International Boundary and Water Commission, U.S. Section

South Bay International Wastewater Treatment Plant Existing Assessment and Rehabilitation Report

July 27, 2023

Final Submittal

Task Order No: 191BWC22F0119

USIBWC SBIWTP Existing Facility Assessment and Rehabilitation Report

July 27, 2023

Prepared By:
Arcadis U.S., Inc.
530 B Street, Suite 1000
San Diego
California 92101
Phone: 602 438 0883
Fax: 602 438 0102

Prepared For:
International Boundary & Water Commission
U.S. Section
Attn: Gilbert Anaya, P.E.
Contracting Officers Representative
4191 North Mesa Street
El Paso, TX 79902-1423

Our Ref:
30115427

Task Order No:
191BWC22F0119

(b) (6) [redacted]

05/22/2023

[redacted]

05/22/2023

[redacted]

05/22/2023

Joel Mora
Facility Assessment Lead

This document is intended only for the use of the individual or entity for which it was prepared and may contain information that is privileged, confidential and exempt from disclosure under applicable law. Any dissemination, distribution or copying of this document is strictly prohibited.

Contents

Tables

[redacted] **6-6**

[redacted]

[redacted]

Figures

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Appendices

Acronyms and Abbreviations

AACE	Association for the Advancement of Cost Engineering
Arcadis	Arcadis U.S., Inc
AS	Activated sludge
ASME	American Society of Mechanical Engineers
AST	Activated Sludge Tanks
BFF	Belt Filter Feed
BFP	Belt filter press
cBOD	Carbonaceous biochemical oxygen demand
CEPT	Chemically enhanced primary treatment
CA	Channel Air
CPU	Central Processing Unit
DAF	Dissolved Air Flotation
EBS	Effluent Blending Structure
F/O	Fiber Optic
GPM	Gallons per minute
H_2SO_4	Sulfuric acid
I/O	Input/Output
IMLR	Intermediate Mixed Liquor Return”
IPS	Influent Pump Station
IW	Influent wastewater
LCC	Local Control Center
LCP	Local Control Panel
LCP-BFP	BFP local control panel
MCC	Motor control centers
MG	Million gallons
MGD	Million gallons per day
MOP 8	WEF Manual of Practice 8
NaOH	Sodium hydroxide
NaOCl	Sodium hypochlorite
NH_3	Ammonia
NPSH	Net pump suction head
NPDES	National Pollutant Discharge Elimination System
NPW	Non potable water
O&M	Operation and Maintenance
OBCC	Operations Building Control Center

OIT	Operator interface terminal
OPC	Opinion of Probable Cost
PA	Process Air
PB-CILA	CILA Pump Station
PCC	Plant Control Center
PE	Primary effluent
PEBS	Primary Effluent Bypass Structure
PLC	Programmable Logic Controller
PSK	Primary skimmings
PST	Primary sedimentation tanks
RAS	Return activated sludge
RCPP	Reinforced concrete pressure pipe
RFP	Rotary fan presses
ROT	REMOTE-OFF-TEST
SBIWTP	South Bay International Wastewater Treatment Plant
SCADA	Supervisory Control and Data Acquisition
SDG&E	San Diego Gas & Electric
SFM	Sewer Force Mains
SOTE	Standard oxygen transfer efficiency
SSK	Secondary skimmings
SST	Secondary Sedimentation Tanks
TD	Tank Drain
TDH	Total dynamic head
TOS	Top of Slab
TSS	Total suspended solids
TWAS	Thickened waste activated sludge
USIBWC	Unites States Section of International Boundary and Water Commission
USST	Unstabilized sludge storage tanks
VFD	Variable frequency drives
VTSH	Vertical turbine solids handling
WAS	Waste activated sludge
WEF	Water Environment Federation
WSEL	Water surface elevation

Executive Summary

ES-1 Introduction

The SBIWTP, located in San Ysidro, San Diego County, California, is owned and operated by the United States Section of the International Boundary and Water Commission (USIBWC). Under Task Order Number 191BWC22F0119, Arcadis U.S., Inc. (Arcadis) is providing professional engineering services to perform an assessment of the existing South Bay International Wastewater Treatment Plant (SBIWTP) to establish requirements for rehabilitation or replacement of existing assets. This Existing Facility Assessment and Rehabilitation Report serves to:

- Document the results of the physical and performance condition assessments completed on the existing assets at the SBIWTP.
- [redacted]
- [redacted]
- [redacted]
- [redacted]

ES-2 Existing SBIWTP Description

The SBIWTP is a 25 million gallons per day (mgd) average annual flow wastewater treatment plant designed to achieve secondary effluent discharge limits for treatment of a major portion of flows originating in Tijuana, Mexico. An overall site plan of the SBIWTP is shown in Figure ES-1. Included in this report is an assessment and rehabilitation recommendations for Goat Canyon and Hollister lift stations which are west of the SBIWTP and convey an additional source of raw sewage to the Plant.

Figure ES-1. SBIWTP Overall Site Plan

ES-3 Condition Assessment Summary

Arcadis performed a comprehensive physical and performance condition assessment of SBIWTP assets to determine the likelihood of failure and to identify the requirements to rehabilitate the SBIWTP. A total of 1,203 assets were evaluated for physical condition at the SBIWTP. Certain asset types were excluded from the assessment including roads, buried utilities, and safety equipment. Approximately 214 assets were not able to be visually assessed due to being submerged or located in a confined or inaccessible space. Performance condition assessment was performed on 1,417 assets, including the inaccessible ones, and each asset received a likelihood of failure score. Figure ES-2 provides a physical condition summary of the existing assets.

Figure ES-2. Physical Condition Summary Chart

Seventy-six percent of the total assets were found to be in good to very good physical condition. The average condition score was 2.3 out of 5. The majority of the assets found in poor to very poor physical condition were associated with the preliminary, primary, and solids processes.

Figure ES-3 provides a performance condition summary of the existing assets.

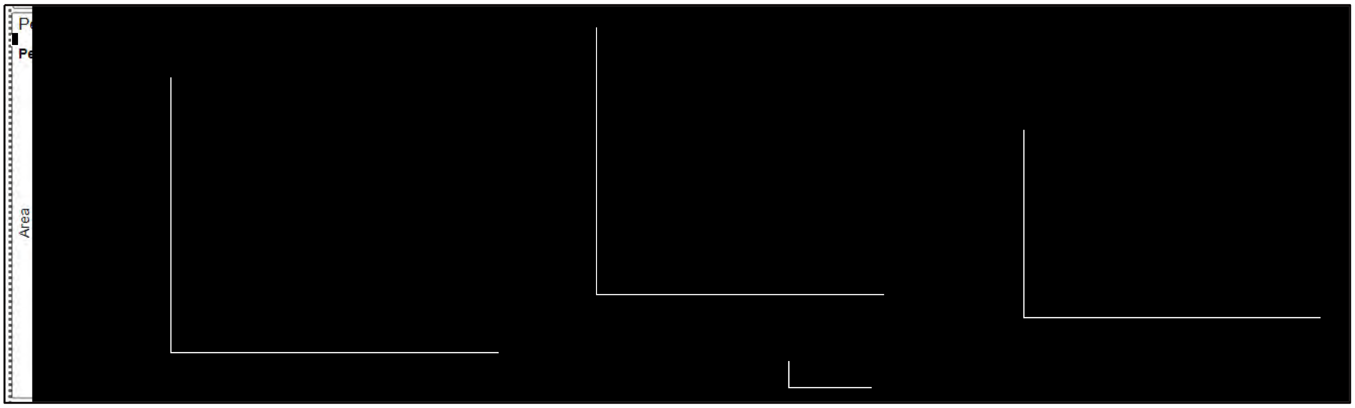

Figure ES-3. Performance Condition by Area Summary Chart

[redacted]

The maximum of the physical and performance scores was applied as the overall condition of the assets for their likelihood of failure score. The results for likelihood of failure for assets at SBIWTP are shown in Figure 3-3.

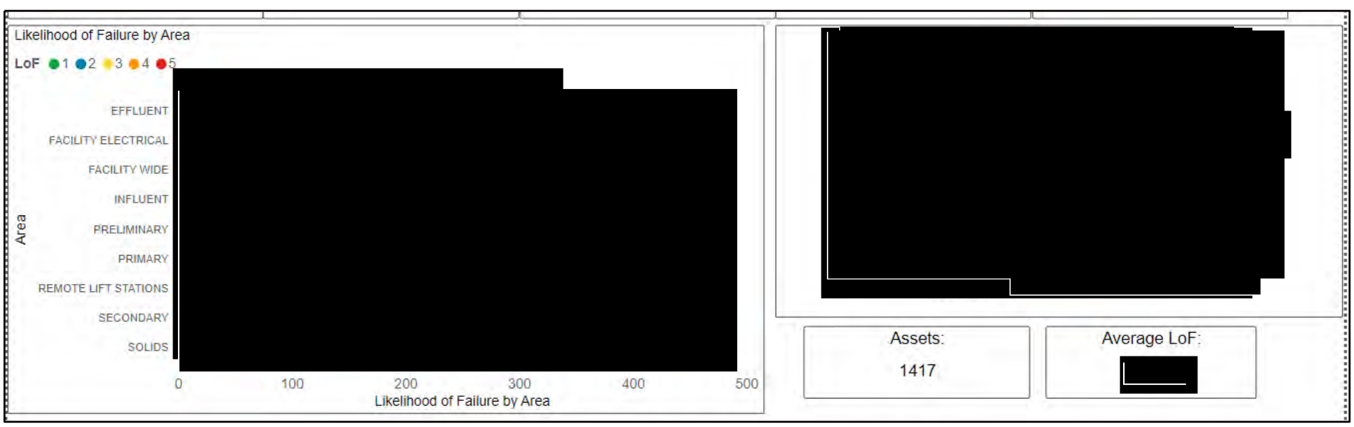

Figure ES-4. Likelihood of Failure Summary Chart

[redacted]

ES-4 Prioritized Rehabilitation Recommendations

Based on the completed physical and performance assessments, rehabilitation alternatives were developed for each of the assessed assets at the SBIWTP.(b) (5) [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

1 Introduction

1.1 Background

The SBIWTP, located in San Ysidro, San Diego County, California, is owned and operated by the USIBWC. Under Task Order Number 191BWC22F0119, Arcadis is providing professional engineering services to perform an assessment of the existing SBIWTP to establish requirements for rehabilitation or replacement of existing assets. Additionally, Arcadis is performing facility planning services to provide additional capacity at the SBIWTP to treat wastewater generated in Tijuana, based on the United States Environmental Protection Agency's (EPA) evaluation of several alternatives to address contaminated transboundary flows.

To document findings, an SBIWTP Existing Facility Assessment and Rehabilitation Report and an SBIWTP Expansion Evaluation for the Largest Expansion Possible Report will be prepared. This Report and conceptual drawings serve to document the results of the physical and performance condition assessments completed on the existing assets at the SBIWTP, describe rehabilitation or replacement alternatives, as applicable, for each of the assets, and define and depict the recommendations for rehabilitation or replacement of assets to restore the SBIWTP to optimal operation and meet NPDES effluent discharge requirements.

When finalized, this Report and conceptual drawings combined with the SBIWTP Expansion Evaluation for the Largest Expansion Possible Report, will serve to define and depict the requirements for the Scope of Work for Rehabilitation and Expansion of the SBIWTP.

1.2 Current SBIWTP Description

The SBIWTP is a 25 mgd average annual flow wastewater treatment plant designed to achieve secondary effluent discharge limits for treatment of a major portion of flows originating in Tijuana, Mexico. The conceptual design of the facility was developed in November 1992 which would allow for an ultimate capacity of 100 mgd average annual flow with a peak hydraulic capacity of 200 mgd, that would achieve secondary treatment limits and include anaerobic digestion of solids and dewatering. The SBIWTP was constructed in phases as follows:

- Design of the advanced primary treatment portion of the SBIWTP in 1994 to provide treatment of 25 mgd annual average flow with peak flows of 75 mgd and accommodating a flow through hydraulic capacity of 100 mgd.
- Design of the secondary treatment plant in 2008 was targeted to treat 25 mgd of primary effluent flow, with all excess primary effluent flow (> 25 mgd) to be blended with the secondary treatment system discharge and discharged through the South Bay Land Outfall and Ocean Outfall facilities. This was subsequently modified prior to finalizing design to allow up to 48.75 mgd of primary effluent flow through the secondary treatment facility.
- Due to inadequate treatment, subsequent construction contracts added primary effluent equalization and three additional final settling tanks to improve the treatment capacity to manage the 48.75 mgd flow in 2018.

1.2.1 Existing Wastewater Collection and Conveyance Description

Figure 1-1 shows the facilities associated with conveying wastewater from the collection system to the SBIWTP.

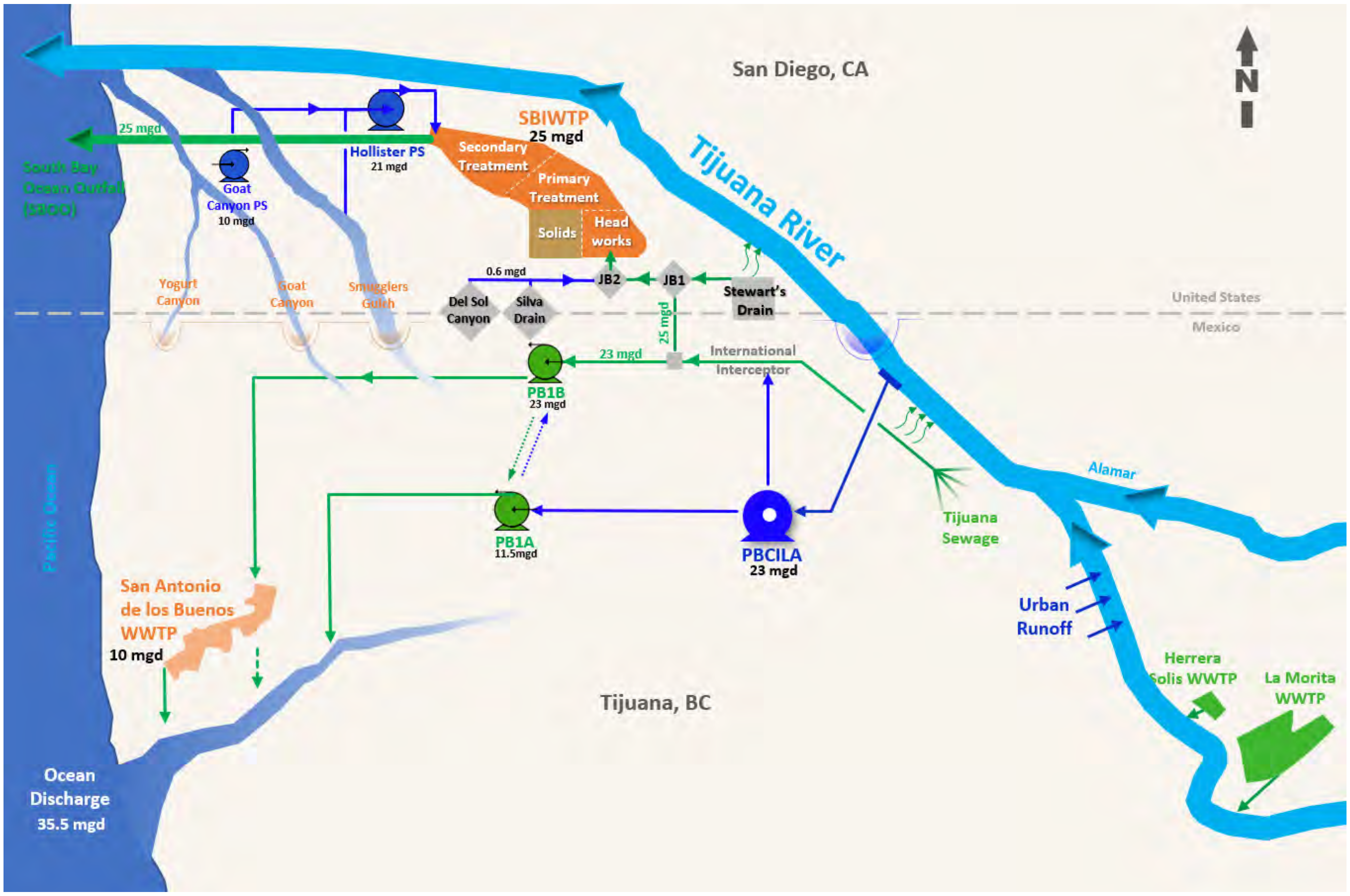

Figure 1-1. SBIWTP Existing Collection and Conveyance Schematic

The primary source of the plant influent is from the existing 72-inch diameter International Interceptor located just south of the USA/Mexico border. A portion of the flow from this 72-inch diameter sewer is intercepted at Pump Station No. 1B in an existing junction box located immediately south of the Mexico border. The wastewater flows by gravity through the 72-inch diameter pipeline toward Junction Box No. 1(JB1), which is located north of the international border near Stewart's Drain. JB1 contains a sluice gate over the 96-inch diameter outlet of the box which can be used for flow control to the SBIWTP. The motor operated sluice gate can only be operated at JB1. Dry weather flow from the Stewart's Drain Diversion Structure also flows to this box via an 18-inch pipeline. The wastewater flows by gravity towards the SBIWTP headworks through the 96-inch diameter pipeline. From JB1, the flow passes through Junction Box No. 2 (JB2), the Headworks Junction Structure, and the Headworks Inlet Structure before reaching the influent screens at the plant. Dry weather flow collected at the Silva Drain and Canyon Del Sol diversions is conveyed by gravity through a 20-inch pipeline and is also discharged to Junction Box No. 2.

The secondary source of plant influent is the 16- and 30-inch Sewer Force Mains (SFM) which convey raw sewage pumped from off-site canyon collection facilities and sewage pump stations located at Goat Canyon and Smuggler's Gulch (Hollister Street).

The tank drainage system also discharges into the Headworks Junction Structure through a 48-inch diameter pipe. The Tank Drain (TD) is a gravity flow piping system located throughout the Plant through which the primary sedimentation, activated sludge and secondary sedimentation tanks are drained as well as solids thickening and dewatering processes. The tank drainage is conveyed to the headworks. The TD system takes all drain lines from process areas by means of gravity flow or pumped lines, in addition to all sewer lines by means of gravity flow from personnel occupied buildings. The TD system consists of 48-, 42-, 36-, 24-, and 18-inch piping and manhole structures.

1.2.1.1 Existing SBIWTP Description

An overall site plan of the SBIWTP is shown in Figure 1-2, and a location of the SBIWTP in relation to Goat Canyon and Hollister Lift Stations is shown in Figure 1-3.

Figure 1-2. SBIWTP Overall Site Plan.

Figure 1-3. SBIWTP, Hollister Lift Station and Goat Canyon Lift Station locations within the Tijuana River Valley.

1.2.1.2 Headworks

The headworks was originally planned as two parallel facilities, where each facility is rated for a peak flow capacity of 100 mgd. These two facilities operating in tandem were originally planned to provide for an ultimate peak flow capacity of 200 mgd. The design capacity of the existing headworks is 25 mgd average annual flow and a peak flow of 75 mgd with the three mechanical screens provided. The facility includes provisions for a fourth mechanical screen channel, which would bring the facility up to 100 mgd capacity if installed. Currently, a manual bar rack is installed in the slot for the fourth mechanical screen.

1.2.1.3 Influent Screens

The Screening Area consists of six screening channels with three self-cleaning, 5/8-inch opening bar spacing, climber-type mechanical bar screens and three manually cleaned bar screens. The screens serve to remove large debris to protect downstream process units and pumping systems. Each screen is rated for 25 mgd. The manual screens can be used for bypass if the mechanical screens fail or are taken out of service as well as help pass flows up to 100 mgd.

1.2.1.4 Influent Pump Station

After passing through the mechanical screens, the wastewater flows by gravity into the Influent Pump Station (IPS). Six vertical turbine solids handling (VTSH) pumps rated for 25 mgd per unit convey the wastewater to the aerated grit chamber.

1.2.1.5 Aerated Grit Chamber

A single aerated grit chamber, rated for a peak flow of 100 mgd, separates grit from the wastewater. Collected grit is pumped via recessed impeller grit pumps to grit cyclone classifiers and separators located in the Grit Dewatering Building. Dewatered grit and screenings are subsequently disposed of in Mexico. This facility is completely covered and provided with odor control.

1.2.1.6 Primary Sedimentation Facilities

Effluent from the aerated grit tank is conveyed by gravity to the five primary sedimentation tanks' influent channel and then through the rapid mixing chamber prior to the in-service primary sedimentation tanks. The primary settling tanks are rated for 25 mgd average annual flow and 75 mgd peak flow. Each of the rapid mixing chambers is used to mix ferric chloride and anionic polymer to improve the settleability of the primary solids. Each primary sedimentation tank has plastic flight and chain sludge collectors to move the settled sludge to dual sludge hoppers located on the inlet side of each primary sedimentation tank. Settled primary sludge is thickened and then removed via pumps to unstabilized sludge storage tanks (USSTs). Primary skimmings (PSK) are removed from each primary sedimentation tank and conveyed by gravity to the PSK pump station where they are concentrated and subsequently pumped through a grinder and then to the USSTs. The effluent weirs are covered to provide odor control.

1.2.1.7 Primary Effluent Equalization Basins

There are two primary effluent equalization basins that were installed to help reduce the daily diurnal flow variability entering the activated sludge facilities at an average daily flow of 25 mgd. These units were sized after completion of the secondary treatment facilities.

1.2.1.8 Activated Sludge Facilities

Primary effluent (PE) is conveyed by gravity to the Primary Effluent Bypass Structure (PEBS) and then conveyed by gravity via a 72-inch PE pipeline to the Activated Sludge Tanks (AST) for secondary treatment. The activated sludge process is rated for 25 mgd average annual flow and a peak flow of 48.75 mgd. Channel aeration is provided in the AST influent channel via coarse air bubble diffusers that are supplied with air by channel aeration blowers located in the Blower Building on the north side of the ASTs. From the AST influent channel, PE is conveyed via gravity into each AST by two parallel 24-inch pipes that discharge to an 18-inch diffusion header located in the "B" zone of each AST.

Each AST is subdivided into seven treatment zones ("A", "B", "C", "D", "E", "F" and "Aerobic"). Each of these seven zones is separated by a red wood overflow baffle.

