ICR SANITARY DISTRICT WASTEWATER TREATMENT UPGRADES

TECHNICAL MEMORANDUM

PREPARED FOR:

ICR SANITARY DISTRICT

302 W Willis Street
Prescott, AZ 86301

MAY 2022

Expires 12/31/23

PREPARED BY:

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE

The intent of this technical memorandum is to summarize (1) the current operation at the existing wastewater treatment plant (WWTP) at Inscription Canyon Ranch Sanitary District (ICRSD), (2) the estimated future wastewater flows, and (3) the recommended wastewater treatment plant improvements to address these future flows. Inscription Canyon Ranch (ICR) is an equestrian community with large residential lots and luxury homes. Kimley-Horn (KH) is contracted with ICRSD for the review of the wastewater treatment facilities and the preliminary recommendations of improvements required to address current and future wastewater flows. Additionally, recommendations based on technologies available are also included.

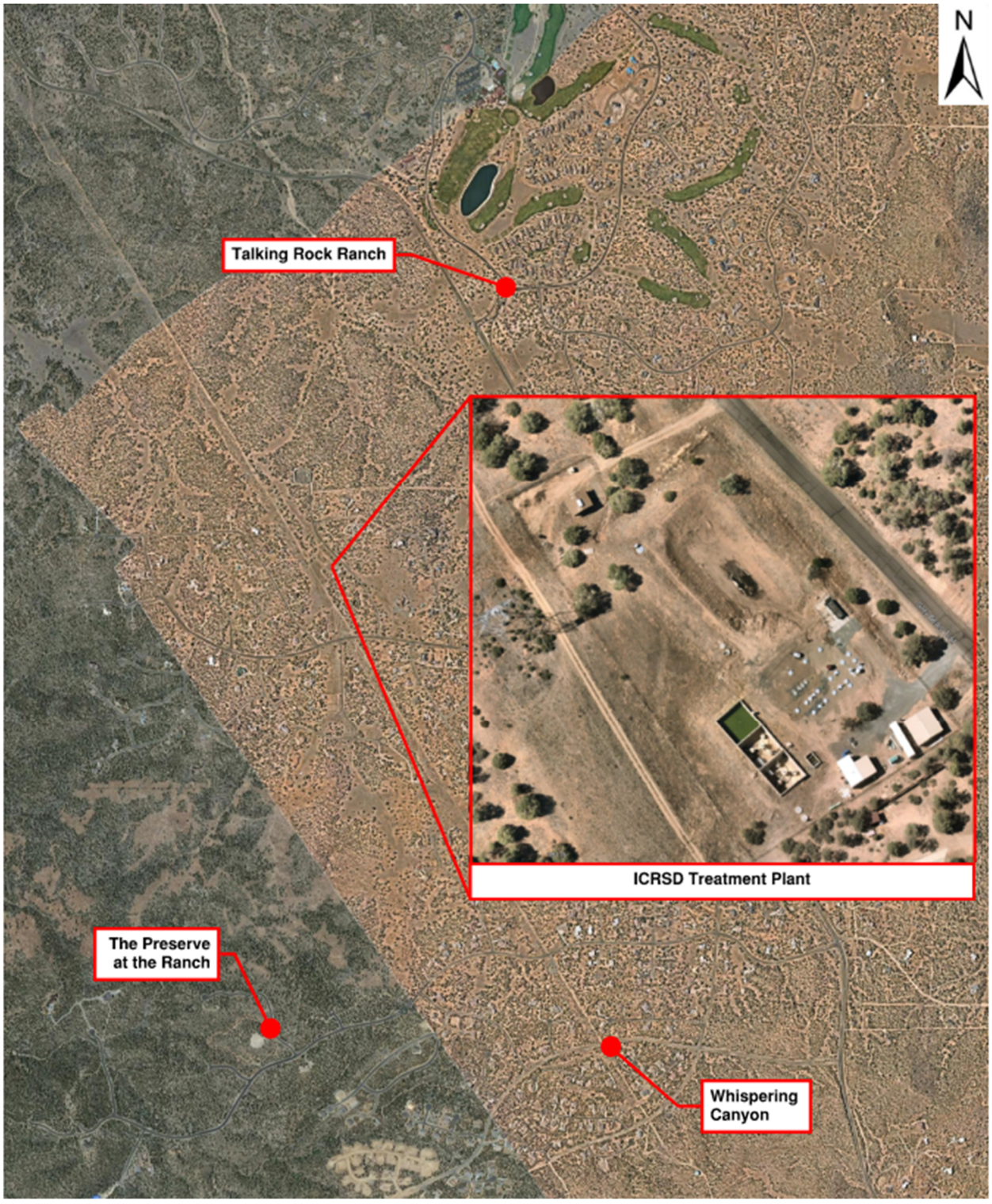
1.2 BACKGROUND AND EXISTING CONDITIONS

ICRSD Wastewater Treatment Plant is located within the ICR community in northern Arizona, within Yavapai County, approximately 30-minutes north of the City of Prescott. Hiking, biking, horseback riding, and golfing are available year-round. The treatment plant currently serves ICR, Whispering Canyon, the Preserve at the Ranch, and Talking Rock Ranch. See **Appendix A** for an overall site map of the service area.

The existing ICRSD treatment plant currently utilizes an extended aeration process from Santec Corporation (Santec). The Santec modules were designed for six (6) construction phases and future expansion. Phase 1 and 1A Santec modules were installed after an amendment to the original permit was issued on December 30, 2002, which allowed for permitted flow up to 455,000 GPD. The current design capacity of the plant is 90,000 GPD. See **Figure 1-1** for an overall map of the existing facilities.

The original ICRSD treatment plant utilized a Sequencing Batch Reactor (SBR), which was approved under Arizona Department of Environmental Quality's (ADEQ) Aquifer Protection Permit (APP) No. P-103119 on July 30, 1997 with a design capacity of 120,000 gallons per day (GPD) and a permitted capacity of 46,000 GPD with a class B reuse effluent standard. In order to comply with the new class B+ reuse standard in the 2002 permit the original SBR system was taken out of service in 2003 after the first Santec module was installed. Another amendment was issued on March 2, 2010 to increase permitted capacity with the installation of a Membrane Bioreactor (MBR). However, according to the wastewater treatment plan assessment (provided in **Appendix C**) performed by Civiltec Engineering, Inc. (Civiltec) in March 2019 the MBR system was never installed because it increased operator supervision, was cost prohibitive, and provided more treatment capacity sooner than what could be reasonably funded. Therefore, no upgrades were made, and the installation of the recommended MBR system was never completed. The Santec system has been in continued operation since that time and ICRSD is now preparing to address future flows from the surrounding tributary area.

Figure 1-1: Facility Map



2 WASTEWATER FLOW PROJECTIONS

The communities being served by the ICRSD have seen a steady increase in population since 2011 with an average of 24 new homes being built/connected every year. The plant is currently servicing 787 connections with 103 pending connections. Final buildout is anticipated be reach 1,706 homes. However, for the purposes of this planning effort, 1,900 connections are used in **Table 2-1** below to allow for a greater future potential maximum buildout.

The March 2019 report by Civiltec documents the existing Average Daily Flow (ADF) rates based on 15-months of historical WWTP Self-Monitoring Report Forms (SMRFs), are 47,400 GPD, which results in 78.35 GPD of wastewater collected per connection. Current March 2022 Flow Rates are approaching 70,000 GPD. According to the latest U.S Census Bureau (Bureau) population data the average Arizona home has 2.68 persons per household. Wastewater flows have been estimated based on unit design flows from the Arizona Administrative Code (AAC) 18-09 Table 1 and the latest Bureau data, which are summarized in **Table 2-1** below.

Table 2-1: Wastewater Flow Projections (AAC Design Flow)

Land Use	Unit	Unit Design Flow (gpd/unit)	Population per unit	Average Dry Weather Flow (gpd)
Single Family Dwelling[1]	1,900	80	2.68[3]	152,000
Total Average Dry Weather Flow (gpd)				**152,000**
Estimated Service Area Population				5,092
Peaking Factor[1]				1.98
Peak Dry Weather Flow (gpd)				**300,960**
Inflow and Infiltration[2] (gpd)				20,600
Peak Wet Weather Flow (gpd)				**331,056**

1. *Source:* Arizona Administrative Code 18-09.
2. Inflow and infiltration (I/I) is a percentage of the Peak Dry Weather Flow and was determined based on what is commonly seen in the nearby regional area.
3. U.S. Census Bureau: https://www.census.gov/quickfacts/fact/table/AZ/HSD310219#HSD310219

Plant output data was provided for a 16-month period from January 2021 to April 2022, see **Appendix F**. According to the plant output data, average daily flow for each connection is 89 gpd. Wastewater flows have been estimated based on plant output data, which are summarized in **Table 2-2** below.

Table 2-2: Wastewater Flow Projections (Plant Output Data Design Flow)

Land Use	Unit	Unit Design Flow (gpd/unit)	Population per unit	Average Dry Weather Flow (gpd)
Single Family Dwelling[1]	1,900	89	2.68[3]	169,100
Total Average Dry Weather Flow (gpd)				**169,100**
Estimated Service Area Population				5,092
Peaking Factor[1]				1.98
Peak Dry Weather Flow (gpd)				**334,818**
Inflow and Infiltration[2] (gpd)				33,482
Peak Wet Weather Flow (gpd)				**368,300**

1. *Source:* Arizona Administrative Code 18-09.
2. Inflow and infiltration (I/I) is a percentage of the Peak Dry Weather Flow and was determined based on what is commonly seen in the nearby regional area.
3. U.S. Census Bureau: https://www.census.gov/quickfacts/fact/table/AZ/HSD310219#HSD310219

For planning purposes, the future buildout Average Day Flow is estimated at 169,100 gpd. Future process and treatment equipment should be designed for this Average Design Flow and allow for peak flows through the continued use of flow equalization. As previously presented, the current Santec system is designed for 90,000 gpd. Therefore, an increased capacity of 79,100 gpd is required to address future buildout wastewater flows.

3 TREATMENT ALTERNATIVES

3.1 WASTEWATER TREATMENT SYSTEM ALTERNATIVES

As detailed in the previous sections, the intent of ICRSD is to expand capacity of the onsite wastewater treatment facility with the ability to produce reuse quality effluent for the Talking Rock Golf Course. As part of the current effort, KH has begun coordination with separate packaged treatment plant manufacturers and will continue to explore costs and delivery timelines to meet the ICRSD timeline and specific needs. In addition, KH contacted the Santec representatives to provide cost comparisons related to simply expanding the current system. In summary, the following alternative treatment technologies are considered:

3.1.1. ALT 1: CONVENTIONAL ACTIVATED SLUDGE PROCESS (CAS)

The activated sludge process involves the production of an activated mass of microorganisms capable of stabilizing waste aerobically. **Activated sludge is a proven technology that produces relatively high-quality effluent.** The activated sludge treatment process utilizes a suspended growth process to achieve biological treatment. The process has three main components: an aerated reactor for the microorganisms to achieve treatment while in suspension; liquid/solids separation (commonly achieved in a clarification tank); and a return activated sludge recycle system to return solids from the separation process back to the reactor. Filtration is required following the clarification process to achieve public access reclaimed water standards (high level disinfection). Flow equalization may be required upstream of the activated sludge process to minimize the impacts of peak flows to the process.

Many variations of the activated sludge process are available such as conventional plug flow with or without tapered diffused aeration, oxidation ditch, Modified Ludzack-Ettinger (MLE), Bardenpho, step feed, contact stabilization, high purity oxygen, and extended aeration. This memorandum specifically discusses the following:

- Conventional plug flow with Tapered Diffused Aeration
- Conventional plug flow MLE
- Conventional plug flow Bardenpho
- Oxidation Ditch type activated sludge processes.

Below is a brief overview of each type of CAS system reviewed as part of this analysis.

- **Conventional Activated Sludge - Tapered Diffused Aeration**

The aerobic zones of the reactor are equipped with diffusers to provide air for the biological treatment process. The diffuser density is typically the highest in the first aerobic zone and decreases in subsequent zones to achieve a tapered aeration effect. The anoxic zones are equipped with submersible mixers to keep the mixed liquor in suspension and well mixed at all times. Tapered aeration can increase process control and improve energy efficiency by providing more air (more diffusers) in the first zone, less in the second zone, and the least in the third zone.

- **Modified Ludzack-Ettinger (MLE) Process**

The flow configuration for the MLE type activated sludge process is similar to a conventional configuration. However, the MLE process includes an additional solid recycle stream, provided as an internal recycle from the aerobic zone to the influent. The internal recycle enhances nutrient removal. The MLE activated sludge process combines an anoxic zone with an aerobic zone in a common basin structure. Flow first enters the anoxic zone, where it is mixed with internally recycled mixed liquor.

Aeration is not provided in the anoxic zone. The combination of raw wastewater, RAS, and nitrified mixed liquor under anoxic conditions (nitrate, but no free oxygen) promotes denitrification, where microorganisms in the mixed liquor use nitrate as their oxygen source to metabolize the organic material in the raw wastewater - thereby reducing nitrate and releasing nitrogen gas to the atmosphere. In the aerobic zone, influent ammonia is converted to nitrate by nitrifying microorganisms.

Options for operational flexibility in an MLE process include compartmentalization to facilitate variations in the anoxic zone volume and alternative routings of feed (i.e. step feed) and recirculation streams to allow for modification of the treatment configuration.

- **Bardenpho Process**

The Bardenpho process (4-stage or 5-stage) has been used successfully to meet a total nitrogen limit of 3.0 mg/L and total phosphorus limit of 1.0 mg/L. The 5-stage Bardenpho process includes an initial anaerobic reactor followed by a primary anoxic zone, primary aeration zone, secondary anoxic zone and re-aeration zone in series through the process tank. The first-stage anaerobic zone is used for biological phosphorus removal while the remaining anoxic and aeration zones are primarily for nitrogen removal. The first anoxic zone and aeration zone are essentially the same process as the MLE process. However, a secondary anoxic zone is also provided for additional denitrification to further reduce the effluent total nitrogen from this process. The reaeration zone at the end is provided to add dissolved oxygen to the mixed liquor prior to the secondary clarifiers. To provide sufficient food (carbon) to complete the denitrification reactions, a supplemental carbon feed (ex. methanol or glycerin) could be required in the secondary anoxic zone.

The 4-Stage Bardenpho process operates in the same configuration as the 5-Stage Bardenpho process without the initial anaerobic zone at the influent end of the aeration tank. Because the microorganisms responsible for denitrification are not competing with phosphorus accumulating organisms, better nitrogen reduction may be achieved in the 4-Stage Bardenpho process than in the 5-Stage Bardenpho process.

- **Oxidation Ditch**

Oxidation ditch systems are a proven biological treatment technology that produces relatively high-quality effluent. Nitrification and denitrification can occur in a single tank. Oxidation ditches often use a ring or oval shaped channel equipped with mechanical aeration and mixing – typically accomplished by surface mechanical aerators. The tank configuration, aeration and mixing devices promote plug flow for a system with a relatively long hydraulic detention time. With oxidation ditches, the solids retention time (SRT) is typically increased to 20 to 30 days.

Oxidation ditches require little maintenance, due to the small amount of mechanical equipment required, and often produce less odors compared to other biological treatment processes. The oxidation ditch process typically occurs in two process basins. Oxidation ditches require a large footprint. However, capital costs can be low in addition to providing low operating costs due to reduced solids handling requirements and power requirements compared to other biological treatment technologies. The basin aerators can be designed to allow for deep basins with a smaller footprint. Minimal mechanical equipment is required for the process - resulting in low energy consumption.

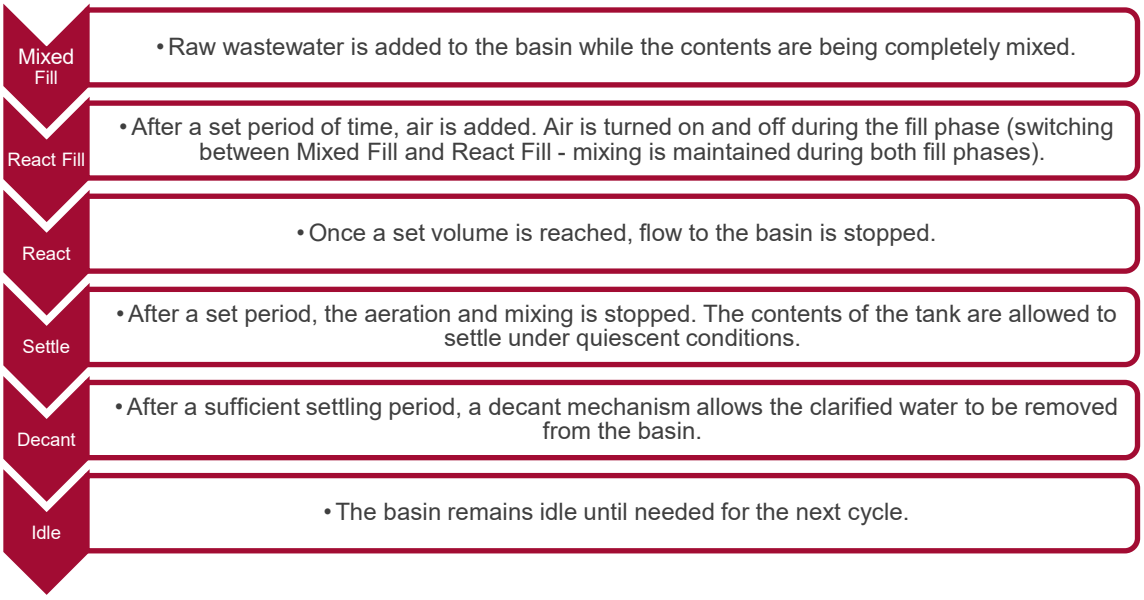
3.1.2. ALT 2: SEQUENCING BATCH REACTOR (SBR)

A sequencing batch reactor (SBR) provides biological treatment through a batch process utilizing the suspended biological growth activated sludge processes. The process is accomplished in six main stages within one process basin. The fill cycle represents the period when the influent wastewater is pumped into the SBR process tank and distributed into an existing sludge blanket contained in the vessel. The fill can occur under mixed or unmixed conditions, and/or aerated or unaerated conditions, depending on the treatment objectives. The react cycle includes mixing and aeration of the wastewater in the SBR vessel. The settle cycle allows the mixed liquor solids to settle, creating a supernatant layer on the top of the vessel. The decant cycle allows the supernatant to be drawn off the top of the vessel and transferred to a separate filtration process. The idle cycle promotes sludge wasting to maintain the desired mixed liquor suspended solids (MLSS) concentration in the SBR reactor. Once a batch is complete, the process starts again. See **Figure 3-1** for a visual of the typical SBR process flow.

Sequencing batch reactors produce a relatively high-quality effluent at widely varying flows and loadings. The process does not require a sludge recycle system or a separate clarification process. Filtration is required following the SBR process to achieve public access reclaimed water standards (high level disinfection). The batch process may require post flow equalization prior to filtration. The SBR process can be accomplished in a relatively small footprint as it combines multiple processes in one basin. The flexible design of SBRs can accommodate varying flow rates and wastewater quality.

SBRs remove organic material and suspended solids similar to other conventional activated-sludge systems and can also be used to biologically remove nutrients such as nitrogen and phosphorus. The SBR process provides system flexibility for operations staff to adjust time intervals for each cycle to enable the desired process control and adapt to effluent limitations.

Figure 3-1: Typical SBR Process Flow



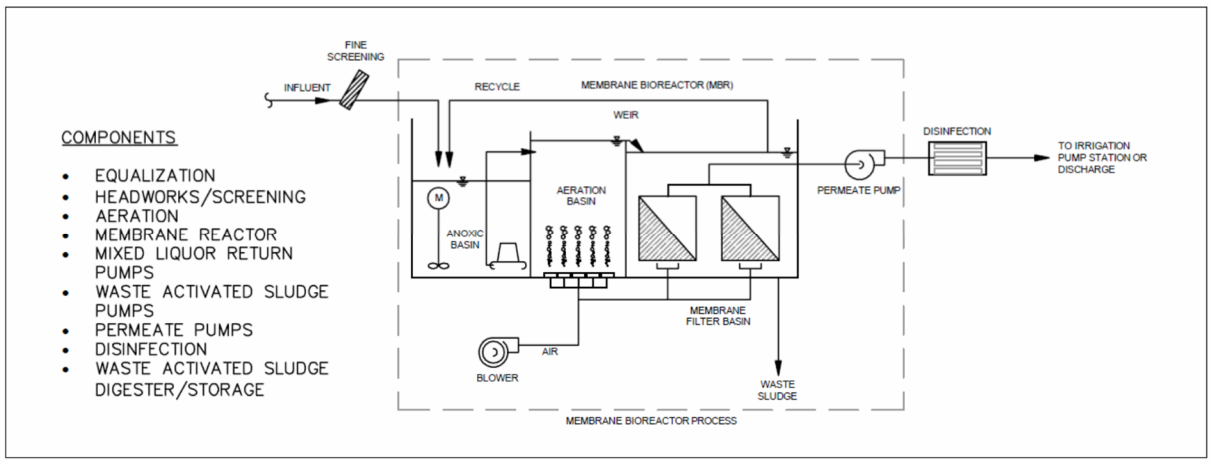
3.1.3. ALT 3: MEMBRANE BIOREACTOR (MBR)

The membrane bioreactor (MBR) process utilizes suspended growth biological treatment in an activated sludge process followed by membrane filtration to achieve solids-liquid separation. The MBR treatment train is similar to conventional treatment processes except that membranes replace the secondary clarifiers and tertiary filters. See **Figure 3-2** for a typical MBR process flow diagram. The effluent total suspended solids (TSS) concentration is low enough that tertiary filtration is not required. In the MBR process, the MLSS can be increased beyond that which is possible in CAS systems. Typically, MBR systems operate at MLSS concentrations in the range of 8,000 to 10,000 mg/L, compared with approximately 2,500 to 3,000 mg/L in a conventional system. The higher MLSS provides the benefit of greater treatment capacity per unit volume of aeration basin. However, in order to minimize the solids buildup near the membrane surface, which would reduce the flow of water through the membranes, air is introduced to scour the membrane surface.

The consistently low TSS concentration in the MBR effluent also promotes more efficient disinfection and enables utilization of more potential disinfection process options. **MBR effluent is most compatible with advanced treatment technologies such as advanced oxidation processes (AOP) to destroy remaining organic compounds**.

Membranes typically have to be replaced every 10 years and typically have higher energy costs than CAS. Process equalization is typically required prior to the MBR process to help eliminate the stress of peak flows on the membranes.

Figure 3-2: Typical MBR Process Flow Diagram



3.2 SUMMARY OF BIOLOGICAL TREATMENT OPTIONS

Summary of biological treatment options considered for the project including the following:

- **Conventional Activated Sludge (CAS)**
  - *Expansion of the Santec Extended Aeration Activated Sludge System*
- **Sequencing Batch Reactor (SBR)**
- **Membrane Bioreactor (MBR)**

Conventional Activated Sludge. A conventional activated sludge process (CAS) comes in numerous configurations and is able to achieve high quality effluent. However, a CAS requires separate process tankage and clarifiers as well as a sludge recycle pumping system, therefore they typically have a high capital cost and larger footprints than MBR and SBR systems of similar treatment sizes. The current Santec system is a variation of the activated sludge technology as an extended aeration system. This system currently utilized by ICRSD provides for B+ quality effluent and has previously been expanded to its current rated capacity of 90,000 gpd.

Sequencing Batch Reactor. The flexible design of SBRs can accommodate varying flow rates and wastewater quality. To accommodate continuous flow, multiple SBR tanks can be provided such that one tank receives flow while the other completes its treatment cycle. SBRs with the addition of tertiary filtration are able to achieve A+ rated reuse water standards. Significant improvements and retrograde of the existing facility, as well as the existing concrete basins, would be required to install an SBR system at the current site. ***This option has been previously evaluated by ICRSD as a possible expansion and upgrade option.***

Membrane Bioreactor. A membrane bioreactor (MBR) can achieve the highest quality effluent in typically the smallest footprint. However, the MBR process typically has the highest capital cost when compared to conventional activated sludge processes (CAS) or sequencing batch reactors (SBR). An MBR application is typically appropriate when the available land or footprint is limited, or the regulatory agencies require the highest quality A+ reuse effluent with advanced treatment. For this treatment application, available land is not a limiting factor and the regulatory requirements would only require basic level of disinfection. ***This option has also been previously evaluated by ICRSD as a possible expansion and upgrade option.***

4 PROJECT RECOMMENDATIONS

Two recommended options are provided based on future capacity (169,100 GPD) and treatment for reuse needs (B+ vs A+). Discussion related to both options are provided, along with anticipated budgetary costs associated with each option. Once a treatment alternative is selected by ICRSD, further refinement of costs and specific equipment availability can be explored.

OPTION 1 – Expansion of Existing Santec System with New Sludge Management. The existing system is designed and permitted for the current flow requirements and simply expanding the existing system would provide the added capacity needed for future buildout scenarios (maximum full build out of 1900 at 169,100 GPD). Therefore, working with the Santec manufacturer to expand the extended aeration system would be required to provide an additional 79,100 gpd. Equalization capacity expansion would also be required to ensure peak flows are adequately managed and diurnal flows do not disrupt efficient process and hydraulic operations of the wastewater treatment plant. Finally, the existing solids handling system is inadequate and wet hauling of sludge continues as the dewatering system requires to be upgraded. Improvements under this option would include the following:

- ***Addition and expansion of the current Santec extended aeration system.*** Construction and installation of additional Santec aeration and clarification modules would allow for the expansion to 169,100 gpd Average Day Flow. Onsite space adjacent to the existing treatment vessels is available and minor site planning would be required to properly site the new expansion. It is anticipated that minimal yard piping and site electrical would be required.
- ***Equalization capacity increase.*** In order to properly convey daily and seasonal peaks in wastewater flows, additional equalization capacity is required and should be included. The current equalization allows for the current 90,000 gpd capacity, and expansion for future flow scenarios would need to be evaluated and added.
- ***Removal of existing sludge handling station.*** The current passive dewatering filtration system performs less efficient than advanced solids press systems. The ICRSD current wet hauls sludge from the site to the local landfill, and options to improve the overall dewatering efficiency has been requested by the operations staff. Removal of the existing system will help provide the proper space and area required to install a new dewatering system.
- ***Addition of new solids handling and dewatering system.*** Recommended improvement to the current dewatering operation would be to add a compact and efficient system to dewater processed sludge. Belt filter press and screw press are both utilized in typical applications as this. In the past, the addition of a new screw press has been presented to the ICRSD staff, and our recommendation would be the addition of this upgrade, regardless of the treatment option selected.

OPTION 2 – New SBR Wastewater Treatment Plant and New Sludge Management. As an alternative to the extended aeration process, the use of the SBR technology provides an efficient and high quality effluent quality for A+ reuse needs. As presented herein, ICRSD has previously explored the option of retrofitting the existing onsite concrete basins for the installation of a new Parkson SBR system. Based on discussion with the ICRSD staff and operations group, input was provided to assist in the preliminary design of an SBR system at this location.

Demolition and removal of the existing Santec system would be required for this option. Sunrise Engineering completed the preliminary design and study for this retrofit and installation, and the design drawings are attached in the Appendix for reference. KH contacted the Parkson representative to obtain updated capital cost estimates related to this option. As with the previous option, an improved solid handling system is recommended, and the following summarizes upgrades associated with this approach.

- ***Demolition of existing Santec System.*** In order to make room for a new SBR system, it is recommended that removal of the existing extended aeration system be completely removed. Headworks and effluent discharge systems can be upgraded or retrofitted and would not require complete removal but the process elements and vessels that currently exist would need to be removed.
- ***SBR system installation.*** Utilizing the existing onsite concrete basins and installation following the general arrangement with the previous predesign completed by Sunrise Engineering would allow for the installation of the new SBR system. The process units would be installed within the existing basins after removal of all standing water, removal of existing mechanical and process equipment, and overall structural assessment is completed on the concrete surfaces.
- ***Removal of existing sludge handling station.*** The current passive dewatering filtration system performs less efficient than advanced solids press systems. The ICRSD current wet hauls sludge from the site to the local landfill, and options to improve the overall dewatering efficiency has been requested by the operations staff. Removal of the existing system will help provide the proper space and area required to install a new dewatering system.
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4.1 ESTIMATED COST OF TREATMENT OPTIONS

OPTION 1 – Expansion of Existing Santec System with New Sludge Management.

OPINION OF PROBABLE CONSTRUCTION COST					**KIMLEY-HORN**
PROJECT: ICRSD - Expand Existing Santec System				**Prepared By:**	RPM
				Date Prepared:	18-May-22
Building, Area:	Expand Existing Santec System			**Proj. No.:**	
Estimate Type:	Conceptual	Construction			
	Preliminary (w/o plans)	Change Order		**Current at ENR**	
	Design Development @	**5% Complete**		**Escalated to ENR**	
				Months to Midpoint of Construct	12

SUMMARY BY AREA

SPECIFICATION SECTION	MATERIALS	INSTALLATION	SUB-CONTRACTOR	TOTAL
DIVISION 01 - GENERAL REQUIREMENTS	$0	$30,000	$0	$30,000
DIVISION 02 - EXISTING CONDITIONS	$0	$50,000	$0	$50,000
DIVISION 03 - CONCRETE	$57,250	$16,398	$0	$73,700
DIVISION 05 - METALS	$20,000	$10,000	$0	$30,000
DIVISION 09 - FINISHES	$1,000	$500	$0	$1,500
DIVISION 13 - SPECIAL CONSTRUCTION	$0	$0	$0	$0
DIVISION 26 - ELECTRICAL	$51,600	$20,498	$0	$72,100
DIVISION 31 - EARTHWORK	$16,100	$225,920	$0	$242,100
DIVISION 32 - EXTERIOR IMPROVEMENTS	$0	$0	$0	$0
DIVISION 33 - UTILITIES	$41,350	$16,400	$0	$57,800
DIVISION 46 - WASTEWATER EQUIPMENT	$685,000	$275,000	$0	$960,000
Subtotals	$872,300	$644,716	$0	$1,517,200
Division 1 Costs @ 0%	$0	$0	$0	$0
Subtotals	$872,300	$644,716	$0	$1,517,200
Taxes - Materials @ 8.75%	$76,326			$76,326
Subtotals	$948,626	$644,716	$0	$1,593,526
Taxes - Labor @ 5.00%		$32,236	$0	$32,236
Subtotals	$948,626	$676,952	$0	$1,625,762
Contractor MU for Sub @ 12%				$0
Subtotals	$948,626	$676,952	$0	$1,625,762
Contractor OH&P @ 15%	$142,294	$101,543		$243,837
Subtotals	$1,090,920	$778,494	$0	$1,869,599
Estimate Contingency @ 20%				$373,920
Subtotal				$2,243,518
Escalate to Midpt of Const. @ 2%				$44,870
Estimated Bid Price				$2,288,389
Total Estimate of Project Cost				$2,333,259

Estimate Accuracy	
+30%	-10%

Estimated Range of Probable Cost		
+30%	Total Est.	-10%
$3,033,237	**$2,333,259**	**$2,099,933**

OPTION 2 – New SBR Wastewater Treatment Plant and New Sludge Management.

OPINION OF PROBABLE CONSTRUCTION COST					**KIMLEY-HORN**
PROJECT: ICRSD - Parkson SBR Wastewater Treatment Plant				**Prepared By:**	RPM
				Date Prepared:	18-May-22
Building, Area:	SBR Wastewater Treatment System			**Proj. No.:**	
Estimate Type:	Conceptual	Construction			
	Preliminary (w/o plans)	Change Order		**Current at ENR**	
	Design Development @	**5% Complete**		**Escalated to ENR**	
				Months to Midpoint of Construct	12

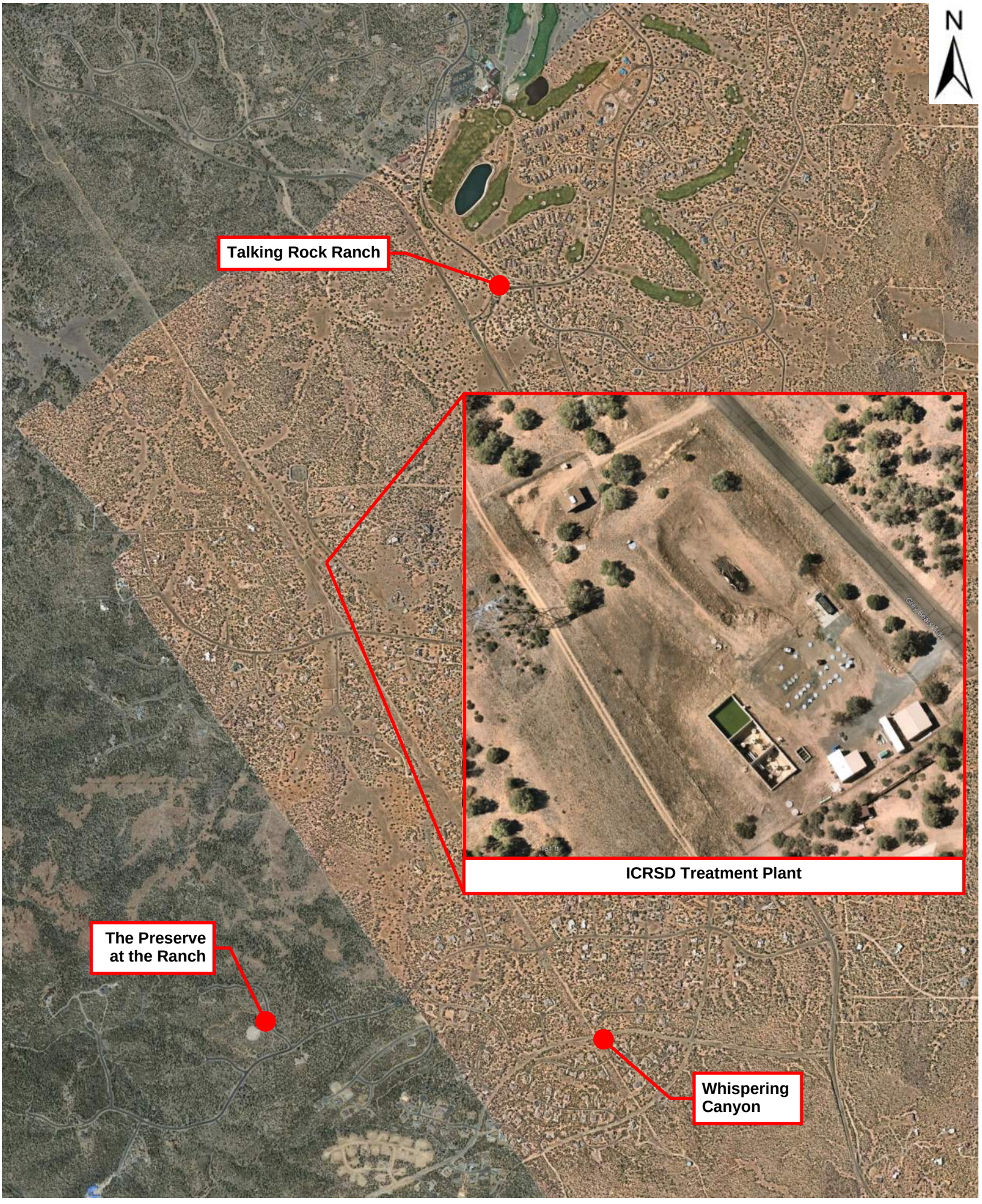
SUMMARY BY AREA

SPECIFICATION SECTION	MATERIALS	INSTALLATION	SUB-CONTRACTOR	TOTAL
DIVISION 01 - GENERAL REQUIREMENTS	$0	$90,000	$0	$90,000
DIVISION 02 - EXISTING CONDITIONS	$0	$200,000	$0	$200,000
DIVISION 03 - CONCRETE	$136,000	$42,040	$0	$178,200
DIVISION 05 - METALS	$135,000	$23,750	$0	$158,800
DIVISION 09 - FINISHES	$25,500	$12,000	$0	$37,500
DIVISION 13 - SPECIAL CONSTRUCTION	$0	$0	$0	$0
DIVISION 26 - ELECTRICAL	$169,200	$56,237	$0	$225,600
DIVISION 31 - EARTHWORK	$44,175	$102,432	$0	$146,700
DIVISION 32 - EXTERIOR IMPROVEMENTS	$0	$0	$0	$0
DIVISION 33 - UTILITIES	$173,750	$44,000	$0	$217,800
DIVISION 46 - WASTEWATER EQUIPMENT	$1,130,000	$450,000	$0	$1,580,000
Subtotals	$1,813,625	$1,020,458	$0	$2,834,600
Division 1 Costs @ 0%	$0	$0	$0	$0
Subtotals	$1,813,625	$1,020,458	$0	$2,834,600
Taxes - Materials @ 8.75%	$158,692			$158,692
Subtotals	$1,972,317	$1,020,458	$0	$2,993,292
Taxes - Labor @ 5.00%		$51,023	$0	$51,023
Subtotals	$1,972,317	$1,071,481	$0	$3,044,315
Contractor MU for Sub @ 12%				$0
Subtotals	$1,972,317	$1,071,481	$0	$3,044,315
Contractor OH&P @ 15%	$295,848	$160,722		$456,570
Subtotals	$2,268,165	$1,232,203	$0	$3,500,885
Estimate Contingency @ 20%				$700,177
Subtotal				$4,201,062
Escalate to Midpt of Const. @ 2%				$84,021
Estimated Bid Price				$4,285,083
Total Estimate of Project Cost				$4,369,104

Estimate Accuracy	
+30%	-10%

Estimated Range of Probable Cost		
+30%	Total Est.	-10%
$5,679,836	**$4,369,104**	**$3,932,194**

Appendix A – Overall Site Map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Talking Rock Ranch
ICRSD Treatment Plant
The Preserve at the Ranch
Whispering Canyon

Appendix B – Sunrise Engineering 30% VE Design

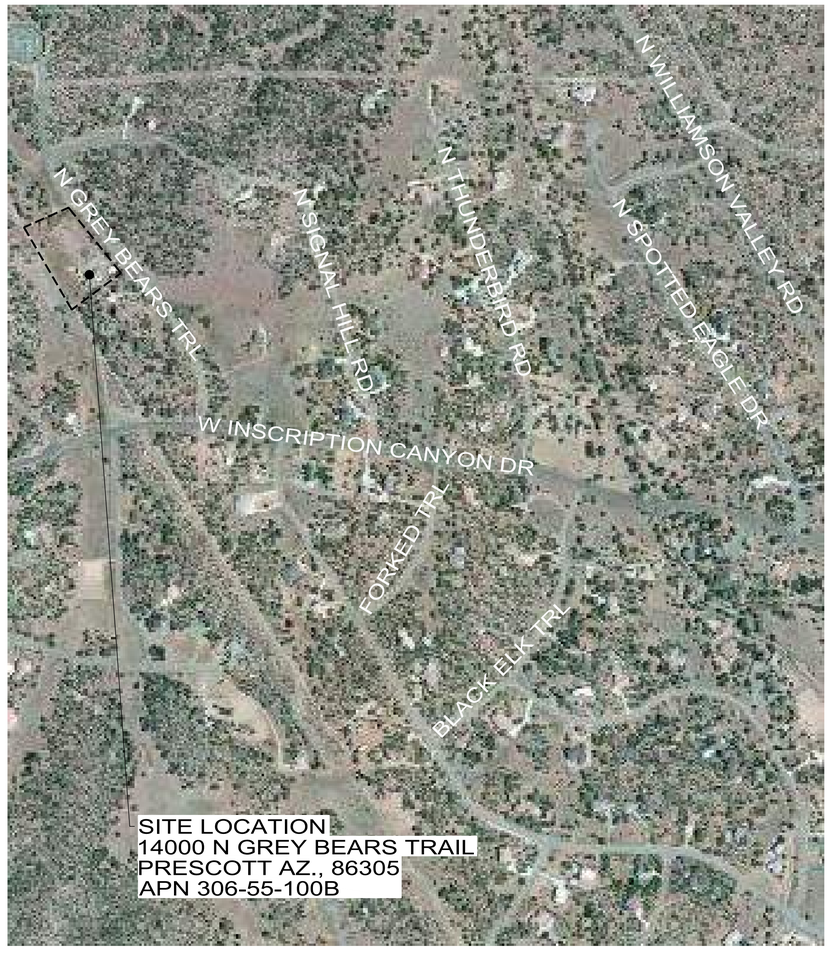
ICR SANITARY DISTRICT

WWTP IMPROVEMENTS AND EXPANSION

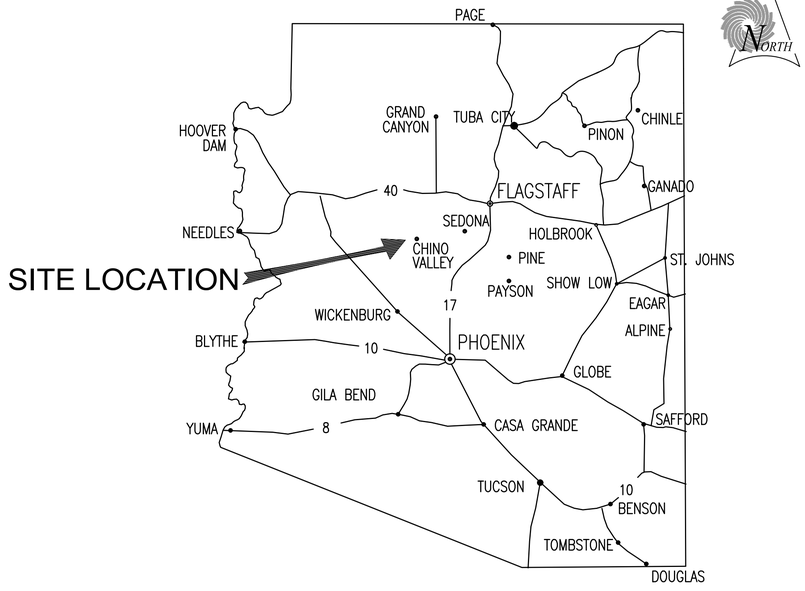
PHASE II - WASTEWATER TREATMENT PLANT

30% PLANS

VICINITY MAP



LOCATION MAP



OWNER:

INSCRIPTION CANYON RANCH SANITARY DISTRICT
PO BOX 215
CHINO VALLEY, ARIZONA 86326
PHONE NO. (928) 237-9347
CONTACT: DAVE BARRERIA

BOARD MEMBERS:

CHAIRPERSON: DAVE BARRERIA
DIRECTOR: WILLIAM DICKRELL
DIRECTOR: AL POSKANZER

DISTRICT MANAGER:

DISTRICT MANAGER: BOB BUSCH
PHONE NO. (928) 713-0548

ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S VINEYARD, SUITE 123
MESA, AZ 85210
TELEPHONE: (480) 768-8600
FAX: (480) 768-8609
CONTACT: TYSON GLOCK, P.E.

PROJECT BENCHMARK

TOP SOUTHEASTERLY CORNER OF EXISTING SBR BASIN
ELEVATION: 5012.45 FEET (DATUM: NAVD88)
NORTHING: 1363407.52
EASTING: 501387.44

FLOOD ZONE

THIS PROPERTY IS LOCATED IN ZONE "X", ACCORDING TO FLOOD INSURANCE RATE MAP (FIRM) FOR YAVAPAI COUNTY, ARIZONA AND INCORPORATED AREAS (COMMUNITY-PANEL NUMBER 1675 OF 3900, MAP NUMBER 04025C1675G WITH THE EFFECTIVE DATE OF SEPTEMBER 3, 2010). ZONE X CONSISTS OF AREAS DETERMINED TO BE OUTSIDE A 500-YEAR FLOODPLAIN AND OUTSIDE THE 1% AND 0.2% ANNUAL CHANCE FLOODPLAINS.

DIRECTIONS TO THE SITE FROM PHOENIX

HEAD ON WEST WASHINGTON STREET TOWARDS 1ST AVENUE, TURN RIGHT ONTO NORTH 7TH AVENUE, TURN LEFT TO MERGE ONTO I-10 TOWARD LOS ANGELES, TAKE EXIT 143A - 143B TO MERGE ONTO I-17 NORTH TOWARD FLAGSTAFF, TAKE EXIT 262 FOR ARIZONA 69 NORTH TOWARD CORDES LAKE ROAD/PRESCOTT, TURN RIGHT ONTO FAIN ROAD, MERGE ONTO ARIZONA 89A SOUTH, CONTINUE ONTO PIONEER PARKWAY, TURN RIGHT ONTO NORTH WILLIAMSON VALLEY ROAD, TURN LEFT ONTO WEST INSCRIPTION CANYON DRIVE, TURN RIGHT ONTO GREY BEARS TRAIL, ARRIVE AT 14000 NORTH GREY BEARS TRAIL.

APPROVALS

THE AUTHORIZED REPRESENTATIVES OF THE FOLLOWING AGENCIES HEREBY ACKNOWLEDGE OR HAVE ACKNOWLEDGED THAT THEY HAVE REVIEWED AND APPROVED THE DESIGN SHOWN BY THESE DRAWINGS. CONSTRUCTION MAY BEGIN AFTER ALL APPROPRIATE PERMITS HAVE BEEN OBTAINED.

YAVAPAI COUNTY _____ DATE _____

811 Know what's **below.** **Call** before you dig. 1-800-782-5348

REV NO.	COMMENT	DATE

FOR REVIEW ONLY NOT FOR CONSTRUCTION

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
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www.sunrise-eng.com

ICR SANITARY DISTRICT

WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION - PHASE II
COVER SHEET

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	G1

P:\ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\G1.dwg Feb 12, 2018 5:08pm tglock

LEGEND

- EXISTING CONCRETE
- EXISTING PAVEMENT
- EXISTING SEWER (s)
- EXISTING WATER LINE (w)
- EXISTING UNDERGROUND ELECTRIC (uge)
- EXISTING OVERHEAD ELECTRIC (ohe)
- EXISTING GAS LINE (g)
- EXISTING UNDERGROUND TELEPHONE (t)
- EXISTING CABLE LINE (c)
- EXISTING IRRIGATION LINE (irr)
- EXISTING PROPERTY LINE
- EXISTING BARBED WIRE FENCE (x)
- X *1443.08* EXISTING SPOT ELEVATION
- *1440* EXISTING CONTOUR
- EXISTING FLOWLINE
- EXISTING GRAVITY OVERFLOW (6"gr)
- EXISTING SEWER FORCE MAIN (fm)
- EXISTING PROCESS AIR LINE
- EXISTING METHANOL FEED LINE
- EXISTING SIGN
- EXISTING GATE VALVE
- EXISTING FIRE HYDRANT
- EXISTING WATER METER
- EXISTING POWER POLE
- EXISTING GUY WIRE
- EXISTING LIGHT POLE
- (E) EXISTING ELECTRIC MANHOLE
- (IR) EXISTING IRRIGATION MANHOLE
- EXISTING IRRIGATION VALVE
- (S) EXISTING SEWER MANHOLE
- EXISTING SEWER CLEANOUT
- (SD) EXISTING STORM DRAIN MANHOLE
- (T) EXISTING TELEPHONE MANHOLE
- EXISTING STORM DRAIN AND STRUCTURE
- EXISTING VEGETATION
- EXISTING MAILBOX
- EASEMENT
- RIGHT-OF-WAY
- ROADWAY CENTERLINE
- B / D2 PLAN, SECTION OR DETAIL LABEL — DRAWING TITLE/SHEET NUMBER

ABBREVIATIONS

ABC	AGGREGATE BASE COURSE
AERT	AERATION TANK
AC	ASPHALT CONCRETE
AWWA	AMERICAN WATER WORKS ASSOCIATION
ASA	AMERICAN STANDARD ASSOCIATION
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
BC	BACK OF CURB
BCF	BRASS CAP FLUSH
BCHH	BRASS CAP IN HAND HOLE
BLDG	BUILDING
BM	BENCHMARK
BTM	BOTTOM
CB	CATCH BASIN
CLT	CHLORINE TANK
CCC	CHLORINE CONTACT CHAMBER
CLF	CLARIFIER
C/L	CENTERLINE
CO	CLEAN OUT
CONC	CONCRETE
CONST	CONSTRUCTION
CY	CUBIC YARD
DC	DECANT STATION
DT	DISINFECTION TANK
DWG	DRAWING
DTL	DETAIL
E	EAST
ELEV	ELEVATION
ELF	EFFLUENT LIFT STATION
EP	EDGE OF PAVEMENT
ESMT	EASEMENT
EX, EXIST	EXISTING
FEQT	FLOW EQUALIZATION TANK
FF	FINISHED FLOOR
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL	FLANGE
FND	FOUND
FO	FIBER OPTIC
FPS	FEET PER SECOND
FT	FOOT, FEET
G	GAS, GUTTER, GRADE
GB	GRADE BREAK
GPM	GALLONS PER MINUTE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
ICRSD	INSCRIPTION CANYON RANCH SANITARY DISTRICT
IN.	INCH, INCHES
INV	INVERT
IRRIG	IRRIGATION
L	LENGTH
LF	LINEAR FEET
LS	LIFT STATION
LT	LEFT
MAG	MARICOPA ASSOCIATION OF GOVERMENTS
MFL	METHANOL FEED LINE
MH	MANHOLE
N	NORTH
NSF	NATIONAL SANITATION FOUNDATION
NA	NOT APPLICABLE
NIU	NOT IN USE
NO.	NUMBER
OHE	OVERHEAD ELECTRIC
P/L	PROPERTY LINE
PAE	PUBLIC ACCESS EASEMENT
PAL	PROCESS AIR LINE
PUAE	PUBLIC UTILITY & ACCESS EASEMENT
PUE	PUBLIC UTILITY EASEMENT
R	RADIUS
RS	RAW SEWAGE
RW	RECOVERY WATER
R/W	RIGHT-OF-WAY
RT	RIGHT
S	SEWER, SLOPE, SOUTH
SBRT	SEQUENCING BATCH REACTOR TANK
S/M	SAWCUT AND MATCH
SDMH	STORM DRAIN MANHOLE
SF	SQUARE FEET
SHT	SLUDGE HOLDING TANK
SSMH	SANITARY SEWER MANHOLE
STA	STATION
STD	STANDARD
SWK	SIDEWALK
SY	SQUARE YARD
T, TEL	TELEPHONE
TW	TREATED WATER
TYP	TYPICAL
UGE	UNDERGROUND ELECTRIC
W	WATER, WEST, WITH
WS	WASTE STREAM
YAG	YAVAPAI ASSOCIATION OF GOVERMENT
XFMR	TRANSFORMER

SHEET INDEX

30% PLANS

REV NO.	COMMENT	DATE

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SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
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ICR SANITARY DISTRICT

WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
SHEET INDEX, LEGEND, & ABBREVIATIONS

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	G2

P:\ICRSD\05609 ww\p upgrade\Dwg\Sheets\Phase II\G2.dwg Feb 12, 2018 5:08pm tglock

30% PLANS

SEI GENERAL NOTES

1. ALL SITE WORK SHALL CONFORM TO THE SPECIFICATIONS AND DETAILS BY THE JHA (JURISDICTION HAVING AUTHORITY) UNLESS SPECIFICALLY STATED OTHERWISE IN THESE PLANS.
2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS PRIOR TO BEGINNING CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF EXISTING PERMITS, RENEWAL OF LAPSED PERMITS, AND OBTAINING ANY NEW PERMITS, INCLUDING, BUT NOT LIMITED TO A DUST CONTROL PERMIT, AND TRAFFIC CONTROL PERMITS AS REQUIRED BY THE JHA.
3. THE CONTRACTOR IS RESPONSIBLE FOR MAKING ARRANGEMENTS FOR INSPECTION AND TESTING.
4. THE CONTRACTOR SHALL NOTIFY THE JHA'S INSPECTION DEPARTMENT 24 HOURS PRIOR TO CONSTRUCTION. CONSTRUCTION CONCEALED WITHOUT THE REQUIRED INSPECTION SHALL BE SUBJECT TO EXPOSURE AT THE CONTRACTOR'S EXPENSE.
5. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. CALL BLUE STAKE AT 1-800-782-5348 AT LEAST 48 HOURS BEFORE ANY CONSTRUCTION BEGINS.
6. THE CONTRACTOR SHALL FOLLOW GUIDELINES AND REGULATIONS SET FORTH BY O.S.H.A. SUNRISE ENGINEERING, INC. WILL NOT BE RESPONSIBLE FOR JOB-SITE SAFETY PROCEDURES OR CONDITIONS.
7. THE CONTRACTOR IS RESPONSIBLE FOR HIS OWN TAKEOFF QUANTITIES. QUANTITIES IF SHOWN HEREON ARE ESTIMATES ONLY AND AS SUCH ARE NOT TO BE USED FOR BID PURPOSES.
8. THE CONTRACTOR IS RESPONSIBLE FOR THE NOTIFICATION OF THE PROPER AUTHORITY(S) IF THERE ARE OBSTRUCTIONS TO PROPOSED IMPROVEMENTS AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY EXISTING ITEM REMOVED TO FACILITATE CONSTRUCTION SHALL BE REPLACED IN THE SAME OR BETTER CONDITION AT THE CONTRACTOR'S EXPENSE.
9. THE CONTRACTOR SHALL COORDINATE WITH UTILITY COMPANIES FOR LOCATION OF SERVICE AND/OR RELOCATION OF UTILITIES IN CONFLICT WITH PROPOSED CONSTRUCTION. THE ENGINEER SHALL NOT BE RESPONSIBLE FOR COORDINATING THE RELOCATION OF UTILITIES, POWER POLES, ETC.
10. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REMOVE AND SAFELY DISPOSE OF ALL REMOVAL MATERIAL AND DEBRIS DEEMED UNSALVAGEABLE BY THE ENGINEER PER THE PROVISIONS SET FORTH IN THE SPECIFICATIONS.
11. THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL ON AND AROUND THE CONSTRUCTION SITE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS.
12. THE CONTRACTOR SHALL PROVIDE ADEQUATE MEANS FOR CLEANING TRUCKS AND/OR OTHER EQUIPMENT OF MUD PRIOR TO ENTERING PUBLIC STREETS, AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO CLEAN STREETS, AND TAKE WHATEVER MEASURES ARE NECESSARY TO INSURE THAT ALL ROADS ARE MAINTAINED IN A CLEAN, MUD AND DUST FREE CONDITION AT ALL TIMES. NO WORK WILL BE CONSIDERED COMPLETE UNTIL ALL PAVEMENTS HAVE BEEN SWEPT CLEAN OF DIRT AND DEBRIS.
13. PRIOR TO MOVING OR DESTROYING PROTECTED NATIVE PLANT SPECIES, THE CONTRACTOR SHALL FILE A FORMAL NOTICE OF INTENT WITH THE ARIZONA DEPARTMENT OF AGRICULTURE NATIVE PLANTS (602) 542-3292.
14. A THOROUGH ATTEMPT HAS BEEN MADE TO SHOW THE LOCATIONS OF ALL UNDERGROUND OBSTRUCTIONS AND UTILITY LINES IN THE WORK AREA. HOWEVER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTIONS AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION AND SHALL DETERMINE THE EXACT LOCATION OF UTILITIES IN ADVANCE OF TRENCHING. THE ENGINEER WILL NOT GUARANTEE ANY ELEVATIONS AT LOCATIONS OF THE EXISTING UNDERGROUND UTILITIES SHOWN ON THESE PLANS.
15. THE CONTRACTOR SHALL PROVIDE A LICENSED SURVEYOR FOR THE SURVEYING/CONSTRUCTION STAKING OF ALIGNMENT AND GRADE FOR EACH MAIN AND/OR FACILITY AS SHOWN ON THE PLANS.
16. EXACT POINT OF MATCHING, TERMINATION AND OVERLAY, IF NECESSARY, MAY BE DETERMINED IN THE FIELD BY THE ENGINEER OF RECORD OR THE RESIDENT ENGINEER OVERSEEING THE PROJECT CONSTRUCTION.
17. ANY AMBIGUITIES OR DEFICIENCIES DISCOVERED ON THESE PLANS ARE TO BE RESOLVED BY SUNRISE ENGINEERING OR ITS APPOINTED REPRESENTATIVE. ANY MODIFICATIONS TO THESE PLANS MADE BY ANYONE OTHER THAN SUNRISE ENGINEERING OR ITS APPOINTED REPRESENTATIVE IS SOLELY RESPONSIBLE FOR THOSE MODIFICATIONS.
18. THE CONTRACTOR SHALL RE-GRADE ALL EARTHEN DRIVEWAYS DISTURBED WITHIN THE RIGHT-OF-WAY DURING THE CONSTRUCTION AND RE-COMPACT THE TOP 1-FEET OF SURFACE MATERIAL TO A MINIMUM COMPACTION OF 90% MAXIMUM DRY DENSITY. THE RE-GRADED DRIVEWAYS SHALL BE OVERLAID WITH A 0.5' LAYER OF HALF-INCH MINUS ROADWAY GRAVEL AND RAKED SMOOTH.
19. THE CONTRACTOR SHALL PROVIDE ALL TRAFFIC CONTROL AND BARRICADES FOR WORK IN THE RIGHT-OF-WAY PER THE STANDARDS SET FORTH BY THE JHA.

ICRSD SEWER GENERAL NOTES

1. ALL WORK SHALL CONFORM TO MARICOPA ASSOCIATION OF GOVERNMENTS (MAG), YAVAPAI ASSOCIATION OF GOVERNMENTS (YAG), ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY (ADEQ) REQUIREMENTS, ADEQ BULLETIN NO. 11 & THE INSCRIPTION CANYON RANCH SANITARY DISTRICT (ICRSD) DESIGN STANDARDS & SPECIFICATIONS, WHICHEVER IS MOST STRINGENT.
2. ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY REQUIREMENTS SHALL BE COMPLIED WITH.
3. ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY REQUIREMENTS SHALL APPLY WHEN MORE STRINGENT THAN THE MAG, YAG OR ICRSD STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION; MORE SPECIFICALLY WHERE THEY PERTAIN TO MAXIMUM ALLOWABLE SEWER LINE/PRESSURE SEWER LINE EXFILTRATION-INFILTRATION RATES.
4. THE CONTRACTOR MUST OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM ICRSD, YAVAPAI COUNTY, ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY AND OTHER REGULATORY AGENCIES AS NEEDED PRIOR TO CONSTRUCTION.
5. PROJECT ENGINEER SHALL BE RESPONSIBLE FOR SUBMITTING TRAFFIC CONTROL PLANS WHICH SHALL BE MADE A PART OF THE PLAN REVIEW REQUEST TO THE COUNTY ENGINEER FOR APPROVAL (IF APPLICABLE).
6. ALL PLANS APPROVED BY THE ICRSD ARE NULL & VOID ONE YEAR FROM DATE OF SIGNATURE IF CONSTRUCTION HAS NOT STARTED
7. ALL TRENCHES & BEDDING SHALL BE PER YAG DETAILS 2-01P & 2-02P. BEDDING MATERIAL SHALL NOT BE LARGER THAN ¾-INCH GRADATION BEDDING DEPTH MAY BE REDUCED FOR LPS SEWER MAINS SMALLER THAN 3-INCH DIAMETER IF APPROVED BY THE DISTRICT MANAGER.
8. ALL GRAVITY SANITARY SEWER PIPE SHALL BE POLYVINYL CHLORIDE (PVC), UNLESS OTHERWISE NOTED, IN ACCORDANCE WITH MAG SPECIFICATIONS. A CERTIFICATE SHALL BE FURNISHED FROM THE MANUFACTURER ATTESTNG THAT THE PIPE MEETS SDR-35 ASTM D3034 REQUIREMENTS.
9. ALL PRESSURE SEWER PIPE SHALL BE POLYVINYL CHLORIDE (PVC), UNLESS OTHERWISE NOTED, IN ACCORDANCE WITH MAG SPECIFICATIONS. A CERTIFICATE SHALL BE FURNISHED FROM THE MANUFACTURER ATTESTING THAT THE PIPE MEETS THE REQUIRED ASTM REQUIRMENTSS, PVC SCHEDULE 80, ASTM D-1785.
10. ANY QUANTITIES SHOWN ON PLANS ARE NOT VERIFIED BY ICRSD OR DISTRICT MANAGER.
11. ALL REVISIONS TO ORIGINAL PLANS MUST BE APPROVED BY THE DISTRICT MANAGER PRIOR TO CONSTRUCTION. ANY UNAPPROVED REVISIONS ARE SUBJECT TO REMOVAL & REPLACEMENT AT CONTRACTOR'S EXPENSE.
12. CONTRACTOR SHALL NOTIFY 'BLUE STAKE' AT 1-800-STAKEIT (1-800-782- 5348) AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
13. THE CONTRACTOR IS TO UNCOVER ALL EXISTING LINES BEING TIED INTO & VERIFY GRADES & ELEVATIONS BEFORE ANY OTHER CONSTRUCTION.
14. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UNDERGROUND PIPELINES, TELEPHONE & ELECTRICAL CONDUITS & STRUCTURES IN ADVANCE OF ANY CONSTRUCTION & OBSERVE ALL POSSIBLE PRECAUTIONS TO AVOID ANY DAMAGE TO SUCH. ICRSD WILL NOT GUARANTEE ANY LOCATION OF UNDERGROUND FACILITIES OR OMISSION OF SAME.
15. COMPLIANCE WITH ALL COUNTY, STATE, AND FEDERAL RULES AND REGULATIONS PERTAINING TO JOB SAFETY SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
16. THE CONTRACTOR SHALL PROVIDE SUFFICIENT MEN & EQUIPMENT ON THE JOB AT ALL TIMES DURING CONSTRUCTION TO COMPLY WITH SPECIFICATIONS & TO COMPLETE THE WORK
17. THE DISTRICT MANAGER SHALL BE NOTIFIED 48 HOURS PRIOR TO THE START OF ANY WORK. THE DISTRICT MANAGER SHALL BE NOTIFIED 48 HOURS PRIOR TO START OF ANY TESTING.
18. ALL WORK & MATERIALS WHICH DO NOT CONFORM TO THE SPECIFICATIONS ARE SUBJECT TO REMOVAL & REPLACEMENT AT THE CONTRACTOR'S EXPENSE.
19. ANY WORK PERFORMED WITHOUT THE KNOWLEDGE OF THE DISTRICT MANAGER OR HIS REPRESENTATIVE IS SUBJECT TO REMOVAL & REPLACEMENT AT THE CONTRACTOR'S EXPENSE.
20. BACKFILLING SHALL NOT BE STARTED UNLESS 48 HOURS NOTICE HAS BEEN PROVIDED TO THE SANITARY DISTRICT MANAGER OR EARLIER IF DISTRICT INSPECTION HAS BEEN PERFORMED.
21. ALL FRAMES, COVERS, VALVE BOXES, & MANHOLES SHALL BE ADJUSTED TO FINISH GRADE UPON COMPLETION OF PAVING, UTILITY, OR RELATED CONSTRUCTION.
22. ALL SEWER TAP LATERALS SHALL BE CONSTRUCTED TO THE LOT LINE OR INTERIOR EDGE OF THE PUE WHICHEVER IS FURTHER ONTO THE PROPERTY. A PLUG OR CAP MUST BE INSTALLED AT THE END OF EACH LATERAL WITH A 2X4 INSTALLED VERTICALLY FORM THE PLUG OR CAP UP TO 2 FEET ABOVE GRADE. THESE 2X4'S SHALL HAVE #10 STEEL WIRE WRAPPED AROUND THEM TO AID IN THE LOCATING THE LATERAL. THE 2X4 SHALL BE PAINTED GREEN AND THE DEPTH OF THE SERVICES (FROM GRADE TO TOP OF CAP OR PLUG) SHALL BE MARKED ON THE 2X4. METAL 2X4'S WITHOUT WIRE ARE ALSO ACCEPTABLE.
23. WATER-SEWER SEPARATION SHALL BE PURSUANT TO AAC R-18-5-502C.
24. GRAVITY SEWER LINE DEFLECTION TESTS SHALL BE DONE ON 100% OF ALL LINES.
25. THE TOTAL LENGTH OF THE GRAVITY SEWER LINE SHALL BE TESTED FOR UNIFORM SLOPE BY LAMP LIGHTING, REMOTE CAMERA, OR SIMILAR METHOD APPROVED BY THE DEPARTMENT AND THE RESULTS RECORDED.
26. COVER EACH GRAVITY SEWER LINE WITH AT LEAST 3 FEET OF EARTH COVER MEETING THE REQUIREMENTS OF "RIGID PIPE BEDDING FOR SANITARY SEWERS" (WWM 104) REVISED JULY 2002, & "FLEXIBLE PIPE BEDDING FOR SANITARY SEWERS" (WWM 105), REVISED JULY 2002, PUBLISHED BY PIMA COUNTY WASTEWATER MANAGEMENT.
27. ADEQUATE COMPACTION TESTS SHALL BE TAKEN. LOCATIONS AND FREQUENCY OF TESTING MAY BE ADJUSTED BY THE DISTRICT MANAGER IF THE DISTRICT MANAGER OR INSPECTOR DETERMINES MODIFIED TESTING IS NEEDED. IF ANY TEST FAILURES ARE EXPERIENCED, THE DISTRICT RESERVES THE RIGHT TO REQUIRE ADDITIONAL TESTING AT NO EXPENSE TO THE DISTRICT.
28. ANY PREVIOUSLY TESTED SEWER LINES BROKEN DURING THE INSTALLATION OF OTHER ADJACENT UTILITIES WILL BE REPAIRED AND RETESTED TO THE SATISFACTION OF THE SANITARY DISTRICT MANAGER.
29. SEWER FORCE MAIN AND LPS LINES SHALL BE DESIGNED AND CONSTRUCTED OF A MATERIAL SUITABLE FOR SANITARY SEWER PRESSURE PIPE PER ICRSD STANDARD DESIGN AND SPECIFICATIONS. SEWER LINES SHALL BE PRESSURE TESTED TO A MINIMUM OF 50 PSI ABOVE DESIGN WORKING PRESSURE AT THE LOWEST POINT IN THE SYSTEM FOR A MINIMUM OF 4 HOURS IN ACCORDANCE WITH AAC R18-9.
30. PRIOR TO PROJECT ACCEPTANCE, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING THE DISTRICT WITH A VIDEO DVD & A HARD COPY REPORT OF ALL OF THE MAIN LINES INSTALLED & SERVICES AND NEW OR REPLACED PRIVATE SERVICES.
31. ACCEPTANCE OF THE COMPLETED WORK WILL NOT BE GIVEN UNTIL 3 MIL MYLAR & CAD FORMAT DIGITAL 'AS-BUILT' PLANS ON YAVAPAI COUNTY DATUM & COORDINATES HAVE BEEN SUBMITTED BY A REGISTERED PROFESSIONAL ENGINEER AND APPROVED BY THE DISTRICT MANAGER.
32. SEWER MANHOLES EXFILTRATION TESTS SHALL BE DONE ON 100% OF ALL LINES. VACUUM TESTING IN ACCORDANCE WITH 'AGENCY' STANDARDS MAY BE USED IN LIEU OF EXFILTRATION TEST. THE CONTRACTOR SHALL TEST EACH MANHOLE USING ONE OF THE FOLLOWING TEST PROTOCOLS:

A. WATERTIGHTNESS TESTING BY FILLING THE MANHOLE WITH WATER. THE CONTRACTOR SHALL ENSURE THAT THE DROP IN WATER LEVEL FOLLOWING PRESOAKING DOES NOT EXCEED 0.0034 OF TOTAL MANHOLE VOLUME PER HOUR

B. NEGATIVE AIR PRESSURE TESTING USING THE "STANDARD TEST METHOD FOR CONCRETE SEWER MANHOLES BY NEGATIVE AIR PRESSURE" (VACUUM) TEST, C1244-02E1 (2002), PUBLISHED BY THE AMERICAN SOCIETY FOR TESTING AND MATERIALS. THIS MATERIAL IS INCORPORATED BY REFERENCE & DOES NOT INCLUDE ANY LATER AMENDMENTS OR EDITIONS OF THE INCORPORATED MATERIAL, & MAY BE VIEWED AT THE ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY, 1110 W. WASHINGTON, PHOENIX, AZ. 85007, OR OBTAINED FROM THE AMERICAN SOCIETY FOR TESTING & MATERIALS INTERNATIONAL, 100 BAR HARBOR DRIVE, WEST CONSHOHOCKEN, PA.19428-2959.

