) in the BNR process will be instituted in order to minimize process-train footprint while also allowing investigation of the following known issues[1]:

- High sludge production at low SRT
- The buildup of carbon dioxide in the mixed liquor which suppresses pH and inhibits nitrification resulting in impaired biological nutrient removal

NOTE-1: Central Kitsap County Wastewater Treatment Plant Alternatives Development Workshop (October 28, 2008)

In order to benefit from the experience and expertise of water recycling agencies within the region, the HWRP Demonstration Project has pulled together a collaborative effort between LASAN, LADWP and West Basin Municipal Water District (WBMWD).

In 2009, LADWP initiated the Los Angeles Recycled Water Master Plan (RWMP), a comprehensive effort, to explore regional water reclamation opportunities. In addition, the LADWP primary role will be constructing conveyance infrastructure to deliver reclaimed water to regional end-users.

WBMWD was instrumental in developing the Hyperion Regional Water Reuse Study Phase II which recommended the HWRP Demonstration Project as a benchmark for successful implementation of full-scale (70 MGD) water reclamation. Additionally, WBMWD will be an intermediate agency to further process HWRP's effluent and customize it for a variety of applications. Furthermore, WBMWD will provide conveyance infrastructure to supply end-users.

The HWRP reclaimed water will be delivered to some of the customers via WBMWD conveyance system.

The LASAN research team, in charge of HWRP Demonstration Project, has extensive experience in conducting pilot studies which have culminated in the successful implementation and operation of the following water reclamation plants:

- Los Angeles Glendale Water Reclamation Plant (LAGWRP)
- Donald C. Tillman Water Reclamation Plant (DCTWRP)
- Terminal Island Water Reclamation Plant (TIWRP)
- Hyperion Water Reclamation Plant (HWRP)

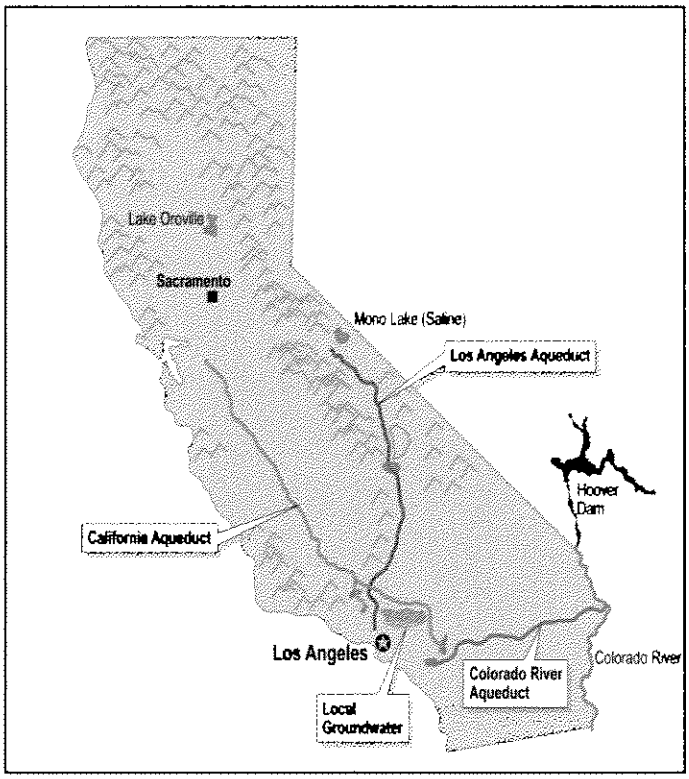
Additionally, the LASAN team has made significant strides in water reclamation through the design and implementation of pilot studies at HWRP's sister plants (LAGWRP, DCTWRP and TIWRP). The DCTWRP pilot study recently completed construction and has started operation. The TIWRP pilot study served as the basis of design for the current Advanced Water Purification Facility (AWPF) which recycles approximately 50% of its plant influent flow of 15 MGD (average dry weather). It has been in operation since early 2006 and is currently undergoing expansion and upgrades to enable recycling of full, influent flow by December 2016.