- Zone "A" is the pre-anoxic zone and receives only return activated sludge (RAS) flows. This zone is mixed but is not aerated.
- Zone "B" is the anaerobic zone and receives overflow from Zone "A" and PE. This zone is mixed but is not aerated. Zone "B" can also receive Intermediate Mixed Liquor Return (IMLR) from the effluent end of the last "aerated" zone within the AST.
- Zone "C" is an anoxic zone and receives overflow from Zone "B". This zone is mixed but is not aerated.

- Zone “D” is an anoxic zone and receives overflow from Zone “C”. This zone is mixed but is not aerated. Zone “D” can also receive IMLR from the effluent end of the last “aerated” zone within the AST.
- Zone “E” is an anoxic zone and receives overflow from Zone “D”. This zone is mixed but is not aerated.
- Zone “F” is an anoxic zone and receives overflow from Zone “E”. This zone is mixed but is not aerated.
- The “Aerobic” Zones receive flow from Zone “F” and are sub-divided into three aeration zones that do not include any baffles. Each aeration sub-zone includes an independent air drop leg with flow control valves and air flow meters and fine bubble diffusers. The air to each drop leg is supplied by Process Air Blowers located in the Blower Building.

At the western end of the ASTs, after the last aerobic zone, the mixed liquor is discharged over weirs and co-mingled in the common AST effluent channel, from which it flows by gravity to the Secondary Sedimentation Tanks (SSTs) influent channel. Channel aeration is provided in the AST effluent channel and the SST influent channel via coarse air bubble diffusers in the channels to maintain solids in suspension that are supplied with air by channel aeration blowers located in the Blower Building on the north side of the ASTs.

The activated sludge process can manage nitrification, and by using the IMLR pumps, will denitrify a portion of the produced nitrate, thus providing a payback of oxygen used for nitrification.

1.2.1.9 Secondary Sedimentation Facilities

The mixed liquor enters each of thirteen SSTs through two parallel influent channel wall penetrations, which utilize diffuser assemblies (24-inch tees) to disperse the mixed liquor as it enters each SST. Settled, secondary sludge collects in two sludge hoppers at the effluent (north) end of each SST, and the secondary skimmings (SSK) are collected in the rotary skimmer at the influent (south) end of each SST. Clarified secondary effluent flows by gravity through three launders in each SST to the SST Effluent Channel and subsequently to the Effluent Blending Structure.

Each of the 13 SSTs is equipped with a plastic chain and flight collector apparatus that moves the settled secondary sludge (return activated sludge) to the two sludge hoppers located at the effluent (east) end of each of the SSTs. RAS is removed from the hoppers through suction piping and delivered by gravity into the RAS Wet Well. RAS is sent back to the ASTs.

The waste activated sludge (WAS) system pumps flow to the Dissolved Air Flotation (DAF) Thickeners.

1.2.1.10 Chlorination

Chlorine, in the form of sodium hypochlorite, is used throughout the SBIWTP for intermittent pre-chlorination at the Headworks Inlet Structure and Canyon Collector/Tank Drain Joint Structure; intermittent chlorination of the primary sludge line for hydrogen sulfide control and to avoid methane gas production in the USSTs; intermittent RAS chlorination to help suppress the growth of filamentous organisms in the activated sludge system; intermittent chlorination of the non-potable water (NPW) distribution system to help suppress organic growth in the NPW distribution system; and continuous plant effluent chlorination for effluent disinfection.

1.2.1.11 Primary Sludge Thickening

Primary sludge is thickened in the primary sedimentation tanks between 4% to 6% total solids and pumped to the USSTs.

1.2.1.12 Waste Activated Sludge Thickening

WAS thickening facilities consists of two DAF thickeners with polymer feed facilities to maximize DAF solids and hydraulic loading capacity. WAS is pumped via the WAS pumps located below the RAS/WAS Wet Well in the SST effluent gallery to the DAF thickeners. Thickened waste activated sludge (TWAS) is pumped from the DAF thickeners to the USSTs.

1.2.1.13 Unstabilized Sludge Storage Facilities

Unstabilized primary sludge, thickened waste activated sludge, and skimmings from the primary and secondary sedimentation tanks are delivered to the USSTs via their respective pumping facilities. Each sludge and skimming source is delivered to the USSTs via a separate glass-lined ductile iron pipe that enters the storage tanks at an elevation above the high operating level. Each storage tank is provided with a dedicated external recirculation pump recirculation system. In addition, each USST is provided with ferric chloride supply to reduce the potential for odor production and to minimize deposition of struvite.

1.2.1.14 Sludge Dewatering Facilities

Unstabilized sludge from the unstabilized sludge storage tanks flows by gravity to the belt filter press (BFP) sludge feed pumps which pump the sludge to the BFPs in the Sludge Dewatering Building. Polymer is injected into the feed manifold piping upstream of each BFP to enhance the dewatering characteristics of the sludge. The dewatered sludge (cake) is conveyed to the lime stabilization facilities at the Sludge Dewatering Building. One of two inclined belt conveyors is provided for each pair of BFPs.

1.2.1.15 Sludge Conveyance and Lime Stabilization Facilities

Dewatered sludge (cake) is conveyed from the Sludge Dewatering Building to the Lime Stabilization Facilities by the BFP conveyors. The lime stabilization facilities are composed of quicklime storage facilities, lime transfer facilities, sludge/lime mixing facilities, and a stabilized sludge conveyance system.

Two parallel systems of lime stabilization facilities are provided. Each system includes a lime storage silo, volumetric feeder, lime transfer conveyor, and a sludge/lime mixer. Stabilized sludge from each system is conveyed by an individual incline truck loading conveyor to the Truck Loading Building to the east of the lime stabilization facilities.

2 Treatment Process Design Criteria

2.1 Existing Flow and Loading Data

The source of the influent wastewater is from the International Collector which includes wastewater from Tijuana and Tijuana River water that is diverted by the CILA Pump Station (PB-CILA). Table 2-1 shows the annual average influent wastewater characteristics for total suspended solids (TSS) and five-day carbonaceous biochemical oxygen demand (cBOD) from data provided by USIBWC. The data sheets provided by SBIWTP staff identify the 24-hour composite samples as the primary influent, however, these samples are the raw wastewater that do not include internal plant recycle streams – such as DAF thickener subnatant and BFP filtrate.

Table 2-1. Average Annual Influent Wastewater Characteristics.

Year	Flow, mgd	TSS, mg/l	TSS lbs/d	cBOD5, mg/l	cBOD5, lbs/d
2018	24.6	331	67,000	294	59,300
2019	25.1	337	70,600	278	58,200
2020	27.2	324	73.400	268	60,800
2021	24.4	347	67,300	275	53,300
Average	25.3	335	69,600	279	57,900

[redacted]

- [redacted]
- [redacted]

[redacted]

Table 2-2. PB-CILA Impact Analysis on Influent Wastewater Characteristics

Dates (2022)	[redacted]	Flow, mgd	TSS, mg/l	cBOD, mg/l
January 15 – February 9	Off	11.4	304	245
January 1-14 and February 10-23	On	18.7	315	251
August 2 – August 17*	Off	32.6	370	269
July 17-30 and August 18-31*	On	26.6	330	268

*Note that July 31 and August 1, 2022, had influent TSS of 3,204 and 2,804 mg/l which were not included in the average as these are an order of magnitude higher than the other data. Also, the cBOD for these two days were 457 and 490 mg/l.

[redacted]

Influent loading variability was also reviewed. To determine the influent loading variability, the year 2019 was chosen as the reference point. This decision was made based on the completeness of the data available, and feedback from SBIWTP staff indicating that 2019 was a typical year that did not include the sudden influxes of solids and debris that have been experienced recently. Table 2-3 shows the annual average, maximum month, and 7-day maximum loading.

Table 2-3. Influent Loading Variability – Calendar Year 2019

Flow	cBOD		TSS	
	lbs/d	Factor	lbs/d	Factor
Average	58,749	1.00	64,756	1.00
Maximum - 30 day	67,708	1.15	76,602	1.18
Maximum - 7 day	73,430	1.25	88,210	1.36

Overall, these loading variabilities are common for typical municipal wastewater influent characteristics and will be used to assess the expansion needs for the facility.

2.2 Effluent Quality Requirements

For the purposes of this Facility Assessment and Rehabilitation Report, the assumption is that the current effluent discharge limits for the various constituents would remain the same concentration as current limits taken from the California Regional Water Quality Control Board Order No. R9-2014-009 as amended by order nos. R9-2014-0094, R9-2017-2024, and R9-2019-0012 NPDES No. CA0108928. Note that the loadings were assumed to be modified to reflect the new expanded discharge flow of 50 mgd. The effluent requirements for major constituents is shown in Table 2-4.

Table 2-4. Estimated Effluent Limitations for Major Constituents for 50 mgd Average Annual SBIWTP

Constituent	Units	Monthly Average	Weekly Average	Maximum
cBOD5	mg/l lbs/d	25 10.425	40 16,680	
TSS	mg/l lbs/d	30 12,510	45 18,765	

Constituent	Units	Monthly Average	Weekly Average	Maximum
Oil and grease	mg/l lbs/d	25 10.425	40 16,680	75 31,275
Settleable solids	ml/l	1.0	1.5	3.0
Turbidity	NTU	75	100	225

The average monthly percent removal of cBOD5 and TSS will not be less than 85%.

2.3 Treatment Process Performance

The SBIWTP had achieved its discharge limit performance until recently. A review of the facility's effluent quality indicates that starting in November 2020, effluent discharge quality declined as shown in Table 2.5. As discussed during site visits, condition assessment inspections, and technical decisions meetings, the SBIWTP has been challenged by the influent wastewater quantity and quality during wet weather events. Specific challenges identified include:

- Influent Flow Rates – peak hourly flow rates have exceeded the facility design peak flow of 50 mgd and the daily flows rates greater than 37 mgd and monthly flows of 32 mgd. Junction Box No.1's 96-inch discharge gate is not operable (it has been welded open to avoid catastrophic failure). Therefore, the plant has been hydraulically overwhelmed.
- Influent Screening and Grit – Slug loads of screenings, grit, and clay-like material have stressed the mechanical screens and the grit chamber, resulting in premature failures and overloading the operating units. As discussed in Sections 4.2 and 4.3, the mechanical screens and grit chamber are near the end of their useful life and not always available.
- Cascading Effect throughout the Facility – as noted above, the failure to capture screenings leads to clogging of grit pumps, which are operated at their maximum flow rate to attempt to manage the excess grit. These screenings and grit enter the primary settling tanks, causing failures, thus increasing the primary effluent TSS beyond design. Note that the design of the primary effluent was in the range of 100 mg/l TSS. There were significant periods when the primary effluent TSS was greater than 150 mg/l, which significantly increased the BOD and TSS loading into the activated sludge process.

  The high effluent TSS and resulting BOD concentrations are a result of excess solids loading to the activated sludge facility. This caused higher mixed liquor concentrations that were beyond the activated sludge and settling tanks capacity, thus resulting in TSS washout as shown in Table 2-5. This excess solids loading on the settling tanks caused an increase in WAS requirements. With the higher primary and WAS loads, the solids processing equipment, which also are nearing the end of their useful life, are operating at their maximum capacity. This cascading effect caused the effluent quality to deteriorate.

The effluent quality is shown in Table 2-5.

Table 2-5. Monthly Average Effluent Quality

	2019			2020			2021			2022		
	Flow, mgd	TSS, mg/l	cBOD, mg/l	Flow, mgd	TSS, mg/l	cBOD, mg/l	Flow, mgd	TSS, mg/l	cBOD, mg/l	Flow, mgd	TSS, mg/l	cBOD, mg/l
JAN	23.1	10	10	24.7	13	9	24.3	46	23	12.3	9	7
FEB	22.0	8	7	23.2	21	16	21.8	61	41	20.5	100	55
MAR	24.6	10	9	22.6	11	8	20.6	14	10	24.0	143	48
APR	29.0	10	8	23.3	11	8	21.3	13	9	23.4	128	61
MAY	24.5	8	7	26.4	13	9	24.6	17	11	22.7	77	45
JUN	26.4	12	9	28.5	12	9	24.9	10	7	23.2	27	19
JUL	25.4	10	8	25.9	15	11	24.8	15	11	23.6	12	10
AUG	25.8	8	7	29.3	15	11	25.0	10	7	31.3	63	31
SEP	26.0	9	8	31.9	14	8	25.0	16	10	30.7	72	39
OCT	26.0	7	6	31.4	12	9	24.3	10	7	32.4	49	27
NOV	22.8	11	8	30.9	97	44	22.8	11	8	*	*	*
DEC	25.9	12	9	28.1	67	34	19.6	10	8	*	*	*

* Data was not available at the time of analysis.

3 Condition Assessment Summary

Arcadis performed a comprehensive physical and performance condition assessment of SBIWTP assets to determine the likelihood of failure and to identify the requirements to rehabilitate the SBIWTP. Physical condition refers to the current state of repair and operation of an asset, as influenced by age, historical maintenance, and operating conditions, whereas performance condition refers both to the current state of performance and the ability of the asset to deliver required level of service. To evaluate asset physical condition, a standard scale of 1 to 5 (1 – excellent and 5 – very poor) is used to provide a comparative ranking of assets. Physical condition is assessed visually through the scoring of specific criteria for each asset type. Scoring forms were applied containing specific criteria for mechanical, heating, ventilation, and air conditioning (HVAC), electrical/I&C, and structural assets. Performance condition is assessed via a desktop evaluation of current and future performance with scoring criteria also on a scale of 1 to 5 (1 – excellent and 5 – very poor). The overall likelihood of failure score of an asset is the maximum of the physical and performance condition criteria score.

As a part of the assessment, Arcadis followed the below outlined sequence of events:

1. An asset inventory was exported from data provided by USIBWC and organized by process.
2. Guidelines were developed for physical and performance condition scoring.
3. A visual physical condition assessment was performed on site using tablets to collect scores and photographs.
4. The performance condition assessment was performed through interviews with SBIWTP staff and work order analysis.
5. Likelihood of failure scores were calculated from the physical and performance condition, and graphics of the results were developed to support prioritization of the rehabilitation needs.

3.1 Physical Condition Criteria and Results

A total of 1,203 assets were evaluated for physical condition at the SBIWTP. Certain asset types were excluded from this assessment including roads, buried utilities, and safety equipment. Approximately 214 assets were not able to be visually assessed due to being submerged or located in a confined or inaccessible space. Performance condition assessment was performed on 1,417 assets, including the inaccessible ones, and each asset received a likelihood of failure score. The initial inventory provided was updated during the condition assessment process to add new assets not on the initial list, and to identify assets that were no longer in service. Physical Condition Criteria and Results

Physical condition is evaluated through visual inspection and utilizing physical condition scoring criteria defined for each assessment type located in Appendix A-Physical Condition Scoring Criteria by Asset Type. All physical condition assessments are evaluated on a 1 to 5 scale. Assets receiving a condition score of 1 are in very good condition and assets receiving a condition score of a 5 are in very poor condition, as described in Table 3-1.

Table 3-1. Physical Condition Scoring Description

Score	Description of Physical Condition
1 – Very Good	Fully operable, well maintained, and consistent with current standards. Little wear shown and no further action required.
2 – Good	Sound and well maintained but may be showing slight signs of early wear. Delivering full efficiency with little or no performance deterioration. Only minor renewal or rehabilitation may be needed in the near term.
3 – Moderate	Functionally sound and acceptable and showing normal signs of wear. May have minor failures or diminished efficiency with some performance deterioration or increase in maintenance cost. Moderate renewal or rehabilitation needed in near term.
4 – Poor	Functions but requires a high level of maintenance to remain operational. Shows abnormal wear and is likely to cause significant performance deterioration in the near term. Replacement or major rehabilitation needed in the near term.
5 – Very Poor	Effective life exceeded, and/or excessive maintenance cost incurred. A high risk of breakdown or imminent failure with serious impact on performance. No additional life expectancy with immediate replacement needed.

The overall results of the physical condition assessments are shown in Figure 3-[redacted]

[redacted]

Figure 3-1. Physical Condition Summary Chart

[redacted]

Table 3-2. SBIWTP Assets with Very Poor Physical Condition Score

Process	Asset	Physical Score	Physical Comments
[redacted]			

Process	Asset	Physical Score	Physical Comments
[redacted]			

Process	Asset	Physical Score	Physical Comments
[redacted]			

Process	Asset	Physical Score	Physical Comments
[redacted]			

3.2 Performance Condition Criteria and Results

The performance condition evaluation captures the ability of an asset to meet current and future projected needs. Arcadis developed the following criteria for performance condition to capture the other asset failures modes besides physical mortality including capacity, regulatory, reliability, O&M issues, and obsolescence. Each performance criterion is defined as follows, and shown in Table 3-3:

- Capacity: Ability to meet current capacity. (Evaluated at peak and average flows)
- Regulatory: Ability to meet current regulations. (Evaluated at peak and average flows)
- Operation and Maintenance (O&M) Issues: Frequency of O&M Issues above and beyond regular maintenance and equipment breakdowns
- Obsolescence: Equipment technology (Evaluated based on technology age and available spare/replacement parts).

Capacity and regulatory is evaluated at the process level, whereas operation and maintenance issues and obsolescence are evaluated at the group process area level.

Table 3-3. Performance Criterion Description

Criteria	Evaluation	1	2	3	4	5
Capacity	Ability to meet current capacity	Average – Yes Peak - Yes	-	-	Average – Yes Peak - No	Average – No Peak - No
Regulatory	Ability to meet current regulations & permits	Average – Yes Peak – Yes	-	-	Average – Yes Peak – No	Average – No Peak - No
Reliability	Average time equipment is available when needed	99-100%	95-98%	90-94%	85-89%	< 85%
O&M Issues	Frequency of O&M Issues above and beyond regular maintenance (excluding breakdown)	None	Very Infrequently (Quarterly)	Infrequently (Monthly)	Frequently (Weekly)	Very Frequently (< 1 week)
Obsolescence	Equipment Technology, Operating Efficiency, Spare/Replacement Parts	Technology Best Available/ State of the Art	Technology Industry Standard/ ”Tried and True”	Technology Considered Appropriate	Technology Nearing Obsolescence	Technology Obsolete/ Out of Date

Interviews were held with SBIWTP staff to initially score each criterion at the appropriate process or equipment group level. Arcadis applied the individual performance condition scores to assets based on the analysis of this information. Overall, eight one percent of the assets were scored in very poor to moderate performance condition (red, orange, yellow) and thirty nine percent of the assets were in poor to very poor (red, orange) condition as shown in Figure 3-2.

[redacted]

Figure 3-2. Performance Condition by Area Summary Chart

The assets with very poor and poor performance condition existed across all the process areas with a majority in five process areas: Preliminary, Primary, Remote Lift Stations, Secondary, and Solids. The main performance issues included O&M Issues, Obsolescence, and Reliability. The average performance score was 3.36 out of 5. Table 3-4 summarizes the poor and very poor asset groups.

[redacted]

[redacted]	[redacted]	[redacted]	[redacted]
[redacted]			

Process	Asset Type	Asset Group Name	Performance Comments
[redacted]			

3.3 Likelihood of Failure Results

The maximum of the physical and performance scores was applied as the overall condition of the assets for their likelihood of failure score. The results for likelihood of failure for assets at SBIWTP are shown in Figure 3-3.

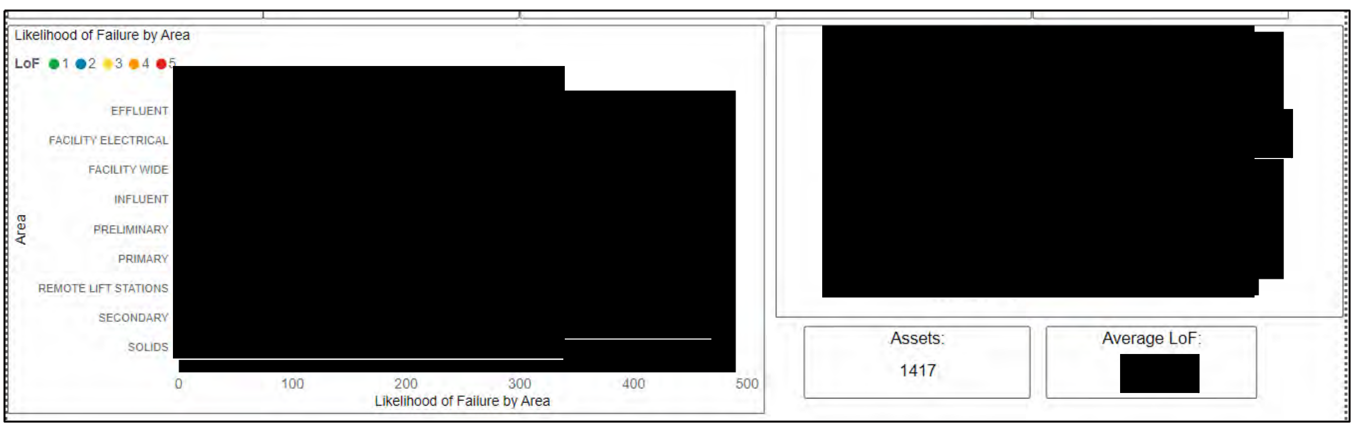

Figure 3-3. Likelihood of Failure Summary Chart

[redacted]. Detailed scoring of performance condition, physical condition, and likelihood of failure for each asset assessed are included in Appendix B- Completed Assessment Scoring. Appendix B also identifies the assets that could not be physically assessed due to inaccessibility (full tanks in service, covered structures, submerged equipment). A structural assessment technical memorandum to further document condition of structural assets at the SBIWTP are included in Appendix C-IBWC SBIWTP Assessment and Facility Planning Structural Assessment Technical Memorandum.

3.4 Planned Asset Rehabilitation by Others

SBIWTP operations has proposed and budgeted capital improvement projects for assets that are nearing or at the end of their useful life and require immediate repair or replacement. The capital projects are expected to be completed between 2023 to 2027. The assets to be repaired or replaced as part of the capital improvements projects proposed 2023 to 2027 will be considered for rehabilitation as part of this Report. The complete list of proposed capital projects is included in Appendix D-2023 to 2027 Capital Improvements Projects.