33. IT WILL BE THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT THE TREATMENT PLANT IS OPERATIONAL AND FUNCTIONAL AT ALL TIMES DURING CONSTRUCTION. THIS MAY INCLUDE, BUT NOT BE LIMITED TO, BYPASS PUMPING AND TEMPORARY LINES FOR THE TREATMENT PROCESS. THE CONTRACTOR SHALL SUBMIT A MAINTENANCE OF PLANT OPERATION (MOPO), PER SPECIFICATION - TREATMENT PLANT MOPO, THAT OUTLINES HOW THE PLANT WILL BE KEPT ONLINE DURING ALL PHASES OF CONSTRUCTION. THIS SHALL BE SUBMITTED TO THE CLIENT AND ENGINEER FOR APPROVAL AT LEAST THREE (3) WEEKS PRIOR TO THE MOPO EVENTS. THE CONTRACTOR SHALL MAKE EVERY EFFORT TO PERFORM WORK ON EQUIPMENT CRITICAL TO THE TREATMENT PROCESS AT TIMES OF LOW DEMAND.

REQURED SPECIAL INSPECTION

CONCRETE
BOLTS INSTALLED IN CONCRETE
REINFORCING STEEL AND PRE-STRESSING STEEL TENDONS
STRUCTURAL WELDING
STRUCTURAL MASONRY
EXPANSION/EPOXY ANCHORS
SOILS
COMPACTION
FABRICATION AND IMPLEMENTATION PROCEDURE
STEEL CONSTRUCTION

THE SPECIAL INSPECTION LIST IS FOR THE WHOLE SHEET IT IS LOCATED ON SEI ATTEMPTED TO PLACE THE SPECIAL INSPECTION REQUIRED FOR EACH INDIVIDUAL PAGE, HOWEVER, IF A SPECIAL INSPECTION WAS NOT LISTED THIS DOES NOT REMOVE RESPONSIBILITY OF THE CONTRACTOR TO INSURE THAT ALL REQUIRED SPECIAL INSPECTIONS ARE MADE. ALSO, THE SPECIAL INSPECTIONS DO NOT OVERRIDE OR SUPERSEDE ANY INSPECTIONS OR TESTING LISTED IN THE SPECIFICATIONS OR OTHERWISE REQUIRED.

REV NO.	COMMENT	DATE

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SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
www.sunrise-eng.com

ICR SANITARY DISTRICT

WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION - PHASE II
GENERAL NOTES

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	G3

P:\ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\G3.dwg Feb 12, 2018 5:08pm tglock

30% PLANS

CONSTRUCTION NOTES

1. ALL PIPELINES SHALL BE INSTALLED AT THE LOCATIONS AS SHOWN ON THE DRAWINGS OR AS OTHERWISE DIRECTED BY THE ENGINEER.
2. ALL PIPELINE PROFILE ELEVATIONS ARE INVERT ELEVATIONS, UNLESS OTHERWISE INDICATED.
3. BIG PARK WWTP HAS EXISTING ONSITE UTILITIES. THESE UTILITIES HAVE BEEN SHOWN ON THE PLANS TO THE BEST OF THE ENGINEER'S KNOWLEDGE. HOWEVER, THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND OVERHEAD UTILITIES AND PROTECTING THEM FROM DAMAGE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL UTILITIES BE PROTECTED, RESTORED, OR RELOCATED TO ORIGINAL CONDITION AND SERVICEABILITY IF DISTURBED AS A RESULT OF THE CONSTRUCTION ACTIVITIES AT NO ADDITIONAL EXPENSE TO THE OWNER OR ENGINEER UNLESS OTHERWISE STATED IN THE CONTROL DOCUMENTS.
4. ALL FRAMES, COVERS, VALVE BOXES, MANHOLES, ETC. SHALL BE INSTALLED TO FINISH GRADE, UNLESS OTHERWISE INDICATED, OR SHALL BE ADJUSTED TO FINISH GRADE USING GRADE RINGS NOT EXCEEDING 6" IN HEIGHT. THE USE OF CONCRETE COLLARS IS ACCEPTABLE.
5. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS PRIOR TO CONSTRUCTION.
6. THE CONTRACTOR SHALL INSTALL PIPELINES IN ACCORDANCE WITH ELEVATIONS AND DIMENSIONS AS INDICATED ON THE PLANS AND SHALL NOT USE SCALED ELEVATIONS OR DIMENSIONS.
7. THE CONTRACTOR SHALL CONTACT "BLUE STAKES" PRIOR TO EXCAVATION. (800) 782–5348.
8. MARKING TAPE IS REQUIRED TO BE INSTALLED ABOVE ALL UNDERGROUND PIPING AS INDICATED IN THE SPECIFICATIONS OR DRAWINGS.
9. ALL WORK PERFORMED WITHIN STATE ROAD RIGHTS–OF–WAY SHALL CONFORM TO ADOT SPECIFICATIONS.
10. THE CONTRACTOR SHALL INSTALL DUCTILE IRON PIPE IN THE REQ'D AREAS AS SHOWN ON THE DRAWINGS.
11. THE CONTRACTOR SHALL PROVIDE MEANS OF MANAGING ANY STORM WATER, GROUNDWATER, OR NUISANCE WATER AND PREVENT IT FROM INTERFERING WITH THE CONSTRUCTION OPERATION. COST OF CONTROLLING ALL WATER SHALL BE INCLUDED IN THE CONTRACT PRICE FOR RELATED BID ITEMS.
12. THE SITE HAS SHALLOW BEDROCK, AND IT IS ANTICIPATED THAT DURING AND FOLLOWING A STORM EVENT THERE WILL BE WATER FLOWING AT THE SOIL ROCK INTERFACE.THE CONTRACTOR SHALL TAKE THE APPROPRIATE MEASURES TO DEWATER THE CONSTRUCTION SITE IN CASE OF A STORM EVENT.
13. THE CONTRACTOR SHALL INCLUDE THE COST FOR ALL EXCAVATION AND DISPOSAL OF EXCESS AND UNSUITABLE MATERIAL IN THE CONTRACT UNIT PRICE FOR THE RELATED BID ITEM. ALL OTHER COSTS ASSOCIATED WITH THIS PROJECT SHALL BE INCLUDED IN THE PRICES INDICATED IN THE BID SCHEDULE FOR THE VARIOUS APPURTENANT ITEMS OF WORK.
14. ANY CANAL OR DITCH CROSSINGS NOT SPECIFICALLY CALLED ON THE PLANS ARE CONSIDERED INCIDENTAL TO THE INSTALLATION OF THE PIPELINE AND SHALL NOT BE PAID FOR SEPARATELY.
15. THE CONTRACTOR SHALL PROVIDE, INSTALL, AND MAINTAIN ALL ROAD CONSTRUCTION, BARRICADES, CHANNELING DEVICES, AND CONSTRUCTION SIGNS AS REQUIRED BY THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND AS REQUIRED BY THE OWNER AND ENGINEER.
16. ALL BENCHMARKS AND SURVEY CONTROL STAKES PROVIDED BY THE OWNER'S ENGINEER FOR THE CONSTRUCTION OF THE PROJECT SHALL BE PROTECTED FROM DISTURBANCE. IF CONTROL STAKES ARE DISTURBED OR REMOVED PREMATURELY, THE WORK OF RE–STAKING SHALL BE DONE BY THE OWNER'S ENGINEER AT THE CONTRACTOR'S EXPENSE.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SAFETY AND PROTECTION WITHIN AND ADJACENT TO THE JOBSITE. THE ENGINEER WILL NOT BE RESPONSIBLE FOR JOB–SITE SAFETY PROCEDURES AND CONDITIONS.
18. THE CONTRACTOR IS RESPONSIBLE TO ADHERE TO ALL PROVISIONS OF "OSHA SAFETY AND HEALTH STANDARDS FOR THE CONSTRUCTION INDUSTRY".
19. ANY OMISSIONS OR CONFLICTS BETWEEN THE CONSTRUCTION DRAWINGS AND THE ACTUAL CONDITIONS ENCOUNTERED IN THE VARIOUS ELEMENTS OF THE PROJECT SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER AND RESOLVED BY THE ENGINEER BEFORE PROCEEDING WITH ANY WORK INVOLVED.
20. OBSERVATION VISITS TO THE SITE BY THE ENGINEER SHALL NOT BE CONSTRUED AS APPROVAL OF CONSTRUCTION.
21. ALL PIPELINES SHALL BE INSTALLED WITH A MINIMUM OF 3 FEET OF COVER OVER THE TOP OF THE PIPE UNLESS OTHERWISE INDICATED.
22. WHERE THE TREATED WATER OR REUSE PIPELINE MUST CROSS RAW SEWAGE OR WASTE PIPELINES, PIPING SHALL BE INSTALLED ACCORDING TO MAG STANDARDS 404–1 AND 404–2.
23. A TREATED WATER OR REUSE PIPELINE SHALL NOT BE INSTALLED WITH LESS THAN 6 FEET OF HORIZONTAL SEPARATION OUTSIDE EDGE OF PIPE TO OUTSIDE EDGE OF PIPE FROM A RAW SEWAGE OR WASTE PIPELINE.
24. PIPELINE FITTINGS REQUIRED FOR INSTALLATION OF RS, WS, RAS, WAS, PTW OR REUSE PIPING BEYOND THOSE SHOWN ON THE DRAWINGS ARE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL NOT BE PAID FOR SEPARATELY.

    ALL ABOVE GROUND PIPING SHALL BE PAINTED TO BLEND IN WITH SURROUNDINGS, COLOR TO BE SELECTED BY OWNER. ALL ABOVE GROUND PIPING LABELED AS DIRECTED BY OWNER.
25. COMPACTION OF ALL TRENCH MATERIALS SHALL BE IN ACCORDANCE WITH SPECIFICATION REQUIREMENTS.
26. DURING CLEANUP ON CITY STREETS, HISTORIC ROAD DRAINAGE PROFILES SHALL BE RESTORED. ALL ROCKS LARGER THAN 2" SHALL BE RAKED OUT AND REMOVED OR BURIED.
27. FOR ANY WORK COMPLETED ON PRIVATE PROPERTY, UNLESS AGREED OTHERWISE BY THE PRIVATE PROPERTY OWNER, THE CONTRACTOR SHALL REMOVE AND RESTORE LANDSCAPE IMPROVEMENTS ON PRIVATE PROPERTY IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR CONSTRUCTION SECTION 02500 (SEE PARAGRAPH 02500.3.1.3) AND SECTION 2900. SUCH RESTORATION INCLUDES, BUT IS NOT LIMITED TO THE FOLLOWING: FENCES SHALL BE RESTORED IN KIND; TURF SOD SHALL BE REPLACED WITH EQUIVALENT TURF SOD; TREES, WHICH MUST BE REMOVED, SHALL BE REPLACED WITH AN EQUIVALENT TREE UP TO 15 FEET IN HEIGHT; FLOWER BEDS SHALL BE REPLACED TO MATCH THE EXISTING; AND IRRIGATION SYSTEMS MUST BE RESTORED TO ORIGINAL CONDITION. THIS WORK IS TO BE CONSIDERED INCIDENTAL TO THE INSTALLATION OF PIPELINES AND MANHOLES ON PRIVATE PROPERTY.
28. CONTRACTOR TO FIELD VERIFY ALL EXISTING ELEVATIONS, CONNECTION ELEVATIONS, AND ELEVATIONS OF EXISTING AND NEW PIPE CROSSINGS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF DISCREPANCIES OCCUR BETWEEN THE PLANS AND FIELD MEASUREMENTS BEFORE INSTALLATION OF PIPING.
29. THE CONTRACTOR IS RESPONSIBLE FOR MAKING ARRANGEMENTS FOR INSPECTION AND TESTING.
30. THE CONTRACTOR IS RESPONSIBLE FOR ALL MATERIALS, EQUIPMENT, AND ANY NECESSARY COMPONENTS, UNLESS SPECIFICALLY INDICATED OTHERWISE.
31. SURFACE FINISHES OF ALL CONCRETE SHALL BE AS FOLLOWS UNLESS OTHERWISE SPECIFIED:
    ALL VERTICAL EXTERIOR EXPOSED SURFACES:
    F5 FINISH PER SPECIFICATION 03100
    ALL VERTICAL BASIN OR TANK INTERIOR CONCRETE WALL SURFACES (WATERSIDE):
    F3 FINISH PER SPECIFICATION 03100
    ALL FLUID TANK FLOOR SLAB SURFACES:
    S2 FINISH PER SPECIFICATION 03100
    ALL BUILDING FLOOR SLAB SURFACES:
    S2 FINISH PER SPECIFICATION 03100
    ALL SIDEWALK SURFACES:
    S3 FINISH PER SPECIFICATION 03100
    ALL OUTDOOR PADS:
    S3 FINISH PER SPECIFICATION 03100
    ALL SURFACES TO GET COATING:
    F2 FINISH PER SPECIFICATION 03100
32. INTERIOR SURFACE COATING OF SPECIFIC CONCRETE STRUCTURES AS SHOWN IN THE DRAWINGS SHALL BE AS FOLLOWS UNLESS OTHERWISE SPECIFIED:

    STRUCTURES REQUIRING AN INTERIOR COATING
    F3 FINISH PER SPECIFICATION 03100
    COATING SYSTEM SHALL BE PER SPECIFICATION 09911

    EXTERIOR SURFACE COATING OF SPECIFIC CONCRETE STRUCTURES AS SHOWN IN THE DRAWINGS SHALL BE AS FOLLOWS UNLESS OTHERWISE SPECIFIED:

    STRUCTURES REQUIRING AN EXTERIOR COATING
    F3 FINISH PER SPECIFICATION 03100
    STAINING AND SEALER PER SPECIFICATION 09912 AND 09913
33. ALL BOLTS, NUTS, WASHERS, ECT SHALL BE STAINLESS STEEL UNLESS OTHERWISE SPECIFIED.
34. ALL ASPECTS OF THE EXISTING PLANT MUST REMAIN ONLINE AND OPERATIONAL DURING THE COURSE OF CONSTRUCTION, UNTIL THE NEW BNR SYSTEM IS ONLINE AND APPROVAL IS GIVEN FROM THE ENGINEER. IT IS THE CONTRACTORS RESPONSIBILITY TO MITIGATE ANY ISSUES THAT ARISE DUE TO CONSTRUCTION THAT MIGHT IMPACT THE OPERATION OF THE EXISTING PLANT AT NO COST TO THE OWNER.
35. IN ORDER TO INSTALL NEW EQUIPMENT CONTROL PANELS IN THE EXISTING CONTROL BUILDING, EXITING BLOWER #1 MUST BE REMOVED. REMOVAL OF EXISTING BLOWER #1 MUST BE PERFORMED AT THE LATEST TIME POSSIBLE DURING THE CONSTRUCTION SCHEDULE. THE REMOVED BLOWER MUST BE KEPT IN A LOCATION WHERE IT CAN BE EASILY ACCESSIBLE SO IF BLOWER #2 (BLOWER IN OPERATION) GOES DOWN IT CAN QUICKLY BE INSTALLED WITH MINIMAL DOWN TIME TO THE PLANT. IT IS THE CONTRACTOR'S RESPONSIBILITY TO RE–INSTALL BLOWER #1 IN CASE BLOWER #2 ISN'T FUNCTIONING PROPERLY FOR ANY REASON. THIS SHALL BE DONE AT NO EXTRA COST TO THE OWNER.
36. SEE SPECIFICATION 01590 FOR PROCEDURES TO SWITCH OVER BETWEEN TREATMENT SYSTEM AND STARTUP.

CONCRETE NOTES

1. ALL CONCRETE CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH ACI 318 AND ACI 301, EXCEPT AS MODIFIED BY THE CONSTRUCTION DOCUMENTS.
2. CONCRETE SHALL HAVE THE FOLLOWING COMPRESSIVE STRENGTHS:

CONCRETE	MIN. f'c (28 DAYS)	SLUMP	W/CRATIO	CLASS
FOUNDATIONS	4500 PSI	3" TO 5"	0.45	F2
INT. SLAB–ON–GRADE	4000 PSI	3" TO 5"	0.45	F2
CONCRETE NOT NOTED	4500 PSI	3" TO 5"	0.45	F2

    SLUMP: CONCRETE w/ ADMIXTURES SHALL HAVE A MAXIMUM SLUMP OF 5".
    STRUCTURAL DESIGN OF FOOTINGS ASSUMED F'c = 2500 PSI.
3. ADMIXTURES:
    3.1. AIR ENTRAINMENT ASTM C–260
    3.2. CALCIUM CHLORIDE NOT PERMITTED
    3.3. ALUMINUM PRODUCTS NOT PERMITTED
4. CONCRETE MIXES SHALL BE DESIGNED BY A CERTIFIED LABORATORY, STAMPED BY AN APPROPRIATELY LICENSED SPECIALTY ENGINEER, AND APPROVED BY THE ENGINEER OF RECORD. MIX DESIGNS SHALL INCLUDE THE PROJECT NAME AND INDICATE THEIR USE WITHIN THE STRUCTURE. MIX DESIGNS SHALL BE PROPORTIONED TO MINIMIZE SHRINKAGE AND HAVE PROVEN SHRINKAGE CHARACTERISTICS OF 0. 05% OR LESS BASED ON TESTING PER ASTM C157.
5. IF USED, EARLY STRENGTH CONCRETE SHALL BE PROPORTIONED TO DEVELOP THE 28 DAY COMPRESSIVE STRENGTH AT THE AGE REQUIRED BY THE CONTRACTOR. CONTRACTOR SHALL SUBMIT TEST DATA FOR REVIEW BY THE STRUCTURAL ENGINEER TO SUBSTANTIATE THE CONCRETE STRENGTH AT THE REQUIRED AGE.
6. ALL CONCRETE SHALL BE NORMAL WEIGHT OF 145 POUNDS PER CUBIC FOOT USING HARD ROCK AGGREGATES CONFORMING TO ASTM C33 U.N.O. WHERE LIGHTWEIGHT CONCRETE IS SPECIFIED, CONCRETE SHALL BE 110 POUNDS PER CUBIC FOOT USING AGGREGATES CONFORMING TO ASTM C330. LARGEST NOMINAL AGGREGATE SIZE SHALL BE 1–1/2" OR GREATER FOR SLABS ON GRADE AND 3/4" OR GREATER FOR ALL OTHER CONCRETE U.N.O.
7. PORTLAND CEMENT SHALL CONFORM TO ASTM C150. TYPE V CEMENT SHALL BE USED FOR CONCRETE IN CONTACT WITH EARTH. TYPE II CEMENT MAY BE USED ELSEWHERE. CEMENT SHALL BE TYPE V WITH POZZOLAN WHERE CONCRETE IS IN CONTACT WITH SOIL CONTAINING VERY SEVERE SULFATE EXPOSURE.
8. FLY ASH MAY BE USED IN CONCRETE, SUBJECT TO APPROVAL BY THE ARCHITECT AND ENGINEER, PROVIDED THE FOLLOWING CONDITIONS ARE MET:
    8.1. FLY ASH SHALL COMPLY WITH ASTM C618.
    8.2. CEMENT CONTENT SHALL BE REDUCED A MINIMUM OF 15 PERCENT UP TO A MAXIMUM OF 25 PERCENT WHEN COMPARED TO AN EQUIVALENT CONCRETE MIX DESIGN WITHOUT FLY ASH. FLY ASH CONTENT SHALL NOT COMPRISE MORE THAN 35 PERCENT OF THE TOTAL CEMENTITIOUS CONTENT. THE WATER–CEMENT RATIO SHALL BE CALCULATED BASED ON THE TOTAL CEMENTITIOUS MATERIAL IN THE MIX.
    8.3. CLASS F FLY ASH SHALL BE USED IN SULFATE RESISTANT CONCRETE WITH f'c EQUAL TO OR GREATER THAN 4000 PSI. CLASS C FLY ASH MAY BE USED ELSEWHERE.
9. WATER SOLUBLE CHLORIDE ION CONCENTRATIONS IN CONCRETE SHALL BE LIMITED PER ACI 318, SECTION 4.4.
10. ALL CONCRETE EXPOSED TO FREEZE/THAW CYCLES OR DEICING CHEMICALS SHALL CONFORM TO ACI 318, SECTION 4.2.
11. TIME BETWEEN CONCRETE BATCHING AND PLACEMENT SHALL BE IN ACCORDANCE WITH ASTM C94.
12. CONCRETE MIXING, PLACEMENT AND QUALITY SHALL BE PER IBC SECTION 1905. MECHANICALLY VIBRATE ALL CONCRETE WHEN PLACED. SLABS ON GRADE NEED BE VIBRATED ONLY AROUND AND UNDER FLOOR DUCTS OR SIMILAR ELEMENTS. REMOVE ALL DEBRIS FROM FORMS BEFORE PLACING CONCRETE. CONCRETE SHALL NOT BE DROPPED THROUGH REINFORCING STEEL SO AS TO CAUSE SEGREGATION OF AGGREGATES. UNCONFINED FALL OF CONCRETE SHALL NOT EXCEED 5 FEET.
13. PROTECT CONCRETE FROM DAMAGE OR REDUCED STRENGTH DUE TO COLD OR HOT WEATHER IN ACCORDANCE WITH ACI 305 AND 306. CONTRACTOR SHALL TAKE SPECIAL CURING PRECAUTIONS TO MINIMIZE SHRINKAGE CRACKING OF CONCRETE SLABS.
14. ALL REINFORCING STEEL SHALL BE SET AND TIED IN PLACE PRIOR TO POURING OF CONCRETE, EXCEPT THAT VERTICAL DOWELS FOR MASONRY WALL REINFORCING MAY BE "FLOATED" IN PLACE. DO NOT FIELD BEND BARS PARTIALLY EMBEDDED IN HARDENED CONCRETE UNLESS SPECIFICALLY INDICATED OR APPROVED BY THE ENGINEER OF RECORD.
15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLACEMENT AND LOCATION OF ANY AND ALL EMBED ITEMS INCLUDING PLATES, BOLTS, AND OTHER INSERTS SPECIFIED IN THE DRAWINGS. REINFORCING STEEL FOR PRECAST CONCRETE PANELS SHOWN ON THE DRAWINGS ARE FOR THE GRAVITY, SEISMIC AND WIND LOADS ONLY. LIFTING PROCEDURES OF ALL PRECAST PANELS SHALL BE THE CONTRACTORS RESPONSIBILITY. THE CONTRACTOR SHALL SUBMIT A COPY OF THE DESIGN CALCULATIONS AND SHOP DRAWINGS TO THE ENGINEER OF RECORD FOR ALL PRECAST CONCRETE REINFORCEMENT AND LIFTING HARDWARE ASSOCIATED WITH HIS CHOSEN INSTALLATION PROCEDURE.
16. ALL ITEMS TO BE CAST IN CONCRETE SUCH AS REINFORCEMENT, DOWELS, BOLTS, ANCHORS, SLEEVES, ETC., SHALL BE SECURELY POSITIONED IN THE FORMS.
17. MECH., ELECT., AND PLUMBING PENETRATIONS / EMBEDDED CONDUITS SHALL COMPLY WITH THE FOLLOWING:

    a. ELECTRICAL CONDUITS MAY BE EMBEDDED IN STRUCTURAL CONCRETE ONLY AS NOTED IN TYPICAL DETAILS FOR WALLS AND CAST–IN–PLACE ELEVATED SLABS (EMBEDDED CONDUITS IN CONCRETE OVER STEEL DECK ARE NOT PERMITTED) OR WHERE SPECIFICALLY APPROVED IN WRITING BY THE ENGINEER. PIPING SHALL NOT BE EMBEDDED IN STRUCTURAL CONCRETE U.N.O. EMBEDDED ITEMS SHALL NOT IMPAIR THE STRENGTH OF THE MEMBER.

    b. REFER TO TYPICAL DETAILS FOR ACCEPTABLE CONDUIT, PIPING, AND DUCT PENETRATIONS THRU SLABS AND WALLS. DO NOT CUT ANY REINF. THAT MAY INTERFERE WITH PERMITTED PENETRATIONS. OPENINGS SHALL NOT BE CORED WITHOUT PRIOR WRITTEN APPROVAL OF ENGINEER THRU THE ARCHITECT. PENETRATIONS THRU BEAMS AND COLUMNS ARE PERMITTED ONLY WHERE SPECIFICALLY DETAILED.

    c. CONTRACTOR SHALL SUBMIT SHOP DRAWING SHOWING SIZES AND DIMENSIONED LOCATIONS OF ALL PENETRATIONS AND EMBEDDED CONDUITS IN WALLS AND ELEVATED SLABS. SHOP DRAWING MUST BE APPROVED BY ENGINEER PRIOR TO CONCRETE PLACEMENT. PENETRATIONS AND EMBEDDED CONDUITS NOT SHOWN ON APPROVED SHOP DRAWING WILL NOT BE PERMITTED UNLESS SPECIFICALLY APPROVED IN WRITING BY THE ENGINEER.
18. FORMWORK, SHORING, AND RESHORING SHALL BE DESIGNED PER ACI 347 RECOMMENDATIONS BY AN APPROPRIATELY LICENSED SPECIALTY ENGINEER EXPERIENCED IN THIS TYPE OF WORK AND SHALL BE SUBMITTED TO ENGINEER OF RECORD FOR REVIEW. FOR MULTISTORY CONSTRUCTION, SHORING/RESHORING DESIGN SHALL DEMONSTRATE THAT SHORES/RESHORES WILL BE PROVIDED FOR A SUFFICIENT NUMBER OF FLOORS TO DISTRIBUTE IMPOSED CONSTRUCTION LOADS TO SEVERAL SLAB LEVELS WITHOUT CAUSING EXCESSIVE STRESSES AND SLAB DEFLECTIONS. FOR PURPOSES OF SHORING/RESHORING CALCULATIONS, MAGNITUDES OF REDUCED LIVE LOADS SHALL BE TAKEN TO BE 60% OF VALUES INDICATED IN BASIS FOR DESIGN U.N.O.
19. CONSTRUCTION JOINTS OR POUR JOINTS IN STRUCTURAL ELEMENTS (BEAMS, COLUMNS, ELEVATED SLABS, ETC.) NOT SPECIFICALLY SHOWN OR NOTED ON THE DRAWINGS REQUIRE PRIOR APPROVAL OF THE ENGINEER. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS SHOWING PROPOSED JOINTS TO ENGINEER FOR APPROVAL.
20. CONSTRUCTION JOINT SURFACES SHALL BE CLEANED AND LAITANCE REMOVED. HORIZONTAL JOINT SURFACES SHALL BE ROUGHENED TO 1/4" AMPLITUDE. THOROUGHLY WET ALL JOINT SURFACES AND REMOVE STANDING WATER IMMEDIATELY PRIOR TO NEW CONCRETE PLACEMENT.
21. CONCRETE SHALL BE CURED IN ACCORDANCE WITH ACI 318, SECTIONS 5.11.1 OR 5.11.2, WHICHEVER IS APPLICABLE, UNLESS ALTERNATE METHODS HAVE BEEN APPROVED BY THE ARCHITECT AND ENGINEER. WHERE CURING COMPOUNDS HAVE BEEN APPROVED FOR SLAB CURING, CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING COMPATIBILITY OF COMPOUNDS WITH ANTICIPATED FLOOR FINISH (e.g., RESILIENT TILE) PRIOR TO CURING COMPOUND APPLICATION.

REINFORCING STEEL NOTES

1. REINFORCING STEEL SHALL BE DETAILED AND PLACED IN ACCORDANCE WITH ACI 318 AND CRSI'S MANUAL OF STANDARD PRACTICE.
2. REINFORCING STEEL SHALL CONFORM TO ASTM A615 OR ASTM A706 (A706 REQUIRED FOR ALL REINFORCING TO BE WELDED) AND SHALL BE GRADE 60 (fy = 60 KSI) DEFORMED BARS U.N.O. REINFORCING IN SLABS ON GRADE MAY BE GRADE 40 (fy = 40 KSI) DEFORMED BARS FOR ALL BARS #4 AND SMALLER U.N.O. ON PLANS OR DETAILS.
3. ALL DIMENSIONS SHOWING THE LOCATION OF REINFORCING STEEL NOT NOTED AS "CLEAR" OR "CLR." ARE TO CENTER OF STEEL. CLEAR COVER FOR NON–PRESTRESSED CONCRETE REINFORCING SHALL BE AS NOTED BELOW, U.N.O. ON PLANS OR DETAILS. CLEAR COVER FOR PRESTRESSED CONCRETE AND FOR PRECAST CONCRETE MANUFACTURED UNDER PLANT CONTROL CONDITIONS SHALL BE PER ACI 318, SECTIONS 7.7.2 AND 7.7.3, RESPECTIVELY.

EXPOSURE CONDITIONS	COVER:
CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH	3"
EXPOSED TO WEATHER (INCLUDES SLABS ON GRADE)	
NO. 5 AND SMALLER	1 1/2"
NO. 6 AND LARGER	2"
NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND	
STRUCTURAL SLABS, WALLS, JOISTS	
NO. 11 AND SMALLER	3/4"
NO. 14 AND LARGER	1 1/2"
BEAMS, COLUMNS (PRIMARY REINFORCEMENT, TIES, STIRRUPS, SPIRALS)	1 1/2"

4. LAP SPLICES OF REINFORCING STEEL SHALL CONFORM TO TYPICAL REBAR LAP SCHEDULE U.N.O. NO TACK WELDING OF REINFORCING BARS ALLOWED. LATEST ACI CODE AND DETAILING MANUAL APPLY. AT WALLS AND FOOTINGS, PROVIDE BENT CORNER BARS TO MATCH AND LAP WITH HORIZ. BARS AT ALL CORNERS AND INTERSECTIONS U.N.O. VERT. WALL BARS SHALL BE SPLICED AT OR NEAR FLOOR LINES. SPLICE TOP BARS AT CENTER LINE OF SPAN AND BOTTOM BARS AT THE SUPPORT IN SPANDRELS, BEAMS, GRADE BEAMS, ETC., U.N.O. ON PLANS OR DETAILS.
5. MECHANICAL SPLICE COUPLERS SHALL HAVE CURRENT ICC APPROVAL AND SHALL BE CAPABLE OF DEVELOPING 125% OF THE SPLICED BAR'S YIELD STRENGTH.
6. ALL REINFORCING SHALL BE BENT COLD. BARS SHALL NOT BE UN–BENT AND RE–BENT. FIELD BENDING OF REBAR SHALL NOT BE ALLOWED UNLESS SPECIFICALLY NOTED.
7. WELDING OF REINFORCING BARS, METAL INSERTS, AND CONNECTIONS SHALL BE MADE ONLY AT LOCATIONS SHOWN ON PLANS OR DETAILS. SEE WELDING SECTION OF G.S.N. FOR ADDITIONAL REQUIREMENTS.
8. REINFORCING BAR SPACINGS SHOWN ON PLANS ARE MAX. ON CENTER DIMENSIONS. DOWEL ALL VERT. REINFORCING TO FOUNDATION. SECURELY TIE ALL BARS IN LOCATION BEFORE PLACING CONCRETE. MIN. CLEAR SPACING BETWEEN PARALLEL REINFORCEMENT SHALL BE THE LARGER OF 1–1/2 TIMES NOMINAL BAR DIA. OR 1–1/3 TIMES MAX. AGGREGATE SIZE OR 1–1/2". CLEAR SPACING LIMITATION APPLIES ALSO TO CLEAR DISTANCE BETWEEN A CONTACT LAP SPLICE AND ADJACENT SPLICES OR BARS.
9. MIN. REINFORCING AT EDGES OF CONCRETE WALL OPENINGS SHALL BE (2) #5 BARS. EXTEND THE GREATER OF THE DEVELOPMENT LENGTH OF THE BAR PER TYPICAL REBAR LAP SCHEDULE OR 24" MIN. PAST EDGES OF OPENING U.N.O. HOOK ENDS AT INTERFERENCE WITH EXTENSION.

REV NO.	COMMENT	DATE

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SUNRISE ENGINEERING
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ICR SANITARY DISTRICT

WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
GENERAL NOTES

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	G4

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30% PLANS

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WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
DESIGN CRITERIA

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	G5

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30% PLANS

ONSITE LS
ICR
W.C LS
T.R. LS
WASH WATER FROM POTABLE WATER LINE
SCREENINGS
CONCRETE CHANNEL
MANUAL BAR SCREEN
GRIT REMOVAL
WL
FEQ TANK
EXISTING AERATORS
EMERGENCY STORAGE TANK
EXISTING FEQ BLOWER
M
ANOXIC TANK
BNR TANK
TE
AE
DO
CLARIFIER
WATER FROM POTABLE WATER LINE
ODOR SCRUBBER
FEQ BLOWERS
FUTURE
W
TABLET CHLORINATOR
CONTAINMENT CURB
CATCH BASIN
DEWATERED SLUDGE HAULED OFFSITE
BOX FILTER
SLUDGE PUMP
DECANT AIR LIFT
EXISTING SLUDGE THICKENER
CHLORINE CONTACT TANK
EXISTING EFFLUENT LIFT STATION
TO T.R GOLF COURSE
DEWATERED SLUDGE
POLYMER FEED

ABBREVIATIONS

DO	DISSOLVED OXYGEN
FEQ	FLOW EQUALIZATION
RAS	RETURN ACTIVATED SLUDGE
UV	ULTRA VIOLET
WAS	WASTE ACTIVATED SLUDGE

DECANT LINE (GRAVITY FLOW)

LT	LEVEL TRANSMITTER (ULTRASONIC WATER LEVEL SENSOR)
PT	PRESSURE TRANSMITTER (PRESSURE TRANSDUCER LEVEL SENSOR)
WL	WATER LEVEL FLOAT

LEGEND

BLOWER
BLOWER AIR FILTER
BUTTERFLY VALVE
CENTRIFUGAL PUMP
CHECK VALVE
DOUBLE LEAF CHECK VALVE
GLOBE VALVE
GATE VALVE
CONCENTRIC REDUCER
EXISTING PIPING
NEW PIPING
FUTURE PIPING
TEMPERATURE PRIMARY ELEMENT
ANALYSIS PRIMARY ELEMENT
METER
MOTOR ACTUATOR
PLUG VALVE
SAFETY RELIEF VALVE
AERATING TANK MIXER
TANK MIXER
WATER LEVEL FLOAT

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WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
PROCESS DIAGRAM

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	G6

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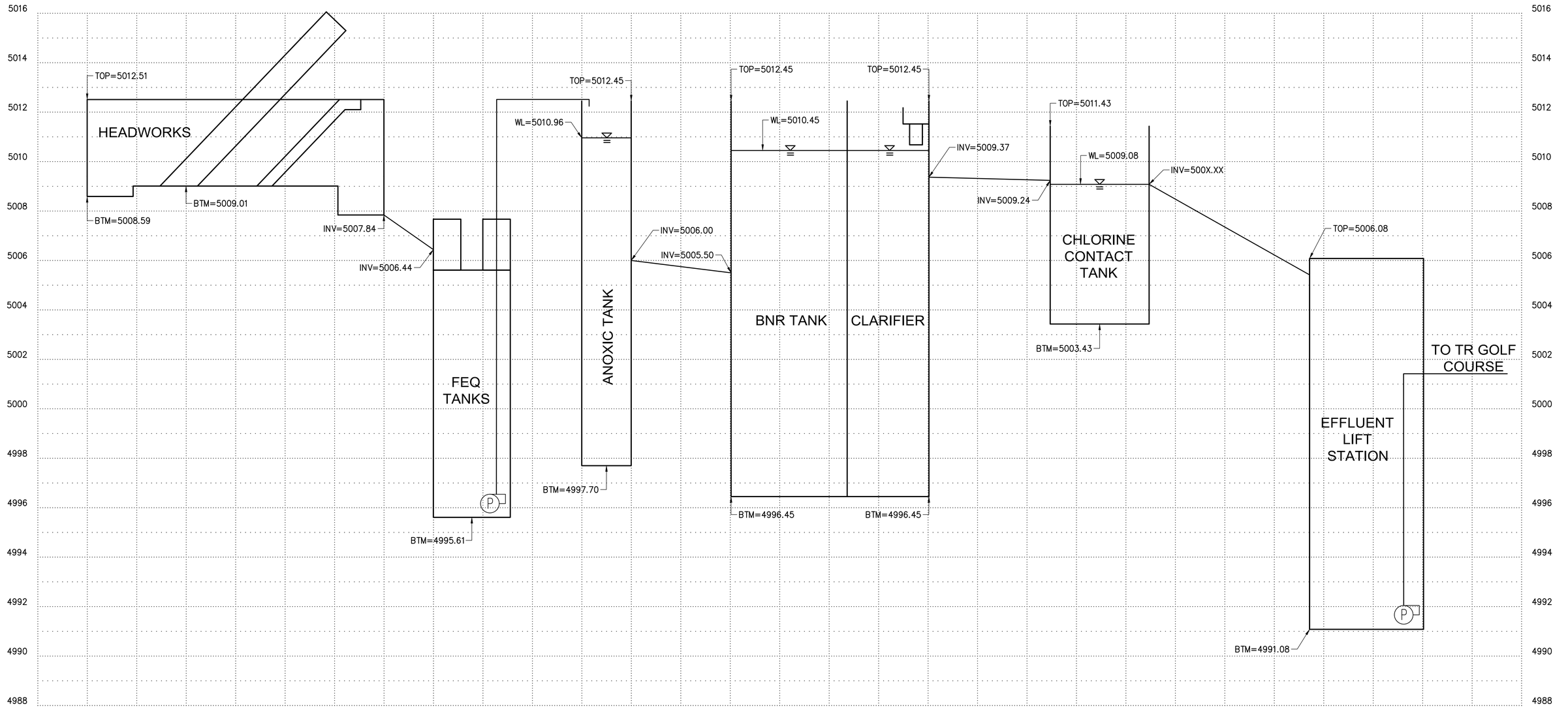

WATER HYDRAULIC PROFILE

SCALE
0 2' 4'
HORIZ: 1" = 2'
VERT: 1" = 2'

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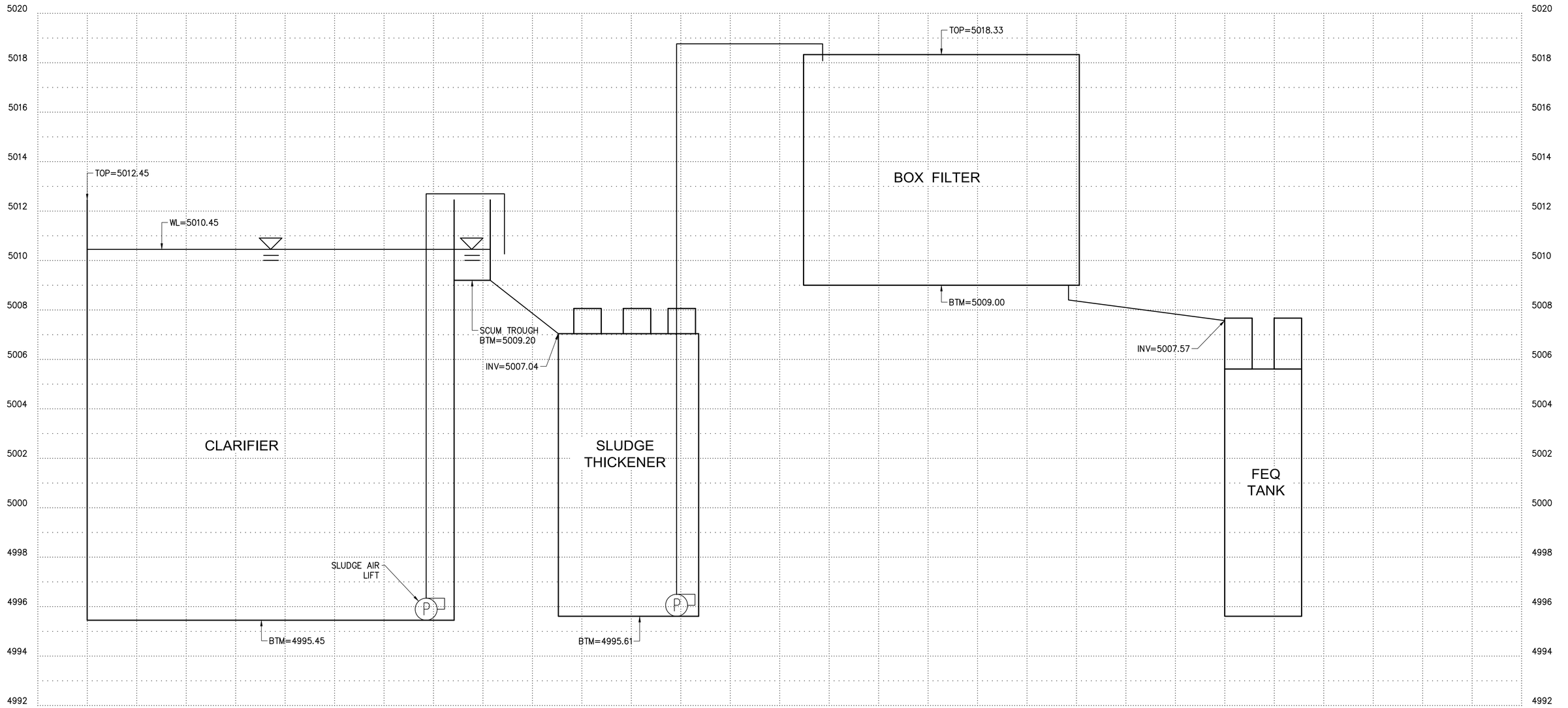
WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
HYDRAULIC PROFILE

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	G7



SLUDGE HYDRAULIC PROFILE

SCALE
0 2' 4'
HORIZ: 1" = 2'
VERT: 1" = 2'

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ICR SANITARY DISTRICT

WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
HYDRAULIC PROFILE

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	G8

30% PLANS

P: \ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\G8.dwg Feb 12, 2018 5:08pm tglock

30% PLANS

N GREY BEARS TRAIL

NORTH

EFFLUENT LIFT STATION

SECTION LINE

EX GEOTUBE

EX GEOTUBE

SLUDGE HOLDING TANK

FLOW EQUALIZATION TANK

EXISTING VALVE PROTECT IN PLACE

DENITRIFICATION TANK

FLOW EQUALIZATION TANK

LIFT STATION (NOT IN USE)

FLOW METER

CHLORINE CONTACT TANK

CLARIFIER TANK

AERATION TANK#2

PAL

DECANT STATION

AERATION TANK#1

SLUDGE HOLDING TANK

SBR TANK#1

SBR TANK#2

MFL

EXISTING WATER DEPARTMENT BUILDING

SBR LIFT STATION

AERATION TANK#1

EXISTING TRANSFORMER PROTECT IN PLACE

EXISTING STANDBY GENERATOR

EXISTING WASTEWATER TREATMENT BUILDING

EXISTING TREE PROTECT IN PLACE

(2) 36" SD

(2) 36" SD

(2) 36" SD

125' POWER LINE EASEMENT BOOK 192 DEEDS PAGE 213

20' UTILITY EASEMENT

SCALE 0 30' 60'

HORIZ: 1" = 30'

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REV NO.	COMMENT	DATE

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WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
EXISTING SITE PLAN

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	C1

P: \ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\C1.dwg Feb 12, 2018 5:14pm tglock

30% PLANS

DEMO NOTES

1. REMOVE LIFT STATION AND VAULT DOWN TO 5' BELOW GRADE. FILL REMAINDER WITH 1 SACK SLURRY, GRADE TO PROPOSED SURFACE. REMOVE CONTROL PANEL AND ELECTRICAL WIRING BELOW GRADE.
2. ABANDON IN PLACE ONCE EXISTING PLANT IS SHUT DOWN.
3. GEOTUBE REMOVAL MUST BE COORDINATED WITH THE PLANT OPERATOR TO ENSURE SLUDGE WASTING IS NOT REQUIRED BEFORE NEW GEOTUBES ARE ON LINE.

GENERAL NOTES

1. CARE SHALL BE TAKEN WHEN EXCAVATING. ALL UTILITIES MAY NOT BE SHOWN ON THE PLANS. IT IS THE CONTRACTORS RESPONSIBILITY TO POT HOLE AND FIELD LOCATE UTILITIES IN THE AREA OF CONSTRUCTION.

N GREY BEARS TRAIL
25' R/W
10' EX EP
25' R/W
21' EX UGE
17' EX UGE
12' EX W
10' EX W
10' EX EP
4' EX S
SECTION LINE
EX GEOTUBE
EX GEOTUBE
SEE DRAWING C4
ENLARGED DEMO PLAN 2
SLUDGE HOLDING TANK
FLOW EQUALIZATION TANK PROTECT IN PLACE
FLOW EQUALIZATION TANK PROTECT IN PLACE
DENITRIFICATION TANK
CLARIFIER TANK
CHLORINE CONTACT TANK
(2) 36" SD
FLOW METER
AERATION TANK#2
AERATION TANK#1
EXISTING WATER DEPARTMENT BUILDING
(2) 36" SD
EXISTING TRANSFORMER PROTECT IN PLACE
EXISTING STANDBY GENERATOR
(2) 36" SD
125' POWER LINE EASEMENT BOOK 192 DEEDS PAGE 213
20' UTILITY EASEMENT
WHISPERING CANYON LIFT STATION AND VAULT PROTECT IN PLACE
SEE DRAWING C3
ENLARGED DEMO PLAN 1
EXISTING TREE PROTECT IN PLACE

SCALE
0 30' 60'
HORIZ: 1" = 30'

811 Know what's below. Call before you dig. 1-800-782-5348

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WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
DEMOLITION PLAN

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	C2

P:\CIKSD\05609 ww1p upgrade\Dwg\Sheets\Phase II\C2.dwg Feb 12, 2018 5:14pm tglock

30% PLANS

DEMO NOTES

1. DEMO/REMOVE CONTROL PANEL. CONTRACTOR TO SALVAGE CONTROL PANELS AND PROVIDE TO OWNER. REMOVE CONDUIT UP TO 3' BELOW THE SURFACE.
2. REMOVE PIPING AS REQUIRED TO INSTALL NEW PIPING
3. CLEAR AND GRUB
4. REMOVE ALL NON-CONCRETE ITEMS FROM THE INSIDE OF BASIN. THIS INCLUDES, BUT IS NOT LIMITED TO, VALUING PIPING, PIPE SUPPORTS, ANCHORING SYSTEMS, PUMPS, HOSES, AERATOR, AND EQUIPMENT. PIPING SHALL BE REMOVED 2 FEET FROM THE OUTSIDE OF THE BASIN AND CAPPED.
5. REMOVE CONCRETE FILLET
6. REMOVE PIPING AND SALVAGE BLOWER. PROVIDE BLOWER TO OWNER
7. ABANDON PIPING IN PLACE

GENERAL NOTES

1. ALL EXISTING RAILING FOR CONCRETE STRUCTURES SHALL BE PROTECTED IN PLACE.
2. CARE SHALL BE TAKEN WHEN EXCAVATING. ALL UTILITIES MAY NOT BE SHOWN ON THE PLANS. IT IS THE CONTRACTORS RESPONSIBILITY TO POT HOLE AND FIELD LOCATE UTILITIES IN THE AREA OF CONSTRUCTION.

EXISTING RAILING PROTECT IN PLACE

COPPER LINE ABANDON IN PLACE

PANEL PROTECT IN PLACE

EXISTING LIFT STATION PROTECT IN PLACE

EXISTING RAILING PROTECT IN PLACE

5008

5010

5006

5004

SCALE 0 5' 10'

HORIZ: 1" = 5'

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WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
ENLARGED DEMO PLAN

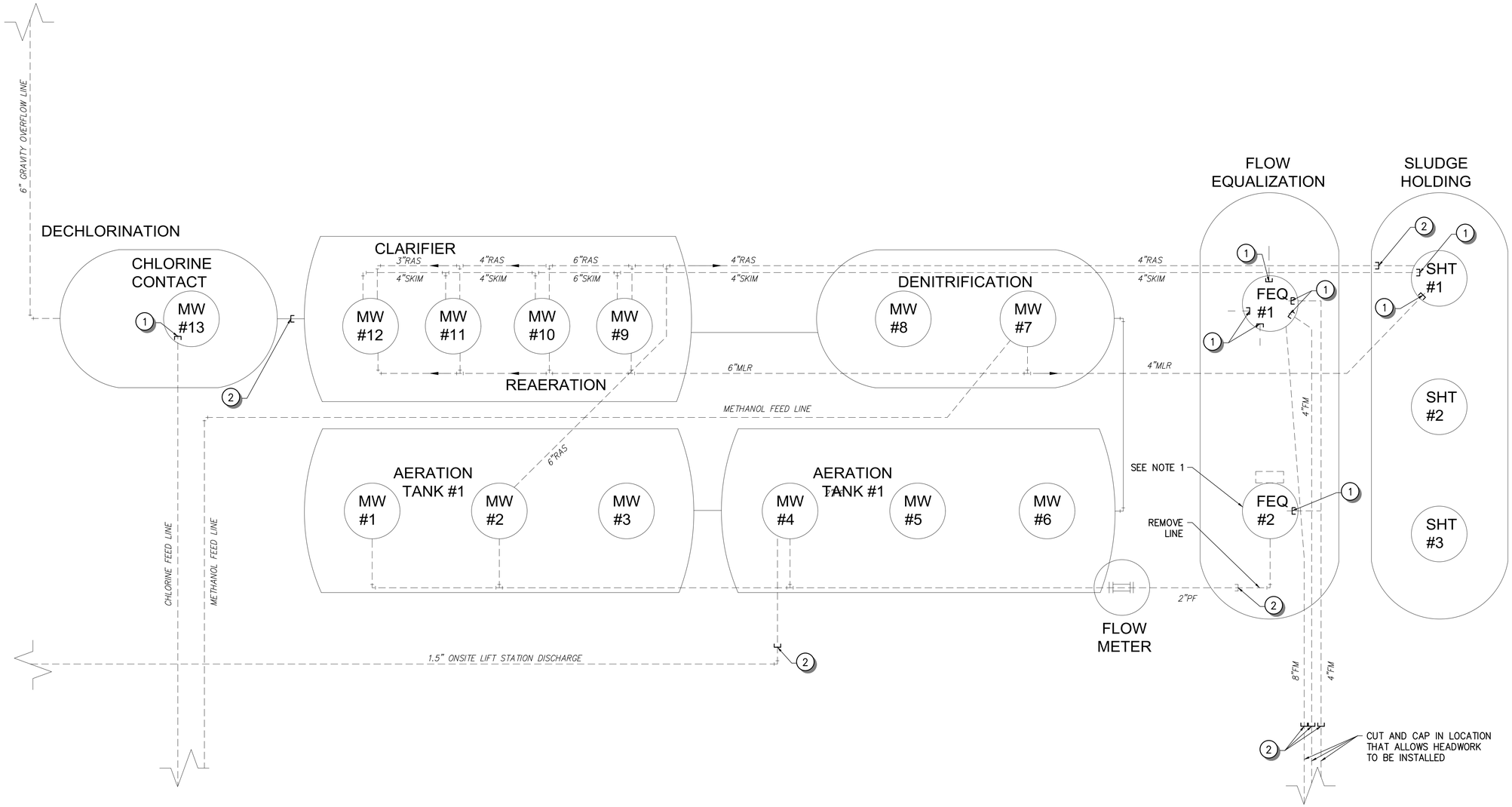
SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	C3

P:\ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\C3.dwg Feb 12, 2018 5:14pm tglock

30% PLANS

ABBREVIATIONS

RAS	RETURN ACTIVATED SLUDGE LINE
SKIM	SKIMMER WASTE LINE
MLR	MIXED LIQUOR RETURN LINE
PF	PROCESS FEED LINE
FM	FORCE MAIN



DEMO NOTES

1. CUT TO PAST WALL AND CAP. VERIFY ALL LINES WITH OPERATOR PRIOR TO CUTTING
2. CUT AND CAP LINE
3. REMOVE AND SALVAGE EXISTING GRAVEL
4. CLEAR AND GRUB AREA PER SPECIFICATION 02015

GENERAL NOTES

1. CONTRACTOR TO REMOVE PUMPS, GUARDRAIL, PIPING, AND ALL APPURTENANCES ASSOCIATED WITH THE FEQ TANK PUMPS. DIFFUSER EQUIPMENT TO BE PROTECTED IN PLACE.

REV NO.	COMMENT	DATE

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WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
ENLARGE DEMO PLAN II

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	C4

P:\ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\C4.dwg Feb 12, 2018 5:14pm tglock

30% PLANS

N GREY BEARS TRAIL

NORTH

EFFLUENT LIFT STATION

SECTION LINE

SEE DRAWING C6
ENLARGED SITE PLAN

EXISTING FLOW EQUALIZATION TANK

EXISTING FLOW EQUALIZATION TANK

EXISTING SLUDGE HOLDING TANK

LIFT STATION (NOT IN USE)

CHLORINE CONTACT TANK

(2) 36" SD

EXISTING WATER DEPARTMENT BUILDING

EXISTING WASTEWATER TREATMENT BUILDING

125' POWER LINE EASEMENT BOOK 192 DEEDS PAGE 213

20' UTILITY EASEMENT

SCALE
0 30' 60'
HORIZ: 1" = 30'

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WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
PROPOSED SITE PLAN

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.
05609	TG	JC	TG	X of XX

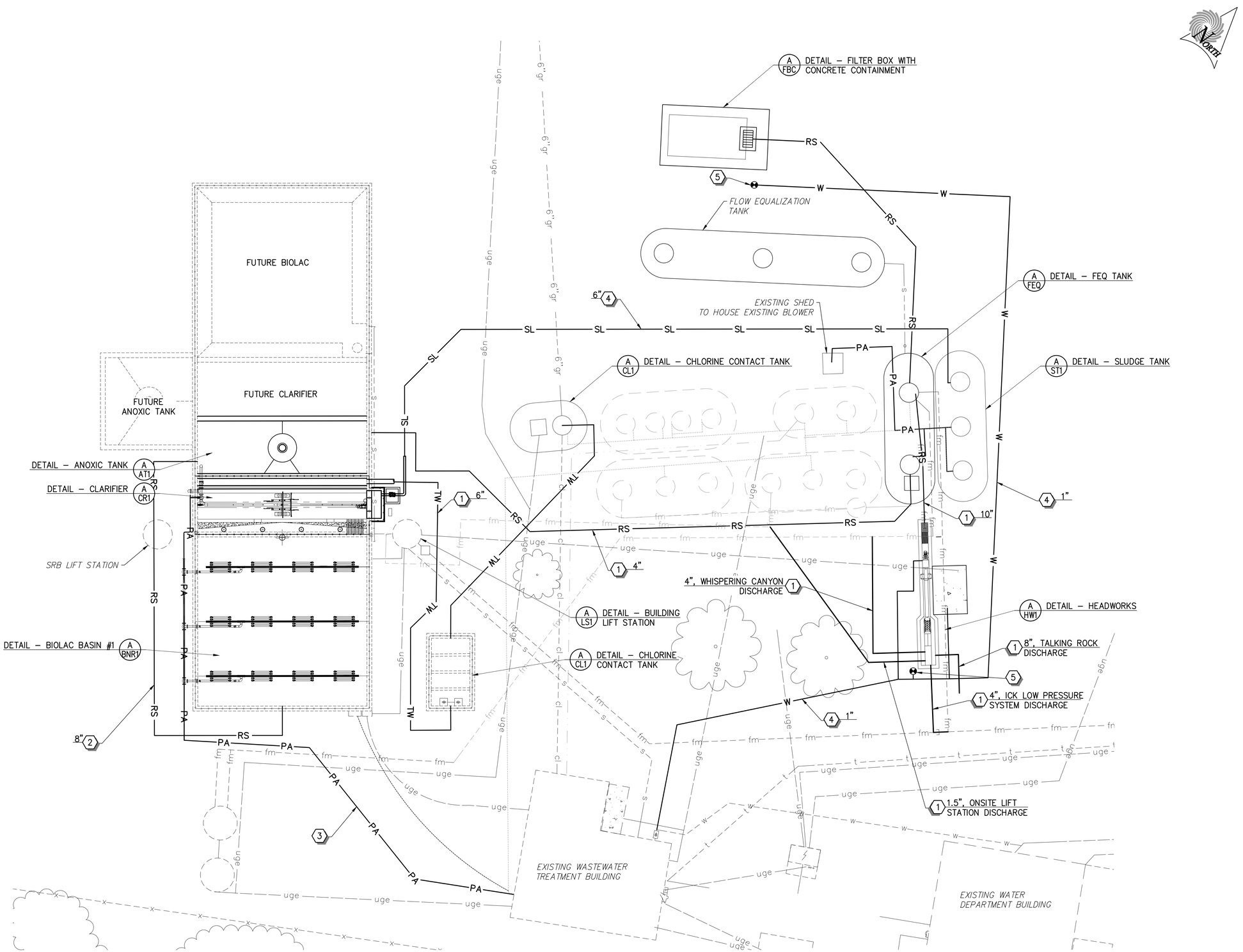
C5

P:\ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\C5.dwg Feb 12, 2018 5:14pm tglock

30% PLANS

CONSTRUCTION NOTES

1. C900/HDPE, SIZE PER PLAN
2. DIP, SIZE PER PLAN
3. AIR LINE, SIZE AND MATERIAL TBD
4. SCH 80 PVC, SIZE PER PLAN
5. HYDRANT



SCALE
0 10' 20'
HORIZ: 1" = 10'

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WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
ENLARGED SITE DETAIL

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	C6

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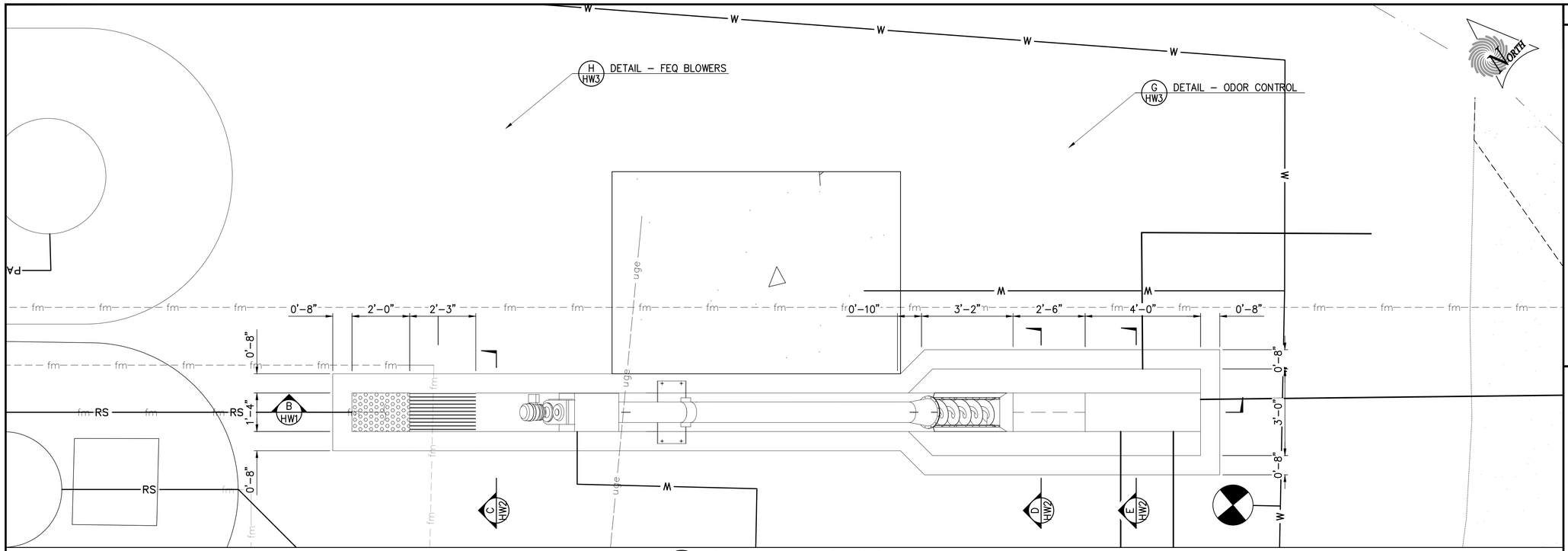
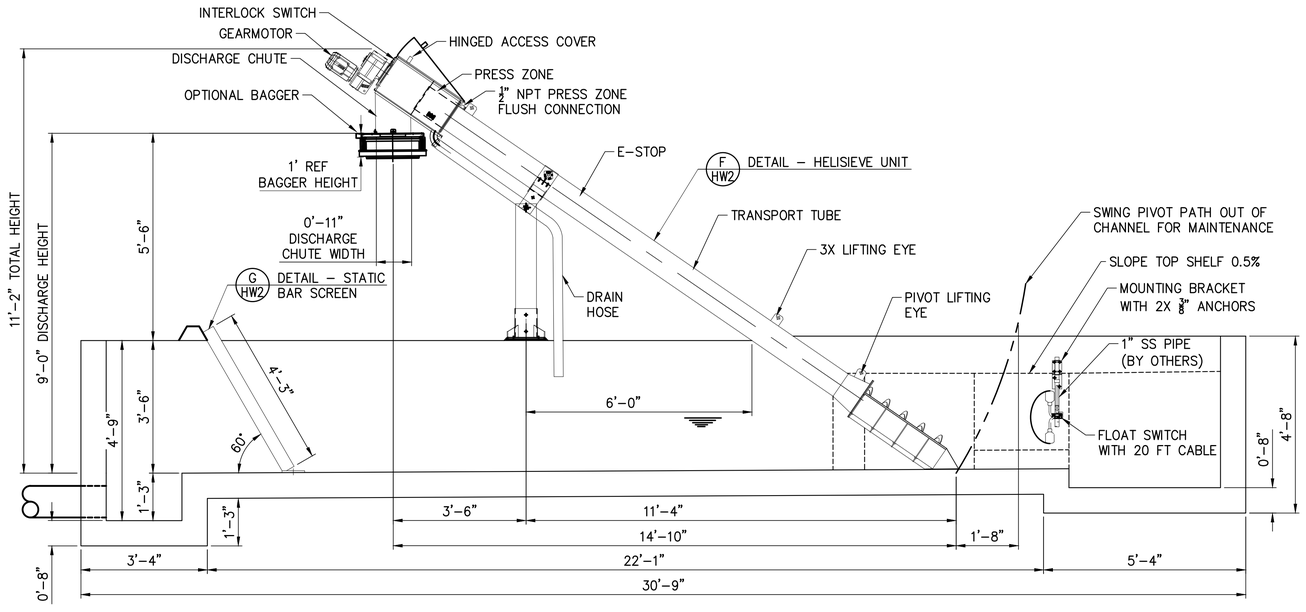


A C3 **DETAIL - HEADWORKS**
SCALE: 1" = 2'



B HW1 **SECTION- HEADWORKS**
SCALE: 1" = 2'

CONSTRUCTION NOTES

GENERAL NOTES

1. ALL 316 STAINLESS STEEL CONSTRUCTION EXCEPT FOR HIGH STRENGTH CARBON STEEL SPIRAL, SIDE SEALS, FLEXIBLE HOSE, DRAIN HOSE, BRUSH SECTIONS, E–STOP, GEARMOTOR, INTERLOCK SWITCH, AND SOLENOID VALVES.
2. GEARMOTOR: 1 HP, 230/460V, 3 PH, 60 HZ, SEVERE DUTY, 11 RPM OUTPUT.
3. SCREEN OPENING: ø.25" PERFORATED.
4. SCREEN WEIGHT: 1038 LBS
5. PRESS ZONE SPRAY WATER USAGE: 8 GPM @ 40 PSI
6. ELECTRICAL DEVICES:
   A. SOLENOID VALVE: 120V, 60 HZ
   B. E–STOP: 120V, 1PH, 60 HZ
   C. INTERLOCK SWITCH: 120V, 1PH, 60HZ, LEAD TYPE–18/2 X 6' LONG.
7. PROVIDE SUFFICIENT FLEXIBILITY IN WATER AND ELECTRICAL CONNECTIONS TO ALLOW THE SCREEN BASKET TO PIVOT OUT OF CHANNEL FOR MAINTENANCE.
8. LIFTING CAPACITY FOR PIVOT LIFTING EYE SHALL BE EQUAL TO THE UNIT WEIGHT.