STRETCHING WATER SUPPLIES

The HWRP Demonstration Project will provide recommendations for regional policies/goals for water recycling and helps provide reclaimed water for continued growth in a sustainable manner by reducing Southern California's dependency on water from the following sources as shown in Figure 4:

- Imported water from the Eastern Sierra Nevada Mountains (Los Angeles Aqueduct)
- Imported water from Bay-Delta (California Aqueduct)
- Imported water from Colorado River
- Local groundwater supply
- Seawater Desalination

Figure 4- Southern California Sources of Water



The HWRP Water Reclamation Study establishes the roadmap for reclaimed water supply of 70 MGD by year 2025, for the following end-use applications:

Seawater Intrusion Barriers

To reduce the influx of seawater into the drinking water aquifers in coastal communities that rely heavily on groundwater

Indirect Potable Reuse (IPR)

To indirectly augment drinking water supplies through Groundwater Replenishment (GWR). This is currently being practiced by agencies such as Orange County Water District (OCWD), etc.

Industrial Uses

To supply reclaimed water for manufacturing and industrial applications such as cooling towers and boiler feed water in refineries and power plants

Direct Potable Reuse (DPR) (Future)

In future years, to directly augment direct, potable, drinking water supplies without buffering. Currently, DPR applications are not permitted by state or federal regulations in the United States due to public health risk and public perception.

ENVIRONMENT AND WATER QUALITY

The HWRP Water Reclamation Study establishes a roadmap for a reclaimed water supply of 70 MGD by year 2025, which will address the following environmental issues:

Groundwater Quality

The AWT reclaimed water from HWRP will be injected into the West Coast and Dominguez Gap seawater intrusion barriers to reduce the influx of seawater protecting the fresh water aquifers in the Central and West Coast Basins (CWCB). Additionally, the HWRP reclaimed water will mitigate the over drafting of groundwater aquifers by reducing the dependency on local groundwater supplies and replenishing the groundwater (GWR).

These projects are regulated by the California Department of Public Health (CDPH) and the Regional Water Quality Control Board (RWQCB) to ensure safety for humans and the environment.

Surface Water Quality

As part of the Machado Lake Ecosystem Restoration Project, the AWT reclaimed water from HWRP will augment Machado Lake to improve the water quality. The 290-acres Machado Lake is located at the Ken Malloy Harbor Regional Park in the Harbor City and Wilmington communities of Los Angeles.

Endangered Species

Expanding the HWRP's reclaimed water production is a major step toward reducing the dependency on imported water from Bay-Delta (California Aqueduct), Eastern Sierra-Nevada (Los Angeles Aqueduct) and Colorado River and supports habitat restoration to preserve the population of endangered species in natural streams.

Receiving Water Bodies (Santa Monica Bay)

The expanded reclaimed water production at HWRP (70 MGD by 2025) will result in significant reduction on HWRP's Secondary Effluent discharge into Santa Monica Bay; thus, is a major step toward restoration of marine habitat in Santa Monica Bay.

LEGAL AND INSTITUTIONAL REQUIREMENTS

Title 22 of the California Code of Regulations (Title 22) governs recycled water treatment in California. The primary legal obstacle to implementing reclaimed water projects is an onerous permitting process. Reclaimed water applications such as IPR implicate existing laws and regulations pursuant to Title 22 of the California Code of Regulations.

A project sponsor is required to validate each of the treatment processes and provide evidence of the treatment process's ability to reliably and consistently achieve the log reduction to meet the requirements of Pathogenic Microorganisms pursuant to California Department of Public Health Regulations (Title 22).

The HWRP Demonstration Project will validate the ability of the AWT process (MBR + RO + UV/AOP) to achieve pathogenic microorganisms credited log reduction and will include an Operation/Optimization and a Monitoring Plan per Title 22. Additionally, Disinfection By-Products (DBPs) and Constituents of Emerging Concern (CECs) will also be monitored for compliance as part of the HWRP Demonstration Project.

The HWRP Demonstration project will produce results to demonstrate compliance with regulatory and institutional requirements to eliminate barriers toward successful implementation of a full-scale, 70 MGD water reclamation facility at HWRP.