4 Liquid Stream Processes – Primary Treatment

4.1 Off Site Pump Stations

The SBIWTP collection and conveyance facilities collect and transfer raw sewage from the Tijuana, Mexico collection system and from fugitive transboundary wastewater streams to the SBIWTP for treatment. Five diversion structures collect the transboundary sewage, and two pump stations and the associated force mains convey the sewage to the plant Headworks. Three diversion structures – Canyon Del Sol, Silva's Drain, and Stewart's Drain, collect transboundary sewage, which is directly conveyed by gravity sewers to the SBIWTP Headworks. The fourth diversion structure at Goat Canyon collects transboundary sewage to the Goat Canyon Pump Station. The fifth diversion structure at Smuggler's Gluch collects transboundary sewage to the Hollister Street Pump Station. Refer to Figure 1-1 in Section 1.2.1 for the locations of the diversion structures.

At each diversion structure, transboundary surface flow is impounded to prevent grit and heavy solids from entering the downstream collection system. The diversion structures consist of two chambers. The first chamber is designed to trap sand and grit. Flow then enters the second chamber conveying flow downstream to the collection system. Based on interviews with SBIWTP staff, during high flow conditions or rain events, the diversion structures are isolated to prevent transboundary flow from entering the SBIWTP.

4.1.1 Existing Facilities Description/Design Criteria

4.1.1.1 Goat Canyon Pump Station

An off-site diversion structure at Goat Canyon collects transboundary sewage, which is then conveyed by gravity to the Goat Canyon Pump Station. The Goat Canyon Pump Station pumps the transboundary sewage flows through a dual force main to Hollister Street Pump Station. The Goat Canyon Pump Station includes the following equipment:

- Four submersible pumps
  - Two smaller capacity pumps (1,835 gpm), P-1 and P-2, tied into a 12-inch forcemain
  - Two larger capacity pumps (3,085 gpm), P-3 and P-4, tied into a 16-inch forcemain
  - Associated valves and appurtenances
- Two submersible pumps, S-1 and S-2, for site drainage
- Surge arrestor tank to handle surge pressure in the event of a power failure
- Water supply well to provide non-potable water to the pump station
- Odor reduction station
  - Three-stage scrubber
  - One blower
  - Sodium hydroxide and sodium hypochlorite chemical tanks, metering pumps, recirculation pumps, and associated valves and appurtenances
- Emergency generator in the event of utility power service failure

- Outdoor rated generator with an in-based diesel fuel tank sized to power all the operating equipment for a period of eight hours.

The Goat Canyon Collector and Goat Canyon Wet Well is shown in Figure 4-1 and Figure 4-2.

Figure 4-1. Goat Canyon Collector

Figure 4-2. Goat Canyon Pump Station Wet Well

Table 4-1 shows the design criteria for the Goat Canyon Pump Station equipment.

Table 4-1. Goat Canyon Pump Station Existing Design Criteria

Parameter	Units	Value
Goat Canyon Collector Capacity	mgd	7.0
Goat Canyon Pump Station Capacity	mgd	7.0
Pump P-1 and P-2 Design Criteria	-	1,835 gpm, 105-ft TDH
Pump P-1 and P-2 Horsepower	HP	75
Pump P-3 and P-4 Design Criteria	-	3,085 gpm, 70-ft TDH
Pump P-3 and P-4 Horsepower	HP	75
Sump Pump Design Criteria	-	119 gpm, 9.9-ft TDH
Sump Pump Horsepower	HP	2
Well Water Supply Pump Design Criteria	-	75 gpm, 260-ft TDH
Well Water Supply Pump Horsepower	HP	7.5
Surge Tank Design Flowrate	gpm	4,000
Surge Tank Design Pressure	psi	100
Scrubber Flow Rate	cfm	670
Scrubber Design H_2S Concentration	Ppm	25
Odor Reduction Blower Horsepower	HP	2
Odor Reduction Chemical Metering Pumps	HP	0.5
Odor Reduction Recirculation Pumps	HP	0.75
Standby Generator	kW	350

4.1.1.2 Hollister Street Pump Station

An off-site diversion structure at Smuggler's Gulch collects transboundary sewage, which is then conveyed by gravity to the Hollister Street Pump Station. Hollister Street Pump Station pumps the combined transboundary sewage flows through a dual force main to the tank drain system at the SBIWTP. The Hollister Street Pump Station includes the following equipment:

- Four submersible pumps
  - Two smaller capacity pumps (2,660 gpm), P-1 and P-2, tied into a 16-inch forcemain
  - Two larger capacity pumps (9,750 gpm), P-3 and P-4, tied into a 30-inch forcemain
  - Associated valves and appurtenances
- Two submersible pumps, S-1 and S-2, for site drainage

- Surge arrestor tank to handle surge pressure in the event of a power failure
- Odor reduction station
  - Three-stage scrubber
  - Sodium hydroxide and sodium hypochlorite chemical tanks, metering pumps, recirculation pumps, and associated valves and appurtenances
- Emergency generator in the event of utility power service failure
  - Outdoor rated generator with an in-based diesel fuel tank sized to power all the operating equipment for a period of 8 hours.

The Smuggler's Gulch Collector and Hollister Street Pump Station are shown in Figures 4-3 and 4-4.

Figure 4-3. Smuggler's Gulch Canyon Collector

Figure 4-4. Hollister Street Pump Station Wet Well

Table 4-2 shows the design criteria for the Hollister Street Pump Station equipment.

Table 4-2. Hollister Street Pump Station Existing Design Criteria

Parameter	Units	Value
Smuggler's Gulch Collector Capacity	MGD	14.0
Hollister Pump Station Capacity	MGD	21.0
Pump P-1 and P-2 Design Criteria	-	2,660 gpm, 78-ft TDH
Pump P-1 and P-2 Horsepower	HP	100
Pump P-3 and P-4 Design Criteria	-	9,750 gpm, 61-ft TDH
Pump P-3 and P-4 Horsepower	HP	200
Sump Pump Design Criteria	-	119 gpm, 9.9-ft TDH
Sump Pump Horsepower	HP	2
Surge Tank Design Flowrate	gpm	16,950
Surge Tank Design Pressure	psi	125
Scrubber Flow Rate	cfm	1,000
Scrubber Design H2S Concentration	ppm	25
Odor Reduction Blower Horsepower	HP	3

Parameter	Units	Value
Odor Reduction Chemical Metering Pumps	HP	0.5
Odor Reduction Recirculation Pumps	HP	0.75
Standby Generator	kW	600

4.1.2 Assessed Conditions

[redacted]

[redacted]

Asset	Score	Reason
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Sand and sediments is a constant challenge by the coastal areas. Erosion from the canyons gets mobilized and transports sediments and fines that enter the collection systems wearing down the equipment. [redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

4.2 Headworks

4.2.1 Existing Facilities Description/Design Criteria

The headworks facility is the first stage in the treatment process at the SBIWTP. It includes two structures, the Headworks structure and the Grit Chamber. The Headworks consists of the Screenings Discharge Area, Influent Pump Station (IPS), Grit Dewatering Area, and Storage Bin Area. The influent screens remove solid materials larger than the screen openings, the influent pumps lift wastewater to the Grit Chamber, and the Grit Chamber settles and removes solid grit particles from the influent flow before primary sedimentation.

The headworks facility at SBIWTP receives influent sewage from Mexico via a direct connection through a 96-inch interceptor sewer and indirectly via the 48-inch tank drain pipe conveying flow diverted from Goat Canyon and Smuggler's Gulch. These pipelines terminate at the south end of the Headworks facility. From the Headworks Junction Structure, flows are conveyed via a 96-inch sewer to the Headworks Inlet Structure and then to the screenings area. In the screenings area there are six screening channels with three self-cleaning, climber mechanical bar screens and three manually cleaned bar screens. After screening, the wastewater is conveyed to the IPS in which six vertical turbine solids handling (VTSH) pumps are installed to pump the wastewater to the Grit Chamber.

Refer to Figure 4-8 and Figure 4-9 for drawings of the headworks facilities including headworks influent channel, mechanical screens, and influent pumps.

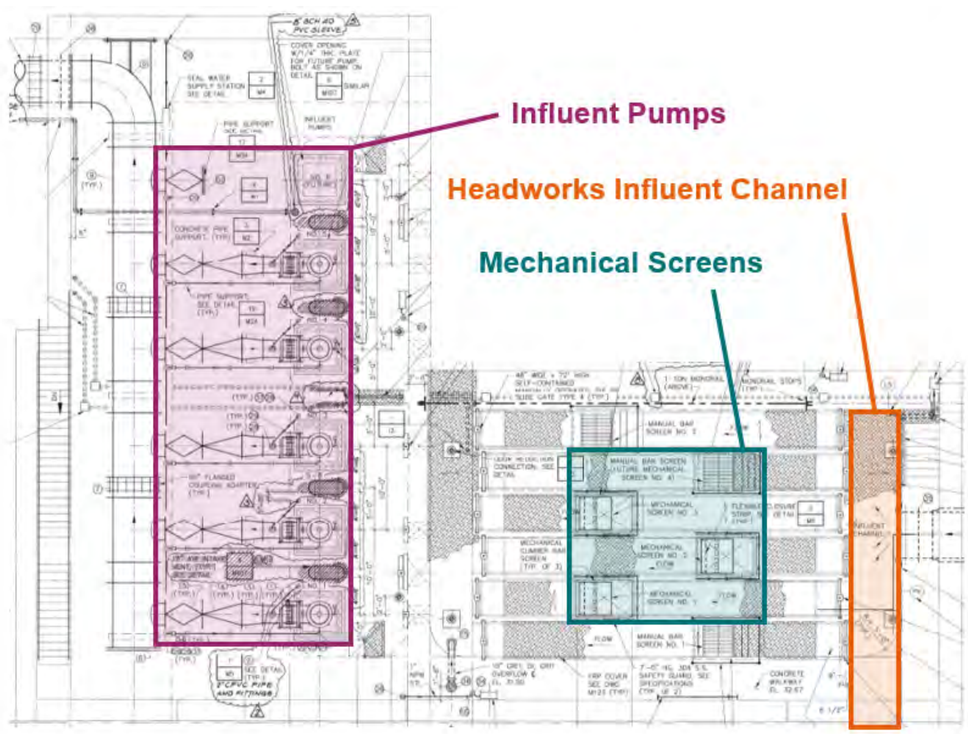

Figure 4-8. Headworks Plan Overview

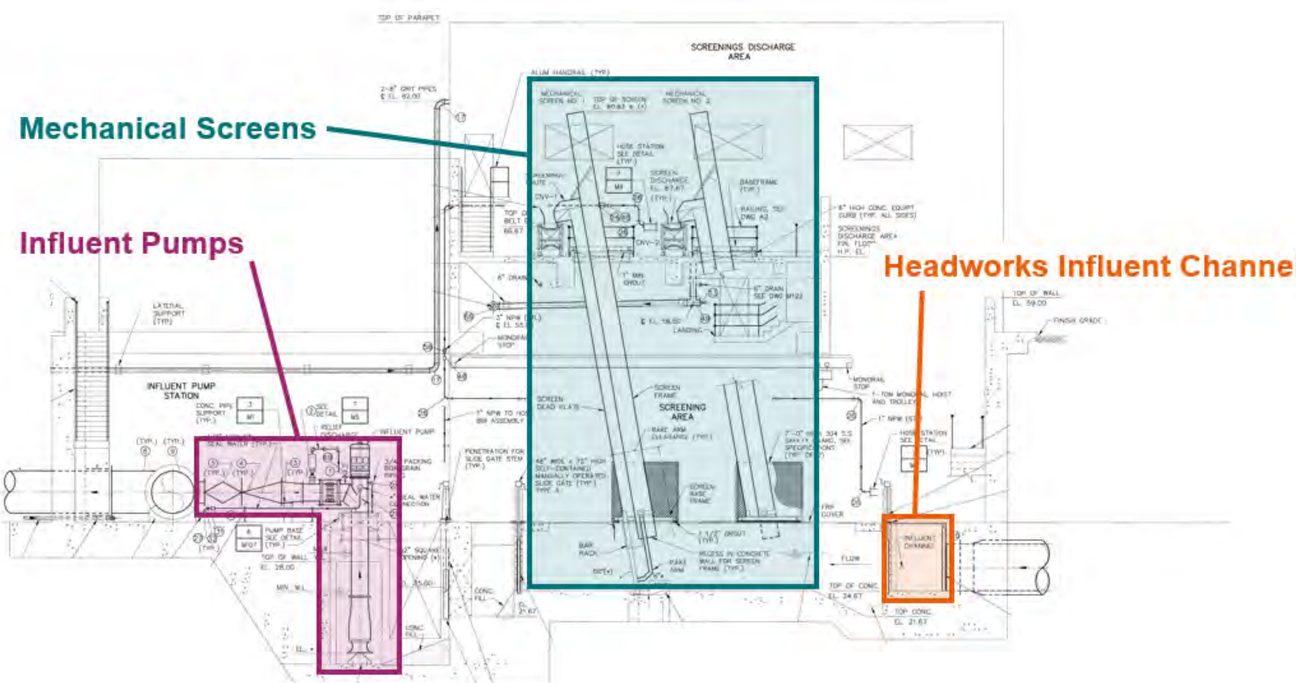

Figure 4-9. Headworks Sectional Overview

Design Criteria

Table 4-5 shows the design criteria for the mechanical screens and Table 4-6 shows the design criteria for the influent pumps.

Table 4-5. Mechanical Screens Original Design Criteria

Annual Average Flow	25 mgd
Peak Flow	75 mgd
Peak Flow per Mechanical Bar Screen Channel	25 mgd
Type	Climber type bar screen
Channel Velocity @ Q Avg and Recycle	1.3 feet/second
Channel Velocity @ Q Peak and Recycle	4.0 feet/second
Number of Channels	6
Number of Manual Bar Screens	3
Number of Mechanical Bar Screens	3
Manual Bar Screen Openings	1-1/2 inch
Mechanical Bar Screen Openings	5/8 inch

Table 4-6. Influent Pumps Original Design Criteria

Pumps	VTSH Type
Annual Average Flow	25 mgd
Peak Flow	100 mgd
Capacity per Pump	18,050 gpm @ 60 ft TDH
Motor Size	400 hp
Number of Constant Speed Pumps	3
Number of Variable Speed Pumps	3

4.2.2 Assessed Conditions

The headworks facilities were assessed to determine their current condition. The assessment findings presented in this report are taken from assessments carried out by SBIWTP staff, as well as by Arcadis after conducting site visits and meetings with SBIWTP and USIBWC staff.

[redacted]

[redacted].

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

4.3 Grit Facilities

4.3.1 Existing Facilities Description/Design Criteria

The 60-inch header pipe from the IPS discharges to the bottom of the grit chamber inlet box. It flows up through the inlet box and into the aerated grit chamber. Recessed impeller grit pumps remove the settled grit from the hoppers and convey slurry to the grit classifier/separator units.

The aerated grit chamber consists of six grit hoppers with dedicated pumps, and two positive displacement blowers to supply air to coarse bubble diffusers located in the aerated grit chamber. There are six dry pit grit pumps, one for each hopper, each with a constant speed, recessed impeller centrifugal type pump. The grit pumps are configured into two groups of three pumps with each group discharging into one of two common grit slurry pipelines that each discharge into a single grit classifier located in the existing Headworks facility. Three grit classifiers, which include both hydrocyclonic grit separators and the grit dewatering conveyors, are located in the upper level of the Headworks facility and above the loadout area. These units are valved such that either of the two grit slurry pipelines can discharge to the grit classifier located in the middle of the three units, while the two units on the ends are typically valved to their closest and corresponding grit slurry pipelines.

See Figure 4-19 for a plan view of the grit chamber and grit pumps, and Figure 4-20 for a plan view of the grit classifiers.

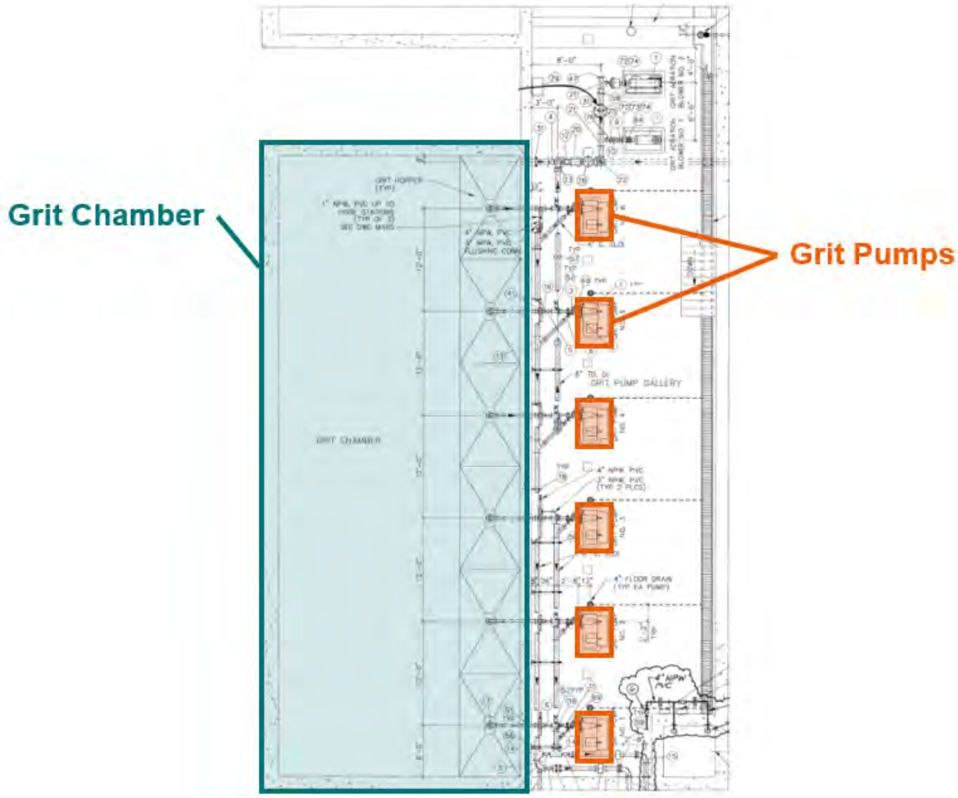

Figure 4-19. Grit Chamber Overview

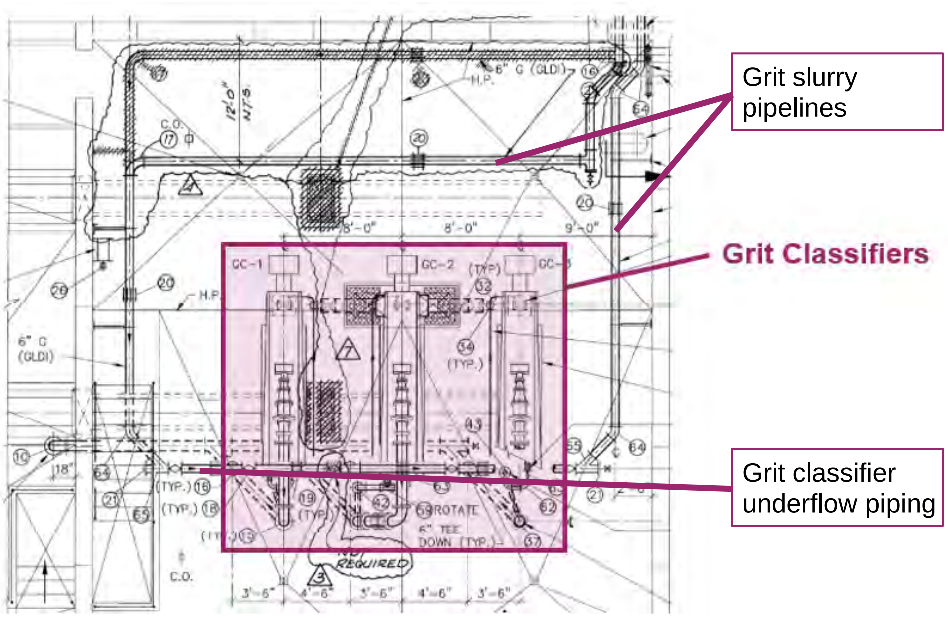

Figure 4-20. Grit Classifier Overview

Design Criteria

Table 4-11 presents the original design criteria for the grit chamber, Table 4-12 presents the original design criteria for the grit pumps, and Table 4-13 presents the original design criteria for the grit classifiers.

Table 4-11. Grit Chamber Original Design Criteria

Chamber Dimensions (L x W x D)	72-feet x 28-feet x 14-feet
Annual Average Flow	25 mgd
Peak Flow	100 mgd
Velocity @ Q Avg and Recycle	0.13 feet/second
Velocity @ Q Peak and Recycle	0.4 feet/second
Number of Chambers	1
Grit Production (Average)	4 $feet^3$/MG
Grit Production (Peak)	40 $feet^3$/MG
Air Supply	4.0 to 7.4 cubic feet per minute/linear feet

Table 4-12. Grit Pumps Original Design Criteria

Pumps	Constant speed, recessed impeller centrifugal
Number of Grit Pumps	6
Design Capacity per Pump	160 gpm @ 121 feet TDH
Intermediate Capacity per Pump	160 gpm @ 80 feet TDH
Minimum Capacity per Pump	160 gpm @ 55 feet TDH
Motor	40 hp, 1800 rpm, 460v, 3 phase, 60 Hz, high efficiency, severe duty

Table 4-13. Grit Classifiers Original Design Criteria

Number of Units	3
Type	18-inch diameter screw type dewatering grit conveyor with hydrocyclonic separator
Maximum Capacity	500 gpm
Motor	1 hp, 1750 rpm, 460 v, 3 phase, 60 Hz, explosion proof

[redacted] [redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

4.4 Primary Sedimentation

4.4.1 Existing Facilities Description/Design Criteria

Grit chamber effluent flows by gravity to the PST channel, which then flows to the rapid mixing chamber and primary sedimentation tanks. Each tank is equipped with two inlets and a finger diffuser assembly on the influent end. Each tank is also equipped with effluent launders, weirs, and valves on the effluent end.

Each tank has a chain and flight collector mechanism with 3-inch by 8-inch collector flights with 10-foot separation, resting on support rails and driven by sludge collector drives. The skimmings are drawn off and removed by rotary scum troughs located near the effluent end of each tank and are pumped by the primary skimmings pumps to the USSTs. Sludge is pushed along the bottom of the tank towards the influent end and pumped by the primary sludge pumps to the USSTs.

Figure 4-22 illustrates the layout of the primary sedimentation tanks, rapid mix chambers, rotary scum troughs, and associated equipment.

