Valiano
Wastewater Treatment and Water Reclamation Plant Preliminary Design Report

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Contents

Appendices

Tables

Figures

Valiano Wastewater Treatment and Water Reclamation Plant (WTWRF) Preliminary Design Report

February 2016

1. Summary and Findings

The proposed Valiano development, located in San Diego County, will require provisions for treatment and reuse of wastewater generated by the community. Wastewater treatment could potentially be accomplished with a Standalone Plant (Option 1), a Scalping Plant (Option 2), or a Standalone Plant without Solids Processing (Option 3). The following points summarize the findings of this report regarding wastewater treatment for the Valiano development:

- The Valiano WTWRF will be located approximately one mile from the existing Harmony Grove WTWRF. It is assumed that both facilities will be operated by a single entity, possibly the County or other agency, and therefore providing continuity between the two plants will help simplify and streamline operations and maintenance requirements. All options considered in this report assume that the laboratory space at the Harmony Grove WTWRF will be used for sample analysis for the Valiano WTWRF, and therefore laboratory space will not be provided at the Valiano WTWRF. Similarly, personnel space will be shared between the two facilities and is located at the Harmony Grove WTWRF.
- The Harmony Grove WTWRF was designed to serve only the Harmony Grove Village, and any proposed options that utilize the plant may not be feasible. The final Valiano Sewer Facilities option will be subject to approval by the agency that will own and operate the sewer facilities.
- The Aero-Mod treatment process is a pre-engineered, pre-packaged system that will meet the treatment requirements for the Valiano WTWRF. A similar Aero-Mod system is installed at the Harmony Grove WTWRF, and elsewhere in San Diego County.
- Given the magnitude of the proposed Valiano WTWRF, certain components of the plant can be scaled back compared to the Harmony Grove WTWRF. Specifically, the Flow Equalization Tank could be an offline system only dedicated to storing flow in excess of PDWF (Options 1 and 3), rather than passing all flow through the Equalization Tank. Additionally, disk filters have been identified for use at Valiano WTWRF, as opposed to the deep-bed sand filters installed at the Harmony Grove WTWRF.
- Flow from the Valiano development could potentially be diverted to the Harmony Grove WTWRF in case of an emergency or for operations and maintenance at the Valiano WTWRF. The Valiano WTWRF could therefore be designed with minimal to no redundancy. Additionally, the Valiano WTWRF could rely on the Harmony Grove WTWRF for solids processing. The logistics of these possibilities must be explored in the detailed design of the Valiano WTWRF.

- The capital cost summary of the three options identified to provide wastewater treatment at Valiano is as follows, listed from least cost to greatest cost:

Option	Capital Cost	Cost per Gallon
Option 2, Scalping Plant	$3,338,230	$46/gal
Option 3, Standalone Plant without Dewatering	$3,950,110	$55/gal
Option 1, Standalone Plant	$4,682,480	$65/gal

2. Introduction

The proposed Valiano development (project) is located on approximately 239 acres within the unincorporated area known as Eden Valley located in northern San Diego County. The property is located approximately one mile south of State Route 78 (SR-78) and the Nordahl Road exit along Country Club and Hill Valley Drives. When fully developed, the project will contain 326 residential units on varying lot sizes within five neighborhoods. The project is being processed as a General Plan Amendment and Specific Plan with the County of San Diego (County). See **Figure 1** for project location within the County.

Project Description. The proposed Valiano development will consist of 326 residential units encompassing approximately 239 acres located in the unincorporated area known as Eden Valley, just west of the city of Escondido.

Purpose of Report

The purpose of this report is to develop a design concept for a stand-alone Valiano Wastewater Treatment and Water Reclamation Facility (WTWRF), and explore the opportunities and constraints associated with a modified "scalping" plant that relies on redundancy from the 0.18 million gallon per day (mgd) Harmony Grove Plant.

Title 22 Regulations

The water reclamation facility project will comply with the State of California and the County of San Diego Health Department requirements for the use of the treatment, disinfection, storage and distribution of recycled water. All the provisions of Title 22 Code of Regulations dated January 2009, for unrestricted reuse of recycled water will be followed.

3. Proposed County Sewer System to Serve Valiano

An on-site collection system and a new WTWRF owned and operated by the County will be required for sewer service. The WTWRF is presented in this preliminary project concept design report.

Recycled water would be conveyed to Rincon Del Diablo Municipal Water District (Rincon MWD) for on-site irrigation and disposal.

3.1 Sewer Collection System

Wastewater Flows

Design criteria published by San Diego County was used to estimate the total projected flow to the Valiano WTWRF. Typical residential wastewater flows in San Diego County have been observed between 60 to 70 gallons per person over the past several years resulting from reduced indoor water use and conservation and economic impacts. Based on the estimated residential density for the Valiano development of 2.9 people per house, the flow could range from approximately 175 gpd/EDU to 200 gpd/EDU. San Diego County design criteria calls for 215 gpd/EDU based on a more conservative flow and 3.0 people per unit. In order to provide a conservative design for the WTWRF and to comply with the County design criteria, the Valiano WTWR will be based on a flow of 215 gpd/EDU.

Given the expected population of the Valiano WTWRF service area, the average sewer flow to the WTWRF is estimated as 72,100 gpd. Design peak flows were also calculated using factors from the San Diego County design criteria. Peak flow factors and resulting flow conditions are summarized on **Table 1.** According to the peaking factors of the design criteria, peak wet-weather wastewater flows to the Valiano WTWRF could reach up to 288,300 gpd, or approximately 200 gallons per minute (gpm).

Table 1 Project Wastewater Generation

Site	Units/Acres	Unit (gpd/unit)	Average Flow (gpd)	PDWF (gpd)	PWWF (gpd)
Condominium Residential (detached)	49	180	8,820	21,350	35,280
Single Family Residential	277	215	59,560	144,120	238,220
Neighborhood Park	2.7	450	1,080	2,610	4,320
Recreation Center	2.9	900	2,610	6,320	10,440
Total	**326**		**72,100**	**174,400**	**288,300**

Notes: Design criteria for the WTWRF facility is a peaking factor of 2.11 per County e-mail, with design flows for WTWRF being 152,100 gpd.
Park includes only restroom facility and recreation center each assumed at 90% of water use for return to sewer flow.
Pump station design flows: Peak Dry Weather Flow (PDWF) PF = 2.42; Peak Wet Weather Flow (PWWF) PF = 4.0

System and Hydraulic Profile

Based on the project topography, the proposed on-site sewer system would generally flow to a low point in the southeast potion of the project, at the proposed WTWRF. A series of lift stations is required however to convey flow from the service area to the WTWRF. **Figure 2** illustrates the location of the proposed sewer collection system. All on-site gravity sewer pipeline sizes are a minimum of 8 inches.

Sewer lift stations are required to convey flows through the project. A preliminary design report would be prepared and submitted to the County for approval outlining the specific lift station design requirements. Two smaller lift stations (LS 1 and LS 3) each serving only about 10 to 37 homes are assumed privately owned and maintained by a Homeowner Association (HOA).

The WTWRF will receive gravity flow at an influent manhole with a depth of approximately 5 feet. During final design the influent depths can be adjusted if a slightly deeper manhole is preferred. Hydraulics through the Valiano WTWRF are discussed further in Section 4 of this report.

4. Valiano WTWRF

The Valiano project will require an on-site WTWRF to accommodate the wastewater treatment and disposal needs within the project's development timeline. The primary treatment process at the Valiano WTWRF will be an extended-aeration AeroMod system, similar to the process recently installed at the Harmony Grove WTWRF. Considering the close vicinity of the proposed Valiano WTWRF to the Harmony Grove WTWRF, providing a similar system at both locations will help simplify and streamline County operations and maintenance requirements.

Several options for design of the Valiano WTWRF were developed to minimize cost and optimize efficiency of plant maintenance and operations. The three options are summarized as follows:

Option 1 – Standalone Plant. This option involves provision of a wastewater treatment plant that does not rely on other regional plants for supplemental treatment processes. This option, along with all other options, assumes that the laboratory space at the Harmony Grove WTWRF will be used for regulatory analysis of samples from the Valiano WTWRF. **Figure 4** provides a site plan for the proposed Option 1 layout.

Option 2 – Scalping Plant. This option assumes that the Valiano WTWRF will only be designed for peak dry weather flow conditions, without provisions for redundancy. All peak flow beyond the PDWF will be diverted to the Harmony Grove WTWRF. Additionally, the Harmony Grove WTWRF will be used as backup if one or more of the processes at Valiano must be removed from service. Additionally, this option assumes that all solids from the Valiano WTWRF will be conveyed to Harmony Grove for processing. **Figure 5** provides a site plan for the proposed Option 2 layout.

Option 3 – Standalone Plant without Solids Processing. This option is identical to Option 1, with the exception that solids from the Valiano WTWRF will be conveyed to the Harmony Grove WTWRF for processing. **Figure 6** provides a site plan for the proposed Option 3 layout.

Option 1 will be discussed in this section of the report to serve as a baseline for the design of the Valiano WTWRF. Subsequent sections provide detail regarding Options 2 and 3.

4.1 Treatment Process Introduction

The Valiano WTWRF will include the following components, which are discussed in further detail throughout this report:

- **Headworks and Influent Pump Station –** the Headworks will serve to remove large inorganic debris from the influent wastewater to prevent clogging and damage of downstream pumps and equipment.
- **Flow Equalization –** all influent flow exceeding the Peak Dry Weather Flowrate (0.174 mgd) will be diverted to an Equalization Tank for storage until the influent flow rate is consistently below the PDWF rate. This will help to minimize the size of the treatment equipment, while minimizing use of the Equalization tank.
- **AeroMod Treatment System –** the main treatment component of the plant. The purpose of the AeroMod system is to reduce the Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), Total Nitrogen (TN) and Total Phosphorus (TP) of the influent wastewater. The Aero-Mod system includes aeration zones, clarification, and aerobic digestion.
- **Tertiary Disk Filters –** the tertiary cloth disk filters will be housed in the Operations Building, and will serve to reduce turbidity to effluent standards.
- **Disinfection –** chlorine addition and contact tanks will be provided in accordance with Title 22 standards to adequately disinfect plant effluent. Chemical storage and metering equipment will be housed in the Operations Building.
- **Effluent Pumping Station –** conveys treated effluent to the Wet Weather Storage facility, or directly to the Rincon MWD.
- **Solids Dewatering –** a Centrifuge Dewatering System to dewater solids for off-site disposal. The centrifuge dewatering system will be installed in the Operations Building.
- **Odor Control –** will be provided to mitigate odors from the Headworks and the Centrifuge Dewatering system.
- **Off-Quality Effluent Storage –** to temporarily store effluent that does not meet treatment requirements. Off-quality effluent storage will also receive backwash water from the Disk Filters, and centrate from the Centrifuge. The contents of this tank will be pumped to the head of the facility for additional treatment as influent flow conditions permit.
- **Wet-Weather Storage –** will be provided offsite. Cartridge filters provide treatment to water stored in the wet-weather facility as it is conveyed to the Rincon MWD.

A process flow diagram of the proposed Valiano WTWRF is provided on **Figure 3** of this report.

4.2 Design Criteria

Design Flows

The Valiano WTWRF will be designed to treat average and peak flows as outlined in section 2.1 of this report. Design flows are based on the total anticipated quantity of EDUs in the development, and a flowrate of 215 gpd generated from each EDU. A summary of the design flows is provided in **Table 2.**

Table 2 Design Flow

Design Flow	Peaking Factor	Flow Value (gpd)
Average Daily Flow (ADF)	-	72,000
Peak Dry Weather Flow (PDWF)	2.42	174,000
Peak Wet Weather Flow (PWWF)	4.00	288,000

Influent Wastewater Criteria

Design criteria for influent characteristics and strength was generated using assumed values for typical domestic wastewater. The anticipated loading per capita per day was obtained from Metcalf & Eddy, and assumes that kitchen waste will be disposed in the sewer system. A summary of the influent criteria used in design is provided in **Table 3.**

Table 3 Influent Wastewater Criteria

	Load per Capita	Average Loading		Peak Month	Peak Day
Constituent	lbs/day	lbs/day	mg/L	lbs/day	lbs/day
Biological Oxygen Demand (BOD)	0.22	210	350	260	510
Chemical Oxygen Demand (COD)	0.48	460	770	560	1,110
Total Suspended Solids (TSS)	0.25	240	400	320	630
Ammonia Nitrogen (NH_3-N)	0.019	18	30	23	27
Total Kjelddahal Nitrogen (TKN)	0.032	30	50	39	64
Total Phosphorus (TP)	0.0076	7	12	9	12
Inorganic Phosphorus	0.0048	5	8	6	7

Effluent Wastewater Criteria

Effluent from the Valiano WTWRF will comply with Title 22 of the California Code of Regulations, Section 60304, “Use of Recycled Water for Irrigation.” The following specific treatment goals from the Title 22 regulations will serve as the basis of design for the Valiano WTWRF:

- Filter effluent turbidity less than 2 NTU. Filter influent turbidity must not be greater than 5 NTU for more than 15 consecutive minutes, and should never exceed 10 NTU (Section 60304).

- Filtered wastewater will be disinfected by a chlorine disinfection process following filtration that provides a CT value of not less than 450 mg-min/L at all times with a modal contact time of at least 90 minutes, based on peak dry weather flow (Section 60301.230).

- The median concentration of total coliform bacteria measured in the disinfected effluent should not exceed an MPN of 2.2 per 100 mL utilizing the bacteriological results of the last seven days for which analyses have been completed and the number of total coliform bacteria does not exceed an MPN of 23 per 100 mL in more than one sample in any 30-day period. No sample shall exceed an MPN of 240 total coliform bacteria per 100 mL.

4.3 Hydraulic Profile

A Hydraulic Profile of the proposed Valiano WTWRF is provided in **Figure 7** of this report. As shown on the hydraulic profile, the influent sewer to the plant is expected to enter the facility at a relatively shallow elevation, around 5 feet below grade, although this depth could be modified during final design. Flow will move directly by gravity from the influent manhole to the Headworks screening channel. As flow exits the screening channel, the hydraulic grade line is approximately seven feet below grade, and continued gravity flow through the plant is therefore not practical. Flow is pumped from the Headworks to the Equalization Tank splitter box. The splitter box will direct all flow below the PDWF rate by gravity through the Aero-Mod system, and all flow above PDWF to the Flow Equalization Tank. From the Aero-Mod, flow will continue to move by gravity through the Disk Filters, the Chlorine Contact Tank, and into the Effluent Pump Station.

In addition to the Influent and Effluent Pumping Stations, pumping will be required from the Flow Equalization Tank and the Off-Quality Effluent Storage tank on an as needed basis.

4.4 Influent Headworks and Pumping Station

The primary purpose of the Headworks is to remove large, inorganic debris from the influent wastewater to prevent clogging and/or damage to downstream pumps and equipment. Given the hydraulic profile through the Valiano WTWRF, an in-channel Rotating Drum Screen is proposed for the Headworks facility. A catalogue cut with information regarding a potential Rotating Drum Screen is provided in Appendix A of this report. A plan sketch of the proposed Headworks is provided on **Figure 8**.

Flow from the influent sewer will enter the Headworks by gravity and spill into a 2-foot wide concrete channel recessed into the Headworks floor. Flow typically moves through a Rotating Drum Screen, which is configured with the main screening unit inside the channel. The screening unit itself is a perforated plate basket type screen, situated at an angle within the channel. Flow moves into the center of the basket, and passes through the perforations in the screen. Debris collects inside the basket, until the water level upstream of the screen reaches a pre-set value. At this point, the screen basket and interior screw rotates to convey solids out of the channel, into the washer/compactor. Screen perforations will have a diameter of 0.25-inches. The screen basket is automatically washed to prevent debris from accumulating on the surface of the screen. A non-potable water (NPW) source is typically required for washing the screen basket.

The washer/compactor is integral to the screening unit, and serves to wash organics from the screenings back into the wastewater. This prevents wasting of organics, and mitigate odors from the screenings. Wash water is obtained from the recycle water source used to clean the screen basket. Once washed, the unit compacts the screenings and discharges them to a dumpster located below the unit. As shown on **Figure 8**, an overhead door adjacent to the plant driveway will facilitate removal of the dumpster for off-site disposal.

All materials of construction for components of the influent screen in direct contact with influent wastewater will be AISI Type 304 Stainless Steel. This includes the screen basket, the transport tube for screenings, and the screw conveyor. The influent screen with washer/compactor will be designed to handle PWWF of 0.288 mgd.

Design criteria for the screening unit is provided on **Table 4**.

Table 4 Influent Screen - Design Criteria

Parameter	Criteria
Screen Type	Rotating Drum Screen
Quantity	1
Channel Width	24-in
Basket Diameter	23-in
Perforated Opening	0.25-in
Screen Inclination	35°
Screw Conveyor Diameter	10-in
Water Requirements	15 gpm @ 80 psi
Motor Rating	2.0 HP

As shown on **Figure 8**, a bypass screen with a manually cleaned bar-rack is provided to screen solids if the Rotating Drum Screen is out of service. The manual bar rack will be pre-fabricated of aluminum, and will include bars spaced at ½-inch. The gate to the bypass channel will normally be closed, but can be opened manually by operations staff if removing the Rotating Drum Screen from service. A slide gate will also be provided in the channel to the Rotating Drum Screen to isolate the channel for maintenance purposes. Additionally, an overflow line is provided on the influent channel upstream of the isolation gates, to divert flow to the bypass channel if the Rotating Drum Screen becomes clogged.

NFPA Requirements

According to National Fire Protection Agency (NFPA) 820, "Standard for Fire Protection in Wastewater Treatment and Collection Facilities", screening facilities must be ventilated at a minimum rate of 12 Air Changes per Hour (ACH) to meet National Electric Code (NEC) of Class

1, Division 2 classification. Under Class 1, Division 2 requirements, electrical components such as motors and control panel enclosures are not required to be explosion proof. Atkins recommends ventilating the Headworks facility through the Odor Control System at a rate of 12 ACH to eliminate the need for costly explosion proof equipment. Assuming an interior height of 14 feet for the Headworks, the building will require ventilation at 1,750 cfm. The Headworks building will be ventilated through the Odor Control System, discussed in Section 3.12 of this report.

Influent Pumping Station

Screened wastewater from the Headworks will flow by gravity to the influent pumping station. The influent pumping station includes a wet well with valve vault. Two submersible, centrifugal pumps are provided in the wet well, designed to convey flow to the Equalization Tank splitter box. As will be discussed in Section 3.4 of this report, the Equalization Tank splitter box will be configured to distribute flow to either the Aero-Mod process or to the Equalization Tank, depending on the rate of influent flow. The influent pump station must therefore be set to pump flow continuously to the splitter box at the same rate that flow is entering the pump station. In order to accomplish this method of operation, the influent pumps will be equipped with VFDs, and set to seek a given level in the wet well.

Design criteria for the Influent Pump Station is provided in **Table 5.**

Table 5 Influent Pump Station Design Criteria

Parameter	Criteria
Configuration	Submersible
Quantity of Pumps	2
Type of Pump	Centrifugal
Design Flow, max.	200 gpm
Design TDH, max.	25 feet
Wet Well Diameter	6 feet
Operating Depth	2.0 feet
Motor Rating	3 HP

4.5 Flow Equalization

Wastewater pumped from the influent pumping station is conveyed to the flow splitter box at the head of the Equalization Tank. A sketch of the flow splitter box and Equalization Tank is provided on **Figure 9** and **Figure 10,** respectively. The purpose of the splitter box is to divert all flow less than or equal to the PDWF rate to the Aero-Mod system, and divert all flow greater than the PDWF rate to the Equalization Tank. All processes downstream of the Flow Equalization Tank will be designed for the PDWF rate. This configuration will help to minimize usage of the Equalization Tank, as PWWF flow events are not anticipated to be a common occurrence. The Equalization

Tank requires aeration and pumping, so bypassing the tank on a regular basis and minimizing usage will help optimize energy use and reduce operations and maintenance requirements.

Flow Splitter Box

As shown on **Figure 9,** flow from the Influent Pump Station enters into a central chamber of the splitter box. As influent flow increases and the water surface elevation rises in the influent chamber, flow will spill over an adjustable weir gate to an adjacent chamber. Flow then moves from this first chamber to the Aero-Mod process. The weir gate will be set at the elevation corresponding with the PDWF, so that all flow less than or equal to the PDWF is conveyed to the Aero-Mod. If flow continues to increase, and exceeds PDWF, the water surface rises above a second weir gate and flow into another distribution chamber. The second distribution chamber then conveys flow to the Equalization Tank. As both of the weir gates will be adjustable, plant operations can choose to modify the flowrate at which wastewater is diverted to the Equalization Tank. Additionally, all flow could potentially be diverted to the Equalization Tank by raising the weir to the first chamber, and completely lowering the weir to the Equalization Tank.