30% PLANS

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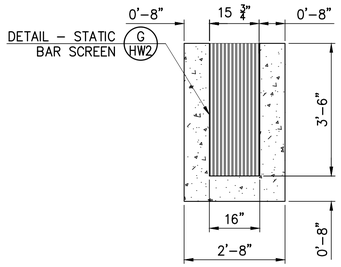
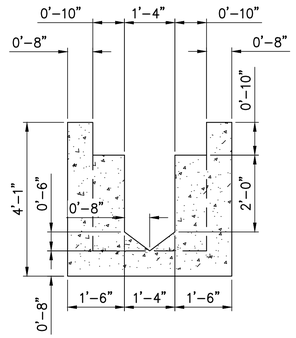
WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
HEADWORKS PLAN

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	HW1

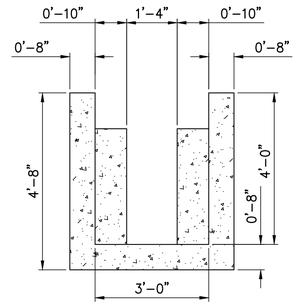
P:\ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\HW1.dwg Feb 12, 2018 5:17pm tglock



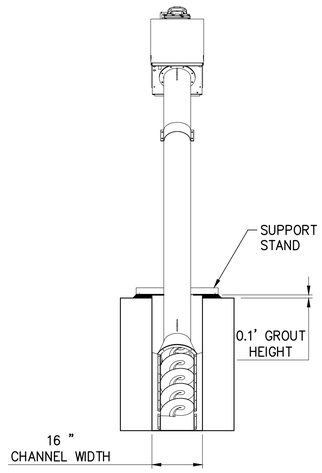
C HW1 SECTION - HEADWORKS
SCALE: 1" = 2'



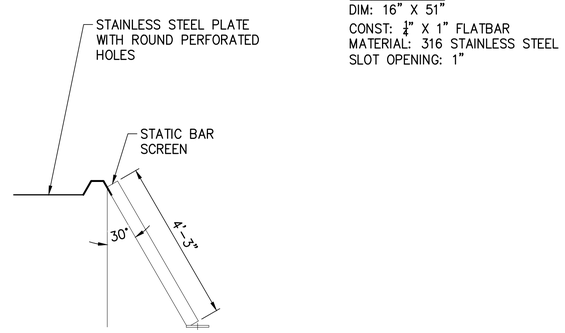
D HW1 SECTION - HEADWORKS
SCALE: 1" = 2'



E HW1 SECTION - HEADWORKS
SCALE: 1" = 2'



F HW1 DETAIL - HELISIEVE UNIT
SCALE: 1" = 2'



SCREEN PANEL
DIM: 16" X 51"
CONST: ¼" X 1" FLATBAR
MATERIAL: 316 STAINLESS STEEL
SLOT OPENING: 1"

G HW1 DETAIL - STATIC BAR SCREEN
SCALE: 1" = 2'

CONSTRUCTION NOTES

GENERAL NOTES

30% PLANS

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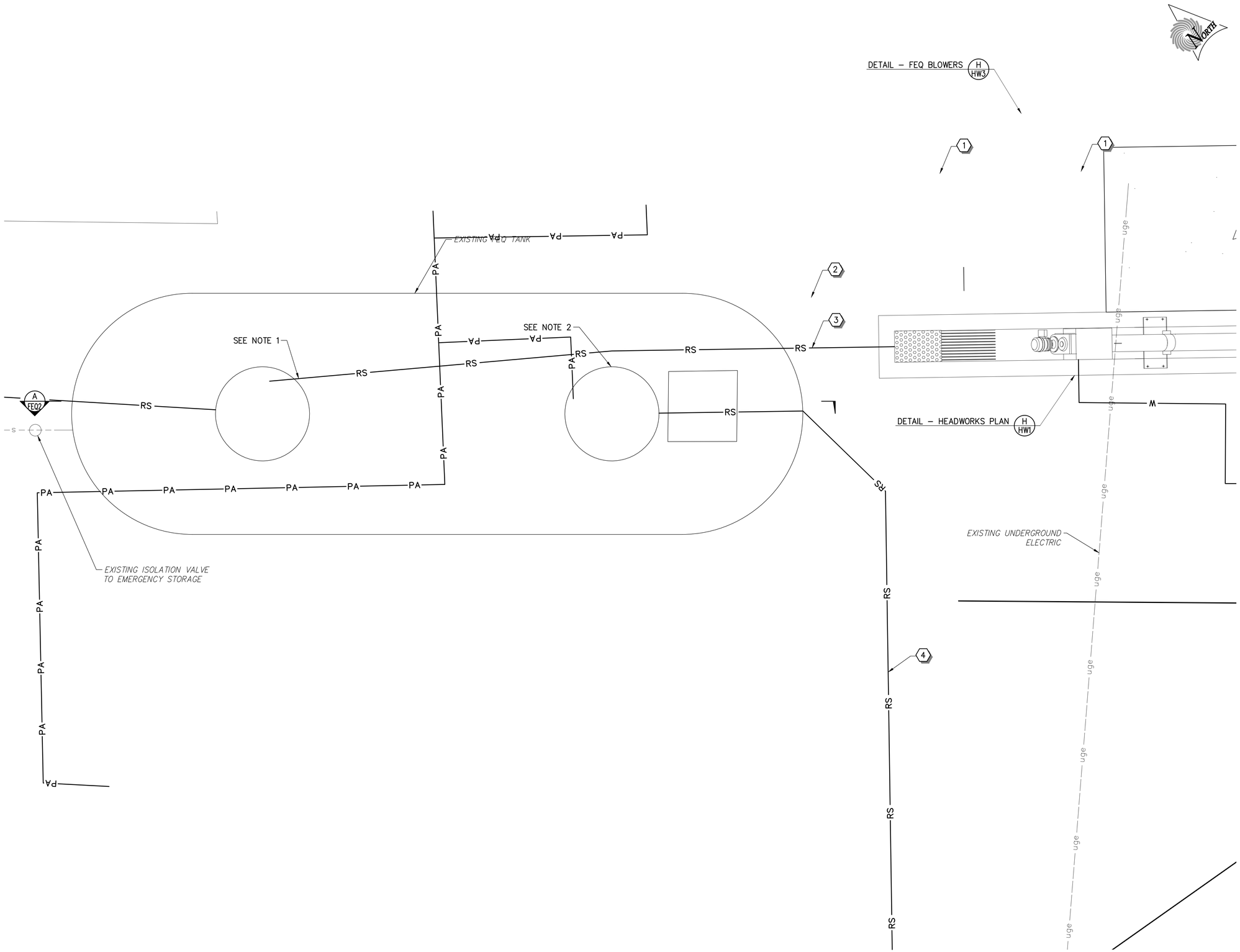
WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
HEADWORKS PLAN VIEW

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	HW2

P:\ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\HW2.dwg Feb 12, 2018 5:17pm tglock

30% PLANS



CONSTRUCTION NOTES

1. BLOWER
2. AIR PIPING
3. 10" C900 OR HDPE PIPE
4. 4" C900 OR HDPE PIPE

GENERAL NOTES

1. CONTRACTOR TO CUT EXISTING PIPING RIGHT OUTSIDE OF FEQ TANK AND INSTALL 8" X 10" REDUCER AND NEW 10" PIPING.
2. CONTRACTOR TO CONNECT AIR PIPING TO EXISTING DIFFUSER PIPING.

SCALE
0 2' 4'
HORIZ: 1" = 2'

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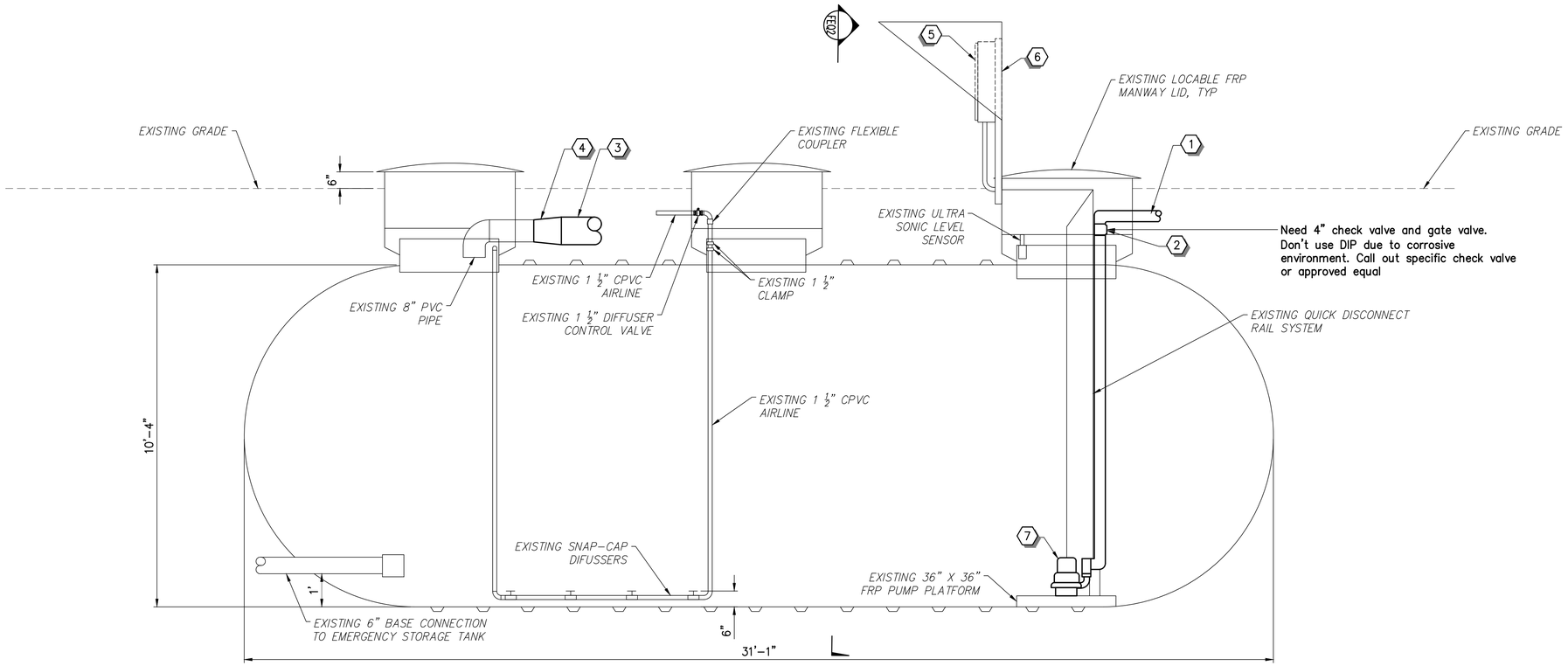
WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
FEQ TANK PLAN

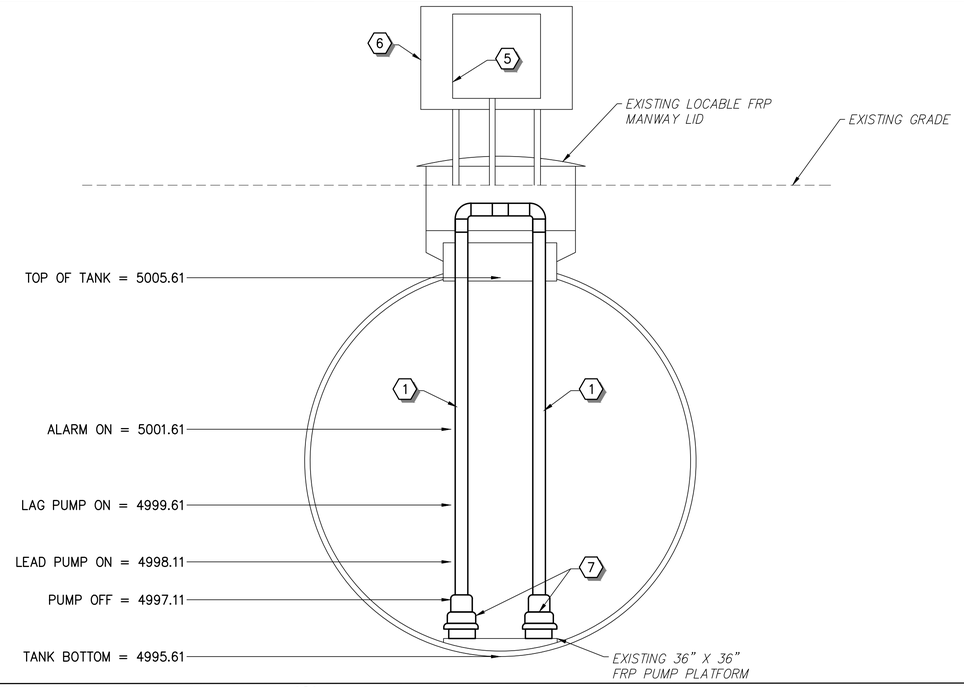
SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	FEQ1

P:\ICRSD\05609 ww\tp upgrade\Dwg\Sheets\Phase II\FEQ1.dwg Feb 12, 2018 5:21pm tglock



A HW2 **SECTION - FEQ TANK SECTION VIEW**

NOT TO SCALE



NOTE:
PUMP GUIDE RAIL SYSTEM OMITTED FOR CLARITY

B HW2 **SECTION - FEQ TANK SECTION VIEW**

NOT TO SCALE

CONSTRUCTION NOTES

1. 4" C900 OR HDPE PIPE
2. 4" PVC CHECK VALVE
3. 10 C900 OR HDPE PIPE
4. 8" X 10" REDUCER
5. CONTROL PANEL
6. SHADE CANOPY
7. PUMPS

GENERAL NOTES

30% PLANS

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WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
FEQ TANK SECTION VIEW

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	FEQ2

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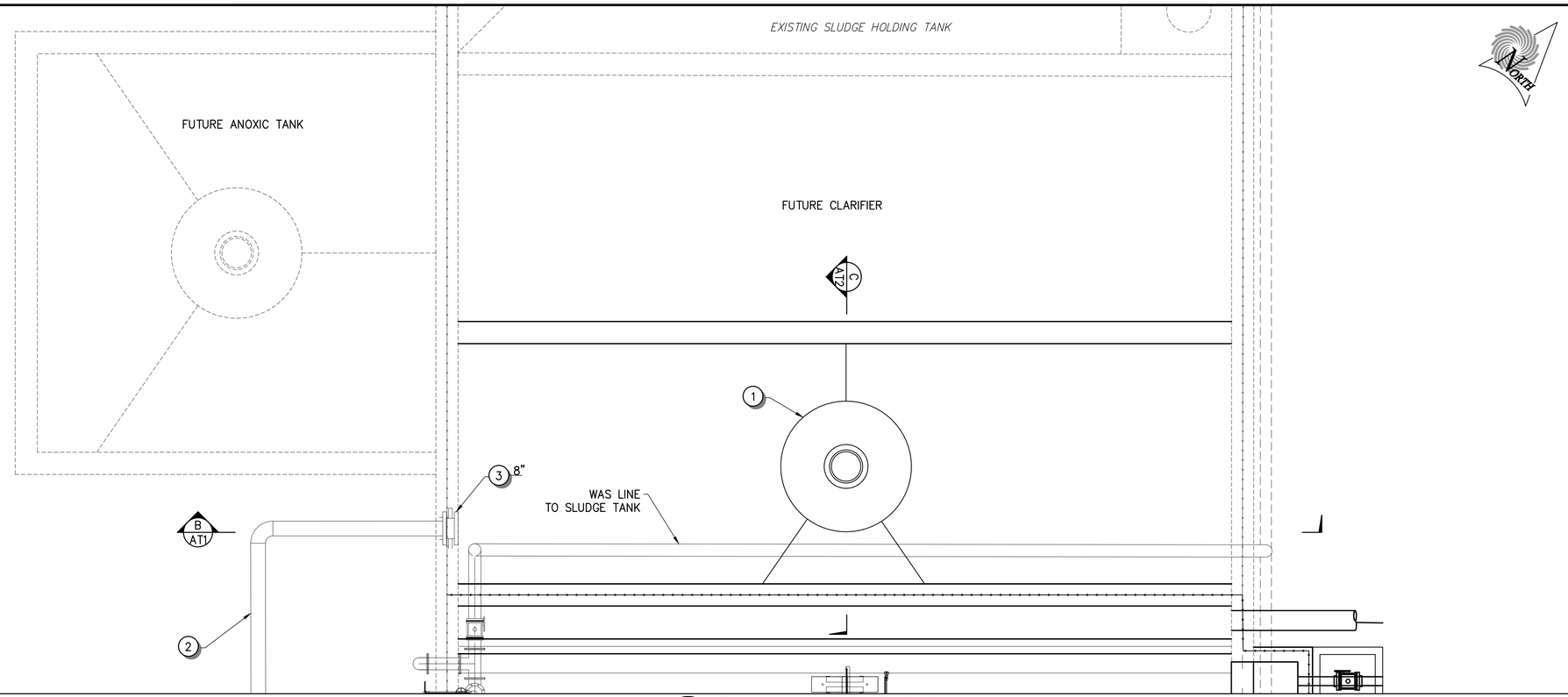
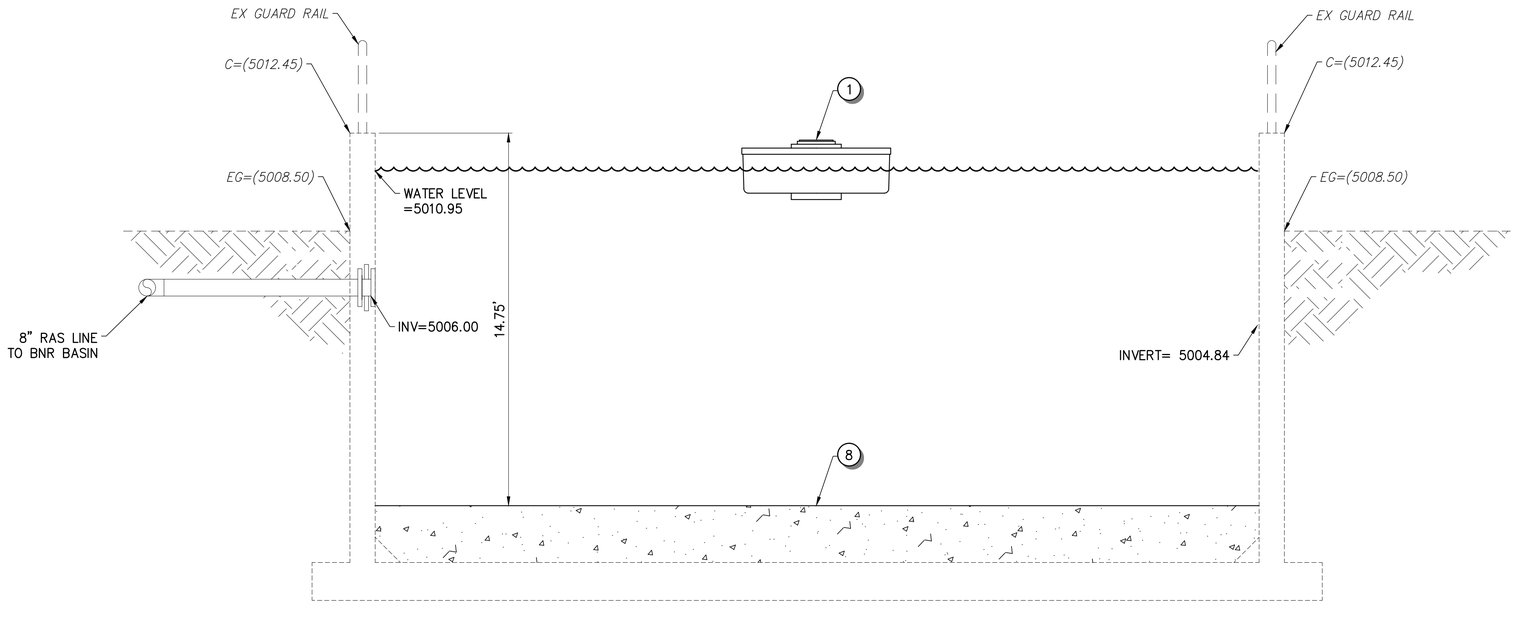


A PLAN - ANOXIC TANK

SCALE: 1" = 3'



B SECTION - ANOXIC TANK

SCALE: 1" = 3'

CONSTRUCTION NOTES

1. ANOXIC MIXER (BY PARKSON)
2. 8" DIP PIPE
3. WEEP RING PER DETAIL ____, SHEET _____ SIZE PER PLAN
4. 4" DIP PIPE
5. 6" DIP PIPE
6. 4" DIP PLUG VALVE WITH VALVE BOX ACCORDING TO MAG STD DTL 391-1
7. 4" DIP ELBOW
8. 1.25' OF GROUT PER SPEC _____
9. HANDRAIL PER DWG _____, DETAIL _____

GENERAL NOTES

30% PLANS

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WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
ANOXIC TANK PLAN VIEW

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	AT1

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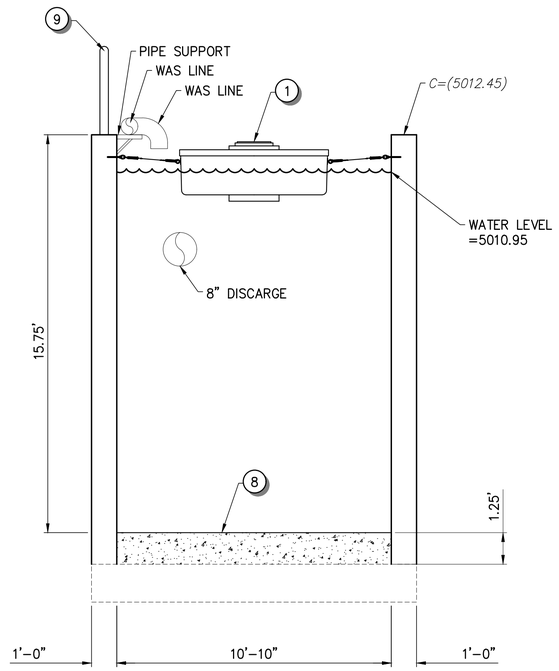
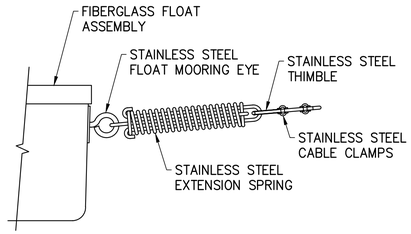
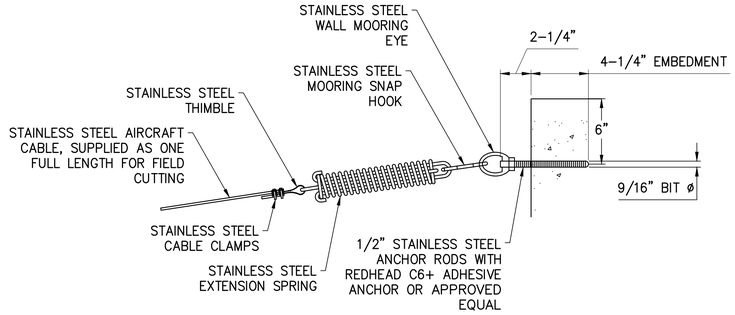


C ~ SECTION - ANOXIC TANK
SCALE: 1" = 2'



D ~ DETAIL - MOORING ANCHORING (MIXER)
SCALE: 1" = 2'



Design Load on Bolt (lbs)	Bolt Rated Capacity @ a 45° (lbs)	Epoxy Rated Capcity (lbs)
432	600	17,684

E ~ DETAIL - MOORING ANCHORING (WALL)
SCALE: 1" = 2'

CONSTRUCTION NOTES

1. ANOXIC MIXER (BY PARKSON)
2. 12" DIP PIPE
3. WEEP RING PER DETAIL ____, SHEET _____ SIZE PER PLAN
4. 4" DIP PIPE
5. 6" DIP PIPE
6. 4" DIP PLUG VALVE WITH VALVE BOX ACCORDING TO MAG STD DTL 391–1
7. 4" DIP ELBOW
8. 1.25' OF GROUT PER SPEC _____
9. HANDRAIL PER DWG _____, DETAIL _____

GENERAL NOTES

30% PLANS

REV NO.	COMMENT	DATE

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MESA, ARIZONA 85210
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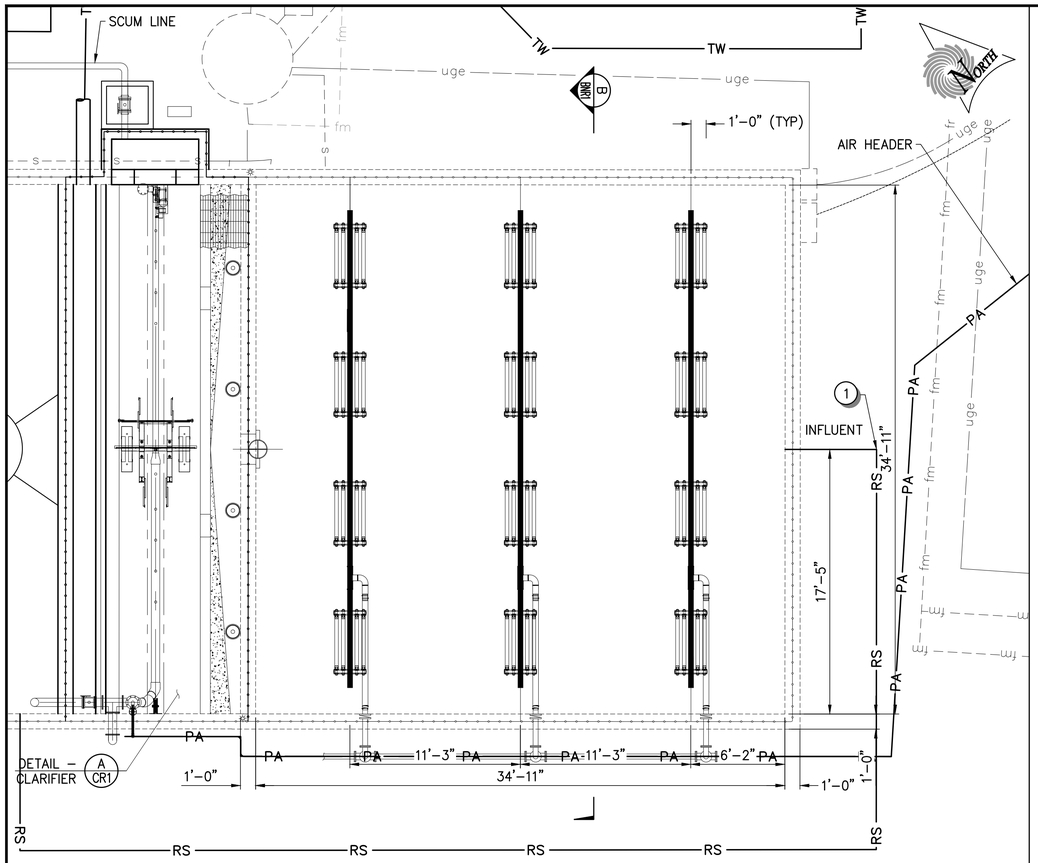
www.sunrise-eng.com

ICR SANITARY DISTRICT

WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
ANOXIC TANK SECTION + DETAILS

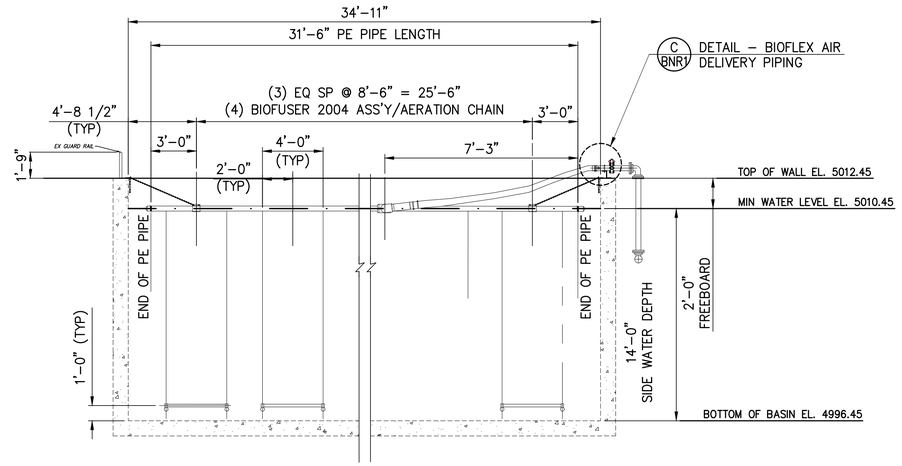
SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	AT2

P:\ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\AT2.dwg Feb 12, 2018 5:24pm tglock



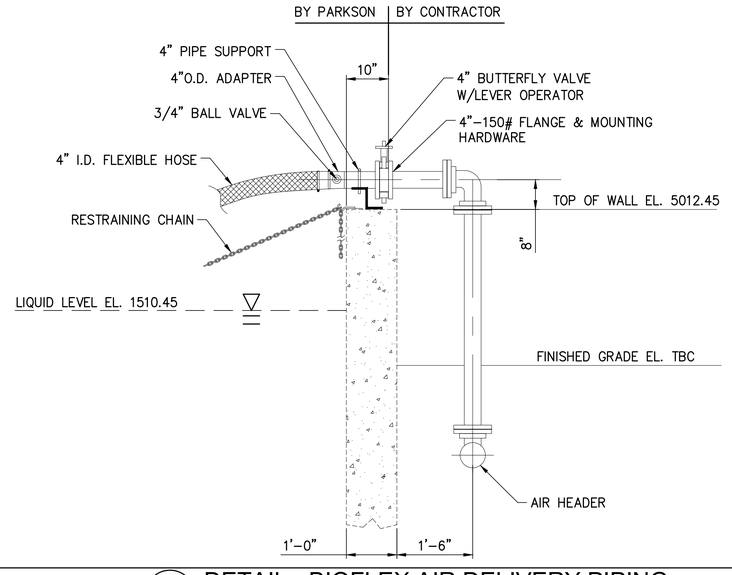
A C3 DETAIL - BIOLAC BASIN #1

SCALE: 1" = 5'



B BNR1 SECTION - BIOLAC BASIN #1

SCALE: 1" = 5'



C BNR1 DETAIL - BIOFLEX AIR DELIVERY PIPING

NTS

CONSTRUCTION NOTES

1. 8" DIP LONG RADIUS BEND

GENERAL NOTES

30% PLANS

SCALE
0 5' 10'
HORIZ: 1" = 5'

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WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
BNR TANK PLAN VIEW

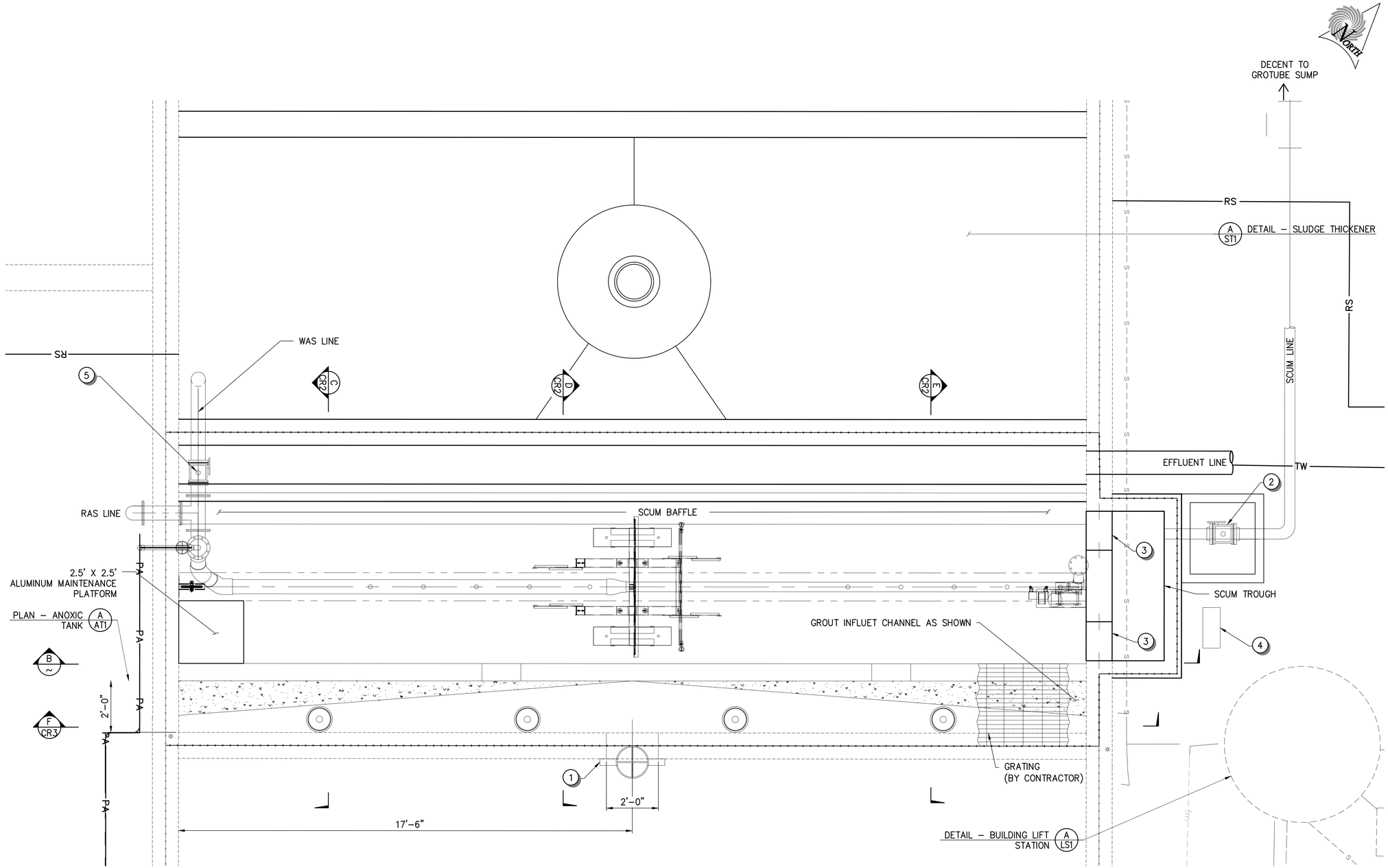
SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	BNR1

P:\ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\BNR1.dwg Feb 12, 2018 5:29pm tglock

30% PLANS

CONSTRUCTION NOTES

1. ALUMINUM INFLUENT SLIDE GATE
2. PLUG VALVE WITH ACTUATOR FOR SCUM REMOVAL (BY PARKSON)
3. SKIMMER SCUM BEACH SUPPLIED BY PARKSON INSTALLED BY CONTRACTOR
4. FLOCC RAKE CONTROL PANEL
5. WAS VALVE WITH ACTUATOR (BY PARKSON)



A ~ PLAN - CLARIFIER
SCALE: 1" = 2'

SCALE
0 5' 10'
HORIZ: 1" = 5'

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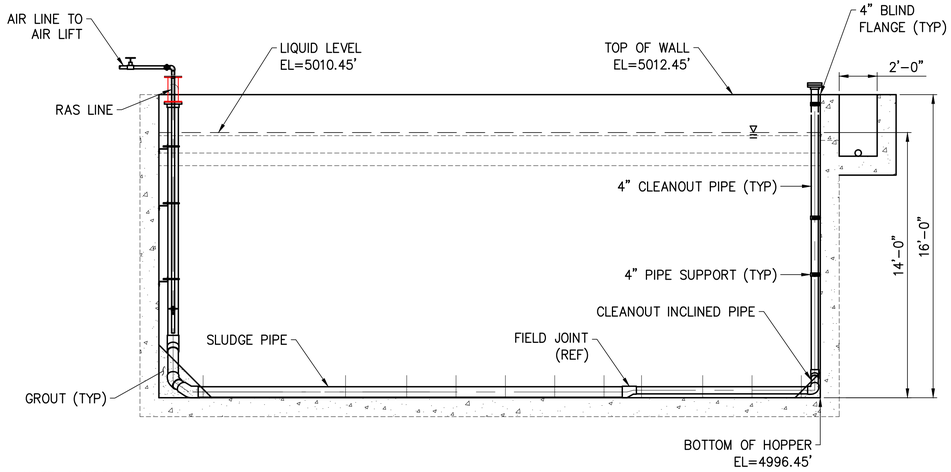
WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
CLARIFIER PLAN VIEW & SECTION

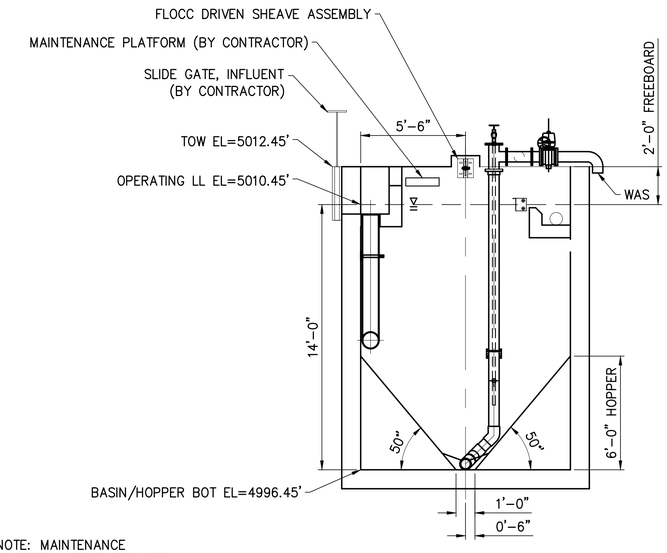
SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	CR1

P:\ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\CR1.dwg Feb 12, 2018 5:34pm tglock



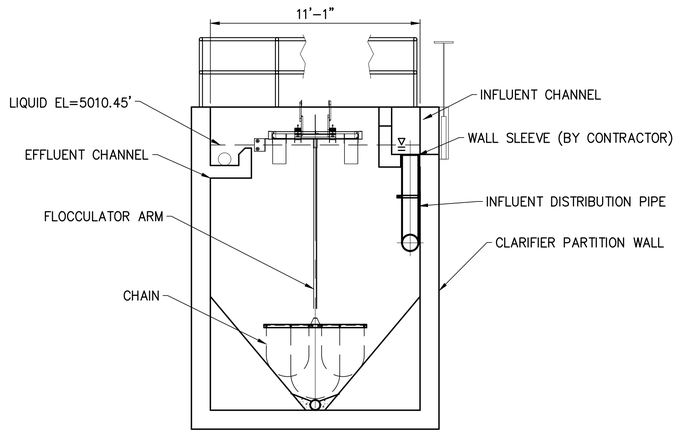
NOTE: HANDRAILS, PLATFORMS, SKIMMER, AND WEIR OMITTED FOR CLARITY

B ~ DETAIL - CLARIFIER (ELEVATION)
SCALE: 1" = 4'



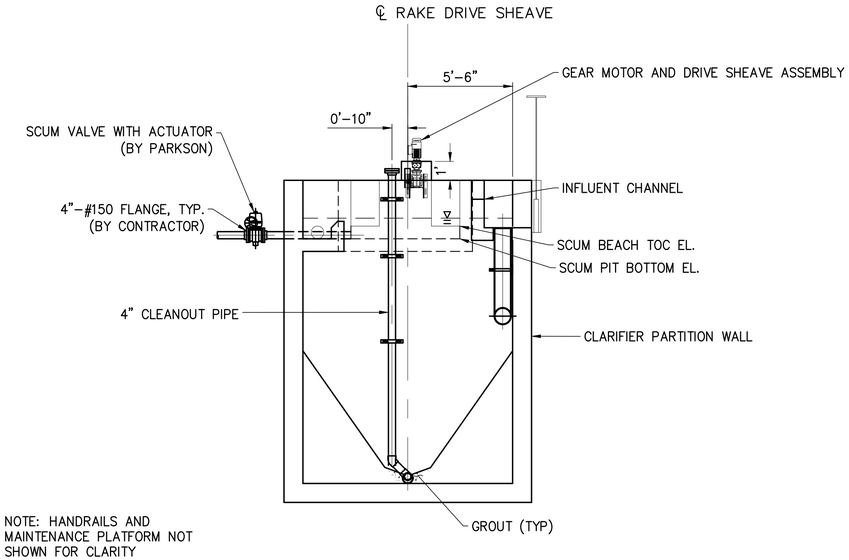
NOTE: MAINTENANCE PLATFORM NOT SHOWN FOR CLARITY

C ~ DETAIL - CLARIFIER
SCALE: 1" = 4'



NOTE: MAINTENANCE PLATFORM NOT SHOWN FOR CLARITY

D ~ DETAIL - CLARIFIER
SCALE: 1" = 4'



NOTE: HANDRAILS AND MAINTENANCE PLATFORM NOT SHOWN FOR CLARITY

E ~ DETAIL - CLARIFIER
SCALE: 1" = 4'

30% PLANS

SCALE
0 5' 10'
HORIZ: 1" = 5'

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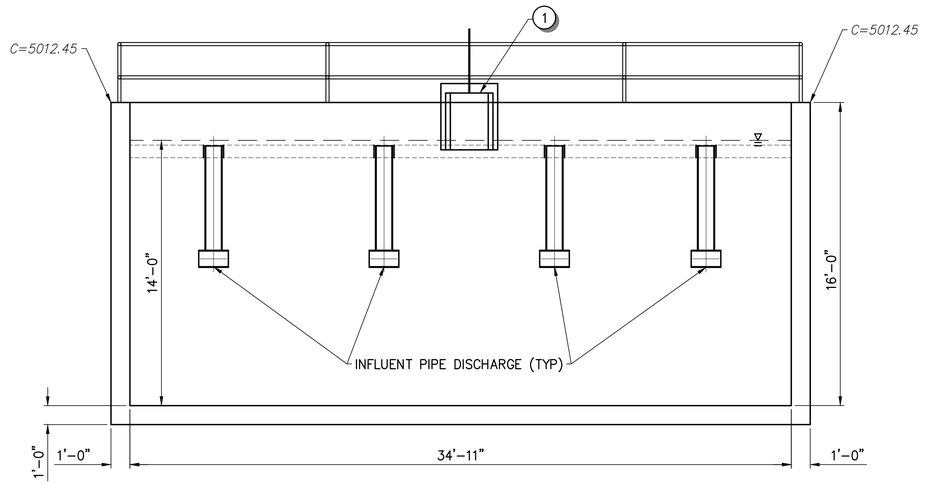
WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
CLARIFIER SECTION VIEW

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	CR2

P:\ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\CR2.dwg Feb 12, 2018 5:34pm tglock



NOTE: PLATFORMS OMITTED FOR CLARITY

F ~ SECTION - CLARIFIER
SCALE: 1" = 4'

CONSTRUCTION NOTES

1. ALUMINUM INFLUENT SLIDE GATE

GENERAL NOTES

30% PLANS

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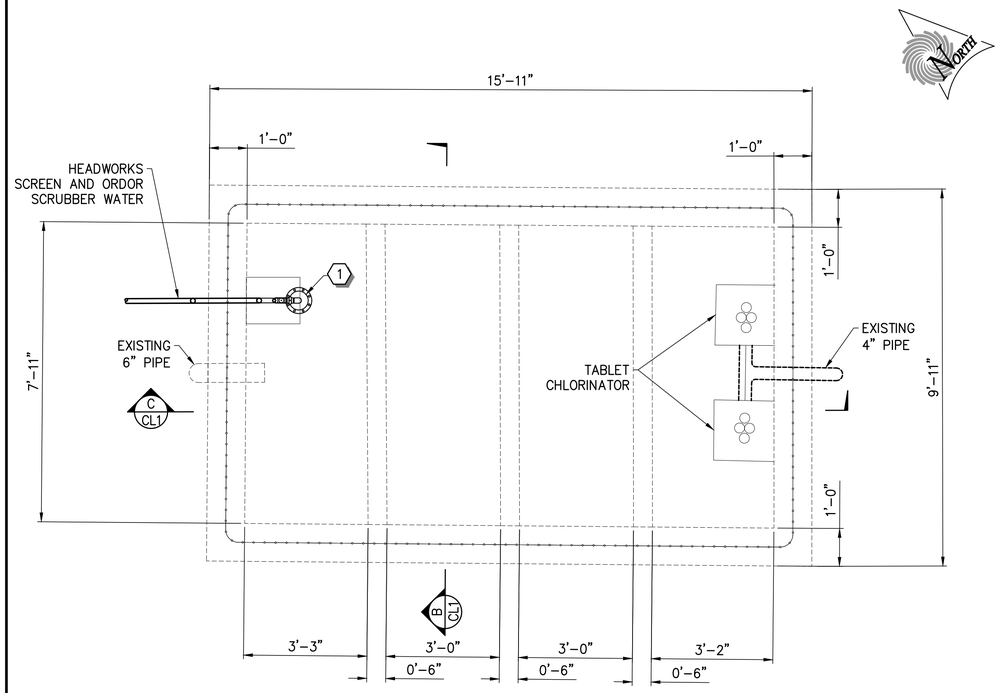
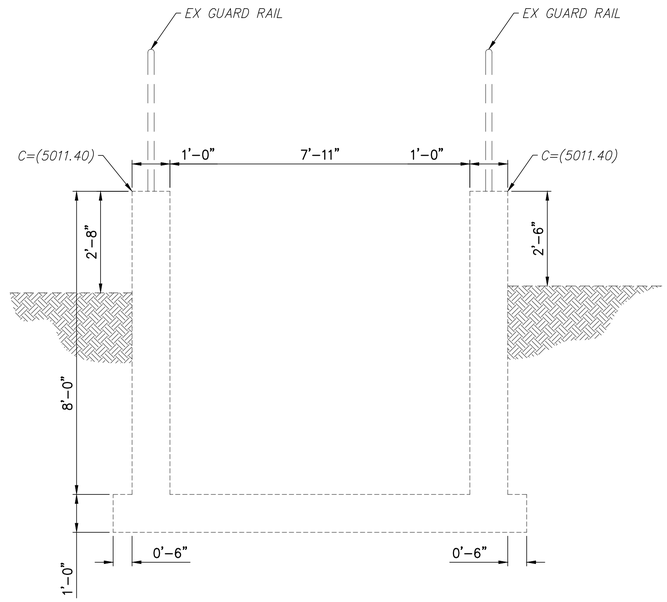
WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
CLARIFIER DETAILS

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	CR3

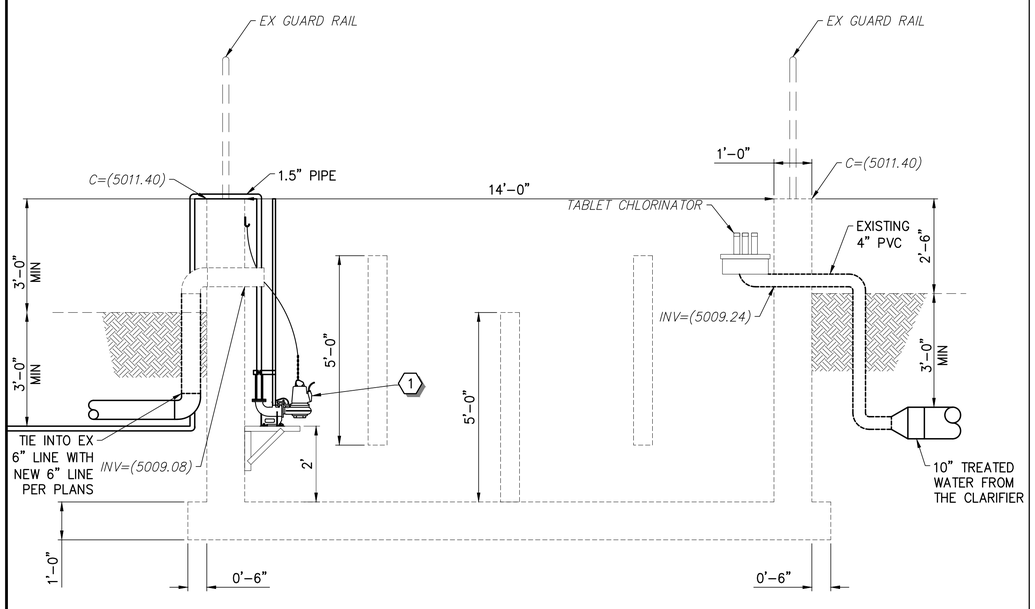
P: \ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\CR3.dwg Feb 12, 2018 5:35pm tglock



A C3 DETAIL - CHLORINE CONTACT BASIN
SCALE: 1" = 2'



B CL1 SECTION - CHLORINE CONTACT BASIN
SCALE: 1" = 2'



C CL1 SECTION - CHLORINE CONTACT BASIN
SCALE: 1" = 2'

CONSTRUCTION NOTES

GENERAL NOTES

1. CONCRETE STRUCTURE DIMENSIONS BASED ON SURVEY INFORMATION AND AS-BUILT'S PROVIDED BY THE DISTRICT.
2. PAINT ABOVE GROUND PVC PIPING WITH UV RESISTANT PAINT PER SPEC. _____
3. CHLORINE CONTACT BASIN AND RAILING ARE EXISTING. PROTECT IN PLACE.

30% PLANS

SCALE
0 5' 10'
HORIZ: 1" = 5'

811 Know what's below. Call before you dig. 1-800-782-5348

REV NO.	COMMENT	DATE

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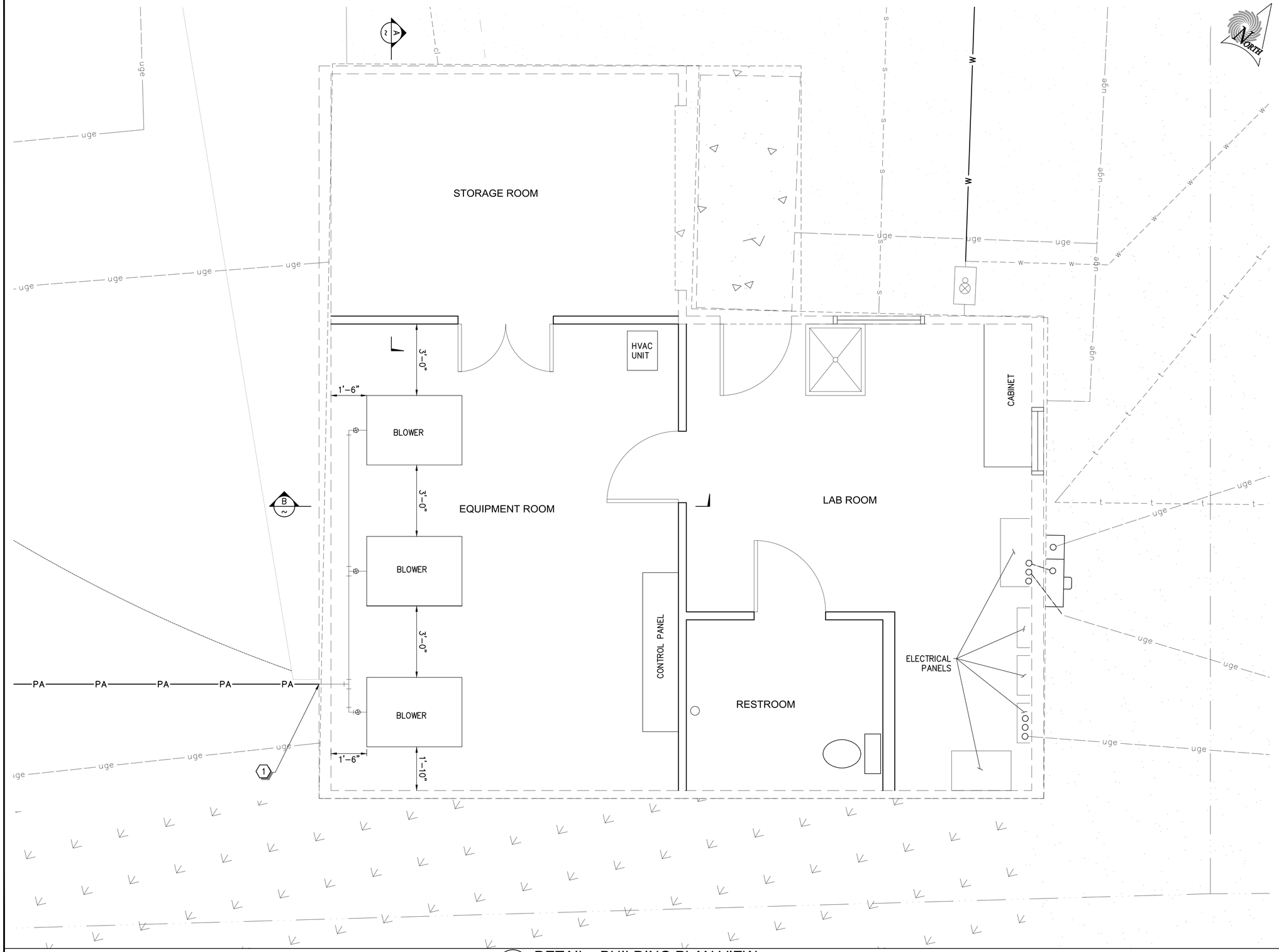
WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
CHLORINE CONTACT TANK PLAN VIEW

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.
05609	TG	JC	TG	X of XX

CL1

P:\ICRSD\05609 wwtp upgrade\Dwg\Sheets\Phase II\CL1.dwg Feb 12, 2018 5:36pm tglock



A BD1 DETAIL - BUILDING PLAN VIEW
SCALE: 1" = 2'

CONSTRUCTION NOTES

GENERAL NOTES

1. CONTRACTOR TO TIE INTO EXISTING 4" AIR LINE AS IT LEAVES BUILLDING

30% PLANS

SCALE
0 5' 10'
HORIZ: 1" = 5'

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ICR SANITARY DISTRICT

WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
PLAN VIEW OF BUILDING

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	BD1

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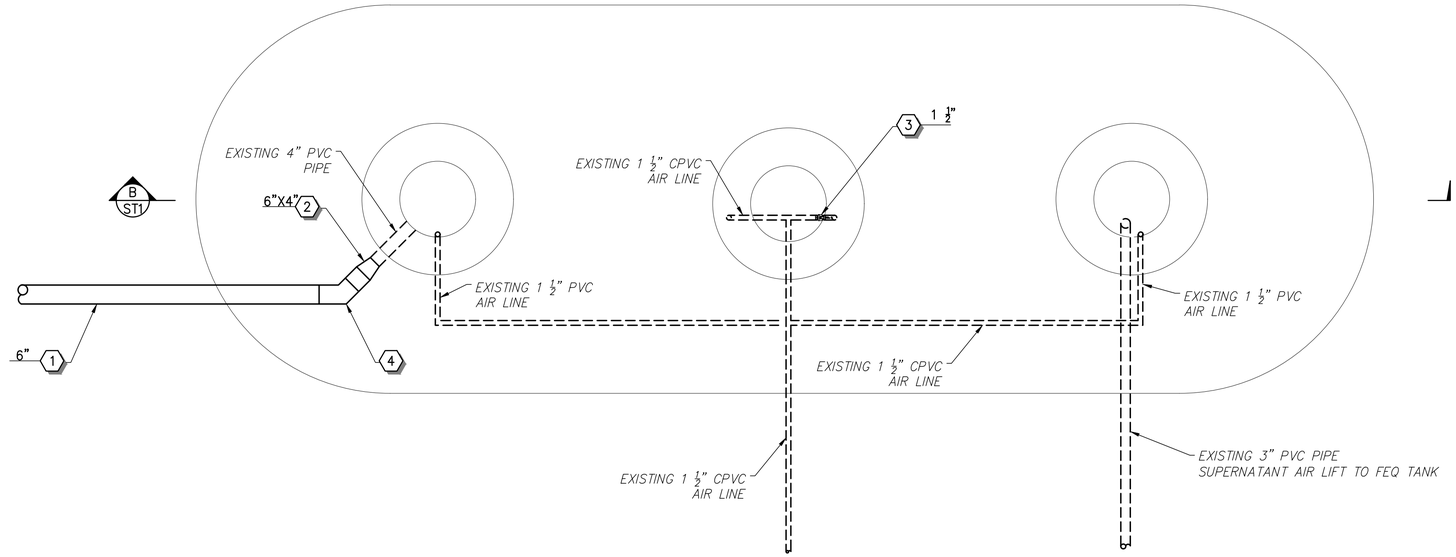
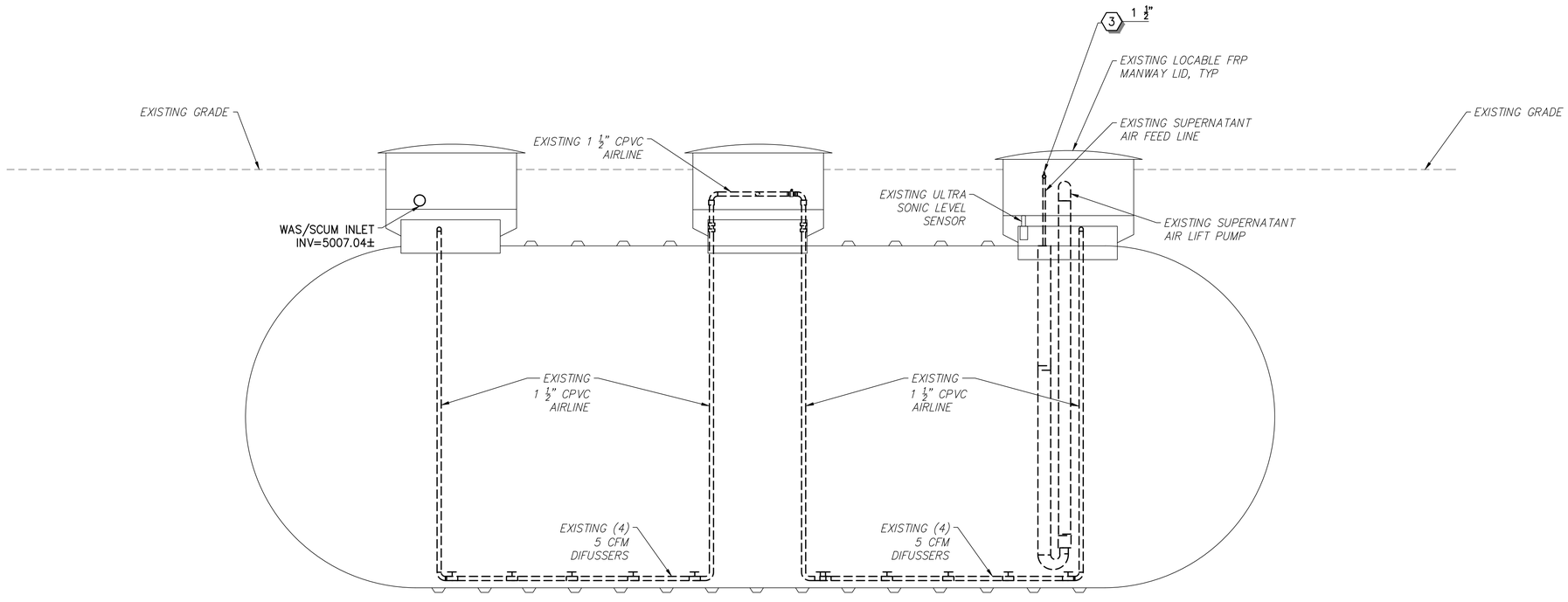


A ST1 DETAIL - SLUDGE TANK
SCALE: 1" = 2'



B ST1 SECTION - SLUDGE TANK
SCALE: 1" = 2'

CONSTRUCTION NOTES

1. C900/HDPE, SIZE PER PLAN
2. PVC REDUCER, SIZE PER PLAN
3. BALL VALVE, SIZE PER PLAN
4. C900/HDPE FITTING, AS NEEDED TO MAKE CONNECTION
5. SCH 80 PVC, SIZE PER PLAN

HYDRANT

30% PLANS

REV NO.	COMMENT	DATE

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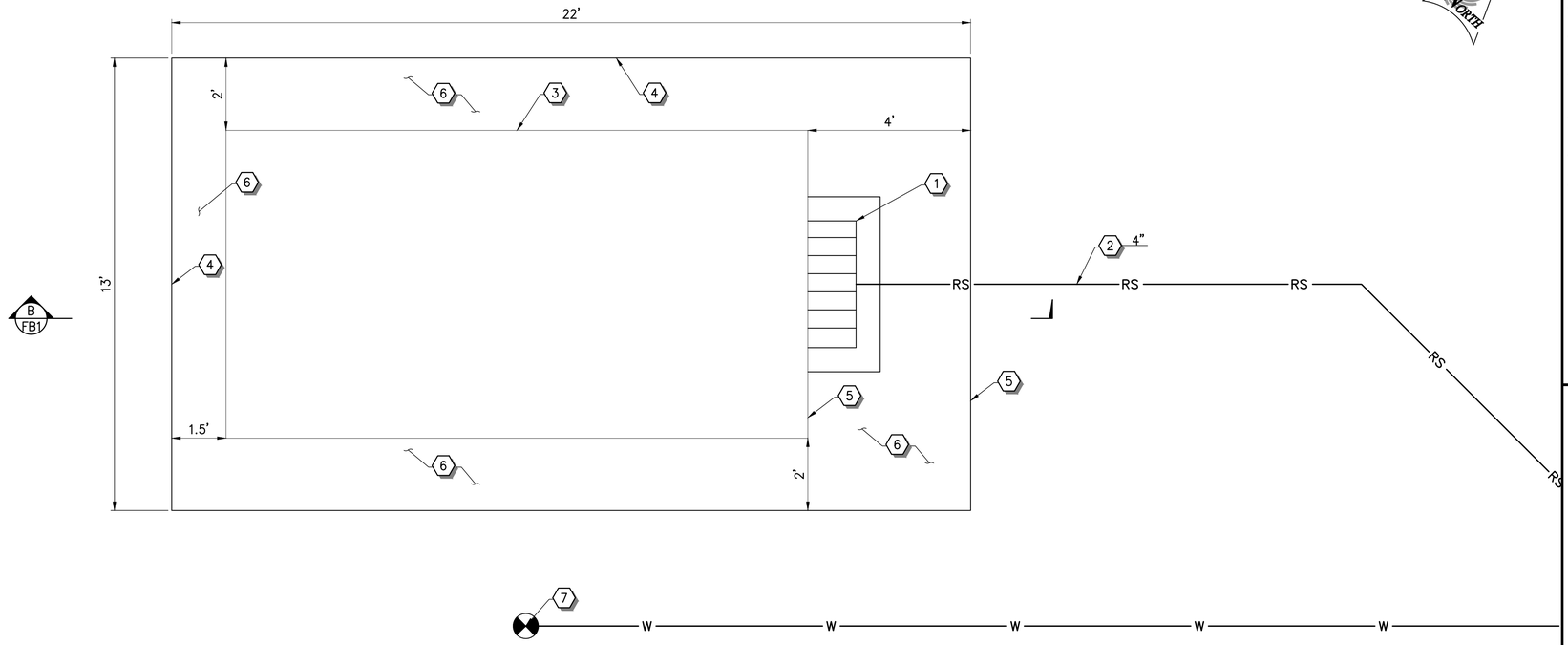
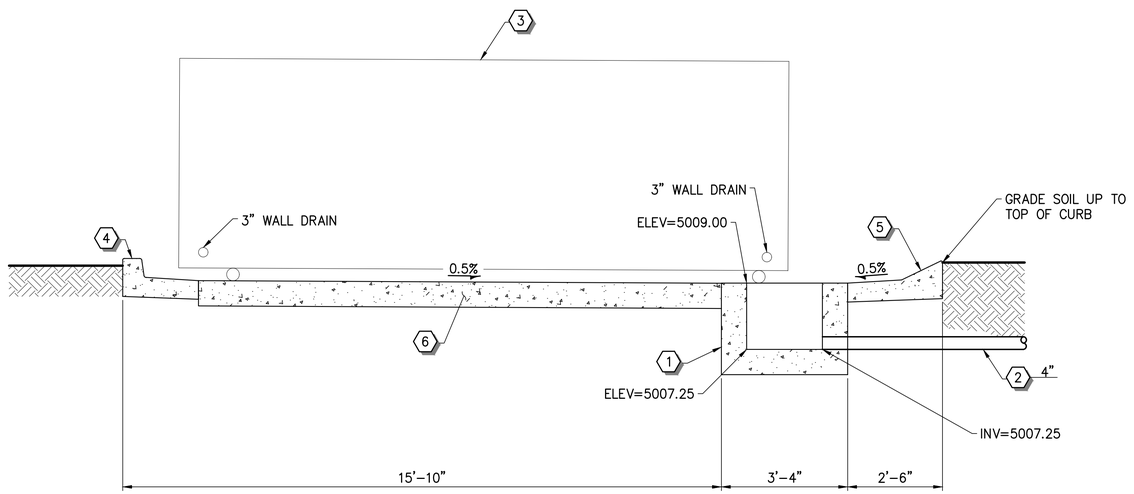
WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
SLUDGE THICKENER PLAN VIEW

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.
05609	TG	JC	TG	X of XX

ST1



A FB1 DETAIL - FILTER BOX
SCALE: 1" = 2'



B FB1 SECTION - FILTER BOX
SCALE: 1" = 2'

CONSTRUCTION NOTES

1. CATCH BASIN TYPE 'F' PER MAG STD DETAIL 535
2. HDPE/C900 PIPE, SIZE PER PLAN
3. 20 CUBIC YARD BOX FILTER
4. CURB AND GUTTER, TYPE A, PER MAG STD DETAIL 220-1
5. MOUNTABLE CURB AND GUTTER, TYPE F, PER MAG STD DETAIL 220-1
6. 8" CONCRETE SLAB
7. FROST FREE HYDRANT (INSTALLED BY CLIENT)

GENERAL NOTES

1. SLOPE CONCRETE 0.5% IN ALL DIRECTIONS TO CATCH BASIN.
2. FILTER BOX WHEELS ON EITHER SIDE OF CATCH BASIN.

30% PLANS

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WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
FILTER BOX

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	FB1

Appendix C – Civiltec Report

Basis of Design Report
Wastewater Treatment Plant
Improvements & Expansion

Final March 11, 2019

Prepared For

ICRSD

Inscription Canyon Ranch Sanitary District

PO Box 215, Chino Valley, AZ 86323

Prepared By

CIVILTEC
engineering inc.