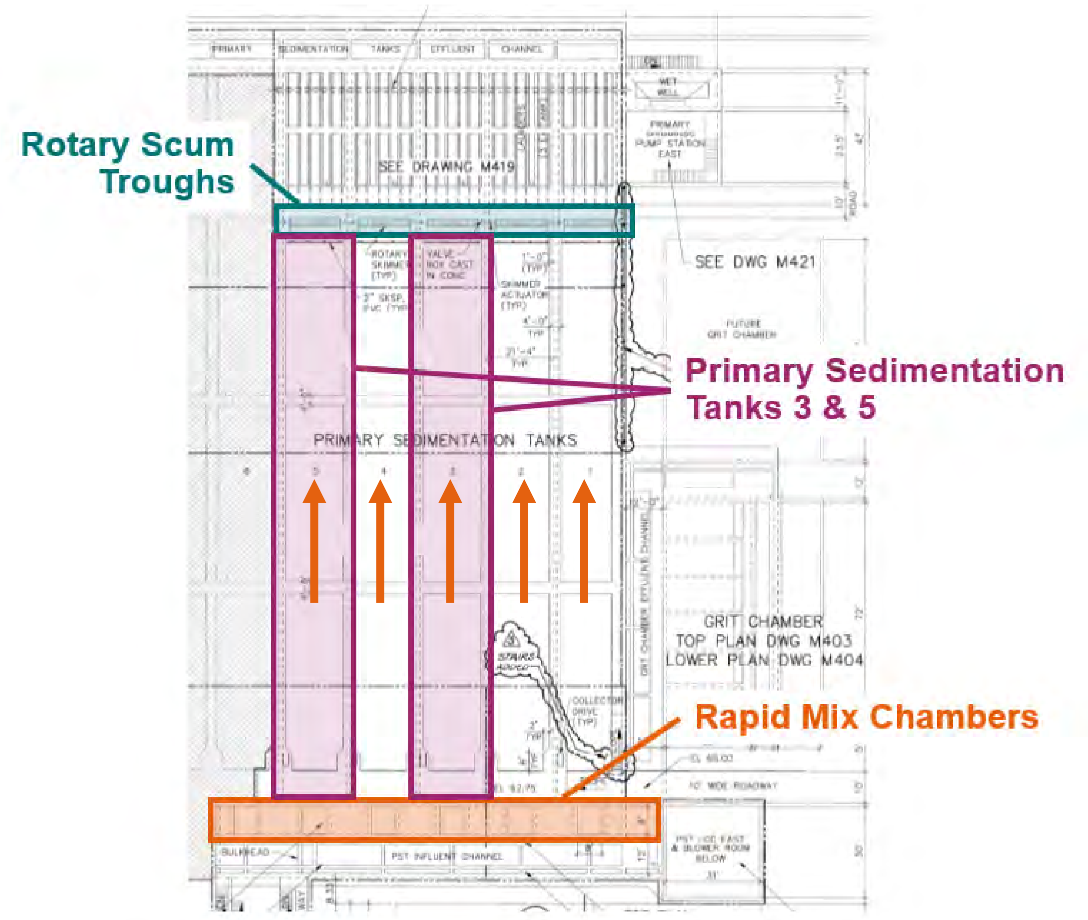

Figure 4-22. Primary Sedimentation Overview

Design Criteria

Table 4-17 shows the original design criteria for the primary sedimentation facilities and Table 4-18 shows the design criteria for the primary sludge pumps.

Table 4-17. Primary Sedimentation Facilities Original Design Criteria

Tank Dimensions (L x W x D)	240-foot x 21.33-foot x 13.5-foot
Annual Average Flow	25 mgd
Peak Flow	75 mgd
Hydraulic Capacity	100 mgd
Maximum Overflow Rate @ Q Avg and Recycle	1,000 gallons per day/foot^2
Maximum Overflow Rate @ Q Peak and Recycle	3,000 gallons per day/foot^2
Maximum Weir Loading Rate @ Q Avg and Recycle	14,000 gallons per day/linear feet
Maximum Weir Loading Rate @ Q Peak and Recycle	42,000 gallons per day/linear feet
Number of Tanks	5
Rapid Mix Detention Time @ Q Avg	1 minute
Rapid Mix Detention Time @ Q Peak	20 seconds
Rapid Mix Velocity Gradient	300 to 400 sec^{-1}
Ferric Chloride Dose	25 to 40 mg/L (continuous)
Anionic Polymer Dose	0.2 to 1.2 mg/L (continuous)
Removal Efficiency of TSS	75%
Removal Efficiency of Total $cBOD_5$	45%
H_2S Scrubber Design Loading	34 ppm

Table 4-18. Primary Sludge Pumps Original Design Criteria

Pump	Recessed impeller
Number of Pumps	3
Capacity per Pump	115 gallons per minute
Pump Speed, Rated	1540 rotations per minute
Total Dynamic Head	95 feet
Motor	25 hp, 1800 rpm, 460 v, 3 phase, 60 Hz, direct coupled, VFD driven

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

4.4.3.2.3 [redacted]

4.5 Advanced Primary Chlorination Facility

4.5.1 Existing Facilities Description/Design Criteria

The Advanced Primary Chlorination facility is located north of the Primary Sedimentation Tanks. It houses the sodium hypochlorite and sodium bisulfite storage and feed systems. Figure 4-27 shows a plan view of the Advanced Primary Chlorination facility along with the dose locations it services.

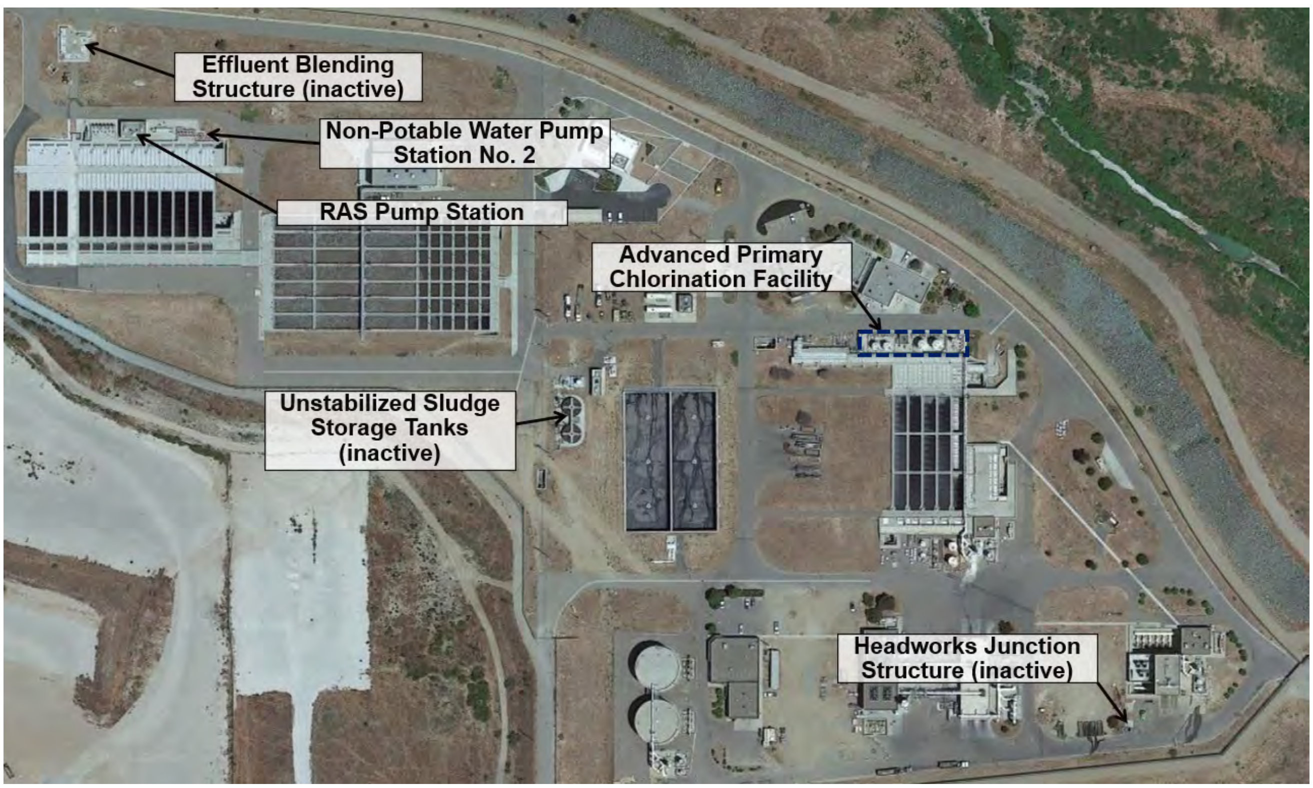

Figure 4-27. Advanced Primary Chlorination Facility and Dose Locations. Off-site Canyon Collector/Tank Drain Joint Structure not shown.

Sodium hypochlorite was designed to be dosed at the Headworks Junction Structure and Canyon Collector/Tank Drain Joint Structure (off-site) for pre-chlorination, USSTs for hydrogen sulfide control, RAS pump station for sludge bulking control, NPW Pump Station No. 2 wet well for algal growth control, and the Effluent Blending Structure (EBS) for disinfection of secondary effluent. Only two locations are actively feeding sodium hypochlorite, including the NPW Pump Station No. 2 wet well and RAS pump station. NPW Pump Station No. 2 is continuously fed chemical while the RAS pump station is dosed on an as-needed basis. The other dose locations are inactive. The sodium hypochlorite storage and feed system was designed with the components summarized in Table 4-21.

Table 4-21. Sodium Hypochlorite System Design Components

Chemical		**Sodium Hypochlorite**		
Concentration		12.5%		
Dose Locations		Headworks, Canyon Collector/Tank Drain Joint Structure, USST, RAS Pump Station, NPW Pump Station No. 2, Effluent Blending Structure		
Storage Requirements				
No. Bulk Storage Tanks		2		
Material		FRP w/ DOW Derakane 411-350 Coating		
Tank Dimensions		15 feet, 6 inches diameter by 22 feet, 6 inches high (straight shell height)		
Nominal Capacity		31,650 gal (ea.)		
Total Nominal Capacity		63,300 gal		
Storage at Average Flow		10.5 days		
Feed Requirements	**Unit**	**Minimum**	**Average**	**Maximum**
Pre-Chlorination (Headworks, USST) Pump				
Dose	mg/L	Headworks: 5 USST: 3	Headworks: 7 USST: 5	Headworks: 10 USST: 10
Flow	mgd	Headworks: 15 USST: 0.7	Headworks: 25 USST: 1	Headworks: 75 USST: 1.4
Feed Rate	gph	Headworks: 21 USST: 0.6	Headworks: 49 USST: 1	Headworks: 210 USST: 4
RAS Chlorination (RAS, Canyon Collector/Tank Drain Joint Structure) Pump				
Dose	mg/L	RAS: 55 Joint Structure: 5	RAS: 60 Joint Structure: 7	RAS: 65 Joint Structure: 10
Flow	mgd	RAS: 15 Joint Structure: 15	RAS: 17 Joint Structure: 25	RAS: 19 Joint Structure: 75
Feed Rate	gph	RAS: 230 Joint Structure: 21	RAS: 292 Joint Structure: 49	RAS: 353 Joint Structure: 210
NPW Pump Station No. 2 Chlorination Pump				
Dose	mg/L	10	15	20
Flow	mgd	2	3	4
Feed Rate	gph	6	12	23

Chemical		**Sodium Hypochlorite**		
Effluent Chlorination Pump				
Dose	mg/L	10	15	20
Flow	mgd	25	25	77
Feed Rate	gph	70	105	430
Feed Equipment				
Type	**Double Diaphragm, Positive Displacement**			
	Quantity		**Horsepower**	**Max Pressure (psi)**
Pre-chlorination (Headworks, USST) Pump	1 (Duty)		1.5	45
RAS Chlorination (RAS, Canyon Collector/Tank Drain Joint Structure) Pump	1 (Duty)		1.5	45
NPW Pump Station No. 2 Chlorination Pump	2 (1 Duty, 1 Standby)		0.75	150
Effluent Chlorination Pump	2 (1 Duty, 1 Standby)		2	45

The existing storage capacity was designed using an average chlorination demand of 24 mg/l at an average plant flow of 25 mgd for ten and one-half days. The pump capacities listed in the table above were based on average flow conditions for each process area. Maximum flows consider a future nominal plant expansion flow value of 50 mgd with a peak flow of 75 mgd.

Under contract CC-2B, two pumps were dedicated to pre-chlorination dosing. Contract CC-3 converted pre-chlorination pump no. 1 to a RAS pump station dosing pump for intermittent chlorination. The RAS chlorination pump could also dose at the Canyon Collector/Tank Drain Joint Structure as needed. Pre-chlorination pump no. 2 remained dedicated to pre-chlorination needs and could also dose to the USSTs as needed. Both the pre-chlorination and RAS chlorination pumps originally had the flexibility of dosing to all four dose locations (RAS pump station, Canyon Collector/Tank Drain Joint Structure, Headworks, USST) if one pump was out of service by manually opening a set of valves on a cross connection between the pre-chlorination discharge pump line to the intermittent chlorination pump discharge line. Contract CC-3 removed the cross connect piping. There is currently no NaOCl being dosed at the USSTs or the Canyon Collector/Tank Drain Joint Structure.

Sodium hypochlorite is delivered at the RAS pump station header via the RAS Chlorination Vault. The vault also contains the control valves and rotameter used to manually control the sodium hypochlorite addition to the NPW Pump Station No. 2 system. The pair of NPW Pump Station No.2 chlorination pumps operate in a duty and standby configuration.

Sodium hypochlorite can be dosed at the EBS using a remote injector and in-line diffuser. Two chlorine dilution water pumps are located at the discharge of the EBS to increase mixing of the chemical prior to dosing. Plant effluent chlorination is no longer needed because when the plant transitioned from treating primary effluent to secondary effluent, the requirement for effluent chlorination was removed from SBIWTP's permit.

The sodium bisulfite storage and feed system was designed and installed under contract CC-2 when the plant functioned as a primary treatment facility. The purpose of the system was to dechlorinate the chlorine residual in the primary effluent prior to it being discharged. Now that the plant functions as a secondary treatment plant, sodium bisulfite is not needed. Both the chlorination and dechlorination dose points are located at the EBS which does not provide a long enough contact time for effluent disinfection. The sodium bisulfite system has never been operated at the plant.

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

5 Liquid Stream Processes – Secondary Treatment

5.1 Activated Sludge Tanks

The existing ASTs were sized in November 1993 based on the design criteria established in November 1990 and the ASTs have been in operation as seven basins since November 2010.

5.1.1 Existing Facilities Description/Design Criteria

The PE from the PST is conveyed to the PEBS, which allows the flow to be split between the ASTs, Equalization tanks, and the EBS. A motor operated gate allows the average PE flow of 25 mgd and the associated peak PE flow of 48.75 mgd to be conveyed via a 72-inch PE gravity flow pipeline to the ASTs for secondary treatment. Flows beyond 48.75 mgd will bypass the ASTs and flow by gravity to the Equalization tanks or to the EBS through the metered 66-inch PE bypass pipeline. AST facilities are shown in Figure 5-1 .

The Equalization tanks receive excess flow beyond 25 mgd to the ASTs, and this stored PE at the Equalization tanks is discharged back to the ASTs when the influent flows fall below 25 mgd. The Equalization tanks' effluent pump is operated at a rate to increase the flows to the ASTs to 25 mgd. Therefore, the Equalization tanks serve to provide a constant flow to the ASTs. During a site visit SBIWTP staff noted the Equalization tanks and ancillary equipment are new and not in need of rehabilitation. Currently there are only two 1-inch hose stations for washdown located at the top and mid-points of the east and west walls. These two hose stations do not provide sufficient washdown water capacity for the Equalization tanks. The installation of strategically placed water cannons will help improve washdown for plant staff. Arcadis' recommendation is to install turret type water cannons on the top and at mid-points for the Equalization tanks north, east, and west walls.

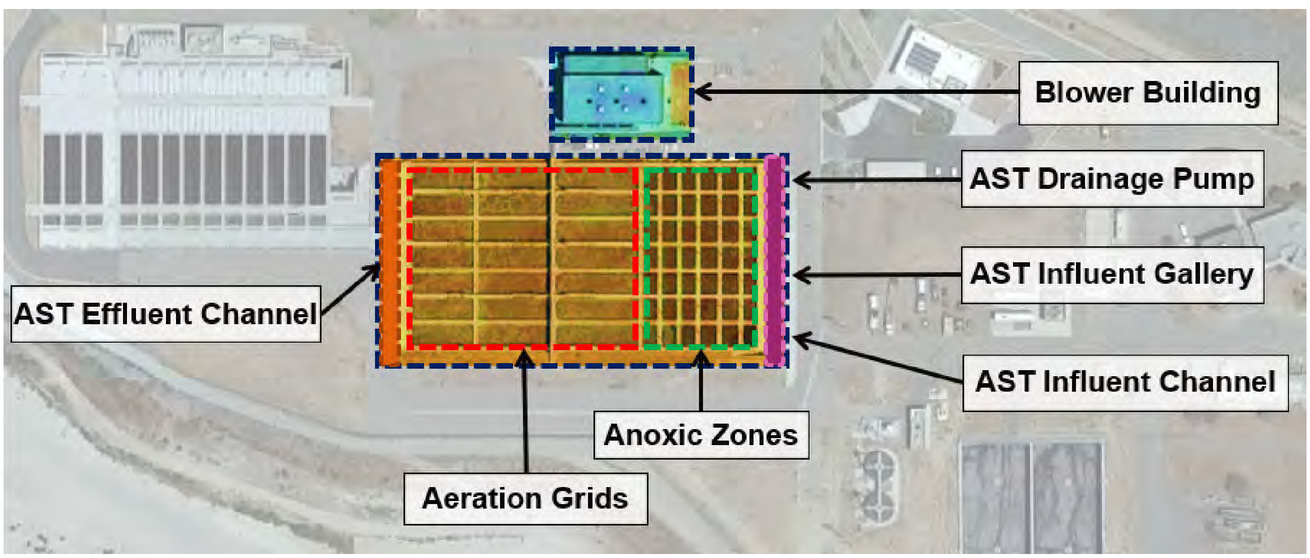

Figure 5-1. ASTs Existing Facilities

The existing AST provides treatment via a conventional activated sludge process that contains pre-anoxic, anaerobic, anoxic, and aerobic zones. The 72-inch pipeline conveys the PE to the AST influent channel junction box, before discharging into the AST influent channel, which is kept aerated via coarse bubble air diffusers. Two parallel 24-inch pipelines convey the PE into an 18-inch diffusion header that distributes the flow to each AST into the first anaerobic zone (Zone B). The ASTs consist of seven parallel trains referred to in numerological order from one to seven. Each train is comprised of nine zones in series starting with Zone A. The zones are each equipped with either a mixer or an array of diffusers. A summary of each train and respective basin volumes is presented in Table 5-1.

Table 5-1. Activated Sludge Tanks In-Service at SBIWTP General

Dimensions	Description	Function	Existing		
Number			7	Units	Total
Length			350	ft	each
Width			24	ft	each
Side Water Depth			18	ft	each
Tank Volume			151,200	ft3	each
Existing Zones:					
Zone A	Pre-Anoxic Zone, Mixed Zone – receives RAS Flows	*Stabilize RAS. Remove free oxygen and nitrate from RAS*	0.0506	MG	each
Zone B	Anaerobic Zone, Mixed Zone - receives Zone A + PE Flows	*Absorb BOD directly, hydrolyze particulate BOD into dissolved BOD*	0.0671	MG	each
Zone C	Anoxic Zone, Mixed Zone - receives Zone B Flows		0.0671	MG	each
Zone D	Anoxic Zone, Mixed Zone - receives Zone C Flows	*Return nitrate-nitrogen into the process flow. Microorganisms reduce to nitrogen gas from oxidizing BOD*	0.0616	MG	each
Zone E	Anoxic Zone, Mixed Zone - receives Zone D Flows		0.0616	MG	each
Zone F	Anoxic Zone, Mixed Zone - receives Zone E Flows		0.0616	MG	each
Aeration Tank Grid 1	Aerobic Zone, receives Zone F Flows, aerated via fine bubble diffusers	*Enable microorganisms to oxidize organic nitrogen to nitrate*	0.2717	MG	each
Aeration Tank Grid 2	Aerobic Zone, receives Zone 1 Flows, aerated via fine bubble diffusers		0.2464	MG	each

Dimensions	Description	Function	Existing		
Aeration Tank Grid 3	Aerobic Zone, receives Zone 2 Flows, aerated via fine bubble diffusers		0.2123	MG	each
Volume per Basin			1.1	MG	each
Total Volume			7.7	MG	total

As shown in Figure 5-2, the ASTs begin with pre-anoxic conditions in Zone A, receiving RAS flows only, then move to anaerobic conditions with the mixing of RAS and PE influent at Zone B. Zones C through F are anoxic having minimal mixing. Following the anoxic zones, there are three aerobic zones providing aeration of the mixed liquor and flow nitrification via Grid 1, Grid 2, and Grid 3, finally mixed liquor is returned by the IMLR pumps.