Flow Equalization Tank

The Equalization Tank will be designed to store PWWF in excess of the PDWF flow during a 24-hour period. The operating capacity will be approximately 58,500 gallons, with overall tank dimensions of 15-feet wide by 30-feet long by 20-feet deep. During a storm event, flow will enter the Equalization Tank from the designated splitter box chamber. As the water surface elevation in the tank approaches a depth of approximately 3 feet above the elevation of the aeration diffusers, the aeration blowers will turn on to introduce air to the Equalization Tank. The blowers designated for the Equalization Tank will be located in the Operations Building. Aeration of the Equalization Tank will help promote mixing in the tank, and prevent the wastewater from becoming septic. Air diffusers will provide air to the tank, and the drop legs serving to supply air will be supported by an interior baffle wall running the length of the tank. The baffle wall will help to promote mixing in the tank by deflecting air away from the center wall to the tank sidewall.

The Equalization Tank bottom will be sloped towards a sump located at the east end of the tank. Three submersible pumps will be located in the sump, and will serve to empty the contents of the Equalization Tank following a PWWF event. Flow from the equalization pumps will discharge to the chamber of the splitter box designated for conveying flow to the Aero-Mod system. Each pump will be sized for approximately 60 gpm, which is slightly less than the instantaneous rate equivalent to the difference between the ADF and the PDWF. Three pumps will be provided so if operations staff chooses to constantly run the Equalization Tank, two pumps can operate concurrently to deliver flow equivalent to the PDWF rate. The third Equalization Pump will serve as a backup, redundant unit.

Non-potable water hydrants will be provided at the Flow Equalization Tank for cleaning the tank following a PWWF event. As previously mentioned, the tank bottom is sloped to the pump sump located at the end of the tank, so wash water can be diverted to the sump and pumped out of the tank. Considering that the tank will be designed for intermittent use and will require cleaning, the tanks are open top with walkways running around the perimeter of the tank and down the center of the tank. This allows access to the pump return line and the aeration drop-legs.

Design criteria for the Flow Equalization Tank is provided in **Table 6.**

Table 6 Flow Equalization Design Criteria

Parameter	Criteria
Flow Equalization Operating Volume	58,500 gal
Diffuser Type	Coarse Bubble
Tank Dimensions	
Width	15 feet
Length	30 feet
Operating Depth	18 feet
Blowers	
Quantity of Blowers	2
Blower Type	Positive Displacement
Location	Operations Building
Pumps	
Quantity of Pumps	3
Pump Type	Centrifugal, Submersible
Location	EQ Tank Sump
Design Flow per Pump	60 gpm
Design TDH	22 feet

4.6 Aero-Mod Treatment System

The Aero-Mod system is an extended aeration, activated sludge process capable of meeting biological nutrient removal limits. The Aero-Mod system is a pre-engineered, packaged system, meaning all internal components (other than tankage) are designed and provided by the manufacturer. Aero-Mod has provided similar installations as proposed for Valiano at other facilities in San Diego County, including the Harmony Grove WTWRF.

The Aero-Mod system for the Valiano WTWRF will consist of two separate, parallel treatment trains all located in a single concrete tank. **Figure 11**, provides a layout of the proposed Aero-Mod system. As shown on the Aero-Mod layout, each treatment train consists of a first stage aeration phase, followed by a second stage aeration phase, and subsequently clarification. Solids from the clarifier are either returned to the head of the system for recycle (RAS), or wasted to the aerobic digester. The aerobic digester and sludge pumps are integral to the Aero-Mod process.

Two positive displacement blowers, provided by Aero-Mod, supply air to all stages of the treatment process. As shown on **Figure 12** of the Operations Building, the blowers will be located in a dedicated room of the building. Aeration will cycle between the first and second stages for two hour periods. In other words, the first stages are aerated for two hours, while air remains off to the second stages. After the two hour period, air is shut off to the first stages, and turned on to the second stages for a two hour period. Air is regulated by valves located on the distribution lines rather than cycling blowers on and off.

Aeration primarily serves to promote nitrification and BOD reduction. Nitrification involves the conversion of ammonia (NH_4-N) to nitrate (NO_3-N) in the presence of oxygen. Anoxic conditions, which are created when air is shut off to a particular zone, promotes the denitrification process. Denitrification allows for conversion of NO_3-N to N_2 gas, thereby reducing the total nitrogen concentration in the wastewater. The Aero-Mod system will be equipped with dissolved oxygen sensors, which controls the operation of the aeration blowers. A specific dissolved oxygen (DO) value will be set, and the blowers will ramp speed up and down to maintain the DO set point. This helps to optimize energy and air use, especially during low organic loading periods.

Alkalinity is required to facilitate the nitrification reactions. As shown on **Figure 12,** provisions for caustic storage and addition is included in the design of the Operations Building. Specifics regarding the caustic dosage will be included in the detailed design of the Valiano WTWRF facility.

Table 7 provides a breakdown of the design criteria for the Aero-Mod system at the Valiano WTWRF.

Table 7 Aero-Mod Design Criteria

Parameter	Criteria
Influent Criteria	
Flow, ADF	0.072 mgd
Flow, PDWF	0.174 mgd
BOD_5	350 mg/L
TSS	400 mg/L
Ammonia-N	30 mg/L
Phosphorus	12 mg/L
Temperature	20°C
Effluent Criteria	
BOD_5	10 mg/L
TSS	15 mg/L
Ammonia-N	0.5 mg/L
Nitrates	8 mg/L
Phosphorus	6 mg/L
Retention Time	28 hours
Aeration Tank Volume	84,000 gal
Sludge Age	15 days
Operating Criteria – Aeration Stages	
Mixed Liquor Suspended Solids	3,209 mg/L
Mixed Liquor Volatile Suspended Solids	10.9%
F/M Ratio, lbs BOD/lb MLVSS	0.13
F/M Ratio, lbs BOD/lb MLSS	0.09

Parameter	Criteria
Operating Criteria – Aerobic Digester	
Volatile Solids Reduction	28.9%
Sludge Age	28 days
Air Required for Stabilization	37 cfm
Air Required for Mixing	83 scfm
Operating Criteria – Clarifiers	
Total Clarifier Surface Area	160 sf
Total Weir Length	58 feet
Tank Wall Depth	16 feet
Freeboard	2 feet
Surface Overflow Rate, avg	225 gpd/sf
Surface Overflow Rate, max	1,000 gpd/sf
Weir Overflow Rate, avg	1,241 gpd/lf
Weir Overflow Rate, max	5,517 gpd/lf
Solids Loading Rate, avg	12 lbs/d/sf
Solids Loading Rate, max	28.1 lbs/d/sf
Blowers	
Quantity	2
Type	Positive Displacement
Location	Operations Building
Horsepower	20 HP

4.7 Tertiary Disk Filters

Clarified effluent from the Aero-Mod system will flow by gravity to the tertiary disk filters, located in a dedicated room of the Operations Building. The tertiary disk filters will primarily serve to reduce the turbidity of the clarified water to the requirements of Title 22, Section 60304. Several disk filter products are listed as “conditionally” acceptable for compliance with treatment requirements of the California Water Recycling Criteria (Title 22)” (California Water Board, State Water Resources Control Board Division of Drinking Water, 2015). Only the disk filter products and manufacturers listed in this document will be considered for use at the Valiano WTWRF.

Figure 12 provides a layout of the disk filters in the Operations Building. Two disk filter units will be provided to ensure complete redundancy at PDWF conditions. Each unit, contained in a pre-manufactured steel tank, contains circular disks covered with a proprietary cloth material. As flow enters a filter unit, the influent spills over a weir and submerges the disks from the exterior. Flow moves from the exterior of the disks through the cloth media, and into a central collection tube. Smaller solids will collect on the exterior of the cloth, while heavier, larger solids will fall to the bottom of the tank. The headloss through the media will increase as the solids accumulate on the cloth surface. As the headloss through the disks increases, the water surface will rise in the filtration tank. Eventually, the water surface will reach a pre-determined point, at which backwash will initiate.

Backwash of the disk filter is accomplished by applying a small vacuum to the central collection tube of the filter, and concurrently scraping solids from the cloth with a backwash shoe. The filter disk rotates during backwash while the shoe remains stationary. The solids that accumulated on the filter cloth during the filtration process fall to the bottom of the tank and collect with the previously settled, heavier solids. Once the solids have been removed from the exterior of the disks, a backwash solids pump will turn on to convey the solids settled in the tank back to the treatment process. Specifically, backwash water and solids are conveyed to the Off-Quality Effluent Storage tank, and eventually conveyed to the head of the plant at the Flow Equalization Splitter box.

A proposal for the tertiary disk filters at the Valiano WTWRF is provided in Appendix A along with information regarding the system. Design criteria for the tertiary filters is provided on **Table 8**.

Table 8 Disk Filter Criteria

Parameter	Criteria
Quantity of Filter Units	2
Quantity of Discs per Filter Unit	2
Total Quantity of Discs Required	4
Total Filter Area	21.6 ft^2
Maximum Design Flow per Unit	0.172 mgd
Influent Parameters	
Average TSS	10 mg/L
Influent Maximum TSS	20 mg/L
Influent Turbidity	5 NTU
Effluent Parameters	
Average TSS	5 mg/L
Turbidity	2 NTU
Hydraulic Loading	
Average	2.31 gpm/ft^2
Maximum	5.59 gpm/ft^2
Solids Loading Rate	1.34 lbs TSS/day/ft^2

4.8 Disinfection

The disinfection process at the Valiano WTWRF will be designed for compliance with the regulations of Title 22, Section 60301.230, “Regulations for Disinfected Tertiary Recycled Water.” Disinfection with liquid Sodium Hypochlorite (NaOCl) will be utilized. The following conditions of Title 22, Section 60301.230 regulations apply to the Valiano WTWRF:

- The CT value must be greater than or equal to 450 mg-min/L at all times with a modal contact time of at least 90 minutes, based on PDWF rates. The CT value is the product of total chlorine residual and modal contact time.

- Median concentration of total coliform bacteria measured in the disinfected effluent must not exceed an MPN of 2.2 per 100 mL utilizing the bacteriological results of the last seven days for which analyses have been completed and the number of total coliform bacteria does not exceed an MPN of 23 per 100 mL in more than one sample in any 30-day period. No sample shall exceed an MPN of 240 total coliform bacteria per 100 mL.

Sodium Hypochlorite (hypochlorite) will be used as the disinfectant at the Valiano WTWRF to provide continuity between the Valiano and the Harmony Grove WTWRFs. Given the close proximity of the two facilities, hypochlorite delivery could potentially occur on the same day for both plants, minimizing the cost for chemical delivery. Continuity of these systems also allows operator familiarity with both systems, which will help minimize maintenance requirements.

Chlorine Contact Tanks

Liquid sodium hypochlorite will be added to the rapid mix chamber located at the head of the chlorine contact tanks. Rapid mixing will be accomplished with a mechanical mixer to ensure adequate distribution of chemical to the water as it enters the chlorine contact tanks. Flow from the mix chamber will be diverted to one of the two chlorine contact tanks via a submerged opening at the bottom of the mix chamber. The submerged opening prevents splashing from the mix chamber into the entrance of the chlorine contact tanks. Gates provided at these openings isolate the chlorine contact tanks for maintenance and cleaning. **Figure 13** provides a layout of the proposed mix chamber and chlorine contact tanks.

Per Title 22 regulations, each of the two chlorine contact tanks will be designed to allow a modal contact time of 90 minutes at PDWF. Redundant tanks will be provided so the tanks can be periodically removed from service for cleaning. As shown on **Figure 13,** each tank has three, 3-foot wide passes to promote plug flow through the reactors. Each pass has a length of 24 feet, providing a total reactor length of 72 feet. The length to width ratio for the reactor is therefore greater than 20, as recommended by Metcalf & Eddy to promote plug flow and optimize the disinfection process. The total flow depth in the chlorine contact tank is preliminarily set at 7 feet, which will be controlled by an adjustable weir gate at the end of each reactor.

Hypochlorite Storage and Addition

Per the Title 22 regulations for disinfection, the chlorine residual at the end of the 90-minute modal contact time must be 5 mg/L. The initial chlorine dosage must therefore account for the initial chlorine demand of the filtered effluent, the chlorine decay in the reactor, and the 5 mg/L residual required at the end of the reactor. Using typical demand and decay factors for chlorine given in Metcalf & Eddy, the total sodium hypochlorite demand was calculated to be 13.25 mg/L. This calculation assumes that 12.5% hypochlorite solution will be delivered to the facility, and will decay to 10% solution while in storage. With a dosing rate of 13.25 mg/L, hypochlorite addition will range from 8 gallons per day under ADF conditions to 19.2 gallons per day under PDWF conditions.

Hypochlorite addition is flow-paced to optimize dosage, and prevents excessive residual chlorine in the finished recycled water. Alternatively, chlorine dosage could be paced according to Oxidation Reduction Potential (ORP). The location of the flow measurement device and the type of device utilized will be determined during detailed design of the Valiano WTWRF.

Sodium hypochlorite will be stored in a polyethylene tank located in the Operation Building. A figure showing the proposed tank and metering pump location is provided in **Figure 12.** As shown on **Figure 12**, secondary containment is provided around the tank to hold the complete contents of the tank in an emergency situation. The tank will be designed for an operational volume of approximately 400-gallons of Sodium Hypochlorite, which equates to 20-days of storage under PDWF conditions. Realistically, delivery should be required once each month. Chemical delivery ports will be provided on the side of the Operations Building near the driveway to allow fill of the hypochlorite tank.

All pumps, piping, and valves associated with the hypochlorite storage and metering system will be manufactured of materials compatible with sodium hypochlorite.

Design criteria for the Disinfection System at the Valiano WTWRF is provided in **Table 9.**

Table 9 Disinfection Design Criteria

Parameter	Criteria
Disinfection Method	Sodium Hypochlorite, 12.5% solution
Dosage Rate	13.25 mg/L
Contact Time	90-minutes
CT-value	450 mg-min/L
Contact Tanks	
Quantity	2
Number of Passes/Tank	3
Width per Pass	3 feet
Length per Pass	72 feet
Length : Width	>20
Mixing	Mechanical, Rapid Mix
Hypochlorite Storage Volume	400 gallons
Hypochlorite Metering Pumps	
Quantity	2
Pump Rate, min	0.3 gph
Pump Rate, max	0.8 gph

4.9 Recycled Water Pump Station

Effluent meeting the permitted requirements will be diverted to the Recycled Water Pumping Station directly from the Chlorine Contact Tanks. The pump station will serve to convey water directly to the Rincon de Diablo Municipal Water District system for re-use as irrigation water. Alternatively, the treated water could be conveyed to the off-site wet weather storage facility. The recycled water pump station would be sized for the maximum day irrigation demands and similar to Harmony Grove WRP operated by the County as part of the wastewater plant operations. The estimated capacity for the recycled water pump station at the WTWRF is about 150 gpm. As shown on **Figure 13,** two vertical turbine pumps will be provided to convey treated water to the re-use system. The vertical turbine pumps will be designed to operate in with the Harmony Grove Recycled Water Pump Station and the recycle water reservoir. The Harmony Grove WRP Pump Station and the 3.1 mg R1-A Reservoir establishes the 959 Pressure Zone system.

4.10 Off-Quality Effluent Storage

As shown on **Figure** 13**,** the off-quality effluent storage tank is located adjacent to the chlorine contact tanks and effluent pumping station. Per Title 22 regulations, 24-hours of on-site storage must be provided to contain treated water that does not meet permit requirements. Provisions will therefore be included to divert any water that does not meet permit requirements from the effluent pumping station to the off-quality effluent storage tank. The treated water will constantly be monitored by a sampler located on the top slab of the effluent pumping station. If any parameters of the treated water are discovered to be non-compliant, the gate between the effluent pumping station and the off-quality effluent storage tank is opened, and water will be allowed to flow into the tank.

In addition to storing the off-quality effluent, the tank also receives flow from the disk filter backwash and the centrifuge dewatering system. The operating volume of the tank will therefore be approximately 85,000 gallons.

The off-quality effluent storage tank has a sloped bottom to a sump area containing two submersible, centrifugal pumps. Each pump will be designed to convey 60 gpm to the head of the treatment plant, and specifically, the influent chamber of the Flow Equalization Splitter Box. During normal operation of the off-quality effluent storage tank (when only backwash and centrate are diverted to the tank) the pumps will be called to turn on automatically once a specific level is reached in the tank. However, when the tank is also used to store off-quality effluent, plant operations will manually operate the pumping system from the off-quality effluent tank during a low-flow period of the day. Otherwise, if flow is pumped to the head of the plant during a PDWF event, flow could be automatically and unnecessarily be diverted to the flow equalization tank.

4.11 Solids Processing

Solids produced from the extended aeration treatment system are wasted periodically to the aerobic digesters integral to the Aero-Mod process. According to the Aero-Mod design criteria, solids will be wasted at a concentration of 3,200 mg/L, or 0.32%. In order to thicken the contents of the digester, aeration ceases for a brief period of time each day, allowing solids to settle and liquid to decant from the top of the tank. This mode of periodic settling helps to increase the solids concentration of the digester to approximately 1.2%. This concentration of 1.2% is difficult to haul and dispose offsite, and contains water which could otherwise be treated and conveyed from the plant for re-use. The solids from the digester must therefore be dewatered to a greater concentration for off-site disposal.

Dewatering at the Valiano WTWRF will be accomplished with a centrifuge system located in a dedicated room of the Operations Building. **Figure 12** provides a layout of the dewatering system envisioned in the Operations Building. The centrifuge dewatering system for the Valiano WTWRF will be similar to that of Harmony Grove, to provide continuity between the two facilities. Similar to the Harmony Grove WTWRF, solids dewatering will only occur one day of each week.

Solids are conveyed from the digesters to the centrifuge with positive displacement sludge pumps, provided as part of the Aero-Mod system. The centrifuge dewaters solids from the influent concentration of approximately 1.2% to approximately 15%. Dewatered solids are then conveyed to a dumpster located in the centrifuge room, and removed on a weekly basis for off-site disposal.

Approximately weekly 700 lbs of solids at 15% concentration will be produced by the Valiano WTWRF. Centrate from the centrifuge will be diverted through a floor drain in the Operations Building and conveyed to the off-quality effluent storage tank for eventual recycle through the plant.

NFPA Requirements

According to National Fire Protection Agency (NFPA) 820, "Standard for Fire Protection in Wastewater Treatment and Collection Facilities", dewatering facilities must be ventilated at a minimum rate of 6 Air Changes per Hour (ACH). Given the approximate dimensions of the dewatering room as shown on **Figure 12,** the room will need to be ventilated at a rate of approximately 250 scfm. Considering the foul smell typically associated with dewatering processes, the air from the centrifuge dewatering room in the Operations Building will be ventilated through the Odor Control System. The dewatering room is part of the Operations Building, but doors and windows will not be provided between the dewatering room and other rooms in the building to maximize efficiency of the Odor Control system, and ensure compliance with NFPA standards.

Design criteria for the Dewatering System is provided in **Table 10.**

Table 10 Dewatering Design Criteria

Parameter	Criteria
Dewatering System	Centrifuge
Total Influent Dry Solids	1,000 lbs/week
Influent Solids Concentration	1.2%
Solids Capture Rate	90%
Solids Cake Concentration	15%
Total Quantity of Dewatered Solids	4,700 lbs/week

4.12 Odor Control

Considering the close vicinity of the Valiano WTWRF to a residential community, an odor control system is recommended to treat odorous air from the plant. Specifically, odor control is recommended for the Headworks and the Centrifuge Dewatering Room, as these two processes are typically the most offensive in terms of odors from a wastewater treatment facility. The odor control system will be located near the Headworks building, and will be an activated carbon system configured similar to that at the Harmony Grove WTWRF. The activated carbon system works to adsorb odor-causing compounds such as hydrogen sulfide, to prevent emission to ambient air. Activated carbon is typically contained in a closed vessel, and odorous air is ventilated through the vessel to allow contact with the activated carbon. Activated carbon eventually becomes saturated with the adsorbed material, and must be removed periodically for re-activation. The odor control system manufacturer is typically responsible for removing saturated carbon and replacing it with re-activated carbon.

Although the activated carbon system requires periodic replacement of media, the system is beneficial for plants such as the Valiano WTWRF, as additional water, chemicals, etc. are not required to operate the system. Systems such as chemical and biological scrubbers are typically more effective at reducing odorous compounds from foul air, but require significantly more mechanical equipment, controls, and maintenance than activated carbon systems. A chemical or biological scrubber would be excessive for the Valiano WTWRF, and the activated carbon system should be sufficient for this application. The odor control system will be further evaluated in detailed design to ensure the activated carbon will be adequate for the Valiano WTWRF.

Per previous discussion, the Headworks building and Centrifuge Dewatering room must be ventilated at a rate of 1,750 scfm and 250 scfm, respectively. The Odor Control System at the Valiano WTWRF will therefore be designed for an air flowrate of 2,000 scfm. Air from both the Headworks and Centrifuge Dewatering Room will be ducted to the Odor Control System, and combined prior to passage through the system.

5. Option 2 – Scalping Plant

The Valiano WTWRF will be constructed approximately one mile from the Harmony Grove WTWRF, a similar facility based around the Aero-Mod treatment process. The Harmony Grove WTWRF is designed for a capacity of 0.2 mgd average daily flow, and a peak dry weather flow of 0.4 mgd. Given the current water usage rates for the residential areas around Harmony Grove and Valiano compared with the San Diego County design flow requirements, the flow to Harmony Grove could potentially be less than the design flow conditions. The Harmony Grove WTWRF could therefore potentially take on a portion, or all of the flow from the Valiano WTWRF in the case of an emergency condition at the Valiano WTWRF.