Uncertainties affecting timing of research completion in regard to environmental compliance and permitting are considered to be minimal due to the fact that the research study area will be located on fully developed property (HWRP). As described in Section IV.D.5 Environmental Compliance, there are no environmental compliance concerns associated with the construction of the HWRP Demonstration Project. Multiple on-site projects have proceeded without schedule delays associated with environmental compliance and permitting requirements.

RENEWABLE ENERGY AND ENERGY EFFICIENCY

The HWRP Demonstration Project will be a benchmark for selecting/optimizing various treatment trains for energy efficiency and to reduce energy and carbon footprint of BNR/ASP.

The energy use profile for individual process components will be developed as part of this effort. These profiles will be based on wastewater characteristics of the influent and required water quality of the effluent. From there, potential energy saving will be calculated. Additionally, energy saving nomograms will be developed to quantify energy savings for full-scale, reclaimed water implementation at HWRP.

The study will also monitor process parameters associated with Oxygen Transfer Efficiency (OTE). State of the art monitoring sensors will be used to optimize SRT/DO balance, resulting in significant reduction of power requirements.

WATERSHED PERSPECTIVE

The HWRP Demonstration Project was recommended as part of the Hyperion Regional Water Reuse Alignment Study, Phase II to identify a strategy for the reuse of Hyperion water within a regional reuse plan that couples the end use of Hyperion water with appropriate water treatment technologies, defines key agencies, describes obstacles relating to technical, legal, and financial aspects of the program and describes how HWRP effluent may be impacted by these constraints.

The scope of study, relating to Watershed Perspective, includes the following:

- Developing a strategy for water reclamation implementation in collaboration with regional stakeholders such as WBMWD, MWD and LADWP
- Evaluation of potential water quantity and water quality demands in Los Angeles Basin
- A cost-benefit analysis on various water treatment alternatives
- Addressing challenges of collaboration such as the integration of multiple stake-holder approaches into one comprehensive plan
- Addressing regulatory issues, institutional issues, and legal issues associated with groundwater basins

To promote widespread education and support for innovative and substantive water recycling endeavors, the demonstration plant shall be designed to be suitable for public and stakeholder tours.

ENVIRONMENTAL COMPLIANCE

1. ***Will the research study activities impact the surrounding environment (i.e., soil [dust], air, water [quality and quantity], animal habitat, etc.)?***

➢ ***Please briefly describe all earth-disturbing work and any work that will affect the air, water, or animal habitat in the research study area.***

The project will consist of construction activities related to the implementation of AWT (Fine screens, MBR, RO and UV-AOP) and associated facilities. Construction activities may result in potential impacts to the surrounding environment. However, there will be minimal impacts on the surrounding environment as the HWRP Demonstration Facility will be situated within the existing footprint of HWRP as shown in Figure 2.

Air quality impacts from the proposed project are anticipated to insignificant with implementation of mitigation measures and will be limited to the impacts from equipment activity during construction phase.

➢ ***Please also explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.***

Environmental impacts from the proposed project will be insignificant as the project site will be situated within the existing footprint of HWRP (Concrete slab).

Mitigation measures will be implemented to ensure that potential impacts remain insignificant and that project activities will not exceed South Coast Air Quality Management District significance thresholds. Mitigation measures will include the following:

- Using best available control measures during soil disturbance
- Limit allowable engine idling for trucks and heavy equipment
- Utilizing equipment that will minimize diesel-related air quality impacts

Construction activities will be conducted in compliance with local and state stormwater laws. Best Management Practices as defined by HWRP Stormwater Pollution Prevention Plan (SWPPP) will be upheld to prevent offsite water quality impacts.

2. ***Are you aware of any species listed, or proposed to be listed as a Federal endangered or threatened species, or designated Critical Habitat in the research study area? If so, how would they be affected by activities associated with the proposed research study activities?***

There are no known Federal endangered/threatened species/Critical Habitat in the research study activity area as the project site will be located on previously developed land, within the existing footprint of HWRP.

3. ***Are there wetlands or other surface waters inside the research study boundaries that potentially fall under Federal Clean Water Act jurisdiction as "waters of the United States?" If so, please describe and estimate any impacts the research study activities may have.***

There are no wetlands or surface waters inside the research study boundary. Furthermore, any run-off water from the study activity area will be managed according the Hyperion SWPPP (Storm Water Pollution Prevention Plan).