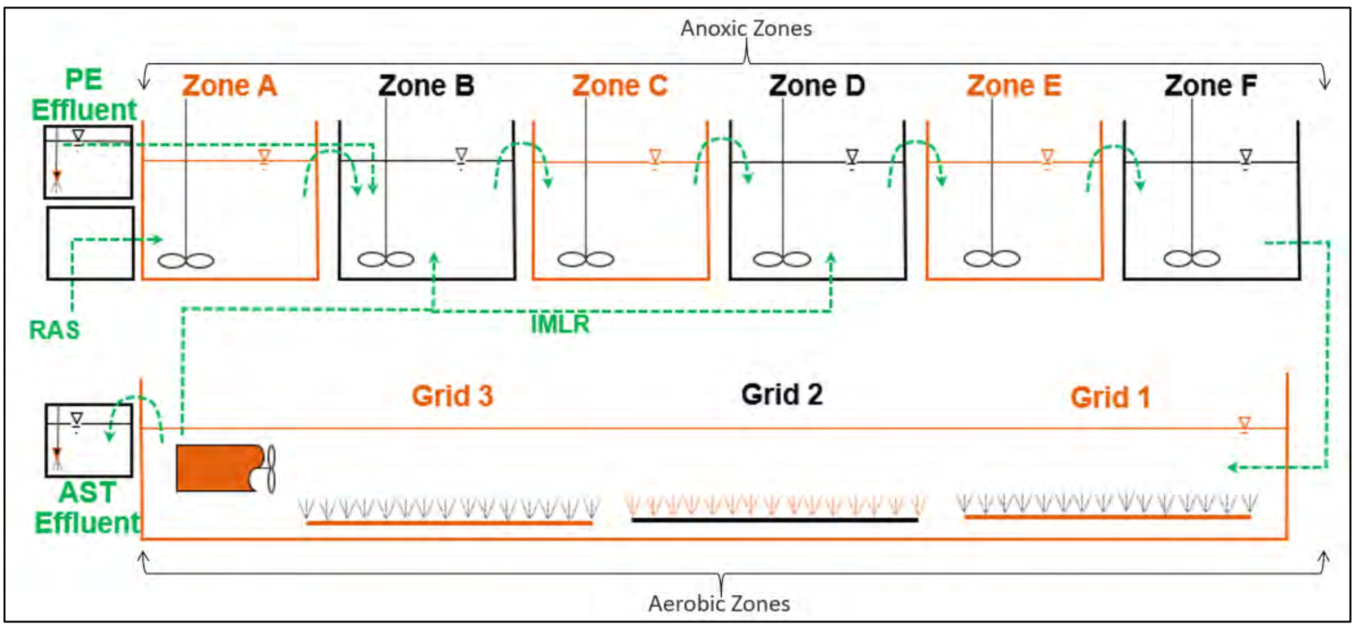

Figure 5-2. Simplified ASTs Flow Schematic.

The major components of each AST, include baffled pre-anoxic, anaerobic, anoxic, and aerobic “selector” zones as shown in Figure 5-2. Mixers are included in the pre-anoxic, anaerobic, and anoxic zones; the air diffusers provide fine bubble air in the aerobic zones. The IMLR pumps return over 9,000 gpm of nitrified mixed liquor to Zone B or Zone D. The mixed liquor is discharged from aeration tank Grid 3 into the effluent channel, which is aerated with coarse bubble diffusers, prior to flowing via gravity to the secondary sedimentation tanks.

The current process aeration requirements were calculated for SBIWTP and are summarized in Table 5-2. A diffuser submergence of 17 feet was assumed to develop standard oxygen transfer efficiency (SOTE) values and required airflow. SOTE values are based on efficiency data for 9-inch membrane disc diffusers on other Arcadis projects at similar depth and diffuser densities. There are 1,328 operational diffusers per basin in Grid 1, 588 in Grid 2, and 288 in Grid 3 at range-day diffuser flux rates from 0.5 to 2.5 standard cubic feet per minute (scfm) per diffuser. The process air blowers need to provide air to the three grids to seven ASTs in service for mixing.

Table 5-2. Activated Sludge Tanks Design Criteria.

AST Criteria	Minimum Day	Minimum Month	Annual Average	Maximum Month	Maximum Day
Tanks in Service	7	7	7	7	7
Influent Flow (mgd)	16.2	22.5	25.3	25.9	42.1
Influent BOD (mg/L)	61.8	177.1	227.2	282.36	408
Influent TKN (mg/L)	68.5	68.5	68.5	68.5	68.5
Influent Ammonia (mg/L)	59	59	59	59	59
Actual Oxygen Requirement (lb O2/day)	21,184	51,061	67,987	81,510	110,379
Alpha	0.55	0.55	0.55	0.55	0.55
Beta	0.95	0.95	0.95	0.95	0.95
Target Dissolved Oxygen (mg/L)	2	2	2	2	1
AOR / SOR	0.33	0.33	0.33	0.33	0.33
Standard Oxygen Requirement (lb O_2/day)	64,193	154,732	206,021	247,000	334,483
Standard O_2 Transfer Efficiency	34.34%	34.17%	34.00%	33.32%	32.65%
Process Airflow, scfm	5,419	13,126	17,565	22,423	30,984

5.1.2 [redacted]

[redacted]

[redacted]

Figure 5-3. AST Assessment Scoring Summary

The physical conditions included the following equipment groups within the AST system:

- Aeration Basin Polymer System
- Aeration Basin Drainage Pumping
- AST Influent Gallery
- Aeration Basin Influent channel
- Aeration Basin Tanks
- NPW Pumping
- AST Basin Mixing
- AST Basin Piping
- Process Aeration Piping Diffusers
- IMLR Pumping
- Process Aeration Blowers
- Aeration Blower Building

Following the physical assessment, a performance assessment was conducted by interviewing SBIWTP staff to better understand any issues not captured during physical assessment. [redacted]

[redacted]

Figure 5-4. AST Performance Assessment Scoring Summary

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

- [redacted]

[redacted]

- [redacted]

- [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

5.1.3 Rehabilitation Strategy

5.1.3.1 Alternatives Considered

[redacted]

[redacted]

Table 5-3. Selector Zone Mixing and Tank Drainage

Zone System	Function	Detention Time (mins)	Flow (cfs)	Flow ID	Power (hp)	Mixer (Type)	No.	Propeller (Type)	Op. Rate (rpm)
Zone A	Pre-Anoxic Zone	*31.6*	3.64	Q_{RAS}	4	Direct Drive Mixer, Flygt Model 4640	42	14.5-in, 3 blade 316 SS	855
Zone B	Anaerobic Zone	*5.2*	29.90	$Q_{RAS+PE+IMLR}$					
Zone C	Anoxic Zone	*5.2*	29.90						
Zone D		*4.6*	29.90						
Zone E		*4.6*	29.90						
Zone F		*4.6*	29.90						
Intermediate Mixed Liquor Return	Mixed Liquor Return	--	20.72	$Q_{RAS+PE+IMLR}$	40	Submergible propeller pump, Flygt Corporation Model PP4680	7	3 blade 316 SS	440
Tank Drainage	Mixed Liquor Removal	--	3.34	$Q_{RAS+PE+IMLR}$	25	Horizontal Self-Priming, Centrifugal Pump, Crown Pump Model PO8LA-12LTDH 32-ft	1		1200

[redacted]

Table 5-4. Activated Sludge Tanks: Influent, Aeration, and Effluent Channel

Zone/System	Description	Detention Time (mins)	Flow (cfs)	Flow ID	Diffuser (Type)	Pressure (psig)	No.
AST Influent Channel	PE Effluent	0	3.68	Q_{PE}	Model SD-1000 single coarse bubble drop diffusers, Sanitaire	6.61	45

Zone/System	Description	Detention Time (mins)	Flow (cfs)	Flow ID	Diffuser (Type)	Pressure (psig)	No.
Aeration Tank Grid 1	Aerobic Zone	20.8	30.45	$Q_{RAS+PE+IMLR}$	Fine Bubble, PTFE membrane. 9-in diameter disc diffusers	9.4	1,440
Aeration Tank Grid 2		18.8	13.38			9.4	700
Aeration Tank Grid 3		16.4	6.63			9.4	352
AST Effluent Channel	AST Effluent	0	3.68	$Q_{RAS+PE+IMLR}$	Model SD-1000 single coarse bubble drop diffusers, Sanitaire	6.61	45

[redacted]

[redacted] [redacted]

[redacted]

5.2 Blowers and Blower Building

5.2.1 Existing Facilities Description/Design Criteria

Process Air (PA) Blowers are in the North Blower Building, immediately north of the ASTs. These blowers generate and supply compressed PA to the fine bubble air diffusers in the aerobic treatment zones of the ASTs. Currently, there are three skid-mounted, single stage, centrifugal air compressors/blowers installed and in-service, with provisions and space for installation of a fourth blower. The installed PA Blowers are Dresser Roots Model 16-inch, IGC-H manufactured by Dresser Roots, Dresser Inc. Each blower is equipped with an inlet and outlet silencer. The blowers were installed in late 2010/early 2011. Table 5-5 summarizes the sizing/design criteria for each blower.

Table 5-5. Sizing/Design Criteria for Compressors and Blowers

Barometric Pressure (All Inlet Conditions)	14.7 psia
Min. Blower Inlet Pressure (All Inlet Conditions)	14.5 psia
CONDITION NO. 1 – MAX AIR DELIVERY	
Individual Blower Output to ASTs	12,500 scfm
Discharge Pressure	23.7 psia
Ambient Temperature	100 Deg F
Relative Humidity	85%
CONDITION NO. 2 – AVG AIR DELIVERY	
Individual Blower Output to ASTs	9,100 scfm
Discharge Pressure	23.21 psia
Ambient Temperature	60 Deg F
Relative Humidity	60%
CONDITION NO. 3 – MIN AIR DELIVERY	
Individual Blower Output to ASTs	7,500 scfm
Discharge Pressure	23.02 psia
Ambient Temperature	40 Deg F
Relative Humidity	40%

CONDITION NO. 4 – MIN BLOWER DELIVERY	
Individual Blower Output to ASTs	5,600 scfm
Discharge Pressure	22.9 psia
Ambient Temperature	40 Deg F
Relative Humidity	40%

*Sources: CC-3 Contract Documents Specifications, O&M Manual

Air is drawn into each blower through louvered inlets located along the southern side of the building. Four 8-foot by 10-foot louvered inlets are provided on the southern wall of the blower building in line with the intakes of the blowers. All are fixed aluminum weather louvers designed with drainable head members to discharge water away from the sills. Internal insect and bird screens are provided on the louvers to prevent insects and small animals and blowing debris from gaining access into the building.

In addition to the louvered intakes on the building, inlet filters are mounted to the blower intakes within the Blower Building to protect the blower impellers. A 4.5-foot by 6.5-foot filter housing is provided on each blower intake for the mounting of the filter media, and it tapers to a 24-inch round flange for connection to the blower inlets. The filters are dual media, with an initial pre-filter to remove large particles, and a final fiberglass filter to remove fine particles. A differential pressure switch, integral to the filter housing provides notification when filters need to be replaced.

The Channel Air (CA) facilities are located within the North Blower Building, on the east side of the building. These blowers generate CA for the AST and SST channels, keeping the flow adequately mixed to prevent settling in the channels. One blower is dedicated to both influent and effluent channels of the AST, a second blower is dedicated to the influent channel of the SST, and the third blower serves as a standby, capable of supplying air to either location. The three CA Blowers are skid-mounted, rotary lobe positive displacement blowers. Each blower was provided with removable replacement sheaves to allow adjustment to the maximum and minimum shaft speeds. The CA Blowers are Robuschi Model 106 manufactured by Robuschi USA Inc. These were installed in late 2010/early 2011. Table 5-6 summarizes the sizing/design criteria for each blower.

Table 5-6. Sizing/Design Criteria for Blowers

Barometric Pressure (All Inlet Conditions)	14.7 psia
Relative Humidity	100%
Ambient Temperature	100 Deg F
CONDITION NO. 1 – MAX AIR DELIVERY	
Maximum Blower Speed	2,060 rpm
Individual Blower Output	2,000 scfm
Discharge Pressure	7.41 psig

CONDITION NO. 2 – DESIGN AIR DELIVERY	
Maximum Blower Speed	1,750 rpm
Individual Blower Output	1,650 scfm
Discharge Pressure	6.61 psig
CONDITION NO. 3 – MIN AIR DELIVERY	
Maximum Blower Speed	1,300 rpm
Individual Blower Output	1,100 scfm
Discharge Pressure	5.52 psig

*Sources: CC-3 Contract Documents Specifications, O&M Manual

Air is drawn into an inlet filter/silencer atop each blower unit through a 10-inch flanged inlet opening. Surfaces inside the filter/silencer are lined with 2-inch acoustical foam to reduce noise levels by 18 to 20 dbA and includes a filter element to remove particulate matter and protect the blower lobes. The filter element has a 99% removal efficiency for particles 1 micron and larger and is surrounded by steel mesh and sealed between molded rubber ends so it is removable, cleanable, and reusable.

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted]

5.3 Secondary Sedimentation Tanks and Skimmings Pump Station

5.3.1 Existing Facilities Description/Design Criteria

Thirteen SSTs located on the northwest side of the plant are used to remove activated sludge (AS). This area also includes facilities for RAS pumping, WAS pumping, NPW Pump Station #2, and SSK pumping and are described in following paragraphs.

AS from the ASTs is delivered to the existing SSTs via a common influent channel located to the south side of the tanks. Each tank is equipped with two 24-inch diameter inlet diffuser assemblies and manual 24-inch knife gate valves to shut off flow at each tank. A slot for stop plate insertion is also present at each inlet to isolate each tank. As liquid flows from one end of the tank to the other, settleable solids/AS dropout of suspension and clarified effluent over tops three launders affixed with V-notched weirs. Secondary effluent collects in a common effluent channel. Secondary effluent is used throughout the plant, conveyed by NPW Pump Station #2. Secondary effluent exits the area through the effluent discharge structure before entering an underground pipe to be conveyed to the EBS and effluent metering.

The SSTs are equipped with a plastic chain and flight collector to move AS and SSK. The settled sludge in each tank is conveyed to the north end to two hoppers. Connected piping running within the north side pipe gallery delivers sludge to the RAS/WAS wet well by gravity.

The SSKs are floatable materials and are removed from each SST near each tank inlet using an electric actuated 18-inch diameter rotary skimmer connected to a common header. SSKs removal is aided by the chain and flight collectors and NPW spray bar. Skimmings are conveyed by gravity to the wet well of the SSK Pump Station. Table 5-7 summarizes the design criteria for the existing SST and SSK Pump Station.

Table 5-7. Existing Secondary Sedimentation Area Design Criteria

Secondary Sedimentation Tanks	
Design Criteria	
Flow AA	25 mgd
Flow Peak Hour	48.70* mgd
Number of Basins	13
Basin Size LxWxD_Water (Avg)	160-foot x 20-foot x 14.4-foot
Surface Overflow Rate (SOR) at AA	661 gpd/sf** (12 Basins)
SOR at Peak	1,287 gpd/sf (13 Basins)
SOR at Peak	1,395 gpd/sf (12 Basins)
Weir Length per Basin	340-foot
Effluent Wier Elevation	54.00-foot
Inlet Channel Width	22-foot, 5-inch
Effluent Channel Width	10-foot
Solids Loading Rate @ Average***	11.5 PPD/ft2
Solids Loading Rate @ Peak***	23 PPD/ft2
SST Sludge Collector	
Type	Plastic Chain and Flight
Drive HP	0.5
Drive Speed RPM	1,750
Voltage/Phase/Hertz	460V/3P/60 Hz

Skimmings Mechanism	
Type	Rotating Skimmer
Size	18-inch
Length	20-foot
Drive HP	0.5
Drive Speed RPM	19
Voltage/Phase/Hertz	460V/3P/60 Hz

Skimmings Pump Station	
Design Criteria	
Quantity	2
Pump Type	3-inch Recessed Impeller
Flow	510 gpm
Total Dynamic Head	81.4-foot
Motor HP	40
Voltage/Phase/Hertz	460V/3P/60 Hz
Manufacturer	Twin Pumps, Model 3523C

*O&M Manual, pg 1.6-2, Malcom Pirnie, 2011
**Existing SOR included 10% recycled flows
***Final Design Report for SBIWTP Infrastructure Improvements

[redacted] [redacted]

[redacted] s

[redacted]

[redacted] [redacted]

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

5.4 RAS and WAS Pump Stations

5.4.1 Existing Facilities Description/Design Criteria

The SBIWTP has one RAS pump station and one WAS pump station. Each of these two pump stations were constructed under the CC-3 contract. The RAS and WAS pump stations are each approximately 12 years old. The RAS and WAS pump stations are co-located and share a wet well which is fed by secondary settled sludge from the SSTs. The RAS pump station is located on the SST deck, north of the secondary effluent channel locations nearest SST 8 and SST 9. The WAS pump station is in the pump gallery, below the SST deck and effluent channel nearest SST 8 and SST 9. The location of the RAS and WAS pump stations is shown in Figure 5-21.

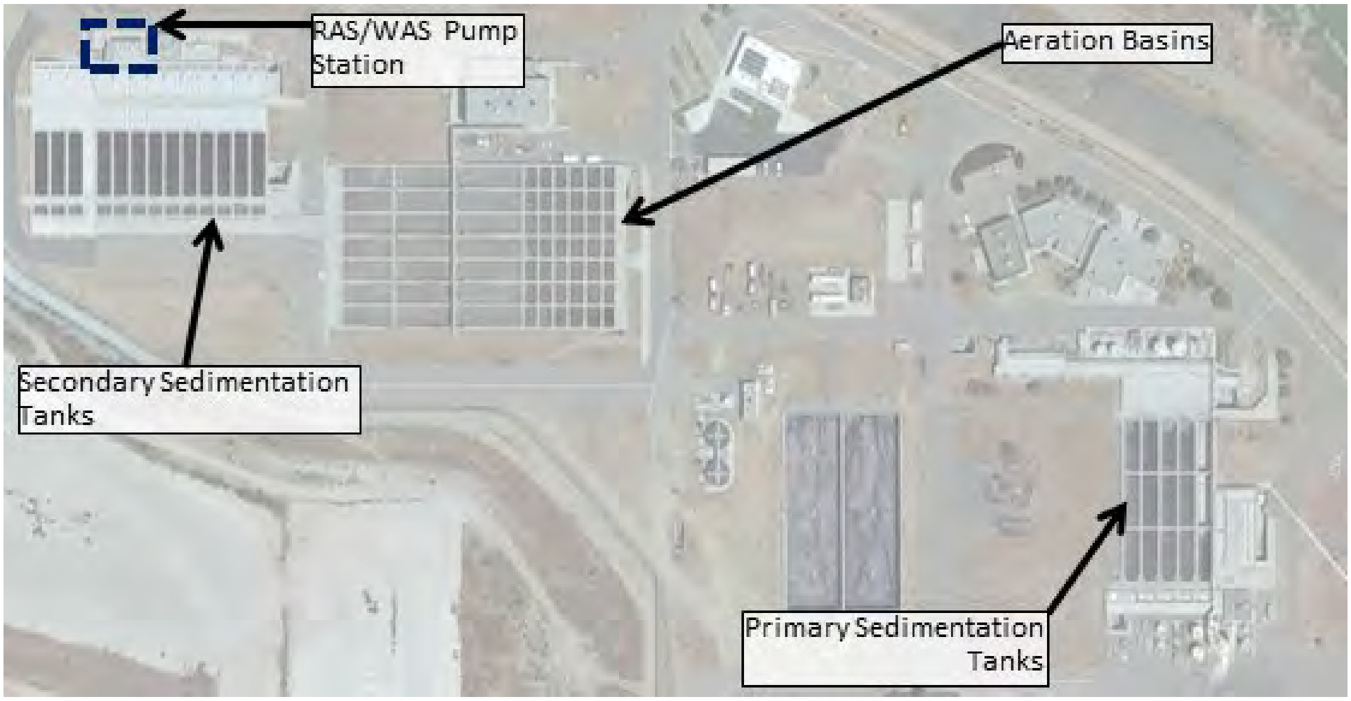

Figure 5-21. Location of RAS and WAS Pump Stations

The estimated current RAS flowrates at the SBIWTP range from approximately 6,100 gpm to approximately 12,200 gpm. The estimated current WAS flowrate is approximately 420 gpm. The current RAS and WAS flowrates are summarized in Table 5-8 below.

Table 5-8. Estimated RAS and WAS Flowrates

	25 mgd Current, gpm
RAS 35%	6,075
RAS 70%	12,153
WAS	417

The RAS pump station consists of six submersible pumps, three of which are VFD operated, and a wet-well. The firm capacity of the RAS pump station is 13,500 gpm. Each of the six submersible pumps are rated for 2,700 gpm at 44 feet of TDH. The submersible pumps were installed recently and are approximately five years old. The submersible pumps replaced the original vertical turbine pumps that were installed in approximately 2012. Additionally, all the non-buried piping and valves were replaced when the submersible pumps were installed. The top deck of the RAS pump station is shown in Figure 5-22.

Figure 5-22. Top Deck of the RAS Pump Station

The WAS pump station consists of two progressive cavity pumps and shares the wet-well with the RAS pump station. The firm capacity of the WAS pump station is 500 gpm. Each progressive cavity pump is rated for 500 gpm at 9.5 feet of net pump suction head (NPSH). The progressive cavity pumps are approximately 12 years old. One of the two WAS pumps located inside the WAS pump station is shown in Figure 5-23.

Figure 5-23. WAS Pump

Table 5-9 summarizes each pump station.

Table 5-9. Existing Pumping Capacities

	RAS Pump Station	WAS Pump Station
Pump Type	Submersible	Progressive Cavity
Pump Quantity	6	2
Firm Capacity (gpm)	13,500	500

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted]

A summary of the rehabilitation recommendations for the RAS and WAS pump stations are shown in Table 5-12.

[redacted]

5.5 Effluent Blending and Metering Structures

5.5.1 Existing Facilities Description/Design Criteria

The SBIWTP is designed with one EBS and one effluent metering structure. The EBS is approximately 24 years old as it was designed and constructed as part of the CC-2 contract in 1998. Under normal operating conditions, treated secondary effluent from the SBIWTP passes through the EBS upstream of the effluent metering vault. The EBS can also accept PE should there be a scenario where all, or a portion of secondary treatment is bypassed. PE is delivered to the blending structure via a 66-inch reinforced concrete pressure pipe (RCPP). Secondary effluent is delivered to the blending structure by an 84-inch RCPP; plant effluent leaves the structure through a 72-inch RCPP to the effluent metering structure. Each of these large diameter pipes can be isolated or opened by means of wall mounted slide gates located within the effluent blending structure. The blending structure is also equipped with a pair of chlorine dilution water pumps, a sodium bisulfite metering pump, and respective diffuser systems to provide the option of disinfection and dechlorination. However, since startup, neither the chlorination nor the dechlorination equipment has been used due to the SBIWTP's current permit which does not require disinfection (chlorination) of the plant effluent. The effluent blending structure is also equipment with knockout panels and future slide gate access hatches to accommodate future plant expansions which could include additional secondary plant effluent and effluent from future chlorination basins.

The effluent metering structure is located downstream of the EBS with the purpose of metering plant effluent. The metering structure serves as a meter vault which contains the 48-inch plant effluent magnetic flowmeter, and the respective run of 48-inch steel pipe through the metering vault walls. Additionally, the metering vault is also equipped with the plant effluent sampling station with the intended purpose of metering residual chlorine levels as a feedback control to the dechlorination equipment. As with the chlorination and dechlorination equipment previously discussed in the EBS, the effluent sampling station has not been used since startup due to the plant's current operating mode of not chlorinating plant effluent.