Option 2 for a Scalping Plant is based on providing the very bare minimum to treat wastewater from the Valiano community, assuming that the Harmony Grove WTWRF will take on flow from Valiano in an emergency condition. The Valiano WTWRF under the Option 2 scenario will be designed for the PDWF as outlined in Section 2.1 of this report. However, the plant will not be designed to accommodate flow above PDWF, and all flow above the PDWF rate will be diverted to the Harmony Grove WTWRF. Additionally, minimal to no redundancy is provided under this option. It is anticipated that the Regional Board will include in the permit conditions potential use of Harmony Grove WTWRF for redundancy needs.

A site plan for Option 2 is provided on **Figure 5**. As shown on the site plan, the footprint required for facilities under Option 2 is significantly less than that for Option 1. A summary of the primary differences between Option 1, Standalone Plant, and Option 2, Scalping Plant is provided as follows:

- **Flow Equalization –** Flow equalization will not be provided under Option 2. This will eliminate the Flow Equalization splitter box, the tank, and the two blowers located in the

Operations Building. As previously discussed, all flow above the PDWF will be diverted to the Harmony Grove WTWRF.

- **Tertiary Disk Filter –** Option 1 includes two complete, redundant tertiary disk filter units. Only one disk filter unit will be provided for Option 2 to eliminate redundancy. The filter room in the Operations building will therefore be smaller for Option 2 as compared with Option 1.

- **Chlorine Contact Tank –** Option 1 includes two redundant chlorine contact tanks. Only one tank will be provided under Option 2.

- **Solids Processing –** All solids from the Valiano WTWRF will be conveyed or hauled to the Harmony Grove WTWRF for processing. This eliminates the need for a Centrifuge Dewatering System, reducing the size of the Operations Building required for Option 1. Section 5 of this report regarding Option 3 provides further information regarding the processing of solids from Valiano at the Harmony Grove WTWRF.

All other facilities at the Valiano WTWRF will be identical to those proposed for Option 1.

6. Option 3 – Standalone Plant without Solids Processing

The third option for the Valiano WTWRF is similar to Option 1 for the standalone plant, except Option 3 does not include provisions for onsite solids dewatering. Rather, Option 3 assumes that the solids generated by the Valiano WTWRF will be transported to the Harmony Grove WTWRF for processing. Solids could be transferred from Valiano to Harmony Grove through either a pumping system, or by sludge hauling vehicles.

Sludge hauling vehicles would collect the contents of the aerobic digesters at the Valiano WTWRF on a weekly basis for transport to Harmony Grove. This would require the County to obtain a long term agreement with a hauling company, and sludge transport through the community may not be desirable for the community. Alternatively, a pump station could be provided at the Valiano WTWRF to convey solids directly to the Harmony Grove WTWRF. This option, however, requires small diameter piping to be installed between the two facilities. Considering new roads have recently been installed in the Harmony Grove community, trenchless technology such as directional drilling would be recommended for installing a forcemain under this option.

Depending on the actual solids generation at Harmony Grove and the available digester volume, sludge from Valiano could potentially discharge from either trucks or forcemain directly to the aerobic digesters at the Harmony Grove WTWRF. However, mixing of sludge from the two facilities could be problematic if there is filamentous growth at the Valiano WTWRF. As previously discussed, the aerobic digesters that are part of the Aero-Mod system allow for sludge settling and decant of liquid to the head of the plant. If the sludge from Valiano contains filamentous bacteria and is introduced to the Harmony Grove digester, filamentous bacteria could make its way into the biomass of the Harmony Grove WTWRF. Filamentous bacteria can cause foaming and process related issues. In order to avoid mixing solids from both plants, a tank dedicated to Valiano solids could be constructed on the Harmony Grove site. This would also help to prevent potential over-loading of the digester at the Harmony Grove WTWRF.

According to discussions with the designer for the Harmony Grove WTWRF and San Diego County, the centrifuge dewatering system at the Harmony Grove WTWRF is only expected to operate one day each week for solids processing. The dewatering system therefore has sufficient capacity to process additional sludge, and solids processing may need to occur for two, rather than one day at Harmony Grove. Considering that the same operations staff will be operating the Valiano and Harmony Grove WTWRFs, this option will allow the staff to conduct dewatering operations at one central location. Only one centrifuge would require maintenance, and off-site hauling of dewatered solids could be condensed to one system.

Figure 6 shows the proposed site plan for this Option 3. As shown on the site plan, the size of the Operations Building is reduced from Option 1 as the centrifuge dewatering room is no longer included in the building. The odor control system requirements would also be smaller for Option 3 compared with Option 1, since the odor control system for Option 1 ventilates the centrifuge dewatering room in the Operations Building.

7. Estimate of Probable Cost

An order of magnitude cost was developed to compare the three Options. Materials and construction costs were obtained from vendors, and other similar local projects such as the Harmony Grove WTWRF. **Table 11** includes a summary of the estimate of probable cost for all three options. The detailed estimate of probable cost is provided in Appendix B of this report.

Table 11 Estimate of Probable Cost

Facility	Option 1	Option 2	Option 3
Headworks and Influent Pumping Station	$475,700	$475,700	$475,700
Flow Splitter Box and Equalization	$406,560	-	$606,560
Aero-Mod Treatment System	$1,249,500	$1,249,500	$1,249,500
Operations Building	$1,750,400	$634,530	$799,530
Off-Quality Effluent Storage	$157,000	$157,000	$157,000
Chlorine Contact Tank/Effluent PS	$153,300	$112,980	$153,300
Odor Control System	$391,520	$314,020	$314,020
Paving/Sitework	$98,500	$98,500	$98,500
Subtotal Cost[1]	*$4,682,480*	*$3,042,230*	*$3,654,110*
Solids Pumping Station and Piping to HG	-	$296,000	$296,000
Total Plant Cost[2]	**$4,682,480**	**$3,338,230**	**$3,950,110**

1 Sub-total cost is the cost for Options 2 and 3 assuming solids will be hauled offsite.
2 Total plant cost assumes that solids will be pumped to HG.

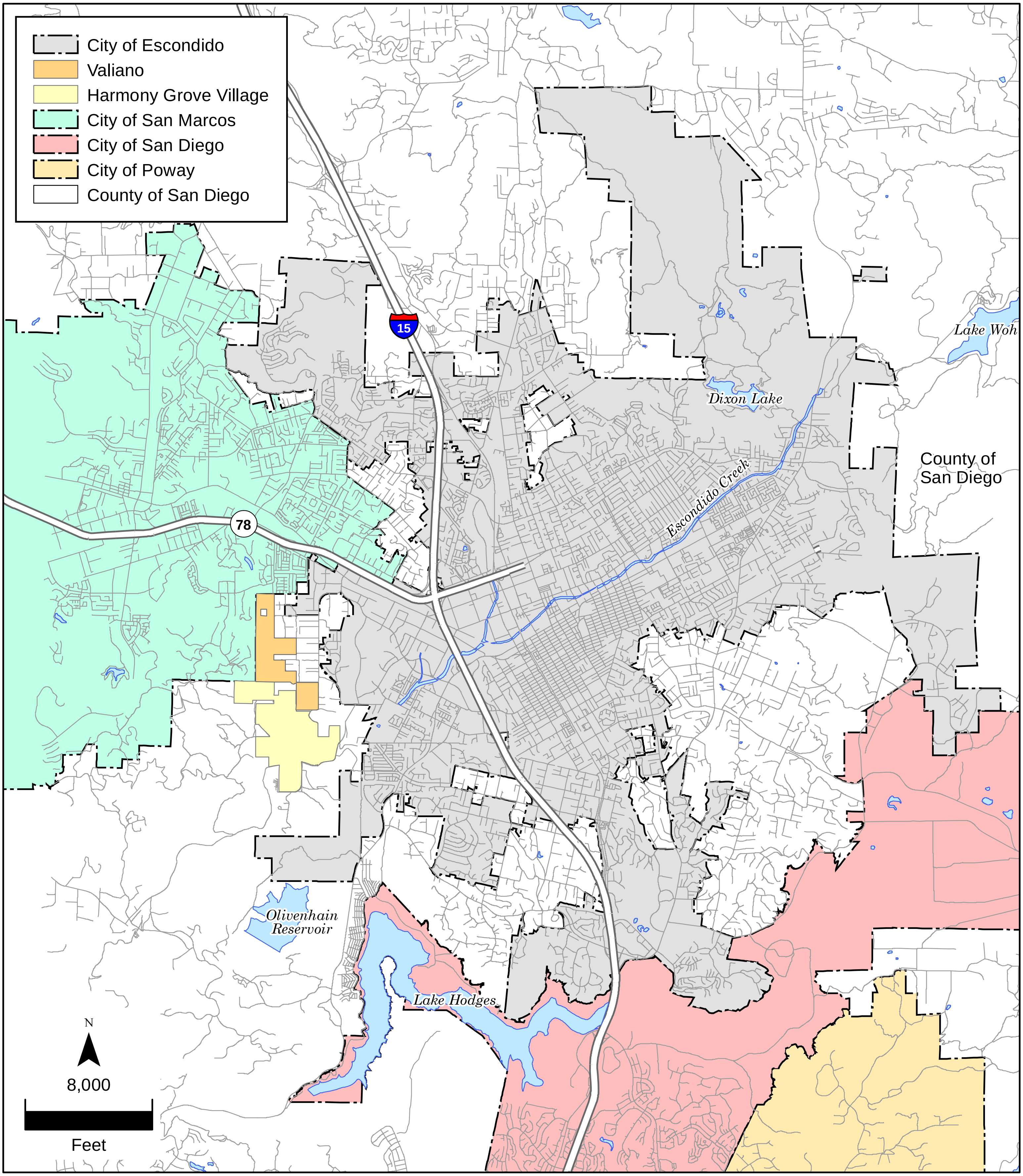

Figure 1 : Vicinity Map

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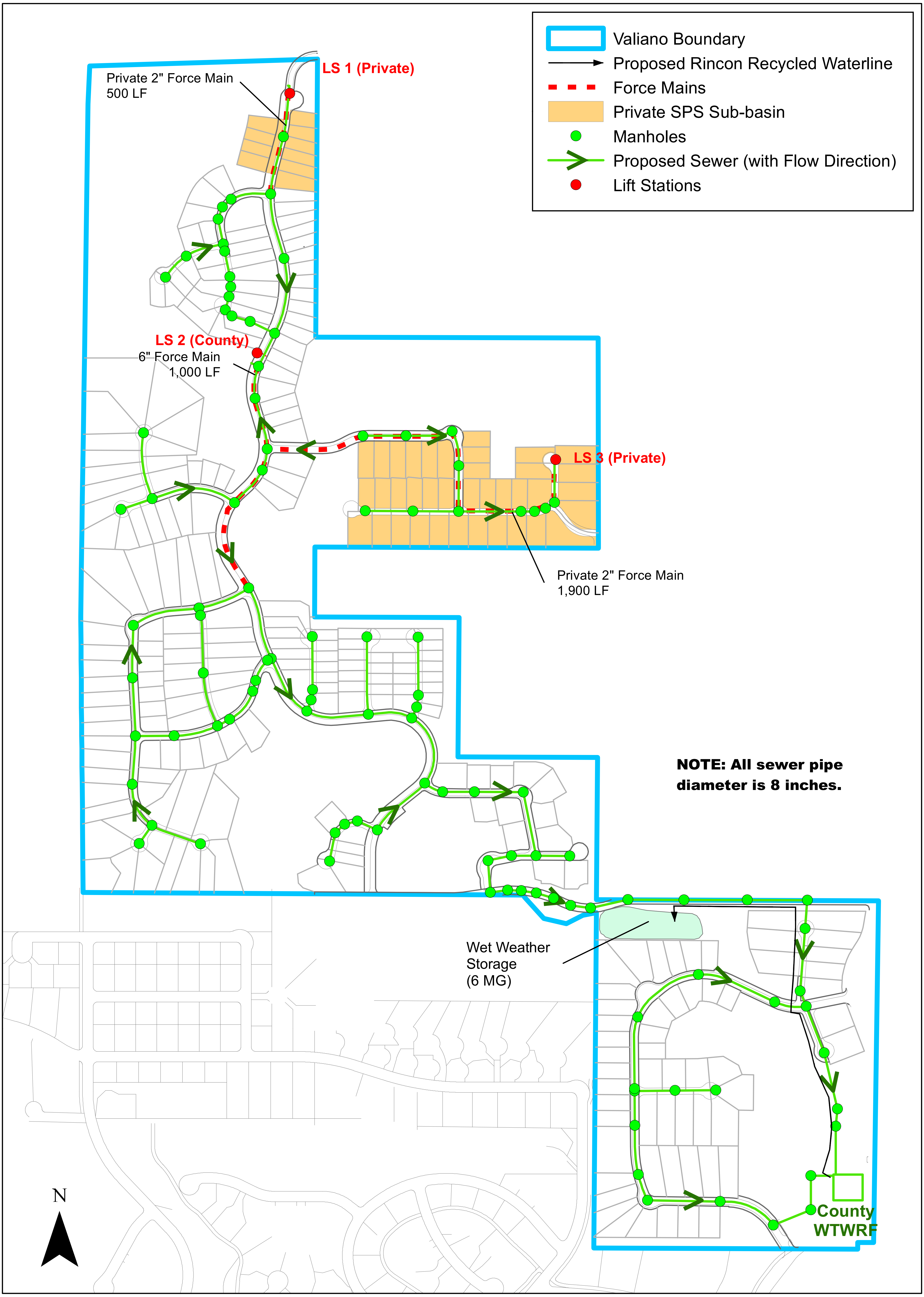
Valiano WTWRF PDR
October 2015



PROPOSED ON-SITE COUNTY SEWER SYSTEM

Figure 2

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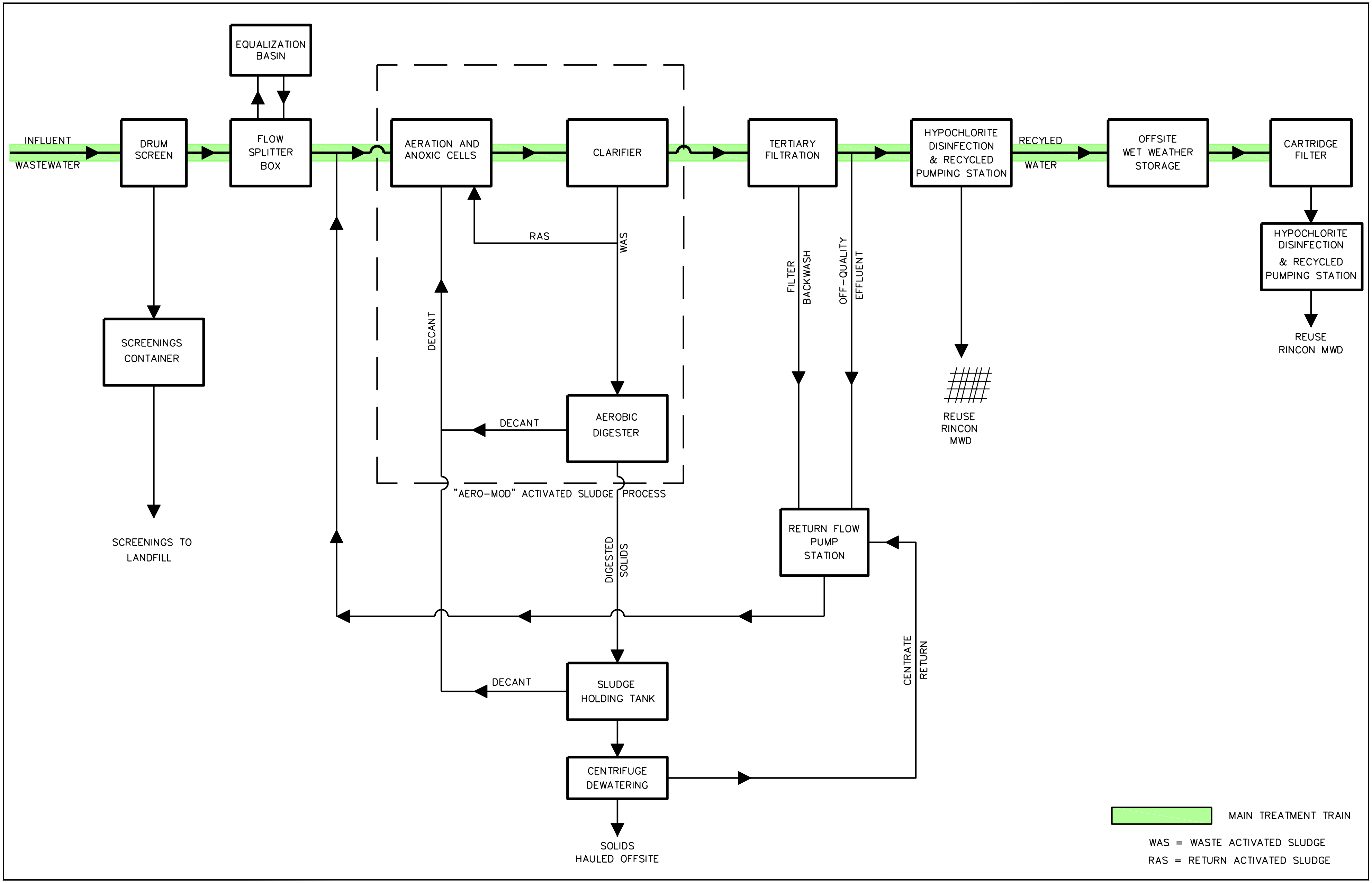
Valiano WTWRF PDR
October 2015



VALIANO WTWRF
PROCESS SCHEMATIC
Figure 3

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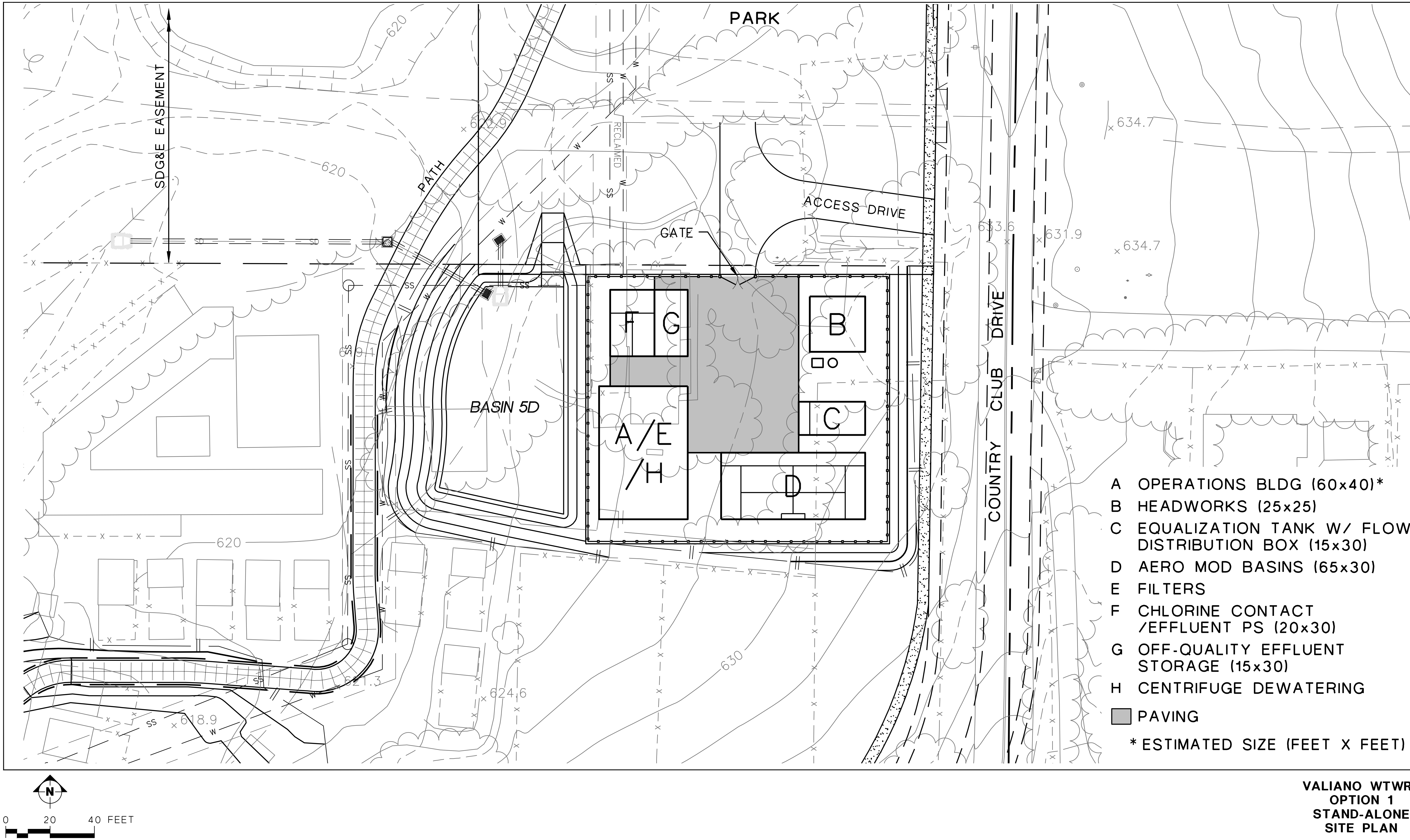