4. ***Are there any known archeological sites in the research study activities area? If so, please describe and estimate any impacts the research study may have.***

   There are no known archeological sites within the research study activities area. Furthermore, the subject area will be located on previously developed land, as it is within the footprint of a fully operational wastewater treatment plant, HWRP.

5. ***Will the proposed research study activities have a disproportionately high and adverse effect on low income or minority populations? If so, please describe and estimate any impacts the research study may have.***

   The proposed research study activities will have no adverse effect on low-income or minority populations. The project will equally benefit the entire population of the region including low income and minority populations by providing solutions to water scarcity.

6. ***Will the research study activities limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands? If so, please describe and estimate any impacts the research study activities may have.***

   The research study activities will not limit access to ceremonial use of Indian sacred sites and will not impact tribal lands, as research study activities will be conducted within the HWRP site.

7. ***Will the research study activities contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area? If so, please describe and estimate any impacts the research study activities may have.***

   The research study activities will not contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species know to occur in the area.

REQUIRED PERMITS OR APPROVALS

Table 1 outlines permits required for developing the proposed research study. LASAN's Regulatory Affairs Division (RAD) will work with the California SWRCB (State Water Resources Control Board) and California RWQCB-Los Angeles Region (Regional Water Quality Control Board) to obtain required permitting with these agencies. Design and construction firms, contracting with LASAN to build the HWRP Demonstration Facility, will take the lead on obtaining permitting in regard to California DWR, SCAQMD, and Department of Building and Safety.

Table 1 - Required Permits

Agency	Permit, Approval, or Review
California State Water Resources Control Board (SWRCB)	• Review for compliance with Recycling Policy • Approval of California Water Code (CWC) section 1211 process • NPDES Permit for Discharges
California Regional Water Quality Control Board, Los Angeles Region (Regional Board)	• Permit for groundwater recharge (Waste discharge requirements--WDR) • Title 22 Report review • CWA Section 401 Water Quality Certification for water quality impacts of construction • Regulation of recharge into a potable groundwater basin • Regulation of injection wells into a potable basin
California Department of Water Resources (DWR)	• Injection well permit
South Coast Air Quality Management District (SCAQMD)	• Revision to existing HTP Permit to Operate
Department of Building and Safety	• Construction plans plan checks and permits

RESEARCH STUDY BUDGET

FUNDING PLAN

Table 2 - Summary of Non-Federal and Federal Funding Sources

Funding Sources	Funding Amount
Non-Federal entities	
LA Sanitation	$13,795,048.00
Non-Federal subtotal:	$13,795,048.00
Other Federal entities	$0
Requested Reclamation funding:	$300,000
Total Research study funding:	**$14,095,048.00**

Table 3 - Funding Sources

Funding sources	Percent of total research study cost	Total cost by source
Recipient funding	97.9%	$13,795,048.00
Reclamation funding	2.1%	$300,000
Other Federal funding	0%	$0
Totals	100%	**$14,095,048.00**

BUDGET PROPOSAL

OPINION OF PROBABLE CONSTRUCTION COST (OPCC)

The OPCC is classified as Class 4 Cost Estimates by the Association for the Advancement of Cost Engineering (AACE) International. Class 4 estimates are generally prepared based on limited information and have wide accuracy ranges. The level of project definition is between 1% and 15%. Class 4 estimates use equipment and size factoring, parametrics and modeling techniques. The accuracy range limits for a Class 4 estimate are low -15% to -30% and high +20% to +50% with a 90% confidence that the actual cost will fall within the bounds of these ranges after application of appropriate contingencies as defined by AACE International.