The location of the EBS and effluent metering structure are shown in Figure 5-31.

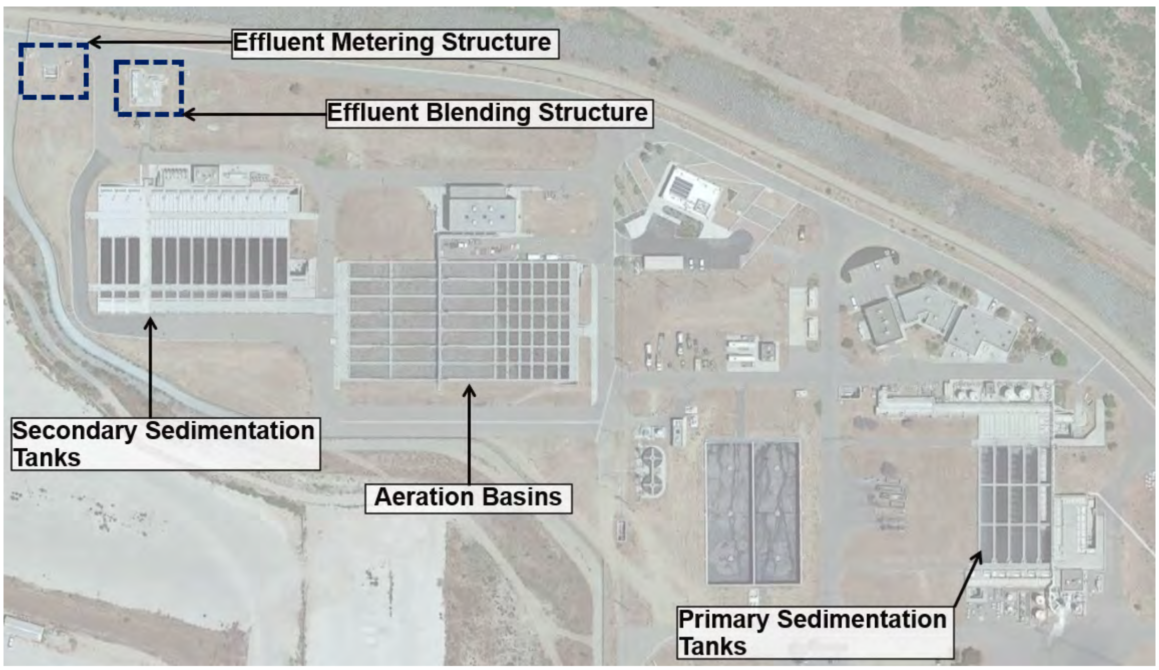

Figure 5-31. Locations of EBS and Effluent Metering Structure

Existing hydraulic capacities were evaluated for the EBS and for the pipeline and flowmeter within the effluent metering structure. The hydraulics evaluated pipeline velocities and anticipated high water level elevations for the current 25 mgd average daily flow of the plant, and peak 50 mgd flows. These high water elevations were referenced against the design maximum water surface elevations (WSEL) within the structure at the respective flows. Additionally, the anticipated WSELs were also referenced against the Blending Structure's Top of Slab (TOS) elevation to check for overflow conditions. No hydraulic issues were identified in this evaluation. A summary of the major hydraulic parameters evaluated are shown in Table 5-13.

Table 5-13. Major Hydraulic Parameters at EBS and Metering Structures

Parameter	Units	Average, 25 mgd	Peak, 50 mgd
Maximum WSEL at Distribution Structure	ft	45.00	45.00
48-inch Flowmeter Fluid Velocity	fps	3.0	6.0

Parameter	Units	Average, 25 mgd	Peak, 50 mgd
Total Approximate Head loss	ft	0.30	1.00
Approximate WSEL at Blending Structure	ft	45.30	46.00
Blending Structure TOS Elevation	ft	56.00	56.00

[redacted] [redacted]

[redacted]

5.5.2.2 Effluent Metering Structure

[redacted]

[redacted] [redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

6 Solids Processing

6.1 Solids Thickening (DAFT)

This section summarizes the assessment and recommended rehabilitation for the existing solids thickening systems and associated auxiliaries at the plant.

6.1.1 Existing Facilities Description/Design Criteria

The thickening facilities concentrate the WAS before it is pumped to the USSTs. WAS is pumped by the WAS pumps to the DAFT units. TWAS is then subsequently pumped to the USST units. Figure 6-1 shows the location of the existing DAF units and the compressor building.

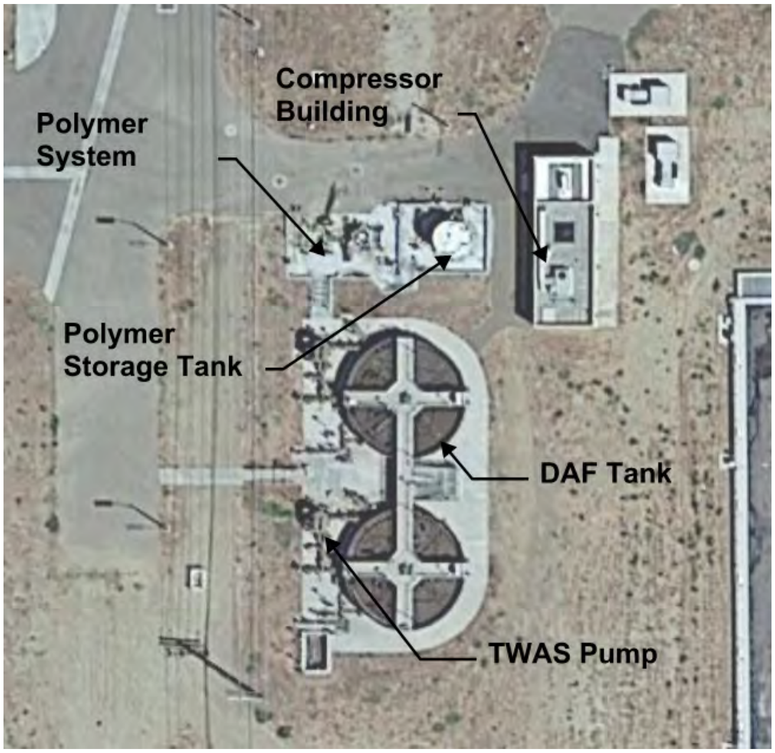

Figure 6-1. DAF Unit Existing Facility

The existing WAS thickening facilities consist of two steel DAF tanks, each 27 feet in diameter and 9 feet 9 inches high, installed in 2012 with support facilities and two 10 HP reciprocating air compressors located in the compressor building near the DAF tanks (see Figure 6-2). Each DAF unit contains a pressurization and air injection system (pressurization pump, pressurization tank, back-pressure control valve, and air control panel), a TWAS pumping and metering system (TWAS pump and common TWAS flow meter; see Figure 6-3), and a polymer addition system (polymer storage and mix tanks, a polymer transfer pump, and polymer feed pumps). The TWAS pumps shown in Figure 3 are each 5 HP and have a 40 psig discharge capacity.

Figure 6-2. DAF Tank

Figure 6-3. TWAS Pump and Metering System

WAS is pumped from the RAS and WAS pump stations to each DAFT tank and mixed with polymer and pressurized DAFT underflow. The rotating surface skimmers push the floated TWAS into a TWAS float box where it is removed via a TWAS pump and conveyed to the USSTs. Table 6-1 summarizes the design criteria for the DAF tanks.

Table 6-1. Existing DAFT Tanks Design Criteria

DAFT Tank Design Criteria		
Design Parameter	**Design Criteria**	**2022 Operating Condition**
Annual Average Daily Plant Flow	25 mgd	24.42 mgd
Maximum DAF Flow Rate / DAFT	390 gpm	465 gpm
Maximum DAF Hydraulic Loading / DAFT	1.46 gpm/ft^2	*
DAF Influent Solid Concentration / DAFT	0.2 – 0.6 % TS	*
Maximum Solid Loading Rate / DAFT	1.5 lbs SS/hr-ft^2	*
Average Solid Loading / DAFT	20,628	50,720
TWAS Flow Rate	0.061 mgd	0.149 mgd
WAS Concentration	4,404 mg/l	10,681 mg/l
Polymer Load Rate per Dry Ton of WAS Suspended Solid / DAFT	150 mg/l	*
Minimum Thickened Float Sludge Concentration /DAFT	3.5% TS	4% TS
DAFT Tank Surface Area	573 ft^2	573 ft^2

*Current operating data are unavailable and not reported by SBIWTP staff.

Table 6-1 also specifies the operating values for 2022 based on SBIWTP staff performance reports. The solids loading and WAS concentrations shown in the table have considerable deviation from the original design basis. The main underlying issue for the deviation is the performance of the primary treatment system, where the TSS removal efficiency is decreased to 38% compared to the 75% removal efficiency in the design criteria. The PST's have also lost almost 50% of the treatment capacity on average in 2022. If rehabilitation measures are taken for the PST's, each DAFT unit can handle the current 25 mgd plant flow rate. There are two 5-HP positive displacement TWAS pumps manufactured by Netzch. Each DAFT tank has a dedicated TWAS pump rated to pump 80 gpm at a TDH of 40 psi. The pumps were installed in 2012.

As mentioned earlier, the DAF neat polymer addition system is provided for polymer storage, transfer, mixing, and supply to the diluted solution to the DAFT system to increase solids capture rate in the DAF thickening process. There is one 5,600-gallon FRP storage tank with two Netzch positive displacement progressive cavity polymer transfer pumps rated for 35 gph capacity at 20 psi TDH, with one a run / stand-by operating mode. The pumps operate based on the polymer level in the mixing tank. The 560-gallon FRP mixing tank is diluting polymer to concentrations of 0.05% to 0.3% from initial 30% concentration prior to addition to the DAFT feed stream. The mixing tank is equipped with a 1-HP mixer. The diluted polymer is delivered to the DAFT tanks through polymer feed pumps. Polymer feed pumps (one for each DAF unit) deliver polymer at 0.05% to 0.30% solution to the DAFT units. The polymer feed pumps are manifolded in pairs to allow any of the pumps to deliver polymer solution to any of the DAFT units; however, each pump is normally dedicated to their respective DAFT unit. Each 1-HP Netzch positive displacement progressive cavity pump has a 10 gpm capacity at approximately 30 psi TDH, and 280 rpm maximum pump speed. Table 6-2 summarizes the design criteria for the polymer system at the DAF thickening facility. Figure 6-4 shows the polymer storage and mixing system dedicated to the DAF unit.

Table 6-2. Polymer System Design Criteria for DAF Facility

Design Parameter	Design Criteria
Bulk Polymer Storage Capacity	5,600 gallons
Bulk Polymer Concentration	0.284 active dry lbs. / gal.
Bulk Polymer Transfer Pump	2X 1.5 HP, 35 gph @ 20 psi TDH
Polymer Mixing Tank Capacity	560 gallons
Polymer Feed Pump	2 X 1 HP, 10 gpm @ 30 psi TDH
Neat Polymer Dilution Rate	0.005 ~ 0.03 lbs. / gal. make up water
Polymer Mixing Tank “Make-up” Volume	185 gallons
Active Dry Lbs. Polymer Addition Rate	1.19 active dry lbs. in batch
Volume Neat Polymer Needed in Batch	4.19 gallons
Polymer Load Rate per dry ton of WAS Suspended Solids/DAF	4 dry lb/ dry ton TSS

Figure 6-4. DAF Polymer Addition System

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

6.2 Unstabilized Sludge Storage/Sludge Mixing

6.2.1 Existing Facilities Description/Design Criteria

The unstabilized sludge storage facilities consist of two storage tanks (USST 1 and USST 2). Each USST is equipped with an external pump recirculation mixing system and is ventilated to a common odor reduction station. Unstabilized primary sludge, TWAS, and skimmings from the primary and secondary sedimentation tanks are delivered to the sludge storage facilities via their respective pumping facilities. Each sludge and skimming source is delivered to the sludge storage tanks via a separate glass lined ductile iron pipe that enters the storage tanks at an elevation above the high operating level. Figure 6-7 shows the location of the USST facility and Figure 6-8 shows an overall view of the tanks.

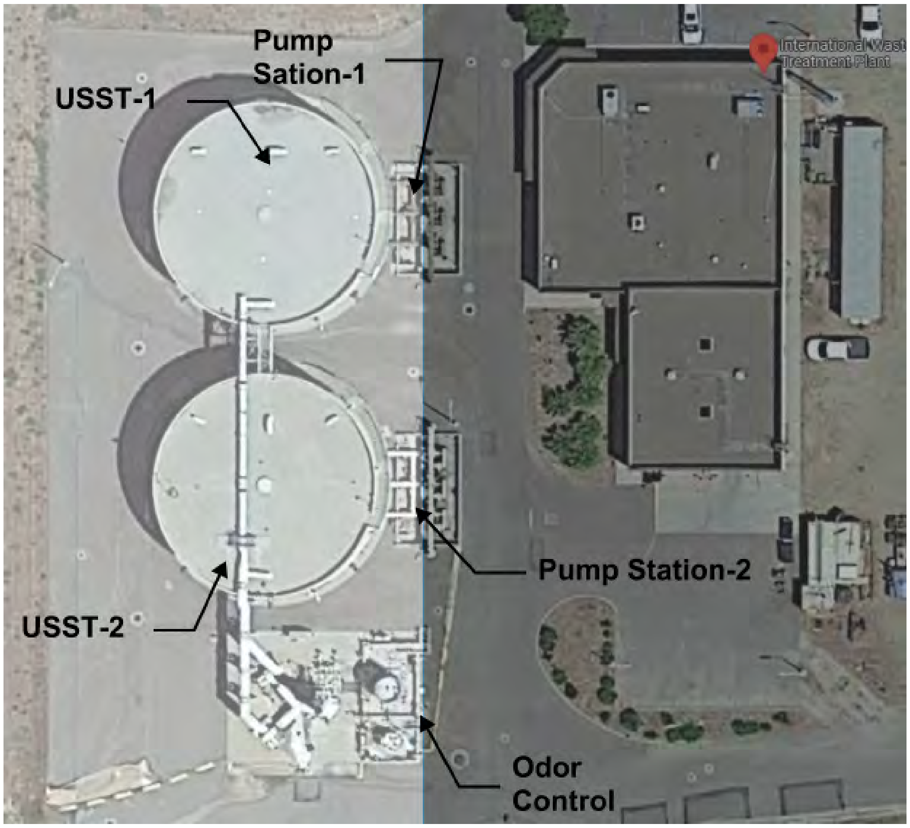

Figure 6-7. USST Facility Layout

Figure 6-8. USST Storage Tanks

Each storage tank is provided with a dedicated external pump recirculation mixing system to minimize stratification in the tank and to optimize the consistency of the combined sludge and skimmings flow to the downstream sludge dewatering facilities located in the Sludge Dewatering Building. Each sludge storage tank is covered and the atmosphere beneath the cover is ventilated and delivered to the unstabilized sludge storage odor reduction station. This station consists of a single stage counter current packed column and exhaust fans to provide a slight negative pressure within the tanks, see Table 6-4.

Table 6-4. Existing USST Design Criteria

Unstabilized Sludge Storage Tanks (USST)	
Design Parameter	**Design**
Dimensions	68-foot x 25-foot
Storage Time at Annual Average Design Loading	4 days
Mixing Turnover Time at Normal Operating Level	25 minutes
Air Change to Odor Reduction at 50% Capacity	6 per hour
Air Change to Odor Reduction at Empty Tank	3 per hour
H_2S Scrubber Design Load	50 ppm

The sludge mixing system for each storage tank consists of three sludge mixing pumps. Table 6-5 identifies the design criteria for the USST sludge mixing pumps. One additional pump is available as an off-the-shelf replacement unit. The pumps draw the sludge from the bottom of storage tank and recirculate it back via the discharge piping. For USST 1, each sludge mixing pump is horizontal, severe-duty, non-clog, recessed impeller centrifugal pumps manufactured by Goulds and rated for 3,400 gpm capacity at a TDH of 55 feet and is driven by a constant speed 125-HP motor that is connected to the pump shaft by a V-belt and sheave assembly. For USST 2, each sludge mixing pump is a Wemco-Hidrostal single vane screw pump, rated for 3,400 gpm capacity at a TDH of 55 feet. Each pump is driven by a 75-HP, variable speed motor.

Table 6-5. Existing Design Criteria for USST Recirculation Pumps

USST		
Design Parameter	**Pump Station 1**	**Pump Station 2**
Manufacturer	Goulds	Wemco-Hidrostal
Pump Type	horizontal, severe-duty, non-clog, recessed impeller centrifugal pumps	Horizontal single vane screw pump, not-clog
Design Capacity	3400 gpm @ 55-ft TDH	3400 gpm @ 55-ft TDH
Electrical Motor Horsepower	125-hp Constant Speed	75-hp Variable Speed

Odorous air from the USST is continuously ventilated and treated by the unstabilized sludge storage odor reduction station located south of the USSTs. The unstabilized sludge storage odor reduction station consists of a one-stage counter current chemical scrubber and exhaust fans to provide a negative pressure within the vapor space of the tank. The tank ventilators' inlets and outlets are configured to allow a "sweep effect" to maximize the collection of the potential odorous compounds. The scrubber is a closed vessel in which a scrubber solution of sodium hypochlorite (NaOCl), sodium hydroxide (NaOH), and water is continuously recirculated to the top of the scrubber and distributed over plastic media.

[redacted] [redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

6.3 Sludge Dewatering

6.3.1 Existing Facilities Description/Design Criteria

The Sludge Dewatering Facilities condition and dewater the unstabilized sludge to a dry sludge cake with a target concentration of 22 to 25%. The unstabilized sludge flows by gravity from the USSTs to the sludge feed pumps located south of the Sludge Dewatering Building. Prior to the sludge feed pumps, one sludge grinder is provided to grind the sludge and reduce potential for clogging in the dewatering equipment. The sludge is pumped to the Sludge Dewatering Building by one of four sludge feed pumps where it is dewatered by one of four BFPs. Polymer conditioning is provided to enhance sludge dewatering. Polymer is added into the sludge stream upstream of the BFPs. The polymer system consists of two bulk storage tanks with two transfer pumps which pump the concentrated polymer to two polymer mixing tanks. NPW is added to the mixing tanks to dilute the polymer to its required concentration of 0.15 to 0.20%. The BFPs are operationally configured in pairs, allowing for interchangeable support equipment and controls within each pair. After dewatering, the sludge cake is deposited onto the BFP conveyors. There are two in-line conveyors for each pair of BFPs. The BFP conveyors then convey the sludge cake to the Lime Stabilization Facilities located east of the Sludge Dewatering Building. Figure 6-11 shows the location for the solids processing area. A simplified process flow diagram of the existing solids processing area is provided in Figure 6-12.

Figure 6-11. Solids Processing Location Plan

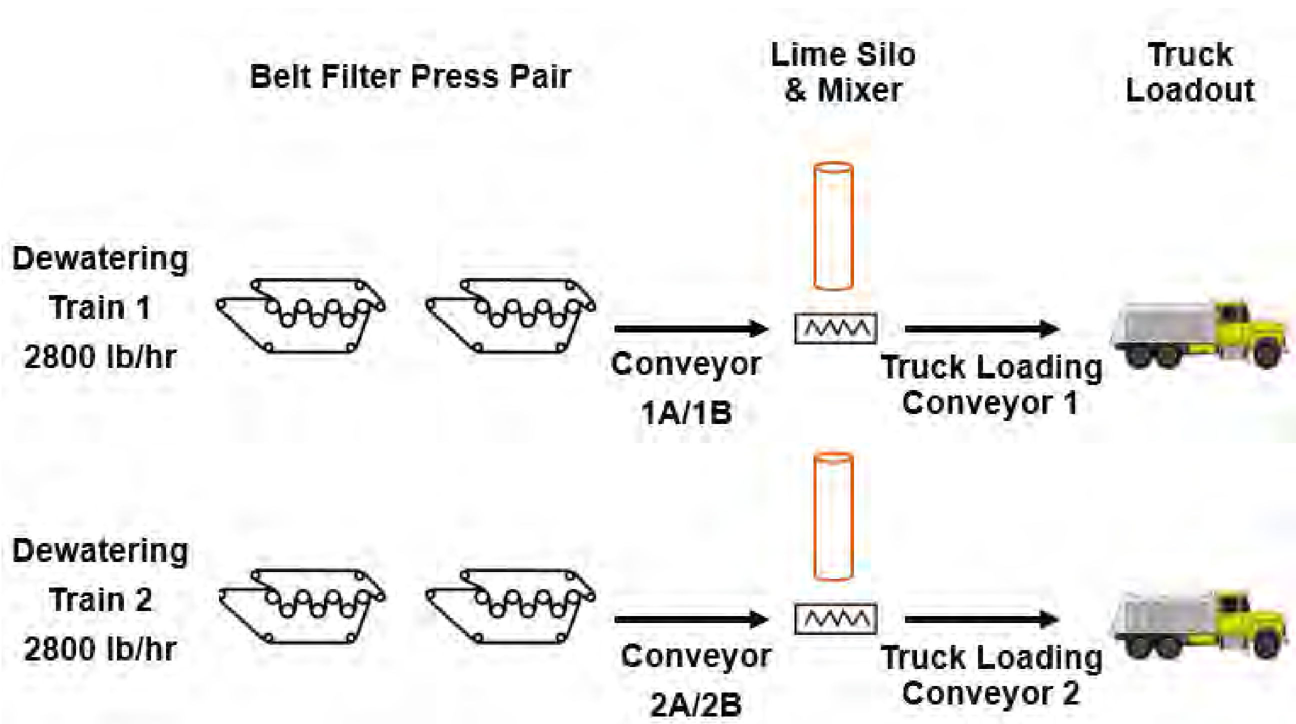

Figure 6-12. Solids Processing Area Simplified Process Flow Diagram

Additional information and design criteria for each major component of the Sludge Dewatering Facilities is provided in the sections below.

6.3.1.1 Sludge Feed

Unstabilized sludge is conveyed by gravity from the USSTs to the Sludge Dewatering Building via one 12-inch glass lined ductile iron pipeline. This pipeline is reduced to a 10-inch pipeline that is then connected to a 6-inch grinder. The sludge grinder is provided with a manual bypass and shown in Figure 6-13. The existing criteria for the double-shaft grinder is provided in Table 6-6.