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VALIANO WTWRF OPTION 1 STAND-ALONE SITE PLAN

Figure 4

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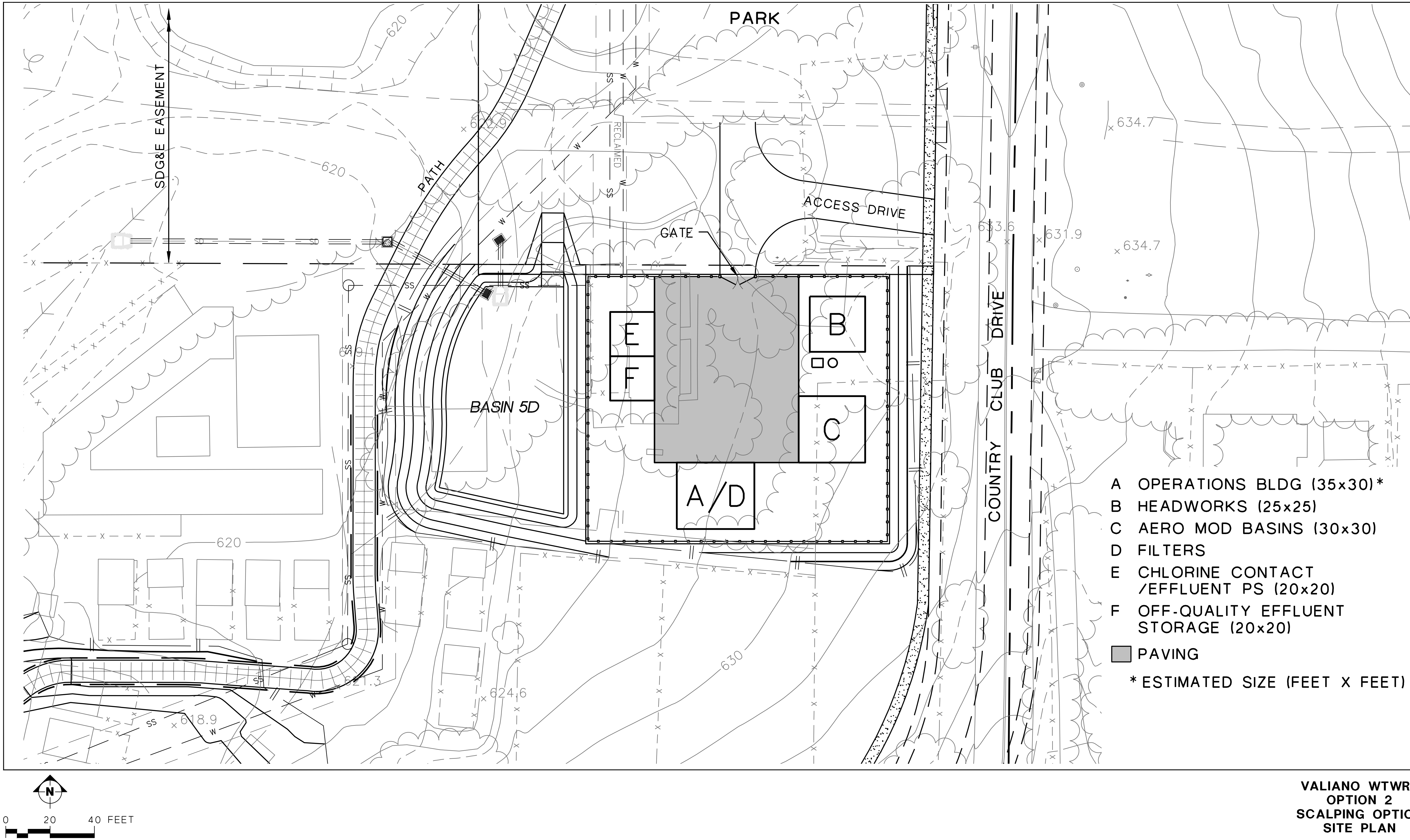

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VALIANO WTWRF
OPTION 2
SCALPING OPTION
SITE PLAN

Figure 5

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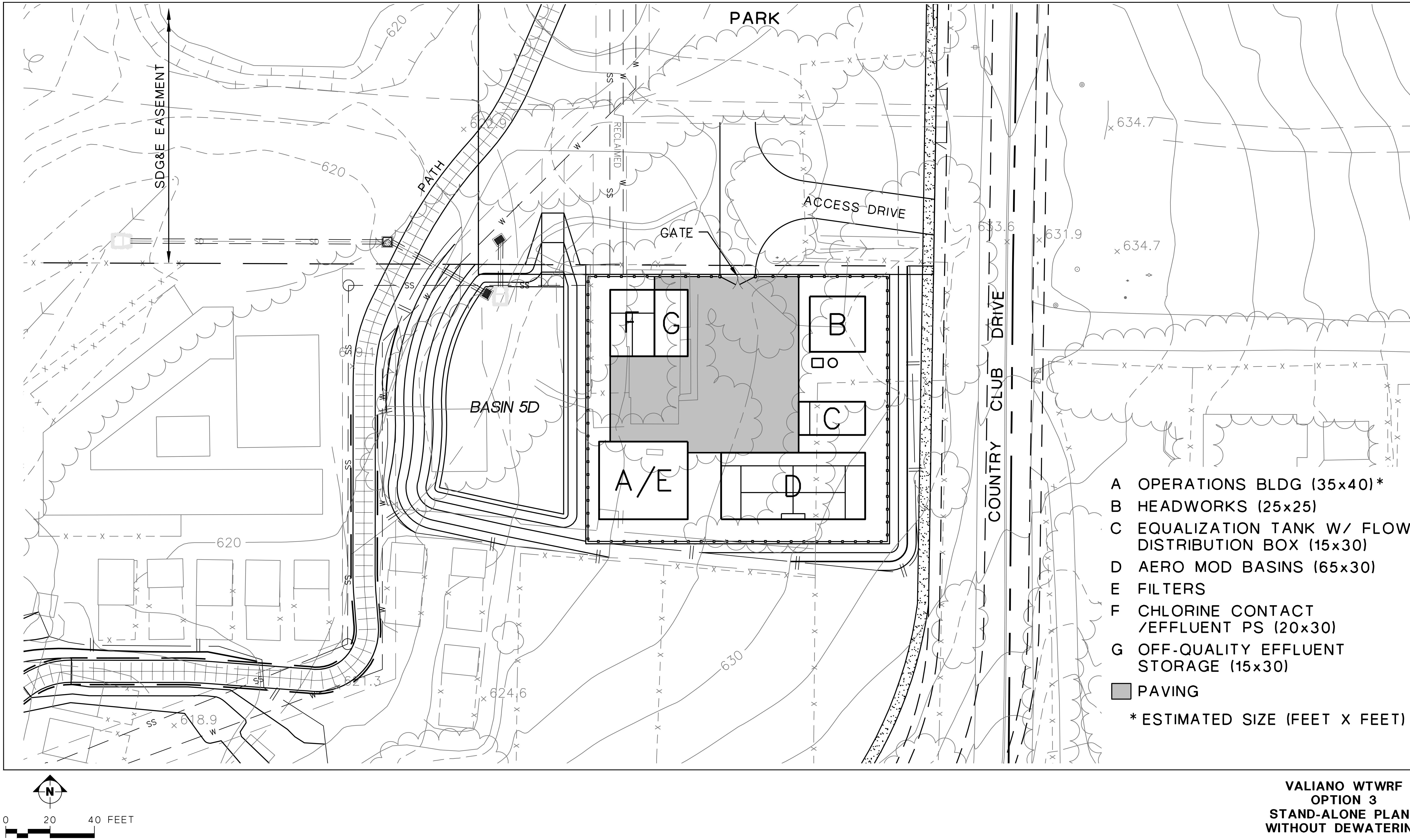

VALIANO WTWRF
OPTION 3
STAND-ALONE PLANT
WITHOUT DEWATERING

Figure 6

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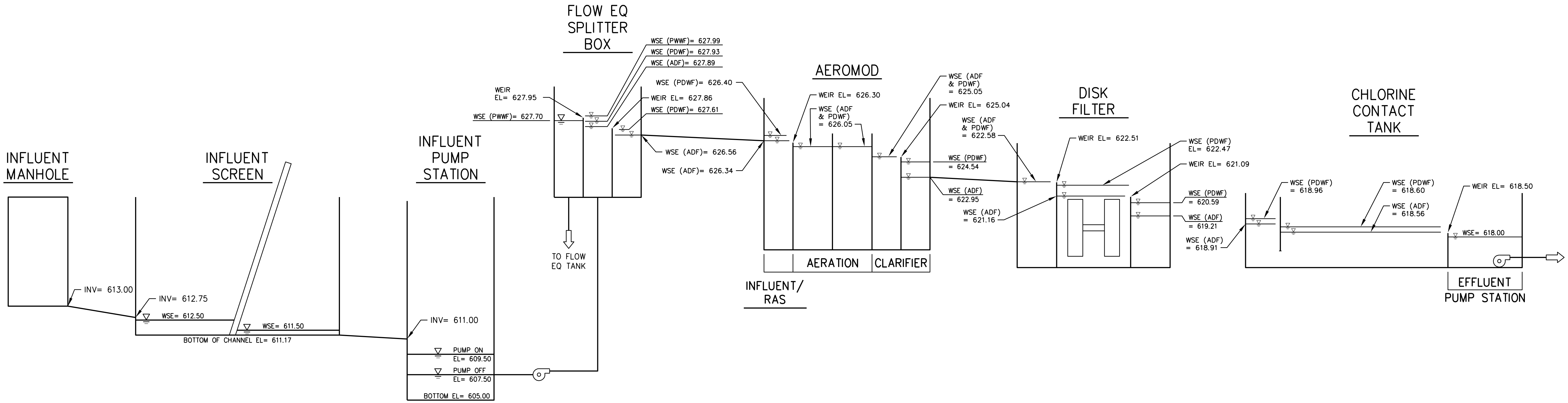

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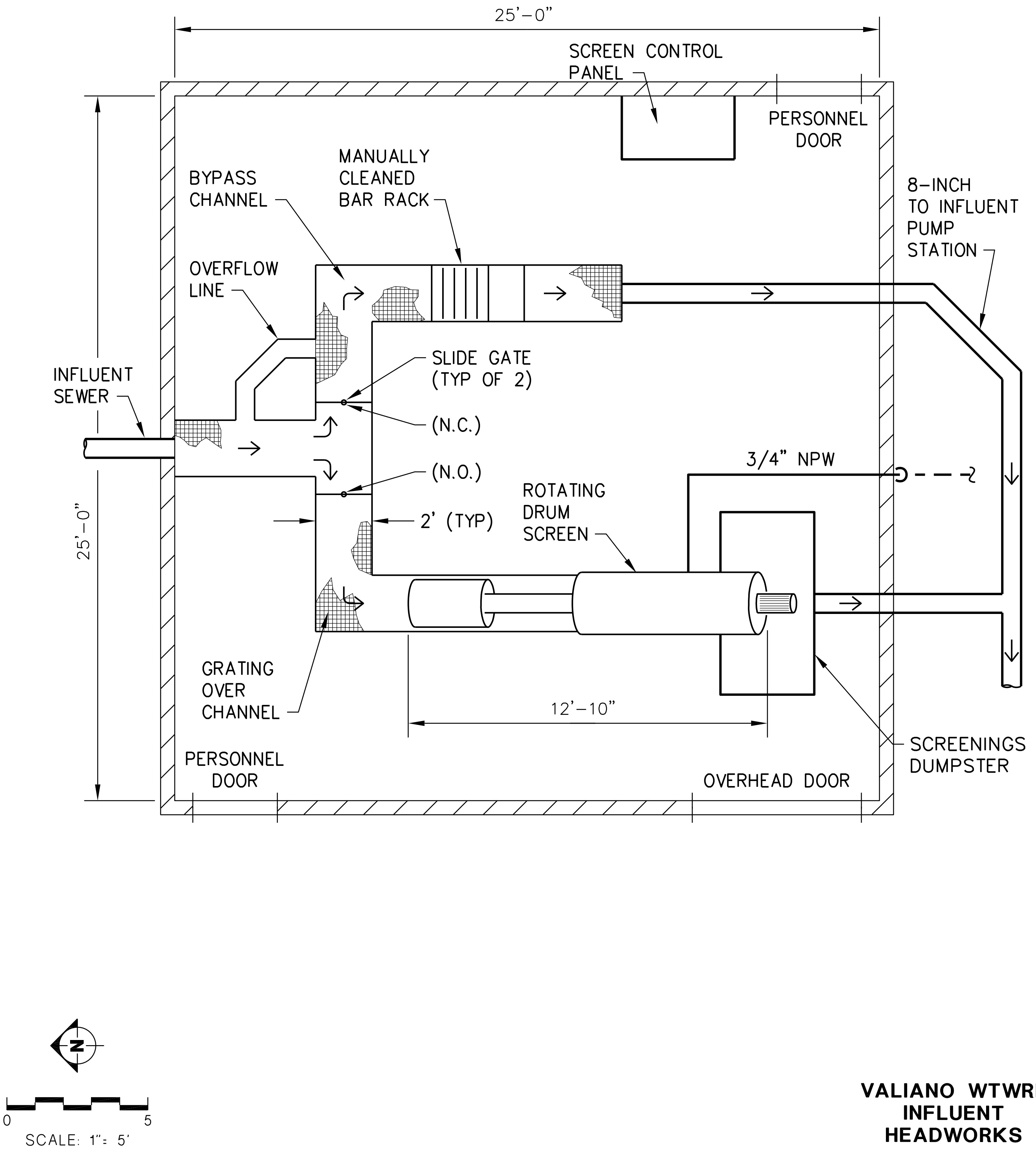
VALIANO WTWRF HYDRAULIC PROFILE

Figure 7



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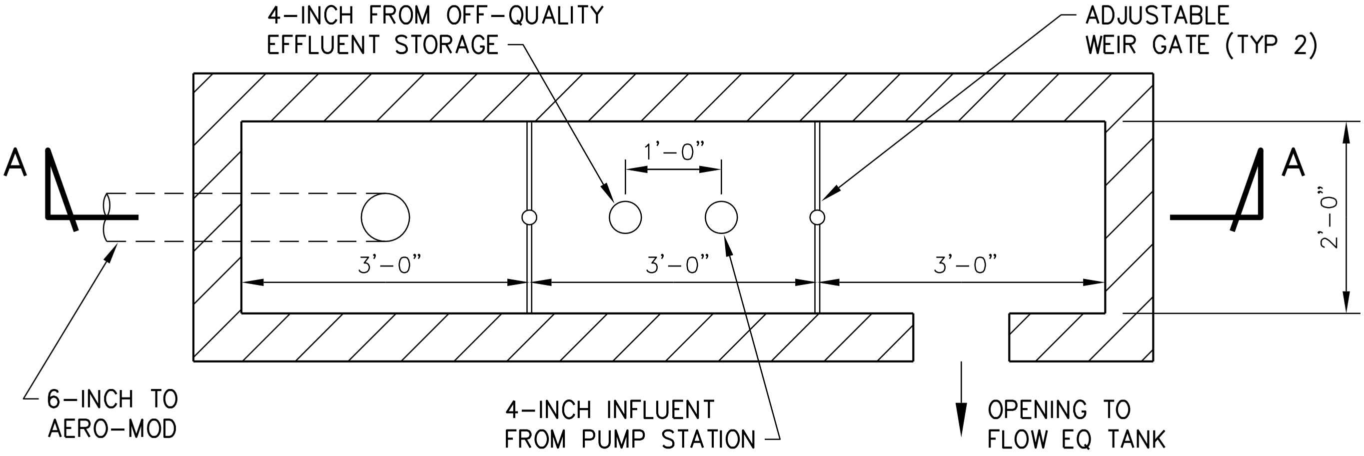
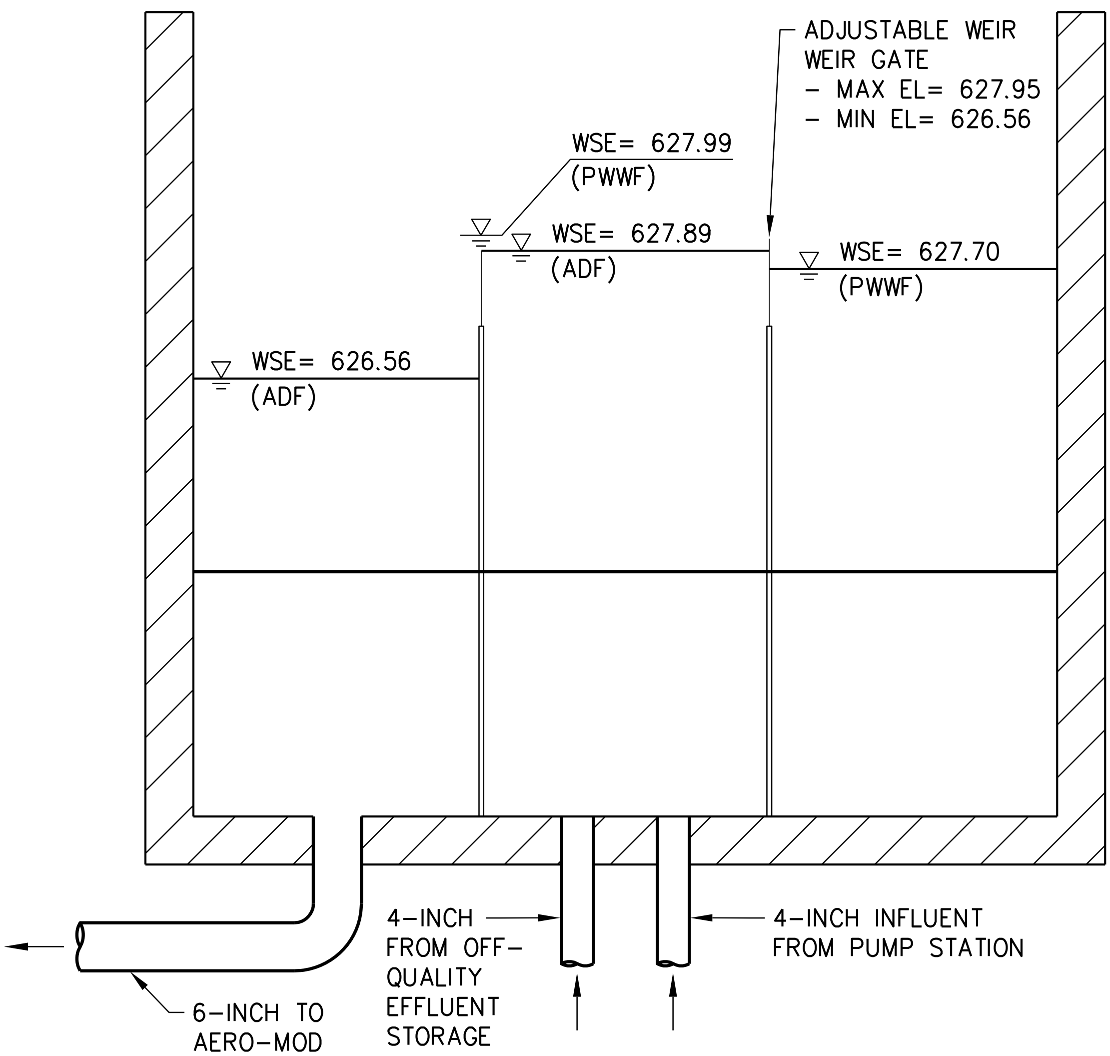
VALIANO WTWRF
INFLUENT
HEADWORKS