It should be noted that the OPCC was escalated to reflect the implementation schedule that shows construction starting in October of 2016. Finally, OPCC pricing assumes competitive market conditions, defined as three or more bidders per trade. In addition to the equipment and structural construction costs, the following cost items have been included in Table 4:

Table 4- OPCC for HWRP Demonstration Project

ITEM	UNIT	LABOR	MATERIAL	EQUIPMENT	TOTAL
Mobilization/Demobilization		$34,543	$165,486		$200,029
Fine Screens		$32,629	$53,457	$36,543	$122,629
MBR		$613,686	$1,277,286	$1,263,914	$3,154,886
RO-UV-AOP		$721,125	$1,381,635	$1,461,015	$3,563,775
TOTAL		$1,401,982	$2,877,864	$2,761,472	$7,041,318
Estimated Contingency	10%	$140,198	$287,786	$276,147	$704,132
Scope Contingency	5%	$70,099	$143,893	$138,074	$352,066
Subtotal		$1,612,279	$3,309,543	$3,175,693	$8,097,516
Sales Tax	9%	NA	$297,859	$285,812	$583,671
Subtotal		$1,612,279	$3,607,402	$3,461,505	$8,681,187
Labor Overhead	38%	$612,666	NA	NA	$612,666
Subtotal		$2,224,946	$3,607,402	$3,461,505	$9,293,853
Escalation	6%				$557,631
Subtotal					$9,851,484
Engineering & Administration	10%				$985,148
Permitting/Enviro/Geotech	10%				$985,148
Construction Management	10%				$985,148
Procurement/Execution	3%				$295,545
Inspection/Startup Testing	5%				$492,574
Testing and Data Analysis					$500,000
TOTAL					**$14,095,048**

BUDGET NARRATIVE

MOBILIZATION/DEMOBILIZATION

The costs associated with mobilization and demobilization include field offices and associated equipment, such as office equipment, communications and utilities. Site controls for survey, layouts, and benchmarks, environmental controls for stormwater, dust, and noise are included. Work area protection including lighting, visual barriers, signage and fencing are incorporated. Closeout includes the removal of field office, final housekeeping and area restoration.

FINE SCREENS

The fine screens will be installed in the area that currently houses the existing, out-of-service Dissolved Air Floatation (DAF) system. The installation will require the demolition of the DAFs. It was determined that it would be more cost beneficial to demolish the all of the equipment, even though only a portion of the area is needed for 1 MGD of screens. The screens will be contained in a building to protect them from the elements as well as the neighboring view.

In addition to the center flow screens and motors that will be constructed, Variable Frequency Drives (VFDs) will be supplied for the screens to modulate the rate at which the screens turn.

The screenings will be collected in a chute and sent to the solids processing. Washdown assembly will also be needed to ensure that the screens do not become clogged.

Various instrumentation will be supplied to monitor the level in the screening channels, headloss, and flow. The construction costs for the fine screens are summarized in Table 5.

Table 5- Estimated Construction Costs for Fine Screens

ITEM	LABOR	MATERIAL	EQUIPMENT	TOTAL
Site Work				
Demolition	$14,971	$8,657		$23,629
Influent/Effluent Connection	$3,086	$1,371		$4,457
Screening Building	$5,914	$19,857	$7,914	$33,686
Electrical	$5,543	$13,486	$3,743	$22,771
Subtotal	$29,514	$43,371	$11,657	$84,543
Equipment & I&C Installation				
Gates			$3,000	$3,000
Screens			$20,286	$20,286
VFD			$429	$429
Discharge Assembly			$200	$200
Slide Rails			$486	$486
Washdown Assembly			$29	$29
Instrumentation			$457	$457
Installation	$3,114	$10,086		$13,200
Subtotal	$3,114	$10,086	$24,886	$38,086
TOTAL	**$32,629**	**$53,457**	**$36,543**	**$122,629**

MBR

The MBR process scheme will be constructed in the area that currently houses the existing, out-of-service Dissolved Air Floatation (DAF) system. The installation will require the demolition of the DAFs. It was determined that it would be more cost beneficial to demolish the all of the equipment, even though only a portion of the area is needed for screens.

Buildings will be constructed to house the new blowers and the ancillary support equipment for the MBR. The construction costs are divided to account for the building components that are common to both buildings, such as eyewashes, stairways, and lighting, separately from the equipment that the buildings will house.

The ancillary support equipment consists largely of chemicals that are used for cleaning. The chemical pumps will be equipped with VFDs. Bridge cranes will also be supplied to aid with the lifting of the membrane cassettes and blowers for periodic maintenance.