Professional Engineering Report
for the
Wastewater Treatment Plant Improvements & Expansion

PREPARED FOR

Inscription Canyon Ranch Sanitary District
PO Box 215, Chino Valley, AZ 86323
Phone: 928.713.0548

ON
March 11, 2019

Under the Supervision of:

EXPIRES 3/31/2019

Christopher J Dusza, P.E. #35885

Table of Contents

List of Figures

List of Tables

Appendices

List of Abbreviations

Abbreviation	Description
A.A.C.	Arizona Administrative Code
A+	An effluent standard established by ADEQ
ADEQ	Arizona Department of Environmental Quality
ADF	Average Daily Flow (Annual)
APP	Aquifer Protection Permit
APS	Arizona Public Service
AQUA	AQUA Engineering, Inc.
ATS	Automatic Transfer Switch
B+	An effluent standard established by ADEQ
BADCT	Best Available Demonstrated Control Technology
bCOD	Biodegradable Chemical Oxygen Demand
BOD	Biochemical Oxygen Demand
BODR	Basis of Design Report
Civiltec	Civiltec Engineering, Inc.
CPVC	Chlorinated Polyvinylchloride
CO^2	Carbon Dioxide
DO	Dissolved Oxygen
FRP	Fiberglass Reinforced Plastic
FT^2	Square Foot
GAL	Gallons
GPD	Gallons Per Day
GPM	Gallons Per Minute
HRT	Hydraulic Retention Time
District	Inscription Canyon Ranch Sanitary District
KVA	Kilo-volt Ampere
Kw	Kilowatt
MBR	Membrane Bioreactor
MG	Million Gallons
mg/L	Milligrams per Liter
MGD	Million Gallons per Day
ml	milliliter
MLR	Mixed Liquor Reduction
MLSS	Mixed Liquor Suspended Solids
MLVSS	Mixed Liquor Volatile Suspended Solids
O&M	Operations and Maintenance
PDF	Peak Daily Flow
PDMF	Peak Day Monthly Flow
PDWF	Peak Dry Weather Flow
pH	Concentration of Hydrogen (*scale of acidity*)

Abbreviation	Description
PID	Proportional-Integral-Derivative Controller
psi	pounds per square inch
PVC	Polyvinyl Chloride
PWWF	Peak Wet Weather Flow
RAS	Return Activated Sludge
Santec	Santec Corporation
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control and Data Acquisition System
SCFM	Standard Cubic Feet per Minute
SES	Service Entrance Section
SDR	Standard Dimension Ratio
SMRF	Self-Monitoring Report Form
SRT	Solid Retention Time
STEP	Septic Tank Effluent Pumping
TDH	Total Dynamic Head
TKN	Total Kieidahl Nitrogen
TSS	Total Suspended Solids
VFD	Variable Frequency Drive
WAPA	Western Area Power Administration
WWTP	Wastewater Treatment Plant

Executive Summary

Summary

This basis of design report prepared for ICRSD provides a history of their Wastewater Treatment Plant (WWTP) located near Prescott, Arizona, and includes an overview of the permitted design criteria, the wastewater characteristics and processes at the plant. It comprises an evaluation of flow and prior studies for the purpose of quantifying existing wastewater generation within the plant's service area and assessing the impact of this flow and future growth on WWTP capacity. All existing processes at the plant were evaluated to determine if they can adequately treat the projected future flows. In cases where existing processes were determined inadequate, the report presents alternatives for improvement. The improvement alternatives presented were developed in consideration with the permitted design criteria, projected capital costs, required hydraulic capacities, operation and maintenance requirements, and need for redundancy.

Conclusions

The existing WWTP must be upgraded in order to treat the projected increase in design flow in accordance with the criteria of a Class B+ wastewater effluent. The report proposes upgrades to the existing equalization basin, aeration basins, anoxic/denitrification basin, reaeration/secondary clarifier, sludge discharge, and chlorine contact basin, and includes minor electrical modifications associated with the improvements. These upgrades will not only provide adequate usage for future demands but will also improve the plant's overall efficiency. A preliminary cost evaluation estimates the entire WWTP upgrade project will cost approximately $500,000.

Recommendations

This report recommends upgrades to the following WWTP process components as a part of the improvement project:

- *Equalization Basin*: Install an additional pump and upsize the discharge line to handle monthly maximum daily flow.
- *Aeration Basins and Anoxic/Denitrification Basin*: Install improvements to 2 reactors to increase air flow rate. Convert remaining 2 reactors to anoxic tanks and connect to the existing anoxic tank in series.
- *Reaeration/Secondary Clarifier*: Install a new reaeration/secondary clarifier identical in size and configuration to the existing unit.
- *Sludge Discharge*: Install a new sludge handling system to improve dewatering operations.

Chapter One - Existing and Future Conditions

1.1 Project Purpose, Scope and Need

The Inscription Canyon Ranch Sanitary District (District) owns and operates a conventional activated sludge – extended aeration wastewater treatment plant (WWTP) located at 14400 Grey Bears Trail in the unincorporated territory of Yavapai County, Arizona (Prescott area). The WWTP serves the master planned communities of Inscription Canyon Ranch, Whispering Canyon, the Preserve at the Ranch and Talking Rock Ranch. The District is currently committed to serve approximately 1,450 residential units within its service area. Currently, the District operates and maintains the WWTP through a service contract with A Quality Water Company, LLC.

The facility was permitted under the Arizona Department of Environmental Quality's (ADEQ) Aquifer Protection Permit (APP) rules as Permit No. P-103119 including associated amendments. The facility was originally permitted on July 30, 1997 utilizing a Sequencing Batch Reactor (SBR) with a design capacity of 120,000 gallons per day (GPD) and a permitted capacity of 46,000 GPD. On December 30, 2002 a Significant Amendment to the original permit was issued by ADEQ to increase the permitted flow from 46,000 GPD to 455,000 GPD utilizing a modified extended aeration process (Santec Corporation (Santec) modules).

On March 2, 2010, another Significant Amendment to the permit was issued to support the use of a Membrane Bioreactor (MBR) system to be constructed in two phases, the first phase being designed to treat 250,000 GPD and the second phase being designed to treat 455,000 GPD (phase 2 includes phase 1 treatment facilities). The permit calls for the MBR system to deliver an A+ effluent classification. The permit covers the operations of the existing Santec and newly planned MBR system. The District has not constructed the MBR system and is not considering construction of this system.

The existing (operating) Santec plant has an original design capacity of 62,500 GPD. It is currently required to produce B+ wastewater effluent.

There are currently 605 active connections to the WWTP. Average Daily Flow (ADF) rates, based on 15-months of historical WWTP Self-Monitoring Report Forms (SMRFs), are 47,400 GPD resulting in an average connection contribution of 78.35 GPD (See Appendix F). Wastewater is collected in an equalization tank then pumped to the aeration tanks. Aerated flow is passed into the anoxic tank for denitrification and then air is reintroduced in the next tank. After the reaeration tank, the flow is passed to the clarifier tank. Sodium hypochlorite is dosed for disinfection of the clarified effluent in the chlorine contact basin. Dechlor tablets are introduced to dechlorinate the effluent water before being collected into an effluent lift station. Two submersible pumps are used to discharge treated effluent to the effluent storage pond using a 6-inch polyvinyl chloride (PVC) force main. A portion of the settled sludge from the clarifier is returned to the aeration tanks as return activated sludge (RAS) and a portion of the flow is wasted into the sludge holding tank. There is a provision to waste the mixed liquor suspended solids (MLSS) flow from the reaeration basin to the sludge holding tank or to the denitrification tank for further processing. Supernatant from the sludge holding tank is discharged to the equalization basin. Sludge is routinely pumped from the sludge holding tank

to a dewatering bag for further dewatering. Once the dewatering bag is full and solids are relatively dry the solids are loaded on a truck for further treatment and disposal.

The purposes of preparing this report are as follows:

- Quantify the potential hydraulic expansion capability of the existing Santec facility.
- Obtain laboratory analysis results for the chemical and physical characteristics of the wastewater.
- Obtain, review and analyze historic WWTP flow data including internal return rates and effluent discharge rates to quantify the WWTP water balance.
- Establish final updated total build-out capacity for the plant. Based on data from the existing subdivisions, and any pending additional sources, define the total number of lots that will be connected at community build-out. This value will be used to establish updated future WWTP maximum flow values for ADF.
- Collect updated climatic conditions data for the site (Temperature, Precipitation, Evaporation Rates, Wind Speed and Direction).
- Review treated effluent water quality reports and determine permit-appropriate limits. Define if process modifications can be made that would result in different effluent water quality while expanding the hydraulic capacity of the facility.
- Prepare designs for new electrical service equipment at the site. Prepare preliminary design of new motor controls for the new equalization basin pumps and blowers for process aeration and lifting.
- Prepare preliminary designs to integrate the existing chemical disinfection equipment into the ultimate design and necessary ancillary equipment.
- Study the integration of the existing solids handling tank into the ultimate system design and continue use of the existing blower and aeration equipment to aerobically digest solids. It is anticipated that final treatment of solids will occur at another facility. The design does not consider installation of improvements adequate to comply with the Class B or A biosolids designation.
- Prepare preliminary construction cost estimates based on the preliminary investigations and designs.

1.2 WWTP History

The existing WWTP was originally designed to have six (6) construction phases, which included maintaining the original SBR plant in operation (see Table 1.1). Based on current flow production the permitted capacity of the plant can support connection of 33 more homes before it reaches 80% of the system capacity. Total permitted capacity of the existing SBR plus five Santec modules was determined to be 455,500 GPD. The first Santec module was constructed in 2003. It is the only Santec module currently constructed.

The original SBR plant (operational from pre-1999 to 2002) has been taken off line and is currently out of service. Since only the first phase Santec nitrification/denitrification extended aeration process module has been constructed, the current District WWTP design capacity is 62,500 GPD. This ADF rate is used as the basis for the calculations included in this report.

Table 1.1 Santec's September 3, 2002 Basis of Design Report (BODR) WWTP Phasing

Phase	Additional Rated Capacity (GPD) & {Accumulated Capacity}	No. of Additional Homes Supported at 78.35 GPD/Home**	No. of Homes Supported at 80% of Accumulated Capacity
Existing SBR	46,000 (out of service)	out of service	NA
1	62,500 {62,500)	798	638
1A*	27,500 {90,000}	350	919
2	103,500 {193,500}	1,321	1,976
3	131,000 {324,500}	1,672	3,313
4	131,000 {455,500}	1,672	4,651
Sum	**455,500**	**5,814**	

*Phase 1A is an intermediate phase established in this report to enable achieving 90,000 gpd Accumulated Capacity.
**Number of homes supported is based on recent flow monitoring established in the July 24, 2018 report prepared by Civiltec (See Appendix F)

The out of service SBR structure consists of three 35-foot by 35-foot by 17-foot deep reinforced concrete chambers with a total operational capacity of 412,360 gallons (GAL). It may be possible to reuse these structures in the future since the concrete is still in good condition.

1.2.1 Permitting with ADEQ

The WWTP operates under amended APP No. P-103119 issued in 2002 and 2010. The original APP was issued in July of 1997. The 1997 permit was for a SBR with a design capacity of 120,000 GPD to comply with a Class B re-use standard, although the APP permit was limited to 46,000 GPD operational capacity. In 2002, the APP was amended changing the treatment process to modified extended aeration with an ultimate design capacity of 0.455 million gallons per day (MGD) and a Class B+ re-use standard. The existing WWTP currently operates within Phase 1 of the design with a design treatment capacity of 62,500 GPD.

Another amendment to the APP was completed in 2010 changing the treatment process to an MBR system, complying with a Class A+ re-use standard. The MBR was designed by AQUA Engineering, Inc. (AQUA) for a design flow of 0.455 MGD, which was based upon a design report dated December 19, 2008. This facility has not been constructed. The existing APP allows the current WWTP to operate in its current configuration until the new MBR is constructed and operational. Regulatory sampling protocols were established in the 2002 APP to monitor the operating conditions of the existing WWTP.

According to the recent flow analysis, which was based on data provided by the District, the facility has the following characteristics (see Table 1.2).

Table 1.2 Wastewater Characteristics

Constituent	Unit	Influent Concentration		
		Minimum	Average	Maximum
BOD	mg/l	169.0	293.9	403.0
TSS	mg/l	101.0	236.5	1220.0
pH	pH Unit	6.4	6.9	7.2
Total Nitrogen	mg/l	55.0	60.0	68.5

Constituent	Unit	Influent Concentration		
		Minimum	Average	Maximum
TKN	mg/l	55.0	60.0	68.5
Ammonia	mg/l	42.4	44.2	46.0
Nitrate/Nitrite	mg/l	<0.20	<0.2	0.3
Total Organic N	mg/l	11.3	15.8	24.5
Alkalinity	mg/l	125.0	218.1	332.0
Total Phosphorous	mg/l	6.4	7.7	10.7

1.3 Existing Environment of the Facility

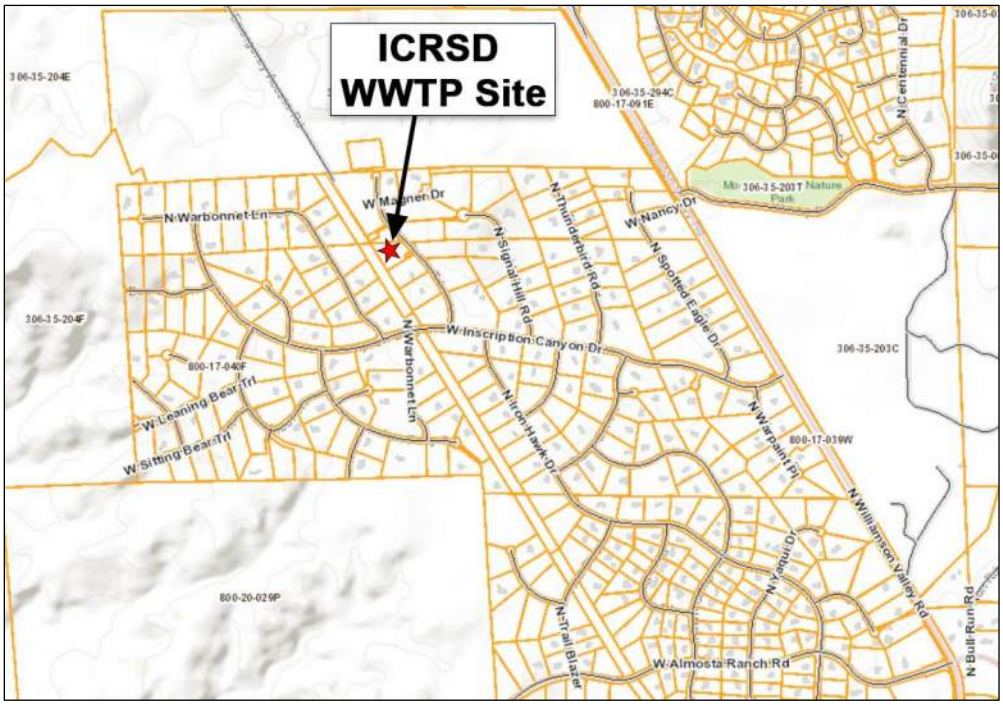
1.3.1 Study Area

The existing facility is located at 14000 Grey Bears Trail on Parcel 306-55-029G and 306-55-100B in Yavapai County, Arizona (34.7458° N Latitude and 112.5772° W Longitude) as shown in Figure 1-1. The site is bounded by Grey Bears Trail to the east, the Western Area Power Administration (WAPA) easement to the west (owned by Yavapai County) and privately-owned residential properties to the north and south.

Figure 1-1 also shows the location of the WWTP. The existing SBR basins lie just south of the existing plant. The WWTP facility is situated on the southerly portion close to the site access road at an approximate elevation of 5,015 feet.

The sewer collection system is a combination of gravity, low pressure force mains and septic tank effluent pumping (STEP) systems and collects all the wastewater from the District service area. Existing 4-inch force mains discharge from Inscription Canyon Ranch, Whispering Canyon, and the Preserve. An 8-inch force main discharges from Talking Rock Ranch resulting in two 4-inch and one 8-inch main supplying wastewater into the flow equalization basin located at the head of the WWTP.

Figure 1-1 Vicinity Map



1.3.2 Existing Wastewater Flow and Growth Potential

WWTP flow data was provided to Civiltec Engineering, Inc. (Civiltec) for a previous study and report (District WWTP Capacity Evaluation July 24, 2018 – See Appendix F) in order to evaluate flow rates and the number of WWTP connections. The WWTP data that was provided was inclusive of the year 2017 and first quarter of 2018 for water quality constituents. Daily flow data was provided for the calendar years 2017 and the first quarter of 2018.

Based on ADFs, the facility is approaching 80% of its operating capacity. The study identifies the influent flow characteristics shown in Table 1.3.

Table 1.3 WWTP Influent Flow Characteristics

Flow Description	GPD
Permitted WWTP Capacity (Discharge Limit) (100%) APP No. P-103119	62,500
15-month Average "Minimum Flow" January 2018 Flow Value	41,000
15-month Average "Average Flow" 15 months Combined and Averaged	47,400
15-month Average "Maximum Flow" July 2017 Flow Value	59,000
95% WWTP Capacity ADEQ Treatment Capacity Threshold (Alert Level)	59,375

The previous report indicated that:

a) Current wastewater flows are produced by residential uses with minor contributions from recreational facilities that serve the nearby developments. Historic flows treated at the existing WWTP show an ADF of 47,400 GPD or 78.35 GPD per equivalent house connection. Peak daily flow (PDF) rates are approximately 124 GPD per equivalent house connection.

b) The existing WWTP has capacity for an additional monthly ADF rate of 375 GPD before 95% of its Discharge Limit (Alert Level) has been reached (based on the month of July 2017 flows). Based on the current APP, when the WWTP receives 95% of its rated flow during any given month of reporting, the permittee shall apply to ADEQ for an APP amendment to expand the WWTP or submit a report detailing the reasons an expansion is not necessary. (This assumes the 95% threshold in the existing APP applies to the existing Santec plant.)

c) Increase the capacity of the WWTP to 90,000 GPD to accommodate near-term future growth.

Future Plant Expansion

As discussed, the current ADF is 78.35 GPD per equivalent house connection. It is acknowledged that certain homes within the District's service area are seasonally occupied. If the occupancy trends change in the future, then this value will subsequently change. Although it is beyond the scope of this report to identify future occupancy types and trends, the following information could be used for concept-level planning for future situations associated with District wastewater flows. Intermittent flowrate calculations should be performed during future months to assist the District in identifying occupancy patterns.

Using 80 GPD per person design flow rate cited in Arizona Administrative Code (A.A.C.) Title 18 Chapter 9 (Table 1) with an average of 2.3 persons per household as a basis, the calculated A.A.C. average daily design flow rate is 184 GPD per lot. The current ADF is approximately 43 percent of this A.A.C. ADF.

Assuming the current flowrate is applied to 2500 residential units at build-out, the total expected ADF at build-out would be about 195,000 GPD. If, however, occupancy trends vary over time such that the ADF per house connection increases, this build-out ADF would be greater. Various scenarios are presented in Table 1.4, which shows possible build-out ADF's based upon varying percentages of the A.A.C. ADF.

Table 1.4 Build-Out Scenarios and Impact to ADF

ADF per House Connection	Percent of A.A.C. ADF	No. of homes	Total ADF
78	**43%**	2500	195,000
110	**60%**	2500	275,000
147	**80%**	2500	367,500
184	**100%**	2500	460,000

Influent Biochemical Oxygen Demand (BOD)

Limited analytical data was available to characterize actual WWTP loading and water quality. During the month of December 2018 composite sampling was performed over a 7-day period. Thirteen (13) samples were taken. During the sampling period the facility saw an average BOD concentration of 294 mg/l that results in a BOD loading of 116 pounds per day. Half of the samples taken indicated that BOD concentrations peak at more than 325 mg/l and can reach up to 403 mg/l. A value of 350 mg/l is considered for design and treatment system analysis purposes.

Influent Total Suspended Solids (TSS)

The average TSS concentration during the sampling period was 237 mg/l, which is low for domestic strength wastewater. TSS is not considered a critical design element for domestic WWTPs. However, due to the localized load and lack of infiltration or inflow, a value of 300 mg/l will be utilized for design purposes.

Influent Nitrogen

The average ammonia concentration during the sampling period was 60 mg/l, which is high for domestic strength wastewater. A value of 45 mg/l is normal for domestic wastewater flow. A Total Kjeldahl Nitrogen (TKN) value of 60 mg/l will be used for design purposes. Nitrate and nitrite concentrations were negligible in the influent stream and will not be considered in the design.

1.3.3 Effluent Limitations

Reuse Limitations

The WWTP is classified as B+ reclaimed water. According to State of Arizona, Arizona Administrative Code (A.A.C.) R18-11-305, Class B+ reclaimed water is wastewater that has undergone secondary treatment, nitrogen removal treatment and disinfection. The disinfected effluent shall follow the requirements below before discharging to disposal facilities.

- The concentration of fecal coliform organism in four of the last seven daily reclaimed water samples is less than 200/100 ml.
- The single sample maximum concentration of fecal coliform organism in a reclaimed water is less than 800/100 ml.
- The 5-sample geometric mean concentration of total nitrogen in a reclaimed water sample is less than 10 mg/l.

According to ADEQ, Class B+ effluent is allowed for surface irrigation of an orchard or vineyard, golf course irrigation, dust control, restricted access landscape irrigation, pasture for milking animals etc. However, it is not allowed for snowmaking, vehicle and equipment washing, spray irrigation of an orchard or vineyard, fire protection system, toilet and urinal flushing and open landscape irrigation.

The current practice of disposal is to blend the effluent with potable well water and use it for irrigation at a nearby golf course, which is a type of direct reuse that only requires Class B+

effluent. Table 1.5 illustrates the differences between the different classes of reclaimed water according to A.A.C. R-18-11-301.

Table 1.5 Reclaimed Water Classification

Reclaimed Water Classification		Class A+	Class A	Class B+	Class B	Class C
Treatment	Secondary	X	X	X	X	X
	Nitrogen Removal	X	-	X	-	-
	Filtration (including coagulation/ polymer addition)	X	X	-	-	-
	Disinfection	X	X	X	X	Optional
Effluent Quality Standards	Fecal Coliform 4 of 7 Samples, CFU/100ml	Non-Detect	Non-Detect	<200	<200	<1,000
	Fecal Coliform Single Sample Max., CFU/100ml	<23	<23	<800	<800	<4,000
	Nitrogen (5-sample geometric mean), mg/l	<10	-	<10	-	-
	Turbidity, 24-hour Average, NTU	<2	<2	-	-	-
	Turbidity, Instantaneous Mac. NTU	5	5	-	-	-

After discussions with the District it is not anticipated that effluent discharge classification requirements are expected to change. As a result, the proposed design assumes current effluent discharge requirements (B+).

Existing Effluent Quality Monitoring

WWTP effluent quality is monitored to guarantee effluent stays within the requirements prescribed in the APP. The APP is a part of Arizona's regulatory program for the protection of groundwater quality. As specified in A.A.C. R18-9-B201, all facilities operating under an APP must exhibit Best Available Demonstrated Control Technology (BADCT). The current APP compliance is based on monitoring at the point of discharge from the effluent lift station located at:

Identification	Latitude	Longitude
Point of Discharge – Effluent Pump Station	34° 44' 47.0" N	112° 34' 42.4" W

In addition to the monitoring point of discharge, the current APP requires monitoring of the WWTP discharge flow rate which is measured daily, downstream of the chlorination point and monthly total nitrogen as shown in Table 1.6.

Table 1.6 Discharge Monitoring Requirements

Parameter	AL	DL	Sampling Frequency	Reporting Frequency
Maximum Daily Flow	Reserved	Reserved	Daily	Quarterly
Average Monthly Flow			Monthly	Quarterly
Nutrients:				
Total Nitrogen		Reserved	Monthly	Quarterly
Nitrate-Nitrite as N		Reserved	Monthly	Quarterly

Parameter	AL	DL	Sampling Frequency	Reporting Frequency
TKN		Reserved	Monthly	Quarterly

The current APP permit is issued for the MBR system with a flow of 0.455 MGD (APP - 103119-2010.3.2), which was not constructed. This permit will likely need to be revised by significant amendment prior to startup of the upgraded WWTP.

1.4 Projected Design Criteria

Data collected at the facility over the two-week study period and previous analysis performed by AQUA was used to create the design criteria for this study. The design criteria data is illustrated in Table 1.7. The effluent design criterion is based on the evaluation of current loadings coupled with projected population conditions in the near-term as established in the expected discharge limitations for recycled water use.

Table 1.7 Design Criteria

Parameter	Initial (Current Flow)	Updated (Current Flow)	Design Criteria (Proposed Flow)
	FLOW		
ADF – GPD	62,500	62,500	90,000
PDMF – GPD		78,125	112,500
	BIOCHEMICAL OXYGEN DEMAND		
Influent BOD, mg/l	220	350	350
Total Pounds / Day	115	182	263
Effluent Requirement – mg/l	30	30	30
	TSS		
Influent mg/l	220	300	300
Total Pounds / Day	115	156	225
Effluent Requirement – mg/l	30	30	30
	TOTAL COLIFORM		
Effluent Requirement Average – Organism/100ml		<200	<200
Effluent Requirement Maximum – Organism/100ml		<800	<800
	TKN		
Influent mg/l	40	60	60
Total Nitrogen Effluent Requirement – mg/l	<10	10	10

Chapter Two - Existing Process Evaluation

2.1 Existing WWTP Facilities

On November 13, 2018, Civiltec conducted a site visit of the WWTP to assess the physical condition of the visible equipment, conduct operational discussions with the facility operator-of-record, and photograph portions of the site. Civiltec reviewed the existing flow and performed code evaluation.

The District's WWTP receives pumped wastewater from local residential developments into a combination flow equalization tank and influent pump station. This raw wastewater is then distributed to aeration tanks outfitted with fine-bubble diffusers, a denitrification tank and re-aeration tanks before flowing to a clarifier. Following clarification, the treated wastewater is disinfected in a chlorine contact basin, dechlorinated and pumped from an effluent pump station to a residential golf course lake. See Appendix A for a figure of the District's WWTP generalized process flow diagram.

Wastewater solids are bagged into specially adapted sludge dewatering bags where they are dried and hauled off-site, on a periodic basis, per regulatory guidelines to a local sanitary landfill.

The WWTP component working volumes shown in Table 2.1.

Table 2.1 Existing WWTP Component Capacities

Component	Volume/Flow	Volume
Flow Equalization	41,000 GAL	0.041 MG
Aeration Basins	45,256 GAL	0.045 MG
Denitrification	9,398 GAL	0.010 MG
Clarification	11,626 GAL	0.012 MG
Chlorine Contact	6,967 GAL	0.007 MG
Sludge Holding	15,295 GAL	0.015 MG
Wet Well Pumping Capacity	70 GPM @ 25 Feet Total Dynamic Head (TDH)	
Aeration Blowers	458 Standard Cubic Feet per Minute (SCFM) @ 5.5 Pounds per Square Inch (psi), 20 Horsepower	

The facility was designed as a conventional activated sludge WWTP operating in the extended aeration mode. The WWTP incorporates a nitrification/denitrification component to reduce the discharging nitrogen levels. The extended aeration process is sometimes referred to as a "total oxidation process" in which all the influent BOD is converted to carbon dioxide (CO_2).

High levels of flow variation, in an extended aeration WWTP, can cause excess solids to be wasted in the final effluent. Therefore, it is critical that the WWTP flow be managed at a steady and balanced flow rate. The use of flow equalization basins/tanks and pumps operated with variable frequency drives (VFDs) is beneficial in controlling excess solids wasting related

to high levels of flow variation. This WWTP has flow equalization as an operational component.

2.2 Process Capacity Evaluation

Capacity calculations of the existing facilities are found in Appendix B. These calculations use conventional standards for determining performance of the existing process units. Each unit process is characterized by its individual strengths and weaknesses. Some of the unit processes are limited in their ability to operate optimally or redundantly to achieve the 62,500 GPD plant capacity and require operational adjustments by the operator or operate at the higher end of standard design criteria to meet treatment objectives. In light of this, this overall plant capacity is rated at 62,500 GPD when considering that some of the unit processes in the plant are operating outside of operational range.

2.2.1 Hydraulic Capacity

Hydraulic capacity is based on the overall WWTP and components such as pumping units, pipeline dimensions and some of the process units. Table 2.2 summarizes hydraulic capacity of process equipment.

Table 2.2 Hydraulic Capacity of WWTP

Location	Description	Capacity
Sewer: Talking Rock to Flow Equalization Tank	8-inch Force Main Standard Dimension Ratio (SDR)-21	0.936 MGD (Average Velocity 4.22 Feet/Second)
Sewer: Whispering Canyon to Flow Equalization Tank	4-inch Force Main	0.451 MGD (Max Velocity 8 Feet/Second*)
Sewer: Inscription Canyon to Flow Equalization Tank Preserve	4-inch Force Main	0.451 MGD (Max Velocity 8 Feet/Second*)
Sewer: Influent Lift Station to Equalization Tank	4-inch	0.113 MGD (Average Velocity 2 Feet/Second)
Influent Lift Station	1 Duty, 1 Standby	
Effluent Lift Station Pumps	1 Duty, 1 Standby (220 GPM @ 52 Foot TDH and 400 GPM @ 106 Foot TDH) – 6-inch Force Main Pipe	316,800 GPD (Velocity = 2.5 Feet/Second) 576,000 GPD (Velocity = 4.5 Feet/Second)
Effluent to Lift Station	8-inch PVC	57,900 GPD (Average Velocity = 1.6 Feet/Second)
RAS	6-inch PVC	90,800 GPD
MLR	6-inch PVC	90,800 GPD
Equalization Basin Lift Pumps	1 Duty, 1 Standby (70 GPM @27 Foot TDH). Discharge Pipe 2-inch	96,480 GPD Pipe Velocity = 6.84 Feet/Second

*Hydraulic capacity of the force main is determined based on the industry standard assumed maximum of velocity of 8 Feet/Second. It has not been determined whether the existing pumps have enough available head to pump the maximum velocity.

2.2.2 Biological Treatment Capacity

In general, the existing biological treatment process was designed in 2001 to treat the influent wastewater for secondary effluent quality requirements for nitrogen effluent of 10 mg/l. Nitrogen reduction is necessary per the ADEQ requirement to qualify for B+ effluent quality. The current sewer average flow to the WWTP varies and has recorded effluent flows

approaching the permitted capacity of the plant. A comprehensive WWTP system analysis was performed utilizing the design criteria adopted in Section 1 for future flow of 90,000 GPD. Table 2.3 summarizes the existing WWTP capacity and whether the WWTP can process the design flow of 62,500 GPD.

Table 2.3 Biological Treatment Capacity (Check for 62,500 GPD)

Location	Description	Capacity	Discussion
Equalization	Tank 1 Capacity 16,000 GAL Tank 2 Capacity 25,000 GAL Combined Dimensions: 10 Foot-4-inch Diameter by 31 Foot-1-inch Length	Satisfactory to Process 62,500 GPD (surplus 25,000 GAL)	Basin volumes are adequate. Pumping equipment has been equipped with VFDs to better manage flow and energy usage.
Aeration Process	(2) 12 Foot-5-inch Diameter by 28 Foot-1-inch Length, Tank Capacity 45,978 GAL	Satisfactory to Process 62,500 GPD (surplus 22,381 GAL)	Existing diffusers have ability to deliver air and the HRT for process has a surplus that may be operated as an anoxic zone.
Anoxic Process (Denitrification)	(1) 10 Foot-4-inch Diameter by 21 Foot-5-inch Length, Tank Capacity 9,856 GAL	Marginal to Process 62,500 GPD (surplus 2,017 GAL) when Reactor 4 is operated as anoxic	This deficiency is alleviated operationally by operating existing aeration basins as anoxic zones thus providing adequate volume to denitrify and meet effluent objectives
Re-Aeration Process	(1) 12 Foot-5-inch Diameter by 28 Foot-1-inch Length, Tank Capacity 9,398 GAL	Clarifier is used for Re-aeration Process	Air utilized in
Clarifier	(1) 12 Foot-5-inch Diameter by 28 Foot-1-inch Length, Tank Capacity 11,626 GAL	Marginal to Process 62,500 GPD	Typical surface loading rates of clarifiers following extended aeration processes are limited to 400 gpd/SF under average flow conditions. At 62,500 GPD the surface loading rate of the clarifier would be operating at 600 GPD/SF which is acceptable under peak (i.e. infrequent) surface loading conditions only. Additional clarifier capacity is warranted to accommodate any permitted flows above 62,500 gpd

Location	Description	Capacity	Discussion
Chlorine Contact	(1) 10 Foot-4-inch Diameter by 15 Foot-11-inch Length, Tank Capacity 6,967 GAL	Satisfactory to Process 62,500 GPD (167 Minute Contact Time)	Baffles in existing tank ensure that short circuiting.
Sludge Holding Tank	(1) 10 Foot-4-inch Diameter by 31 Foot-1-inch Length, Tank Capacity 15,295 GAL	Satisfactory to Process 62,500 GPD	While the sludge holding tank is not required to meet Class A or B requirements the size of the tank requires sludge be wasted on a routine and daily basis thus overburdening operators. Improvements to solids handling are warranted to minimize operator labor.
Process Air	(2) 458 SCFM with 20 Horsepower Motor	Marginal to Process 62,500 GPD (Deficit of 263 SCFM when one Blower is kept as Standby)	Both blowers may be operated simultaneously to provide sufficient oxygen to the process. However, this does not provide the necessary redundancy to operate the plant and improvements are warranted.
Dewatering Bags	50'x30' Bags	Satisfactory to Process 62,500 GPD	The dewatering process is limited by its configuration. Operators must daily waste solids from the sludge holding tank. Dewatering bags are located in the existing ponds that are not ideally conducive to dewatering and evaporation as the pond does not allow for proper draining. Improvements are warranted.

2.2.3 Equalization Tanks

The existing equalization tanks have a combined capacity of 41,000 GAL. The hydraulic analysis indicates the tanks have adequate capacity to store the flow for processing the design flow of 62,500 GPD.

2.2.4 Aerobic/Anoxic Tanks

The anoxic/denitrification tank is insufficient to handle the denitrification of the process on its own. Reactors 3 and 4 are currently being operated with reduced air mimicking an anoxic zone. Thus, through operator manipulation, anoxic capacity can be increased by converting aeration tank 4 to anoxic and adding more diffusers into aeration tank 3. Approximately 11,561 GAL of aerobic volume and 19,153 GAL of anoxic volume is required to process the 62,500 GPD flow from the existing WWTP. Approximately, 22,381 GAL of aerobic volume is surplus, and 1,896 GAL of anoxic volume is deficit. By converting aerobic Reactor 4 to an anoxic zone, anoxic volume will increase to 21,170 GAL and aerobic volume will decrease to 33,942 GAL thus satisfying the anoxic zone volume requirements and enabling the plant to maintain a 62,500 gpd capacity.

2.2.5 Secondary Clarifier

The surface loading rate of the clarifier is well above the design parameters established for an extended air process. Under average day conditions, the surface loading rate should be a maximum of 400 GPD/square foot (ft^2). The current surface loading rate is 640 GPD/ft^2 which is acceptable for short period peak loading but is not acceptable for average day loading. Considering this, a new clarifier is warranted. This is currently the limiting factor to the process. Because of this, the current WWTP design cannot be rated at anything higher than 62,500 GPD. The Clarifier with constant operator supervision is permitted to operate at 62,500 GPD when utilizing a peak loading surface rate of 650 GPD/ ft^2

2.2.6 Chlorine Contact Basin

The chlorine contact tank has capacity to process 62,500 GPD. The current tank provides 167 minutes of contact time. The permit only requires 60 minutes of contact time. 6 mg/l of chlorine dose is assumed for the contact time. There are baffles in the chlorine contact tank that will minimize short circuiting.

2.2.7 Process Air

Considering all of the process air is supplied by only two blowers there is not adequate capacity with backup to keep up with oxygen/air requirements. Potentially, both blowers can operate at all times, however; this is not typical. The process air capacity is a limiting factor for overall WWTP capacity. For the 62,500 GPD, a total of 873 SCFM is required for aerobic, anoxic, digester and airlift processes and would require that both blowers operate simultaneously. In light of this the plant rated capacity is limited to 62,500 gpd.

2.2.8 Sludge Holding Tank

The sludge holding tank has adequate capacity to retain sludge for the flow of 62,500 GPD. The sludge holding tank has 4 SNAP-CAP diffusers and is also equipped with an air lift mechanism to discharge supernatant from the sludge holding tank to the equalization basins. Basically, the tank is acting as a sludge thickener. However, based on solids production operator must manually waste flow from the process daily to maintain the optimal mixed liquor suspended solids concentrations. This is not ideal and requires a labor-intensive operation to maintain plant operations within permitting and standard parameters.

The District utilizes dewatering bags to dewater the sludge from the sludge holding tank. These bags are positioned inside the existing ponds which do not allow for proper drainage and require long drying periods to dewater. This operation is significantly impacted by weather conditions. Improvements to this unit process is warranted. The ADEQ permit requires that the dewatered and bagged sludge be disposed of at an Arizona approved landfill site.

Chapter Three - Description of Improvements

3.1 Evaluation Criteria

A set of parameters was examined to evaluate the relative benefit of various treatment and expansion alternatives. The parameters were utilized to ensure that the most beneficial alternative is selected for implementation. It is important to note that all the available options identified herein including extensive coordination with ADEQ will need to occur to establish realistic APP capacity ratings and effluent quality guidelines as part of the Significant Amendment to the existing APP. Each process is unique and detailed process calculations will be required to define the final treatment capacity. Additionally, a comprehensive Operations and Maintenance (O&M) Manual will be required for the final selected process to maximize final WWTP output capacity.

3.2 Compatibility with the Existing WWTP

The District has constructed a facility that has served the community for many years, but the WWTP is nearing capacity and improvements should be made to increase the capacity of the facility. The existing facilities are in operable condition and the District would like to utilize the existing facilities.

3.3 Treatment Alternatives

This section presents upgrade options for the facility to describe possible treatment processes and upgrades that will improve the performance of the WWTP and provide adequate usage for near-future demands.

3.3.1 No-Expansion Alternative

The WWTP facility will not be able to comply with the requirements set forth in its APP and flow is expected to exceed the treatment capacity in the near future. In order to comply with the desired increased treatment design flow (90,000 GPD) and biological demands, the capacity of the treatment components must be increased. As a result, the no-expansion alternative was not developed further and is not discussed in detail in this report.

3.3.2 Retrofit Old Concrete Basins to the Currently Designed and Permitted MBR Modules

This option would use existing design documents already permitted by ADEQ to construct internal MBR equipment. This process is more complicated, produces a higher quality of effluent and requires a greater degree of operator certification and oversight. This facility has already been designed and permitted by ADEQ as BADCT for this site. Drawbacks include a higher cost to construct than other conventional technologies, increased operator supervision, and increased analytical and reporting costs for A+ wastewater effluent. While this alternative is considered feasible, implementation is cost prohibitive and would provide more treatment capacity sooner than what could be reasonably funded.

3.3.3 Expand Existing Santec Treatment System

This option would modify some of the existing facilities with additional underground tankage to increase the WWTP capacity to 90,000 GPD. Equalization, nitrification and denitrification elements would still be incorporated into the upgrade and the facility could be permitted as BADCT with potentially minimal ADEQ concerns. Some modifications to the existing WWTP may help with overall process operability and capacity expansion.

3.3.4 Equalization Tanks

The existing equalization tanks provide 41,000 GAL of total flow equalization capacity. As such, the equalization tanks are adequate to process 90,000 GPD flow. A total volume of 22,000 GAL of equalization tank capacity is required. Considering this, the volume of the equalization tanks is in excess of that by 19,000 GAL (See Appendix C.1). The existing sump pumps have a capacity of 70 gallons per minute (GPM). They are adequate to process the ADF of 90,000 GPD. However, the pumps should be designed for the monthly maximum daily flow of 80 GPM. In order to process the monthly maximum flow and remain consistent with the existing pumps, an additional 70 GPM pump with a TDH of 30 feet will be added to the adjacent access manhole in the existing Equalization Tank #1. The new submersible pump will be equipped with a new VFD and control panel. The existing control panels for the existing pumps have been upgraded with a VFD and the flow control valve that recirculates water back to Flow Equalization Tank #1 is repurposed and replaced with a manual isolation valve. The 2-inch discharge line from Flow Equalization Tank #1 to the aeration basins discharges at a velocity of 8 feet/second. This velocity is too high. The existing 2-inch discharge line will be capped at Flow Equalization Tank #1 and a new 4-inch discharge line with magnetic flow meter will be constructed parallel to the existing 2-inch line to the aeration basin.

3.3.5 Aeration Basin

The flow from the equalization tanks is pumped to the aerobic basin. The biological treatment of the wastewater starts in the aerobic basin. In the aerobic zone, the wastewater's BOD will be reduced, and ammonia will be transformed into nitrate. Aerobic autotrophic bacteria are responsible for nitrification (transformation of ammonia into nitrate) in the aerobic tank in a two-step process. In a complete mix configuration, the wastewater will be mixed and aerated with fine bubble diffused aeration. The dissolved oxygen (DO) concentration in the aerobic zone will be monitored by a DO probe and maintained at an optimal amount.

The treatment system analysis indicates approximately 16,650 GAL of aerobic volume is required to process the proposed average design flow, assuming a mixed liquor concentration of 2,000 mg/l (See Appendix C.2). The existing aerobic Reactors 1 and 2 have a capacity of 22,989 GAL and would be adequate to process the average design flow of 90,000 GPD. Reactor 1 and 2 will provide sufficient solid retention time (SRT) and hydraulic retention time (HRT) for processing BOD and nitrification. The air diffusers in Reactor 1 and 2 are insufficient. Therefore, 25 more diffusers in Reactor 1 and 28 diffusers in Reactor 2 will be added.

A 4-inch chlorinated polyvinylchloride (CPVC) airline is in place currently to supply air to Reactor 1 and 2. Each reactor will receive 350 SCFM minimum air (See Appendix C.3). A new 20 horsepower blower will be installed inside the existing blower building to provide the added air for the process aeration requirements and redundancy.

3.3.6 Anoxic/Denitrification Basin

The flow from the aeration basin will enter the anoxic basin through a 6-inch pipeline. The hydraulic capacity will be reviewed in the case that the anoxic basin is placed ahead of the aerobic process to minimize methanol usage. In the anoxic /aerobic process, nitrate is fed to the anoxic basin from the RAS, from the sedimentation basin/clarifier and by recirculating mixed liquor from the reaeration chamber/tank. The anoxic basin is a zone, or portion of, that is mixed but not aerated. The DO levels must be less than 1.0 mg/l but never reach 0.0 mg/l. In an anoxic zone the microorganisms will blend with the incoming wastewater and will use the wastewater's BOD as a carbon source for de-nitrification. Key design parameters that affect the amount of nitrogen removal by the system depends on anoxic zone detention time, mixed liquor volatile suspended solids (MLVSS) concentrations, internal recycle rate, influent BOD or biodegradable chemical oxygen demand (bCOD) concentration, and temperature.

The existing anoxic/denitrification tank is insufficient to complete the denitrification process on its own. Reactors 3 and 4 will be converted to anoxic tanks in series with the existing denitrification tank. The diffusers that are currently located in Reactor 3 and 4 will be removed and replaced with an air type mixer similar to what is in the existing anoxic tank. Four (4) total mixers will be added to Reactors 3 and 4. The existing 2-inch slide gate that currently introduces flow from the flow equalization tanks will be closed. The methanol feed line will be realigned to the manhole of Reactor 3.

3.3.7 Mixing System

Mixing will be required in the anoxic zones to maintain the mixed liquor in suspension. Two air type mixers will be installed in the anoxic basin to agitate the incoming mixed liquor and to increase contact between the biomass and the nitrate ions.

3.3.8 Reaeration/Secondary Clarifier

From the anoxic zone/basin, mixed liquor will gravity flow to the re-aeration/secondary clarifier. In the reaeration zone, the wastewater's remaining BOD will be further reduced, and ammonia will be transformed into nitrate. Aerobic autotrophic bacteria are responsible for nitrification (transformation of ammonia into nitrate) in the aerobic tank in the two-step process. In a complete mix configuration, the wastewater will be mixed, aerated and settled. The existing clarifier has two sections, reaeration and clarifier. Four access manways are installed in the reaeration/clarifier tank.

A new clarification/reaeration tank of the same size as the existing with the same configuration will be installed. All skimmer, mixed liquor reduction (MLR) and RAS fluid and air lift lines will be extended to the new clarifier along with air lines for the reaeration process and associated diffusers. The new reaeration/clarifier will be equipped with flow direction baffles, multiple air lifts for removal of sludge, surface skimmers and an effluent collection weir. The flow through the clarifier will be around the circumference of the tank similar to the existing configuration. Flow through the vessel is downward through the aerated upper portion of the reaeration reactor, around the baffle and discharging into the clarifier at the mid depth level. The V-shaped bottom extends full width of the clarifier. Multiple air lift pumps will be in the V-shaped portion proving continuous collection and removal of settling sludge. The settled sludge will be recycled to the denitrification reactor. Mixing in the

reaeration reactor is also accomplished by an airlift pump, which lifts liquid from the bottom of the tank to the water surface. RAS from the clarifier discharges into the inlet end of the denitrification reactor.

A flow splitter box with weirs will be installed between the anoxic tank and clarifiers to collect and distribute the flow into clarifiers. Similarly, effluent flow from both clarifiers will be collected through 6-inch pipelines to a flow splitter box with adjustable weirs. Combined flow will be re-connected with an existing 6-inch pipeline that will discharge into the existing chlorine contact tank.

3.3.9 Recirculation/Transfer

The reaeration/clarifier tanks will be equipped with a RAS line and air line that will lift mixed liquor from the reaeration side of the tank back to the anoxic tanks and also to the sludge disposal basin. The purpose of this recirculation is to allow the nitrates formed in the aeration zone to denitrify in the anoxic zone. Recirculation will be done using an air lift immersed in the tank. 6-inch and 4-inch pipelines in between the sedimentation tank system to the anoxic tank will discharge the mixed liquor and overflow at the head end of the anoxic tank. A 2-inch pipe with accessory valves will be installed to lift the mixed liquor from the effluent side of the tank to the anoxic tank. The optimal recirculation ratio will be fine-tuned once the WWTP is in operation. A recirculation ratio of five to eight times the flow is generally optimal for de-nitrification.

3.3.10 Sludge Discharge

The sludge produced in the sedimentation tanks will be withdrawn to the existing sludge holding tank and with the ability to directly discharge the sludge (WAS) to the dewatering bags. The supernatant return pipe line will continue to be utilized from the sludge holding tank to the equalization tanks. A minimum of 80 SCFM of air is required for sludge processing and additional diffusers may be required to accommodate the sludge mixing requirements.

Currently, the sludge is dewatered using large bags in the sludge basin and dewatered sludge is disposed of off-site. A previous report suggested a new sludge handling system would improve WWTP operations and reduce sludge disposal costs. A sludge bagging unit was installed considering this input. The sludge bagging unit is constructed within the existing WWTP pond. However, due to climatic conditions and its location the sludge dewatering bag is positioned in a location that is not conducive to optimal dewatering and drying. Inside the existing pond soil liner water cannot escape efficiently from the bag and when coupled with cool and wet conditions water is not able to be drawn from the bag causing long dewatering times.

In light of this it is recommended that a new concrete or asphalt slabs that are configured to drain to the flow equalization tanks be installed along with a polymer dosing unit. In this manner dewatering operations will be improved and will create an environment for drying more quickly and creating a dryer sludge product resulting in lower costs for hauling. The dewatering slab will be approximately 105’ in length and 34’ in width and made from asphalt or concrete.

Chapter Four - Effluent Storage and Disposal

Treated effluent from the clarifier currently flows by gravity to the chlorine contact basin and then gravity flows to the effluent pump station. It is then pumped to the effluent storage ponds located off-site approximately 500 feet away from the facility at the local golf course. The current tank provides approximately 120 minutes of contact time.

The existing effluent lift station is equipped with two submersible pumps. It is assumed that they are adequately sized to pump the disinfected effluent to the disposal site. According to the Santec design report, elements of the proposed reuse area and water balances are included in *Talking Rock Ranch, Water Balance Design Memorandum* prepared by Shepard-Wesnitzer Inc.

4.1 Chlorine Disinfection

Disinfection is the most critical component of the wastewater treatment for the protection of public health. Waterborne diseases arise from the contamination of water by dozens of potential pathogens including pathogenic viruses, bacteria or protozoa. Fecal Coliform is generally used as an indicator of the presence of other pathogens. A.A.C. requires the wastewater to be disinfected if it will be recycled for irrigation purposes.

Chlorine is a widely used disinfectant that destroys pathogens. Chlorine disinfection guarantees the District stays within its discharge limitations. The different forms of chlorine have different rates of microbial inactivation. Aqueous chlorine at high pH (>8.5) is mostly in the form of hypochlorite (OCI-) and generally derived from sodium hypochlorite (NaOCl). Sodium hypochlorite is available in liquid form in various concentrations.

Disinfection is a function of contact time and the concentration of the disinfectant. The product of contact time and concentration is known as the dose. The part of the dosed chemical left after satisfaction of the demand and available for disinfection is known as the residual. Regulatory agencies recommend 5 mg/l residual after 90 minutes of modal contact time for chlorine-disinfection system for reclaimed water.

The existing system uses chlorine as a disinfectant, and it is anticipated that the same practice will be continued after improvements. Chlorine will be injected into the flow combination box from the clarifier before discharging into the contact basin, which will provide more than 90 minutes of modal contact time to inactivate pathogens present in the effluent. A standby chlorine supply and automatic devices for switching to metering pumps is currently provided for an uninterrupted chlorine feed system and a chlorine storage site as shown in the site layout plan attached in Appendix D. Upgrades of the disinfection system will depend upon the project costs and determined at final design phase.

Chapter Five - Supervisory Control and Data Acquisition System (SCADA) and Instrumentation

The District's WWTP currently does not operate with a SCADA to monitor and control the operations from a remote location. All control and monitoring functions are done on a local basis. Local control without SCADA will be maintained for the purposes of minimizing construction expenses. All new pumps and blowers will be installed and configured to operate in a hand-off-auto status with the auto setting being controlled locally by a flow or pressure measurement. Any new motors operated by a VFD controller will be configured using local measurements connected into an internal proportional-integral-derivate control algorithm (Proportional-Integral-Derivative Controller (PID) control). Any alarm conditions will be reported to the District using an existing auto-dialer over standard telecommunication channels.

Some additional instrumentation will be added with the WWTP expansion. A new ultrasonic level transmitter will be added to Flow Equalization Tank #2. A new propeller-based flow transmitter will be added to the blower system to monitor the higher flow rates and a new influent flow meter will be added to better monitor influent flow fluctuations.

Chapter Six - Electrical Improvements

The existing WWTP is powered by a main service entrance section (SES) using electrical service provided by Arizona Public Service (APS). The utility service provided is 400 amps, 480/277 volts, three phase, four wire, 60 hertz. In the event of a utility outage emergency power is provided from an existing 150 kilowatt (Kw) standby generator also operating at 480/277 volts, three-phase. Power is switched between the electric utility and the standby generator using a 400-amp rated automatic transfer switch (ATS).

Downstream of the ATS are existing panelboards to protect and distribute the power to both existing and new operating equipment. Panelboards H1A and H1B are both rated for 480/277 volts, 400 amps, three-phase. These two panelboards provide the power to the larger pumps and blower operating within the WWTP. There is also panelboard LP1 that provides 120/208 volt, 200-amps, three-phase power to additional loads requiring the lower voltage. Panelboard LP1 receives power downstream of a 45 kilo-volt ampere (KVA) stepdown transformer. All three panelboards, the ATS and the stepdown transformer are located within the existing treatment building.

A third new two-horsepower flow equalization pump will be added to the existing two pumps, and all three will be controlled by an individual VFD unit. With the use of the VFDs the WWTP can operate under proportional control thereby eliminating the need for the existing recirculating flow control valve at Flow Equalization Tank #1.

A third new 20-horsepower blower will be added to the blower system. All three blower motors will be VFD controlled. Existing interlocks will be modified so that two blowers will operate in parallel with the third unit available as a spare and/or emergency backup.

Chapter Seven - Preliminary Cost Estimates

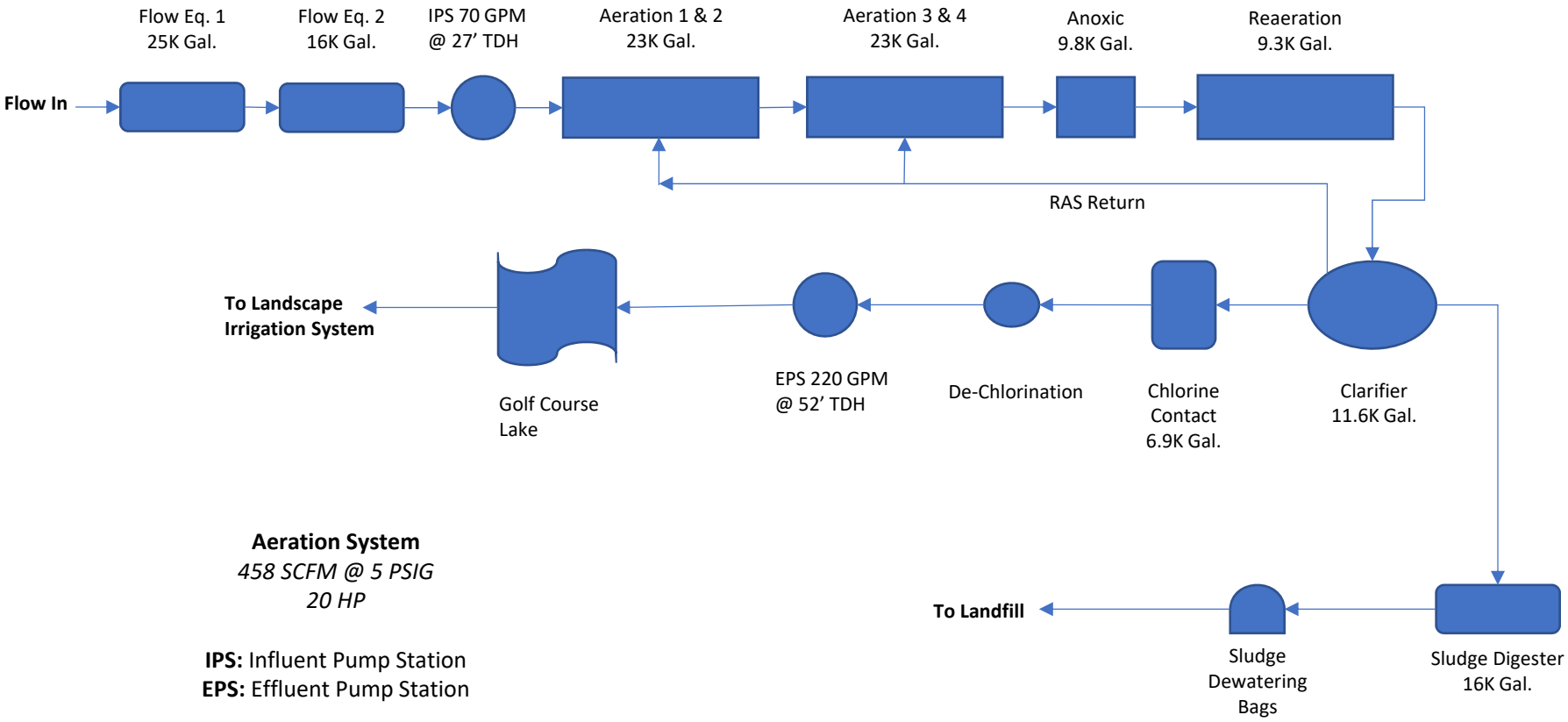
Table 7.1 shows summaries of the preliminary cost estimates for the upgrade of the existing WWTP as identified in previous sections. See Appendix E for detailed cost estimate of project. These preliminary costs do not include O&M costs.