Figure 8



PLAN



SECTION A-A

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VALIANO WTWRF
FLOW EQUALIZATION
SPLITTER BOX

Figure 9

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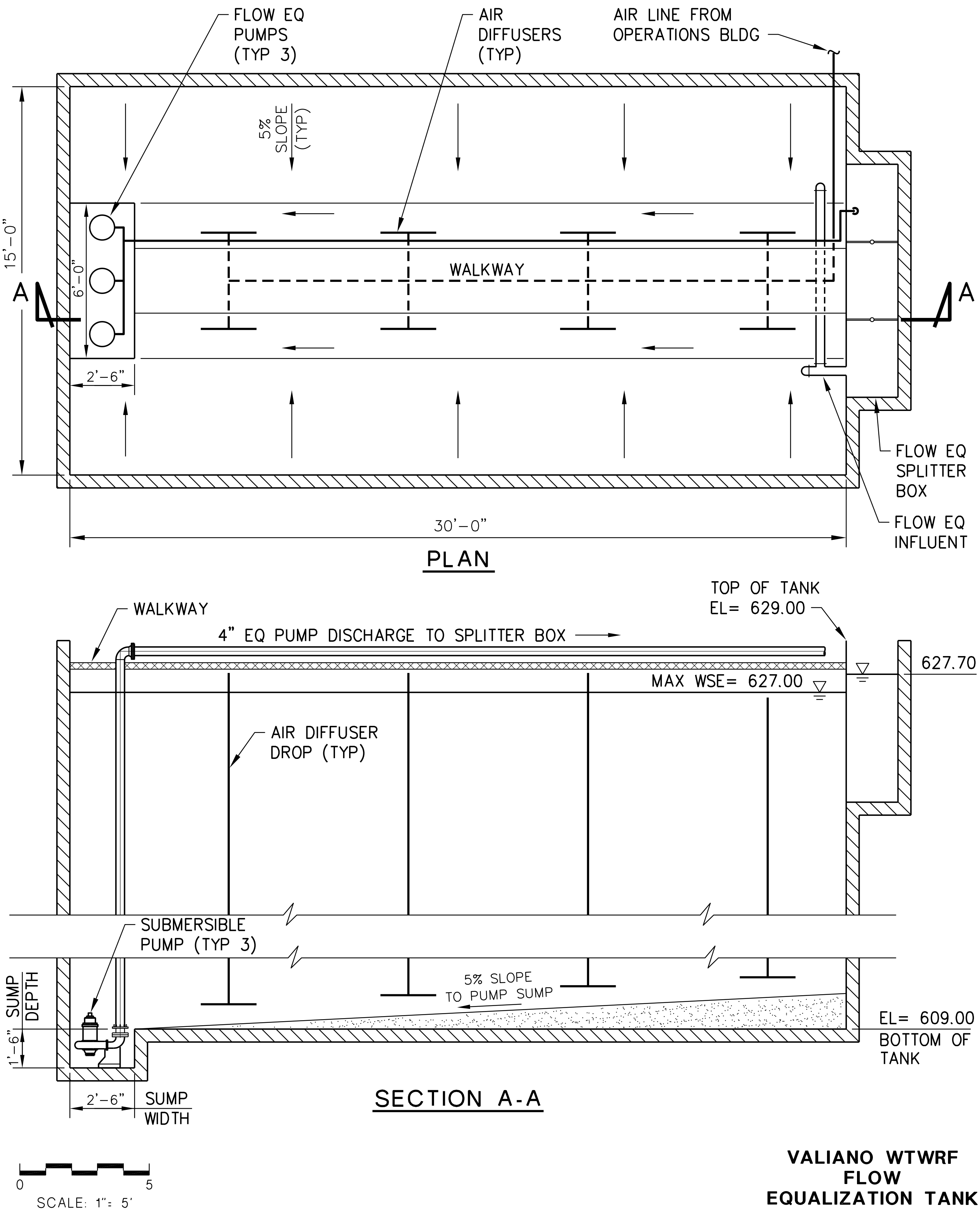

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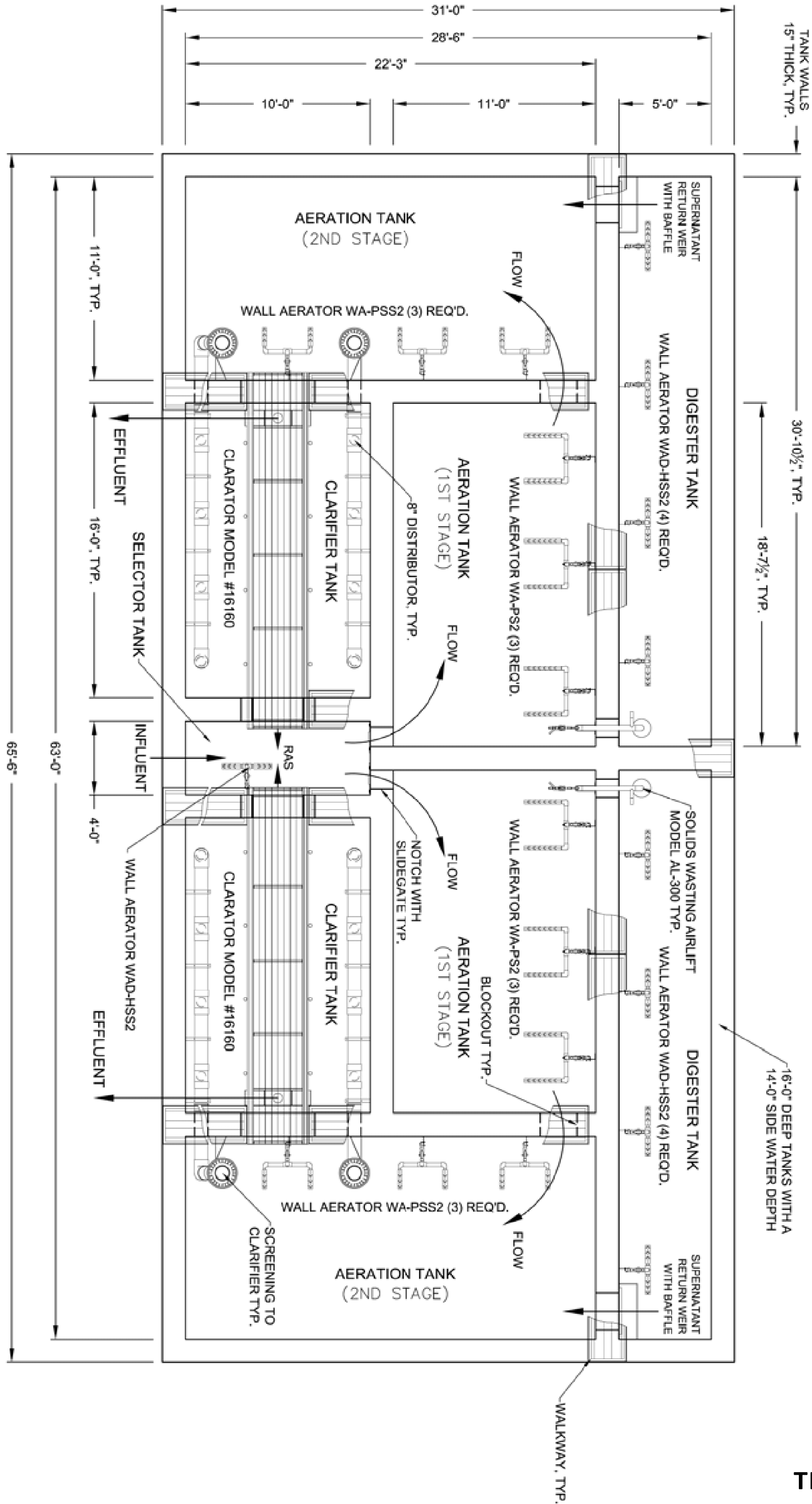
VALIANO WTWRF FLOW EQUALIZATION TANK

Figure 10



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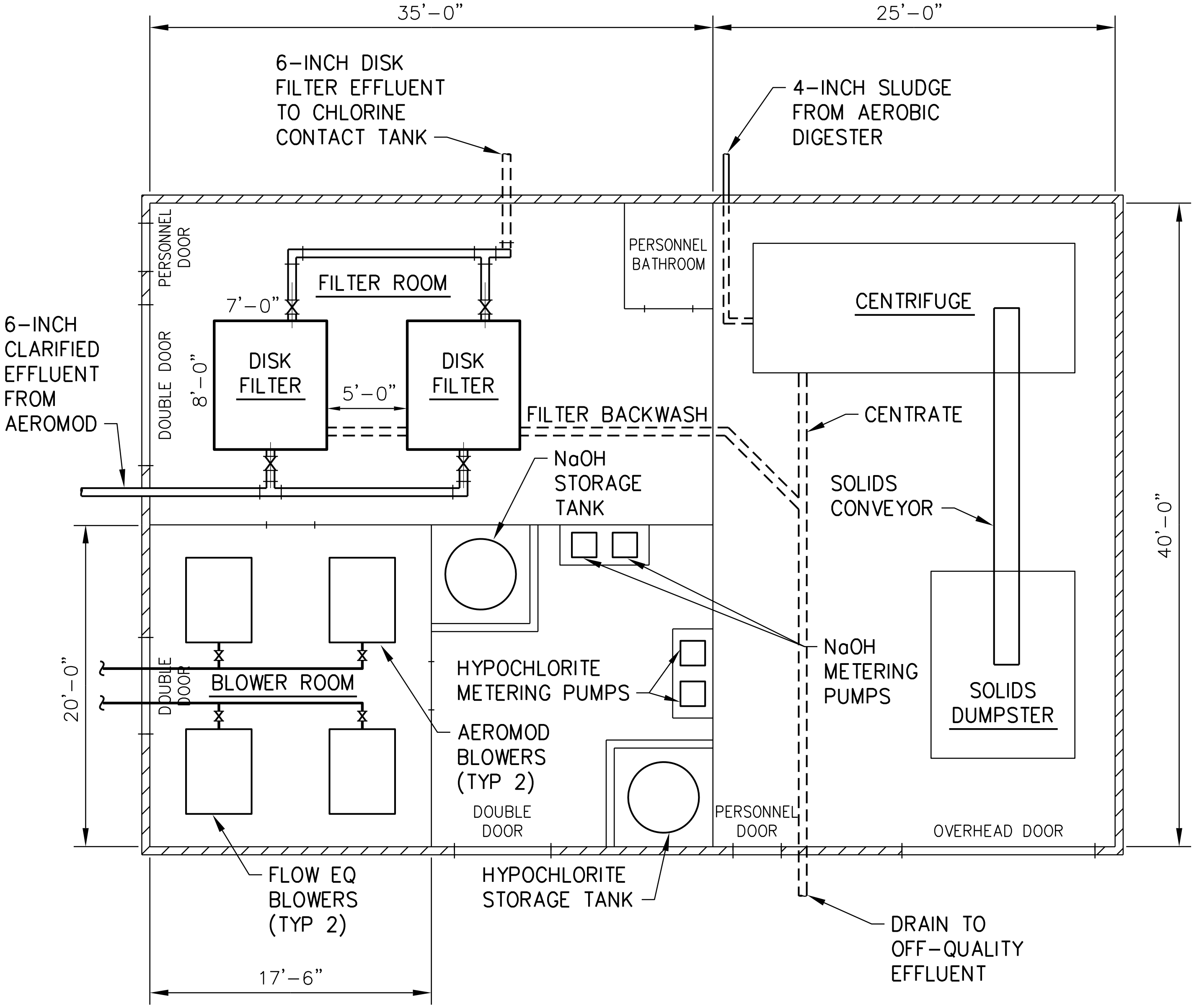
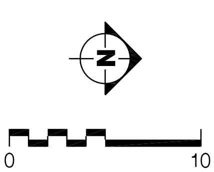
VALIANO WTWRF
AERO-MOD
TREATMENT SYSTEM

Figure 11





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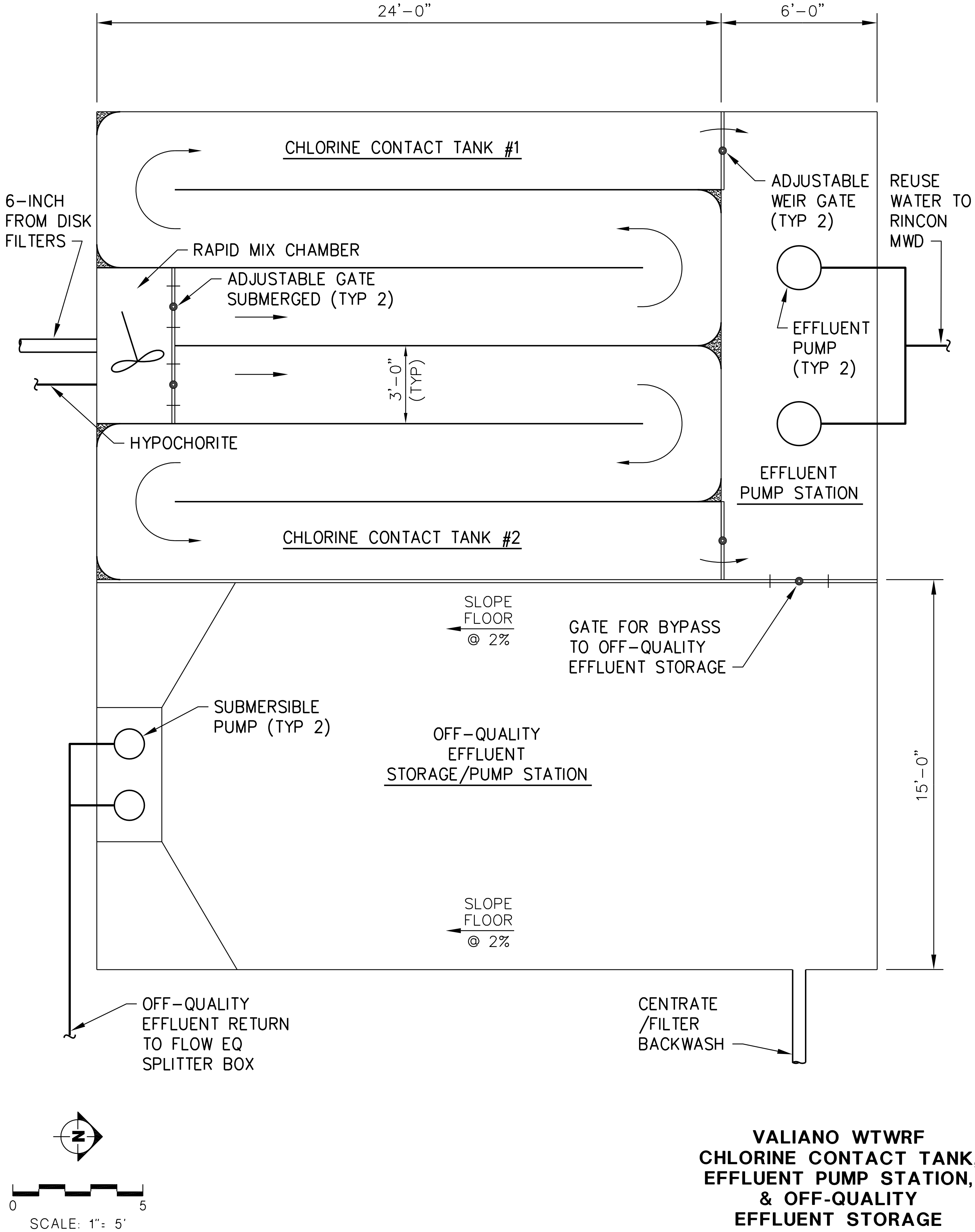
VALIANO WTWRF OPERATIONS BUILDING

Figure 12



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VALIANO WTWRF CHLORINE CONTACT TANK, EFFLUENT PUMP STATION, & OFF-QUALITY EFFLUENT STORAGE

Figure 13

APPENDIX A
EQUIPTMENT INFORMATION

Budgetary Proposal

September 17, 2015

Dan Widdel
630/837-5640, ext. 225
dw@lakeside-equipment.com

TO	PROJECT
Ms. Jennifer A. Moore, P.E. ATKINS 3901 Calverton Boulevard, Suite 400 Calverton, MD 20705	Valiano, CA Valiano WTWRF

EQUIPMENT	UNIT	QTY	TOTAL
Lakeside *Raptor*® Rotating Drum Screen **Model 24RDS - 0.25 - 103**	**$ 94,000**	**1**	**$94,000**

Due to the current volatility of stainless steel prices, budgetary cost of equipment may be subject to change.

SPECIFICATION

Unit Capacity:	1.60	mgd	Maximum Headloss:	12	inches
Inclination:	35	degrees	Maximum Upstream Level:	16	inches
Hole Diameter:	0.25	inches (6 mm)	Nominal Basket Diameter:	23	inches
Water Requirements:	15	gpm at 80 psi	Transport Screw Diameter:	10	inches

SCREEN

AISI 304 stainless steel construction
Standard length screen
Perforated plate screenings basket
2 hp drive unit
3-Zone wash system with solenoid valves
Two (2) float switches
Spare parts

CONTROL PANEL

Non-explosion proof design
NEMA 4X - 304 stainless steel main control panel
No local control station
Fusible disconnect switch with door handle
Control power transformer
Allen-Bradley MicroLogix 1100 PLC
Variable frequency drive with line reactor
Selector switches
Indicator lights

EXCLUSIONS

Grating across channel
Handrail around perimeter of channel
Screenings collection containers
Piping, valves or fittings, unless noted otherwise
Interconnecting conduit or wiring
Discharge chute
Slide gates
Manual bar screen
Special tools

OPTIONAL ITEMS	UNIT PRICE
Extra screen transport tube length (per foot of extra vertical height)	$1,100
Explosion proof design package	$4,600
Booster pump and related controls	$5,800
Weather protection system package	$9,900
Screenings bagger - individual or continuous type	$900

NOTES

FOB:	Chariton, Iowa	Approvals:	6 to 8 weeks
Freight:	Freight allowed to jobsite	Shipment after Approval:	18 to 20 weeks
Start-Up Service:	3 days in 2 trips	Weight per Screen:	1,710 lbs
Warranty:	One (1) year	Installation Time per Screen:	32 hours

1022 E. Devon Avenue | P.O. Box 8448 | Bartlett, IL 60103
T: 630-837-5640 | **F:** 630-837-5647 | **E:** sales@lakeside-equipment.com
www.lakeside-equipment.com

TECHNICAL DATA SHEET

RAPTOR® Rotating Drum Screen, Model 24RDS-0.25

Minimum chamber width .... 24.0 in.
Basket diameter .... 23.0 in.
Basket type .... Perforated plate
Perforated opening... 0.25 in.
Maximum hydraulic capacity .... 1.6 mgd
Maximum upstream water level .... 16.0 in.
Inclination... 35°
Screw conveyor diameter .... 10 in.
Screen material .... Screen basket (AISI 304 stainless steel)
Transport tube (AISI 304 stainless steel)
Screw (AISI 304 stainless steel)
Lower bearing... Self-lubricated, water flushed
Automatic wash system .... Basket wash
Transport wash
Compaction dewater wash
Water requirements... 15 gpm @ 80 psi
Solenoid valves (3) .... ¾ in. two-way
Brass body
NEMA 4/7/9 junction box

Level Sensor:

Sensor type .... Float
Brand .... Linden

Motor:

Rated Effect.. 2.0 HP
Rotations .... 1,800 rpm
Phase, Frequency, Voltage .... 3 Ph / 60 Hz / 230-460 Volts
Frame 145TC
Enclosure... TEFC
Efficiency .... Premium
Duty... Severe
Classification... Non-explosion proof

Gear Reducer:

Brand	Sumitomo SM-Helical
Type	Cycloidal/Helical gear
Ratio	151:1
Stages	2
Torque	14,400 in-lb_f
Thrust	5,800 in-lb_f
Service factor	1.50
Service Interval/oil change	Every 6 months
Grade of oil	ISO 100 - 4EP
Quantity of oil	0.26 gal.

Control Panel:

Enclosure	NEMA 4X (stainless steel)
Logic	Allen-Bradley MicroLogix 1100 PLC
External communication	Remote dry contact outputs for the following; Screen running Malfunction alarm High water level alarm
Other components	Door interlocked fused disconnect VFD with line reactor Control power transformer 120 VAC transient voltage surge suppressor Cabinet heater with thermostat (outdoor installations) LED pilot lights for the following: Control power on (white) High level (amber) Overload shutdown / screen fault (red) Hand-Off-Auto selector switches for the following: Screen drive Wash system Forward-Off-Reverse selector switch for screen drive Re-set push button (black) E-stop push button (red) Door-mounted elapsed time meter White phenolic nameplates with black lettering 600 VAC terminal block U.L. panel label

LAKESIDE EQUIPMENT CORPORATION

Water and Wastewater Treatment Equipment
P.O. Box 8448
Bartlett, IL 60103

REPRESENTATIVES
PRINCIPAL CITIES

TELEPHONE: 630/837-5640
FAX: 630/837-5647

LAKESIDE SCREEN GENERAL DESIGN NOTES

Follow these guidelines when incorporating a Lakeside screen in your project:

Hydraulics

1. Based upon the desired channel velocity, which is typically in the range of 1 to 3 ft/sec, you will need to determine the channel width upstream and downstream of the Lakeside Screen. The channel width may be less than that required to accommodate the Lakeside Screen basket.

2. If there is a transition from an influent feed pipe to an open channel, the maximum water level upstream of the screen should not flood the influent feed pipe. Lower the channel floor to ensure the water level does not exceed 75-percent of the inlet pipe diameter.

3. The Lakeside screen operates on a set water level upstream of the screen. Regardless of the flow rate, once the upstream water level reaches 2.0-inches below the screen's maximum upstream water level, the level sensor will activate the screen for operation. The screen's maximum upstream water level is shown on the screen layout drawing.

Installation Requirements

4. Include provisions to lift and/or rotate the screen out of the channel for service. Considerations might include: mobile lifting equipment, permanently installed hoists, overhead lifting beams or eye hooks. Accessibility, work space and convenience of use must also be considered.

5. Keep the area under the screenings transport screw free from fixed obstructions such as slide gates, electrical conduit, piping and other process equipment to allow pivoting the screen for service.

6. Installations that are subject to **freezing conditions** should be enclosed or have weather protective walls or covers over the basket area. **This protection is necessary to prevent the buildup of ice from storms and wash water overspray.**

7. **Flexible electrical conduit runs** with a drip leg between the screen and hard conduit are **required to allow free rotation of the screen**. The hard conduit should be terminated near the pivot point on the transport screw to minimize the length of flexible conduit.