Figure 6-13. Sludge Feed Grinder

Table 6-6. Sludge Feed Grinder Existing Equipment Criteria

Parameter	Units	Value
Manufacturer/Model	-	Franklin Miller "Task Master" TM8516-06
Quantity	-	1
Pipe Size	inch	6
Capacity	gpm	600
Motor Type	-	Constant Speed
Motor Horsepower	hp	3
Speed	rpm	1,750
Voltage	V/phase/hz	460/3/60

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

After grinding, the sludge is pumped by one of four sludge feed pumps. One sludge feed pump is provided for each BFP. A photo of the existing sludge feed pumps is provided in Figure 6-14. Each sludge feed pump is a single-stage positive displacement progressive cavity pump. The existing criteria for the pumps is provided in Table 6-7.

Figure 6-14. Sludge Feed Pump Station

Table 6-7. Sludge Feed Pumps Existing Equipment Criteria

Parameter	Units	Value
Quantity	-	4
Type	-	Solids Handling Centrifugal
Capacity	gpm	30-130
Max Pressure	psig	30
Max Speed	rpm	397
Motor Type	-	VFD
Horsepower	hp	10
Motor Speed	rpm	1,750
Voltage	V/phase/hz	460/3/60

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

6.3.1.2 Belt Filter Press

There are four BFPs installed at the Sludge Dewatering Building. Each BFP is configured with ancillary equipment including a hydraulic system, wash water booster pump, and control panel. Each BFP is installed over a concrete drain sump to collect filtrate and washdown water, and spills. This drain feeds into a pipeline that recycles the liquids back to the headworks for processing. Each BFP is provided with steering and tensioning assemblies which are incorporated with hydraulic belt adjustments using the hydraulic system provided. Upstream of each BFP, there is a 4-inch magnetic flow meter with a polymer injection ring immediately following. The flow meter measures the sludge flow prior to polymer injection. Each BFP local control panel (LCP-BFP) is located next to the BFP and provides complete control capabilities of the polymer feed pump, sludge feed pump, wash water booster pump, hydraulics system, and other process control parameters for the dedicated BFP. Based on interviews with SBIWTP staff, all BFPs that are available are typically in service, as there is a lack of redundancy available to meet demand at peak conditions with a unit out of service. A photo of the existing BFPs is provided in Figure 6-15 and the existing wash water pumps in Figure 6-16.

Figure 6-15. Existing BFP (from top)

Figure 6-16. Wash Water Pump

Dewatered sludge is discharged from the BFPs onto the BFP conveyors. BFP No. 1 and No. 2 discharges to BFP Conveyor No. 1A, BFP No. 3 and No. 4 to BFP Conveyor No. 2A. BFP Conveyors No. 1A and No. 2A subsequently discharge the cake onto BFP Conveyors No. 1B and No. 2B, respectively. Refer to Section 6.3.1.4 for additional information related to the BFP Conveyors.

The existing criteria for the BFPs and the wash water pumps are provided in Table 6-8 and Table 6-9, respectively.

Table 6-8. Belt Filter Press Existing Equipment Criteria

Parameter	Units	Value
Manufacturer/Model	-	Ashbrook-Simon-Hartley Model 3V Winklepress
Quantity	-	4
Belt Width	meter	2.2
Solids Loading*	lbs/hr-m	650
Hydraulic Loading*	gpm/meter	50
Polymer Dosage*	dry lbs/dry ton	10
Sludge Concentration (prior to Dewatering)	%	4
Dewatered Sludge Concentration	%	22-25

Parameter	Units	Value
Solids Capture	%	95
Time to Evacuate USSTs	days	7
Belt Speed	m/min	1-6
Belt Drive Motor Type	-	Variable Speed
Horsepower	hp	3
Motor Speed	rpm	1,760
Voltage	V/phase/hz	460/3/60

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

*The original design loading rates differ from the observed loading rates based on analysis of plant data. The observed loading and polymer dosage of the units are greater than the existing criteria as outlined within the O&M Manual.

Table 6-9. Wash Water Booster Pump Existing Equipment Criteria

Parameter	Units	Value
Manufacturer/Model	-	Peerless Pumps, Series F, Model F1815
Quantity	-	4
Type	-	Centrifugal
Capacity	gpm	120
TDH	ft	190
Motor Type	-	Constant Speed
Horsepower	hp	15
Pump Speed	Rpm	3,525
Voltage	V/phase/hz	460/3/60

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

6.3.1.3 Polymer Feed System

The polymer feed system consists of bulk polymer storage, bulk polymer transfer, polymer solution/mixing, and polymer addition facilities. There are two bulk polymer storage tanks located on the north side of the Lime Stabilization Facilities and west of the truck loading building. The tanks are enclosed in a containment area with chemical resistant coating to provide spill containment in the event of tank failure. A sump is also provided within the bulk polymer storage area. The existing criteria, as determined by the O&M Manual, for the bulk polymer storage tanks is provided in Table 6-10.

Table 6-10. Bulk Polymer Storage Tank Existing Criteria

Parameter	Units	Value
Manufacturer	-	Belco Manufacturing Company
Quantity	-	2
Capacity	gal	12,600
Days of Storage*	days	30
Material	-	Fiberglass
Tank Diameter	ft	12
Tank Height	ft	15

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

* The original design days of storage differ from the observed storage based on analysis of plant data and polymer usage. The observed polymer dosage of the units is greater than the existing criteria as outlined within the O&M Manual, therefore reducing the days of storage.

The bulk polymer tanks feed into bulk polymer transfer pumps which deliver the bulk polymer at 4% solution to the polymer mixing tanks. The bulk polymer transfer pumps are located south of each of the bulk polymer storage tanks. One pump is dedicated to each bulk polymer storage tank and for each polymer mixing tank. The existing criteria for the bulk polymer transfer pumps are provided in Table 6-11.

Table 6-11. Polymer Transfer Pump Existing Equipment Criteria

Parameter	Units	Value
Manufacturer/Model	-	Moyno Model 1L3 SSQ DBB
Quantity	-	2
Type	-	Single-Stage Progressive Cavity
Capacity	gph	6-90
Max Pressure	psig	20
Max Speed	rpm	700
Motor Type	-	Variable Speed
Horsepower	hp	1.0
Motor Speed	rpm	1,750
Voltage	V	90

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

The polymer mixing tanks are located south of the Lime Stabilization Facilities and west of the Truck Loading Building. The polymer mixing tanks receive the bulk polymer from the bulk polymer transfer pumps and dilute the polymer to a target concentration of 0.15 to 0.20% prior to addition to the BFP feed stream using portable, clamp mount mixers. Make-up water and polymer is added as required to reach the target concentration on a continuous, on demand basis. When polymer is required, mixing tank level sensors control the activation and deactivation of the polymer solution make-up capabilities. A minimum of 60 minutes of detention time is required to allow for polymer activation and conditioning. The existing criteria of the polymer mixing tanks and mixers is provided in Table 6-12.

Table 6-12. Polymer Mixing Tank Existing Criteria

Parameter	Units	Value
Mixing Tank Criteria		
Manufacturer	-	Belco Manufacturing Company
Quantity	-	2
Material	-	Fiberglass
Capacity	gal	1,600
Detention Time	min	82
Tank Diameter	ft	6
Tank Height	ft	8
Mixer Criteria		
Mixer Manufacturer/Model	-	Chemineer, Inc., Model 5 JTC
Mixer Motor Horsepower	hp	2
Mixer Motor Speed	rpm	1,750
Mixer Motor Voltage	V/phase/hz	230/460 / 3 / 60

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

After sufficient mixing and aging for polymer activation and conditioning, the polymer is pumped to the BFPs in the Sludge Dewatering Building by the polymer feed pumps. There are four polymer feed pumps, one dedicated to each BFP, located west of the polymer mixing tanks. Figure 6-17 shows one of the pumps. The existing criteria for the polymer feed pumps is provided in Table 6-13.

Figure 6-17. Polymer Feed Pump

Table 6-13. Polymer Feed Pump Existing Equipment Criteria

Parameter	Units	Value
Manufacturer/Model	-	Moyno Model 2L4 SSQ DBB
Quantity	-	4
Type	-	Two-Stage Progressive Cavity
Diluted Polymer Concentration	%	0.15-0.20
Capacity	gph	45-900
Max Pressure	psig	20
Max Pump Speed	rpm	780
Motor Type	-	Variable Speed
Horsepower	hp	2.0
Motor Speed	rpm	1,750
Voltage	V	90

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

6.3.1.4 Belt Filter Press Conveyor System

There are two trains of BFP conveyors that deliver sludge cake from the Sludge Dewatering Building to the Lime Stabilization Facilities. Two BFPs are assigned to each conveyor train, with each conveyor train operating independently of the other. There are no cross connections between the trains, limiting the available redundancy of the conveyor system. Conveyor No. 1A and No. 2A run underneath BFP 1 and 2 and BFP 3 and 4, respectively. Conveyor No. 1B and No. 2B receive the sludge from Conveyor No. 1A and No. 2A, respectively, and are inclined at approximately 17°. Conveyor No. 1B and No. 2B discharge the sludge into the sludge/lime mixers. Conveyor No. 1B is shown in Figure 6-18. The existing criteria for the BFP conveyors is provided in Table 6-14.

Figure 6-18. BFP Conveyor No. 1B

Table 6-14. BFP Conveyor System Existing Equipment Criteria

Parameter	Units	Value
Manufacturer/Model	-	Taunton Engineering Company, Scandura No. 74, Type MOR-SC
Quantity	-	4 (1A, 1B, 2A, 2B)
Conveyor Width	in	24
Conveyor 1A/2A Length	ft	87.25
Conveyor 1B/2B Length	ft	55.5
Capacity	lbs/inch width	220
Motor Type	-	Variable Speed (VFD)
Motor horsepower	hp	3
Motor Speed	rpm	1,750
Voltage	V/phase/hz	460/3/60

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Figure 6-20. Dewatering Expansion to Add Third Train

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Table 6-16. Sludge Feed Grinder Design Criteria

Parameter	Units	Value
Quantity	-	2
Size	inch	6
Capacity	gpm	500
Motor Type	-	Constant Speed
Motor Horsepower	hp	3
Speed	rpm	1,750
Voltage	V/phase/hz	460/3/60

Table 6-17. Sludge Feed Pumps Design Criteria

Parameter	Units	Value
Quantity	-	2
Type	-	Centrifugal Chopper
Capacity	gpm	500
TDH	ft	60
Motor Type	-	VFD
Horsepower	hp	20
Motor Speed	rpm	1,750
Voltage	V/phase/hz	460/3/60

[redacted] [redacted]t

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Table 6-22. Polymer Transfer Pump Design Criteria

Parameter	Units	Value
Quantity	-	2
Type	-	Single-Stage Progressive Cavity
Capacity	gph	6-90
Max Pressure	psig	20
Max Speed	rpm	700
Motor Type	-	Variable Speed
Horsepower	hp	1.0
Motor Speed	rpm	1,750
Voltage	V	90

Table 6-23 Polymer Mixing Tank Design Criteria

Parameter	Units	Value
Quantity	-	2
Material	-	Fiberglass
Capacity	gal	1,600
Detention Time	min	80
Tank Diameter	ft	6
Tank Height	ft	8
Mixer Manufacturer/Model Basis of Design	-	Chemineer, Inc., Model 5 JTC, or equal
Mixer Motor Horsepower	hp	2
Mixer Motor Speed	rpm	1,750
Mixer Motor Voltage	V/phase/hz	230/460 / 3 / 60

Table 6-24. Polymer Feed Pump Design Criteria

Parameter	Units	Value
Quantity	-	6
Type	-	Two-Stage Progressive Cavity
Diluted Polymer Concentration	%	0.15-0.20
Capacity	Gph	45-900
Max Pressure	psig	20
Max Pump Speed	rpm	780
Motor Type	-	Variable Speed
Horsepower	hp	2.0
Motor Speed	rpm	1,750
Voltage	V	90

[redacted] [redacted]

[redacted]

Table 6-25. BFP Conveyor System Design Criteria

Parameter	Units	Value
Quantity	-	6 (1A, 1B, 2A, 2B, 3A, 3B)
Screw Diam.	in	16
Motor Type	-	Variable Speed (VFD)
Motor horsepower	hp	3
Motor Speed	rpm	1,750
Voltage	V/phase/hz	460/3/60

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted]

6.4 Lime Stabilization

6.4.1 Existing Facilities Description/Design Criteria

Lime is added to unstabilized sludge to raise the pH to 12 or higher to create an environment that is not conducive to the survival of pathogens. Upon reaching a pH of 12 or greater the sludge is considered stabilized. The lime stabilization facilities include lime storage facilities, lime conveyance facilities, and sludge/lime mixer facilities. Figure 6-21 shows the location of the solids processing area.

Figure 6-21. Solids Processing Location Plan

6.4.1.1 Lime Storage

The existing lime storage facilities are composed of the lime storage silos and associated feeding equipment including the fill lines, volumetric feeder, lime shakers, dust collectors, lime transfer conveyors, and sludge/lime mixers. Figure 6-22 shows the existing sludge/lime mixer. The existing design criteria of the lime storage and stabilization areas is provided in Table 6-26, Table 6-27, and Table 6-28.

Figure 6-22. Sludge/Lime Mixer

Table 6-26. Lime Silo Existing Equipment Criteria

Parameter	Units	Value
Manufacturer	-	Taunton Engineering Co., Inc.
Number of Treatment Trains	--	2
Lime Silo Storage Capacity	tons/train	90
Silo Diameter	ft	12
Silo Height	ft	54
Average Dose Rate	ton/hr/train	0.25
Quicklime Storage Time	days/train	15
Minimum pH of Sludge	--	2 hr at pH 12 plus 22 hr at pH 11.5

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Water Treatment Plant (2011)

Table 6-27. Lime Transfer Conveyor Existing Equipment Criteria

Parameter	Units	Value
Manufacturer	-	Taunton Engineering Co., Inc.
Lime Feed Capacity	ft^3/hr/train	3-32
Motor Type	-	Variable Speed DC
Volumetric Feeder Horsepower	hp	1
Volumetric Feeder Speed	rpm	1,800
Volumetric Feeder Voltage	V/phase/hz	230/1/60
Discharge Chute Size	in	6
Max Conveyor Speed	rpm	20
Quicklime Dosage	% dry weight	30
Conveyor Motor Type	-	Constant Speed
Horsepower	hp	3
Speed	rpm	1,750
Voltage	V/phase/rpm	460/3/60

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Water Treatment Plant (2011)

Table 6-28. Sludge Lime Mixer Existing Equipment Criteria

Parameter	Units	Value
Manufacturer	-	Taunton Engineering Co., Inc.
Mixer Type	-	Twin-screw type
Sludge Blending Capacity	tons/hr/train	5.8
Mixer Length	ft	24
Mixer Incline	in	10
Material	-	316 Stainless Steel
Motor Type	-	Variable Speed (VFD)
Horsepower	hp	7.5
Speed	rpm	1750
Voltage	V/phase/hz	460/3/60

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Water Treatment Plant (2011)

[redacted]

[redacted]

Table 6-30 Lime Silo Design Criteria

Parameter	Units	Value
Number of Treatment Trains	--	3 (currently 2 trains)
Lime Silo Storage Capacity	tons/train	90
Silo Diameter	ft	12
Silo Height	ft	54
Lime Fill Pipe Diameter	in	4
Dust Collector Filtration Area	sq. ft	250

Parameter	Units	Value
Quicklime Storage Time	days/train	15
Discharge Chute Size	in	6
Minimum pH of Sludge	--	2 hr at pH 12 plus 22 hr at pH 11.5

Table 6-31. Lime Transfer Conveyor Design Criteria

Parameter	Units	Value
Lime Feed Capacity	ft^3/hr/train	3-32
Volumetric Feeder Horsepower	hp	1
Volumetric Feeder Speed	rpm	1,800
Volumetric Feeder Voltage	V/phase/hz	230/1/60
Motor Type	--	Variable Speed DC
Max Conveyor Speed	rpm	20
Quicklime Dosage	% dry weight	30
Conveyor Motor Type	--	Constant Speed
Horsepower	hp	3
Speed	Rpm	1750
Voltage	V/phase/rpm	460/3/60

Table 6-32. Sludge Lime Mixer Design Criteria

Parameter	Units	Value
Mixer Type	--	Twin-screw type
Sludge Blending Capacity	Tons/hr/train	5.8
Mixer Length	ft	24
Mixer Incline	in	10
Material	--	316 Stainless Steel
Motor Type	--	Variable Speed (VFD)
Horsepower	hp	7.5
Speed	rpm	1,750
Voltage	V/phase/hz	460/3/60

[redacted]

6.5 Truck Loading Building

6.5.1 Existing Facilities Description/Design Criteria

The existing sludge conveyance facilities deliver the dewatered stabilized sludge cake to the truck loading building. The system consists of two belt conveyors that carry stabilized sludge from the sludge/lime mixer to the truck loading building. Figure 6-23 shows the location of the solids processing area. Figure 6-24 shows the truck loading conveyor discharge. The existing design criteria for the two belt conveyors are provided in Table 6-33.

Figure 6-23. Solids Processing Location Plan

Figure 6-24. Truck Loading Conveyor Roof Discharge

Table 6-33. Truck Loading Conveyor System Existing Equipment Criteria

Parameter	Units	Value
Manufacturer/Model	--	Taunton Engineering Company, Scandura No. 74, Type MOR-SC
Number of Belt Conveyors	--	2
Conveyor No. 1 Length*	ft	79’-2”
Conveyor No. 2 Length*	ft	99’-2”
Conveyor Width	in	24
Capacity	Lbs/inch width	220
Motor horsepower	hp	3
Motor Speed	rpm	1,750
Voltage	V/phase/hz	460/3/60

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Water Treatment Plant (2011)

*Estimated from Design Drawings project CC-2 DWG number M2804 and M3001

[redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted]

7 Support Facilities

7.1 Headworks Odor Control

7.1.1 Existing Facilities Description/Design Criteria

The Headworks odor reduction station continuously ventilates and treats odorous air from the Screening Area, IPS wet well, and Storage Bin/Grit Dewatering areas. The Headworks odor reduction station is located east of the Storage Bin/Grit Building with ductwork extending from the containment areas to the odor reduction station. The objective of the Headworks odor reduction station is to remove H_2S and other odorous compounds from the following locations:

- Headworks Inlet/Junction Structures
- Screening Area (channels)
- Influent Pump Station – Wet Well
- Storage Bin/Grit Dewatering Building

The odor reduction station consists of a single stage counter current packed column and exhaust fans to provide negative pressure within the containment areas. The scrubber is a closed vessel with NaOCl, NaOH, and make-up water are continuously recirculated to the top of the scrubber to distribute over the scrubber media. Fresh chemicals (NaOCl and NaOH) and make-up water are added to the scrubber solution which displaces spent scrubber solution (blowdown) into an overflow drain. The overflow drain returns to the Headworks via the tank drainage system. An automatic water softening system is provided to treat make-up water for the scrubbers, capable of producing a maximum flow of six gpm and daily capacity of 3,000 gallons. The existing Headworks odor reduction station is show in Figure 7-1.

Figure 7-1. Headworks Odor Reduction Station

The existing design criteria for the Headworks odor reduction station is provided in Table 7-1.

Table 7-1. Headworks Odor Reduction Existing Design Criteria

Parameter	Units	Value
Air Change Covered Tank	per hour	6
Air Change Building	per hour	12
H_2S Design Loading to Scrubber	ppm	25
Scrubber Capacity	cfm	16,200
Total Residence Time	sec	1.5 – 1.7
Scrubber Vessel Diameter	feet	7
Scrubber Wall Height	feet	30
Exhaust Fan Motor Horsepower	hp	50
Exhaust Fan Speed	rpm	1,775
Exhaust Fan Voltage	V/phase/hz	460/3/60
Recirculation Pumps Design Criteria	-	240 gpm @ 65-ft TDH
NaOH Metering Pumps Design Criteria	-	0.3-3.0 gph @ 125 psig
NaOCl Metering Pumps Design Criteria	-	3.1-23.0 gph @ 125 psig

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

7.2 Primary Sedimentation Odor Control

7.2.1 Existing Facilities Description/Design Criteria

The Primary Sedimentation Tank odor reduction station continuously ventilates and treats odorous air from the Grit Chamber and Primary Sedimentation Tank channels. The Primary Sedimentation Tank odor reduction station is located south of the Primary Sedimentation Facilities with ductwork extending from the containment areas to the odor reduction station. The objective of the Primary Sedimentation Tank odor reduction station is to remove H_2S and other odorous compounds from the following locations:

- Grit Chamber
- Primary Sedimentation Tank Influent Channel
- Primary Sedimentation Tank Launder
- Primary Sedimentation Tank Effluent Channel
- Skimming Station.

The odor reduction station consists of a single stage counter current packed column and exhaust fans to provide negative pressure within the containment areas. The scrubber is a closed vessel with NaOCl, NaOH, and make-up water are continuously recirculated to the top of the scrubber to distribute over the scrubber media. Fresh chemicals (NaOCl and NaOH) and make-up water are added to the scrubber solution which displaces spent scrubber solution (blowdown) into an overflow drain. An automatic water softening system is provided to treat make-up water for the scrubbers, capable of producing a maximum flow of six gpm and daily capacity of 3,000 gallons. The overflow drain returns to the Headworks via the tank drainage system. The existing Primary Sedimentation Tank Odor Reduction Station is shown in Figure 7-6.

Figure 7-6. Primary Sedimentation Tank Odor Reduction Station

The existing design criteria for the Primary Sedimentation Tank odor reduction station is provided in Table 7-4.