Table 7.1 Summary of Preliminary Cost Estimates to Upgrade the WWTP

Item	Cost
Aeration Equipment	$35,404.09
Flow Equalization Tank Improvements	$36,522.32
Aeration Basin	$10,330.66
Anoxic Basin	$3,398.00
Reaeration/Clarifier	$137,196.91
Dewatering Improvements	$44,521.48
General Requirements	$212,979.94
TOTAL	**$480,353.40**
Alternate A1 – Substitute Asphalt Dewatering Pad for Concrete Dewatering Pad	*+ $19,120.92*
TOTAL (w/ Alternate)	**$499,474.32**

Appendix A - District's WWTP Generalized Process Flow Diagram

ICRSD's WWTP
Generalized Process Flow Diagram



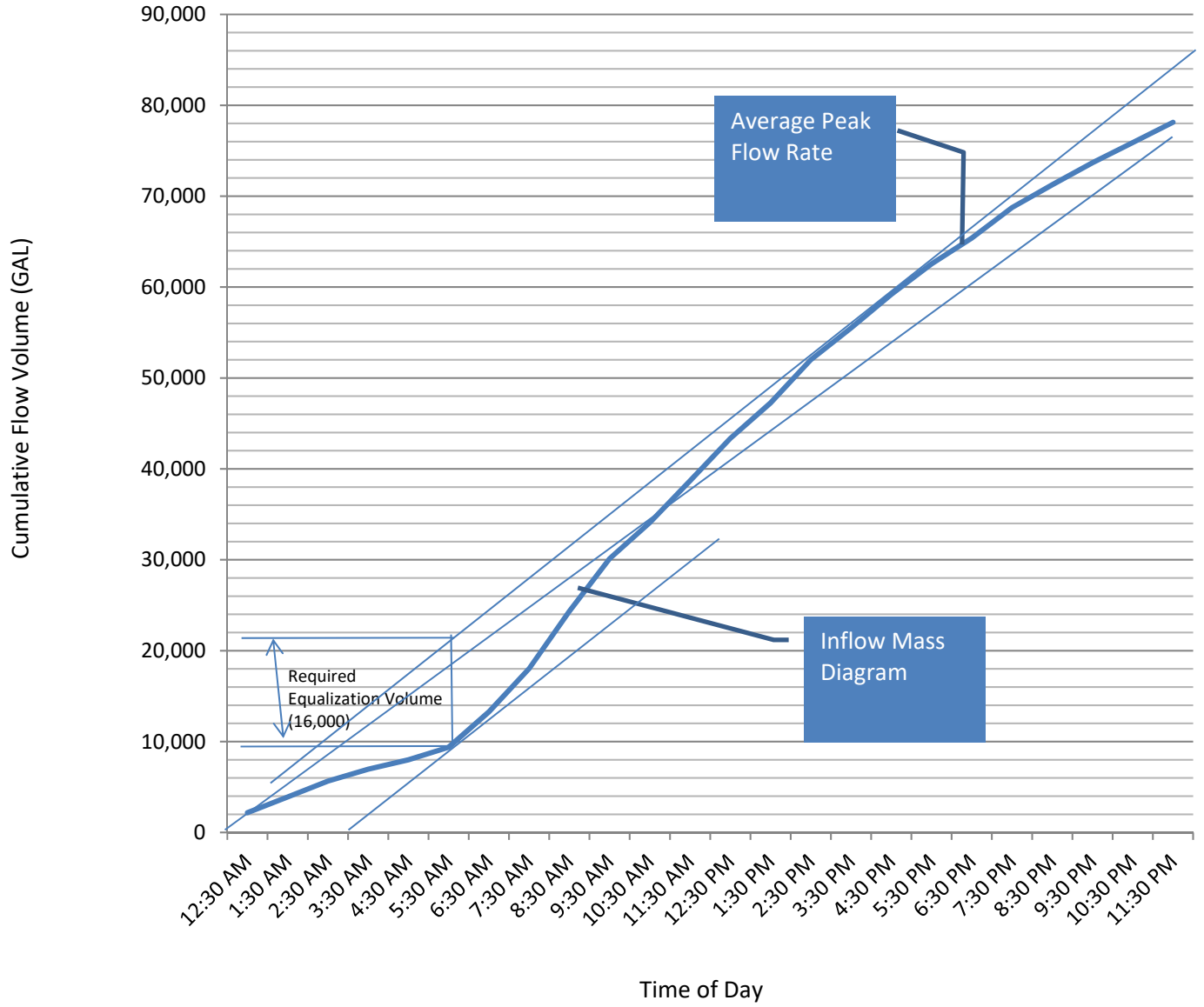
Aeration System
458 SCFM @ 5 PSIG
20 HP

IPS: Influent Pump Station
EPS: Effluent Pump Station

Appendix B - Process Capacity Calculations

Appendix B.1- Flow Mass Diagram (Peak Day Monthly Flow 78,125 GPD)

Flow Mass Diagram (Current Peak Day Flow 78,125 GPD)



Appendix B.2 - Kinetic Reactions (62.5K GPD)

Santec Kinetic Reactions

Project: ICRSD Treatment Facility Prepared: 01/17/2019

Engineer: Civiltec Engineering Engineer CSH

Influent Characteristics

Ave. design flow, MGD 0.0625 43.375 260.25

	Influent		Effluent
	mg/l	lbs/day	mg/l
BOD5	350	182	30
TSS	300	156	30
NH3-N	44	23	2.5
TKN	60	31	10
NO3-N	0.2	0	8
NO2-N	0	0	0
TP	7.7	4	5

	BOD	Flow, GPD
ICRSD	350	62500
	300	0
	10	0
Blended BOD	350	

BOD5, mg/L 350 NH3-N, mg/L 44 TP, mg/L 9

TSS, mg/L 300 TKN, mg/L 60

A) Determine Basin Volume

Basin volume is determined by minimum sludge age required to maintain a healthy population of nitrifying organisms at the minimum wastewater temperature. $SRT_{min}=1/(\mu_{max}*EXP(0.098*(T_{min}-15)))*TPF*SF$, where:

Minimum wastewater temperature, T_{min} =	**17.5**	degrees C
μ_{max} =	1	$days^{-1}$
K_{O2} =	1.3	
Desired Oxygen Concentration	2	mg/l
pH	7.2	
Y	0.2	
μ'_m =	0.774316	$days^{-1}$
k' =	3.87158	$days^{-1}$
k_d =	0.05	$days^{-1}$
Diurnal Peak Factor, DPF =	1	
Monthly Peak Factor, MPF =	1.25	
DPF x MPF = Total Process Peak Factor, TPF =	1.25	
Safety Factor, SF =	2.0	
Minimum Solids Residence Time (Nitrification), θ_{minc} =	1.4	days
Selected Solids Residence Time, θ_c =	**3.5**	days
U=	1.7	$days^{-1}$
K_n =	0.54	mg/l
N=	0.42	mg/l
f'_{VSSo}	0.8	
$V_{aerobic}$ =	0.705	
θ'_c =	4.90	days
f_{VSSo}	0.56	

Use McCarty kinetic equations to calculate basin volume required:

1) Inert solids: $M_{o\text{-}IS} = (M_{o\text{-}TSS})(1 - f_{VSSo}) =$

$M_{o\text{-}IS}$ = 41 lb/day

2) Nonbiodegradable VSS: $M_{o\text{-}NS} = (M_{o\text{-}TSS})(1\text{-}f_{VSSo})(f_{NS}) =$

(lb/day influent TSS)(80% VSS),(40% NBVSS) / (100%) 55 lb/day

Santec Kinetic Reactions

Project: ICRSD Treatment Facility Prepared: 01/17/2019

Engineer: Civiltec Engineering Engineer CSH

3) Heterotropic Kinetic Parameters

Growth Rate, $Y_{true,\ 15}$ =	0.58	lb VSS/lb BOD5
Decay rate, b_{15} =	0.4	d^{-1}
BOD Half-saturation coefficient, K_{BOD} =	20	
Adjusting for temperature, $b_T = b_{15}(1.04)^{(T-15)}$ =	0.441	d^{-1}
Maximum Growth Rate, $\mu_{MAX,h}$ =	4.5	$days^{-1}$
U_{BOD} =	1.26	$days^{-1}$

Estimate Effluent BOD_5:

Soluble BOD, $S_e = [K_{BOD}(1+b_T\ \theta_x)]/[\theta_x(\mu_{MAX,h} - b_T) - 1]$ =	3.88	mg/l
Effluent VSS concentration, f =	0.4	
$BOD_{5,total} = S_e + (TSS \times f)$ =		
$BOD_{5,total}$ =	15.88	mg $BOD_{5,total}$/l
HRT_{BOD} =	0.17	days

Observed yield of heterotrophs: $Y_{OBS\ H} = Y_{true}/(1 + b_T\theta_c)$ = 0.23

Heterotrophic Biomass Produced: $M_H = (M_{o\text{-}BOD} - M_{e\text{-}BOD})(Y_{OBS\text{-}H})$ = 42 lb/day

4) Autotrophic Kinetic Parameters

Growth Rate, $Y_{true,\ 20}$ =	0.2	lb VSS/lb NH3-N
Decay Rate, Kd =	0.05	$days^{-1}$
Ammonia half-saturation coefficient, K_{sn} =	0.54	mg NH_3-N/L
Oxygen half-saturation coefficient, Ko =	1.3	mg DO/L
Maximum growth rate, μ_{max} =	1	$days^{-1}$
Adjusting for temperature, Dissolved Oxygen, pH: $\mu_{max\ T} = \mu_{max}\, e^{0.098(T-15)}$ =	0.774	$days^{-1}$
$b_T = b_{15}(1.04)^{(T-15)}$ =	0.050	$days^{-1}$

Santec Kinetic Reactions

Project: ICRSD Treatment Facility Prepared: 01/17/2019

Engineer: Civiltec Engineering Engineer CSH

		N=	0.42 mg NH_3-N/L
		HRT_N =	0.18 days
	Calculate observed yield of autotrophs:	$Y_{OBS\ A} = Y_{true}/(1 + b_T\theta_c)$ =	0.170
	Nitrogen assimilated by heterotrophic biomass:		
		Nitrogen content of biomass: N_{bm} =	12%
		Nitrogen assimulated: $M_{NA-H} = (M_H)(N_{bm})$ =	5 lb/day
	Nitrogen assimilated by autotrophic biomass (1st iteration):		
		TKN oxidized: $M_{TKN-o} = M_{o-TKN} - M_{NA-H}$ =	26 lb/day
		Autotrophic Biomass Produced: $M_A = (M_{TKN-o})(Y_{OBS\ A})$ =	5 lb/day
		Nitrogen assimilated by autotrophic biomass: $M_{NA-A} = (M_A)(N_{bm})$ =	0.64 lb/day
	Nitrogen assimilated by autotrophic biomass (2nd iteration):		
		TKN oxidized: $M_{TKN-o} = M_{o-TKN} - M_{NA-H} - M_{NA-A}$ =	26 lb/day
		Autotrophic Biomass Produced: $M_A = (M_{TKN-o})(Y_{OBS\ A})$ =	5 lb/day
		Nitrogen assimilated by autotrophic biomass: $M_{NA-A} = (M_A)(N_{bm})$ =	0.58 lb/day
		TKN oxidized: $M_{TKN-o} = M_{o-TKN} - M_{NA-H} - M_{NA-A}$ =	26 lb/day
		Oxidized TKN Concentration = $(M_{TKN-o})(1000)/Q$ =	49 mg/l
5)	**Total Solids Production Rate:**	$P_x = M_{0-IS} + M_{o-NS} + M_H + M_A$ =	144 lb/day
		Overall Yield: $Y_N = P_x/M_{o-BOD}$ =	0.79
		MLVSS: (Mo-NS + MH + MA) / Px =	71.22%
6)	**Aerobic Basin Volume Calculations:**		
		Calculate required volume, based on MLSS concentration of	2000 mg/l
		Required Volume, V = $HRT_{largest}$*(Q)	11561 gallons
		Selected basin volume =	33942 gallons
7)	**Anoxic Basin Volume Calculations:**		
		θ_a =	1.06 days
		θ_{DN} =	0.31 days
		U_{DN}=	0.10 $days^{-1}$
		DO	0.10 mg/l
		U'_{DN}=	0.07 $days^{-1}$
		θ'_{DN} =	0.31 days
		Required Volume, V = θ'_{DN}*(Q)	19153 gallons
		Selected basin volume =	21170 gallons
		R=	4
		R_{flow}=	193 gpm
8)	**Waste Activated Sludge:**	WAS TSS: X_W =	15000 mg/l
		WAS Flow: QW = (((Vr)(Xw)/θc)+(QeXe))/Xw	6200 gal/day
			775.5785 lb/day

B. Determine Actual Oxygen Transfer Rate (AOTR) to be satisfied

1)	**Carbonaceous O2 demand**	oxygen equivalent of cell mass, B =	1.42 lb O2/lb VSS
		Influent BOD_{ULT}:BOD5 RATIO:	1.46
		Effluent BOD_{ULT}:BOD5 RATIO:	1.2
		Carbonaceous oxygen demand design factor, f_{c-o2}:	1.16

Santec Kinetic Reactions

Project:	ICRSD Treatment Facility	Prepared:	01/17/2019
Engineer:	Civiltec Engineering	Engineer	CSH

a) Mass of BOD_5 O_2 demand equivalents entering the system:

lb BOD5/d x Influent BODULT:BOD5 RATIO = 266 lb/day

b) Mass of BOD_5 O_2 demand equivalents leaving the system:

lb BOD5/day x Effluent BODULT:BOD5 RATIO = 8.28 lb/day

c) Mass of O_2 equivalents leaving the system as biomass:

heterotrophic VSS/d + autotrophic VSS/d x lb O2/lb VSS = 67 lb/day

d) Carbonaceous O_2 demand: $_{co2}(a - b - c)$ = 191 lb/day

e) Carbonaceous O_2 demand (selected): 191 lb/day

2) Nitrification oxygen demand:

Nitrification oxygen equivalent: 4.57
Denitrification oxygen credit: 2.86

Nitrification oxygen demand: lb O2/lb NH3-N x lb TKN oxidized/day 117 lb/day

3) Denitrification oxygen credit:

Denitrification oxygen credit:
lb O2/lb NO3-N x lb TKN oxidized/d - lb effluent NO3-N/day = 22 lb/day

4) Net oxygen demand, AOR:

lb Carb. O2/d + lb Nit. O2/d - lb Denit. Credit/day = 286 lb/day

Appendix B.3 - Aeration Requirements (62.5K GPD)

AERATION SYSTEM DESIGN FORM (62.5K GPD)

PROJECT NAME ICRSD WASTEWATER TREATMENT PLANT
JOB NUMBER: 2018732

	Influent mg/l	lbs/day	Effluent mg/l
BOD5	350	182.4375	30
TSS	300	156.375	30
NH3-N	44	22.935	2.5
TKN	60	31.275	10
NO3-N	0	0.10425	8
NO2-N	0	0	0
TP	8	4.013625	5

DESIGN FLOW

Annual Average =	**0.06**	MGD-AADF	use ADF
Max Month	0.08	MGD-MMADF	
Max Day	0.08	MGD-MDADF	
Peak Hour	0.12	MGD-PHF	

Influent BOD_5	350
Influent bCOD/BOD5	**1.46**
Effluent bCOD/BOD5	**1.2**

INFLUENT CBOD5 =	511	mg/L	No deduction for EQ or Screenings as indicated in DH report
EFFLUENT CBOD5 =	36	mg/L	Permit

INFLUENT TKN =	**60**	mg/L	Influent (average, assumed)
EFFLUENT TKN =	**10**	mg/L	

SLUDGE PRODUCTION:

Sludge Production = [CBOD5(in) - CBOD5(out)] * Design Flow * 8.34 * Yield

Yield = (mass of solids per mass of CBOD5 removed)

Aerobic SRT =	**3.45**	days	at AADF
Yield =	**0.79**	lbs TSS / lb CBOD5 removed	at AADF
Sludge production	**195.3**	lbs/day	
Nitrogen removed in the sludge	**5.0%**	percent (assume)	MOP 8 5-9%, 5% often used in design
Nitrogen removed in the sludge	**9.8**	lbs/day	18.731914 mg/L

OXYGEN REQUIREMENTS:

Mass of CBOD5 = [CBOD5(in) - CBOD5(out)] * Design Flow * 8.34

Mass of CBOD5 =	**247.6**	lbs/day	No deduction for Biomass Leaving the system and BOD5 leaving the system
CBOD5 Oxygen Requirements =	**1.42**	lb O2 per lb of CBOD5	
CBOD5 Oxygen Requirements =	**351.6**	lbs/day	

Mass of TKN = [TKN(in) - TKN(out)] * Design Flow * 8.34 - N in Sludge

Mass of TKN =	**16.3**	lbs/day	
TKN Oxygen Requirements =	**4.57**	lb O2 per lb of TKN	(MOP 8)
TKN Oxygen Requirements =	**74.5**	lbs/day	

Denite Credit = 2.86 lbs per lb of NO3- reduced (MOP 8)

lb of NO3- reduced =	**2**	lbs/day	at AADF
Denite Credit =	**5.7**	lbs/day	

WAS Credit = 1.42 lbs per lb of WAS removed

lb VSS/lb BOD5r	0.5		Bio WAS yield*%VS WAS; 0.65 *0.657
	247.6		Mass BODr
	128.3		lb VSS/lb BOD5r
WAS Credit 1.42	**182.2**	lbs/day	

Total Oxygen Requirements

	Avg Day		
CBOD5	351.6		
TKN	74.5	426.1	lb/day
Denite Credit	5.7		
WAS	182.2		
Total AOR	**286.0**	lb/day	Based on Process Design Calcs Spreadsheet. The Lower value controls

AOR / SOR FOR Fine Bubble=

alpha = Kla for wastewater / Kla for clean water

alpha = 0.70 for coarse bubble
0.65 for medium bubble
0.50 for fine bubble
0.80 for LSSA

beta = C*(inf) for wastewater / C*(inf) for clean water

beta = 0.950 SRT = 5 days
0.960 SRT = 10 days
0.965 SRT = 15 days
0.970 SRT = 20 days

C = Operating D.O. Concentration
C = **2.0** mg/L

tau = [C*(s) @ operating temperature] / [C*(s) @ 20C]

Note standard values from Sheet 2

tau (15) = 10.08 mg/L / 9.09 mg/L

tau (15) = **1.11**

omega = atmospheric pressure correction factor

omega = (barometric pressure) / (standard pressure)

barometric pressure (interpolated from Sheet 4)

elevation (MSL)	pressure (psi)
2880	13.25
2882	13.24
2884	13.24
2886	13.24
2888	13.24
2890	13.24
2892	13.24
2894	13.24

Site Elevation = 5000 MSL

omega = 12.220 psi / 14.7 psi

Omega = 0.83

C*(s20) = D.O. concentration at saturation @ 20C and 100% RH

C*(20) = C*(s20) * [P(b) - P(vt) + 0.433 d(e)] / [P(s) - P(vt)]

C*(20) = 9.90 mg/L
(Reference Figure 5 - EPA Summary Report Fine Pore (Fine Bubble) Aeration Systems)

Theta = temperature correction coefficient
Theta = 1.024

T = liquid temperature

T = 17.5 C

Summary for AOR/SOR calculation:

***alpha* =**	**0.700**	For Coarse Bubble
***beta* =**	**0.960**	
***Tau* =**	1.109	
***Omega* =**	0.831	
***C*20* =**	9.900	
***C* =**	2.000 mg/L	
***Temp* =**	18 C	
***theta* =**	1.024	

AOR / SOR = 0.451 20 C

SOR = 635 lb/day

Diffuser Transfer Efficiency

% per foot	**1.00%**	Assume
SWD	**11.25**	
Diffuser Submergence	**10.75**	
Course Bubble, SOTE	10.8%	percent

Field Oxygen Transfer Efficieny = SOTE * AOR / SOR

F.O.T.E. =

	20C
Bubble	4.84%

DETERMINE AIR FLOW REQUIREMENTS

Q(s) = SOR / [0.075 * 0.232 * 1440 * SOTE]

	Course Bubble
Q(s) =	**523 SCFM**

Blower Inlet Flow Rate
Q(a) = Q(s) * 0.0276 * T(1) / [P(1) - ((Rh/100) * P(vt))]

T(1) = inlet air temperature in Rankin

Temperature =	110	F
T(1) =	570	R
	12.220	
P(1) =	12.020	psi
P(vt) =	0.74	psi
Rh	16.48	%

	20C
Q(a) =	**692** ICFM

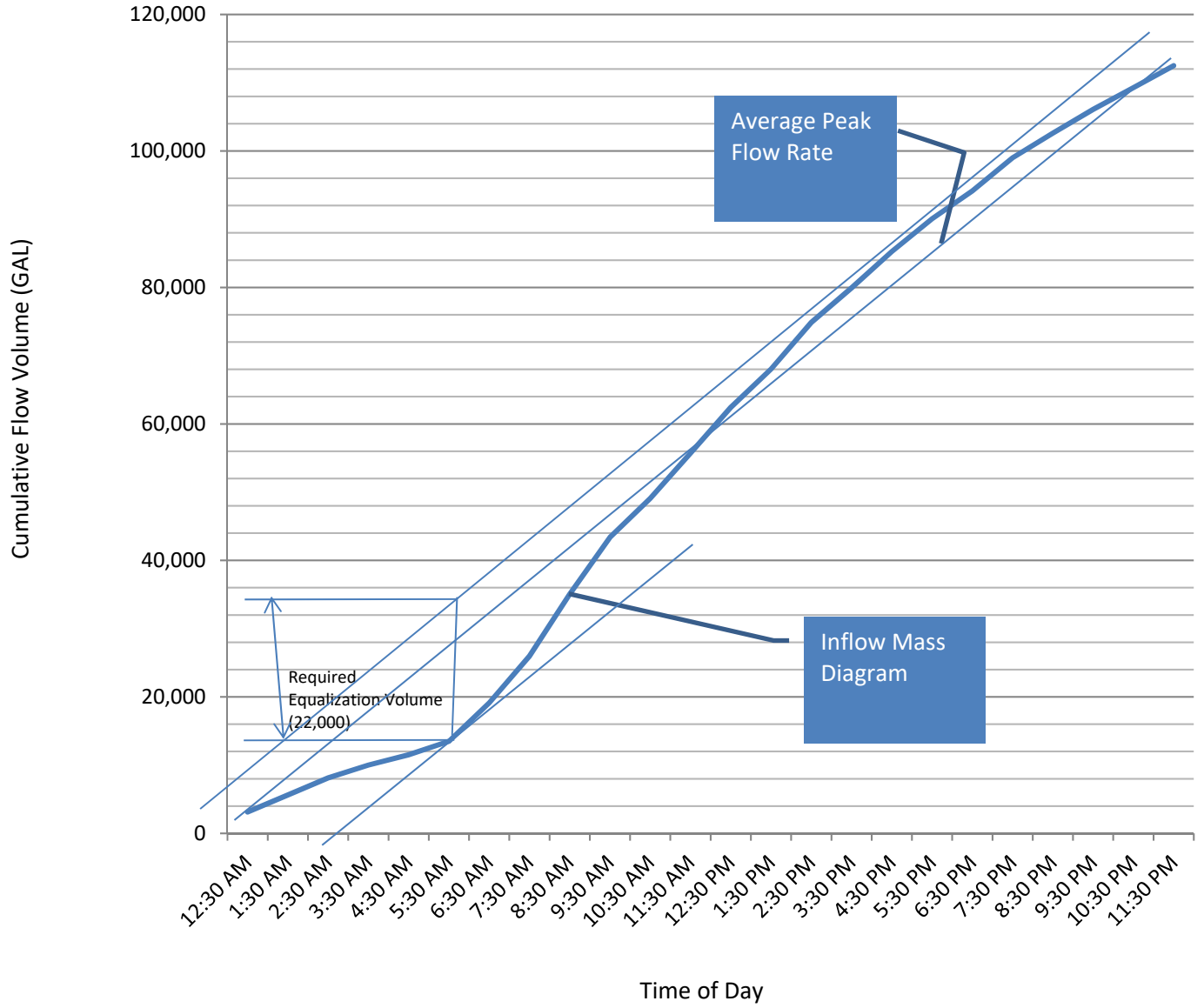
Check mixing requirement:

Mixing rate:	**30**	SCFM/1000 ft3
Volume of Nitrification Tanks:	0.02117	MG
Volume of Nitrification Tanks:	2830	ft3
SCFM required:	85	SCFM
Digester Air	52	SCFM
Airlift Supernatent Recycle	0.04	SCFM
Airlift RAS	39	SCFM
Airlift Mixed Liquor	13	SCFM
Airlift Skimmer Waste	9	SCFM
Total Air Requirement	721	
Blowers		
Number	2.0	
Capacity, each	458.0	SCFM
Capacity, total	916	SCFM

Appendix C - Process Capacity Calculations – 90K GPD

Appendix C.1 - Flow Mass Diagram (Peak Day Monthly Flow 112,500 GPD)

Flow Mass Diagram (Future Peak Day Flow 112,500 GPD)



Appendix C.2 - Kinetic Reactions (90K GPD)

Santec Kinetic Reactions

Project: ICRSD Treatment Facility Prepared: 01/23/2019
Engineer: Civiltec Engineering Engineer CSH

Influent Characteristics

Ave. design flow, MGD 0.0900 62.46 374.76 78.08

	Influent		Effluent
	mg/l	lbs/day	mg/l
BOD5	350	263	30
TSS	300	225	30
NH3-N	44	33	2.5
TKN	60	45	10
NO3-N	0.2	0	8
NO2-N	0	0	0
TP	7.7	6	5

	BOD	Flow, GPD
ICRSD	350	90000
	300	0
	10	0
Blended BOD	350	

BOD5, mg/L 350 NH3-N, mg/L 44 TP, mg/L 9
TSS, mg/L 300 TKN, mg/L 60

A) Determine Basin Volume

Basin volume is determined by minimum sludge age required to maintain a healthy population of nitrifying organisms at the minimum wastewater temperature. $SRT_{min}=1/(\mu_{max}*EXP(0.098*(T_{min}-15)))*TPF*SF$, where:

Minimum wastewater temperature, T_{min} =	**17.5**	degrees C
μ_{max} =	1	$days^{-1}$
K_{O2} =	1.3	
Desired Oxygen Concentration	2	mg/l
pH	7.2	
Y	0.2	
μ'_m =	0.774316	$days^{-1}$
k' =	3.87158	$days^{-1}$
k_d =	0.05	$days^{-1}$
Diurnal Peak Factor, DPF =	1	
Monthly Peak Factor, MPF =	1.25	
DPF x MPF = Total Process Peak Factor, TPF =	1.25	
Safety Factor, SF =	2.0	
Minimum Solids Residence Time (Nitrification), θ_{minc} =	1.4	days
Selected Solids Residence Time, θ_c =	**3.5**	days
U=	1.7	$days^{-1}$
K_n =	0.54	mg/l
N=	0.42	mg/l
f'_{VSSo}	0.8	
$V_{aerobic}$ =	0.705	
θ'_c =	4.90	days
f_{VSSo}	0.56	

Use McCarty kinetic equations to calculate basin volume required:

1) Inert solids: $M_{o-IS} = (M_{o-TSS})(1 - f_{VSSo}) =$

M_{o-IS} = 60 lb/day

2) Nonbiodegradable VSS: $M_{o-NS} = (M_{o-TSS})(1-f_{VSSo})(f_{NS}) =$

(lb/day influent TSS)(80% VSS),(40% NBVSS) / (100%) 80 lb/day

Santec Kinetic Reactions

Project: ICRSD Treatment Facility Prepared: 01/23/2019

Engineer: Civiltec Engineering Engineer CSH

3) Heterotropic Kinetic Parameters

Growth Rate, $Y_{true,\ 15}$ =	0.58	lb VSS/lb BOD5
Decay rate, b_{15} =	0.4	d^{-1}
BOD Half-saturation coefficient, K_{BOD} =	20	
Adjusting for temperature, $b_T = b_{15}(1.04)^{(T-15)}$ =	0.441	d^{-1}
Maximum Growth Rate, $\mu_{MAX,h}$ =	4.5	$days^{-1}$
U_{BOD} =	1.26	$days^{-1}$

Estimate Effluent BOD_5:

Soluble BOD, $S_e = [K_{BOD}(1+b_T\ \theta_x)]/[\theta_x(\mu_{MAX,h} - b_T) - 1]$ =	3.88	mg/l
Effluent VSS concentration, f =	0.4	
$BOD_{5,total} = S_e + (TSS \times f)$ =		
$BOD_{5,total}$ =	15.88	mg $BOD_{5,total}$/l
HRT_{BOD} =	0.17	days

Observed yield of heterotrophs: $Y_{OBS\ H} = Y_{true}/(1 + b_T\theta_c)$ = 0.23

Heterotrophic Biomass Produced: $M_H = (M_{o\text{-}BOD} - M_{e\text{-}BOD})(Y_{OBS\text{-}H})$ = 60 lb/day

4) Autotrophic Kinetic Parameters

Growth Rate, $Y_{true,\ 20}$ =	0.2	lb VSS/lb NH3-N
Decay Rate, Kd =	0.05	$days^{-1}$
Ammonia half-saturation coefficient, K_{sn} =	0.54	mg NH_3-N/L
Oxygen half-saturation coefficient, Ko =	1.3	mg DO/L
Maximum growth rate, μ_{max} =	1	$days^{-1}$
Adjusting for temperature, Dissolved Oxygen, pH: $\mu_{max\ T} = \mu_{max}\, e^{0.098(T-15)}$ =	0.774	$days^{-1}$
$b_T = b_{15}(1.04)^{(T-15)}$ =	0.050	$days^{-1}$

Santec Kinetic Reactions

Project: ICRSD Treatment Facility Prepared: 01/23/2019

Engineer: Civiltec Engineering Engineer CSH

		N=	0.42 mg NH_3-N/L
		HRT_N =	0.18 days
	Calculate observed yield of autotrophs:	$Y_{OBS\ A} = Y_{true}/(1 + b_T\theta_c)$ =	0.170
	Nitrogen assimilated by heterotrophic biomass:		
		Nitrogen content of biomass: N_{bm} =	12%
		Nitrogen assimulated: $M_{NA-H} = (M_H)(N_{bm})$ =	7 lb/day
	Nitrogen assimilated by autotrophic biomass (1st iteration):		
		TKN oxidized: $M_{TKN-o} = M_{o-TKN} - M_{NA-H}$ =	38 lb/day
		Autotrophic Biomass Produced: $M_A = (M_{TKN-o})(Y_{OBS\ A})$ =	8 lb/day
		Nitrogen assimilated by autotrophic biomass: $M_{NA-A} = (M_A)(N_{bm})$ =	0.92 lb/day
	Nitrogen assimilated by autotrophic biomass (2nd iteration):		
		TKN oxidized: $M_{TKN-o} = M_{o-TKN} - M_{NA-H} - M_{NA-A}$ =	37 lb/day
		Autotrophic Biomass Produced: $M_A = (M_{TKN-o})(Y_{OBS\ A})$ =	8 lb/day
		Nitrogen assimilated by autotrophic biomass: $M_{NA-A} = (M_A)(N_{bm})$ =	1.20 lb/day
		TKN oxidized: $M_{TKN-o} = M_{o-TKN} - M_{NA-H} - M_{NA-A}$ =	37 lb/day
		Oxidized TKN Concentration = $(M_{TKN-o})(1000)/Q$ =	49 mg/l
5)	**Total Solids Production Rate:**	$P_x = M_{0-IS} + M_{o-NS} + M_H + M_A$ =	207 lb/day
		Overall Yield: $Y_N = P_x/M_{o-BOD}$ =	0.79
		MLVSS: (Mo-NS + MH + MA) / Px =	71.22%
6)	**Aerobic Basin Volume Calculations:**		
		Calculate required volume, based on MLSS concentration of	2000 mg/l
		Required Volume, V = $HRT_{largest}$*(Q)	16648 gallons
		Selected basin volume =	22628 gallons
7)	**Anoxic Basin Volume Calculations:**		
		θ_a =	1.06 days
		θ_{DN} =	0.31 days
		U_{DN}=	0.10 $days^{-1}$
		DO	0.10 mg/l
		U'_{DN}=	0.07 $days^{-1}$
		θ'_{DN} =	0.31 days
		Required Volume, V = θ'_{DN}*(Q)	27580 gallons
		Selected basin volume =	32484 gallons
		R=	4
		R_{flow}=	278 gpm
8)	**Waste Activated Sludge:**	WAS TSS: X_W =	15000 mg/l
		WAS Flow: QW = (((Vr)(Xw)/θc)+(QeXe))/Xw	9507 gal/day
			1189.294 lb/day

B. Determine Actual Oxygen Transfer Rate (AOTR) to be satisfied

1)	**Carbonaceous O2 demand**	oxygen equivalent of cell mass, B =	1.42 lb O2/lb VSS
		Influent BOD_{ULT}:BOD5 RATIO:	1.46
		Effluent BOD_{ULT}:BOD5 RATIO:	1.2
		Carbonaceous oxygen demand design factor, f_{c-o2}:	1.16

Santec Kinetic Reactions

Project:	ICRSD Treatment Facility	Prepared:	01/23/2019
Engineer:	Civiltec Engineering	Engineer	CSH

a) Mass of BOD_5 O_2 demand equivalents entering the system:

lb BOD5/d x Influent BODULT:BOD5 RATIO = 384 lb/day

b) Mass of BOD_5 O_2 demand equivalents leaving the system:

lb BOD5/day x Effluent BODULT:BOD5 RATIO = 11.92 lb/day

c) Mass of O_2 equivalents leaving the system as biomass:

heterotrophic VSS/d + autotrophic VSS/d x lb O2/lb VSS = 97 lb/day

d) Carbonaceous O_2 demand: $_{co2}(a - b - c)$ = 275 lb/day

e) Carbonaceous O_2 demand (selected): 275 lb/day

2) Nitrification oxygen demand:

Nitrification oxygen equivalent: 4.57
Denitrification oxygen credit: 2.86

Nitrification oxygen demand: lb O2/lb NH3-N x lb TKN oxidized/day 168 lb/day

3) Denitrification oxygen credit:

Denitrification oxygen credit:
lb O2/lb NO3-N x lb TKN oxidized/d - lb effluent NO3-N/day = 32 lb/day

4) Net oxygen demand, AOR:

lb Carb. O2/d + lb Nit. O2/d - lb Denit. Credit/day = 412 lb/day

Appendix C.3 - Aeration Requirements (90K GPD)

AERATION SYSTEM DESIGN FORM (90K GPD)

PROJECT NAME ICRSD WASTEWATER TREATMENT PLANT
JOB NUMBER: 2018732

	Influent mg/l	lbs/day	Effluent mg/l
BOD5	350	262.71	30
TSS	300	225.18	30
NH3-N	44	33.0264	2.5
TKN	60	45.036	10
NO3-N	0	0.15012	8
NO2-N	0	0	0
TP	8	5.77962	5

DESIGN FLOW

Annual Average =	**0.09**	MGD-AADF	use ADF
Max Month	0.11	MGD-MMADF	
Max Day	0.11	MGD-MDADF	
Peak Hour	0.11	MGD-PHF	

Influent BOD_5	350	
Influent bCOD/BOD5	**1.46**	
Effluent bCOD/BOD5	**1.2**	
INFLUENT CBOD5 =	511 mg/L	No deduction for EQ or Screenings as indicated in DH report
EFFLUENT CBOD5 =	36 mg/L	Permit
INFLUENT TKN =	**60** mg/L	Influent (average, assumed)
EFFLUENT TKN =	**10** mg/L	

SLUDGE PRODUCTION:

Sludge Production = [CBOD5(in) - CBOD5(out)] * Design Flow * 8.34 * Yield

Yield = (mass of solids per mass of CBOD5 removed)

Aerobic SRT =	**3.45**	days	at AADF
Yield =	**0.79**	lbs TSS / lb CBOD5 removed	at AADF
Sludge production	**281.2**	lbs/day	
Nitrogen removed in the sludge	**5.0%**	percent (assume)	MOP 8 5-9%, 5% often used in design
Nitrogen removed in the sludge	**14.1**	lbs/day	18.731914 mg/L

OXYGEN REQUIREMENTS:

Mass of CBOD5 = [CBOD5(in) - CBOD5(out)] * Design Flow * 8.34

Mass of CBOD5 =	**356.5** lbs/day	No deduction for Biomass Leaving the system and BOD5 leaving the system
CBOD5 Oxygen Requirements =	**1.42** lb O2 per lb of CBOD5	
CBOD5 Oxygen Requirements =	**506.3** lbs/day	

Mass of TKN = [TKN(in) - TKN(out)] * Design Flow * 8.34 - N in Sludge

Mass of TKN =	**23.5** lbs/day	
TKN Oxygen Requirements =	**4.57** lb O2 per lb of TKN	(MOP 8)
TKN Oxygen Requirements =	**107.3** lbs/day	

Denite Credit = 2.86 lbs per lb of NO3- reduced (MOP 8)

lb of NO3- reduced =	**3** lbs/day	at AADF
Denite Credit =	**8.2** lbs/day	

WAS Credit = 1.42 lbs per lb of WAS removed

lb VSS/lb BOD5r		0.5	Bio WAS yield*%VS WAS; 0.65 *0.657
		356.5	Mass BODr
		184.8	lb VSS/lb BOD5r
WAS Credit	1.42	**262.4**	lbs/day

Total Oxygen Requirements

	Avg Day		
CBOD5	506.3		
TKN	107.3	613.5	lb/day
Denite Credit	8.2		
WAS	262.4		
Total AOR	**411.9**	lb/day	Based on Process Design Calcs Spreadsheet. The reasonable value controls

AOR / SOR FOR Fine Bubble=

alpha = Kla for wastewater / Kla for clean water

alpha = 0.70 for coarse bubble
0.65 for medium bubble
0.50 for fine bubble
0.80 for LSSA

beta = C*(inf) for wastewater / C*(inf) for clean water

beta = 0.950 SRT = 5 days
0.960 SRT = 10 days
0.965 SRT = 15 days
0.970 SRT = 20 days

C = Operating D.O. Concentration
C = **2.0** mg/L

tau = [C*(s) @ operating temperature] / [C*(s) @ 20C]

Note standard values from Sheet 2

tau (15) = 10.08 mg/L / 9.09 mg/L

tau (15) = **1.11**

omega = atmospheric pressure correction factor

omega = (barometric pressure) / (standard pressure)

barometric pressure (interpolated from Sheet 4)

elevation (MSL)	pressure (psi)
2880	13.25
2882	13.24
2884	13.24
2886	13.24
2888	13.24
2890	13.24
2892	13.24
2894	13.24

Site Elevation = 5000 MSL

omega = 12.220 psi / 14.7 psi

Omega = 0.83

C*(s20) = D.O. concentration at saturation @ 20C and 100% RH

C*(20) = C*(s20) * [P(b) - P(vt) + 0.433 d(e)] / [P(s) - P(vt)]

C*(20) = 9.90 mg/L
(Reference Figure 5 - EPA Summary Report Fine Pore (Fine Bubble) Aeration Systems)

Theta = temperature correction coefficient
Theta = 1.024

T = liquid temperature

T = 17.5 C

Summary for AOR/SOR calculation:

***alpha* =**	**0.700**	For Coarse Bubble
***beta* =**	**0.960**	
***Tau* =**	1.109	
***Omega* =**	0.831	
***C*20* =**	9.900	
***C* =**	2.000 mg/L	
***Temp* =**	18 C	
***theta* =**	1.024	

AOR / SOR = 0.451 20 C

SOR = 914 lb/day

Diffuser Transfer Efficiency

% per foot	**1.00%**	Assume
SWD	**11.25**	
Diffuser Submergence	**10.75**	
Course Bubble, SOTE	10.8%	percent

Field Oxygen Transfer Efficieny = SOTE * AOR / SOR

F.O.T.E. =

	20C
Bubble	4.84%

DETERMINE AIR FLOW REQUIREMENTS

Q(s) = SOR / [0.075 * 0.232 * 1440 * SOTE]

	Course Bubble
Q(s) =	**753 SCFM**

Blower Inlet Flow Rate
Q(a) = Q(s) * 0.0276 * T(1) / [P(1) - ((Rh/100) * P(vt))]

T(1) = inlet air temperature in Rankin

Temperature =	110	F
T(1) =	570	R
	12.220	
P(1) =	12.020	psi
P(vt) =	0.74	psi
Rh	16.48	%

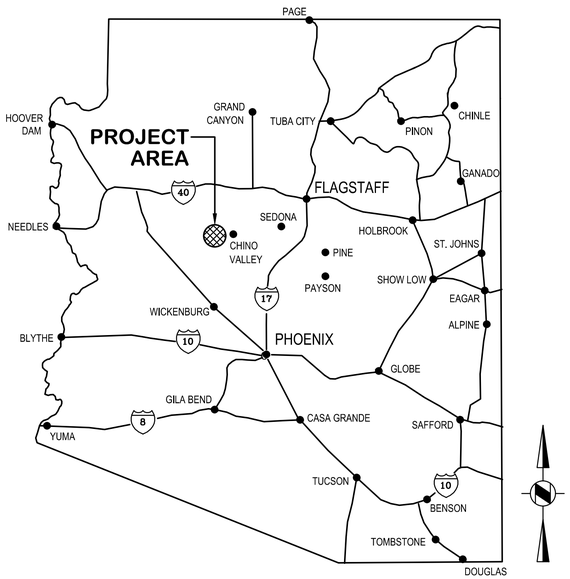
	20C
Q(a) =	**996** ICFM

Check mixing requirement:

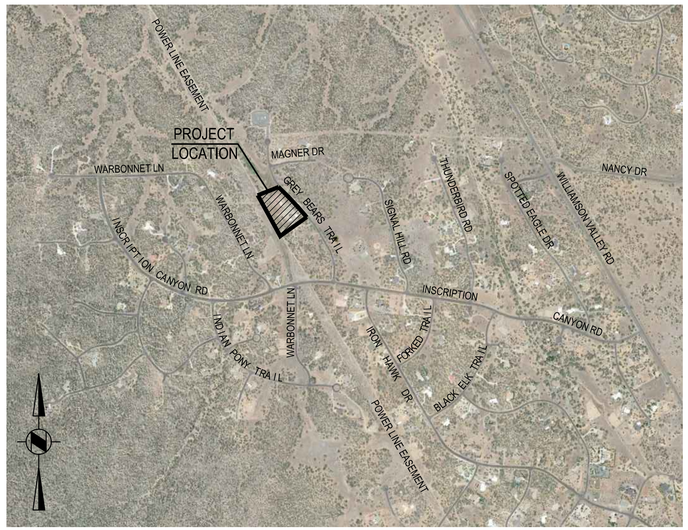
Mixing rate:	**30**	SCFM/1000 ft3
Volume of Nitrification Tanks:	0.032484	MG
Volume of Nitrification Tanks:	4342	ft3
SCFM required:	130	SCFM
Digester Air	68	SCFM
Airlift Supernatent Recycle	0.05	SCFM
Airlift RAS	56	SCFM
Airlift Mixed Liquor	13	SCFM
Airlift Skimmer Waste	9	SCFM
Total Air Requirement	1,029	SCFM
Blowers		
Number	2.0	
Capacity, each	458.0	SCFM
Capacity, total	916	SCFM

Appendix D - ISCRD WWTP Site Layout

ICR SANITARY DISTRICT
WWTP IMPROVEMENTS AND UPGRADES
2019



LOCATION MAP
NOT TO SCALE



VICINITY MAP
NOT TO SCALE

OWNER

INSCRIPTION CANYON RANCH SANITARY DISTRICT

PO BOX 215
CHINO VALLEY, AZ 86326
PHONE - (928) 237-9347

BOARD OF DIRECTORS

DAVE BARRERIA - CHAIRPERSON

WILLIAM DICKRELL - DIRECTOR

AL POSKANZER - DIRECTOR

DISTRICT MANAGER

BOB BUSCH

PHONE - (928) 713-0548

BENCHMARK: **ELEV. 5012.45 (DATUM: NAVD88)**

TOP SOUTHEASTERLY CORNER OF EXISTING SBR BASIN

NORTHERN: 1363407.52

EASTING: 501387.44

No.	DATE:	REVISION:	APP.
3			
2			
1			

NOTICE TO CONTRACTORS:
THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING "BLUE STAKE" AT 1-800-STAKE IT (1-800-782-5348) TWO WORKING DAYS PRIOR TO ANY EXCAVATION OR CONSTRUCTION.

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING ITEMS ARE NOT TO SCALE

Call at least two full working days before you begin excavation.
ARIZONA811
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
Maricopa County: (602) 659-7500

2054 N. Willow Creek Rd.
Prescott, AZ 86301
Phone: 928.771.2376
Fax: 928.771.2377
Web: www.civiltec.com

CIVILTEC engineering inc.
Civil, Water, Wastewater, Drainage, and Transportation Engineering Construction Management • Surveying
California • Arizona

INSCRIPTION CANYON RANCH SANITARY DISTRICT
WWTP IMPROVEMENTS & UPGRADE
COVER SHEET

DE: XX	CH: XX	DR: XX	JN: 2018732.00	SHEET OF XX

X:\2018\2018732.00\CRSD-WWTP Improvements & Upgrade\DWG\Sheets\Improvement Plans\2018732.00-SHT-01-COVR.dwg | 1/31/2019 11:26 AM

GENERAL NOTES:

1. ALL SITE WORK SHALL CONFORM TO THE SPECIFICATIONS AND DETAILS BY THE JHA (JURISDICTION HAVING AUTHORITY) UNLESS SPECIFICALLY STATED OTHERWISE IN THESE PLANS.
2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS PRIOR TO BEGINNING CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF EXISTING PERMITS, RENEWAL OF LAPSED PERMITS, AND OBTAINING ANY NEW PERMITS, INCLUDING, BUT NOT LIMITED TO A DUST CONTROL PERMIT, AND TRAFFIC CONTROL PERMITS AS REQUIRED BY THE JHA.
3. THE CONTRACTOR IS RESPONSIBLE FOR MAKING ARRANGEMENTS FOR INSPECTION AND TESTING.
4. THE CONTRACTOR SHALL NOTIFY THE JHA'S INSPECTION DEPARTMENT 24 HOURS PRIOR TO CONSTRUCTION. CONSTRUCTION CONCEALED WITHOUT THE REQUIRED INSPECTION SHALL BE SUBJECT TO EXPOSURE AT THE CONTRACTOR'S EXPENSE.
5. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. CALL BLUE STAKE AT 1-800-782-5348 AT LEAST 48 HOURS BEFORE ANY CONSTRUCTION BEGINS.
6. THE CONTRACTOR SHALL FOLLOW GUIDELINES AND REGULATIONS SET FORTH BY O.S.H.A. SUNRISE ENGINEERING, INC. WILL NOT BE RESPONSIBLE FOR JOB-SITE SAFETY PROCEDURES OR CONDITIONS.
7. THE CONTRACTOR IS RESPONSIBLE FOR HIS OWN TAKEOFF QUANTITIES. QUANTITIES IF SHOWN HEREON ARE ESTIMATES ONLY AND AS SUCH ARE NOT TO BE USED FOR BID PURPOSES.
8. THE CONTRACTOR IS RESPONSIBLE FOR THE NOTIFICATION OF THE PROPER AUTHORITY(S) IF THERE ARE OBSTRUCTIONS TO PROPOSED IMPROVEMENTS AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY EXISTING ITEM REMOVED TO FACILITATE CONSTRUCTION SHALL BE REPLACED IN THE SAME OR BETTER CONDITION AT THE CONTRACTOR'S EXPENSE.
9. THE CONTRACTOR SHALL COORDINATE WITH UTILITY COMPANIES FOR LOCATION OF SERVICE AND/OR RELOCATION OF UTILITIES IN CONFLICT WITH PROPOSED CONSTRUCTION. THE ENGINEER SHALL NOT BE RESPONSIBLE FOR COORDINATING THE RELOCATION OF UTILITIES, POWER POLES, ETC.
10. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REMOVE AND SAFELY DISPOSE OF ALL REMOVAL MATERIAL AND DEBRIS DEEMED UNSALVAGEABLE BY THE ENGINEER PER THE PROVISIONS SET FORTH IN THE SPECIFICATIONS.
11. THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL ON AND AROUND THE CONSTRUCTION SITE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS.
12. THE CONTRACTOR SHALL PROVIDE ADEQUATE MEANS FOR CLEANING TRUCKS AND/OR OTHER EQUIPMENT OF MUD PRIOR TO ENTERING PUBLIC STREETS, AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO CLEAN STREETS, AND TAKE WHATEVER MEASURES ARE NECESSARY TO INSURE THAT ALL ROADS ARE MAINTAINED IN A CLEAN, MUD AND DUST FREE CONDITION AT ALL TIMES. NO WORK WILL BE CONSIDERED COMPLETE UNTIL ALL PAVEMENTS HAVE BEEN SWEPT CLEAN OF DIRT AND DEBRIS.
13. PRIOR TO MOVING OR DESTROYING PROTECTED NATIVE PLANT SPECIES, THE CONTRACTOR SHALL FILE A FORMAL NOTICE OF INTENT WITH THE ARIZONA DEPARTMENT OF AGRICULTURE NATIVE PLANTS (602) 542-3292.
14. A THOROUGH ATTEMPT HAS BEEN MADE TO SHOW THE LOCATIONS OF ALL UNDERGROUND OBSTRUCTIONS AND UTILITY LINES IN THE WORK AREA. HOWEVER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTIONS AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION AND SHALL DETERMINE THE EXACT LOCATION OF UTILITIES IN ADVANCE OF TRENCHING. THE ENGINEER WILL NOT GUARANTEE ANY ELEVATIONS AT LOCATIONS OF THE EXISTING UNDERGROUND UTILITIES SHOWN ON THESE PLANS.
15. THE CONTRACTOR SHALL PROVIDE A LICENSED SURVEYOR FOR THE SURVEYING/CONSTRUCTION STAKING OF ALIGNMENT AND GRADE FOR EACH MAIN AND/OR FACILITY AS SHOWN ON THE PLANS.
16. EXACT POINT OF MATCHING, TERMINATION AND OVERLAY, IF NECESSARY, MAY BE DETERMINED IN THE FIELD BY THE ENGINEER OF RECORD OR THE RESIDENT ENGINEER OVERSEEING THE PROJECT CONSTRUCTION.
17. ANY AMBIGUITIES OR DEFICIENCIES DISCOVERED ON THESE PLANS ARE TO BE RESOLVED BY SUNRISE ENGINEERING OR ITS APPOINTED REPRESENTATIVE. ANY MODIFICATIONS TO THESE PLANS MADE BY ANYONE OTHER THAN SUNRISE ENGINEERING OR ITS APPOINTED REPRESENTATIVE IS SOLELY RESPONSIBLE FOR THOSE MODIFICATIONS.
18. THE CONTRACTOR SHALL RE-GRADE ALL EARTHEN DRIVEWAYS DISTURBED WITHIN THE RIGHT-OF-WAY DURING THE CONSTRUCTION AND RE-COMPACT THE TOP 1-FEET OF SURFACE MATERIAL TO A MINIMUM COMPACTION OF 90% MAXIMUM DRY DENSITY. THE RE-GRADED DRIVEWAYS SHALL BE OVERLAID WITH A 0.5' LAYER OF HALF-INCH MINUS ROADWAY GRAVEL AND RAKED SMOOTH.
19. THE CONTRACTOR SHALL PROVIDE ALL TRAFFIC CONTROL AND BARRICADES FOR WORK IN THE RIGHT-OF-WAY PER THE STANDARDS SET FORTH BY THE JHA.

GRADING AND DRAINAGE NOTES:

1. AN APPROVED GRADING AND DRAINAGE PLAN SHALL BE ON THE JOB SITE AT ALL TIMES. DEVIATIONS FROM THE PLAN MUST BE PRECEDED BY AN APPROVED PLAN REVISION.
2. GRADING AND DRAINAGE PLAN APPROVAL INCLUDES THE CONSTRUCTION OF ALL SURFACE IMPROVEMENTS SHOWN ON THE APPROVED PLAN, INCLUDING, BUT NOT LIMITED TO RETENTION AREAS, SEDIMENTATION BASINS AND/OR OTHER DRAINAGE FACILITIES, DRAINAGE PATTERNS, WALLS, CURBS, ASPHALT PAVEMENT AND BUILDING FLOOR ELEVATIONS.
3. CONTRACTOR SHALL PROVIDE LEVEL BOTTOM IN ALL RETENTION BASINS AT ELEVATIONS AS SHOWN ON THE PLANS. SLOPE PROTECTION SHALL BE APPLIED TO PREVENT EROSION.
4. GRADES SHOWN IN RETENTION BASINS ARE DESIGN FINISHED GRADES. SHOULD THE CONTRACTOR OR ANY SUBCONTRACTOR PLAN TO PLACE SPOIL DIRT FROM FOOTINGS, UTILITY TRENCHES, LANDSCAPING, SWIMMING POOLS, ETC. IN THE BASIN, THEN THE BASINS SHOULD BE SUFFICIENTLY OVER EXCAVATED DURING THE ROUGH GRADING OPERATION TO ALLOW FOR THE PLACEMENT OF THE FILLER LANDSCAPING MATERIALS.
5. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND CONFIRMING DEPTHS OF ALL THE EXISTING UTILITY LINES WITHIN PROPOSED RETENTION BASIN AREAS. IF THE BASIN CANNOT BE CONSTRUCTED PER PLAN BECAUSE OF CONFLICTS, THE CONTRACTOR SHOULD DISCUSS MODIFICATION OF BASIN CONFIGURATION WITH THE INSPECTOR TO DETERMINE IF A PLAN REVISION OR FIELD CHANGE IS REQUIRED.
6. ALL DRAINAGE PROTECTIVE DEVICES SUCH AS SWALES, INTERCEPTOR DITCHES, PIPES, PROTECTIVE BERMS, CONCRETE CHANNELS OR OTHER MEASURES DESIGNED TO PROTECT ADJACENT BUILDINGS OR PROPERTY FROM STORM RUNOFF MUST BE COMPLETED PRIOR TO BUILDING CONSTRUCTION.
7. COMPACTION SHALL COMPLY WITH MAG PART 200 - EARTHWORK.
8. A THOROUGH ATTEMPT HAS BEEN MADE TO SHOW THE LOCATIONS OF ALL UNDERGROUND OBSTRUCTIONS AND UTILITY LINES IN THE WORK AREA. HOWEVER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTIONS AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION AND SHALL DETERMINE THE EXACT LOCATION OF UTILITIES IN ADVANCE OF TRENCHING. THE ENGINEER WILL NOT GUARANTEE ANY ELEVATIONS AT LOCATIONS OF THE EXISTING UNDERGROUND UTILITIES SHOWN ON THESE PLANS.

ICRSD SEWER GENERAL GENERAL NOTES:

1. ALL WORK SHALL CONFORM TO MARICOPA ASSOCIATION OF GOVERNMENTS (MAG), YAVAPAI ASSOCIATION OF GOVERNMENTS (YAG), ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY (ADEQ) REQUIREMENTS, ADEQ BULLETIN NO. 11 & THE INSCRIPTION CANYON RANCH SANITARY DISTRICT (ICRSD) DESIGN STANDARDS & SPECIFICATIONS, WHICHEVER IS MOST STRINGENT.
2. ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY REQUIREMENTS SHALL BE COMPLIED WITH.
3. ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY REQUIREMENTS SHALL APPLY WHEN MORE STRINGENT THAN THE MAG, YAG OR ICRSD STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION; MORE SPECIFICALLY WHERE THEY PERTAIN TO MAXIMUM ALLOWABLE SEWER LINE/PRESSURE SEWER LINE EXFILTRATION-INFILTRATION RATES.
4. THE CONTRACTOR MUST OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM ICRSD, YAVAPAI COUNTY, ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY AND OTHER REGULATORY AGENCIES AS NEEDED PRIOR TO CONSTRUCTION.
5. PROJECT ENGINEER SHALL BE RESPONSIBLE FOR SUBMITTING TRAFFIC CONTROL PLANS WHICH SHALL BE MADE A PART OF THE PLAN REVIEW REQUEST TO THE COUNTY ENGINEER FOR APPROVAL (IF APPLICABLE).
6. ALL PLANS APPROVED BY THE ICRSD ARE NULL & VOID ONE YEAR FROM DATE OF SIGNATURE IF CONSTRUCTION HAS NOT STARTED.
7. ALL TRENCHES & BEDDING SHALL BE PER YAG DETAILS 2-01P & 2-02P. BEDDING MATERIAL SHALL NOT BE LARGER THAN 3/4-INCH GRADATION BEDDING DEPTH MAY BE REDUCED FOR LPS SEWER MAINS SMALLER THAN 3-INCH DIAMETER IF APPROVED BY THE DISTRICT MANAGER.
8. ALL GRAVITY SANITARY SEWER PIPE SHALL BE POLYVINYL CHLORIDE (PVC), UNLESS OTHERWISE NOTED, IN ACCORDANCE WITH MAG SPECIFICATIONS. A CERTIFICATE SHALL BE FURNISHED FROM THE MANUFACTURER ATTESTING THAT THE PIPE MEETS SDR-35 ASTM D3034 REQUIREMENTS.
9. ALL PRESSURE SEWER PIPE SHALL BE POLYVINYL CHLORIDE (PVC), UNLESS OTHERWISE NOTED, IN ACCORDANCE WITH MAG SPECIFICATIONS. A CERTIFICATE SHALL BE FURNISHED FROM THE MANUFACTURER ATTESTING THAT THE PIPE MEETS THE REQUIRED ASTM REQUIREMENTS, PVC SCHEDULE 80, ASTM D-1785.
10. ANY QUANTITIES SHOWN ON PLANS ARE NOT VERIFIED BY ICRSD OR DISTRICT MANAGER.
11. ALL REVISIONS TO ORIGINAL PLANS MUST BE APPROVED BY THE DISTRICT MANAGER PRIOR TO CONSTRUCTION. ANY UNAPPROVED REVISIONS ARE SUBJECT TO REMOVAL & REPLACEMENT AT CONTRACTOR'S EXPENSE.
12. CONTRACTOR SHALL NOTIFY 'BLUE STAKE' AT 1-800-STAKEIT (1-800-782- 5348) AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
13. THE CONTRACTOR IS TO UNCOVER ALL EXISTING LINES BEING TIED INTO & VERIFY GRADES & ELEVATIONS BEFORE ANY OTHER CONSTRUCTION.
14. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UNDERGROUND PIPELINES, TELEPHONE & ELECTRICAL CONDUITS & STRUCTURES IN ADVANCE OF ANY CONSTRUCTION & OBSERVE ALL POSSIBLE PRECAUTIONS TO AVOID ANY DAMAGE TO SUCH. ICRSD WILL NOT GUARANTEE ANY LOCATION OF UNDERGROUND FACILITIES OR OMISSION OF SAME.
15. COMPLIANCE WITH ALL COUNTY, STATE, AND FEDERAL RULES AND REGULATIONS PERTAINING TO JOB SAFETY SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
16. THE CONTRACTOR SHALL PROVIDE SUFFICIENT MEN & EQUIPMENT ON THE JOB AT ALL TIMES DURING CONSTRUCTION TO COMPLY WITH SPECIFICATIONS & TO COMPLETE THE WORK.
17. THE DISTRICT MANAGER SHALL BE NOTIFIED 48 HOURS PRIOR TO THE START OF ANY WORK. THE DISTRICT MANAGER SHALL BE NOTIFIED 48 HOURS PRIOR TO START OF ANY TESTING.
18. ALL WORK & MATERIALS WHICH DO NOT CONFORM TO THE SPECIFICATIONS ARE SUBJECT TO REMOVAL & REPLACEMENT AT THE CONTRACTOR'S EXPENSE.
19. ANY WORK PERFORMED WITHOUT THE KNOWLEDGE OF THE DISTRICT MANAGER OR HIS REPRESENTATIVE IS SUBJECT TO REMOVAL & REPLACEMENT AT THE CONTRACTOR'S EXPENSE.
20. BACKFILLING SHALL NOT BE STARTED UNLESS 48 HOURS NOTICE HAS BEEN PROVIDED TO THE SANITARY DISTRICT MANAGER OR EARLIER IF DISTRICT INSPECTION HAS BEEN PERFORMED.
21. ALL FRAMES, COVERS, VALVE BOXES, & MANHOLES SHALL BE ADJUSTED TO FINISH GRADE UPON COMPLETION OF PAVING, UTILITY, OR RELATED CONSTRUCTION.
22. ALL SEWER TAP LATERALS SHALL BE CONSTRUCTED TO THE LOT LINE OR INTERIOR EDGE OF THE PUE WHICHEVER IS FURTHER ONTO THE PROPERTY. A PLUG OR CAP MUST BE INSTALLED AT THE END OF EACH LATERAL WITH A 2X4 INSTALLED VERTICALLY FORM THE PLUG OR CAP UP TO 2 FEET ABOVE GRADE. THESE 2X4'S SHALL HAVE #10 STEEL WIRE WRAPPED AROUND THEM TO AID IN THE LOCATING THE LATERAL. THE 2X4 SHALL BE PAINTED GREEN AND THE DEPTH OF THE SERVICES (FROM GRADE TO TOP OF CAP OR PLUG) SHALL BE MARKED ON THE 2X4. METAL 2X4'S WITHOUT WIRE ARE ALSO ACCEPTABLE.
23. WATER-SEWER SEPARATION SHALL BE PURSUANT TO AAC R-18-5-502C.
24. GRAVITY SEWER LINE DEFLECTION TESTS SHALL BE DONE ON 100% OF ALL LINES.
25. THE TOTAL LENGTH OF THE GRAVITY SEWER LINE SHALL BE TESTED FOR UNIFORM SLOPE BY LAMP LIGHTING, REMOTE CAMERA, OR SIMILAR METHOD APPROVED BY THE DEPARTMENT AND THE RESULTS RECORDED.
26. COVER EACH GRAVITY SEWER LINE WITH AT LEAST 3 FEET OF EARTH COVER MEETING THE REQUIREMENTS OF "RIGID PIPE BEDDING FOR SANITARY SEWERS" (WWM 104) REVISED JULY 2002, & "FLEXIBLE PIPE BEDDING FOR SANITARY SEWERS" (WWM 105), REVISED JULY 2002, PUBLISHED BY PIMA COUNTY WASTEWATER MANAGEMENT.
27. ADEQUATE COMPACTION TESTS SHALL BE TAKEN. LOCATIONS AND FREQUENCY OF TESTING MAY BE ADJUSTED BY THE DISTRICT MANAGER IF THE DISTRICT MANAGER OR INSPECTOR DETERMINES MODIFIED TESTING IS NEEDED. IF ANY TEST FAILURES ARE EXPERIENCED, THE DISTRICT RESERVES THE RIGHT TO REQUIRE ADDITIONAL TESTING AT NO EXPENSE TO THE DISTRICT.
28. ANY PREVIOUSLY TESTED SEWER LINES BROKEN DURING THE INSTALLATION OF OTHER ADJACENT UTILITIES WILL BE REPAIRED AND RETESTED TO THE SATISFACTION OF THE SANITARY DISTRICT MANAGER.
29. SEWER FORCE MAIN AND LPS LINES SHALL BE DESIGNED AND CONSTRUCTED OF A MATERIAL SUITABLE FOR SANITARY SEWER PRESSURE PIPE PER ICRSD STANDARD DESIGN AND SPECIFICATIONS. SEWER LINES SHALL BE PRESSURE TESTED TO A MINIMUM OF 50 PSI ABOVE DESIGN WORKING PRESSURE AT THE LOWEST POINT IN THE SYSTEM FOR A MINIMUM OF 4 HOURS IN ACCORDANCE WITH AAC R18-9.\
30. PRIOR TO PROJECT ACCEPTANCE, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING THE DISTRICT WITH A VIDEO DVD & A HARD COPY REPORT OF ALL OF THE MAIN LINES INSTALLED & SERVICES AND NEW OR REPLACED PRIVATE SERVICES.
31. ACCEPTANCE OF THE COMPLETED WORK WILL NOT BE GIVEN UNTIL 3 MIL MYLAR & CAD FORMAT DIGITAL 'AS-BUILT' PLANS ON YAVAPAI COUNTY DATUM & COORDINATES HAVE BEEN SUBMITTED BY A REGISTERED PROFESSIONAL ENGINEER AND APPROVED BY THE DISTRICT MANAGER.
32. SEWER MANHOLES EXFILTRATION TESTS SHALL BE DONE ON 100% OF ALL LINES. VACUUM TESTING IN ACCORDANCE WITH 'AGENCY' STANDARDS MAY BE USED IN LIEU OF EXFILTRATION TEST. THE CONTRACTOR SHALL TEST EACH MANHOLE USING ONE OF THE FOLLOWING TEST PROTOCOLS:

A. WATERTIGHTNESS TESTING BY FILLING THE MANHOLE WITH WATER. THE CONTRACTOR SHALL ENSURE THAT THE DROP IN WATER LEVEL FOLLOWING PRESOAKING DOES NOT EXCEED 0.0034 OF TOTAL MANHOLE VOLUME PER HOUR.

B. NEGATIVE AIR PRESSURE TESTING USING THE "STANDARD TEST METHOD FOR CONCRETE SEWER MANHOLES BY NEGATIVE AIR PRESSURE" (VACUUM) TEST, C1244-02E1 (2002), PUBLISHED BY THE AMERICAN SOCIETY FOR TESTING AND MATERIALS. THIS MATERIAL IS INCORPORATED BY REFERENCE & DOES NOT INCLUDE ANY LATER AMENDMENTS OR EDITIONS OF THE INCORPORATED MATERIAL, & MAY BE VIEWED AT THE ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY, 1110 W. WASHINGTON, PHOENIX, AZ. 85007, OR OBTAINED FROM THE AMERICAN SOCIETY FOR TESTING & MATERIALS INTERNATIONAL, 100 BAR HARBOR DRIVE, WEST CONSHOHOCKEN, PA.19428-2959.

LEGEND

	EXISTING CONCRETE
///	EXISTING PAVEMENT
——— – – – – s ———	EXISTING SEWER
——— – – – – w ———	EXISTING WATER LINE
— — — — — — uge —	EXISTING UNDERGROUND ELECTRIC
— — — — — — ohe —	EXISTING OVERHEAD ELECTRIC
——— – – – – g ———	EXISTING GAS LINE
——— – – – – t ———	EXISTING UNDERGROUND TELEPHONE
——— – – – – c ———	EXISTING CABLE LINE
— — — — — — irr —	EXISTING IRRIGATION LINE
——— – – ——— – – ———	EXISTING PROPERTY LINE
———x– – – – ———	EXISTING BARBED WIRE FENCE
X *1443.08*	EXISTING SPOT ELEVATION
– – – – *1440* – – – –	EXISTING CONTOUR
——— · · · ———	EXISTING FLOWLINE
— – – – – 6"gr —	EXISTING GRAVITY OVERFLOW
——— – – – – fm———	EXISTING SEWER FORCE MAIN
----------	EXISTING PROCESS AIR LINE
— · · — · · — · · —	EXISTING METHANOL FEED LINE
	EXISTING SIGN
	EXISTING GATE VALVE
	EXISTING FIRE HYDRANT
	EXISTING WATER METER
	EXISTING POWER POLE
	EXISTING GUY WIRE
	EXISTING LIGHT POLE
E	EXISTING ELECTRIC MANHOLE
IR	EXISTING IRRIGATION MANHOLE
	EXISTING IRRIGATION VALVE
S	EXISTING SEWER MANHOLE
	EXISTING SEWER CLEANOUT
SD	EXISTING STORM DRAIN MANHOLE
T	EXISTING TELEPHONE MANHOLE
	EXISTING STORM DRAIN AND STRUCTURE
	EXISTING VEGETATION
	EXISTING MAILBOX
— — — — — — — — —	EASEMENT
———————————	RIGHT-OF-WAY
——— ——— ——— ———	ROADWAY CENTERLINE

ABBREVIATIONS

ABC	AGGREGATE BASE COURSE
AERT	AERATION TANK
AC	ASPHALT CONCRETE
AWWA	AMERICAN WATER WORKS ASSOCIATION
ASA	AMERICAN STANDARD ASSOCIATION
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
BC	BACK OF CURB
BCF	BRASS CAP FLUSH
BCHH	BRASS CAP IN HAND HOLE
BLDG	BUILDING
BM	BENCHMARK
BTM	BOTTOM
CB	CATCH BASIN
CLT	CHLORINE TANK
CCC	CHLORINE CONTACT CHAMBER
CLF	CLARIFIER
C/L	CENTERLINE
CO	CLEAN OUT
CONC	CONCRETE
CONST	CONSTRUCTION
CY	CUBIC YARD
DC	DECANT STATION
DT	DISINFECTION TANK
DWG	DRAWING
DTL	DETAIL
E	EAST
ELEV	ELEVATION
ELF	EFFLUENT LIFT STATION
EP	EDGE OF PAVEMENT
ESMT	EASEMENT
EX, EXIST	EXISTING
FEQT	FLOW EQUALIZATION TANK
FF	FINISHED FLOOR
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL	FLANGE
FND	FOUND
FO	FIBER OPTIC
FPS	FEET PER SECOND
FT	FOOT, FEET
G	GAS, GUTTER, GRADE
GB	GRADE BREAK
GPM	GALLONS PER MINUTE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
ICRSD	INSCRIPTION CANYON RANCH SANITARY DISTRICT
IN.	INCH, INCHES
INV	INVERT
IRRIG	IRRIGATION
L	LENGTH
LF	LINEAR FEET
LS	LIFT STATION
LT	LEFT
MAG	MARICOPA ASSOCIATION OF GOVERMENTS
MFL	METHANOL FEED LINE
MH	MANHOLE
N	NORTH
NSF	NATIONAL SANITATION FOUNDATION
NA	NOT APPLICABLE
NIU	NOT IN USE
N0.	NUMBER
OHE	OVERHEAD ELECTRIC
P/L	PROPERTY LINE
PAE	PUBLIC ACCESS EASEMENT
PAL	PROCESS AIR LINE
PUAE	PUBLIC UTILITY & ACCESS EASEMENT
PUE	PUBLIC UTILITY EASEMENT
R	RADIUS
R/W	RIGHT-OF-WAY
RT	RIGHT
S	SEWER, SLOPE, SOUTH
SBRT	SEQUENCING BATCH REACTOR TANK
S/M	SAWCUT AND MATCH
SDMH	STORM DRAIN MANHOLE
SF	SQUARE FEET
SHT	SLUDGE HOLDING TANK
SSMH	SANITARY SEWER MANHOLE
STA	STATION
STD	STANDARD
SWK	SIDEWALK
SY	SQUARE YARD
T, TEL	TELEPHONE
TYP	TYPICAL
UGE	UNDERGROUND ELECTRIC
W	WATER, WEST, WITH
YAG	YAVAPAI ASSOCIATION OF GOVERMENT
XFMR	TRANSFORMER

KEY MAP

No.	DATE:	REVISION:	APP.
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NOTICE TO CONTRACTORS:
THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING "BLUE STAKE" AT 1-800-STAKE IT (1-800-782-5348) TWO WORKING DAYS PRIOR TO ANY EXCAVATION OR CONSTRUCTION.