8. **Flexible hose runs or quick disconnect fittings** in the wash water piping are **required** to permit rotation of the screen out of the channel.

9. Rapid closure of the wash water solenoid valves furnished on the Lakeside screen will generate a water hammer in the wash water piping. Installation of a **water hammer eliminator** is suggested to protect piping, backflow preventers or other connected equipment from the potentially damaging effects.

10. Provision for a screenings discharge container should be considered at design time. If standard size containers are available at an existing plant and will be used for the screen, check to insure the space between the operating floor and discharge hopper will accommodate the container. While containers come in many different sizes and shapes, generally a 1 cu yd container will have an overall height of approximately 42 in. If your project requires additional space, contact Lakeside for assistance in providing the correct screen for your application.

11. For tank-mounted screens:

    a. If the screen is used for septage hauling applications, the tank inlet must be sufficiently below the truck outlet to insure proper flow.

    b. Adequate supports should be furnished for any tank mounted inlet and outlet piping.

    c. Lakeside furnished tanks are not designed as pressure vessels. Adequate pressure and vacuum relief, by others, is required.

Electrical Controls

12. Surges in the plant power supply may damage electronic equipment in the control panel. **Surge suppression** is suggested where there is a history of utility upsets or when there is a regular test program of switching between utility power and emergency power systems.

13. The control panel must be located to **avoid direct exposure to the sun**. High solar heating can prevent proper operation of internal electronic equipment.

14. **Separate conduit runs** are required for high voltage power, control power and signal wiring.

15. Conduit runs must enter the bottom of the control panel and should be provided with moisture drains. Moisture from conduits entering at other locations can cause problems with sensitive electronic equipment. Water damage is not covered by Lakeside's warranty.

    Conduit entering the top of the panel will void the warranty.

Stainless Steel and Rust

16. The main body of the Lakeside Screen is constructed of stainless steel. Contact with ferrous materials will cause iron oxide (rust) to form on the surfaces. We suggest protecting all stainless surfaces during storage, handling, and installation to prevent the unsightly formation of rust. Some of the common causes are summarized below:

    a. Contact with carbon steel chain or cable.
    b. Wire brushes contaminated with iron.
    c. Grindings from nearby fabrication.
    d. Weld splatter from nearby fabrication.
    e. High iron content wash or process water.

DW
11/15/05

Bulletin #2316 July 2005

Raptor® Rotating Drum Screen

Innovative Screening Solutions

LAKESIDE
Water Purification Since 1928

The Lakeside *RAPTOR*® Rotating Drum Screen

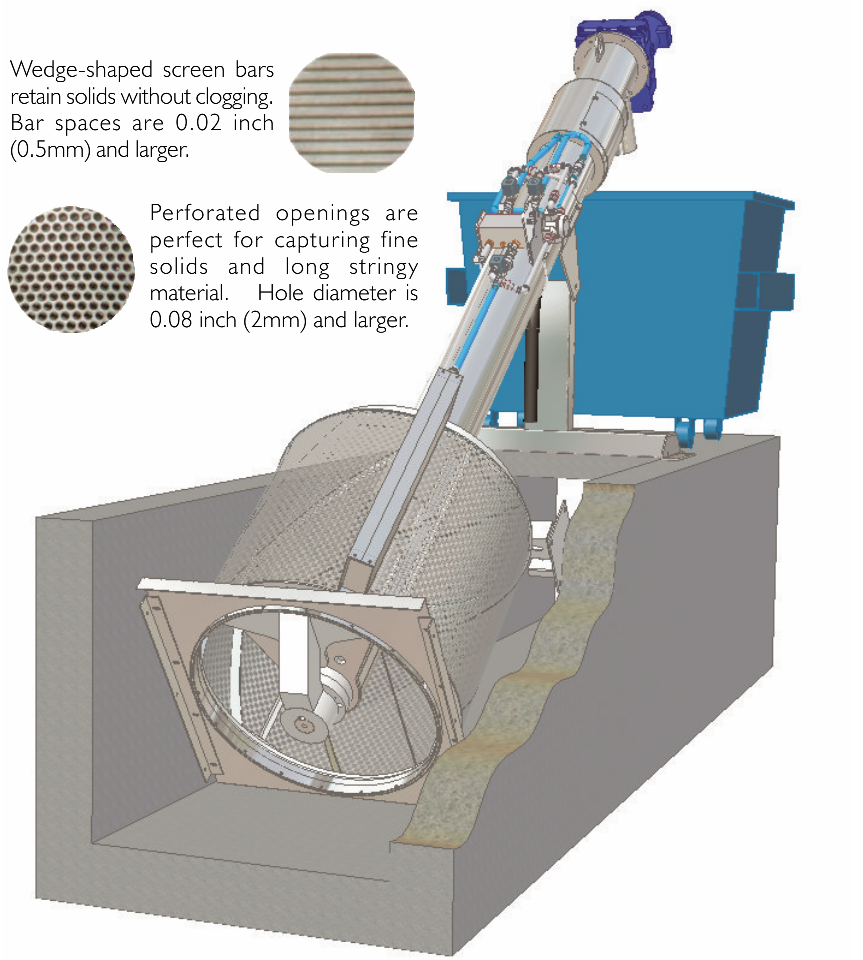
The Lakeside *Raptor*® Rotating Drum Screen meets and exceeds the expectations of operators worldwide with its innovative screening solutions. Not only does the Rotating Drum Screen remove solids, but it also washes and dewaters captured screenings. Along with a simple design and operation process, this screen has a high removal efficiency and low disposal costs.

Screen, Compact and Dewater in a Single Unit

Wastewater from the influent channel flows directly into the screening basket. Fabricated with either wedge-shaped screen bars or perforated plate, the screening basket retains fine solids without clogging. Installed at the front of the screening basket, a seal assembly plate prevents unscreened wastewater from bypassing the screen.

When the wastewater rises to a predetermined level, the screening basket rotates and lifts the screened material out of the influent flow stream. As the material reaches the top of the screening basket, with the help of gravity, it drops into the central screw conveyor/compactor. Any material still in the screening basket is removed by a spray wash system. This system also flushes organic materials back into the influent channel.

The central screw conveyor/compactor transports screened material to the discharge chute and storage container. During transport, the solids are compacted and dewatered up to a 40 percent dry solids content.



Equipment Features and Benefits

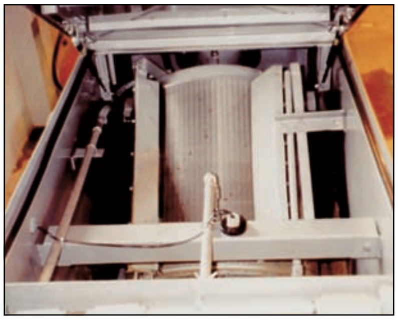
- All stainless steel construction for superior corrosion resistance
- Simple mechanical design requires little maintenance
- Hinged structural support allows unit to pivot out of channel for maintenance at floor level
- Simple drive assembly makes service easy and reduces maintenance costs
- Unit is shipped fully assembled to minimize installation expenses
- All mating parts are machined to ensure proper fit and operation

The Rotating Drum Screen's mechanical design and stainless steel construction lengthen its service life.

Exceptional Efficiency and Handling

- Unique screening basket provides high screening removal efficiency
- Ideal for scum removal applications
- Two-stage screenings wash water system helps return organic material to wastewater stream
- Integrated screening press reduces volume and weight of screenings for lower disposal costs and cleaner operation
- Enclosed transport tube and optional bagging attachment reduce odors and offer a clean working environment for operators
- Optional insulation and heating systems permit cold climate operation

Product Options



Tank Mounting

Available for all size screens, the entire unit can be enclosed in a pre-engineered tank.

Bagging Attachment

Available for all size screens, the enclosed transport and optional continuous bagging attachment reduce odors and provide a clean work area.

Weather Protection

Available for all size screens and transport tubes, the Lakeside weather protection system protects to 13° below zero (minus 25° C).

Control Panel

Lakeside control panels are PLC-equipped for versatile and efficient operation. Explosion-proof designs are also available.

Treatment equipment and systems solutions from Lakeside

Lakeside offers a wide range of equipment and systems for virtually all stages of wastewater treatment from influent through final discharge. Each process and equipment item that we supply is manufactured with one goal in mind . . . to reliably improve the quality of our water resources in the most cost-effective way possible.

We've been doing just that since 1928.

Aeration
newair® Diffuser
CLR Process
E.A. Aerotor
Magna Rotors
Rotor Covers
Level Control Weirs

Submersible Products
Mixers
Propeller Pumps
Grinder Pumps

Clarification
Spiraflo Clarifier
Spiravac Clarifier
Tertiary Treatment using Series Clarification
Full-Surface Skimming

Trickling Filters

Trash & Screen Rakes

***RAPTOR®* Screening Products**
Fine Screen
Micro Strainer
Rotating Drum Screen
Wash Press
Septage Acceptance Plant

Other Screening Products
Water Intake Screens
CSO Screens

Packaged Headworks Systems
RAPTOR® Complete Plant
H-PAC

Grit Collection
SpiraGrit
Aeroductor
RAPTOR® Grit Washer
Inline Grit Collector
Model L Grit Classifier

Screw Pumps
Open Screw Pumps
Enclosed Screw Pumps

LAKESIDE
Water Purification Since 1928

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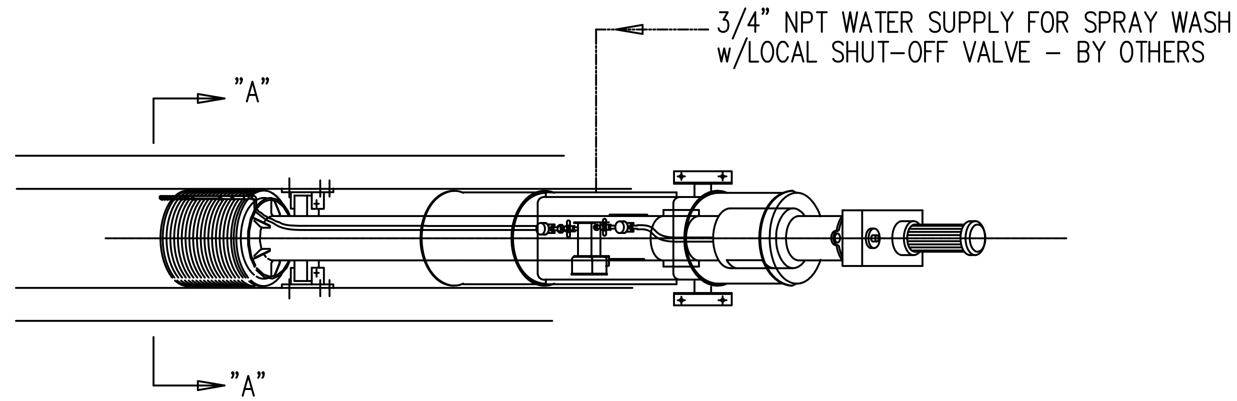
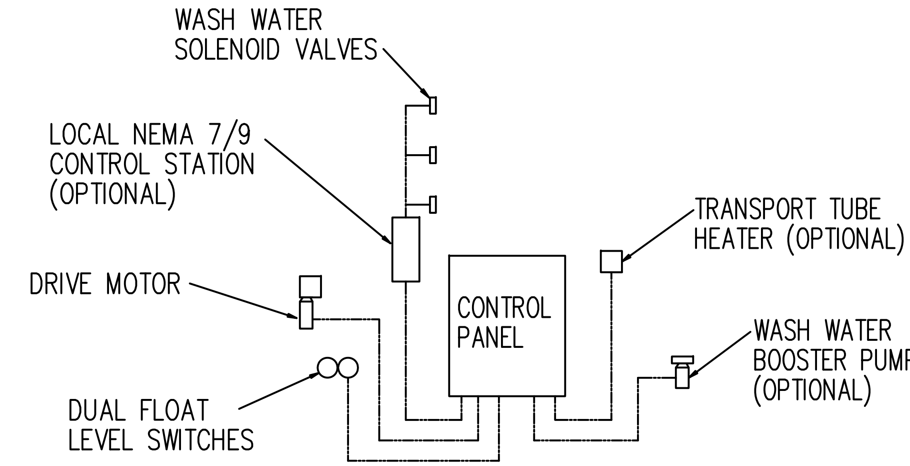
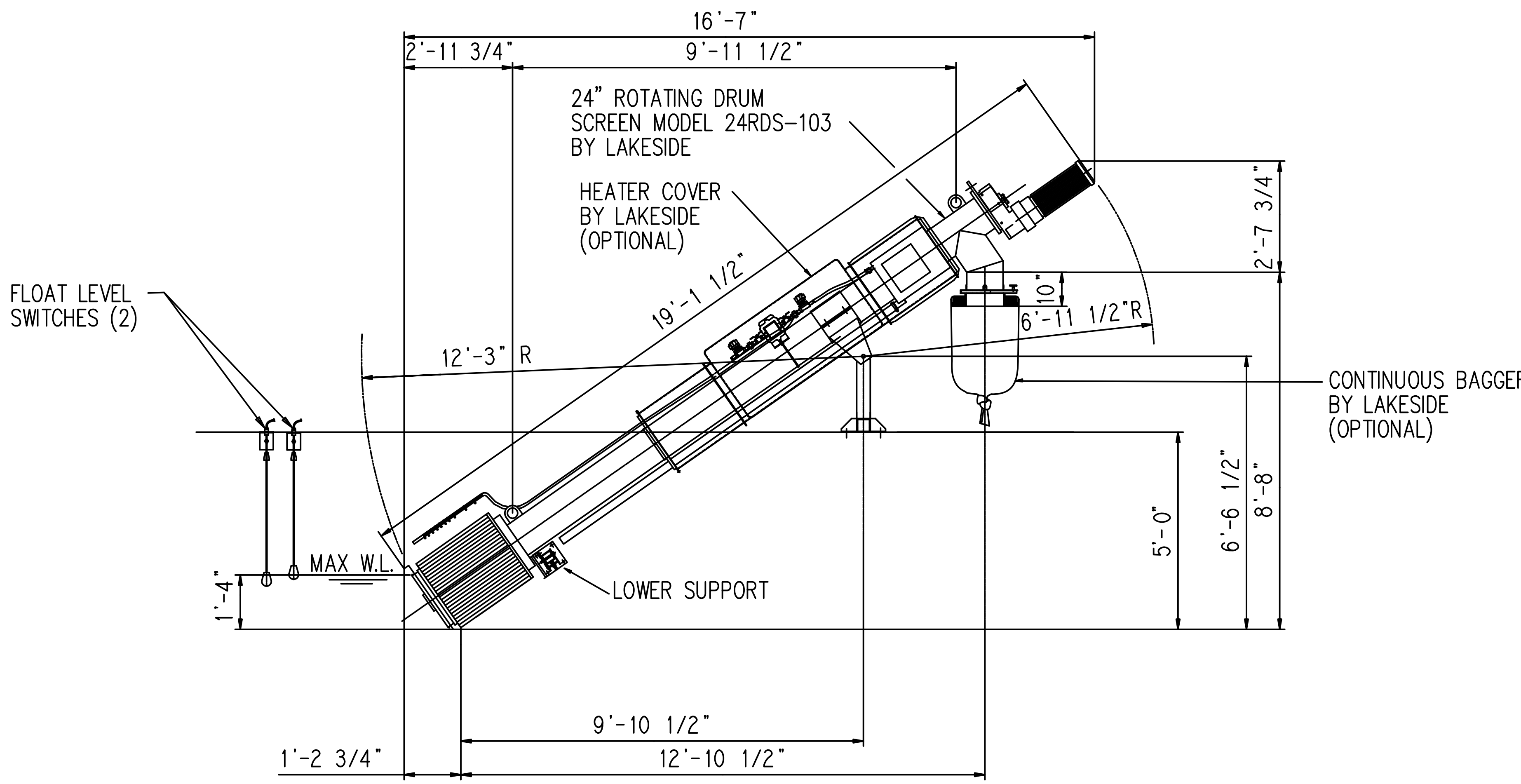


PLAN

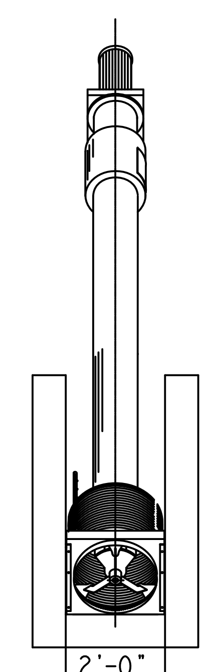


CONTROL INTERCONNECTION DIAGRAM

ALL CONDUIT AND WIRE CONNECTIONS BETWEEN CONTROL PANEL AND SCREEN COMPONENTS BY OTHERS.



ELEVATION



SECTION "A-A"
(HEATER COVER NOT SHOWN THIS VIEW)

REVISIONS	DATE	DR.	CHKD.
C REVISED TO STD. 24RDS-103	10-17-13	GS	
B REVISED	11-18-05	JS	

LAKESIDE EQUIPMENT CORPORATION

DR. JS | DATE 3-31-05 | CHKD. | FILE NO. 250

RAPTOR® ROTATING DRUM SCREEN
MODEL 24RDS-103

DWG. NO. D-71773-S | REV. C

Equipment Information - Tertiary Disk Filters

PROCESS DESIGN REPORT

VALIANO WTF CA

Design#: 141441

Option: Preliminary Design

Designed By: Sophia Bainbridge on Tuesday, August 25, 2015

Design Notes

Filtration

- The filter recommendation assumes the upstream process is an activated sludge system with an SRT of 5 days or longer.

- The anticipated filtered effluent quality is based on the filter influent conditions as shown under "Design Parameters" of this Process Design Report. In addition, the filter influent should be free of algae and other solids that are not filterable through a nominal 10 micron pore size media. Provisions to treat algae and condition the solids to be filterable are the responsibility of others.

- For this application, pile filter cloth is recommended.

- The following filter recommendation has been designed in accordance with the State of California Title 22 Code of Regulations related to recycled water.

A. The cloth media filters shall:
1. Provide a 24-hour average filtered effluent of 2 NTU or less.
2. Provide a filtered effluent not to exceed 5 NTU for more than 5% of the time within a 24-hour period.
3. Provide a filtered effluent not to exceed 10 NTU at any time.

B. Filter influent turbidity is continuously measured, and shall not exceed 5 NTU for more than 15 minutes and never shall exceed 10 NTU, and that there is the capability to automatically activate chemical addition or divert the wastewater from the filter should the filter influent turbidity exceed 5 NTU for more than 15 minutes.

Equipment

- Equipment selection is based upon Aqua Aerobic Systems' standard materials of construction and electrical components.

- Aqua-Aerobic Systems, Inc. is familiar with various “Buy American” Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project’s “Buy American” provisions.

AquaDISK Tertiary Filtration - Design Summary

DESIGN INFLUENT CONDITIONS

Pre-Filter Treatment:	Secondary		
Avg. Design Flow	= 0.072 MGD	= 50.00 gpm	= 273 m³/day
Max Design Flow	= 0.174 MGD	= 120.8 gpm	= 659 m³/day

DESIGN PARAMETERS	Influent	mg/l	Effluent Required	<= mg/l	Effluent Anticipated	<= mg/l
Avg. Total Suspended Solids:	TSSa	10	TSSa	5	TSSa	5
Max. Total Suspended Solids:	TSSm	20	--	--	--	--
***Turbidity:**	NTU	5	NTU	2	NTU	2

*Note: Tubidity represented in Nephelometric Turbidity Units (NTU's) in lieu of mg/l.

AquaDISK FILTER RECOMMENDATION

Qty Of Filter Units Recommended	= 1
Number Of Disks Per Unit	= 2
Total Number Of Disks Recommended	= 2
Total Filter Area Provided	= 21.6 ft² = (2.01 m²)
Filter Model Recommended	= AquaDisk Package: Model ADFSP-11-2E-PC
Filter Media Cloth Type	= OptiFiber PA2-13

AquaDISK FILTER CALCULATIONS

Filter Type:

Vertically Mounted Cloth Media Disks featuring automatically operated vacuum backwash . Tank shall include a rounded bottom and solids removal system.

Average Flow Conditions:

Average Hydraulic Loading
= Avg. Design Flow (gpm) / Recommended Filter Area (ft²)
= 50 / 21.6 ft²
= 2.31 gpm/ft² (1.57 l/s/m²) at Avg. Flow

Maximum Flow Conditions:

Maximum Hydraulic Loading
= Max. Design Flow (gpm) / Recommended Filter Area (ft²)
= 120.8 / 21.6 ft²
= 5.59 gpm/ft² (3.80 l/s/m²) at Max. Flow

Solids Loading:

Solids Loading Rate
= (lbs TSS/day at max flow and max TSS loading) / Recommended Filter Area (ft²)
= 29 lbs/day / 21.6 ft²
= 1.34 lbs. TSS /day/ft² (6.55 kg. TSS/day/m²)

Cloth Media Filters

AquaDisk Tanks/Basins

1 AquaDisk Model # ADFSP-11x2E-PC Package Filter Painted Steel Tank(s) consisting of:

- 2 disk tank(s) will be painted steel, estimated dry weight is 3,475 lbs., and estimated operating weight is 7,750 lbs.
Each tank will include an integral solids waste collection manifold.
The tank finish will be:
Interior: Near white sandblast (SSPC-SP10), painted with Tnemec N69 polyamide epoxy (color safety blue) 2 coats 4-6 mils each for 8-12 mils DFT.
Exterior: Commercial sandblast (SSPC-SP6), painted Tnemec N69 Hi-Build Epoxoline II (color safety blue) 2 coats 3-4 mils each, 1 coat Tnemec 1075 Endura-Shield II, 2-3 mils for 8-11 mils DFT.
- 2" ball valve(s).