Permeate will be pumped from the MBR tank into a tank for use in the RO system. The permeate pumps will be equipped with a VFD. Table 6 summarizes the construction costs of the MBR system.

Table 6 - Estimated Construction Costs for MBR

ITEM	LABOR	MATERIAL	EQUIPMENT	TOTAL
Demolition	$25,571	$116,229		$141,800
Influent/Effluent Connection	$78,714	$41,057		$119,771
Buildings	$221,000	$493,571	$59,943	$774,514
Electrical	$65,971	$178,914	$100,400	$345,286
Subtotal	$391,257	$829,771	$160,343	$1,381,371
Equipment & I&C Installation				
Reactor Retrofit				
Gates			6,000	6,000
Anoxic Mixer			9,000	9,000
IMLR Pump			25,457	25,457
IMLR VFD			8,914	8,914
Air Pipe			6,086	6,086
Fine Bubble Diffuser			32,571	32,571
Instrumentation			3,657	3,657
Installation	19,200	219,514		238,714
Subtotal	19,200	219,514	91,686	330,400
Blower System				
Blower			$128,571	$128,571
Bridge Crane			$1,286	$1,286
Instrumentation			$743	$743
Installation	$8,257	$30,114		$38,371
Subtotal	$8,257	$30,114	$130,600	$168,971
MBR System				
Eyewash			$143	$143
Washdown Assembly			$57	$57
Slide Rail for Pump			$486	$486
Bridge Crane			$5,714	$5,714
VFD			$429	$429
Membrane System			$714,286	$714,286
Gates			$9,686	$9,686
Permeate Pump			$11,714	$11,714
Backpulse Pump			$1,657	$1,657
CIP Pump VFD			$914	$914
RAS Pump			$90,000	$90,000
RAS Pump VFD			$24,000	$24,000
WAS Pump			$11,143	$11,143
WAS Pump VFD			$914	$914
Instrumentation			$10,143	$10,143
Installation	$194,971	$197,886		$392,857
Subtotal	$194,971	$197,886	$881,286	$1,274,143
TOTAL	**$613,686**	**$1,277,286**	**$1,263,914**	**$3,154,886**

AWT (RO-UV/AOP)

The RO-UV/AOP process scheme will be constructed in the area that currently houses the existing, out-of-service Dissolved Air Floatation (DAF) system. The installation will require the demolition of the DAFs.

Buildings will be constructed to house the new blowers and the ancillary support equipment for the MBR. The construction costs are divided to account for the building components that are common to both buildings, such as eyewashes, stairways, and lighting, separately from the equipment that the buildings will house.

The ancillary support equipment consists largely of chemicals that are used for cleaning. The chemical pumps will be equipped with VFDs. The RO building will house the ancillary support equipment for the facility, such as the chemicals needed for cleaning and stabilization of the product water. This includes storage tanks and pumps. The construction costs are divided to account for the building components that are common to buildings, such as eyewashes, stairways, and lighting, separately from the equipment that the buildings will house. Table 7 summarizes the construction cost of the RO-UV/AOP system.

Table 7- Estimated Construction Costs for AWT (RO-UV/AOP)

ITEM	LABOR	MATERIAL	EQUIPMENT	TOTAL
Demolition	$95,400	$104,085		$199,485
Influent/Effluent Connection	$154,620	$72,270		$226,890
Building	$288,675	$638,595	$4,635	$931,905
Electrical	$82,755	$224,370	$125,955	$433,080
Subtotal	**$621,450**	**$1,039,320**	**$130,590**	**$1,791,360**
RO System & Structure				
Washdown Assembly			$90	$90
Bridge Crane			$11,250	$11,250
Filtrate Pumps			$62,010	$62,010
RO Membranes			$739,350	$739,350
Cartridge Filters			$6,210	$6,210
Primary Concentrate Pumps			$6,930	$6,930
Degasifier Tower			$27,000	$27,000
Fan			$13,500	$13,500
RO Flush Pump			$8,415	$8,415
Brine Waste Pump			$11,250	$11,250
Product Water Pump			$88,020	$88,020
Instrumentation			$210,645	$210,645
Installation	$81,945	$279,675		$361,620
Subtotal	**$81,945**	**$279,675**	**$1,184,670**	**$1,546,290**
UV-AOP System			$121,500	$121,500
Chemical System			$21,060	$21,060
Instrumentation			$3,195	$3,195
Installation	$17,730	$62,640		$80,370
Subtotal	**$17,730**	**$62,640**	**$145,755**	**$226,125**
TOTAL	**$721,125**	**$1,381,635**	**$1,461,015**	**$3,563,775**

ESTIMATED CONTINGENCY
Estimate contingency was included at 10% to cover variability in quantification efforts.