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING ITEMS ARE NOT TO SCALE

Call at least two full working days before you begin excavation.
ARIZONA811
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
Maricopa County: (602) 659-7500

CIVILTEC engineering inc.
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2054 N. Willow Creek Rd.
Prescott, AZ 86301
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Fax: 928.771.2377
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INSCRIPTION CANYON RANCH SANITARY DISTRICT
WWTP IMPROVEMENTS & UPGRADE
NOTES SHEET

DE: XX	CH: XX	DR: XX	JN: 2018732.00	SHEET OF XX

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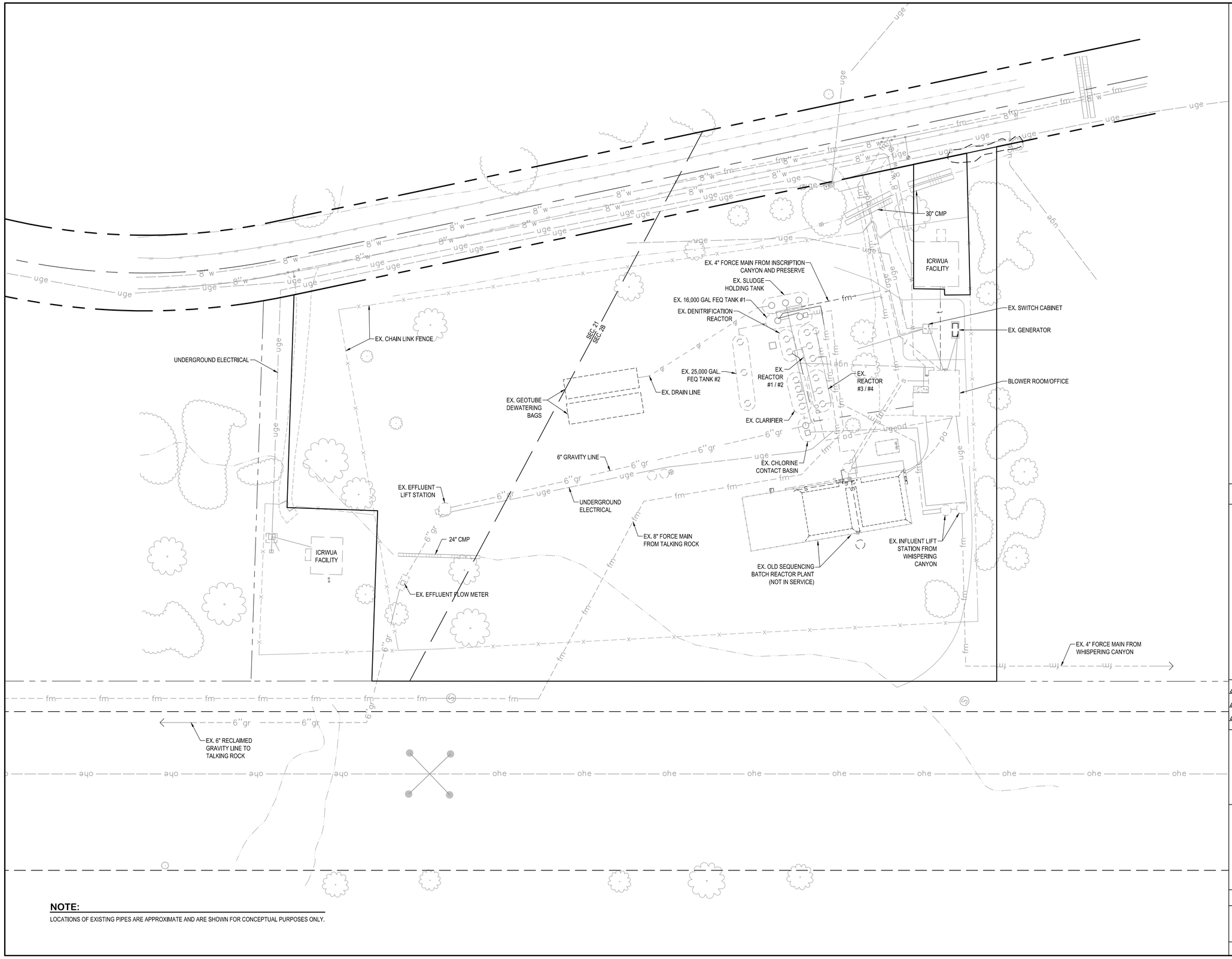

NOTE:

LOCATIONS OF EXISTING PIPES ARE APPROXIMATE AND ARE SHOWN FOR CONCEPTUAL PURPOSES ONLY.

KEY MAP

No.	DATE:	REVISION:	APP.
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INSCRIPTION CANYON RANCH SANITARY DISTRICT

EXISTING SITE PLAN

DE: XX	CH: XX	DR: XX	JN: 2018732.00	SHEET OF XX

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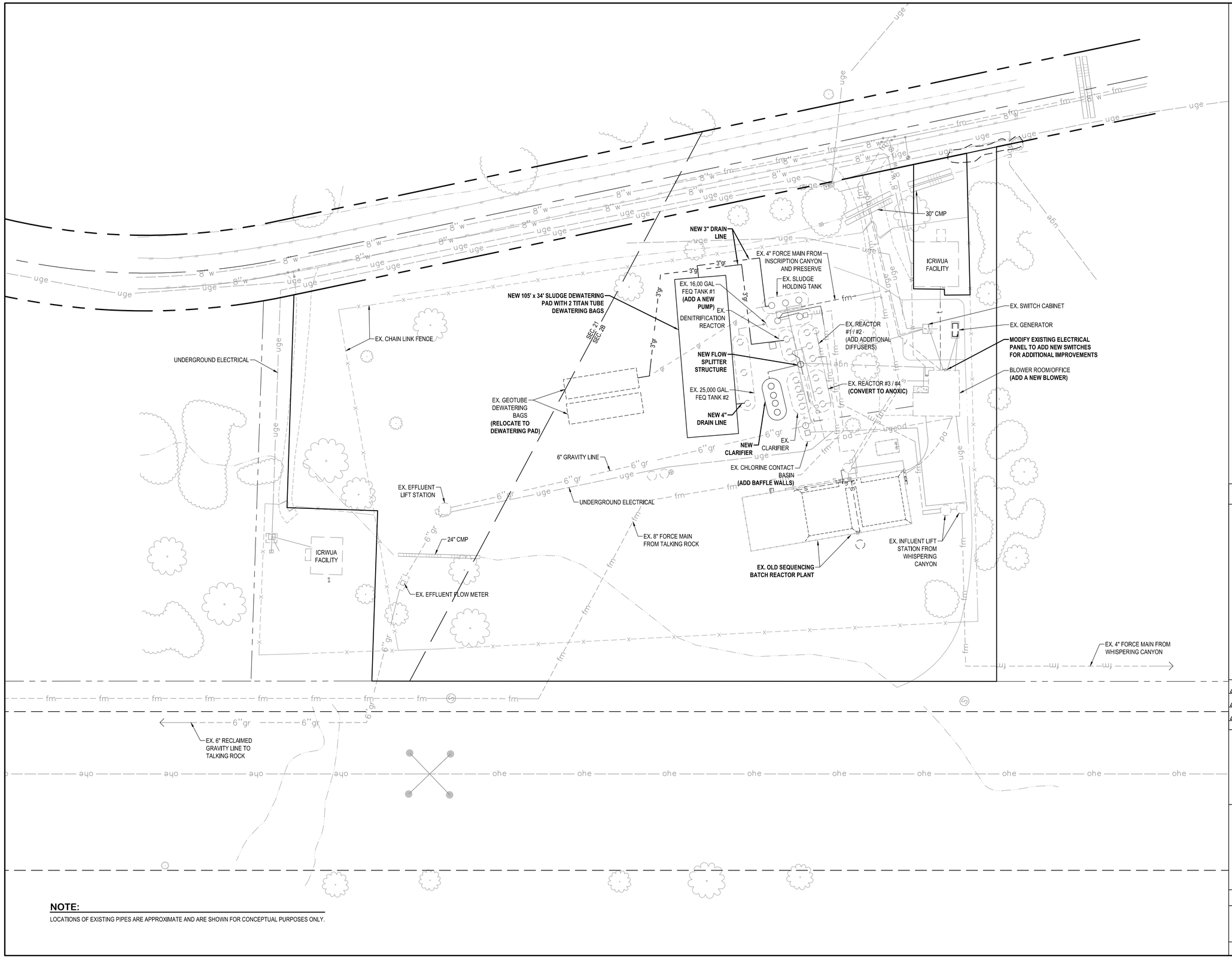

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KEY MAP

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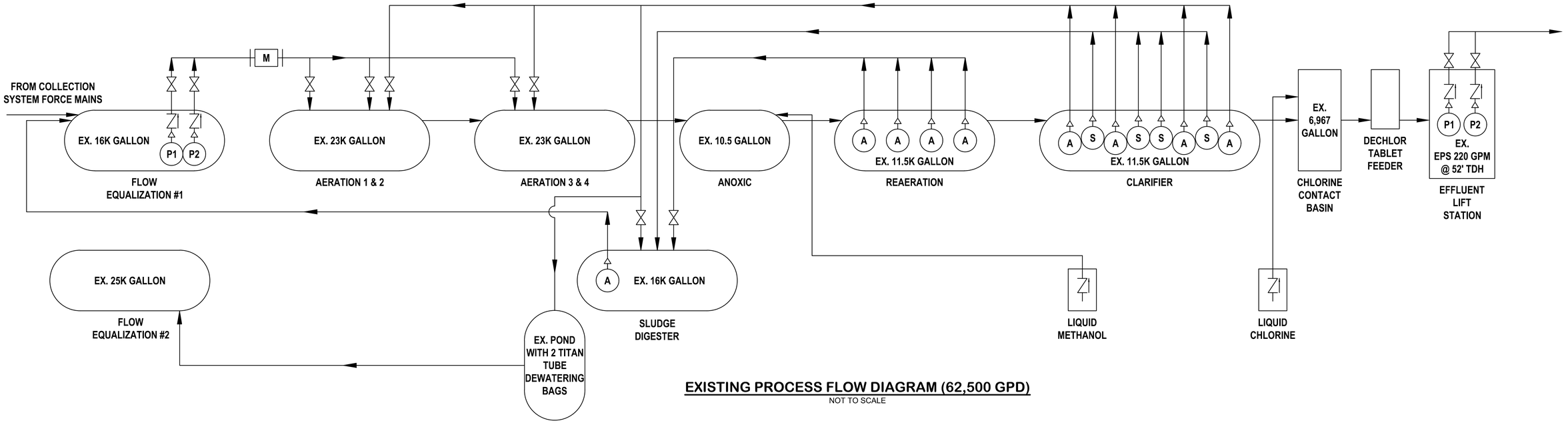
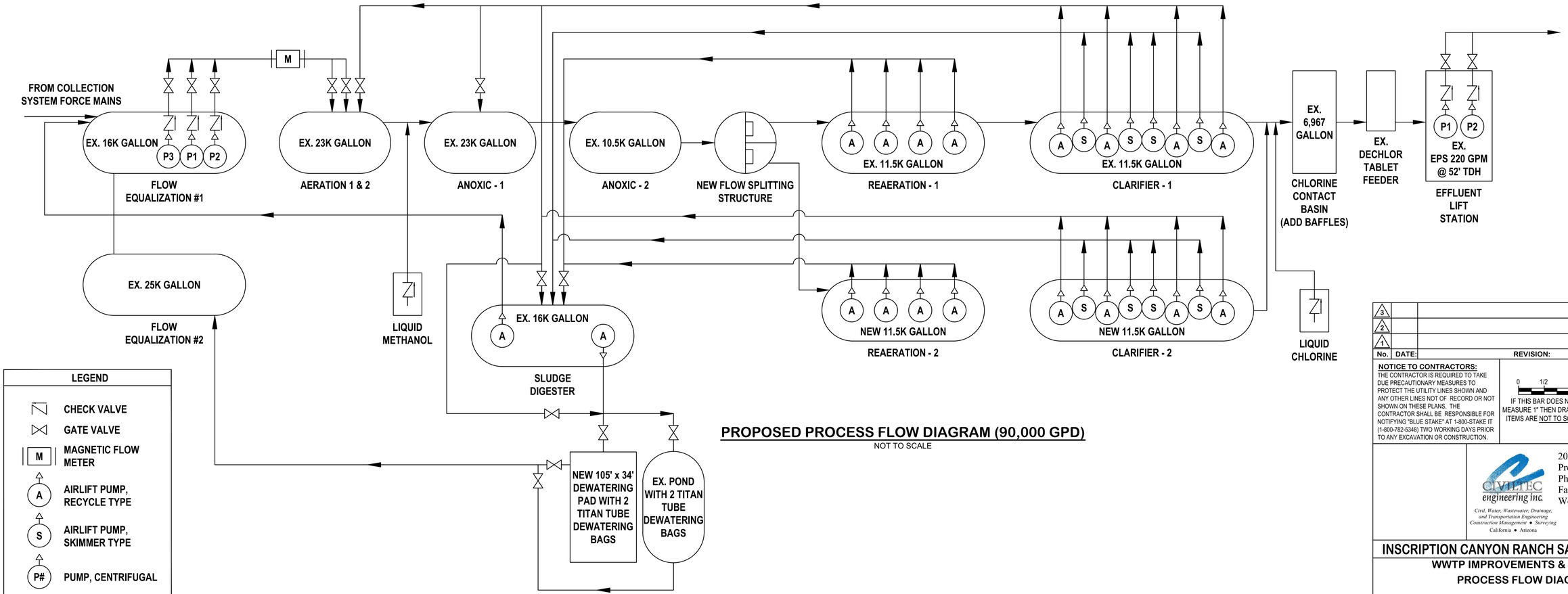


EXISTING PROCESS FLOW DIAGRAM (62,500 GPD)

NOT TO SCALE



PROPOSED PROCESS FLOW DIAGRAM (90,000 GPD)

NOT TO SCALE

LEGEND

- CHECK VALVE
- GATE VALVE
- M — MAGNETIC FLOW METER
- A — AIRLIFT PUMP, RECYCLE TYPE
- S — AIRLIFT PUMP, SKIMMER TYPE
- P# — PUMP, CENTRIFUGAL

No.	DATE:	REVISION:	APP.
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INSCRIPTION CANYON RANCH SANITARY DISTRICT

WWTP IMPROVEMENTS & UPGRADE

PROCESS FLOW DIAGRAM

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Appendix E - Cost Estimate

Quantity Estimate - Wood Roof Upgrades
Alternative 1
Quantity Estimate - Santec System Expansion

ICRSD WWTP

Aeration Equipment						
Item	Location	Quantity		$/Unit (Installed)	$ Extended Cost	CSI #
Install 20 HP Blower	Inside Existing Blower Room	1.00	EA	$ 16,374.27	$ 16,374.27	03.0502 021
Install Conduit and Wires	From Existing Electrical Room to FEQ Control Panels	30.00	LF	$ 36.74	$ 1,102.08	16.5001 001, 16.5802 0041
Install 20 HP Motor Starter	In Electrical Cabinet Adjacent to Existing Control Panels	1.00	EA	$ 3,630.01	$ 3,630.01	16.3002 131, 16.3008 041
6" CPVC Air Lines	Adjacent to Existing Clarifier	125.00	LF	$ 80.71	$ 10,089.00	02.2005 010
Install Pull Boxes and Boxes	As Necessary	1.00	EA	$ 799.20	$ 799.20	16198.1
Install Circuit Breakers	Ex Main Service Switchboard	1.00	EA	$ 2,044.60	$ 2,044.60	16.2501 021
Install Electrical Cabinets	On Stanchions Adjacent to Existing Control Panels	1.00	EA	$ 1,364.93	$ 1,364.93	Manufacturer Quote
SUM					**$ 35,404.09**	

Flow Equalization Basin Improvements						
Item	Location	quantity		$/Unit (Installed)	$ Extended Cost	CSI #
Install 2 HP 70 GPM @ 25 TDH Submersible Pump	Second Access Manway in FEQ Basin	1.00	EA	$ 16,047.67	$ 16,047.67	15.1006 031
Install 4" Piping (PVC)	From FEQ to Aeration Basin	30.00	EA	$ 30.41	$ 912.38	02.5304 051
Install 4" Mag Meter	Existing Flow Control Vault	1.00	EA	$ 5,514.00	$ 5,514.00	Manufacturer Quote
Install Ultrasonic Transmitter	Second Access Manway in FEQ Basin	1.00	EA	$ 1,915.28	$ 1,915.28	Manufacturer Quote
Install Conduit and Wires	From Existing Electrical Room to FEQ Control Panels	200.00	LF	$ 31.00	$ 6,199.20	16.5001 001, 16.5802 0041
Install 2 HP Variable Frequency Drive	In Electrical Cabinet Adjacent to Existing Control Panels	1.00	EA	$ 2,037.55	$ 2,037.55	16.3002 111, 16.3008 021
Install Pull Boxes and Boxes	As Necessary	1.00	EA	$ 799.20	$ 799.20	16198.1
Install Circuit Breakers	Ex Main Service Switchboard	1.00	EA	$ 1,732.12	$ 1,732.12	16.2501 011
Install Electrical Cabinets	On Stanchions Adjacent to Existing Control Panels	1.00	EA	$ 1,364.93	$ 1,364.93	Manufacturer Quote
SUM					**$ 36,522.32**	

Aeration Basin						
Item	Location	quantity		$/Unit (Installed)	$ Extended Cost	CSI #
Diffusers	Inside Reactor #1/#2	75.00	EA	$ 28.49	$ 2,136.38	Manufacturer Quote
Air 2" CPVC Air Piping	Inside Reactor #1/#2	100.00	LF	$ 57.11	$ 5,711.20	15.4104 011
2" Ball/Slide Valves	2" at Air Inlets	4.00	EA	$ 620.77	$ 2,483.08	15.4303 011
SUM					**$ 10,330.66**	

Anoxic Basin						
Item	Location	quantity		$/Unit (Installed)	$ Extended Cost	CSI #
Remove Existing Diffusers and Install Mixers	Inside Reactor #3/#4	4.00	EA	$ 849.50	$ 3,398.00	Manufacturer Quote
SUM					**$ 3,398.00**	

Reaeration/Clarifier						
Item	Location	quantity		$/Unit (Installed)		CSI #
Install 23,000 Gallon Tank	Adjacent to Existing Clarifier	1.00	EA	$ 99,602.86	$ 99,602.86	15.1008 041
Excavation	Adjacent to Existing Clarifier	170.83	CY	$ 93.30	$ 15,938.06	02.2004 021
Backfill	Adjacent to Existing Clarifier	34.17	CY	$ 104.20	$ 3,560.01	02.2005 011
Site Grading	Around New and Existing Clarifier	800.00	SF	$ 3.24	$ 2,592.00	02.2001 071
3" CPVC Air Lines	Adjacent to Existing Clarifier	150.00	LF	$ 59.00	$ 8,850.00	02.2005 010
Diffusers	Inside Reaeration Tank	12.00	EA	$ 28.49	$ 341.82	Manufacturer Quote
6" PVC MLRR, Skim and RAS Piping	Adjacent to Existing Clarifier	170.00	LF	$ 37.13	$ 6,312.17	02.2005 011
SUM					**$ 137,196.91**	

Dewatering Improvements						
Item	Location	Quantity		$/Unit (Installed)		CSI #
Polymer System	West of New Clarifier and East of Existing Pond	1.00	LS	$ 12,602.40	$ 12,602.40	USA Blue Book PolyBlend PB Sc
Asphalt Dewatering Pad	West of New Clarifier and East of Existing Pond	3,570.00	SF	$ 4.64	$ 16,579.08	02.6001 031, 02.6002 021, 02.
3" PVC	From Reaeration and Sludge Holding Tank to Dewatering Pad	250.00	LF	$ 59.00	$ 14,750.00	Item 51
4" PVC	From Dewatering Pad to Flow Equalization Tank #1	10.00	LF	$ 59.00	$ 590.00	Item 51
SUM					**$ 44,521.48**	

Subtotal						

TOTAL					**$ 267,373.45**	

01 General Requirements						
Construction Management and Administration			LS	8%	$ 20,053.01	
General Conditions			LS	4%	$ 11,229.69	1.1
Startup and Phasing			LS	10%	$ 26,737.35	
Mobilization			LS	4%	$ 11,497.06	1.101
Permits, Licenses & Fees			$ Per Every 1000$	$ 10.00	$ 2,673.73	1.1031
Office Trailer		4.00	Month	$ 1,107.16	$ 4,428.65	1.1043011
Material Handling Equipment			LS	3%	$ 8,021.20	
Insurances, Comprehensive			LS	2%	$ 5,347.47	
Non-Manual Labor, Distributable Benefits, Payroll Tax, Worker's Comp			LS	1%	$ 2,673.73	
Non-Distributable Labor and Supervision			LS	3%	$ 8,021.20	
Profit			LS	20%	$ 53,474.69	
Overhead			LS	2%	$ 5,347.47	
Contingencies			LS	20%	$ 53,474.69	1.4
SUM					**$ 212,979.94**	

Total					**$ 480,353.40**	

Alternates						
A1 - Concrete Dewatering Pad		3,570.00	SF	$ 10.00	$ 35,700.00	
Less Asphalt Dewatering Pad					$ (16,579.08)	
SUM					**$ 19,120.92**	

Total w/ Alternates					**$ 499,474.32**	

Appendix F - District WWTP Capacity Evaluation July 24, 2018

Inscription Canyon Ranch Sanitary District
Wastewater Treatment Plant
Capacity Evaluation

July 24, 2018

Prepared For:
Inscription Canyon Ranch Sanitary District
PO Box 215, Chino Valley, AZ 86323
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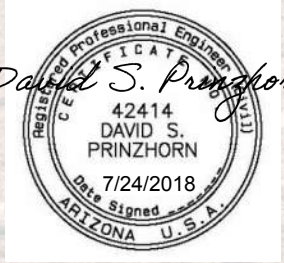
Board Members
Dave Barreira, Board Chair
Bill Dickrell
Al Poskanzer

District Manager – Bob Busch



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CIVILTEC
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List of Abbreviations

Abbreviation	Name
ADEQ	Arizona Department of Environmental Quality
ADF	Average Daily Flow (Annual)
APP	Aquifer Protection Permit
A+	An effluent standard established by ADEQ
B+	An effluent standard established by ADEQ
BOD	Biochemical Oxygen Demand
BODR	Basis of Design Report
Civiltec	Civiltec Engineering, Inc.
CO2	Carbon Dioxide
F:M	Food to Mass Ratio
GPD	gallons per day
GPM	gallons per minute
ICRSD	Inscription Canyon Ranch Sanitary District
MCRT	Mean Cell Residence Time
MG	Million Gallons
mg/L	Milligrams per Liter
MGD	Million Gallons per Day
ml	milliliter
MLSS	Mixed Liquor Suspended Solids
PDF	Peak Daily Flow
pH	Concentration of Hydrogen (*scale of acidity*)
psi	pounds per square inch
SBR	Sequencing Batch Reactor
SCFM	Standard Cubic Feet per Minute
SMRF	Self-Monitoring Report Form
Santec	Santec Corporation
TDH	Total Dynamic Head
TSS	Total Suspended Solids
VFD	Variable Frequency Drive
WEF	Water Environment Federation
WRP	Wastewater Reclamation Plant
WWTP	Wastewater Treatment Plant

Executive Summary

Background

The Inscription Canyon Ranch Sanitary District (ICRSD) currently operates a 62,500 gallon per day (GPD) wastewater treatment plant (WWTP) northwest of Prescott, Arizona.

Based on average daily flows (ADF), the facility is approaching 80% of its operating capacity and the ICRSD has requested a detailed analysis of system characteristics including:

- Wastewater flow assessment of the current and pending sources,
- Interview current plant operator to determine existing operating conditions,
- Plant capacity process calculations, and
- Options available that may assist in increasing existing plant capacity.

This report summarizes Phase 1 of the efforts of two phases ICRSD has identified to plan for future needs. Phase 2 will include a more detailed analysis of possible alternatives to plant enhancements that could result in increased capacity and/or future physical expansion and is scheduled to begin after review and consideration of the findings of the Phase 1 efforts discussed herein.

The summary discussion in the table below is based upon the following plant capacity and flow information:

Flow Description	GPD
Permitted Plant Capacity (Discharge Limit) (100%) Aquifer Protection Permit (APP) No. P-103119	62,500
15-month Average "Minimum Flow" January 2018 Flow Value	41,000
15-month Average "Average Flow" 15 months Combined and Averaged	47,400
15-month Average "Maximum Flow" July 2017 Flow Value	59,000
95% Plant Capacity Arizona Department of Environmental Quality (ADEQ) Treatment Capacity Threshold (Alert Level)	59,375

Summary

a) The existing governing APP for ICRSD was issued March 2, 2010 (see Appendix A) and is based on plans and process calculations prepared by Aqua Engineering, for a membrane bioreactor system capable of delivering an A+ effluent classification. The permit allows up to 455,000 GPD treatment and covers

the existing Santec Corporation (Santec) plant until the newly planned plant is operational.

b) The existing active Santec plant is an extended aeration activated sludge plant with a design capacity of 62,500 GPD producing B+ quality effluent. In December of 2002, a "Significant Amendment" to the APP was issued to increase permitted flow from 0.046 million gallons per day (MGD) to 0.455 MGD. Based on the date of the as-built plans for the Santec facility, it was constructed in 2003.

c) Current wastewater flows are produced by residential uses with minor contributions from recreational facilities that serve the nearby developments. Historic flows treated at the existing plant show an ADF of 47,400 GPD or 78.35 GPD per equivalent house connection. Peak daily flow (PDF) rates are approximately 124 GPD per equivalent house connection.

d) The existing WWTP has capacity for an additional *monthly ADF* rate of 375 GPD before 95% of its Discharge Limit (Alert Level) has been reached, (based on the month of July 2017 flows). Based on the current APP, when the plant receives 95% of its rated flow during any given month of reporting, the permittee shall apply to ADEQ for an APP amendment to expand the plant or submit a report detailing the reasons an expansion is not necessary. (This assumes the 95% threshold in the existing APP applies to the existing Santec plant.)

e) The WWTP is administratively over-committed to future connections by 67,169 GPD for the ADF and 98,863 GPD for the peak monthly ADF.

f) The plant operator has identified certain physical components of the plant that will enhance operating conditions such as variable frequency drives (VFD) for influent pumps and aeration control improvements. These enhancements are not expected to increase physical treatment capacity.

g) Preliminary process calculations show the calculated volumes for the aeration basin, denitrification basin and chlorine basin exceed actual volumes provided from the Granite Basin Engineering's *2013 As-Built Process Schematics* (see Appendix B). It is our understanding that these volume differences have not affected the ability for ICRSD to comply with effluent quality parameters required by ADEQ.

h) Certain options may be available to offer minor increases in the physical treatment capacity of the existing plant. A.A.C. R18-9-A211(B)(2) states a significant APP permit amendment to an individual permit is required if the increase in design flow exceeds 10% (for plants treating under 500,000 GPD). This equates to an increase of up to 6,250 GPD which results in total plant capacity of up to 68,750 GPD. Discussions would need to take place with ADEQ to verify that this rule could apply to ICRSD's case. The second, longer-term solution would be to expand the existing plant with like-kind or another treatment process to increase plant capacity.

This would likely trigger the need for a "Significant Amendment" to the current APP.

i) If Phase 2 of this engineering endeavor begins, it will include alternatives to increase plant capacity (if possible) and plant expansion. Coordination with the ADEQ will be necessary due to the likely requirement for a "Significant Amendment" to the existing APP. Phase 2 should include engineering, planning, construction drawings, and supporting process calculations. Once verified by ADEQ, embarking on Phase 2 will enable the interim operation of the plant to be utilized for treatment of up to 3,500 GPD additional *ADFs in a month*, based on July 2017 flows, up to a total of 62,500 GPD of physical capacity until new improvements are operational. (See Section 2).

1. Introduction

ICRSD operates a conventional activated sludge – extended aeration WWTP located at 14400 Grey Bears Trail in the unincorporated territory of Yavapai County, Arizona (Prescott area).

The facility was permitted under the ADEQ's APP rules as Permit No. P-103119 including associated amendments.

The facility was originally permitted on July 30, 1997 utilizing a Sequencing Batch Reactor (SBR) with a design capacity of 120,000 GPD and a permitted capacity of 46,000 GPD.

On December 30, 2002 a Significant Amendment to the original permit was issued by ADEQ to increase the permitted flow from 46,000 GPD to 455,000 GPD utilizing a modified extended aeration process (Santec modules).

On March 2, 2010, another Significant Amendment to the permit was issued to support the use of a Membrane Bioreactor system to be constructed in two phases, the first phase being designed to treat 250,000 GPD and the second phase being designed to treat 455,000 GPD (phase 2 includes phase 1 treatment facilities). The permit calls for the membrane bioreactor system to deliver an A+ effluent classification. The permit covers the operations of the existing Santec and newly planned membrane bioreactor system. ICRSD has not constructed the membrane bioreactor system and it is our understanding it is not under the purview of their current considerations.

The existing (operating) Santec plant is constructed to treat 62,500 GPD. It is currently required to produce B+ wastewater effluent.

1.1 Currently Issued ADEQ APP

The existing ADEQ APP has been written and approved for a membrane bioreactor treatment plant that was designed by Aqua Engineering based upon a sealed design report dated December 19, 2008. This new facility has not been constructed as of the date of this report. The existing APP allows the current WWTP to operate in its current configuration until the new membrane bioreactor plant is constructed and operational. Regulatory sampling protocols were established in the 2002 APP to monitor the operating conditions of the existing WWTP.

1.2 Existing WWTP Phasing

The existing WWTP was originally designed to have six (6) construction phases which included maintaining the original SBR plant in operation (see Table 1.1). Total permitted capacity of the existing SBR plus five Santec modules was determined to be 455,500 GPD. The first Santec module was constructed in 2003. It is the only Santec module currently constructed.

The original SBR Plant (operational from pre-1999 to 2002) has been taken off line and is currently "out of service" and since only the first phase Santec nitrification/denitrification extended aeration process module has been constructed the current ICRSD WWTP capacity is rated at 62,500 GPD. This ADF rate is used as the basis for the calculations included in this report.

Table 1.1 – Santec's 9/3/2002 BODR Treatment Plant Phasing

Phase	Rated Capacity (GPD)	No. of Homes Supported at 78.35 Gallons*
Existing SBR	46,000 (out of service)	O.O.S.
1	62,500	798
2	131,000	1,672
3	131,000	1,672
4	131,000	1,672
Sum	**455,500**	**5,814**

**See Section 2*

The "out-of-service" SBR structure consists of three 35-foot by 35-foot by 17-foot deep reinforced concrete chambers with a total operational capacity of 412,360 gallons. It may be possible to reuse these structures in the future since the concrete is still in good condition.

2. Existing Wastewater Flow

There are currently 605 active connections to the WWTP. ADF rates, based on 15-months of historical WWTP Self-Monitoring Report Forms (SMRFs), are 47,400 GPD (see Table 2.1) resulting in an average connection contribution of 78.35 GPD. For the purposes of this report, connection contributions are on the equivalent basis of single-family residential connections. It is acknowledged that Talking Rock Ranch compound contains non-residential components, however, its wastewater flows are included in the cited flows.

Peak incoming wastewater flows are managed using two flow equalization tanks, at the head of the plant, with a combined storage capacity of 41,000 gallons. Based on discussions with the facility Operator-of-Record, Derek M. Scott, peak flow rates are currently near 75,000 GPD. This results in a PDF peaking factor of 1.58.

Table 2.1 – 15-Month Historic Wastewater Flows

Year/Month	Flow (ADF)
2017 - Jan	48,000
2017 - Feb	47,000
2017 - Mar	47,000
2017 - Apr	45,000
2017 - May	45,000
2017 - Jun	45,000
2017 - Jul	59,000 (Max.)
2017 - Aug	47,000
2017 - Sep	46,000
2017 - Oct	47,000
2017 - Nov	49,000
2017 - Dec	52,000
2018 - Jan	41,000 (Min.)
2018 - Feb	47,000
2018 - Mar	46,000
ADF	**47,400 (Avg.)**

2.1 Flow Limitations Cited in Existing APP

Section 2.6.2.2.1 of the current APP (Exceeding Permit Flow Limit) states “If the Alert Level for average monthly flow in Section 4.2, Table 1A-1, 1A-2, or 1A-3 has been exceeded, the permittee shall submit an application to ADEQ for an APP amendment to expand the wastewater reclamation plant (WRP) or submit a report detailing the reasons an expansion is not necessary.” Flow limitations cited in the existing APP are included in Table 2.2.

Table 1A-1, 1A-2, and 1A-3 cite Alert Level of 95 percent of the discharge limit for the “ADFs in a month”. These tables assume application of a membrane bioreactor plant, but

due to the fact that the existing plant falls under the auspices of this APP, we will apply the same ruling to it. In July of 2017, ADFs were 59,000 GPD. Using the reasoning outlined above, an application to ADEQ for an APP amendment would need to be submitted when ADFs in a month reach 59,375 GPD (95% of 62,500). Using July 2017 as a baseline and using a total capacity of 62,500 GPD, physical plant limitations would be exceeded when an additional 3,500 GPD is contributed to the plant. Using 97.5 GPD per equivalent connection (59,000 GPD / 605 connections) in July 2017, the number of additional connections would be 35 before discharge limitations are reached.

Table 2.2 – Flow Limitations Cited in Existing APP

Existing Discharge Limit	Alert Level (95%)	Current ADF Max. Month (GPD)	Add'l Flow before Alert Level Reached	Add'l Lots @ 97.5* GPD	Add'l Flow before Discharge Limit Reached	Add'l Lots @ 97.5* GPD
62,500 GPD	59,375 GPD	59,000 GPD	375 GPD	3	3,500 GPD	35

**(59,000 GPD / 605 Lots)*

2.2 Existing Arizona Administrative Code Application

As discussed in Section 8, certain options may be available to offer minor increases in the physical treatment capacity of the existing plant. Arizona Administrative Code R18-9-A211(B)(2) states a "Significant APP permit amendment" to an individual permit is required if the increase in design flow exceeds 10% (for plants that treat under 500,000 GPD)." Ten percent of 62,500 equates to 6,250 GPD, which results in total plant capacity of 68,750 GPD (see Table 2.3). If it is determined that the existing plant can be modified to accommodate an additional 6,250 GPD, discussions would need to take place with ADEQ to verify that this rule could apply to ICRSD's case. Using 97.5 GPD per equivalent connection in July, the number of additional connections would be 100 before discharge limitations are reached.

Table 2.3 – Existing Arizona Administrative Code Application

Existing Discharge Limit	10% Additional Flow (GPD)	Total Discharge Limit	Alert Level (95% of 68,750)	Current ADF Max. Month (GPD)	Add'l Flow before Alert Level Reached	Add'l Lots before Alert Level Reached	Add'l Flows before Discharge Limit Reached	Add'l Lots before Discharge Limit Reached
62,500 GPD	6,250 GPD	68,750 GPD	65,313	59,000 GPD	6,313 GPD	64	9,750 GPD	100

2.3 General Engineering Practice - Expansion Planning

Generally, national engineering best practices determine when a treatment facility reaches 80 percent of its design capacity, facility expansion design, permitting and construction should occur (WEF Manual of Practice No. 28 (2005), Page 10). Based on the existing ICRSD WWTP, expansion design should commence when the ADF reaches 50,000 GPD (62,500 GPD x 0.80 = 50,000 GPD) (see Table 2.4). The facility is currently treating an ADF of 47,400 GPD, so under this practice, expansion design should occur when another 2,600 gallons of ADF is added. Based on connection flowrates in Section 2, this equates to approximately 33 physical lot connections.

Table 2.4 - Summary of Flows Triggering Expansion

Method	Alert Level (GPD)	Current Applicable Flowrate	Add'l Lots until Expansion	Discharge Limit	Add'l Lots until Discharge Limit Reached
Existing APP	59,375	59,000	3	62,500	35
Arizona Administrative Code*	65,313	59,000	64	68,750	100
General Engineering Practice	50,000	47,400	33	62,500	192

**If Section R18-9-A211(B)(2) deemed applicable by ADEQ*

3. Existing Wastewater Capacity Commitment

A total of 1,655 connections have been approved by ICRSD for connection to the sanitary sewer collection and treatment systems per Table 3.1 (data provided by ICRSD, dated June 22, 2018). This results in an annual ADF commitment of 129,669 GPD (1,655 lots x 78.35 GPD per lot = 129,669 GPD).

Table 3.1 – Existing Residential Lot Commitments

Development	Lots
Talking Rock	948
Whispering Canyon	280
Inscription Canyon	382
Preserve at the Ranch	45
Total	**1,655**

The existing WWTP has a rated treatment capacity of 62,500 GPD. The total annual ADF commitment equals 129,669 gallons. This results in an annual ADF over-commitment of 67,169 gallons above the current WWTP rated capacity (see Table 3.2).

Using 97.5 GPD (monthly ADFs per connection), commitments equal 1,655 x 97.5 = 161,363 GPD. The over-commitment based on this analysis is 98,863 GPD.

Table 3.2 – Summary of Over-Commitments

Flow Characterization	Over-Commitment (GPD)
Average Annual Flow	67,169
Monthly ADFs	98,863

4. Current Operating Conditions

Based on field discussions with the plant operator-of-record, the following issues were discussed to identify current operating conditions, planned and unplanned process improvements that could enhance system operations. These identified items do not increase plant hydraulic capacity.

1. There is a need to install a second VFD at the influent pump station to mitigate peak flow events and the harmful effects they have on plant operations. It is our understanding that ICRSD is currently receiving price quotations to perform this work.

2. Research and install new blower air control devices so that air flow to the aeration basins can be regulated to improve overall treatment process adjustability and final effluent quality.

3. Research and install a more efficient sludge processing and disposal system.

5. WWTP Capacity Evaluations and Criteria

On June 22, 2018, Civiltec Engineering, Inc. (Civiltec) conducted a site visit to the WWTP to assess the physical condition of the visible equipment, conduct operational discussions with the facility operator-of-record, and photograph portions of the site.

ICRSD's WWTP receives pumped wastewater from local residential developments into a combination flow equalization tank and influent pump station. This raw wastewater is then distributed to aeration tanks outfitted with fine-bubble diffusers, a denitrification tank and re-aeration tanks before flowing to a clarifier. Following clarification, the treated wastewater is disinfected in a chlorine contact basin, dechlorinated, and pumped from an effluent pump station to a residential golf course lake. See Appendix C for a figure of ISCRD's WWTP Generalized Process Flow Diagram.

Wastewater solids are bagged into specially adapted sludge dewatering bags where they are dried and hauled off-site, on an annual basis, per regulatory guidelines to a local sanitary landfill.

The WWTP component working volumes are currently sized in Table 5.1 (from the Granite Basin Engineering's *2013 As-Built Process Schematics*).

Table 5.1 – Existing WWTP Component Capacities

Component	Volume/Flow	Volume
Flow Equalization	46,663 Gallons	0.046 MG
Aeration Basins	42,632 Gallons	0.043 MG
Denitrification	9,856 Gallons	0.010 MG
Clarification	11,626 Gallons	0.012 MG
Chlorine Contact	6,545 Gallons	0.006 MG
Sludge Holding:	16,135 Gallons	0.016 MG
Wet well Pumping Capacity	49 GPM @ 27 Feet Total Dynamic Head	
Aeration Blowers	307 Standard Cubic Feet per Minute (SCFM) @ 5.5 psi, 20 Horsepower	

The treatment plant is designed for the following influent and effluent parameters based on ADEQ's APP rules and Santec's BODR (see Table 5.2).

Table 5.2 – Facility Design Criteria

Description	Influent	Mass	Effluent
Flow	0.0625 MGD	--	--
BOD	220 mg/L	128.44 Pounds	30 mg/L
TSS	220 mg/L	128.44 Pounds	30 mg/L
Nitrogen	40 mg/L	21.02 Pounds	<10 mg/L
pH	7.2	--	--

The facility was designed as a conventional activated sludge WWTP operating in the "extended aeration" mode. The plant incorporates a nitrification/denitrification component to reduce the discharging nitrogen levels. The extended aeration process is sometimes referred to as a "total oxidation process" in which all the influent biochemical oxygen demand (BOD) is converted to carbon dioxide (CO2).

High levels of flow variation, in an extended aeration plant, can cause excess solids to be wasted in the final effluent. Therefore, it is critical that plant flow be managed at a steady and balanced flow rate. The use of flow equalization basins/tanks and pumps operated with VFDs is beneficial in controlling excess solids wasting related to high levels of flow variation. This WWTP has flow equalization as an operational component.

Typical operating parameters for extended aeration mode WWTPs are outlined in Table 5.3.

Table 5.3 – Typical Extended Aeration Treatment Plant Operating Parameters

Parameter	Value
BOD Loading (No. BOD/Day/1000 cubic feet)	10 – 20
Mixed Liquor Suspended Solids (MLSS)	3,000 – 6,000 mg/L
Food to Mass Ratio (F:M)	0.05 – 0.15
Sludge Age (Days)	20 +
Aeration Period (Hours)	20 - 30
Return Activated Sludge Flow Rate (%)	50 - 100
BOD Removal Efficiency (%)	85 - 95
Mean Cell Residence Time (MCRT)	20 – 40 days

6. Plant Specific Wastewater Process Evaluation

Conventional activated sludge calculations, following the Water Environment Federation (WEF) *Manual of Practice 8* guidelines are summarized in Table 6.1 and process calculation results obtained for the constructed and permitted annual ADF of 62,500 GPD in Table 6.2.

Table 6.1 – Input Values used for Process Calculations

Parameter	Value
Influent BOD	220 mg/L
Influent TSS	220 mg/L
Influent Total Kjeldahl Nitrogen	36 mg/L
Influent Flow	62,500 GPD
Hydraulic Peaking Factor	1.58 x
MLSS	5,500 mg/L
Design Dissolved Oxygen	2.0 mg/L
Minimum Dissolved Oxygen	1.0 mg/L
Temperature Coefficients	20 degrees C
High Operating Temperature	29.44/85 degrees C/F
Low Operating Temperature	7.22/45 degrees C/F
Sludge Volume Index	110
Target MCRT	30 Days

Actual analytical results collected in January 2006 indicated the following results:

BOD	183.3 mg/L
TSS	191.2 mg/L
N	40.0 mg/L

Actual analytical results collected in July 2018 indicated the following results:

MLSS	2,460 mg/L

Table 6.2 – Calculation Output Values (MLSS @ 5,500 mg/L)

Parameter	Value
Aeration Basin Volume Required	0.0804 MG @ 7.22 Degrees C 0.0701 MG @ 29.44 Degrees C
Standard Oxygen Requirement	457 Pounds per Day @ 2.0 mg/L Dissolved Oxygen
(Using Fine Bubble Aeration)	3 Horsepower Blower
Solids Retention Time	66 days @ 7.22 Degrees C 16 days @ 29.44 Degrees C
Anoxic/Denite Volume Required	0.0141 MG
Return Activated Sludge Rate	0.225 MGD
Clarifier Overflow Rate Average	182 GPD/Square Foot
Clarifier Overflow Rate Peak	288 GPD/Square Foot
Clarifier MLSS	6,346 mg/L
Sludge Digester Volume Required	0.0052 MG @ 7.22 Degrees C
Sludge Digester O2 Req. @ 7.22 Degrees Centigrade	49.34 Pounds
Sludge Digester O2 Req. @ 29.44 Degrees Centigrade	53.0 Pounds
Sludge Digester Concentration	20,000 mg/L
Sludge Digester Blower Sizing	1.0 Horsepower with Coarse Bubble Diffuser
Estimated MCRT	29.04 days
Calculated F:M Ratio	0.040

7. Process Summarization

The calculated volumes for the aeration basin, denitrification basin and chlorine basins are based on preliminary process calculations. In each case, calculated volumes exceed actual volumes (see Table 7.1) provided from the Granite Basin Engineering's *2013 As-Built Process Schematics*. It is our understanding that these volume differences have not affected the ability for ICRSD to comply with effluent quality parameters required by ADEQ.

Table 7.1 – Calculated vs. Actual Process Unit Component Sizing

Process Unit	Calculated	Actual
Flow Equalization	-----	0.0410 MG
Aeration Basins	0.0804 MG	0.0520 MG
Denitrification	0.0141 MG	0.0098 MG
Re-Aeration	-----	0.0093 MG
Clarifier	-----	0.0116 MG
Chlorine Contact	-----	0.0069 MG
Digester	0.0052 MG	0.0161 MG
MCRT	29.04 days	-----
F:M Ratio	0.04	0.04
Settleometer	*(From Actual Operator Data Sheets)*	400 – 520 ml
Blowers	-----	25 Horsepower
Flow EQ. Pumps	-----	3 Horsepower

Note: Calculated values should be cross checked against the original Santec process calculations.

8. Increasing Existing Plant Capacity

Several options for possible plant expansion are presented as follows. Some of these options include the possible reuse of the existing concrete basins that were once part of the former SBR process.

Option 1 – Expand plant using same Santec Technology
This option would duplicate the existing facility with additional underground tankage to double the existing plant capacity. Nitrification and Denitrification elements would still be incorporated in the upgrade and the facility could be permitted as BADCT with minimal ADEQ concerns. New plant capacity would be 125,000 GPD. Some modifications to the existing plant may help with overall process operability and marginal capacity expansion.

Another consideration to evaluate would be providing adjustments to the existing treatment plant to improve sludge settleability and MCRT.

Option 2 – Retrofit old concrete basins to a Sanitaire ICEAS Sequencing Batch Reactor (SBR)
This option would include the demolition of all internal components in the existing concrete basins and the structures would be retrofit with new Sanitaire ICEAS process components. ICEAS stands for Intermittent Cycle Extended Aeration System and is a continuous flow biological denitrification process. Coordination with Sanitaire would need to occur to determine what capacity the existing structures could produce using this technology. No problem with ADEQ regarding BADCT for this process.

Option 3 – Retrofit old concrete basins to the currently designed and permitted Membrane Bioreactor (MBR) Modules
This option would use existing design documents already permitted by ADEQ to construct internal membrane Bioreactor equipment. This process is more complicated, produces a higher quality of effluent, and requires a greater degree of operator certification and oversight. This facility has already been permitted by ADEQ as BADCT for this site. Drawbacks include a higher cost to construct than other conventional technologies and increased operator supervision and analytical and reporting costs for A+ wastewater effluent.

Option 4 – Retrofit old concrete basins with a new Parkson Corporation Biolac Process
The Biolac Process is another form of extended aeration process that is typically incorporated into shallow lagoons. This system operates in a series of On/Off modes to accomplish biological denitrification in a single basin. Additionally, the on/off condition creates a wave effect that mixes the wastewater. It is our understanding that this type of facility was under design and that those design efforts have been placed on hold for the time being.

Option 5 – Retrofit old concrete basins to a Four-Stage Bardenpho Process
This option would include the demolition of the existing components in the existing concrete basins and the installation of new Fiber Reinforced Plastic (FRP) baffle walls and new fine and course bubble aeration equipment. The process would provide biological denitrification and would comply with ADEQ BADCT guidelines. Preliminary process calculations indicate that the existing basins could be converted to supply a treatment capacity of 160,000 GPD with a MLSS concentration of 3,500 mg/L. New clarifiers would need to be constructed with this option and a portion of one basin would be used as an Aerobic Digester for sludge management.

Option 6 – Retrofit old concrete basins to a conventional Extended Aeration Plant
This option would include the demolition of the old equipment in the existing concrete basins and a retrofit to a conventional Extended Aeration plant. This facility could perform in conjunction with the existing Santec facility to accomplish the same levels of treatment currently produced. Detailed process calculations and process flow layouts would need to be prepared to establish the total final treatment capacity of the system. This would meet ADEQ BADCT requirements for B+ wastewater effluent.

Plant Capacity Expansion Comments: It is important to note that in all the available options identified herein, extensive coordination with ADEQ will need to occur to establish realistic APP capacity ratings and effluent quality guidelines as part of the "Significant Amendment" to the existing APP. Each process is unique unto itself and detailed process calculations will be required to define the final treatment capacity. Additionally, a comprehensive O & M Manual would be a requirement of the final selected process to maximize final plant output capacity.

These items can be further evaluated for plausibility during the Phase 2 engineering and planning process.

9. Conclusion

Civiltec's analysis of the historical permitting and plant types, planned phasing, wastewater flowrate characteristics, capacity commitments, operating conditions, process calculations (See Appendix D), and plant capacity enhancements offer the following conclusions.

1. The existing governing APP for ICRSD was issued March 2, 2010 and is based on plans and process calculations prepared by Aqua Engineering, for a membrane bioreactor system capable of delivering an A+ effluent classification. The permit allows up to 455,000 GPD treatment and covers the existing Santec plant until the newly planned plant is operational.

2. The existing active Santec plant is an extended aeration activated sludge plant with a design capacity of 62,500 GPD producing B+ quality effluent. In December of 2002, a "Significant Amendment" to the APP was issued to increase permitted flow from 0.046 MGD to 0.455 MGD. Based on the date of the as-built plans for the Santec facility, it was constructed in 2003.

3. Current wastewater flows are produced by residential uses with minor contributions from recreational facilities that serve the nearby developments. Historic flows treated at the existing plant show an ADF production of 47,400 GPD or 78.35 gallons per day per equivalent house connection. PDF rates are approximately 124 gallons per day per equivalent house connection (based on maximum month of July 2017).

4. Based on current APP data, and assuming they apply to the existing Santec plant, the existing discharge limit for the plant is 62,500 GPD. The alert level is 59,375 GPD. The current monthly ADFs in July 2017 is 59,000 GPD, leaving 375 GPD additional flow before the alert level is reached. If engineering, planning and appropriate applications are commenced, submitted, and committed to by ICRSD and evidenced to ADEQ, the additional ADFs prior to the discharge limit being reached is 3,500, GPD which associates to 35 additional equivalent lot connections.

5. Based on Arizona Administrative Code section R18-9-A211(B)(2), if deemed applicable by ADEQ, an increase in design flows up to 10 percent for the Santec plant may be possible without a "Significant APP permit amendment." If plant alterations are shown to be possible during Phase 2 of our analysis, this may increase the discharge limit to 68,750 GPD. This results in additional flows of 9,750 GPD above the July 2017 flow of 59,000 GPD, which associates to 100 additional equivalent lot connections (using 97-5 GPD/lot).

6. We have cited language in Section 2 that describes general engineering practices that call for plant expansion design when 80 percent of ADFs are experienced by the plant. This language is included for general reference only and is not defined in Arizona Administrative Code or ADEQ rules or permit language.

7. The existing WWTP is administratively over-committed for connections by 67,169 GPD based on the ADF value of 78.35 GPD/lot and is over-committed by 98,863 GPD based on the peak monthly flow rate of 97.5 GPD/lot.

8. Discussions with ADEQ are necessary to ascertain whether the existing permit terms associated with the membrane bioreactor system also apply to the existing Santec system. The current permit states an alert level is reached when 95 percent of a monthly ADFs are contributed to the membrane bioreactor plant. In this report, it is assumed that this criterion is also followed for the Santec plant but should be validated by said discussions.

9. The calculated volumes for the aeration basin, denitrification basin and chlorine basins are based on preliminary process calculations. In each case, calculated volumes exceed actual volumes provided from the Granite Basin Engineering's *2013 As-Built Process Schematics*. It is our understanding that these volume differences have not affected the ability for ICRSD to comply with effluent quality parameters required by ADEQ.

10. It may be possible to provide minor increases in the existing plant capacity by installing a larger chlorine contact basin, modifying the anoxic tank zone capacity, and/or providing other sludge disposal options. This will be further analyzed in Phase 2 of our reporting to ICRSD. It is likely that an amendment to the existing APP will be necessary for this task to be recognized by ADEQ.

Appendix A – 2010 Aquifer Protection Permit

ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.azdeq.gov

Janice K. Brewer
Governor

Benjamin H. Grumbles
Director

March 2, 2010

Mr. Gene Leasure, Chairman
Inscription Canyon Sanitary District
5360 West Inscription Canyon drive
Prescott, Arizona 86305

Re: Inscription Canyon Ranch Wastewater Treatment Plant (WWTP), Significant Amendment, Aquifer Protection Permit (APP), File No. 103119 LTF 47152

Dear Mr. Leasure:

Enclosed is a signed copy of an Individual APP with Fact Sheet for the above referenced facility. The permit conditions shall apply from March 2, 2010, which is the date of the Water Quality Division Director's signature, and shall be valid for the life of the facility. Thank you for your cooperation in protecting the water quality of the State of Arizona.

If you have any questions about this permit or need further assistance, please contact me at (800) 234-5677 ext. 4695 or at (602) 771-4695

Sincerely,

Taly Gilama, Project Manager
APP & Reuse Unit
Groundwater Section, Water Quality Division

Enclosures (2)

cc: Asif Majeed, Manager, APP & Reuse Unit
Lynne Dekarske, Environmental Program Specialists, Water Permits Section
Mathew Hodge, Supervisor, Water Quality Compliance Section, Data Unit
Marcia Colquitt, Supervisor, Water Quality Compliance Section, Enforcement Unit

Buck Oberding, Inspector, Water Quality Compliance Section, NRO
Byron James, Northeast Arizona Community Liaison
Mr. Justin R. Logan, Principal Engineer, Aqua Engineering
Shivani Shah, Engineer, APP & Reuse Unit
Marcy Mullins, Reuse Program Coordinator, APP & Reuse Unit
Maribeth Greenslade, Manager, Technical Support Unit
Jeff Emde, Hydrologist, Technical Support Unit
Yavapai County Department of Development Services
Maribeth Greenslade, Manager, TSU
Jennifer Widlowski, Hydrologist, TSU

WRR10: 0125

ADEQ Arizona Department of Environmental Quality

Fact Sheet

Aquifer Protection Permit #P-103119
Place ID 70, LTF 47152
Inscription Canyon Wastewater Treatment Plant
SIGNIFICANT AMENDMENT

The Arizona Department of Environmental Quality (ADEQ) proposes to issue **an amendment** to the Aquifer Protection Permit for the subject facility that covers the life of the facility, including operational, closure, and post-closure periods unless suspended or revoked pursuant to A.A.C. R18-9-A213. This document gives pertinent information concerning the issuance of the permit. The requirements contained in this permit will allow the permittee to comply with the two key requirements of the Aquifer Protection Program: 1) meet Aquifer Water Quality Standards at the Point of Compliance; and 2) demonstrate Best Available Demonstrated Control Technology (BADCT). The purpose of BADCT is to employ engineering controls, processes, operating methods or other alternatives, including site-specific characteristics (i.e., local subsurface geology) to reduce discharge of pollutants to the greatest degree achievable before they reach the aquifer, or to keep pollutants from reaching the aquifer.

I. FACILITY INFORMATION

Name and Location

Name of Permittee:	Inscription Canyon Ranch Sanitary District
Mailing Address:	5360 Inscription Canyon Drive
Facility Name and Location:	Inscription Canyon Ranch Wastewater Treatment Plant 14400 Grey Bears Trail Prescott, AZ 86305 (Yavapai County)

Regulatory Status

The original Aquifer Protection Permit (APP) was issued for this facility on July 30, 1997. A Significant Amendment to increase the flow from 0.046 MGD to 0.455 MGD was issued on December 30, 2002. The application for the current "Significant" permit amendment was received by the Department on March 26, 2008. The purpose of this amendment is to replace the existing WWTP with a new WWTP.

Facility Description

The Inscription Canyon Wastewater Treatment Plant (WWTP) has the capacity to collect and treat a maximum average monthly flow of 0.455 million gallons per day (mgd).

The new WWTP will be constructed in two phases. Phase I is designed to treat 0.25 mgd and the treatment process consists of an existing influent lift station; head works with two fine screens; Membrane Bioreactor (MBR) which comprises of anoxic basin, aeration basin, membrane basin with membrane cassettes; UV disinfection; effluent reuse pump station; and screw press for sludge dewatering. The phase II is designed to treat 0.455 mgd. The phase II treatment process consist of phase I treatment process and additional membrane cassettes; a blower, a permeate

pump, and an upgraded effluent reuse pump station with a new pump. All the WWTP units are constructed of reinforced concrete. Covers are provided for the odor control units, blowers/motors are provided with fiberglass covers and silencers. All the effluent generated shall be used for beneficial purposes as regulated under a valid reclaimed water permit. The sludge, including the screenings, grit, and scum, is hauled off site for disposal in accordance with state and federal regulations.

The new WWTP will produce reclaimed water meeting Class A+ Reclaimed Water Standards (A.A.C. R18-11, Article 3) and shall be delivered for beneficial use under a valid reclaimed water permit under A.A.C. R18-9, Article 7.

The existing WWTP: The treatment process consists of flow equalization, followed by modified extended aeration process with nitrification/denitrification, clarification, sludge holding/digestion, and chlorine disinfection. Treated effluent is stored in lined storage ponds and reused under a valid Reclaimed Water Permit, under A.A.C. title 18, Chapter 9, Article 7. Waste sludge will be treated, thickened, hauled, and disposed in accordance with state and federal regulations.

This amendment is to replace the existing WWTP with a new WWTP. The permit covers the operations of the existing and new WWTP. Existing WWTP monitoring shall be required as per Table IA-3 and IB-2 until the facility begins operation of the new WWTP before or at the end of the 60 day start-up period.

During the initial start-up period not lasting more than 60 days, if the effluent does not meet the discharge monitoring requirements, the effluent shall be dispose off at the existing WWTP. After 60 days effluent shall meet the monitoring requirements in the permit.

Upon construction, completion, operation of the new WWTP, the inflow lines will be redirected from the existing WWTP to the new WWTP. The permitttee shall submit a clean closure application for the existing WWTP as per compliance schedule in Section 3.0.

Amendment Description

This significant permit amendment was initiated by the permittee. This amendment is to replace the existing WWTP with a new WWTP. The permit covers the operations of the existing and new WWTP. Existing WWTP monitoring shall be required as per Table IA-3 and IB-2 until the facility begins operation of the new WWTP before or at the end of the 60 day start-up period:

Listed below are the changes to the permit as a result of this amendment:

1. Section 1.1, Permittee Information: Changed the facility address from 13868 Grey Bear Trail to 14400 Grey Bears Trail Prescott, Arizona.

2. Section 1.1, Permittee Information: Changed the facility contact from Lee Hixton to Gene Leasure.

3. Section 1.2, Authorizing Signature: Changed the authorizing signature from Karen Smith to Michael A. Fulton.

4. Section 2.1, Facility/Site Description: Changed operation and monitoring of existing and new WWTP: Existing WWTP monitoring shall be required as per Table 1A-3 and 1B-2 until the facility begins operation of the new WWTP before or at the end of the 60 day start-up period.

5. Section 2.1, Facility/Site Description: Added the new WWTP as a discharging facility.

6. Section 3.0, Compliance Schedule: Added a compliance schedule.

7. Section 4. , Table 1A-1 and 1A-2 added and Table 1 changed to Table 1A-3.

8. Section 4. , Table 1B-1 and 1B-2 added.

9. Other changes include change in permit language to conform to the most current permit format.

II. BEST AVAILABLE DEMONSTRATED CONTROL TECHNOLOGY (BADCT)

The new and existing WWTPs are designed to meet the treatment performance criteria for new facilities pursuant to A.A.C. R18-9-B204. The facility produces denitrified and disinfected effluent.

III. HYDROGEOLOGIC SETTING

The facility and reuse site are located in the transition zone between the Basin-and-Range and Colorado Plateau physiographic provinces. The facility is located within the Prescott Active Management Area. Groundwater flow direction regionally is to the north-northeast. Information from a well located about 2.5 miles to the northeast of the site first encountered saturated conditions at a depth of 120 feet below ground surface (bgs), beneath an apparent confining layer of basalt located from about 70 feet to 120 feet bgs.

IV. STORM WATER/SURFACE WATER CONSIDERATIONS

The Flood Insurance Rate Map (FIRM) is not available for this area. The facility has performed the drainage and grading study and provided the report. The facility has constructed the rip rap channel to divert the 100-yr flood flow. Based on the drainage study, the facility has certified that the WWTP is protected from the 100-yr flood event.

There are no nearby surface water bodies. No monitoring of surface water is required at this time.

V. COMPLIANCE WITH AQUIFER WATER QUALITY STANDARDS

The pollutant management area is the perimeter of the wastewater treatment plant. The point of compliance is located at the north corner of the wastewater treatment plant. No monitoring is required at the point of compliance, except as required by the ADEQ in response to the contingency plan reporting requirements. Groundwater monitoring is not required at the time of permit issuance, as disposal method is consumptive reuse at the Talking Rock Golf Course, and the water is treated to the Class A+ reclaimed water standard for new WWTP and B+ reclaimed water standard for existing WWTP. All nearby registered wells are located outside the one-half mile radius from the wastewater treatment plant.

Monitoring and Reporting Requirements

To ensure that site operations do not violate Aquifer Water Quality Standards at the point of compliance, representative samples of the effluent shall be collected down stream from the UV disinfection unit. The permittee shall monitor the effluent daily for flow rate and fecal coliform, monthly for total nitrogen, quarterly for metals and Indicator Parameters / Major Cations and Anions, and semi-annually for volatile organic compounds (see Section 4.2, Table IA in the permit).

To ensure that site operations do not violate the Reclaimed Water Quality Standards for the beneficial use of Class A+ reclaimed water, the permittee shall monitor the reclaimed water at the same effluent sampling point as indicated above. The permittee shall monitor the reclaimed water for turbidity continuously, fecal coliform daily, and monthly for total nitrogen. Initial monthly enteric virus sampling is required to indicate four out of seven sample results of non-detect and monthly enteric virus monitoring is required in cases where 2 consecutive 24-hour turbidity limits are violated (see Section 4.2, Table IB in the permit).

Facility inspection and operational monitoring shall be performed on a routine basis (see Section 4.2, Table III in the permit).

Groundwater monitoring is not required.

Point of Compliance (POC)

The hazardous/non-hazardous POC is located as follows:

POC Location	Latitude	Longitude
North corner of the WWTP	34°44'45" N	112°34'38" W

Groundwater monitoring well(s) are not required at the POCs, at the time of permit issuance.

VI. COMPLIANCE SCHEDULE

A compliance schedule is included in Section 3.0 of the permit which includes the requirement for submittal of an Engineer's Certificate of Completion and submittal of clean closure application for the existing WWTP.