AquaDisk Centertube Assemblies

1 Centertube(s) consisting of:

- 304 stainless steel centertube weldment(s).
- Centertube driven sprocket(s).
- Dual wheel assembly(ies).
- Rider wheel bracket assembly(ies).
- Centertube bearing kit(s).
- Effluent centertube lip seal.
- Pile cloth media and non-corrosive support frame assemblies.
- 304 Stainless steel frame top plate(s),
- Media sealing gaskets.
- Disk segment 304 stainless steel support rods.

AquaDisk Drive Assemblies

1 Drive System(s) consisting of:

- Gearbox with motor.
- Drive sprocket(s).
- Drive chain(s) with pins.
- Stationary drive bracket weldment(s).
- Adjustable drive bracket weldment(s).
- Chain guard weldment(s).
- Warning label(s).

AquaDisk Backwash/Sludge Assemblies

1 Backwash System(s) consisting of:

- Backwash shoe assemblies.
- Backwash shoe support weldment(s).
- 1 1/2" flexible hose.
- Stainless steel backwash shoe springs.
- Hose clamps.

1 Backwash/Solids Waste Pump(s) consisting of:

- Backwash/waste pump(s).
- 0 to 15 psi pressure gauge(s).
- 0 to 30 inches mercury vacuum gauge(s).
- Throttling gate valve(s).
- 2" bronze 3 way ball valve(s).

AquaDisk Instrumentation

1 Pressure Transmitter(s) consisting of:

- Level transmitter(s).

1 Vacuum Transmitter(s) consisting of:

- Vacuum transmitter(s).

1 Float Switch(es) consisting of:

- Float switch(es).
- Float switch support bracket(s).

AquaDisk Valves

1 Solids Waste Valve(s) consisting of:

- 2" full port, three piece, stainless steel body ball valve(s), grooved end connections with single phase electric actuator(s). Valve / actuator combination shall be TCI / RCI (RCI, a division of Rotork), Nibco, or equal.
- 2" flexible hose.
- Victaulic coupler(s).

1 Set(s) of Backwash Valves consisting of:

- 2" full port, three piece, stainless steel body ball valve(s), grooved end connections with single phase electric actuator(s). Valve / actuator combination shall be TCI / RCI (RCI, a division of Rotork), Nibco, or equal.
- 2" flexible hose.
- Victaulic coupler(s).

AquaDisk Controls w/Starters

1 Control Panel(s) consisting of:

- NEMA 4X fiberglass enclosure(s).
- Circuit breaker with handle.
- Transformer(s).
- Fuses and fuse blocks.
- Line filter(s).
- GFI convenience outlet(s).
- Control relay(s).
- Selector switch(es).
- Indicating pilot light(s).
- MicroLogix 1400 PLC(s).
- Ethernet switch(es).
- Operator interface(s).
- Power supply(ies).
- Motor starter(s).
- Terminal blocks.
- UL label(s).

1 Conduit Installation(s) consisting of:

- PVC conduit and fittings.

AQUA-AEROBIC SYSTEMS, INC.

Aqua-Aerobic

Cloth Media Filters

Aqua-Aerobic
Cloth Media Filters

Aqua-Aerobic Systems revolutionized tertiary treatment by introducing cloth media disk filtration. After 20 years and over 1,000 installed units worldwide, Aqua-Aerobic continues to lead the industry in the development and application of cloth media technology. Original OptiFiber® pile cloth is the common thread utilized on all of our mechanical configurations: AquaDisk®, Aqua MiniDisk® and AquaDiamond® filters. Satisfied customers realize performance advantages, cost savings and ease of operation and maintenance compared to other tertiary filters and microscreens.

OptiFiber® Cloth Media

OptiFiber® cloth media is engineered exclusively for wastewater and water applications. It is designed to maximize solids removal over a wide range of particle sizes. Its thick, pile construction allows filtered solids to be stored, unlike microscreen media, to extend the time between backwashes. A uniquely designed cloth fiber backing support structure promotes thorough cleaning of the media for optimum performance.

OptiFiber PA2-13®

OptiFiber PES-13®

Ongoing Cloth Media Research

We remain dedicated to advancing the science of cloth media filtration through technical research. Our years of experience in cloth media development provide a unique understanding of the close relationship between cloth construction and performance. Every cloth design must pass rigorous, full-scale field testing prior to commercial implementation. The result is our ability to offer you the highest degree of confidence in achieving your specific performance objectives.

OptiFiber PES-14™

Unique backing design

OptiFiber® Pile Cloth Media Compared to Microscreen Media

Pile Cloth Media

- Depth of media provides increased solids storage
- Backing support offers durability and longer media life
- Direct media contact during backwashing for higher maximum cleaning efficiency
- Variety of application-specific cloth media available, as small as 5 micron nominal pore size

Microscreen

- Flat, no depth for solids storage
- No backing support resulting in media being vulnerable to tearing
- No direct contact with media during backwashing
- 10 micron pore size and greater

AquaDisk®

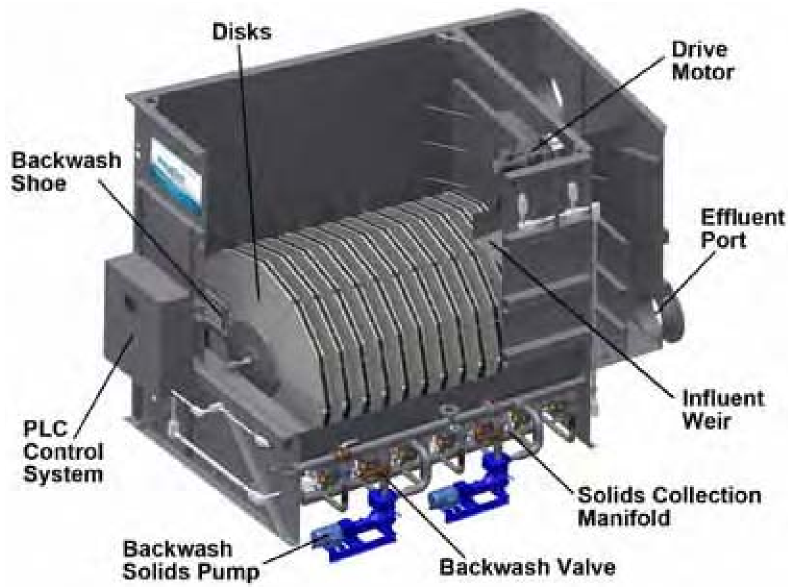
CLOTH MEDIA FILTER

Aqua-Aerobic was first in the market, in 1991, to offer a cloth media disk configuration as an alternative to conventional granular media filtration technologies. A history of exceptional operating experience and durability continues to make AquaDisk® the tertiary filter of choice.

Features and Advantages

- Vertically oriented cloth media disks reduce required footprint
- Each disk has six lightweight, removable segments for ease of maintenance
- Fully automatic PLC control system with color touchscreen Human Machine Interface (HMI)
- Low hydraulic profile
- Higher solids and hydraulic loading rates
- Low backwash rate
- Available in painted steel, stainless steel or concrete tanks
- Low life-cycle cost
- The Aqua MiniDisk® filter is designed for flows up to 0.6 MGD offering the same features as the AquaDisk

Components



Modes of Operation

Filtration Mode

- Inlet wastewater enters filter
- Cloth media is completely submerged
- Disks are stationary
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Tank liquid level rises
- Flow enters the filter by gravity and filtrate is collected inside the disks and discharged
- Heavier solids settle to tank bottom

Backwash Mode

- Solids are backwashed at a predetermined liquid level or time
- Backwash shoes contact the media directly and solids are removed by vacuum pressure of the backwash pump
- Two disks are backwashed at a time (unless a single disk is utilized)
- Disks rotate slowly
- Filtration is not interrupted
- Backwash water is directed to headworks

Solids Wasting Mode

- Heavier solids on the tank bottom are removed on an intermittent basis
- Solids are pumped back to the headworks, digester or other solids collection area of the treatment plant

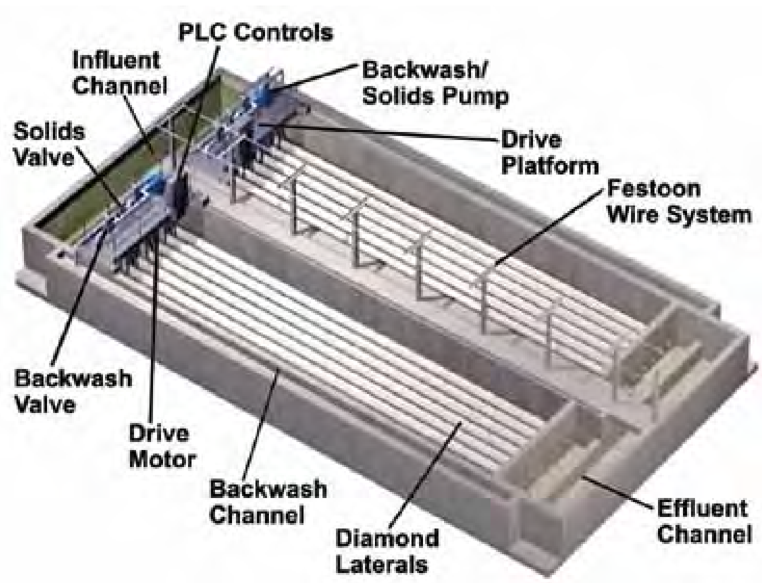
AquaDiamond®
CLOTH MEDIA FILTER

The AquaDiamond® filter is a unique combination of two proven technologies; traveling bridge and cloth media filters. The result is two to three times the flow capacity of a traveling bridge filter within an equivalent footprint, making it ideal for sand filter retrofits.

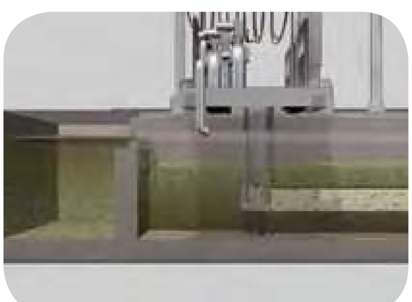
Features and Advantages

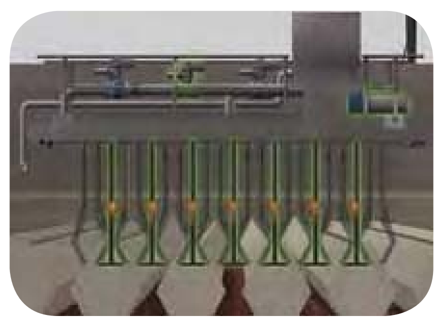
- Up to eight vertically oriented diamond laterals per unit; available in concrete tanks
- Fits neatly into existing traveling bridge filter profile with minimal civil work
- Variable speed drive platform and backwash pump provide immediate response to influent solids excursions
- Advanced drive and tracking system prevents misalignment
- Fully automatic PLC control system with color touchscreen Human Machine Interface (HMI)
- Low hydraulic profile
- Higher solids and hydraulic loading rates
- Low backwash rate
- Components requiring maintenance are easily accessible, resulting in less maintenance costs compared to sand media filters
- Low life-cycle cost

Components



Modes of Operation





Filtration Mode

- Inlet wastewater enters the filter
- Cloth media is completely submerged
- No moving parts
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Flow enters the filter by gravity and filtrate is collected inside the diamond laterals and discharged
- Heavier solids settle to basin floor

Backwash Mode

- Periodic backwashing is initiated by increased headloss due to solids deposits
- The platform traverses the length of the cloth media diamond laterals during backwashing
- Backwash shoes contact the media directly and solids are removed by vacuum pressure of the backwash pump
- The platform only operates during backwashing and solids collection

Solids Wasting Mode

- Heavier solids on the tank bottom are removed on an intermittent basis
- Small suction headers collect and discharge settled solids
- The backwash pump is utilized for solids removal.

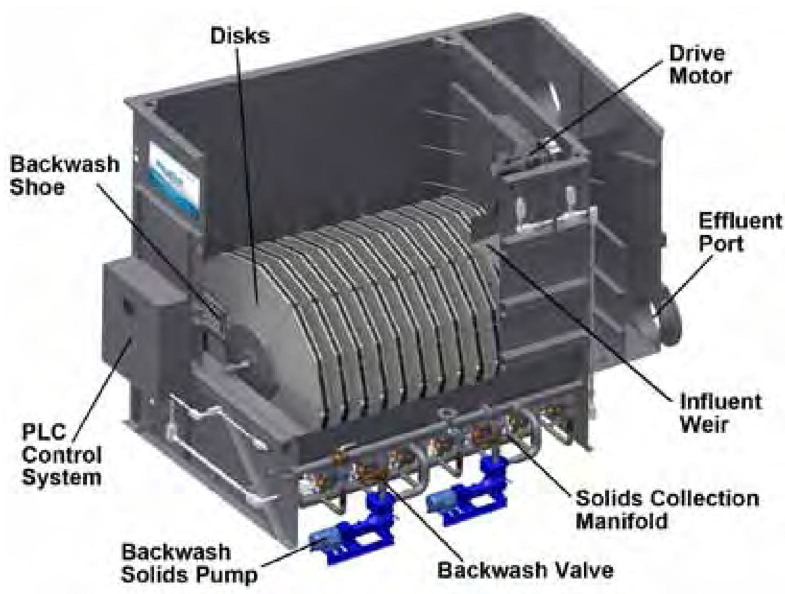
AquaDisk®
CLOTH MEDIA FILTER

Aqua-Aerobic was first in the market, in 1991, to offer a cloth media disk configuration as an alternative to conventional granular media filtration technologies. A history of exceptional operating experience and durability continues to make AquaDisk® the tertiary filter of choice.

Features and Advantages

- Vertically oriented cloth media disks reduce required footprint
- Each disk has six lightweight, removable segments for ease of maintenance
- Fully automatic PLC control system with color touchscreen Human Machine Interface (HMI)
- Low hydraulic profile
- Higher solids and hydraulic loading rates
- Low backwash rate
- Available in painted steel, stainless steel or concrete tanks
- Low life-cycle cost
- The Aqua MiniDisk® filter is designed for flows up to 0.6 MGD offering the same features as the AquaDisk

Components



Modes of Operation

Filtration Mode

- Inlet wastewater enters filter
- Cloth media is completely submerged
- Disks are stationary
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Tank liquid level rises
- Flow enters the filter by gravity and filtrate is collected inside the disks and discharged
- Heavier solids settle to tank bottom

Backwash Mode

- Solids are backwashed at a predetermined liquid level or time
- Backwash shoes contact the media directly and solids are removed by vacuum pressure of the backwash pump
- Two disks are backwashed at a time (unless a single disk is utilized)
- Disks rotate slowly
- Filtration is not interrupted
- Backwash water is directed to headworks

Solids Wasting Mode

- Heavier solids on the tank bottom are removed on an intermittent basis
- Solids are pumped back to the headworks, digester or other solids collection area of the treatment plant

AquaDiamond®

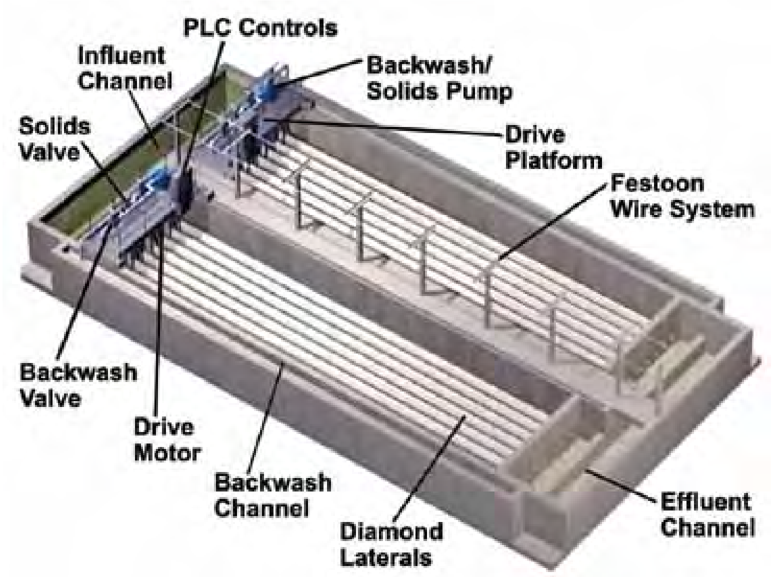
CLOTH MEDIA FILTER

The AquaDiamond® filter is a unique combination of two proven technologies; traveling bridge and cloth media filters. The result is two to three times the flow capacity of a traveling bridge filter within an equivalent footprint, making it ideal for sand filter retrofits.

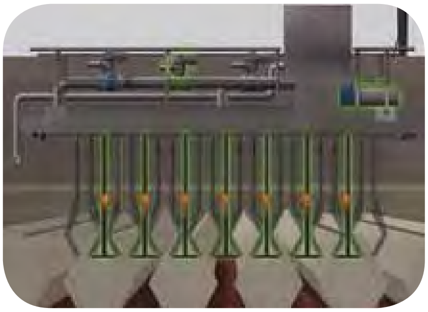
Features and Advantages

- Up to eight vertically oriented diamond laterals per unit; available in concrete tanks
- Fits neatly into existing traveling bridge filter profile with minimal civil work
- Variable speed drive platform and backwash pump provide immediate response to influent solids excursions
- Advanced drive and tracking system prevents misalignment
- Fully automatic PLC control system with color touchscreen Human Machine Interface (HMI)
- Low hydraulic profile
- Higher solids and hydraulic loading rates
- Low backwash rate
- Components requiring maintenance are easily accessible, resulting in less maintenance costs compared to sand media filters
- Low life-cycle cost

Components



Modes of Operation



Filtration Mode

- Inlet wastewater enters the filter
- Cloth media is completely submerged
- No moving parts
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Flow enters the filter by gravity and filtrate is collected inside the diamond laterals and discharged
- Heavier solids settle to basin floor

Backwash Mode

- Periodic backwashing is initiated by increased headloss due to solids deposits
- The platform traverses the length of the cloth media diamond laterals during backwashing
- Backwash shoes contact the media directly and solids are removed by vacuum pressure of the backwash pump
- The platform only operates during backwashing and solids collection

Solids Wasting Mode

- Heavier solids on the tank bottom are removed on an intermittent basis
- Small suction headers collect and discharge settled solids
- The backwash pump is utilized for solids removal.

Aqua-Aerobic Cloth Media Filters
Typical Applications

Municipal Recycle/Reuse

- 18 MGD average daily flow
- AquaDisk filters provide <= 2.0 NTU for stringent reuse applications.

Phosphorus Removal

- 1.5 MGD average daily flow
- AquaDisk filters provide phosphorus removal to 0.1 mg/l in a small footprint.

Traveling Bridge Filter Retrofits

- 162 MGD average daily flow
- AquaDiamond filters retrofitted into traveling bridge filter basins more than doubled the hydraulic capacity within the existing filter footprint.

Deep Bed Filter Retrofits

- 25 MGD average daily flow
- AquaDisk filters replaced sand media filters, increasing hydraulic capacity without the need for construction of new basins.

Small Flows Up To 0.6 MGD

- 0.12 MGD average daily flow
- Aqua MiniDisk® filters in steel package tanks provide reuse water for a west coast gaming facility.

Onsite Pilot Testing

- Cloth Media Filtration Pilot System provides on-site cloth media testing, analysis, and performance validation.
- Totally enclosed system includes a cloth media filter and fully equipped laboratory.

Providing TOTAL Water Management Solutions

Visit our website at www.aqua-aerobic.com to learn more about Aqua-Aerobic Cloth Media Filters and our complete line of products and services:

Aeration & Mixing

Biological Processes

Membranes

Filtration

Controls & Monitoring Systems

Aftermarket Products and Services

AQUA-AEROBIC SYSTEMS, INC.

6306 N. Alpine Rd Loves Park, IL 61111-7655
p 815.654.2501 f 815.654.2508
www.aqua-aerobic.com
solutions@aqua-aerobic.com

The information contained herein relative to data, dimensions and recommendations as to size, power and assembly are for purpose of estimation only. These values should not be assumed to be universally applicable to specific design problems. Particular designs, installations and plants may call for specific requirements. Consult Aqua-Aerobic Systems, Inc. for exact recommendations or specific needs. Patents Apply.