SCOPE CONTINGENCY
Scope contingency was included at 5% for owner preferences, and unknown requirements design requirements.

SALES TAX
Sales Tax was included for the equipment and material costs at 9%.

LABOR OVERHEAD
Labor overhead was included to account for the cost of labor such as insurance, benefits and payroll.

ESCALATION
Escalation was included at 6%. This applies to labor, materials and equipment.
Escalation is prorated from the current date to the mid-point of construction, approximately 1.5 years.

ENGINEERING/ADMINISTRATIVE
10% allowance of the Total Direct Cost

PERMITTING/ENVIRONMENTAL/GEOTECHNICAL
10% allowance of the Total Direct Cost

PROJECT CONSTRUCTION MANAGEMENT
10% allowance of the Total Direct Cost

PROCUREMENT/EXECUTION STRATEGY
3% allowance of the Total Direct Cost

DRAFT OFFICIAL RESOLUTION

RESOLUTION OF THE CITY COUNCIL OF THE CITY LOS ANGELES TO APPLY FOR ACCEPT, NEGOTIATE, AND EXECUTE AN AGREEMENT FOR GRANT FUNDING WITH THE U. S. DEPARTMENT OF THE INTERIOR'S BUREAU OF RECLAMATION FOR THE WATERSMART: WATER RECLAMATION RESEARCH UNDER THE TITLE XVI WATER RECLAMATION AND REUSE PROGRAM FOR FISCAL YEAR 2016

WHEREAS, the U. S. Department of the Interior, Bureau of Reclamation has made $2,000,000 available in total funding under the WaterSMART: Water Recycling and Reuse Research for the Title XVI Water Reclamation and Reuse Program for Fiscal Year (FY) 2016 (Program);

WHEREAS, the intent of the Program is to provide grants for research studies to address water supply challenges by establishing or expanding water reuse markets, improving existing water reuse facilities, and streamlining the implementation of state of the art technology for new facilities;

WHEREAS, Program procedures established by the Bureau of Reclamation require that an official resolution adopted by the applicant's governing body be submitted up to 30 days after the application submission deadline;

WHEREAS, the Hyperion Water Reclamation Plant's Water Reclamation Demonstration Facility (Project) has been identified by the City to be eligible for grant funding up to three-hundred thousand dollars ($300,000) with a minimum match of 75% under the program;

WHEREAS, the total estimated project cost is fourteen million ninety five-thousand forty eight dollars ($14,095,048); and

NOW THEREFORE BE IT RESOLVED, with the concurrence of the Mayor, the City Council of the City of Los Angeles hereby,

1. Authorizes the Director of the Bureau of Sanitation (LASAN), or designee, to apply for, accept, negotiate, and execute all documents, including but not limited to, applications, agreements, amendments, subject to the approval of the City Attorney as to form, which may be necessary to secure grant funding of up to $300,000, if awarded, from the U.S. Department of the Interior for the Hyperion Water Reclamation Plant's Water Reclamation Demonstration Facility;

2. Certifies that LASAN is capable of providing $14,095,048 from the Sewer Construction and Maintenance Fund to implement the Project; and,

3. Certifies that LASAN will work with the Bureau of Reclamation to meet established deadlines for entering into a cooperative agreement.

PASSED and ADOPTED by the City Council this _____ day of _____, 2016, by the following vote:

AYES: _____

NOES: _____

ABSENT: _____

I certify that the foregoing Resolution was adopted by the Council of the City of Los Angeles at its meeting on _____, 2016.

HOLLY L. WOLCOTT, Interim City Clerk

By: _____
Deputy City Clerk