VII. OTHER REQUIREMENTS FOR ISSUING THIS PERMIT

Technical Capability

Inscription Canyon Ranch Sanitary District (WWTP) has demonstrated the technical competence necessary to carry out the terms and conditions of the permit in accordance with A.R.S. § 49-243(N) and A.A.C. R18-9-A202 (B).

The WWTP was designed as per the design report prepared, stamped, dated, and signed (sealed) by Justin Logan, P.E, Aqua Engineering, Inc., dated December 19, 2008 and subsequent submittals that served as additions to design report. The permittee is expected to maintain technical capability throughout the life of the facility.

Financial Capability

The Inscription Canyon Ranch Sanitary District has demonstrated the financial responsibility necessary to carry out the terms and conditions of the permit in accordance with A.R.S. § 49-243(N) and A.A.C. R18-9-A203. The permittee is expected to maintain financial capability throughout the life of the facility.

The permittee submitted a closure cost estimate of $750,000.00. The applicant, being a local government, provided a detailed financial plan on its letterhead for meeting the requirements for financial capability, according to rule R18-9-A203 (B) (1).

Zoning Requirements

Inscription Canyon Ranch Wastewater Treatment Plant has been properly zoned for the permitted use and the permittee has complied with all zoning ordinances in accordance with A.R.S. § 49-243(O) and A.A.C. R18-9-A201 (A) (2) (c).

VIII. ADMINISTRATIVE INFORMATION

Public Notice (A.A.C. R18-9-108(A))

The public notice is the vehicle for informing all interested parties and members of the general public of the contents of a draft permit or other significant action with respect to a permit or application. The aquifer protection program rules require that permits be public noticed in a newspaper of general circulation within the area affected by the facility or activity and provide a minimum of 30 calendar days for interested parties to respond in writing to ADEQ. The basic intent of this requirement is to ensure that all interested parties have an opportunity to comment on significant actions of the permitting agency with respect to a permit application or permit.

Public Comment Period (A.A.C. R18-9-109(A))

The Department shall accept written comments from the public before a significant permit amendment is made. The written public comment period begins on the publication date of the public notice and extends for 30 calendar days. After the closing of the public comment period, ADEQ is required to respond to all significant comments at the time a final permit decision is reached or at the same time a final permit is actually issued.

Public Hearing (A.A.C. R18-9-109(B))

A public hearing may be requested in writing by any interested party. The request should state the nature of the issues proposed to be raised during the hearing. A public hearing will be held if the Director determines there is a significant amount of interest expressed during the 30-day public comment period, or if significant new issues arise that were not considered during the permitting process.

IX. ADDITIONAL INFORMATION

Additional information relating to this permit may be obtained from:

Arizona Department of Environmental Quality
Water Quality Division - Groundwater Section - APP and Reuse Unit
Attn: Taly Gilama
1110 West Washington Street, Mail Code 5415B-3
Phoenix, Arizona 85007
Phone: (602) 771-4695

STATE OF ARIZONA
AQUIFER PROTECTION PERMIT NO. P-103119
PLACE ID 70, LTF 47152
SIGNIFICANT AMENDMENT

1.0 AUTHORIZATION

In compliance with the provisions of Arizona Revised Statutes (A.R.S.) Title 49, Chapter 2, Articles 1, 2, and 3, Arizona Administrative Code (A.A.C.) Title 18, Chapter 9, Articles 1 and 2, A.A.C. Title 18, Chapter 11, Article 4 and amendments thereto and the conditions set forth in this permit, Inscription Canyon Ranch Sanitary District is hereby authorized to operate the Inscription Canyon Ranch Wastewater Treatment Plant located near Prescott, Arizona, in Yavapai County, over groundwater of the Prescott Active Management Area, in Township 16 North, Range 3 West, Section 28, of the Gila and Salt River Base Line and Meridian.

This permit becomes effective on the date of the Water Quality Division Director's signature and shall be valid for the life of the facility (operational, closure, and post-closure periods) unless suspended or revoked pursuant to A.A.C. R18-9-A213. The permittee shall construct, operate and maintain the permitted facilities:

1. Following all the conditions of this permit including the design and operational information documented or referenced below, and
2. Such that Aquifer Water Quality Standards (AWQS) are not violated at the applicable point(s) of compliance (POC) set forth below or if an AWQS for a pollutant has been exceeded in an aquifer at the time of permit issuance, that no additional degradation of the aquifer relative to that pollutant and as determined at the applicable POC occurs as a result of the discharge from the facility.

1.1 PERMITTEE INFORMATION

Facility Name:	Inscription Canyon Ranch Wastewater Treatment Plant (WWTP)
Facility Address:	14400 Grey Bears Trail Prescott, Arizona
County:	Yavapai
Permittee:	Inscription Canyon Ranch Sanitary District
Permittee Address:	5360 W. Inscription Canyon Drive Prescott, Arizona 86305
Facility Contact:	Gene Leasure
Emergency Phone No.:	(928) 443-7418
Latitude/Longitude:	34°44' 45" N/ 112°34' 38" W
Legal Description:	Township 16 N, Range 3E, Section 28, of Gila and Salt River Baseline and Meridian

1.2 AUTHORIZING SIGNATURE

Michael A. Fulton, Director
Water Quality Division
Arizona Department of Environmental Quality

Signed this 2nd day of March, 2010

THIS AMENDED PERMIT SUPERCEDES ALL PREVIOUS PERMITS

2.0 SPECIFIC CONDITIONS [A.R.S. §§ 49-203(4), 49-241(A)]

2.1 Facility / Site Description [A.R.S. § 49-243(K)(8)]

The Inscription Canyon Wastewater Treatment Plant (WWTP) has the capacity to collect and treat a maximum average monthly flow of 0.455 million gallons per day (mgd).

The new WWTP will be constructed in two phases. Phase I is designed to treat 0.25 mgd and the treatment process consists of an existing influent lift station; head works with two fine screens: Membrane Bioreactor (MBR) which comprises of anoxic basin, aeration basin, membrane basin with membrane cassettes; UV disinfection; effluent reuse pump station; and screw press for sludge dewatering. The phase II is designed to treat 0.455 mgd. The phase II treatment process consist of phase I treatment process and additional membrane cassettes; a blower, a permeate pump, and an upgraded effluent reuse pump station with a new pump. All the WWTP units are constructed of reinforced concrete. Covers are provided for the odor control units, blowers/motors are provided with fiberglass covers and silencers. All the effluent generated shall be used for beneficial purposes as regulated under a valid reclaimed water permits. The sludge, including the screenings, grit, and scum, is hauled off site for disposal in accordance with state and federal regulations.

The new WWTP will produce reclaimed water meeting Class A+ Reclaimed Water Standards (A.A.C. R18-11, Article 3) and shall be delivered for beneficial use under a valid reclaimed water permit under A.A.C. R18-9, Article 7.

The existing WWTP treatment process consists of flow equalization, followed by modified extended aeration process with nitrification/denitrification, clarification, sludge holding/digestion, and chlorine disinfection. Treated effluent is stored in lined storage ponds at the reuse site and reused under a valid Reclaimed Water Permit, under A.A.C. title 18, Chapter 9, Article 7. Waste sludge will be treated, thickened, hauled and disposed in accordance with state and federal regulations. The existing WWTP produces reclaimed water meeting Class B+ Reclaimed Water Standards (A.A.C. R18-11, Article 3) and shall be delivered for beneficial use under a valid reclaimed water permit under A.A.C. R18-9, Article 7.

This amendment is to replace the existing WWTP with a new WWTP. The permit covers the operations of the existing and a new WWTP. Existing WWTP monitoring shall be required as per Table 1A-3 and 1B-2 until the facility begins operation of the new WWTP or at the end of the 60 day start-up period, whichever comes later.

During the initial start-up period not lasting more than 60 days, if the effluent does not meet the discharge monitoring requirements, the effluent shall be disposed off at the existing WWTP. After 60 days effluent shall meet the monitoring requirements in the permit for the new WWTP.

Upon operation of the new WWTP, the inflow lines will be redirected from the existing WWTP to a new WWTP. The permitttee shall submit a clean closure application for the existing WWTP as per compliance schedule in Section 3.0.

All industrial hookups and other non-residential hookups to the treatment system shall be authorized according to the applicable federal, state or local regulations.

The site includes the following permitted discharging facilities:

Facility	Latitude	Longitude
Existing WWTP	34° 44' 45" N	112° 34' 38" W
WWTP	34° 44' 45" N	112° 34' 38" W

Annual Registration Fee [A.R.S. § 49-242]

The Annual Registration Fee for this permit is established by A.R.S. § 49-242(E) and is payable to the Arizona Department of Environmental Quality (ADEQ) each year. The design flow is 0.455 million gallons per day.

Financial Capability [A.R.S. § 49-243(N) and A.A.C. R18-9-A203]

The permittee has demonstrated financial capability under A.R.S. § 49-243(N) and A.A.C. R18-9-A203. The permittee shall maintain financial capability throughout the life of the facility. The estimated dollar amount demonstrated for financial capability is $750,000. The financial capability was demonstrated through R18-9-A203 (B) (1) and (2).

2.2 Best Available Demonstrated Control Technology [A.R.S. § 49-243(B) and A.A.C. R18-9-A202(A)(5)]

The new WWTP shall be designed, constructed, operated, and maintained to meet the treatment performance criteria for new facilities as specified in A.A.C. R18-9-B204.

The treatment facility shall not exceed a maximum seepage rate of 550 gallons per day per acre for all containment structures within the treatment works.

The facility shall meet the requirements for pretreatment by conducting monitoring as per R18-9-B204(B)(6)(b)(iii).

2.2.1 Engineering Design

The WWTP was designed as per the design report prepared, stamped, dated, and signed (sealed) by Justin Logan, P.E, Aqua Engineering, Inc., dated December 19, 2008 and subsequent submittals that served as additions to design report.

2.2.2 Site-specific Characteristics

Site specific characteristics were not used to determine BADCT.

2.2.3 Pre-operational Requirements

The permittee shall submit a signed, dated, and sealed Engineer's Certificate of Completion in a format approved by the Department per Compliance Schedule in Section 3.0. The Certificate shall be submitted to the Groundwater Section and a copy shall be sent to the Water Quality Compliance Section.

2.2.4 Operational Requirements

1. The permittee shall maintain a copy of the new Operation and Maintenance (O & M) Manual at the WWTP site at all times and shall be available upon request during inspections by ADEQ personnel.

2. The pollution control structures shall be inspected for the items listed in Section 4.2, Table III - FACILITY INSPECTION (OPERATIONAL MONITORING).

3. If any damage of the pollution control structures is identified during inspection, proper repair procedures shall be performed. All repair procedures and material(s) used shall be documented on the Self-Monitoring Report Form (SMRF) submitted quarterly to the ADEQ Water Quality Compliance Section, Data Unit (see Section 2.7.5).

2.2.5 Reclaimed Water Classification [A.A.C. R18-9-703(C)(2)(a), A.A.C. R18-11-303 through 307]

The new WWTP is rated as producing reclaimed water meeting the Class A+ Reclaimed Water Quality Standards (A.A.C. R18-11, Article 3) which may be used for any allowable Class A, B, or C use under a valid reclaimed water permit (A.A.C. R18-9, Article 7). The existing WWTP is rated as producing reclaimed water meeting the Class B+ Reclaimed Water Quality Standards (A.A.C. R18-11, Article 3) which may be used for any allowable Class B or C use under a valid reclaimed water permit (A.A.C. R18-9, Article 7).

2.3 Discharge Limitations [A.R.S. §§ 49-201(14), 49-243 and A.A.C. R18-9-A205(B)]

1. The permittee is authorized to operate the WWTP with a maximum average annual flow of 0.455 mgd. Three tables are listed in Section 4.2, Tables 1A-1, 1A-2, and 1A-3. The permittee shall use the monitoring table which is commensurate with operation of the facility. Upon commencing operations from the new WWTP (Tables 1A-1/1A-2) the facility may discontinue operation of the existing WWTP (Table 1A-3).

2. The permittee shall notify all users that the materials authorized to be disposed of through the WWTP are typical household sewage and pre-treated commercial wastewater and shall not include motor oil, gasoline, paints, varnishes, hazardous wastes, solvents, pesticides, fertilizers or other materials not generally associated with toilet flushing, food preparation, laundry facilities and personal hygiene.

3. The permittee shall operate and maintain all permitted facilities to prevent unauthorized discharges pursuant to A.R.S. § 49-201(12) resulting from failure or bypassing of applicable BADCT pollutant control technologies including liner failure[1], uncontrollable leakage, overtopping (e.g., exceeding the maximum storage capacity, defined as a fluid level exceeding the crest elevation of a permitted impoundment), of basins, lagoons, impoundments or sludge drying beds, berm breaches, accidental spills, or other unauthorized discharges.

4. Specific discharge limitations are listed in Section 4.2, Tables 1A-1, 2, 3 and 1B-1, 2.

2.4 Point of Compliance (POC) [A.R.S. § 49-244]

The Point of Compliance (POC) is designated at the following location:

POC Location	Latitude	Longitude
North corner of the WWTP	34°44'45" N	112°34'38" W

The Director may amend this permit to designate additional points of compliance if information on groundwater gradients or groundwater usage indicates the need.

2.5 Monitoring Requirements [A.R.S. § 49-243(K)(1), A.A.C. R18-9-A206(A)]

All monitoring required in this permit shall continue for the duration of the permit, regardless of the status of the facility. All sampling, preservation and holding times shall be in accordance with currently accepted standards of professional practice. Trip blanks, equipment blanks and duplicate samples shall also be obtained, and Chain-of-Custody procedures shall be followed, in accordance with currently accepted standards of professional practice. The permittee shall consult the most recent version of the ADEQ Quality Assurance Project Plan (QAPP) and Environmental Protection Agency (EPA) 40 Code of Federal

[1] Liner failure in a single-lined impoundment is any condition that would result in leakage exceeding 550 gallons per day per acre.

Regulations (CFR) PART 136 for guidance in this regard. Copies of laboratory analyses and Chain-of-Custody forms shall be maintained at the permitted facility. Upon request these documents shall be made immediately available for review by ADEQ personnel.

2.5.1 Pre-Operational Monitoring

During the initial start-up period, the permittee shall monitor the flow rate according to Section 4.1, Table 1A-1. Flow rate shall be measured downstream of the UV disinfection unit. Monitoring flow rate shall continue until permittee ceases to dispose effluent to the existing WWTP and initiates routine discharge monitoring under Section 4.2, Table 1A-1.

2.5.2 Discharge Monitoring

Upon cessation of the initial start-up period, the permittee shall monitor the effluent according to Section 4.2, Tables 1A-1 and 1A-2. Representative samples of the effluent shall be collected at the point of discharge downstream of the UV disinfection unit.

Monitoring under Section 4.1, Table 1A-3 shall continue until permittee ceases operation of the existing WWTP, commences operation of new WWTP, and initiates routine discharge monitoring under Section 4.2, Tables 1A-1and 1A-2.

2.5.3 Reclaimed Water Monitoring

The permittee shall monitor the parameters listed under Tables 1B-1and B-2 in addition to the routine discharge monitoring parameters listed in Tables 1A-1, A1-2, and 1A-3. Representative samples of the reclaimed water shall be collected at the point of discharge downstream from UV disinfection unit.

2.5.4 Groundwater Monitoring and Sampling Protocols

Routine groundwater monitoring is not required under the terms of this permit.

2.5.5 Surface Water Monitoring and Sampling Protocols

Routine surface water monitoring is not required under the terms of this permit.

2.5.6 Facility / Operational Monitoring

Operational monitoring inspections shall be conducted according to Section 4.2, Table III.

1. If any damage of the pollution control structures is identified during inspection, proper repair procedures shall be performed. All repair procedures and materials used shall be documented on the SMRF submitted quarterly to the ADEQ Water Quality Compliance Section, Data Unit. If none of the conditions occur, the report shall say "no event" for a particular reporting period. If the facility is not in operation, the permittee shall indicate this on the SMRF.

2. The permittee shall submit data required in Section 4.2, Table III regardless of the operating status of the facility unless otherwise approved by the Department or allowed in this permit.

2.5.7 Analytical Methodology

All samples collected for compliance monitoring shall be analyzed using Arizona state approved methods. If no state approved method exists, then any appropriate EPA-approved method shall be used. Regardless of the method used, the detection limits must be sufficient to determine compliance with the regulatory limits of the parameters specified in this permit. Analyses shall be performed by a laboratory licensed by the Arizona Department of Health Services, Office of Laboratory Licensure and Certification. For results to be considered valid, all analytical work shall meet quality control standards specified in the approved methods. A list of Arizona state-certified laboratories can be obtained at the address below:

Arizona Department of Health Services
Office of Laboratory Licensure and Certification
250 North 17th Ave.
Phoenix, AZ 85007
Phone: (602) 364-0720

2.5.8 Installation and Maintenance of Monitoring Equipment

Monitoring equipment required by this permit shall be installed and maintained so that representative samples required by the permit can be collected. If new groundwater wells are determined to be necessary, the construction details shall be submitted to the ADEQ Groundwater Section for approval prior to installation and the permit shall be amended to include any new monitoring points.

2.6 Contingency Plan Requirements
[A.R.S. § 49-243(K)(3), (K)(7) and A.A.C. R18-9-A204 and R18-9-A205]

2.6.1 General Contingency Plan Requirements

At least one copy of the approved contingency and emergency response plan(s) submitted in the application shall be maintained at the location where day-to-day decisions regarding the operation of the facility are made. The permittee shall be aware of and follow the contingency and emergency plans.

Any AL exceedance, discharge limits (DL), or other permit condition shall be reported to ADEQ following the reporting requirements in Section 2.7.3.

Some contingency actions involve verification sampling. Verification sampling shall consist of the first follow-up sample collected from a location that previously indicated a violation or the exceedance of an AL. Collection and analysis of the verification sample shall use the same protocols and test methods to analyze for the pollutant or pollutants that exceeded an AL or violated DL. The permittee is subject to enforcement action for the failure to comply with any contingency actions in this permit. Where verification sampling is specified in this permit, it is the option of the permittee to perform such sampling. If verification sampling is not conducted within the timeframe allotted, ADEQ and the permittee shall presume the initial sampling result to be confirmed as if verification sampling has been conducted. The permittee is responsible for compliance with contingency plans relating to the exceedance of an AL or violation of a DL or any other permit condition.

2.6.2 Exceeding of Alert Levels/Performance Levels

2.6.2.1 Exceeding of Performance Levels Set for Operational Conditions

1. If an operational performance level (PL) set in Section 4.2, Table III has been exceeded the permittee shall:

a. Notify the ADEQ Water Quality Compliance Section (by phone or fax, see Section 2.7.5) within five days of becoming aware of the exceedance.

b. Submit a written report to the ADEQ Water Quality Compliance Section within 30 days after becoming aware of the exceedance. The report shall document all of the following:

(1) A description of the exceedance and its cause;

(2) The period of the exceedance, including exact date(s) and time(s), if known, and the anticipated time period during which the exceedance is expected to continue;

(3) Any action taken or planned to mitigate the effects of the exceedance or spill, or to eliminate or prevent recurrence of the exceedance or spill;

(4) Any monitoring activity or other information which indicates that any pollutants would be reasonably expected to cause a violation of an AWQS; and

(5) Any malfunction or failure of pollution control devices or other equipment or process.

2. The facility is no longer on alert status once the operational indicator no longer indicates that a PL is being exceeded. The permittee shall, however, complete all tasks necessary to return the facility to its pre-alert operating condition.

2.6.2.2 Exceeding of Alert Levels (ALs) Set for Discharge Monitoring

1. If an AL set in Section 4.2, Table 1A-1, 1A-2, and 1A-3 has been exceeded, the permittee shall immediately investigate to determine the cause. The investigation shall include the following:

a. Inspection, testing, and assessment of the current condition of all treatment or pollutant discharge control systems that may have contributed to the exceedance;
b. Review of recent process logs, reports, and other operational control information to identify any unusual occurrences; and
c. If the investigation procedures indicated in (a) and (b) above fail to reveal the cause of the exceedance, the permittee shall sample individual waste streams composing the wastewater for the parameter(s) in question, if necessary to identify the cause of the exceedance.

2. The permittee shall initiate actions identified in the approved contingency plan referenced in Section 5.0 and specific contingency measures identified in Section 2.6 to resolve any problems identified by the investigation which may have led to the AL exceedance. To implement any other corrective action the permittee shall obtain prior approval from ADEQ according to Section 2.6.6.

3. Within thirty days of an AL exceedance, the permittee shall submit the laboratory results to the ADEQ Water Quality Compliance Section along with a summary of the findings of the investigation, the cause of the exceedance, and actions taken to resolve the problem.

4. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions or other actions.

2.6.2.2.1. Exceeding Permit Flow Limit

1. If the AL for average monthly flow in Section 4.2, Table 1A-1, 1A-2 or 1A-3 has been exceeded, the permittee shall submit an application to ADEQ for an APP amendment to expand the WRP or submit a report detailing the reasons an expansion is not necessary.

2. Acceptance of the report instead of an application for expansion requires ADEQ approval.

2.6.2.3 Exceeding of Alert Levels in Groundwater Monitoring

2.6.2.3.1 Alert Levels for Indicator Parameters

No ALs were established for indicator parameters.

2.6.2.3.2 Alert Levels for Pollutants with Numeric Aquifer Water Quality Standards

Not required at time of permit issuance.

2.6.2.3.3 Alert Levels to Protect Downgradient Users from Pollutants Without Numeric Aquifer Water Quality Standards

Not required at time of issuance.

2.6.3 Discharge Limit Violation

1. If a DL set in Section 4.2, Tables 1A-1, 1A-2, 1A-3 or 1B-2 and 1B-2 has been violated, the permittee shall immediately investigate to determine the cause. The investigation shall include the following:

   a. Inspection, testing, and assessment of the current condition of all treatment or pollutant discharge control systems that may have contributed to the violation;

   b. Review of recent process logs, reports, and other operational control information to identify any unusual occurrences;

   c. If the investigation procedures indicated in (a) and (b) above fail to reveal the cause of the violation, the permittee shall sample individual waste streams composing the wastewater for the parameters in violation, if necessary to identify the cause of the violation.

   The permittee shall submit a report according to Section 2.7.3, which includes a summary of the findings of the investigation, the cause of the violation, and actions taken to resolve the problem. The permittee shall consider and ADEQ may require corrective action that may include control of the source of discharge, cleanup of affected soil, surface water or groundwater, and mitigation of the impact of pollutants on existing uses of the aquifer. Corrective actions shall either be specifically identified in this permit, included in an ADEQ approved contingency plan, or separately approved according to Section 2.6.6.

2. The permittee shall comply with the freeboard requirements as specified in Section 4.2, Table III (Facility Inspections) to prevent the overtopping of an impoundment or sludge drying bed.

If an impoundment or sludge drying bed is overtopped, the permittee shall follow the requirements in Section 2.6.5.3 and the reporting requirements of Section 2.7.3.

3. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions, or other actions.

2.6.4 Aquifer Quality Limit Violation

Not required at time of permit issuance.

2.6.5 Emergency Response and Contingency Requirements for Unauthorized Discharges pursuant to A.R.S. § 49-201(12) and pursuant to A.R.S. § 49-241

2.6.5.1 Duty to Respond

The permittee shall act immediately to correct any condition resulting from a discharge pursuant to A.R.S. § 49-201(12) if that condition could pose an imminent and substantial endangerment to public health or the environment.

2.6.5.2 Discharge of Hazardous Substances or Toxic Pollutants

In the event of any unauthorized discharge pursuant to A.R.S. § 49-201(12) of suspected hazardous substances (A.R.S. § 49-201(19)) or toxic pollutants (A.R.S. § 49-243(I)) on the facility site, the permittee shall promptly isolate the area and attempt to identify the discharged material. The permittee shall record information, including name, nature of exposure and follow-up medical treatment, if necessary, on persons who may have been exposed during the incident. The permittee shall notify the ADEQ Northern Regional Office at (928) 779-0313, and the ADEQ Water Quality Compliance Section at (602) 771-4497 within 24 hours of discovering the discharge of hazardous material which: a) has the potential to cause an AWQS or AQL exceedance; or b) could pose an endangerment to public health or the environment.

2.6.5.3 Discharge of Non-hazardous Materials

In the event of any unauthorized discharge pursuant to A.R.S. § 49-201(12) of non-hazardous materials from the facility, the permittee shall promptly attempt to cease the discharge and isolate the discharged material. Discharged material shall be removed and the site cleaned up as soon as possible. The permittee shall notify the ADEQ Northern Regional Office at (928) 779-0313, and the ADEQ Water Quality Compliance Section at (602) 771-4497, within 24 hours of discovering the discharge of non-hazardous material which: a) has the potential to cause an AQL exceedance; or b) could pose an endangerment to public health or the environment.

2.6.5.4 Reporting Requirements

The permittee shall submit a written report for any unauthorized discharges reported under Sections 2.6.5.2 and 2.6.5.3 to the ADEQ Northern Regional Office and the ADEQ Water Quality Compliance Section within 30 days of the discharge or as required by subsequent ADEQ action. The report shall summarize the event, including any human exposure, and facility response activities and include all information specified in Section 2.7.3. If a notice is issued by ADEQ subsequent to the discharge notification, any additional information requested in the notice shall also be submitted within the time frame specified in the notice. Upon review of the submitted report, ADEQ may require additional monitoring or corrective actions.

2.6.6 Corrective Actions

Specific contingency measures identified in Section 2.6 have already been approved by ADEQ and do not require written approval to implement.

With the exception of emergency response actions taken under Section 2.6.5, the permittee shall obtain written approval from the Groundwater Section prior to implementing a corrective action to accomplish any of the following goals in response to an AL exceedance, or violation of an AQL, DL, or other permit condition:

1. Control of the source of an unauthorized discharge;
2. Soil cleanup;
3. Cleanup of affected surface waters;
4. Cleanup of affected parts of the aquifer; and/or
5. Mitigation to limit the impact of pollutants on existing uses of the aquifer.

Within 30 days of completion of any corrective action, the operator shall submit to the ADEQ Water Quality Compliance Section (see Section 2.7.5), a written report describing the causes, impacts, and actions taken to resolve the problem.

2.7 Reporting and Recordkeeping Requirements [A.R.S. § 49-243(K)(2) and A.A.C. R18-9-A206(B) and R18-9-A207]

2.7.1 Self-Monitoring Report Form

1. The permittee shall complete the SMRF provided by ADEQ. The completed SMRF shall be submitted to the Water Quality Compliance Section, Data Unit.

2. The permittee shall complete the SMRF to the extent that the information reported may be entered on the form. If no information is required during a reporting period, the permittee shall enter "not required" on the SMRF and submit the report to ADEQ. The permittee shall use the format devised by ADEQ.

3. The tables contained in Section 4.0 list the parameters to be monitored and the frequency for reporting results for compliance monitoring. Monitoring and analytical methods shall be recorded on the SMRF.

4. In addition to the SMRF, the information contained in A.A.C. R18-9-A206(B)(1) shall be included for an AL exceedance, or violation of an AQL, DL, or any other permit condition being reported in the current reporting period.

2.7.2 Operation Inspection / Log Book Recordkeeping

A signed copy of this permit shall be maintained at all times at the location where day-to-day decisions regarding the operation of the facility are made. A log book (paper copies, forms, or electronic data) of the inspections and measurements required by this permit shall be maintained at the location where day-to-day decisions are made regarding the operation of the facility. The log book shall be retained for ten years from the date of each inspection, and upon request, the permit and the log book shall be made immediately available for review by ADEQ personnel. The information in the log book shall include, but not be limited to, the following information as applicable:

1. Name of inspector;
2. Date and shift inspection was conducted;
3. Condition of applicable facility components;
4. Any damage or malfunction, and the date and time any repairs were performed;
5. Documentation of sampling date and time; and

6. Any other information required by this permit to be entered in the log book.

Monitoring records for each measurement shall comply with R18-9-A206(B)(2).

2.7.3 Permit Violation and Alert Level Status Reporting

1. The permittee shall notify the Water Quality Compliance Section in writing (by mail or by fax - see Section 2.7.5) within five days (except as provided in Section 2.6.5) of becoming aware of a an AL exceedance, or violation of any permit condition, AQL, or DL.

2. The permittee shall submit a written report to the Water Quality Compliance Section within 30 days of becoming aware of the violation of any permit condition, AQL, or DL. The report shall document all of the following:

   a. Identification and description of the permit condition for which there has been a violation and a description of the cause;
   b. The period of violation including exact date(s) and time(s), if known, and the anticipated time period during which the violation is expected to continue;
   c. Any corrective action taken or planned to mitigate the effects of the violation, or to eliminate or prevent a recurrence of the violation;
   d. Any monitoring activity or other information which indicates that any pollutants would be reasonably expected to cause a violation of an AWQS;
   e. Proposed changes to the monitoring which include changes in constituents or increased frequency of monitoring; and
   f. Description of any malfunction or failure of pollution control devices or other equipment or processes.

2.7.4 Operational, Other or Miscellaneous Reporting

The permittee shall complete the SMRF provided by the Department to reflect facility inspection requirements designated in Section 4.2, Table III and submit to the ADEQ Water Quality Compliance Section, Data Unit (see Section 2.7.5) quarterly along with other reports required by this permit. Facility inspection reports shall be submitted no less frequently than quarterly, regardless of operational status.

If the treatment facility is classified for reclaimed water under this permit, the permittee shall submit the reclaimed water monitoring results and flow volumes to any of the following in accordance with A.A.C. R18-9-703(C)(2)(c):

1. Any reclaimed water agent who has contracted for delivery of reclaimed water from the permittee; and
2. Any end user who has not waived interest in receiving this information.

2.7.5 Reporting Location

All SMRFs shall be submitted to:

Arizona Department of Environmental Quality
Water Quality Compliance Section, Data Unit
Mail Code: 5415B-1
1110 West Washington Street
Phoenix, Arizona 85007
Phone (602) 771-4681

All documents required by this permit to be submitted to the Water Quality Compliance Section shall be directed to both of the following addresses:

Arizona Department of Environmental Quality
Water Quality Compliance Section
Mail Code: 5415B-1
1110 West Washington Street
Phoenix, Arizona 85007
Phone (602) 771-4497
Fax (602) 771-4505

-AND-

Arizona Department of Environmental Quality
Northern Regional Office
1801 West Route 66, Suite 117
Flagstaff, Arizona 86001
Phone (928) 779-0313
Fax (928) 773-2700

All documents required by this permit to be submitted to the Groundwater Section shall be directed to:

Arizona Department of Environmental Quality
Groundwater Section
Mail Code: 5415B-3
1110 West Washington Street
Phoenix, Arizona 85007
Phone (602) 771-4428

2.7.6 Reporting Deadline

The following table lists the quarterly report due dates[2]:

Monitoring conducted during quarter:	Quarterly Report due by:
January-March	April 30
April-June	July 30
July-September	October 30
October-December	January 30

The following table lists the semi-annual and annual report due dates:

Monitoring conducted:	Report due by:
Semi-annual: January-June	July 30
Semi-annual: July-December	January 30
Annual: January-December	January 30

2.7.7 Changes to Facility Information in Section 1.0

[2]A post-mark date no later than the due date is considered meeting the due date requirements under this Section

The Groundwater Section, and the Water Quality Compliance Section, and the Northern Regional Office shall be notified within ten days of any change of facility information including Facility Name, Permittee Name, Mailing or Street Address, Facility Contact Person, or Emergency Telephone Number.

2.8 Temporary Cessation [A.R.S. § 49-243(K) (8) and A.A.C. R18-9-A209 (A)]

The permittee shall give written notice to the Water Quality Compliance Section and the Northern Regional Office before ceasing operation of the facility for a period of 60 days or greater. The permittee shall take the following measures upon temporary cessation:

1. If applicable, direct the wastewater flows from the facility to another state-approved wastewater treatment facility;
2. Correct the problem that caused the temporary cessation of the facility; and
3. Notify ADEQ with a monthly facility status report describing the activities conducted on the treatment facility to correct the problem.

At the time of notification the permittee shall submit for ADEQ approval a plan for maintenance of discharge control systems and for monitoring during the period of temporary cessation. Immediately following ADEQ approval, the permittee shall implement the approved plan. If necessary, ADEQ shall amend permit conditions to incorporate conditions to address temporary cessation. During the period of temporary cessation, the permittee shall provide written notice to the Water Quality Compliance Section and the Northern Regional Office of the operational status of the facility every three years. If the permittee intends to permanently cease operation of any facility, the permittee shall submit closure notification, as set forth in Section 2.9 below.

2.9 Closure [A.R.S. §§ 49-243(K)(6), 49-252 and A.A.C. R18-9-A209(B)]

For a facility addressed under this permit, the permittee shall give written notice of closure to the Water Quality Compliance Section the Northern Regional Office of the intent to cease operation without resuming activity for which the facility was designed or operated.

2.9.1 Closure Plan

Within 90 days following notification of closure, the permittee shall submit for approval to the Groundwater Section, a closure plan which meets the requirements of A.R.S. § 49-252 and A.A.C. R18-9-A209(B)(3).

If the closure plan achieves clean closure immediately, ADEQ shall issue a letter of approval to the permittee. If the closure plan contains a schedule for bringing the facility to a clean closure configuration at a future date, ADEQ may incorporate any part of the schedule as an amendment to this permit.

2.9.2 Closure Completion

Upon completion of closure activities, the permittee shall give written notice to the Groundwater Section indicating that the approved closure plan has been implemented fully and providing supporting documentation to demonstrate that clean closure has been achieved (soil sample results, verification sampling results, groundwater data, as applicable). If clean closure has been achieved, ADEQ shall issue a letter of approval to the permittee at that time. If any of the following conditions apply, the permittee shall follow the terms of post-closure stated in this permit:

1. Clean-closure cannot be achieved at the time of closure notification or within one year thereafter under a diligent schedule of closure actions;
2. Further action is necessary to keep the facility in compliance with the AWQS at the applicable POC;

3. Continued action is required to verify that the closure design has eliminated discharge to the extent intended;
4. Remedial or mitigation measures are necessary to achieve compliance with Title 49, Ch. 2; and
5. Further action is necessary to meet property use restrictions.

2.10 Post-closure [A.R.S. §§ 49-243(K)(6), 49-252 and A.A.C. R18-9 A209(C)]

Post-closure requirements shall be established based on a review of facility closure actions and will be subject to review and approval by the Groundwater Section.

In the event clean closure cannot be achieved pursuant to A.R.S. § 49-252, the permittee shall submit for approval to the Groundwater Section a post-closure plan that addresses post-closure maintenance and monitoring actions at the facility. The post-closure plan shall meet all requirements of A.R.S. §§ 49-201(30) and 49-252 and A.A.C. R18-9-A209(C). Upon approval of the post-closure plan, this permit shall be amended or a new permit shall be issued to incorporate all post-closure controls and monitoring activities of the post-closure plan.

2.10.1 Post-Closure Plan

A specific post-closure plan may be required upon the review of the closure plan.

2.10.2 Post-Closure Completion

Not required at the time of permit issuance.

3.0 COMPLIANCE SCHEDULE [A.R.S. § 49-243(K)(5) and A.A.C. R18-9-A208]

For each compliance schedule item listed below, the permittee shall submit the required information, including a cover letter that lists the compliance schedule items, to the Groundwater Section. A copy of the cover letter must also be submitted to the ADEQ Water Quality Compliance Section.

Description	Due by:
The permittee shall submit a signed, dated, and sealed Engineer's Certificate of Completion in a format approved by the Department that confirms that the new WWTP is constructed according to the Department-approved design report or plans and specifications, as applicable.	Prior to discharging from the new WWTP and within 90 days of completion of construction of the new WWTP.
Discontinue operation of the existing WWTP	Upon commencing operation of the new WWTP or within 60 days of the startup period, whichever comes later.
The permittee shall submit a clean closure application to ADEQ to close the existing WWTP.	Within 90 days of the operations of the new WWTP

4.0 TABLES OF MONITORING REQUIREMENTS

4.1 PRE-OPERATIONAL MONITORING (OR CONSTRUCTION REQUIREMENTS)

TABLE 1 (or 1A, 1B, 1C, etc., as appropriate)

Not applicable at permit issuance.

4.0 TABLES OF MONITORING REQUIREMENTS

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE IA-1 - PHASE I (flows up to 0.25 mgd)[3]
ROUTINE DISCHARGE MONITORING

Sampling Point Number	Sampling Point Identification		Latitude		Longitude
2	Downstream from UV disinfection unit		34° 44' 43.5" N		114° 34' 38.5" W
Parameter	**AL[4]**	**DL[5]**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Total Flow[6]: Daily[7]	Not Established[8]	Not Established	mgd[9]	Daily	Quarterly
Total Flow: Average Monthly	0.24	0.25	mgd	Monthly[10]	Quarterly
Fecal Coliform: Single sample maximum	No Limit	23.0	CFU or MPN[11]	Daily	Quarterly
Fecal Coliform: four (4) of seven (7) samples in a week[12]	Not established	Non-detect[13]	CFU or MPN	Daily	Quarterly
Total Nitrogen[14]: Five-sample rolling geometric mean	8.0	10.0	mg/l	Monthly[15]	Quarterly

[3]No monitoring is required until the facility discontinues monitoring as per Table IA-3 or 60 days from start of the operation of the new WWTP whichever comes earlier. Monitoring for Phase I is no longer required after once the facility commences monitoring under TableIA-2.
[4]AL = Alert Level
[5]DL = Discharge Limit
[6]Monthly average of daily flow values
[7]Flow shall be measured using a continuous recording flow meter which totals the flow daily.
[8]Not Established means monitoring is required but no limits are specified.
[9]mgd = million gallons per day
[10]Monthly = Calculated value = Average of daily flows in a month.
[11]CFU = Colony Forming Units / 100 ml sample. MPN = Most Probable Number / 100 ml sample
[12]**Week** means a seven-day period starting on Sunday and ending on the following Saturday.
[13]If at least four (4) of seven (7) samples in a week are non-detect, report "yes" in the appropriate space on the SMRF (indicating that the standard has been met). If at least four (4) of seven (7) samples in a week have detections of fecal coliform, report "no" in the appropriate space on the SMRF (indicating that the standard has not been met).
[14]Total Nitrogen = Nitrate as N + Nitrite as N + Total Kjeldahl Nitrogen
[15]A five-month geometric mean of the results of the five (5) most recent samples

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE IA-1 - PHASE I (flows up to 0.25 mgd)
ROUTINE DISCHARGE MONITORING (continued)

Parameter	AL	DL	Units	Sampling Frequency	Reporting Frequency
Metals (total):					
Antimony	0.0048	0.006	mg/l	Quarterly	Quarterly
Arsenic	0.04	0.05	mg/l	Quarterly	Quarterly
Barium	1.60	2.00	mg/l	Quarterly	Quarterly
Beryllium	0.0032	0.004	mg/l	Quarterly	Quarterly
Cadmium	0.004	0.005	mg/l	Quarterly	Quarterly
Chromium	0.08	0.1	mg/l	Quarterly	Quarterly
Cyanide (as free cyanide)	0.16	0.2	mg/l	Quarterly	Quarterly
Fluoride	3.2	4.0	mg/l	Quarterly	Quarterly
Lead	0.04	0.05	mg/l	Quarterly	Quarterly
Mercury	0.0016	0.002	mg/l	Quarterly	Quarterly
Nickel	0.08	0.1	mg/l	Quarterly	Quarterly
Selenium	0.04	0.05	mg/l	Quarterly	Quarterly
Thallium	0.0016	0.002	mg/l	Quarterly	Quarterly

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE IA-1 - PHASE I
ROUTINE DISCHARGE MONITORING (continued)

Parameter	AL	DL	Units	Sampling Frequency	Reporting Frequency
Volatile Organic Compounds (VOCs):					
Benzene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Carbon tetrachloride	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
o-Dichlorobenzene	0.48	0.6	mg/l	Semi-Annually	Semi-Annually
para-Dichlorobenzene	0.06	0.075	mg/l	Semi-Annually	Semi-Annually
1,2-Dichloroethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
1,1-Dichloroethylene	0.0056	0.007	mg/l	Semi-Annually	Semi-Annually
cis-1,2-Dichloroethylene	0.056	0.07	mg/l	Semi-Annually	Semi-Annually
trans-1,2-Dichloroethylene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Dichloromethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
1,2-Dichloropropane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Ethylbenzene	0.56	0.7	mg/l	Semi-Annually	Semi-Annually
Hexachlorobenzene	0.0008	0.001	mg/l	Semi-Annually	Semi-Annually
Hexachlorocyclopentadiene	0.04	0.05	mg/l	Semi-Annually	Semi-Annually
Monochlorobenzene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Styrene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Tetrachloroethylene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Toluene	0.8	1.0	mg/l	Semi-Annually	Semi-Annually
Trihalomethanes (total)[16]	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
1,1,1-Trichloroethane	0.16	0.2	mg/l	Semi-Annually	Semi-Annually
1,2,4 - Trichlorobenzene	0.056	0.07	mg/l	Semi-Annually	Semi-Annually
1,1,2 - Trichloroethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Trichloroethylene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Vinyl Chloride	0.0016	0.002	mg/l	Semi-Annually	Semi-Annually
Xylenes (Total)	8.0	10.0	mg/l	Semi-Annually	Semi-Annually

[16] Total Trihalomethanes (TTHMs) are comprised of Bromoform, Bromodichloromethane, Chloroform, and Dibromochloromethane.

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE IA-1 - PHASE I
ROUTINE DISCHARGE MONITORING (continued)

Parameter	AL	DL	Units	Sampling Frequency	Reporting Frequency
Indicator Parameters / Major Cations and Anions:					
pH (field)	Monitor[17]	Monitor	S.U.	Quarterly	Quarterly
Iron	Monitor	Monitor	mg/l	Quarterly	Quarterly
Manganese	Monitor	Monitor	mg/l	Quarterly	Quarterly
Total Organic Carbon	Monitor	Monitor	mg/l	Quarterly	Quarterly
Total Dissolved Solids	Monitor	Monitor	mg/l	Quarterly	Quarterly
Sodium	Monitor	Monitor	mg/l	Quarterly	Quarterly
Potassium	Monitor	Monitor	mg/l	Quarterly	Quarterly
Calcium	Monitor	Monitor	mg/l	Quarterly	Quarterly
Magnesium	Monitor	Monitor	mg/l	Quarterly	Quarterly
Chloride	Monitor	Monitor	mg/l	Quarterly	Quarterly
Sulfate	Monitor	Monitor	mg/l	Quarterly	Quarterly
Alkalinity	Monitor	Monitor	mg/l	Quarterly	Quarterly
Specific Conductivity (field)	Monitor	Monitor	µmhos/cm	Quarterly	Quarterly

[17] Monitoring required, but no limits established.

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE IA-2 - PHASE II (flows up to 0.455 mgd) [18]
ROUTINE DISCHARGE MONITORING

Sampling Point Number	Sampling Point Identification		Latitude		Longitude
2	Downstream from UV disinfection unit		34° 44' 43.5" N		114° 34' 38.5" W
Parameter	**AL[19]**	**DL[20]**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Total Flow[21]: Daily[22]	Not Established[23]	Not Established	mgd[24]	Daily	Quarterly
Total Flow: Average Monthly	0.433	0.455	mgd	Monthly [25]	Quarterly
Fecal Coliform Single sample maximum	No Limit	23.0	CFU or MPN[26]	Daily	Quarterly
Fecal Coliform: four (4) of seven (7) samples in a week[27]	Not established	Non-detect[28]	CFU or MPN	Daily	Quarterly
Total Nitrogen[29]: Five-sample rolling geometric mean	8.0	10.0	mg/l	Monthly[30]	Quarterly

[18]Monitoring under this table is required once the flow exceeds 0.25 mgd or when the facility commences operation under phase II.
[19]AL = Alert Level
[20]DL = Discharge Limit
[21]Monthly average of daily flow values
[22]Flow shall be measured using a continuous recording flow meter which totals the flow daily.
[23]Not Established means monitoring is required but no limits are specified.
[24]mgd = million gallons per day
[25]Monthly = Calculated value = Average of daily flows in a month.
[26]CFU = Colony Forming Units / 100 ml sample. MPN = Most Probable Number / 100 ml sample.
[27]**Week** means a seven-day period starting on Sunday and ending on the following Saturday.
[28]If at least four (4) of seven (7) samples in a week are non-detect, report "yes" in the appropriate space on the SMRF (indicating that the standard has been met). If at least four (4) of seven (7) samples in a week have detections of fecal coliform, report "no" in the appropriate space on the SMRF (indicating that the standard has not been met).
[29]Total Nitrogen = Nitrate as N + Nitrite as N + Total Kjeldahl Nitrogen
[30]A five-month geometric mean of the results of the five (5) most recent samples

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE IA-2 - PHASE II
ROUTINE DISCHARGE MONITORING (continued)

Parameter	AL	DL	Units	Sampling Frequency	Reporting Frequency
Metals (total):					
Antimony	0.0048	0.006	mg/l	Quarterly	Quarterly
Arsenic	0.04	0.05	mg/l	Quarterly	Quarterly
Barium	1.60	2.00	mg/l	Quarterly	Quarterly
Beryllium	0.0032	0.004	mg/l	Quarterly	Quarterly
Cadmium	0.004	0.005	mg/l	Quarterly	Quarterly
Chromium	0.08	0.1	mg/l	Quarterly	Quarterly
Cyanide (as free cyanide)	0.16	0.2	mg/l	Quarterly	Quarterly
Fluoride	3.2	4.0	mg/l	Quarterly	Quarterly
Lead	0.04	0.05	mg/l	Quarterly	Quarterly
Mercury	0.0016	0.002	mg/l	Quarterly	Quarterly
Nickel	0.08	0.1	mg/l	Quarterly	Quarterly
Selenium	0.04	0.05	mg/l	Quarterly	Quarterly
Thallium	0.0016	0.002	mg/l	Quarterly	Quarterly

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE IA-2
ROUTINE DISCHARGE MONITORING - PHASE II (continued)

Parameter	AL	DL	Units	Sampling Frequency	Reporting Frequency
Volatile Organic Compounds (VOCs):					
Benzene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Carbon tetrachloride	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
o-Dichlorobenzene	0.48	0.6	mg/l	Semi-Annually	Semi-Annually
para-Dichlorobenzene	0.06	0.075	mg/l	Semi-Annually	Semi-Annually
1,2-Dichloroethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
1,1-Dichloroethylene	0.0056	0.007	mg/l	Semi-Annually	Semi-Annually
cis-1,2-Dichloroethylene	0.056	0.07	mg/l	Semi-Annually	Semi-Annually
trans-1,2-Dichloroethylene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Dichloromethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
1,2-Dichloropropane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Ethylbenzene	0.56	0.7	mg/l	Semi-Annually	Semi-Annually
Hexachlorobenzene	0.0008	0.001	mg/l	Semi-Annually	Semi-Annually
Hexachlorocyclopentadiene	0.04	0.05	mg/l	Semi-Annually	Semi-Annually
Monochlorobenzene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Styrene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Tetrachloroethylene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Toluene	0.8	1.0	mg/l	Semi-Annually	Semi-Annually
Trihalomethanes (total)[3]	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
1,1,1-Trichloroethane	0.16	0.2	mg/l	Semi-Annually	Semi-Annually
1,2,4 - Trichlorobenzene	0.056	0.07	mg/l	Semi-Annually	Semi-Annually
1,1,2 - Trichloroethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Trichloroethylene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Vinyl Chloride	0.0016	0.002	mg/l	Semi-Annually	Semi-Annually
Xylenes (Total)	8.0	10.0	mg/l	Semi-Annually	Semi-Annually

[3] Total Trihalomethanes (THMs) are comprised of Bromoform, Bromodichloromethane, Chloroform, and Dibromochloromethane.

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE IA-2
ROUTINE DISCHARGE MONITORING - PHASE II (continued)

Parameter	AL	DL	Units	Sampling Frequency	Reporting Frequency
Indicator Parameters / Major Cations and Anions:					
pH (field)	Monitor[32]	Monitor	S.U.	Quarterly	Quarterly
Iron	Monitor	Monitor	mg/l	Quarterly	Quarterly
Manganese	Monitor	Monitor	mg/l	Quarterly	Quarterly
Total Organic Carbon	Monitor	Monitor	mg/l	Quarterly	Quarterly
Total Dissolved Solids	Monitor	Monitor	mg/l	Quarterly	Quarterly
Sodium	Monitor	Monitor	mg/l	Quarterly	Quarterly
Potassium	Monitor	Monitor	mg/l	Quarterly	Quarterly
Calcium	Monitor	Monitor	mg/l	Quarterly	Quarterly
Magnesium	Monitor	Monitor	mg/l	Quarterly	Quarterly
Chloride	Monitor	Monitor	mg/l	Quarterly	Quarterly
Sulfate	Monitor	Monitor	mg/l	Quarterly	Quarterly
Alkalinity	Monitor	Monitor	mg/l	Quarterly	Quarterly
Specific Conductivity (field)	Monitor	Monitor	µmhos/cm	Quarterly	Quarterly

[32] Monitoring required, but no limits established.

4.0 TABLES OF MONITORING REQUIREMENTS

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE IA-3[33]
ROUTINE DISCHARGE MONITORING
(Existing WWTP)

1	Point of discharge into storage basin		34° 44' 45.21" N		112° 34' 40.42" W
Parameter	**AL[34]**	**DL[35]**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Total Flow[36]: Daily[37]	Not Established[38]	Not Established	mgd[39]	Daily	Quarterly
Total Flow: Average Monthly	0.433	0.455	mgd	Monthly [40]	Quarterly
Fecal Coliform Single sample maximum	Reserved	800	CFU or MPN[41]	Daily	Quarterly
Fecal Coliform: four (4) of seven (7) samples in a week[42]	Reserved	200	CFU or MPN	Weekly (Calculated)	Quarterly
Total Nitrogen	8.0	10.0	mg/l	Monthly	Quarterly
Nitrate as N	8.0	10.0	mg/l	Monthly	Quarterly
Nitrite as N	0.8	1.0	mg/l	Monthly	Quarterly
Total Nitrogen[43]: Five-sample rolling geometric mean	8.0	10.0	mg/l	Monthly[44]	Quarterly

[33] Monitoring may be discontinued once the new WWTP commences operation or at the end of the 60 day start-up period, whichever comes later.
[34] AL = Alert Level
[35] DL = Discharge Limit
[36] Monthly average of daily flow values
[37] Flow shall be measured using a continuous recording flow meter which totals the flow daily.
[38] Not Established means monitoring is required but no limits are specified.
[39] mgd = million gallons per day
[40] Monthly = Calculated value = Average of daily flows in a month.
[41] CFU = Colony Forming Units / 100 ml sample. MPN = Most Probable Number / 100 ml sample.
[42] **Week** means a seven-day period starting on Sunday and ending on the following Saturday.
[43] Total Nitrogen = Nitrate as N + Nitrite as N + Total Kjeldahl Nitrogen
[44] A five-month geometric mean of the results of the five (5) most recent samples

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE IA-3
ROUTINE DISCHARGE MONITORING (continued)

Parameter	AL	DL	Units	Sampling Frequency	Reporting Frequency
Metals (total):					
Antimony	0.0048	0.006	mg/l	Quarterly	Quarterly
Arsenic	0.04	0.05	mg/l	Quarterly	Quarterly
Barium	1.60	2.00	mg/l	Quarterly	Quarterly
Beryllium	0.0032	0.004	mg/l	Quarterly	Quarterly
Cadmium	0.004	0.005	mg/l	Quarterly	Quarterly
Chromium	0.08	0.1	mg/l	Quarterly	Quarterly
Cyanide (as free cyanide)	0.16	0.2	mg/l	Quarterly	Quarterly
Fluoride	3.2	4.0	mg/l	Quarterly	Quarterly
Lead	0.04	0.05	mg/l	Quarterly	Quarterly
Mercury	0.0016	0.002	mg/l	Quarterly	Quarterly
Nickel	0.08	0.1	mg/l	Quarterly	Quarterly
Selenium	0.04	0.05	mg/l	Quarterly	Quarterly
Thallium	0.0016	0.002	mg/l	Quarterly	Quarterly

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE 1A-3
ROUTINE DISCHARGE MONITORING (continued)

Parameter	AL	DL	Units	Sampling Frequency	Reporting Frequency
Volatile Organic Compounds (VOCs):					
Benzene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Carbon tetrachloride	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
o-Dichlorobenzene	0.48	0.6	mg/l	Semi-Annually	Semi-Annually
para-Dichlorobenzene	0.06	0.075	mg/l	Semi-Annually	Semi-Annually
1,2-Dichloroethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
1,1-Dichloroethylene	0.0056	0.007	mg/l	Semi-Annually	Semi-Annually
cis-1,2-Dichloroethylene	0.05	0.07	mg/l	Semi-Annually	Semi-Annually
trans-1,2-Dichloroethylene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Dichloromethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
1,2-Dichloropropane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Ethylbenzene	0.56	0.7	mg/l	Semi-Annually	Semi-Annually
Monochlorobenzene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Styrene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Tetrachloroethylene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Toluene	0.8	1.0	mg/l	Semi-Annually	Semi-Annually
Trihalomethanes (total)[45]	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
1,1,1-Trichloroethane	0.16	0.2	mg/l	Semi-Annually	Semi-Annually
1,2,4 - Trichlorobenzene	0.056	0.07	mg/l	Semi-Annually	Semi-Annually
1,1,2 - Trichloroethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Trichloroethylene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Vinyl Chloride	0.0016	0.002	mg/l	Semi-Annually	Semi-Annually
Xylenes (Total)	8.0	10.0	mg/l	Semi-Annually	Semi-Annually

[4] Total Trihalomethanes (THMs) are comprised of Bromoform, Bromodichloromethane, Chloroform, and Dibromochloromethane.

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE IA-3
ROUTINE DISCHARGE MONITORING (continued)

Parameter	AL	DL	Units	Sampling Frequency	Reporting Frequency
Indicator Parameters / Major Cations and Anions:					
pH (field)	Monitor[46]	Monitor	S.U.	Quarterly	Quarterly
Iron	Monitor	Monitor	mg/l	Quarterly	Quarterly
Manganese	Monitor	Monitor	mg/l	Quarterly	Quarterly
Total Organic Carbon	Monitor	Monitor	mg/l	Quarterly	Quarterly
Total Dissolved Solids	Monitor	Monitor	mg/l	Quarterly	Quarterly
Sodium	Monitor	Monitor	mg/l	Quarterly	Quarterly
Potassium	Monitor	Monitor	mg/l	Quarterly	Quarterly
Calcium	Monitor	Monitor	mg/l	Quarterly	Quarterly
Magnesium	Monitor	Monitor	mg/l	Quarterly	Quarterly
Chloride	Monitor	Monitor	mg/l	Quarterly	Quarterly
Sulfate	Monitor	Monitor	mg/l	Quarterly	Quarterly
Alkalinity	Monitor	Monitor	mg/l	Quarterly	Quarterly
Specific Conductivity (field)	Monitor	Monitor	µmhos/cm	Quarterly	Quarterly

[46] Monitoring required, but no limits established. Monitoring is for informational purposes only.

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE IB-1
RECLAIMED WATER MONITORING TABLE - CLASS A+[47]
(New WWTP)

Sampling Point Number	Sampling Point Identification		Latitude	Longitude
2	Downstream from UV disinfection unit		34° 44' 43.5" N	114° 34' 38.5" W
Parameter	**DL**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Fecal Coliform: Single-sample maximum	23	CFU or MPN[48]	Daily[49]	Quarterly
Fecal Coliform: Four (4) of last seven (7) samples	Non-detect[50]	CFU or MPN	Daily	Quarterly
Total Nitrogen[51]: Five-sample rolling geometric mean	10.0	mg/l	Monthly	Quarterly
Turbidity[52]: Single reading	5.0	NTU[53]	Everyday[54]	Quarterly
Turbidity: 24-hour average	2.0	NTU	Everyday	Quarterly
Enteric Virus[55]: Four (4) of last seven (7) samples	Non-detect	PFU[56]	Monthly / Suspended[57]	Quarterly

[47]Reclaimed water monitoring under Table IB-1 is not required until the new WWTP commences operation; monitoring under the table shall be performed in addition to routine discharge monitoring required under Section 4.2, Tables IA-1 and IA-2.

[48]CFU = Colony Forming Units per 100 ml; MPN = Most Probable Number per 100 ml. For CFU, a value of < 1.0 shall be considered to be non-detect. For MPN, a value of < 2.2 shall be considered to be non-detect.

[49]For fecal coliform, "daily" sampling means every day in which a sample can practicably be obtained and delivered in sufficient time for proper analysis, provided that no less than four (4) samples in each calendar week are obtained and analyzed.

[50]If at least four (4) of the last seven (7) samples are non-detect, report "yes" in the appropriate space on the SMRF (indicating that the standard has been met). If at least four (4) of the last seven (7) samples have detections of fecal coliform, report "no" in the appropriate space on the SMRF (indicating that the standard has **not** been met).

[51]Nitrate N. plus Nitrite N. plus Total Kjeldahl Nitrogen (TKN)

[52]Turbidimeter shall have a signal averaging time not exceeding 120 seconds. Occasional spikes due to back-flushing or instrument malfunction shall not be considered an exceedance. All exceedances must be explained and submitted to the Department with the corresponding quarterly SMRF.

[53]NTU = Nephelometric Turbidity Units

[54]For the single turbidity reading, "everyday" means the maximum reading during the 24-hour period.

[55]Initial monthly enteric virus sampling shall be performed to indicate four (4) out of seven (7) sample results of non-detect.

[56]Plaque Forming Units per 40 Liters. A value of < 1.1 PFU/40 L shall be considered to be non-detect.

[57]Enteric virus sampling shall resume only when the discharge limit for the 24-hour average for turbidity is exceeded for two (2) consecutive 24-hour monitoring periods. Monthly enteric virus monitoring shall continue until four (4) out of seven (7) consecutive sample results show no detection. During times when enteric virus sampling is suspended, enter "suspended" in the appropriate space on the SMRF.

TABLE IB-2
RECLAIMED WATER MONITORING TABLE - CLASS B+[58]
(Existing WWTP)

Sampling Point Number	Sampling Point Identification		Latitude	Longitude
1	Point of discharge into storage basin		34° 44' 45.21" N	112° 34' 40.42" W
Parameter	**DL**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Total Nitrogen[59]: Five-sample rolling geometric mean	10.0	mg/l	Monthly[60]	Quarterly
Fecal Coliform: Single-sample maximum	800	CFU or MPN[61]	Daily[62]	Quarterly
Fecal Coliform: Four of last seven samples	200[63]	CFU or MPN	Daily	Quarterly

[58] Reclaimed water monitoring under Table IB-2 shall be performed in addition to routine discharge monitoring required under Section 4.2, Table IA-3. Monitoring under this table this (Table IB-2) may be discontinued once the new WWTP commences operation.

[59] Nitrate N, plus Nitrite N, plus Total Kjeldahl Nitrogen (TKN)

[60] A five-month geometric mean of the results of the five most recent samples.

[61] CFU = Colony Forming Units per 100 ml. MPN = Most Probable Number per 100 ml. For CFU, a value of < 1 shall be considered to be non-detect. For MPN, a value of <2.2 shall be considered to be non-detect.

[62] For fecal coliform, "daily" sampling means every day in which a sample can practicably be obtained and delivered in sufficient time for proper analysis, provided that no less than four samples in each seven-day period are obtained and analyzed.

[63] If at least four of the last seven samples are equal to or less than 200 CFU or MPN per 100 ml, report "yes" in the appropriate space on the SMRF (indicating that the standard has been met). If at least four of the last seven samples are greater than 200 CFU or MPN per 100 ml, report "no" in the appropriate space on the SMRF (indicating that the standard has **not** been met).

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE II
GROUNDWATER MONITORING

Not applicable.

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE III
FACILITY INSPECTION (Operational Monitoring)

Pollution Control Structures/Parameter	Performance Levels	Inspection Frequency	Reporting Frequency
Pump integrity	Good working condition	Weekly	Quarterly
Treatment plant components	Good working condition	Weekly	Quarterly

5.0 REFERENCES AND PERTINENT INFORMATION

The terms and conditions set forth in this permit have been developed based upon the information contained in the following, which are on file with the Department:

1.	APP Application, dated:	07/30/1997 (original APP); 11/29/2001 (significant amendment); 03/26/2008 (significant amendment)
2.	Contingency Plan, dated:	12/23/2008
3.	Final Hydrologist Report, dated:	05/20/2002 (significant amendment); 05/20/2002 (significant amendment); 10/27/09 (significant amendment);
4.	Final Engineering Report, dated:	10/14/09 (significant amendment)
5.	Public Notice, dated:	09/11/02 (original APP); 09/11/02 (significant amendment)
6.	Public Hearing, dated:	Not applicable
7.	Responsiveness Summary, dated:	Not applicable

6.0 NOTIFICATION PROVISIONS

6.1 Annual Registration Fees

The permittee is notified of the obligation to pay an Annual Registration Fee to ADEQ. The Annual Registration Fee is based upon the amount of daily influent or discharge of pollutants in gpd as established by A.R.S. § 49-242(D).

6.2 Duty to Comply [A.R.S. §§ 49-221 through 263]

The permittee is notified of the obligation to comply with all conditions of this permit and all applicable provisions of Title 49, Chapter 2, Articles 1, 2 and 3 of the Arizona Revised Statutes, Title 18, Chapter 9, Articles 1 through 4, and Title 18, Chapter 11, Article 4 of the Arizona Administrative Code. Any permit non-compliance constitutes a violation and is grounds for an enforcement action pursuant to Title 49, Chapter 2, Article 4 or permit amendment, suspension, or revocation.

6.3 Duty to Provide Information [A.R.S. §§ 49-243(K)(2) and 49-243(K)(8)]

The permittee shall furnish to the Director, or an authorized representative, within a time specified, any information which the Director may request to determine whether cause exists for amending or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

6.4 Compliance with Aquifer Water Quality Standards [A.R.S. §§ 49-243(B)(2) and 49-243(B)(3)]

The permittee shall not cause or contribute to a violation of an AWQS at the applicable POC for the facility. Where, at the time of issuance of the permit, an aquifer already exceeds an AWQS for a pollutant, the permittee shall not discharge that pollutant so as to further degrade, at the applicable point of compliance for the facility, the water quality of any aquifer for that pollutant.

6.5 Technical and Financial Capability [A.R.S. §§ 49-243(K)(8) and 49-243(N) and A.A.C. R18-9-A202(B) and R18-9-A203(E) and (F)]

The permittee shall have and maintain the technical and financial capability necessary to fully carry out the terms and conditions of this permit. Any bond, insurance policy, trust fund, or other financial assurance mechanism provided as a demonstration of financial capability in the permit application, pursuant to A.A.C. R18-9-A203(D), shall be in effect prior to any discharge authorized by this permit and shall remain in effect for the duration of the permit.

6.6 Reporting of Bankruptcy or Environmental Enforcement [A.A.C. R18-9-A207(C)]

The permittee shall notify the Director within five days after the occurrence of any one of the following:

1. the filing of bankruptcy by the permittee; or
2. the entry of any order or judgment not issued by the Director against the permittee for the enforcement of any environmental protection statute or rule.

6.7 Monitoring and Records [A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A206]

The permittee shall conduct any monitoring activity necessary to assure compliance with this permit, with the applicable water quality standards established pursuant to A.R.S. §§ 49-221 and 49-223 and §§ 49-241 through 49-252.

6.8 Inspection and Entry [A.R.S. §§ 49-1009, 49-203(B), and 49-243(K)(8)]

In accordance with A.R.S. §§ 41-1009 and 49-203(B), the permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to enter and inspect the facility as reasonably necessary to ensure compliance with Title 49, Chapter 2, Article 3 of the Arizona Revised Statutes, and Title 18, Chapter 9, Articles 1 through 4 of the Arizona Administrative Code and the terms and conditions of this permit.

6.9 Duty to Modify [A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A211]

The permittee shall apply for and receive a written amendment before deviating from any of the designs or operational practices authorized by this permit.

6.10 Permit Action: Amendment, Transfer, Suspension, and Revocation [A.R.S. §§ 49-201, 49-241 through 251, A.A.C. R18-9-A211, R18-9-A212 and R18-9-A213]

This permit may be amended, transferred, suspended, or revoked for cause, under the rules of the Department. The permittee shall notify the Groundwater Section in writing within 15 days after any change in the owner or operator of the facility. The notification shall state the permit number, the name of the facility, the date of property transfer, and the name, address, and phone number where the new owner or operator can be reached. The operator shall advise the new owner or operators of the terms of this permit and the need for permit transfer in accordance with the rules.

7.0 ADDITIONAL PERMIT CONDITIONS

7.1 Other Information [A.R.S. § 49-243(K)(8)]

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, the permittee shall promptly submit the correct facts or information.