APPENDIX B
ESTIMATE OF PROBABLE COST

Valiano WTWRF - Cost Estimate
Option 1 - Stand Alone Plant

Assumptions for Markup:

Installation:	20%
Electrical/Instrumentation:	25%

Item	Unit	Qty	Unit Cost	Installation	Total Cost	Notes
Headworks and Influent Pump Station						
Concrete - Building	CY	46	$ 1,200.00	$ -	$ 55,200.00	Concrete cost from AeroMod Proposal
Building Walls	SF	2100	$ 32.00	$ -	$ 67,200.00	From HG, Increased by 6%
Building Roof	SF	1575	$ 26.50	$ -	$ 41,737.50	From HG, Increased by 6%
Ancillary Building Items	LS	1	$ -	$ -	$ 24,620.63	15% of concrete, wall and roof costs
Influent Screen	EA	1	$ 94,000.00	$ 18,800.00	$ 112,800.00	From Lakeside Proposal
Bypass Bar Screen	EA	1	$ 5,000.00	$ 1,000.00	$ 6,000.00	
Piping (8-in DIP)	LF	50	$ 195.00	$ -	$ 9,750.00	From F+G Estimate
Concrete - Pump Station	CY	12	$ 800.00	$ -	$ 9,600.00	
Submersible Pumps	EA	2	$ 5,000.00	$ 1,000.00	$ 11,000.00	
Valves	LS	1	$ 20,000.00	$ -	$ 20,000.00	
Excavation/Sitework	LS	1	$ 28,313.72	$ -	$ 28,313.72	15% of building costs
Electrical/Instrumentation	LS	1	$ 89,477.03	$ -	$ 89,477.03	Markup of building and equipment costs
				Sub Total =	$ 475,698.88	
Flow Equalization and Flow Splitter Box						
Concrete	CY	88	$ 1,200.00	$ -	$ 105,600.00	Concrete cost from AeroMod Proposal
Piping (8-in DIP)	LF	50	$ 195.00	$ -	$ 9,750.00	
Piping (6-in DIP)	LF	60	$ 150.00	$ -	$ 9,000.00	
Aeration Piping	LF	155	$ 800.00	$ -	$ 124,000.00	
Aeration Blowers	EA	2	$ 5,000.00	$ 2,000.00	$ 12,000.00	
Equalization Pumps	EA	4	$ 5,000.00	$ 4,000.00	$ 24,000.00	
Weir Gate	EA	2	$ 10,000.00	$ 4,000.00	$ 24,000.00	
Excavation/Sitework	LS	1	$ 21,120.00	$ -	$ 21,120.00	20% of Concrete costs
Electrical/Instrumentation	LS	1	$ 77,087.50	$ -	$ 77,087.50	Markup of all costs excluding excavation
				Sub Total =	$ 406,557.50	
AeroMod System						
Concrete	CY	425	$ 1,200.00	$ -	$ 510,000.00	Concrete qty and cost from AeroMod
Equipment	LS	1	$ 425,000.00	$ 85,000.00	$ 510,000.00	Equipment cost from AeroMod
Excavation/Sitework	LS	1	$ 102,000.00	$ -	$ 102,000.00	20% of Concrete costs
Electrical/Instrumentation	LS	1	$ 127,500.00	$ -	$ 127,500.00	Markup of Equipment Costs
				Sub Total =	$ 1,249,500.00	
Operations Building						
Concrete	CY	100	$ 1,200.00	$ -	$ 120,000.00	Concrete cost from AeroMod Proposal
Building Walls	SF	4760	$ 32.00	$ -	$ 152,320.00	
Building Roof	SF	1344	$ 26.50	$ -	$ 35,616.00	
Ancillary Building Items	LS	1	$ 92,380.80	$ -	$ 92,380.80	30% of Building Cost (Plumbing, etc)
Piping (4-in DIP)	LF	100	$ 125.00	$ -	$ 12,500.00	Sludge Piping from Centrifuge
Piping (6-in DIP)	LF	275	$ 150.00	$ -	$ 41,250.00	
Disc Filters	LS	1	$ 220,000.00	$ 44,000.00	$ 264,000.00	From Kruger Proposal

Hypo Storage Tanks	LS	1	$ 10,000.00	$ 2,000.00	$ 12,000.00	
Hypo Feed Pump Skid	LS	1	$ 20,000.00	$ 4,000.00	$ 24,000.00	
Caustic Storage Tanks	LS	1	$ 8,000.00	$ 1,600.00	$ 9,600.00	
Causic Feed Pump Skid	LS	1	$ 20,000.00	$ 4,000.00	$ 24,000.00	
Centrifuge	EA	1	$ 400,000.00	$ 80,000.00	$ 480,000.00	Marked up from HG Proposal
Solids Conveyor	EA	1	$ 50,000.00	$ 10,000.00	$ 60,000.00	From HG Proposal
Excavation/Sitework	LS	1	$ 90,813.36	$ -	$ 90,813.36	20% of Building and Piping Costs
Electrical/Instrumentation	LS	1	$ 331,916.70	$ -	$ 331,916.70	Markup of building and equipment costs
				Sub Total =	$ 1,750,396.86	
Off-Quality Effluent Storage						
Concrete	CY	65	$ 1,200.00	$ -	$ 78,000.00	Concrete cost from AeroMod Proposal
Pumps	EA	2	$ 10,000.00	$ 2,000.00	$ 22,000.00	
Piping (4-in DIP)	LF	100	$ 125.00	$ -	$ 12,500.00	
Excavation/Sitework	LS	1	$ 39,000.00	$ -	$ 39,000.00	50% of Concrete cost - assumes below grade
Electrical/Instrumentation	LS	1	$ 5,500.00	$ -	$ 5,500.00	Markup of Equipment Costs
				Sub Total =	$ 157,000.00	
Chlorine Contact Tank/Effluent Pump Station						
Concrete	CY	70	$ 1,200.00	$ -	$ 84,000.00	Concrete cost from AeroMod Proposal
Effluent Pumps	EA	4	$ 10,000.00	$ 2,000.00	$ 42,000.00	Assumed
Excavation/Sitework	LS	1	$ 16,800.00	$ -	$ 16,800.00	20% of Concrete costs
Electrical/Instrumentation	LS	1	$ 10,500.00	$ -	$ 10,500.00	Markup of Equipment Costs
				Sub Total =	$ 153,300.00	
Odor Control System						
Concrete Pad	CY	8	$ 1,200.00	$ -	$ 9,600.00	
Odor Control System	LS	1	$ 200,000.00	$ 40,000.00	$ 240,000.00	Marked up from HG Proposal
Odor Control Ducting	LF	400	$ 200.00	$ -	$ 80,000.00	
Excavation/Sitework	LS	1	$ 1,920.00	$ -	$ 1,920.00	20% of Concrete costs
Electrical/Instrumentation	LS	1	$ 60,000.00	$ -	$ 60,000.00	Markup of Equipment Costs
				Sub Total =	$ 391,520.00	
Paving/Sitework						
Paving	SF	4800	$ 5.00	$ -	$ 24,000.00	Marked up from HG Proposal
Fence	LF	260	$ 25.00	$ -	$ 6,500.00	Marked up from HG Proposal
Gate	EA	1	$ 6,000.00	$ -	$ 6,000.00	Marked up from HG Proposal
Site Electrical/Lighting	LS	1	$ 50,000.00	$ -	$ 50,000.00	
Planting/Stabilization	LS	1	$ 12,000.00	$ -	$ 12,000.00	50% of Paving Costs
				Sub Total =	$ 98,500.00	
				Total for Plant =	$ 4,682,473.24	

Valiano WTWRF - Cost Estimate
Option 2 - Scalping Option

Assumptions for Markup:

Installation:	20%
Electrical/Instrumentation:	25%

Item	Unit	Qty	Unit Cost	Installation	Total Cost	Notes
Headworks and Influent Pump Station						
Concrete - Building	CY	46	$ 1,200.00	$ -	$ 55,200.00	Concrete cost from AeroMod Proposal
Building Walls	SF	2100	$ 32.00	$ -	$ 67,200.00	From HG, Increased by 6%
Building Roof	SF	1575	$ 26.50	$ -	$ 41,737.50	From HG, Increased by 6%
Ancillary Building Items	LS	1	$ -	$ -	$ 24,620.63	15% of concrete, wall and roof costs
Influent Screen	EA	1	$ 94,000.00	$ 18,800.00	$ 112,800.00	From Lakeside Proposal
Bypass Bar Screen	EA	1	$ 5,000.00	$ 1,000.00	$ 6,000.00	
Piping (8-in DIP)	LF	50	$ 195.00	$ -	$ 9,750.00	From F+G Estimate
Concrete - Pump Station	CY	12	$ 800.00	$ -	$ 9,600.00	
Submersible Pumps	EA	2	$ 5,000.00	$ 1,000.00	$ 11,000.00	
Valves	LS	1	$ 20,000.00	$ -	$ 20,000.00	
Excavation/Sitework	LS	1	$ 28,313.72	$ -	$ 28,313.72	15% of building costs
Electrical/Instrumentation	LS	1	$ 89,477.03	$ -	$ 89,477.03	Markup of building and equipment costs
				Sub Total =	$ 475,698.88	
AeroMod System						
Concrete	CY	425	$ 1,200.00	$ -	$ 510,000.00	Concrete qty and cost from AeroMod
Equipment	LS	1	$ 425,000.00	$ 85,000.00	$ 510,000.00	Equipment cost from AeroMod
Excavation/Sitework	LS	1	$ 102,000.00	$ -	$ 102,000.00	20% of Concrete costs
Electrical/Instrumentation	LS	1	$ 127,500.00	$ -	$ 127,500.00	Markup of Equipment Costs
				Sub Total =	$ 1,249,500.00	
Operations Building						
Concrete	CY	53	$ 1,200.00	$ -	$ 63,600.00	Concrete cost from AeroMod Proposal
Building Walls	SF	2520	$ 32.00	$ -	$ 80,640.00	
Building Roof	SF	1344	$ 26.50	$ -	$ 35,616.00	
Ancillary Building Items	LS	1	$ 53,956.80	$ -	$ 53,956.80	30% of Building Cost (Plumbing, etc)
Piping (6-in DIP)	LF	200	$ 150.00	$ -	$ 30,000.00	
Disc Filters	LS	1	$ 110,000.00	$ 22,000.00	$ 132,000.00	From Aqua Aerobics Proposal
Hypo Storage Tanks	LS	1	$ 10,000.00	$ 2,000.00	$ 12,000.00	
Hypo Feed Pump Skid	LS	1	$ 20,000.00	$ 4,000.00	$ 24,000.00	
Caustic Storage Tanks	LS	1	$ 8,000.00	$ 1,600.00	$ 9,600.00	
Causic Feed Pump Skid	LS	1	$ 20,000.00	$ 4,000.00	$ 24,000.00	
Excavation/Sitework	LS	1	$ 52,762.56	$ -	$ 52,762.56	20% of Building and Piping Costs
Electrical/Instrumentation	LS	1	$ 116,353.20	$ -	$ 116,353.20	Markup of building and equipment costs
				Sub Total =	$ 634,528.56	
Off-Quality Effluent Storage						
Concrete	CY	65	$ 1,200.00	$ -	$ 78,000.00	Concrete cost from AeroMod Proposal
Pumps	EA	2	$ 10,000.00	$ 2,000.00	$ 22,000.00	
Piping (4-in DIP)	LF	100	$ 125.00	$ -	$ 12,500.00	
Excavation/Sitework	LS	1	$ 39,000.00	$ -	$ 39,000.00	50% of Concrete cost - assumes below grade

Electrical/Instrumentation	LS	1	$ 5,500.00	$ -	$ 5,500.00	Markup of Equipment Costs
				Sub Total =	$ 157,000.00	
Chlorine Contact Tank/Effluent Pump Station						
Concrete	CY	42	$ 1,200.00	$ -	$ 50,400.00	Concrete cost from AeroMod Proposal
Effluent Pumps	EA	4	$ 10,000.00	$ 2,000.00	$ 42,000.00	Assumed
Excavation/Sitework	LS	1	$ 10,080.00	$ -	$ 10,080.00	20% of Concrete costs
Electrical/Instrumentation	LS	1	$ 10,500.00	$ -	$ 10,500.00	Markup of Equipment Costs
				Sub Total =	$ 112,980.00	
Odor Control System						
Concrete Pad	CY	8	$ 1,200.00	$ -	$ 9,600.00	
Odor Control System	LS	1	$ 175,000.00	$ 35,000.00	$ 210,000.00	Marked up from HG Proposal
Odor Control Ducting	LF	200	$ 200.00	$ -	$ 40,000.00	
Excavation/Sitework	LS	1	$ 1,920.00	$ -	$ 1,920.00	20% of Concrete costs
Electrical/Instrumentation	LS	1	$ 52,500.00	$ -	$ 52,500.00	Markup of Equipment Costs
				Sub Total =	$ 314,020.00	
Paving/Sitework						
Paving	SF	4800	$ 5.00	$ -	$ 24,000.00	Marked up from HG Proposal
Fence	LF	260	$ 25.00	$ -	$ 6,500.00	Marked up from HG Proposal
Gate	EA	1	$ 6,000.00	$ -	$ 6,000.00	Marked up from HG Proposal
Site Electrical/Lighting	LS	1	$ 50,000.00	$ -	$ 50,000.00	
Planting/Stabilization	LS	1	$ 12,000.00	$ -	$ 12,000.00	50% of Paving Costs
				Sub Total =	$ 98,500.00	
				Sub Total for Plant =	$ 3,042,227.44	Sludge Hauling to HG
Sludge Pumping Station						
Pumps	EA	2	$ 5,000.00	$ 1,000.00	$ 11,000.00	Aeromod Pumps plus extra for higher head
Piping to HG (3-in PVC)	LF	5500	$ 50.00	$ -	$ 275,000.00	Cost assumed to include installation
Electrical/Instrumentation	LS	1	$ 10,000.00	$ -	$ 10,000.00	Assumed
				Sub Total =	$ 296,000.00	
				Total Plant Cost =	$ 3,338,227.44	Sludge Pumping to HG

Valiano WTWRF - Cost Estimate
Option 3 - Stand Alone Plant without Solids Processing

Assumptions for Markup:

Installation:	20%
Electrical/Instrumentation:	25%

Item	Unit	Qty	Unit Cost	Installation	Total Cost	Notes
Headworks and Influent Pump Station						
Concrete - Building	CY	46	$ 1,200.00	$ -	$ 55,200.00	Concrete cost from AeroMod Proposal
Building Walls	SF	2100	$ 32.00	$ -	$ 67,200.00	From HG, Increased by 6%
Building Roof	SF	1575	$ 26.50	$ -	$ 41,737.50	From HG, Increased by 6%
Ancillary Building Items	LS	1	$ -	$ -	$ 24,620.63	15% of concrete, wall and roof costs
Influent Screen	EA	1	$ 94,000.00	$ 18,800.00	$ 112,800.00	From Lakeside Proposal
Bypass Bar Screen	EA	1	$ 5,000.00	$ 1,000.00	$ 6,000.00	
Piping (8-in DIP)	LF	50	$ 195.00	$ -	$ 9,750.00	From F+G Estimate
Concrete - Pump Station	CY	12	$ 800.00	$ -	$ 9,600.00	
Submersible Pumps	EA	2	$ 5,000.00	$ 1,000.00	$ 11,000.00	
Valves	LS	1	$ 20,000.00	$ -	$ 20,000.00	
Excavation/Sitework	LS	1	$ 28,313.72	$ -	$ 28,313.72	15% of building costs
Electrical/Instrumentation	LS	1	$ 89,477.03	$ -	$ 89,477.03	Markup of building and equipment costs
				Sub Total =	$ 475,698.88	
Flow Equalization and Flow Splitter Box						
Concrete	CY	88	$ 1,200.00	$ -	$ 105,600.00	Concrete cost from AeroMod Proposal
Piping (8-in DIP)	LF	50	$ 195.00	$ -	$ 9,750.00	
Piping (6-in DIP)	LF	60	$ 150.00	$ -	$ 9,000.00	
Aeration Piping	LF	155	$ 800.00	$ -	$ 124,000.00	
Aeration Blowers	EA	2	$ 5,000.00	$ 2,000.00	$ 12,000.00	
Equalization Pumps	EA	4	$ 5,000.00	$ 4,000.00	$ 24,000.00	
Weir Gate	EA	2	$ 10,000.00	$ 4,000.00	$ 24,000.00	
Excavation/Sitework	LS	1	$ 21,120.00	$ -	$ 21,120.00	20% of Concrete costs
Electrical/Instrumentation	LS	1	$ 77,087.50	$ -	$ 77,087.50	Markup of all costs excluding excavation
				Sub Total =	$ 406,557.50	
AeroMod System						
Concrete	CY	425	$ 1,200.00	$ -	$ 510,000.00	Concrete qty and cost from AeroMod
Equipment	LS	1	$ 425,000.00	$ 85,000.00	$ 510,000.00	Equipment cost from AeroMod
Excavation/Sitework	LS	1	$ 102,000.00	$ -	$ 102,000.00	20% of Concrete costs
Electrical/Instrumentation	LS	1	$ 127,500.00	$ -	$ 127,500.00	Markup of Equipment Costs
				Sub Total =	$ 1,249,500.00	
Operations Building						
Concrete	CY	53	$ 1,200.00	$ -	$ 63,600.00	Concrete cost from AeroMod Proposal
Building Walls	SF	2520	$ 32.00	$ -	$ 80,640.00	
Building Roof	SF	1344	$ 26.50	$ -	$ 35,616.00	
Ancillary Building Items	LS	1	$ 53,956.80	$ -	$ 53,956.80	30% of Building Cost (Plumbing, etc)
Piping (6-in DIP)	LF	200	$ 150.00	$ -	$ 30,000.00	
Disc Filters	LS	1	$ 220,000.00	$ 44,000.00	$ 264,000.00	From Kruger Proposal
Hypo Storage Tanks	LS	1	$ 10,000.00	$ 2,000.00	$ 12,000.00	

Hypo Feed Pump Skid	LS	1	$ 20,000.00	$ 4,000.00	$ 24,000.00	
Caustic Storage Tanks	LS	1	$ 8,000.00	$ 1,600.00	$ 9,600.00	
Causic Feed Pump Skid	LS	1	$ 20,000.00	$ 4,000.00	$ 24,000.00	
Excavation/Sitework	LS	1	$ 52,762.56	$ -	$ 52,762.56	20% of Building and Piping Costs
Electrical/Instrumentation	LS	1	$ 149,353.20	$ -	$ 149,353.20	Markup of building and equipment costs
				Sub Total =	$ 799,528.56	
Off-Quality Effluent Storage						
Concrete	CY	65	$ 1,200.00	$ -	$ 78,000.00	Concrete cost from AeroMod Proposal
Pumps	EA	2	$ 10,000.00	$ 2,000.00	$ 22,000.00	
Piping (4-in DIP)	LF	100	$ 125.00	$ -	$ 12,500.00	
Excavation/Sitework	LS	1	$ 39,000.00	$ -	$ 39,000.00	50% of Concrete cost - assumes below grade
Electrical/Instrumentation	LS	1	$ 5,500.00	$ -	$ 5,500.00	Markup of Equipment Costs
				Sub Total =	$ 157,000.00	
Chlorine Contact Tank/Effluent Pump Station						
Concrete	CY	70	$ 1,200.00	$ -	$ 84,000.00	Concrete cost from AeroMod Proposal
Effluent Pumps	EA	4	$ 10,000.00	$ 2,000.00	$ 42,000.00	Assumed
Excavation/Sitework	LS	1	$ 16,800.00	$ -	$ 16,800.00	20% of Concrete costs
Electrical/Instrumentation	LS	1	$ 10,500.00	$ -	$ 10,500.00	Markup of Equipment Costs
				Sub Total =	$ 153,300.00	
Odor Control System						
Concrete Pad	CY	8	$ 1,200.00	$ -	$ 9,600.00	
Odor Control System	LS	1	$ 175,000.00	$ 35,000.00	$ 210,000.00	Marked up from HG Proposal
Odor Control Ducting	LF	200	$ 200.00	$ -	$ 40,000.00	
Excavation/Sitework	LS	1	$ 1,920.00	$ -	$ 1,920.00	20% of Concrete costs
Electrical/Instrumentation	LS	1	$ 52,500.00	$ -	$ 52,500.00	Markup of Equipment Costs
				Sub Total =	$ 314,020.00	
Paving/Sitework						
Paving	SF	4800	$ 5.00	$ -	$ 24,000.00	Marked up from HG Proposal
Fence	LF	260	$ 25.00	$ -	$ 6,500.00	Marked up from HG Proposal
Gate	EA	1	$ 6,000.00	$ -	$ 6,000.00	Marked up from HG Proposal
Site Electrical/Lighting	LS	1	$ 50,000.00	$ -	$ 50,000.00	
Planting/Stabilization	LS	1	$ 12,000.00	$ -	$ 12,000.00	50% of Paving Costs
				Sub Total =	$ 98,500.00	
				Sub-Total for Plant =	$ 3,654,104.94	(Sludge Hauling to HG)

Sludge Pumping Station						
Pumps	EA	2	$ 5,000.00	$ 1,000.00	$ 11,000.00	Aeromod Pumps plus extra for higher head
Piping to HG (3-in PVC)	LF	5500	$ 50.00	$ -	$ 275,000.00	Cost assumed to include installation
Electrical/Instrumentation	LS	1	$ 10,000.00	$ -	$ 10,000.00	Assumed
				Sub Total =	$ 296,000.00	
				Plant Total =	$ 3,950,104.94	(Sludge Pumping to HG)