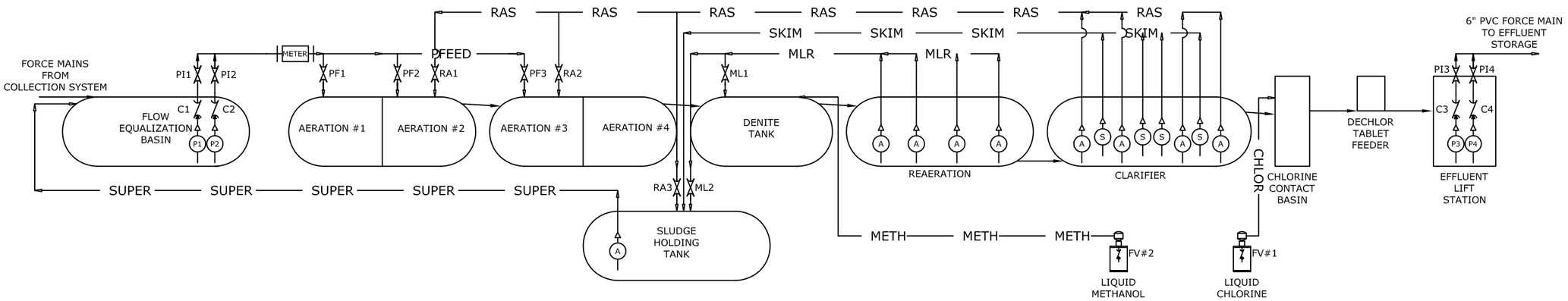
7.2 Severability [A.R.S. §§ 49-201, 49-241 through 251, A.A.C. R18-9-A211, R18-9-A212 and R18-9-A213]

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby. The filing of a request by the permittee for a permit action does not stay or suspend the effectiveness of any existing permit condition.

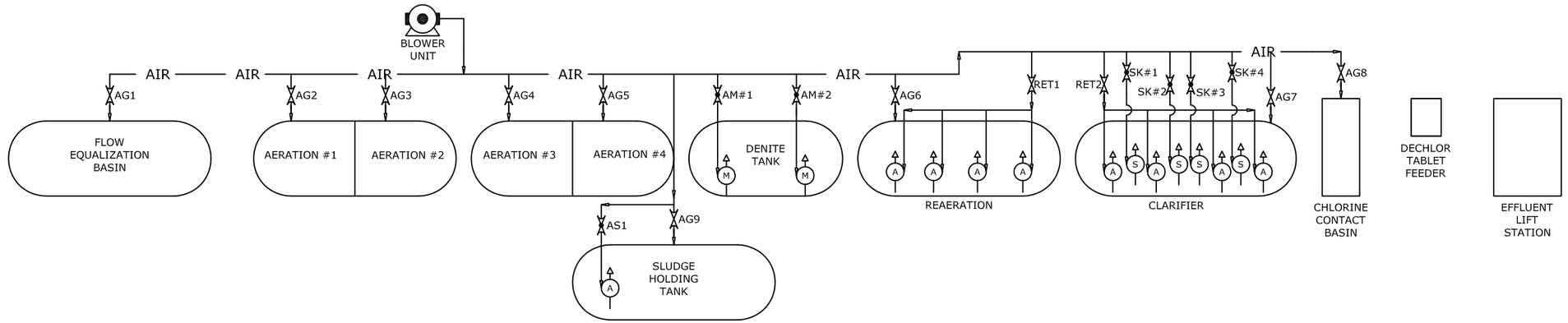
7.3 Permit Transfer

This permit may not be transferred to any other person except after notice to and approval of the transfer by the Department. No transfer shall be approved until the applicant complies with all transfer requirements as specified in A.A.C. R18-9-A212(B) and (C).

Appendix B – Granite Basin Engineering's WWTP 2013 As-Built Process Schematic



HYDRAULIC LINES AND VALVES, N.T.S.



AIR LINES AND VALVES, N.T.S.

SYMBOL LEGEND

AIR	PROCESS AIR LINE
CHLOR	CHLORINE FEED LINE
GR	GRAVITY OVERFLOW LINE
METH	METHANOL FEED LINE
MLR	MIXED LIQUOR RETURN LINE
PFEED	PROCESS FEED LINE
RAS	RETURN ACTIVATED SLUDGE LINE
SKIM	SKIMMER WASTE LINE
SUPER	SUPERNATANT RETURN LINE

	BALL VALVE
	GATE VALVE
	CHECK VALVE
A	AIRLIFT PUMP, RECYCLE TYPE
M	AIRLIFT PUMP, MIXER TYPE
S	AIRLIFT PUMP, SKIMMER TYPE
P#	PUMP, CENTRIFUGAL
M / METER	ECCENTRIC PLUG VALVE, MOTORIZED
	FLOW METER, MAGNETIC

VALVE SCHEDULE

VALVE #	SIZE	#	TYPE
C1-2	2"	2	SWING CHECK
C3-4	4"	2	SWING CHECK
PI1-2	2"	2	SCREW GATE
PI3-4	4"	2	SCREW GATE
PF1-3	2"	3	SLIDE GATE
ML1-2	6"	2	SLIDE GATE
RA1-3	6"	2	SLIDE GATE
AG #1,6-9	1-1/2"	5	SCREW GATE
AG #2-5	2"	4	SCREW GATE
AM #1-2	1/2"	2	COMPACT BALL
AS #1	1/2"	1	COMPACT BALL
SK #1-4	1/2"	4	COMPACT BALL
RET1-2	1-1/2"	2	SCREW GATE

NOTES:
1) VESSELS SHOWN ARE SCHEMATIC ONLY.
2) VESSEL DIMENSIONS AND VOLUMES CAN BE FOUND ON SHEET 3.

PROCESS FLOW SCHEMATIC

DESIGN: MZ | CHECKED: DB

GBE JOB #11097 | DATE: MAY 2013

PREPARED FOR:
INSCRIPTION CANYON RANCH SANITARY DISTRICT

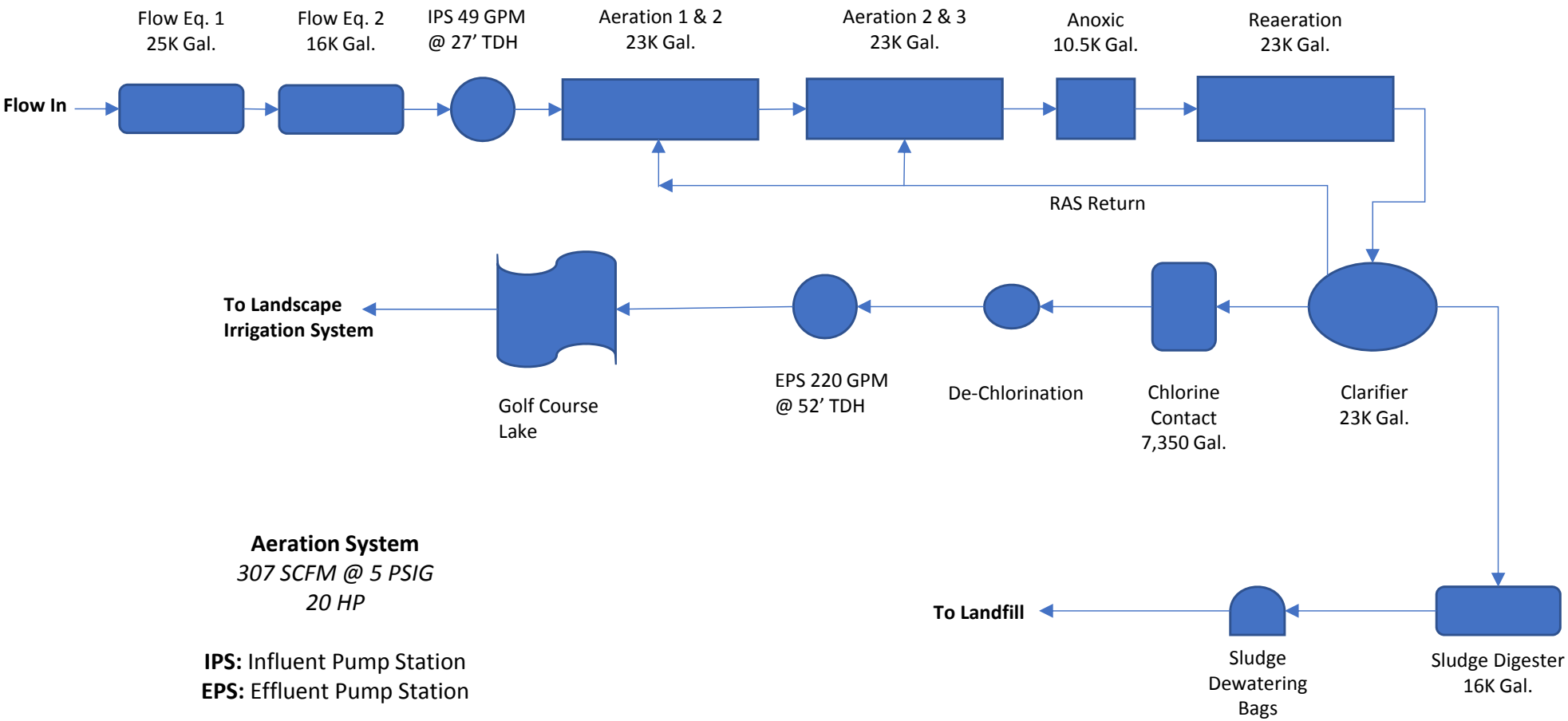
GRANITE BASIN ENGINEERING, INC.
1981 Commerce Center Circle, Suite B
Prescott, AZ 86301
928.717.0171

SANTEC CORPORATION
CASTLE ROCK, COLORADO
PHONE: 303.660.9211 FAX: 303.660.2180

SCHEMATIC FOR EXHIBIT PURPOSES ONLY

Appendix C – ICRSD's WWTP Generalized Process Flow Diagram

Figure 1 - ICRSD's WWTP
Generalized Process Flow Diagram



Aeration System
307 SCFM @ 5 PSIG
20 HP

IPS: Influent Pump Station
EPS: Effluent Pump Station

Appendix D – Civiltec's Wastewater Process Calculations (Existing Facility)

Inscription Canyon Ranch WWTP
AERATION BASINS
DESIGN PARAMETERS

Decay Rates					
Condition	**Parameter**		**Formula or Name**	**Value**	**Units**
	T		Temperature At Which Coefficients Have Been Determined	20	^{o} C
	θ		Temperature Coefficient For Growth And Decay Rates	1.04	
	Y_H		HeterotrpohicTrue Yield	0.6	kg VSS/ kg BOD_5
	b_h		Heterotrophic Decay Coefficient At T	0.1215	day^{-1}
	t		Design Temperature		^{o} C
	33		High Temperature	29.44	^{o} C
	20		Low Temperature	7.22	^{o} C
	$b_{h,\ t}$		Heterotrophic decay coefficient at t $b_{ht} = b_h(\theta)^{t-T}$		day^{-1}
For t = 7	$b_{h,\ 7.2}$	=	0.12(1.04)^(7.22-20)	0.074	day^{-1}
29	$b_{h,\ 29}$	=	0.12(1.04)^(29.44-20)	0.176	day^{-1}
Autotrophic Organisms					
Condition	**Parameter**		**Formula or Name**	**Value**	**Units**
	Y_A		AutotrophicTrue Yield	0.15	kg VSS/ kg BOD_5
	b_a		Autotrophic decay coefficient at T	0.05	day^{-1}
	t		Temperature		^{o} C
	$b_{a\ t}$		Autotrophic decay coefficient at t $b_{at} = b_a(1.04)^{t-15}$		day^{-1}
For t = 7	$b_{a\ 7.2}$	=	0.05(1.04)^7.22-20	0.030	day^{-1}
29	$b_{a\ 29}$	=	0.05(1.04)^29.44-20	0.072	day^{-1}
	K_N		NH_3 Half Sat.	1	mg NH_3-N/l
	K_o		DO Half Sat.	1.3	mg DO/l
	DO		Design Aeration Basin Dissolved Oxygen	2.00	mg/l
	NH_3		Design Effluent Maximum TKN Concentration	0.50	mg/l
	θ		Temperature coefficient	0.098	
	$\mu_{N,\max,}$		Maximum Autotrophic Growth Rate at T	0.47	day^{-1}
	$\mu_{N,\max,\ t}$		Maximum Autotrophic Growth Rate at t $\mu_{N,\max,t} = \mu_{N,\max}\left[e^{\theta(t-T)}\right]$		day^{-1}
For t = 7	$\mu_{N,\max,\ 7.2}$	=	0.47[e^(0.098(7.22-20)]	0.13	day^{-1}
For t = 29	$\mu_{N,\max,\ 29}$	=	0.47[e^(0.098(29.44-20)]	1.19	day^{-1}
	$\mu_{N,\ t}$		Autotrophic Growth Rate at Design Conditions $\mu_{Nt} = \mu_{N,\max,t}\left(\frac{NH_3}{K_N + NH_3}\right)\left(\frac{DO}{K_o + DO}\right)$		day^{-1}
For t = 7	$\mu_{N,\ 7.2}$	=	0.13(0.5/1+0.5)(2/1.3+2)	0.027	day^{-1}
29	$\mu_{N,\ 29}$	=	1.19(0.5/1+0.5)(2/1.3+2)	0.239	day^{-1}

Inscription Canyon Ranch WWTP
AERATION BASINS
DESIGN PARAMETERS

Sludge Retention Time					
	$\theta_{c,\min,\ t}$		Minimum Sludge Retention Time(SRT) at Design Conditions $\theta_{c,\min,t} = \frac{1}{\mu_{Nt}}$		days
For t = 7	$\theta_{c,\min,\ 7.2}$	=	1/0.03	36.85	days
29	$\theta_{c,\min,\ 29}$	=	1/0.24	4.18	days
	SF_{Ditch}		Safety Factor	1.5	
	$\theta_{c,SF,\ t}$		SRT based on Safety Factor $\theta_{c,SF,t} = \theta_{c,\min,t}(SF_{Ditch})$		days
	$\theta_{c,SF,\ 7.2}$	=	36.85(1.5)	55.27	days
	$\hat{\theta}_{c,SF,\ 29}$	=	4.18(1.5)	6.26	days
	$\theta_{c,design}$		SRT used in design based on highest calculated SRT	55	days
Aeration Basin Sizing					
	$Y_{h,OBS,\ t}$		Heterotrophic Yield at Design Temperature and SRT $Y_{h,OBS,t} = \frac{Y_H}{1 + b_{h,t}\theta_{c,design}}$		kg VSS/ kg BOD_5
	$Y_{h,OBS,\ 7.2}$	=	0.6/(1+0.07*55)	0.12	kg VSS/ kg BOD_5
	$Y_{h,OBS,\ 29}$	=	0.6/(1+0.18*55)	0.06	kg VSS/ kg BOD_6
	$Y_{a,OBS,\ t}$		Autotrophic Yield at Design Temperature and SRT $Y_{a,OBS,t} = \frac{Y_A}{1 + b_{a,t}\theta_{c,design}}$		kg VSS/ kg BOD_5
	$Y_{a,OBS,\ 7.2}$	=	0.15/(1+0.03*55)	0.06	kg VSS/ kg BOD_5
	$Y_{a,OBS,\ 29}$	=	0.15/(1+0.07*55)	0.03	kg VSS/ kg BOD_6
	$BOD_{5\ inf}$		Inf BOD_5	220	mg/l
	TSS_{inf}		Inf TSS	220	mg/l
	MLSS		Mixed Liquor Suspended Solids Design Concentration in Aeration Basin	5500	mg/l
	X_N		Design % Nitrogen in MLSS due to Assimilation	12	%
	TKN_{inf}		TKN in Inf.	36.0	mg/l
	$Q_{\ inf\ avg}$		Avg. Inf. Flow	0.06	MGD
	PF		Monthly LoadingPeaking Factor	1.2	
	$\%VSS_{inf}$		Design % Volatile Solids in the Influent	80	%
	$\%ISS_{inf}$		Design % Inert Solids in the Influent	20	%
	$lbsISS_{inf}$		Pounds of Inert Solids Entering the Plant per Day $lbsISS_{\inf} = \%ISS_{\inf} * TSS_{\inf} * 8.34 * Q_{\inf\ avg} * PF$		lbs/day
	$lbsISS_{inf}$	=	20*220*8.34*0.0625*1.2	28	lbs/day

Inscription Canyon Ranch WWTP
AERATION BASINS
DESIGN PARAMETERS

	$\%VSS_{nb}$		Design % Nonbiodegrade Content of Volatile Solids	40	%
	$lbsVSS_{nb}$		Pounds Nonbiodegradable Volatile Solids Entering the Plant per Day $lbsVSS_{nb} = \%VSS_{\inf} * \%VSS_{nb} * TSS_{\inf} * 8.34 * Q_{\inf avg} * PF$		lbs/day
	$lbsVSS_{nb}$	=	80*40*220*8.34*0.0625*1.2	22	lbs/day
	lbs $BOD_{5\ inf}$		Pounds of BOD entering the plant per day $lbsBOD_{5\inf} = BOD_{5\inf} * 8.34 * Q_{\inf avg} * PF$		lbs/day
	lbs $BOD_{5\ inf}$	=	220*8.34*0.0625*1.2	138	lbs/day
	lbsTKN		Pounds of TKN treated in the the plant per day $lbsTKN = (TKN_{\inf} - TKN_{eff}) * 8.34 * Q_{\inf avg} * PF$		lbs/day
	lbsTKN	=	(36-0.5)*8.34*0.0625*1.2	22	lbs/day
	$lbsX_{H,\ t}$		Pounds Heterotrophic Biomass Produced per Day at Design Temperature $lbsX_{H,t} = Y_{h,OBS,t} * lbsBOD_{5\inf}$		lbs/day
	$lbsX_{H,\ 7.2}$	=	0.12*137.61	16	lbs/day
	$lbsX_{H,\ 29}$	=	0.06*137.61	8	lbs/day
	$lbsX_{N\ t}$		Pounds of Nitrogen Assimulated per Day in the HeterotrophicBiomass at design Temperatures $lbsX_{N,t} = lbsX_{H,t} * \%X_{N,t}$		lbs/day
	$lbsX_{N\ 7.2}$	=	16*12	2	lbs/day
	$lbsX_{N\ 29}$	=	8*12	1	lbs/day
	$lbsN_{inf,\ t}$		Pounds of Nitrogen Oxidized in Plant per Day at Design Temperatures $lbsN_{\inf,t} = lbsTKN - lbsX_{N,t}$		lbs/day
	$lbsN_{inf,\ 7.2}$	=	22-2	20	lbs/day
	$lbsN_{inf,\ 29}$	=	22-1	21	lbs/day
	$lbsX_{A,\ t}$		Pounds Autotrophic Biomass Produced per Day at Design Temp. $lbsX_{A,t} = Y_{a,OBS,t} * lbsN_{\inf},t$		lbs/day
	$lbsX_{A,\ 7.2}$	=	20*0.06	1	lbs/day
	$lbsX_{A,\ 29}$	=	21*0.06	1	lbs/day
	$P_{x\ t}$		Mass of Total Activated Sludge Generated per Day $P_{x,t} = lbsISS_{\inf} + lbsVSS_{nb} + lbsX_{H,t} + lbsX_{A,t}$		lbs/day
	$P_{x\ 7.2}$	=	28+22+16+1	67	lbs/day
	$P_{x\ 29}$	=	28+22+8+1	58	lbs/day
	V_{t}		Volume of Aeration Basin based on Design MLSS and $P_{x,t}$ $V_t = \frac{P_{x,t} * \theta_{c,design}}{MLSS * 8.34}$		MG
	$V_{7.2}$	=	67*55/(5500*8.34)	0.0804	MG
	V_{29}	=	58*55/(5500*8.34)	0.0701	MG

Inscription Canyon Ranch WWTP
DENITRIFICATION
DESIGN PARAMETERS

Anoxic Basin Sizing					
$BOD_{5\ inf}$		Inf BOD_5	220	mg/l	
TSS_{inf}		Inf TSS	220	mg/l	
MLSS		Design Value	5500	mg/l	
$Q_{\ inf\ avg}$		Avg. Inf. Flow	0.1	MGD	
PF		Peaking Factor	1.2		
lbs $BOD_{5\ inf}$		Pounds of BOD entering the plant per day $lbsBOD_{5\,\mathrm{inf}} = BOD_{5\,\mathrm{inf}} * 8.34 * Q_{\mathrm{inf}\,avg} * PF$		lbs/day	
lbs $BOD_{5\ inf}$	=	220*8.34*0.0625*1.2	138	lbs/day	
Selector Basin 1 Denitrification					
$F/M_{SX\ 1}$		Design Food to Microrganism Ratio for SX-1	5.5	lbBOD/lb MLSS*d	
T		Equation BaseTemperature	20	^{0} C	
Θ		Temperature Coefficient	1.04		
BOD/DN		Ratio of Pounds BOD Removed per Pound of Nitrogen Removed	3.50		
$DN_{SX1,\ t}$		Temperature Dependent Denitrification Rate at Lowest Temperature $DN_{SX1,t} = (0.03F/M + 0.029day^{-1}) * \Theta^{t-T}$		$lbNO_3$ /lbMLSS*d	
$DN_{SX1,\ 7}$	=	(0.03*5.5+0.029)*1.04^(7.22-20)	0.12	$lbNO_3$ /lbMLSS*d	
$lbsDN_{SX1,\ t}$		Temperature Dependent Pounds of Nitrogen Removed in Selector 1 Based on Design MLSS $lbsDN_{SX1,t} = DN_{SX1,t} * M_{SX1}$		lbs	
$lbsDN_{SX1,\ t}$	=	0.12*25	3	lbs	
$lbsBODR_{SX1}$		Pounds of BOD removed in SX1 $lbsBODR_{SX1} = lbsDN_{SX1,t} * BOD/DN$		lbs	
$lbsBODR_{SX1}$		3*3.5	10	lbs	
$lbsBODIN_{SX2}$		Pounds of BOD Entering SX-2 $lbsBODIN_{sx2} = lbsBOD_{5,\mathrm{inf}} - lbsBODR_{SX1}$		lbs	
$lbsBODIN_{SX2}$		137.61-10	127	lbs	
Selector Basin 2 Denitrification					
$F/MC_{SX\ 2}$		CalculatedF/M Ratio in SX2 Based on BOD Removed in SX1 $F/MC_{SX2} = \frac{lbsBODIN_{SX2}}{M_{SX1} + M_{SX2}}$		lbBOD/lb MLSS*d	
$F/MC_{SX\ 2}$		127/25+25	2.54	lbBOD/lb MLSS*d	
T		Equation BaseTemperature	20	^{0} C	
Θ		Temperature Coefficient	1.04		
BOD/DN		Ratio of Pounds BOD Removed per Pound of Nitrogen Removed	3.50		

Inscription Canyon Ranch WWTP
DENITRIFICATION
DESIGN PARAMETERS

$DN_{SX2,\ t}$		Temperature Dependent Denitrification Rate $DN_{SX2,t} = (0.03F/M + 0.029day^{-1}) * \Theta^{t-T}$		$lbNO_3$ /lbMLSS*d
$DN_{SX2,\ 7}$	=	(0.03*2.54+0.029)*1.04^(7.22-20)	0.06	$lbNO_3$ /lbMLSS*d
$lbsDN_{SX2,\ t}$		Temperature Dependent Pounds of Nitrogen Removed in Selector 2 Based on Design MLSS $lbsDN_{SX2,t} = DN_{SX2,t} * M_{SX2}$		lbs
$lbsDN_{SX2,\ 7}$	=	0.06*25	2	lbs
$lbsBODR_{SX2}$		Pounds of BOD removed in SX2 $lbsBODR_{SX1} = lbsDN_{SX1,t} * BOD/DN$		lbs
$lbsBODR_{SX2}$		2*3.5	6	lbs
$lbsBODIN_{SX3}$		Pounds of BOD Entering SX-3 $lbsBODIN_{SX3} = lbsBODIN_{SX2} - lbsBODR_{SX2}$		lbs
$lbsBODIN_{SX3}$		127-6	122	lbs
Selector Basin 3 Denitrification				
$F/MC_{SX\ 3}$		Calculated F/M Ratio in SX3 Based on BOD Removed in SX1 and SX2 $F/MC_{SX3} = \frac{lbsBODIN_{SX3}}{M_{SX1} + M_{SX2} + M_{SX3}}$		lbBOD/lb MLSS*d
$F/MC_{SX\ 3}$	=	122/25+25+75	0.97	lbBOD/lb MLSS*d
T		Equation BaseTemperature	20	^{o} C
Θ		Temperature Coefficient	1.04	
BOD/DN		Ratio of Pounds BOD Removed per Pound of Nitrogen Removed	3.50	
$DN_{SX3,\ t}$		Temperature Dependent Denitrification Rate $DN_{SX3,t} = (0.03F/M + 0.029day^{-1}) * \Theta^{t-T}$		$lbNO_3$ /lbMLSS*d
$DN_{SX3,\ 7}$	=	(0.03*0.97+0.029)*1.04^(7.22-20)	0.035	$lbNO_3$ /lbMLSS*d
$lbsDN_{SX3,\ t}$		Temperature Dependent Pounds of Nitrogen Removed in Selector 1 Based on Design MLSS $lbsDN_{SX3,t} = DN_{SX3,t} * M_{SX3}$		lbs
$lbsDN_{SX3,\ 7}$	=	0.035*75	3	lbs
$lbsBODR_{SX2}$		Pounds of BOD removed in SX3 $lbsBODR_{SX3} = lbsDN_{SX3,t} * BOD/DN$		lbs
$lbsBODR_{SX2}$		3*3.5	9	lbs
$lbsBODIN_{AX}$		Pounds of BOD Entering Anoxic $lbsBODIN_{AX} = lbsBODIN_{SX3} - lbsBODR_{SX3}$		lbs

Inscription Canyon Ranch WWTP
DENITRIFICATION
DESIGN PARAMETERS

$lbsBODIN_{AX}$		122-9	112	lbs
		Anoxic Basin Denitrification		
$lbsX_{N\ t}$		Pounds of Nitrogen Assimulated per Day in the HeterotrophicBiomass at Lowest Design Temperature $lbsX_{N,t} = lbsX_{H,t} * \%X_{N,t}$		lbs/day
$lbsX_{N\ 7}$	=	16*12	2	lbs/day
$lbsN_{inf,\ t}$		Pounds of Nitrogen Oxidized in Plant per Day at Lowest Design Temperature. This Will Be Used as the Amount Nitrate to be Removed by the Denitrification System. This Results in a Conserative Value since the Nitorgen Leaving (Removed) in the Effluent is not Subtracted . $lbsN_{\inf,t} = lbsTKN_{\inf} - lbsX_{N,t}$		lbs/day
$lbsN_{inf,\ 7}$	=	22-2	20	lbs/day
$lbsDN_{Selectors,\ t}$		Temperature Dependent Pounds of Nitrogen Removed in Selectors $lbsDN_{Selectors,t} = lbsDN_{SX1,t} + lbsDN_{SX2,t} + lbsDN_{SX3,t}$		lbs
$lbsDN_{Selectors\ 7}$	=	3+2+3	7	lbs
$lbsDN_{AX,\ t}$		Temperature Dependent Pounds of Nitrogen to be Removed in the Anoxic Basin $lbsDN_{AX,t} = lbsN_{\inf,t} - lbsDN_{Selectors}$		lbs
$lbsDN_{AX,\ 7}$		20-7	13	lbs
M_{SX}		Pounds of Sludge Mass in Selectors $M_{SX} = M_{SX1} + M_{SX2} + M_{SX3}$		lbs
M_{SX}	=	25+25+75	125	lbs
$DN_{AX,\ t}$		Denitrification Rate in Anoxic Basin Equation 1 uses the known amount of nitrogen to determine the mass of sludge required. Equation 2 uses the known amount of BOD entering the anoxic to determine the mass of sludge required. Equation 3 is the the combination of Equations 1 and 2 which results in one unkown of $M_{AX.}$ Equations 1and 2 will be solved by trial and error values of M_{AX} 1. $DN_{AX,t} = \frac{lbsDN_{AX,t}}{M_{AX}}$ 2. $DN_{AX,t} = \left[0.03 * \left(\frac{lbsBODIN_{AX}}{M_{SX} + M_{AX}}\right) + 0.029\right] * \Theta^{t-T}$ 3. $\frac{lbsDN_{AX}}{M_{AX}} = \left[0.03 * \left(\frac{lbsBODIN_{AX}}{M_{SX} + M_{AX}}\right) + 0.029\right] * \Theta^{t-T}$		$lbNO_3$ /lbMLSS*d

Inscription Canyon Ranch WWTP
DENITRIFICATION
DESIGN PARAMETERS

Set	M_{AX}			645	lbs
Eq. 1	$DN_{AX,t}$	=	13/645	0.02025	$lbNO_3$ /lbMLSS*d
Eq. 2	$DN_{AX,t}$	=	(0.03*(112/(125+645))+0.029)*1.04^7.22-20	0.02022	$lbNO_3$ /lbMLSS*d
	V_{AX}		Volume of Anoxic Based on Design MLSS $V_{AX} = \frac{M_{AX}}{MLSS * 8.34}$		MG
	V_{AX}	=	645/5500*8.34	0.0141	MG

INSCRIPTION CANYON RANCH WASTEWATER PLANT
INTERNAL RECIRCULATION
DESIGN PARAMETERS

INTERNAL RECIRCULATION REQUIREMENTS					
	Q_{IR}		Internal Recirculation Flow Rate		MGD
	Q_{RAS}		Return Activated Sludge Flow Rate		MGD
	$Q_{inf\ avg}$		Avg. Inf. Flow	0.1	MGD
	R_{RAS}		Ratio of Q_{RAS} to $Q_{inf\ avg}$		
	R_{IR}		Ratio of Q_{IR} to $Q_{inf\ avg}$		
	RN_t		Ratio of Nitrate to be Removed to Influent Nitrogen $RN_t = -\frac{lbsX_{N,t}}{lbsTKN_{inf}}$		
	RN_t	=	20/22	0.912	
			Required Denitrification and RAS Rate Used to Determine IR Rate. Set R_{RAS} and trial and error R_{IR} $1.0 - RN_t = \frac{1}{1 + R_{IR} + R_{RAS}}$		
	Set R_{RAS}			1	
	Set R_{IR}			3.6	
	Solve		$1.0 - RN_t$ 1-0.91	0.088	
	Solve		$\frac{1}{1 + R_{RAS} + R_{IR}}$ 1/(1+1+3.6)	0.1786	
	Q_{IR}		$Q_{inf\ avg} * R_{IR}$		MGD
	Q_{IR}	=	0.0625*3.6	0.225	MGD

Inscription Canyon Ranch WWTP
CLARIFIER
DESIGN PARAMETERS

Clarifier Sizing					
	SVI		Design Sludge Volume Index	110	
	MLSS		Mixed Liquor Suspended Solids Design Concentration in Aeration Basin	5500	mg/l
	X_{RAS}		RAS Design Concentration in Clarifier	10000	mg/l
	Q_{RAS}		Return Activated Sludge Flow Rate		MGD
	R_{RAS}		Ratio of Q_{RAS} to $Q_{inf\ avg}$	20 -100	%
	$Q_{inf\ avg}$		Avg. Inf. Flow	0.1	MGD
	PF_{HYD}		Hydraulic Peaking factor	1.6	
	SF_{CLAR}		Safety Factor	1.5	
	SF_L		Limiting Sludge Flux		lbs/ft^2 day
	A		Surface Area of Clarifier $$A = \frac{(Q_{\inf avg} + Q_{RAS}) * MLSS}{SF_L} * PF_{HYD} * SF_{CLAR}$$ $$A = \frac{(Q_{\inf avg}) * MLSS}{SF_L - (Q_{RAS}/A) * MLSS} * PF_{HYD} * SF_{CLAR}$$		ft^2
			To Determine the Surface Area of the Clarifier an Intial Concentration of RAS is set and using the Design SVI a value of RAS Flow per unit aera is obtained from Figue 11.40 in the Water Environment Federation Manual of Practice No. 8. The value obtained is then checked by appling the values obtained into a solids mass balance.		
Set	X_{RAS}			10000	mg/l
	Q_{RAS}/A		From Figure 11.40	0.000495	MGD/ft^2
	SF_L		From Figure 11.40	43	lbs/ft^2 day
	A	=	0.0625*5500*8.34/42.5-(0.000495)*5500*8.34*1.58*1.5	343	ft^2
	D	=	2*(343/3.1417)^0.5	21	ft
	Q_{RAS}	=	(Q_{RAS}/A)*A		MGD
	Q_{RAS}	=	0.000495*343	0.170	MGD
			Perform a Mass Balance using Calculated Values and Average flow with peaking factor. Solids entering influent that contribute to the solids in the Aeration Basin are the nonvolatile and the nonbiodegradable volitile solids. $$MLSS = \frac{lbsISS_{\inf} + lbsVSS_{nb} + (Q_{RAS} * X_{RAS} * 8.34)}{Q_{\inf avg} * PF_{HYD} + Q_{RAS}}$$		
	$lbsISS_{inf}$		From Aeration calculations	28	lbs/day
	$lbsVSS_{nb}$		From Aeration calculations	22	lbs/day
	MLSS	=	28+22+(0.2*10000*8.34)/(0.0625*1.58+0.2)	6346	mg/l
	OF_{avg}		Overflow Rate Based Upon Calculated Diameter and Average Influent Flow $$OF_{avg} = Q_{\inf avg} / D$$		gal/day/ft^2
	OF_{peak}		Overflow Rate Based Upon Calculated Diameter and Peak Hourly Influent Flow $$OF_{peak} = Q_{\inf avg} * PF_{hyd} / D$$		gal/day/ft^2

Inscription Canyon Ranch WWTP
CLARIFIER
DESIGN PARAMETERS

Clarifier Sizing					
	OF_{avg}		0.0625 MGD / 343	182	gal/day/ft^2
	OF_{peak}		0.0625 MGD *1.58/ 343	288	gal/day/ft^2

Inscription Canyon Ranch
AEROBIC DIGESTER
DESIGN PARAMETERS

			Digester Sizing		
	K_{DIG}		Digester Reaction-Rate Constant at 20°C	0.118	1/d
	t		Digester Sludge Temperature		°C
	29.44		High Temperature	29.44	° C
	7.22		Low Temperature	7.22	° C
	X_{RAS}		Sludge Concentration Entering Digester	20000	mg/l
	Q_{DIG}		Flow of Sludge into Digester		MGD
	X_{DIG}		Sludge Concentration in Digester as per cent of RAS Concentration	70	%
	$\%VSS_{DIG}$		Volatile Fraction of Digester Sludge		%
	$\%R_{DIG}$		% Reduction of Volatile Solids in Digester		%
	$\%VSS_{RAS}$		Volatile Fraction of RAS	80	%
	P_X		Pounds Sludge Produced per Day@ 20° C	67	lbs
	θ_{DIG}		Sludge Age(Solids Retention Time)		d
	V_{DIG}		Volume of Digester		MG
	Q_{DIG}		Based upon Solids produced in Aeration calculations $Q_{DIG} = \frac{P_X}{X_{RAS} * 8.34}$		MG
	Q_{DIG}	=	67/20000*8.34	0.0004	MG
			Sludge Age at the Lowest Digester Temperature is Calculated from Figure 12-25 in Metcalf & Eddy Third Edition Wastewater Engineering based upon a Design Per Cent Reduction of Volatile Solids		
Set	$\%R_{DIG}$		Design % Reduction at Lowest Temperature	40	%
	$\theta_{DIG} * t$		From Figure 12-25 at 7.22C	475	
Set	t	=	Lowest temperature	7.22	°C
	$\theta_{DIG\ 7}$	=	475/7.22	66	d
			Find the % reduction at Summer(Highest) Temperature		
Set	t	=		29.44	°C
	$\theta_{DIG} * t$	=	29.44*66	1937	
	$\%R_{DIG}$		From Figure 12-25 at 29.44C	43	%
	$lbs\%R_{DIG}$		Determine the Pounds of Volatile Solids Reduced at Both Temperatures		lbs
	$lbs\%R_{DIG}$		$lbs\%R_{DIG} = P_X * \%VSS_{RAS} * \%R_{DIG}$		lbs
	$lbs\%R_{DIG\ 7}$	=	67*80*40	21	lbs
	$lbs\%R_{DIG\ 29}$	=	67*80*43	23	lbs

Inscription Canyon Ranch
AEROBIC DIGESTER
DESIGN PARAMETERS

Digester Sizing					
	$lbsO_{2DIG}$		Determine the Pounds of Oxygen required for Volatile Solids Reduction at Both Temperatures Based Upon 2.3 lbs O_2 per lb Volatile Solid Reduced		lbs
	$lbsO_{2DIG\ 7}$	=	21*2.3	49.337	lbs
	$lbsO_{2DIG\ 29}$	=	23*2.3	53	lbs
	HP		Determine Horsepower Required		hp
	$O_{2,CAP}$		Oxygen Transfer Capacity of Aeration System	3.5	$lbsO_2$/HP
	HP_{7}	=	49/24*3.5	1	hp
	HP_{29}	=	53/24*3.5	1	hp
	V_{DIG}		Volume of Digester determined at Lowest Temperature $V_{DIG} = \frac{Q_{DIG} * X_{RAS}}{X_{DIG} * (K_{DIG} * \%VSS_{DIG} + 1/\theta_{DIG})}$		MG
	$V_{DIG\ 7}$	=	0.0004*20000/(20000*70*(0.118*80+1/66))	0.0052	MG

Wastewater Process Control using Mean Cell Residence Time (MCRT)

This method is also known as the Solids Retention Time (SRT).
Assume you have 10,000 pounds of solids in your process and you waste 1,000 pounds per day,
then you are wasting 10% per day for a MCRT of 10 days (the time it takes to waste all solids).
So MCRT equals the total pounds of solids in the process divided by the solids wasted and in effluent.

Input only into yellow boxes!

Known Plant Data:

Aeration Basin Volume (gallons):	42,632	0.0426 MGD
Clarifier Volume (gallons):	11,626	0.0116 MGD
Daily Total WAS Flow (gallons):	400	0.0004 MGD
Daily Total Plant Effluent Flow (gallons):	47,400	0.0474 MGD

Required Laboratory Data (all inputs in mg/L):

1. Aeration Basin Mixed Liquor Total Suspended Solids (MLTSS): 5500 *mg/L*
(Collect a well mixed sample from the aeration basin)

2. Clarifier Sludge Concentration (CSC): 1000 *mg/L*
(Collect the entire "Sludge Judge" column amount for mixing)

3. Waste Sludge Flow Concentration (WAS TSS): 20000 *mg/L*
(Collect from discharge point of WAS pumps)

4. Final Effluent Solids Concentration (Effluent TSS): 10 *mg/L*
(Collect at final plant discharge location)

Calculated Values:

1. MLTSS = 1955.53 *pounds*

2. CSC = 96.96 *pounds*

3. WAS TSS = 66.72 *pounds*

4. Eff. TSS = 3.95 *pounds*

Total Sludge Inventory in the Process: 2052.49 *pounds*
Total Solids Wasted and in Effluent: 70.67 *pounds*

Calculated Real Time MCRT: 29.04 Days

Determine how much to waste today:

Desired MCRT (days): 30 *Days*

Calculated Wasting Volume: 64 *pounds per day*
Calculated Wasting Volume: 386 *gallons per day* **<<< Waste this amount today**

Appendix D – Cost Estimations

PROJECT: ICRSD - Expand Existing Santec System

Proj. No.

Current at ENR 2021

Escalated to ENR

Months to Midpoint of Construct 12

Estimate Type:

XX	**Conceptual**
XX	**Preliminary (w/o plans)**
	Design Development @ 90% Design

5.00 % Complete

SPECIFICATION SECTION	Spec Section	Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Total	Source
DIVISION 01 - GENERAL REQUIREMENTS										
		Startup/Testing	1	LS	$0.00	$0.00	$10,000.00	$10,000.00	$10,000	
		Site Cleaning	1	LS	$0.00	$0.00	$10,000.00	$10,000.00	$10,000	
		Equipment Startup	1	LS	$0.00	$0.00	$5,000.00	$5,000.00	$5,000	
		Operation and Maintenance Data	1	LS	$0.00	$0.00	$5,000.00	$5,000.00	$5,000	
						$0.00		**$30,000.00**	**$30,000.00**	**SUBTOTAL - DIVISION 01**
DIVISION 02 - EXISTING CONDITIONS		**Demolition**								
		Minor Equipment Modification	1	LS		$0.00	$50,000.00	$50,000.00	$50,000	
						$0.00		**$50,000.00**	**$50,000.00**	**SUBTOTAL - DIVISION 02**
DIVISION 03 - CONCRETE	**03 00 00**	**Cast-In-Place Concrete**								
		Sludge Thickening Pad	150	CY	$210.00	$31,500.00	$55.10	$8,265.00	$39,800	RS Means 33113350300 & 33113701950
		Dewatering Containment Pad	75	CY	$210.00	$15,750.00	$55.10	$4,132.50	$19,900	RS Means 33113350300 & 33113701950
	03 40 00	**Precast Concrete**								
		Concrete Sewer Manhole and Base	1	EA	$10,000.00	$10,000.00	$4,000.00	$4,000.00	$14,000	Contractor Estimate
		Valve and Access Boxes	0	EA	$1,500.00	$0.00	$500.00	$0.00	$0	Contractor Estimate
						$57,250.00		**$16,397.50**	**$73,700.00**	**SUBTOTAL - DIVISION 03**
DIVISION 05 - METALS	**05 00 00**	**Structural Steel**								
		Miscellaneous Modifications	1	LS	$10,000.00	$10,000.00	$5,000.00	$5,000.00	$15,000	
	05 50 00	**Miscellaneous Metals**								
		Anchor Bolts, Metal Fasteners, Pipe Supports	1	LS	$5,000.00	$10,000.00	$5,000.00	$5,000.00	$15,000	
						$20,000.00		**$10,000.00**	**$30,000.00**	**SUBTOTAL - DIVISION 05**
DIVISION 09 - FINISHES	**09 90 00**	**Painting**								
		Exposed Pipe, Primer and Final Coat	20	LF	$50.00	$1,000.00	$25.00	$500.00	$1,500	
						$1,000.00		**$500.00**	**$1,500.00**	**SUBTOTAL - DIVISION 09**
DIVISION 26 - ELECTRICAL	**26 05 19**	**Low Voltage Electrical Power Conductors and Cables**								
		Conduit, Cabling, Complete	1	LS	$5,000.00	$5,000.00	$10,000.00	$10,000.00	$15,000	Electrical Estimate
		General Sitework	1	LS	$2,500.00	$2,500.00	$5,000.00	$5,000.00	$7,500	Electrical Estimate
	26 09 17	**Control Panels**								
		Service Panel Systems	1	EA	$40,000.00	$40,000.00	$5,000.00	$5,000.00	$45,000	Electrical Estimate
		Instrumentation								
		Flow Meter, External	1	EA	$4,100.00	$4,100.00	$498.37	$498.37	$4,600	Electrical Estimate
		Pressure Switch, External	0	EA	$125.00	$0.00	$30.00	$0.00	$0	Electrical Estimate
		Pressure Gauge, External	0	EA	$125.00	$0.00	$30.00	$0.00	$0	Electrical Estimate
						$51,600.00		**$20,498.37**	**$72,100.00**	**SUBTOTAL - DIVISION 26**
DIVISION 31 - EARTHWORK	**31 00 00**	**Earthwork For Pipelines**								
		Excavation Trenching	1000	CY		$0.00	$14.32	$14,320.00	$14,400	RS Means 312316140880
		Pipeline Backfill and Compaction	1000	CY	$2.50	$2,500.00	$22.00	$22,000.00	$24,500	RS Means 312316141450
	31 22 19	**Finish Grading**								
		General Site Rough and Fine Grading	5,000	SF	$2.72	$13,600.00	$3.56	$17,800.00	$31,400	RS Means 312213200220
	31 23 16	**Excavation**								
		Structural Excavation - Santec Units	2,000	CY		$0.00	$85.90	$171,800.00	$171,800	RS Means 312316160600
						$16,100.00		**$225,920.00**	**$242,100.00**	**SUBTOTAL - DIVISION 31**

DIVISION 33 - UTILITIES	**33 05 19**	**Ductile Iron Pipe**								
		4-inch Diameter DIP	20	LF	$75.00	$1,500.00	$15.00	$300.00	$1,800	
		6-inch Diameter DIP	20	LF	$85.00	$1,700.00	$15.00	$300.00	$2,000	
		8-inch Diameter DIP	20	LF	$95.00	$1,900.00	$15.00	$300.00	$2,200	
		DIP Appurtenances and Fittings	1	LS	$5,000.00	$5,000.00	$2,000.00	$2,000.00	$7,000	
	33 05 31.11	**Polyvinyl Chloride Pipe**								
		2-inch Diameter PVC	0	LF	$35.00	$0.00	$15.00	$0.00	$0	
		3-inch Diameter PVC	0	LF	$45.00	$0.00	$15.00	$0.00	$0	
		4-inch Diameter PVC	50	LF	$55.00	$2,750.00	$15.00	$750.00	$3,500	
		8-inch Diameter PVC	50	LF	$70.00	$3,500.00	$15.00	$750.00	$4,300	
		PVC Appurtenances and Fittings	1	LS	$5,000.00	$5,000.00	$2,000.00	$2,000.00	$7,000	
	33 05 61	**Manholes and Appurtenances**								
		Sanitary Sewer Manholes	2	EA	$10,000.00	$20,000.00	$5,000.00	$10,000.00	$30,000	Contractor Estimate
						$41,350.00		**$16,400.00**	**$57,800.00**	**SUBTOTAL - DIVISION 33**

DIVISION 46 - WASTEWATER EQUIPMENT	**47 00 01**	**Santec Aeration Modules**								
		Santec Equipment and Vessels	1	LS	$455,000.00	$455,000.00	$150,000.00	$150,000.00	$605,000	
	46 00 03	**Sludge Handling Equipment**								
		Parskson Screw Press Dewatering, Return Piping, Solids	1	LS	$230,000.00	$230,000.00	$125,000.00	$125,000.00	$355,000	
						$685,000.00		**$275,000.00**	**$960,000.00**	**SUBTOTAL - DIVISION 46**

PROJECT: ICRSD - Parkson SBR Wastewater Treatment Plant

				Proj. No.	
				Current at ENR	2021
Estimate Type:	XX	Conceptual		Escalated to ENR	
	XX	Preliminary (w/o plans)		Months to Midpoint of Construct	12
		Design Development @ 90% Design	5.00 % Complete		

SPECIFICATION SECTION	Spec Section	Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Total	Source
DIVISION 01 - GENERAL REQUIREMENTS										
		Startup/Testing	1	LS	$0.00	$0.00	$40,000.00	$40,000.00	$40,000	
		Site Cleaning	1	LS	$0.00	$0.00	$25,000.00	$25,000.00	$25,000	
		Equipment Startup	1	LS	$0.00	$0.00	$20,000.00	$20,000.00	$20,000	
		Operation and Maintenance Data	1	LS	$0.00	$0.00	$5,000.00	$5,000.00	$5,000	
						$0.00		**$90,000.00**	**$90,000.00**	**SUBTOTAL - DIVISION 01**
DIVISION 02 - EXISTING CONDITIONS		**Demolition**								
		Existing Mechanical Equipment Removal & Disposal	1	LS		$0.00	$75,000.00	$75,000.00	$75,000	
		Existing Santec System Removal	1	LS		$0.00	$125,000.00	$125,000.00	$125,000	
						$0.00		**$200,000.00**	**$200,000.00**	**SUBTOTAL - DIVISION 02**
DIVISION 03 - CONCRETE	**03 00 00**	**Cast-In-Place Concrete**								
		Reinforced Concrete at Scum Trough	100	CY	$210.00	$21,000.00	$55.10	$5,510.00	$26,600	RS Means 33113350300 & 33113701950
		Sludge Thickening Pad	150	CY	$210.00	$31,500.00	$55.10	$8,265.00	$39,800	RS Means 33113350300 & 33113701950
		Dewatering Containment Pad	75	CY	$210.00	$15,750.00	$55.10	$4,132.50	$19,900	RS Means 33113350300 & 33113701950
		Package Pump Station Maintenance Pads	75	CY	$210.00	$15,750.00	$55.10	$4,132.50	$19,900	RS Means 33113350300 & 33113701950
	03 40 00	**Precast Concrete**								
		Concrete Sewer Manhole and Base	4	EA	$10,000.00	$40,000.00	$4,000.00	$16,000.00	$56,000	Contractor Estimate
		Valve and Access Boxes	8	EA	$1,500.00	$12,000.00	$500.00	$4,000.00	$16,000	Contractor Estimate
						$136,000.00		**$42,040.00**	**$178,200.00**	**SUBTOTAL - DIVISION 03**
DIVISION 05 - METALS	**05 00 00**	**Structural Steel**								
		Clarifier Walkways and Platforms	70	LF	$500.00	$35,000.00	$125.00	$8,750.00	$43,800	RS Means 321713131300
		Clarifier Stairs / Sludge Thickener Ladder and Shade Structures	1	LS	$75,000.00	$75,000.00	$5,000.00	$5,000.00	$80,000	Contractor Estimate
		Pump Shade Structure & Footings	1	LS	$10,000.00	$10,000.00	$5,000.00	$5,000.00	$15,000	Contractor Estimate
	05 50 00	**Miscellaneous Metals**								
		Anchor Bolts, Metal Fasteners, Pipe Supports	1	LS	$15,000.00	$15,000.00	$5,000.00	$5,000.00	$20,000	Contractor Estimate
						$135,000.00		**$23,750.00**	**$158,800.00**	**SUBTOTAL - DIVISION 05**
DIVISION 09 - FINISHES	**09 90 00**	**Painting**								
		Exposed Pipe, Primer and Final Coat	200	LF	$50.00	$10,000.00	$25.00	$5,000.00	$15,000	
		Spot Repair of Tanks	1	LS	$7,500.00	$7,500.00	$3,000.00	$3,000.00	$10,500	Superior Tanks Estimate
		Spot Repair of Booster Pump Stations	1	LS	$3,000.00	$3,000.00	$2,000.00	$2,000.00	$5,000	Phoenix Pumps Estimate
		Spot Repair of Shade Structures	1	LS	$5,000.00	$5,000.00	$2,000.00	$2,000.00	$7,000	
						$25,500.00		**$12,000.00**	**$37,500.00**	**SUBTOTAL - DIVISION 09**
DIVISION 26 - ELECTRICAL	**26 05 19**	**Low Voltage Electrical Power Conductors and Cables**								
		Conduit, Cabling, Complete	1	LS	$45,000.00	$45,000.00	$20,000.00	$20,000.00	$65,000	Electrical Estimate
		General Sitework	1	LS	$35,000.00	$35,000.00	$10,000.00	$15,000.00	$50,000	Electrical Estimate
	26 09 17	**Control Panels**								
		Service Panel Systems	2	EA	$40,000.00	$80,000.00	$10,000.00	$20,000.00	$100,000	Electrical Estimate
		Instrumentation								
		Flow Meter, External	2	EA	$4,100.00	$8,200.00	$498.37	$996.74	$9,200	Electrical Estimate
		Pressure Switch, External	4	EA	$125.00	$500.00	$30.00	$120.00	$700	Electrical Estimate
		Pressure Gauge, External	4	EA	$125.00	$500.00	$30.00	$120.00	$700	Electrical Estimate
						$169,200.00		**$56,236.74**	**$225,600.00**	**SUBTOTAL - DIVISION 26**
DIVISION 31 - EARTHWORK	**31 00 00**	**Earthwork For Pipelines**								
		Excavation Trenching	1200	CY		$0.00	$14.32	$17,184.00	$17,200	RS Means 312316140880
		Pipeline Backfill and Compaction	1350	CY	$2.50	$3,375.00	$22.00	$29,700.00	$33,100	RS Means 312316141450
	31 22 19	**Finish Grading**								
		General Site Rough and Fine Grading	15,000	SF	$2.72	$40,800.00	$3.56	$53,400.00	$94,200	RS Means 312213200220
	31 23 16	**Excavation**								
		Structural Excavation - Wet Wells	25	CY		$0.00	$85.90	$2,147.50	$2,200	RS Means 312316160600
						$44,175.00		**$102,431.50**	**$146,700.00**	**SUBTOTAL - DIVISION 31**

DIVISION 33 - UTILITIES	**33 05 19**	**Ductile Iron Pipe**								
		4-inch Diameter DIP	75	LF	$75.00	$5,625.00	$15.00	$1,125.00	$6,800	
		6-inch Diameter DIP	75	LF	$85.00	$6,375.00	$15.00	$1,125.00	$7,500	
		8-inch Diameter SIP	50	LF	$95.00	$4,750.00	$15.00	$750.00	$5,500	
		DIP Appurtenances and Fittings	1	LS	$6,500.00	$6,500.00	$2,000.00	$2,000.00	$8,500	
	33 05 31.11	**Polyvinyl Chloride Pipe**								
		2-inch Diameter PVC	200	LF	$35.00	$7,000.00	$15.00	$3,000.00	$10,000	
		3-inch Diameter PVC	250	LF	$45.00	$11,250.00	$15.00	$3,750.00	$15,000	
		4-inch Diameter PVC	250	LF	$55.00	$13,750.00	$15.00	$3,750.00	$17,500	
		8-inch Diameter PVC	100	LF	$70.00	$7,000.00	$15.00	$1,500.00	$8,500	
		PVC Appurtenances and Fittings	1	LS	$6,500.00	$6,500.00	$2,000.00	$2,000.00	$8,500	
	33 05 61	**Manholes and Appurtenances**								
		Sanitary Sewer Manholes	2	EA	$10,000.00	$20,000.00	$5,000.00	$10,000.00	$30,000	Contractor Estimate
	33 10 10	**Pump Station**								
		Packaged Pump System	1	EA	$85,000.00	$85,000.00	$15,000.00	$15,000.00	$100,000	Phoenix Pumps Estimate
						$173,750.00		**$44,000.00**	**$217,800.00**	**SUBTOTAL - DIVISION 33**

DIVISION 46 - WASTEWATER EQUIPMENT	**46 00 01**	**Parkson Equipment (support for SBR system)**								
		Parkson Equipment piping and appurtenances	1	LS	$125,000.00	$125,000.00	$75,000.00	$75,000.00	$200,000	
	46 00 02	**Sequencing Batch Reactor Treatment System**								
		Parkson SBR Wastewater Treatment Package System	1	LS	$775,000.00	$775,000.00	$175,000.00	$250,000.00	$1,025,000	
	46 00 03	**Sludge Handling Equipment**								
		Parskson Screw Press Dewatering, Return Piping, Solids	1	LS	$230,000.00	$230,000.00	$125,000.00	$125,000.00	$355,000	
						$1,130,000.00		**$450,000.00**	**$1,580,000.00**	**SUBTOTAL - DIVISION 46**

Appendix E – Parkson Predesign Layouts

30% PLANS

ONSITE LS
ICR
W.C LS
T.R. LS
WASH WATER FROM POTABLE WATER LINE
SCREENINGS
CONCRETE CHANNEL
MANUAL BAR SCREEN
GRIT REMOVAL
WL
FEQ TANK
EXISTING AERATORS
EMERGENCY STORAGE TANK
EXISTING FEQ BLOWER
M
ANOXIC TANK
BNR TANK
TE
AE
DO
CLARIFIER
WATER FROM POTABLE WATER LINE
ODOR SCRUBBER
FEQ BLOWERS
FUTURE
W
TABLET CHLORINATOR
CONTAINMENT CURB
CATCH BASIN
DEWATERED SLUDGE HAULED OFFSITE
BOX FILTER
SLUDGE PUMP
DECANT AIR LIFT
EXISTING SLUDGE THICKENER
CHLORINE CONTACT TANK
EXISTING EFFLUENT LIFT STATION
TO T.R GOLF COURSE
DEWATERED SLUDGE
POLYMER FEED

ABBREVIATIONS

DO	DISSOLVED OXYGEN
FEQ	FLOW EQUALIZATION
RAS	RETURN ACTIVATED SLUDGE
UV	ULTRA VIOLET
WAS	WASTE ACTIVATED SLUDGE

DECANT LINE (GRAVITY FLOW)

LT	LEVEL TRANSMITTER (ULTRASONIC WATER LEVEL SENSOR)
PT	PRESSURE TRANSMITTER (PRESSURE TRANSDUCER LEVEL SENSOR)
WL	WATER LEVEL FLOAT

LEGEND

BLOWER
BLOWER AIR FILTER
BUTTERFLY VALVE
CENTRIFUGAL PUMP
CHECK VALVE
DOUBLE LEAF CHECK VALVE
GLOBE VALVE
GATE VALVE
CONCENTRIC REDUCER
EXISTING PIPING
NEW PIPING
FUTURE PIPING
TEMPERATURE PRIMARY ELEMENT
ANALYSIS PRIMARY ELEMENT
METER
MOTOR ACTUATOR
PLUG VALVE
SAFETY RELIEF VALVE
AERATING TANK MIXER
TANK MIXER
WATER LEVEL FLOAT

811 Know what's below. Call before you dig. 1-800-782-5348

REV NO.	COMMENT	DATE

FOR REVIEW ONLY NOT FOR CONSTRUCTION

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 • FAX 480.768.8609
www.sunrise-eng.com

ICR SANITARY DISTRICT

WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
PROCESS DIAGRAM

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	G6

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30% PLANS

N GREY BEARS TRAIL

NORTH

EFFLUENT LIFT STATION

SECTION LINE

SEE DRAWING C6
ENLARGED SITE PLAN

EXISTING FLOW EQUALIZATION TANK

EXISTING FLOW EQUALIZATION TANK

EXISTING SLUDGE HOLDING TANK

LIFT STATION (NOT IN USE)

CHLORINE CONTACT TANK

(2) 36" SD

EXISTING WATER DEPARTMENT BUILDING

EXISTING WASTEWATER TREATMENT BUILDING

125' POWER LINE EASEMENT BOOK 192 DEEDS PAGE 213

20' UTILITY EASEMENT

SCALE
0 30' 60'
HORIZ: 1" = 30'

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MESA, ARIZONA 85210
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ICR SANITARY DISTRICT

WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
PROPOSED SITE PLAN

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.
05609	TG	JC	TG	X of XX

C5

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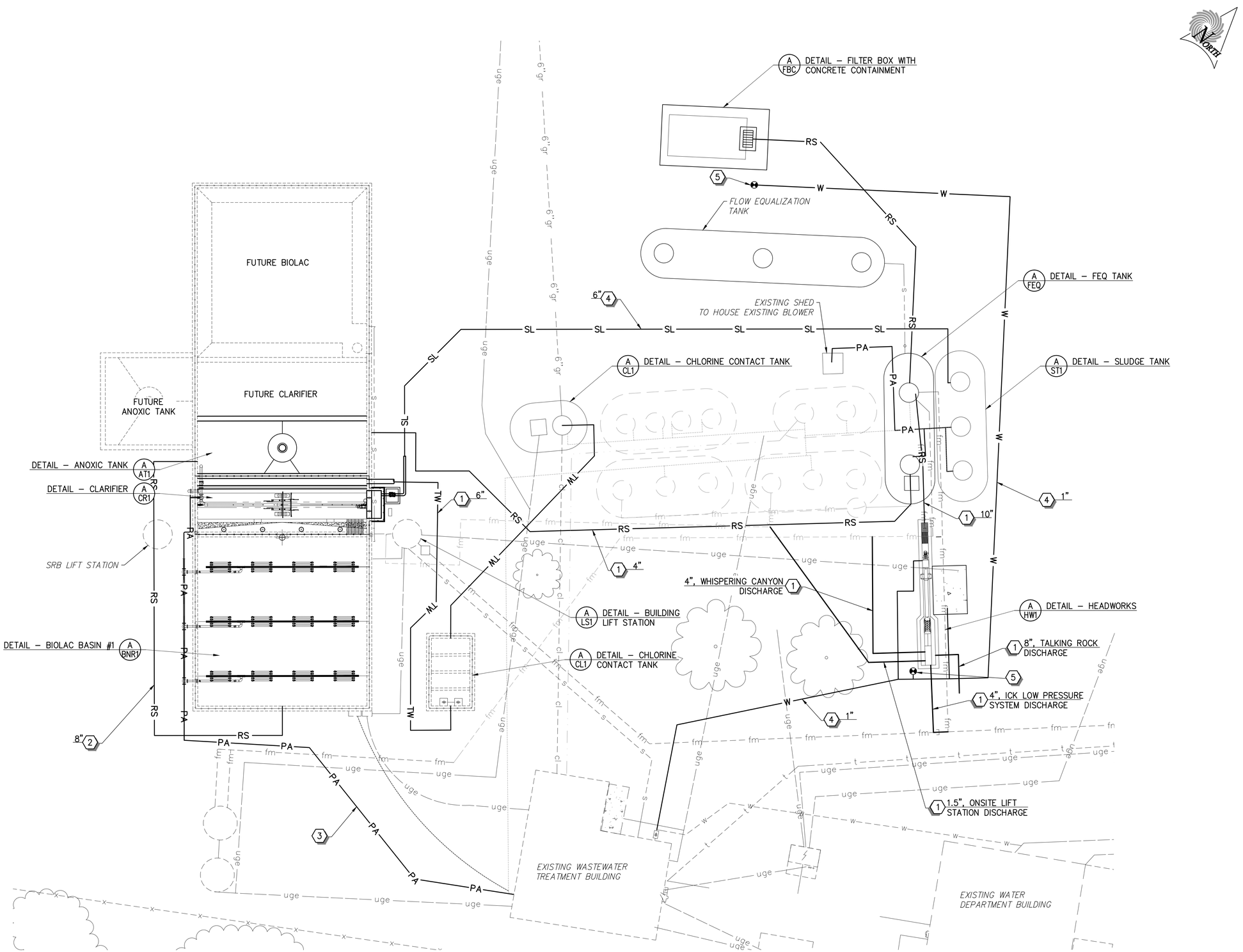
30% PLANS

CONSTRUCTION NOTES

1. C900/HDPE, SIZE PER PLAN
2. DIP, SIZE PER PLAN
3. AIR LINE, SIZE AND MATERIAL TBD
4. SCH 80 PVC, SIZE PER PLAN
5. HYDRANT



SCALE
0 10' 20'
HORIZ: 1" = 10'

811 Know what's **below.** **Call** before you dig. 1-800-782-5348

REV NO.	COMMENT	DATE

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ICR SANITARY DISTRICT

WASTE WATER TREATMENT PLANT
IMPROVEMENTS AND EXPANSION – PHASE II
ENLARGED SITE DETAIL

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
05609	TG	JC	TG	X of XX	C6

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Appendix F – Plant Output Data

ICRSD Plant Output Data

Year	2021												2022			
Month	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April
Total Monthly Flow (gal)	2,045,608	1,957,328	1,782,686	1,792,757	2,105,123	2,046,550	2,098,969	2,216,550	2,050,242	2,221,645	2,155,450	2,003,016	2,058,661	1,899,627	1,762,079	2,418,773
Avg Daily Flow (gpd)	65,987	69,905	57,506	59,759	67,907	68,218	67,709	71,502	68,341	71,666	71,848	64,613	66,408	67,844	56,841	80,626
Connections	743	721	725	727	729	731	753	755	757	759	761	763	773	775	787	789
Flow per Connection (gpd)	89	97	79	82	93	93	90	95	90	94	94	85	86	88	72	102
Avg Daily Flow per Connection (gpd)	**89**															

ICR Sanitary District
Monthly Plant Output

	Jan	Feb	Mar	Apr	May	2021 Jun	Jul	Aug
Tot Monthly Flow, gpd	2,045,608	1,957,328	1,782,686	1,792,757	2,105,123	2,046,550	2,098,969	2,216,550
Monthly Flow Vol, gpd								
Avg Daily Flow, gpd	65987	63140	57506	59759	67907	68218	67709	71502
Homes Constructed	743	721	725	727	729	731	753	755
Usage by Home	89	88	79	82	93	93	90	95
Average Usage/Home								
Reserve Fund	4	4	4	4	4	4	4	4
	$ 9,830,637	$ 10,076,714	$ 10,328,942	$ 10,587,476	$ 10,852,474	$ 11,124,096		
WWTP Capacity	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000
80% Capacity	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000
Monthly								
	90,000	90,000	90,000	90,000	90,000	90,000		

10/23/2003
350

1/2

				2022			
Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
2,050,242	2,221,645	2,155,450	2,003,016	2,058,661	1,899,627	1,762,079	2,418,773
68341	71666	71848	64613	66408	67844	56841	80626
757	759	761	763	773	775	787	789
90	94	94	85	86	88	72	102
4	4	4	4	4	4	4	4
90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000
72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000

2/2