Table 7-4. Primary Sedimentation Tank Odor Reduction Existing Design Criteria

Parameter	Units	Value
Air Change Covered Tank	per hour	6
Air Change Building	per hour	12
H_2S Design Loading to Scrubber	ppm	34
Scrubber Capacity	cfm	15,300
Total Residence Time	sec	1.5 – 1.7
Scrubber Vessel Diameter	ft	7
Scrubber Wall Height	ft	30
Exhaust Fan Motor Horsepower	hp	50
Exhaust Fan Speed	rpm	1,775
Exhaust Fan Voltage	V/phase/hz	460/3/60
Recirculation Pumps Design Criteria	-	240 gpm @ 65-ft TDH
NaOH Metering Pumps	-	0.3-3.0 gph @ 45 psig
NaOCl Metering Pumps	-	3.1-23.0 gph @ 45 psig

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

[redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

7.3 Solids Processing Odor Control

7.3.1 Existing Facilities Description/Design Criteria

The Solids Processing odor reduction station continuously ventilates and treats odorous air from the Sludge Dewatering Building, Lime Stabilization Facilities, and Truck Loading Building areas. The Solids Processing odor reduction station is located east of the Sludge Dewatering Building with continuous ductwork from the containment areas to the odor reduction station. The objective of the Solids Processing odor reduction station is to remove H_2S), ammonia (NH_3), and other odorous compounds from the following locations:

- Sludge Dewatering Building
- Lime Stabilization Facilities
- Truck Loading Building

The Solids Processing odor reduction station consists of a two-stage scrubber and exhaust fans to provide negative pressure within the containment areas. The first stage utilizes sulfuric acid (H_2SO_4) solution to remove the ammonia, and the second stage utilizes NaOCl and NaOH solutions to remove the H_2S. Fresh chemicals and make-up water are added to the scrubber solution which displaces spent scrubber solution (blowdown) into an overflow drain. The overflow drain returns to the Headworks via the tank drainage system. An automatic water softening system is provided to treat make-up water for the scrubbers, capable of producing a maximum flow of 25 gpm and daily capacity of 21,600 gallons. The existing Solids Processing odor reduction station is shown in Figure 7-9.

Figure 7-9. Solids Processing Odor Reduction Station

The existing design criteria for the Solids Processing odor reduction station is provided in Table 7-7.

Table 7-7. Solids Processing Odor Reduction Existing Design Criteria

Parameter	Units	Value
Air Change Covered Tank	per hour	6
Air Change Building	per hour	12
H_2S Design Loading to Scrubber	ppm	10
NH_3 Design Loading to Scrubber	ppm	30
Scrubber Capacity	cfm	48,500
Total Residence Time	sec	1.5 – 1.7
Scrubber Vessel Diameter	ft	12
Scrubber Wall Height	ft	30
Sludge Dewatering Exhaust Fan Motor Horsepower	hp	100
Truck Loading Building Exhaust Fan Motor Horsepower	hp	60
Exhaust Fan Speed	rpm	1,785/1,780
Exhaust Fan Voltage	V/phase/hz	460/3/60
Recirculation Pumps Design Criteria	-	700 gpm @ 65-ft TDH
H_2SO_4 Metering Pumps Design Criteria	-	0.3-3.0 gph @ 45 psig
NaOH Metering Pumps Design Criteria	-	0.3-3.0 gph @ 45 psig
NaOCl Metering Pumps Design Criteria	-	2.3-21.0 gph @ 45 psig

Source of Design Criteria: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

7.4 Chemical Addition Facility

7.4.1 Existing Facilities Description/Design Criteria

The Chemical Addition Facility is located in the southeast corner of the plant to the south of the PSTs. It houses the ferric chloride bulk storage tanks, ferric chloride USST chemical metering pumps, anionic polymer bulk storage, and anionic polymer mixing equipment. Figure 7-14 shows an aerial view of the facility location and the chemical feed locations.

Figure 7-14. Chemical Addition Facility and Dosing Locations.

7.4.1.1 Ferric Chloride

Ferric chloride is a chemical coagulant dosed at the PSTs and USSTs. It is dosed at the PSTs to destabilize particles and create large flocculants that settle. The second dose location is ahead of the USSTs to help decrease odor production by reducing the generation of hydrogen sulfide. Ferric chloride also reduces the formation of struvite in the tanks and sludge lines. Table 7-10 summarizes the design criteria for the ferric chloride storage and feed system.

Table 7-10. Ferric Chloride System Design Criteria

Chemical		Ferric Chloride
Concentration		40%
Dose Locations		Primary Sedimentation Tanks, Unstabilized Sludge Storage Tanks
Storage Requirements		
Bulk Storage Tanks	No.	2
Material		FRP w/ DOW Derakane 411 Coating and C-Vein/Chop Derakane 411 Resin
Tank Dimensions		14 ft. diameter x 20 ft. height
Nominal Capacity	gal (ea.)	23,000
Storage at Average Flow	days	30

Feed Requirements	Unit	Minimum	Average	Maximum
Primary Sedimentation Tank Pump Capacity				
Dose	mg/l	20	25	30
Flow	MGD	15	25	50
Feed Rate	gph	25	53	170
Unstabilized Sludge Storage Tank Pump Capacity				
Dose	mg/l	20	25	30
Flow	MGD	0.68	1	1.36
Feed Rate	gph	1	2	5
Feed Equipment				
Type	**Double Diaphragm, Positive Displacement**			
	Quantity		**Horsepower**	**Max Pressure (psi)**
Primary Sedimentation Tank Pumps	6 (5 Duty, 1 Standby)		1	95
Unstabilized Sludge Storage Tank Pumps	2 (1 Duty, 1 Standby)		1	125

Source of Design Components: Operation and Maintenance Manual for South Bay International Wastewater Treatment Plant (2011)

One additional pump is provided as an off-the-shelf replacement for the PST pumps. The PST chemical metering pumps are located in the PST gallery and are dedicated to dosing ferric chloride to each rapid mix chamber's pump mixer discharge line. The USST chemical metering pumps are located outdoors in the Chemical Addition Facility's ferric chloride bulk storage containment area. The USST pumps act in a duty and standby configuration.

The system was originally designed to transfer chemical from the bulk storage tanks to two open-top tanks with mechanical mixers. Ferric Chloride would mix in the mixing tanks for a minimum of 30 minutes at which point the metering pumps convey chemical from the mixing tanks to their respective dosing locations. While the system was originally designed with two transfer pumps and two mixing tanks, these items were not found at the facility and no record of their installation was found. The existing pipe routing from the bulk storage tanks to the chemical metering pumps was not field verified.

7.4.1.2 Anionic Polymer

Anionic polymer is dosed in addition to ferric chloride at the PSTs for enhanced primary sedimentation. It is dosed at each rapid mix chamber via a diffuser. All five metering pumps are located in the PST gallery. Table 7-11 provides the design criteria for the anionic polymer storage and feed system.

Table 7-11. Anionic Polymer System Design Criteria

Chemical		Anionic Polymer		
Neat Concentration		20%		
Diluted Concentration		0.5%		
Dose Locations		PSTs		
Storage Requirements				
No. of Bulk Storage Tanks		2		
Material		FRP w/ DOW Derakane 411 Coating and C-Vein/Chop Derakane 411 Resin		
Tank Dimensions		8-foot diameter x 9-foot high		
Nominal Capacity		3,300 gal (ea.)		
No. of Mixing Tanks		2		
Material		FRP w/ DOW Derakane 411 Coating and C-Vein/Chop Derakane 411 Resin		
Tank Dimensions		5-foot diameter x 6-foot high		
Nominal Capacity		880 gal (ea.)		
Storage at Average Flow		30 days		
Feed Requirements	**Unit**	**Minimum**	**Average**	**Maximum**
Transfer Pump Capacity	gph	30	-	120
Primary Sedimentation Tank Pump				
Dose	mg/L	0.2	0.6	1.2
Flow	mgd	15	25	50
Feed Rate	gph	24	120	481
Feed Equipment				
Type	**Positive Displacement, Progressive Cavity**			
	Pump Stages	**Quantity**	**Horsepower**	**Max Pressure (psi)**
Transfer Pump	Single	2 (Duty)	1.5	20
Primary Sedimentation Tank Pump	Double	6 (5 Duty, 1 Standby)	1.5	30

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted] [redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted]

7.5 Plant Water Pump Station

7.5.1 Existing Facilities Description/Design Criteria

There are two plant water pump stations; NPW Pump Station No. 1 and NPW Pump Station No. 2. NPW Pump Station No. 1 was constructed under the CC-2 contract and intended to service the original primary treatment facility. NPW Pump Station No. 2 was constructed under the CC-3 contract and designed to serve the plant water demands for the original primary treatment facility and secondary treatment facilities expansion. NPW Pump Station No. 1 is approximately 24 years old and NPW Pump Station No. 2 is approximately 12 years old. Figure 7-19 shows the locations for each of the pump stations.

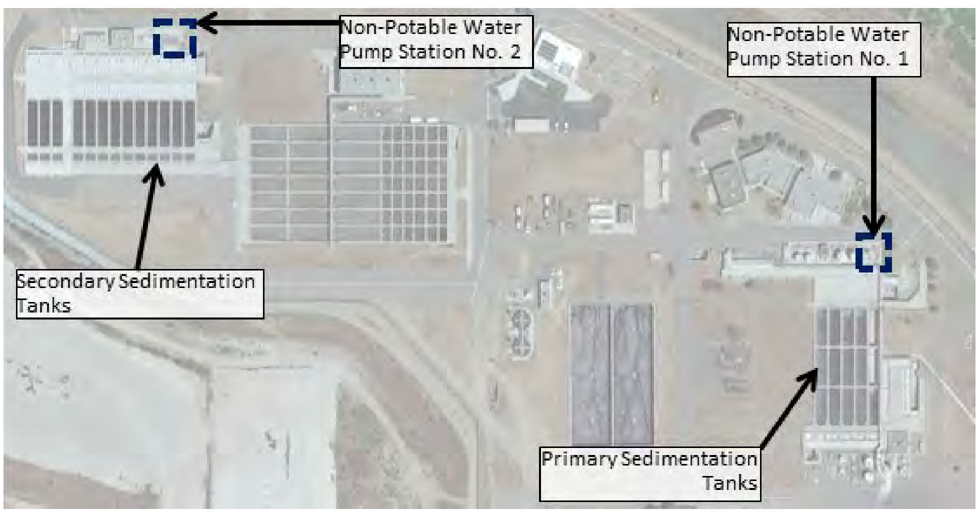

Figure 7-19. Pump Station Locations

The estimated current peak plant water demand at the SBIWTP is approximately 2,700 gpm. The current peak demands for each process are summarized in Table 7-13.

Table 7-13. Estimated NPW Peak Demand Summary

	Current 25 mgd Facility, gpm
Headworks	127
Primary Sedimentation	257
Activated Sludge	1,176
Secondary Sedimentation	155
WAS Thickening	120
USST	112
Solids Handling	725
Total	**2,672**

NPW Pump Station No. 1 consists of four vertical turbine pumps, a wet-well with an air-gap serviced by the City of San Diego potable water system and the City of San Diego reclaimed water system, and a hydropneumatic tank. Each of the four vertical turbine pumps is rated for 420 gpm at 187 feet of TDH. NPW Pump Station No. 1 has a firm capacity of 1,260 gpm. The current normal operating condition for NPW Pump Station No. 1 is as a back-up pump station to NPW Pump Station No. 2 in the event secondary treatment is bypassed. The pumping area for NPW Pump Station No. 1 is shown in Figure 7-20.

Figure 7-20. Pumping Area for NPW Pump Station No. 1

NPW Pump Station No. 2 consists of five vertical turbine pumps, a wet-well served by secondary treatment effluent, and in-line filter strainers. Three of the five vertical turbine pumps are rated for 1,700 gpm at 185 feet of TDH. The remaining two vertical turbine pumps serve as jockey pumps and are each rated for 500 gpm at 185 TDH. NPW Pump Station No. 2 has a firm capacity of 4,400 gpm. The current normal operating condition for NPW Pump Station No. 2 is as the primary plant water pump station for the SBIWTP. The pumping area for NPW Pump Station No. 2 is shown in Figure 7-21.

Figure 7-21. Pumping Area for Non-Potable Water Pump Station No. 2

A summary of each facility is provided in Table 7-14.

Table 7-14. NPW Pumping Summary

	Pump Station No. 1	Pump Station No. 2
Age (yrs)	24	12
Number of Pumps	4	5
Pump Type	Vertical Turbine	Vertical Turbine
Source	City of San Diego Water	Secondary Effluent
Firm Capacity (gpm)	1,260	4,400
SBIWTP Peak Demand (gpm)	2,700	2,700
Pressure Setpoint (psi)	80	80
Purpose	Backup if Secondary Treatment is bypassed	Primary Plant Water Source

[redacted] [redacted]

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

8 Site Electrical/Power Distribution

8.1 Existing Electrical System Overview

Most of the plant electrical system was constructed in 1998 with two expansion projects constructed in 2012 and 2018 for process facilities located in the northwest region of the site. San Diego Gas & Electric (SDG&E) is the serving electric utility and provides power to the plant via a single overhead 12kV feeder that transitions to underground service at the Main Switchgear Building. This building houses two main switchgear lineups, Main Switchgear MS-1 and Main Switchgear MS-2. Each switchgear provides a dedicated power feeder to the individual process facilities throughout the plant. However, a redundant utility service feeder was never installed at the plant and Main Switchgear MS-1 and Main Switchgear MS-2 are tied together via overhead bus duct within the building. This provides some switching flexibility but no true redundancy from the normal utility power source. Each process facility within the plant generally consists of a substation transformer that feeds dedicated electrical rooms for housing MCCs that serve the facility process equipment. Substation transformers are provided with primary selector switches to switch between A and B feeders from the main switchgear lineups.

For backup power, two 2,000W, 12kV diesel generators are installed at the plant with paralleling switchgear housed in a dedicated building. This switchgear then has individual circuit breaker connections to both Main Switchgear MS-1 and Main Switchgear MS-2 for transferring process facilities to backup power. SBIWTP staff has been proactive with maintenance and testing as plant load transfers are conducted monthly to confirm reliability and identify points of failure. Figure 8-1 shows the locations of existing electrical buildings at the plant.

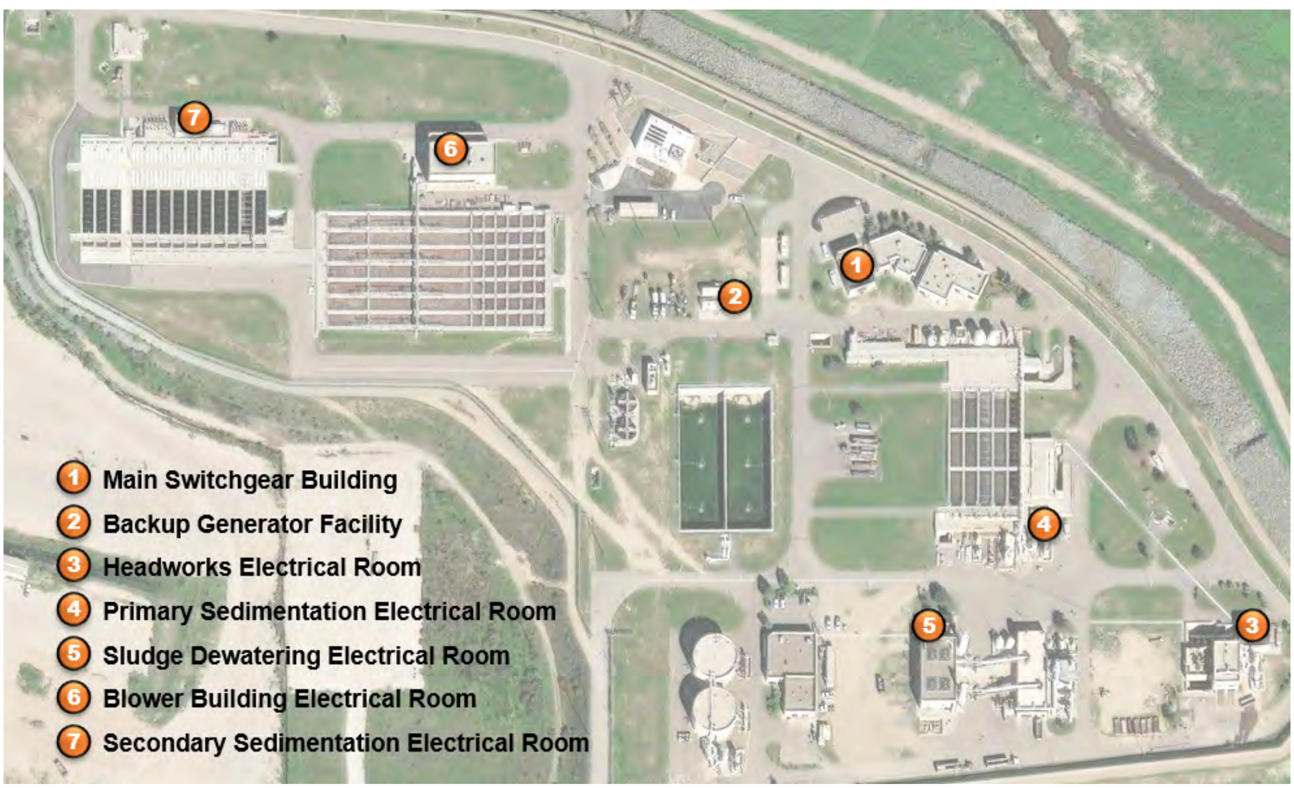

Figure 8-1. Existing Electrical Buildings Site Plan

[redacted] [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

9 Instrumentation and SCADA

9.1 Existing Facilities Description

Existing process controls are in the proximity of each respective process area. The local control panels (LCPs) contain hardwired and networked components, including a programmable logic controller (PLC) with input/output (I/O) modules for sequencing of equipment operation and adjustment of process and/or equipment set points. Field controls at motor driven equipment include, in general, REMOTE-OFF-TEST (ROT) switches at the motors. The OFF position is lockable.

SCADA workstations are located at the Plant Control Center (PCC) and the Operations Building Control Center (OBCC). Figure 9-1 illustrates a segment of the existing SCADA network. During the subsequent design phases this schematic will be updated to include details such as SCADA workstations and indicate physical media connections.

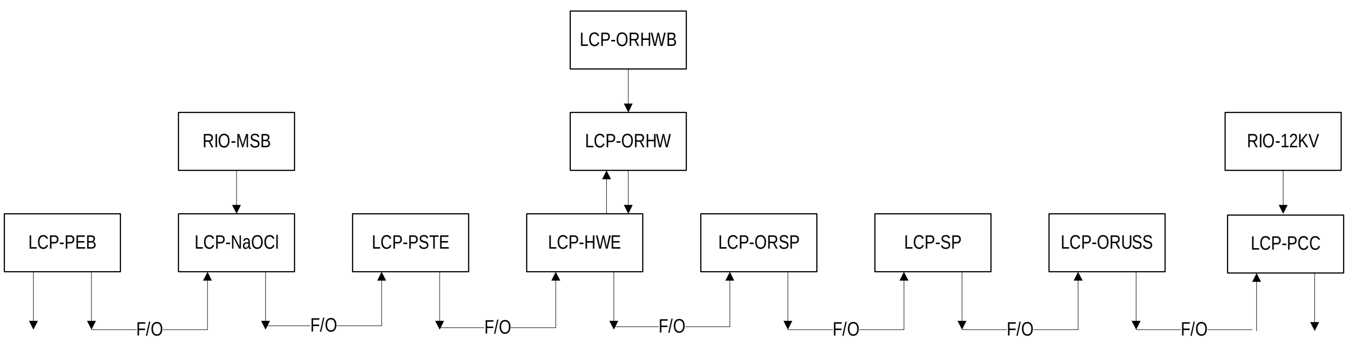

Figure 9-1. Existing SCADA Network Segment - Primaries

Facilities highlighted in Figure 9-1 include:

- Existing headworks controls are located within the Headworks building (LCP-HWE).
- Primary sedimentation controls are adjacent to the PST and the corresponding LCP is LCP-PSTE.
- Solids Processing controls are in the Solids Processing (SP) Building adjacent to the Sludge Dewatering Building (LCP-SP).
- The Sodium Hypochlorite controls are adjacent to the Sodium Hypochlorite Facilities in LCP-NaOCl.

There are two remote sites: Goat Canyon Pump Station and Hollister Street Pump Station – for both, the controls are in the corresponding Electrical / Generator Building.

The plant benefits from a comprehensive Operation and Maintenance Manual that details process operations. Specific details related to plant controls are in Volume 2, Chapter 4.

The Operator uses selector switches to set up equipment operation. Setpoints can be adjusted for each unit process at the operator interface terminal (OIT) mounted on the LCP. For systems constructed with the secondary treatment portion of the plant, the Operator is required to place the ROT switches for all unit process equipment into the REMOTE position. When a system fails within a process area, the individual equipment failure is indicated at the LCP. A separate single alarm is transmitted to and indicated at SCADA. When an LCP failure is indicated at SCADA, the Operator is required to check the specific LCP to determine the specific failure within the unit process area. In addition to the common LCP alarm signal to SCADA, individual alarms for critical failures or conditions are also displayed on SCADA.

The SCADA system is used primarily for remote monitoring of general and/or critical alarms for field equipment and systems. Other discrete statuses and analog indications from field equipment/instrumentation are currently not transmitted to, and therefore not monitored on SCADA. In addition, the SCADA system does not provide any remote-control functionalities.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

10 Site Civil

The site civil condition assessment of SBIWTP consists of visual inspection of site hardscape, general site drainage, paved access roads and interviews with SBIWTP staff to identify areas of concern and opportunities that would improve plant conditions. The site civil assessment was accomplished by a combination of walking and driving the facility. The assessment did not evaluate physical condition using a scoring system, instead the assets were evaluated based on signs of surface distress, operational condition, and history of maintenance based on SBIWTP staff's input.

10.1 Assessed Condition

[redacted]

[redacted]

11 Proposed Rehabilitation Summary

[redacted]

[redacted]

Appendix A

Physical Condition Scoring Criteria by Asset Type

Appendix A
Physical Condition Scoring Criteria by Asset Type

[redacted]

Appendix A

Physical Condition Scoring Criteria by Asset Type

[redacted]

Appendix A

Physical Condition Scoring Criteria by Asset Type

[redacted]

Appendix A

Physical Condition Scoring Criteria by Asset Type

[redacted]

Appendix B

Completed Assessment Scoring

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Appendix C

IBWC SBIWTP Assessment and Facility Planning Structural Assessment Technical Memorandum

IBWC SBIWTP ASSESSMENT AND FACILITY PLANNING

Structural Assessment Technical Memorandum

July 27, 2023

Prepared by Kelsey Structural

KELSEY STRUCTURAL

Prepared for Arcadis, Inc.

ARCADIS

IBWC SBIWTP Assessment and Facility Planning

Structural Assessment Technical Memorandum

Prepared for:

Peter V. Tymkiw, PE
Senior Vice President
Arcadis U.S., Inc.
410 N. 44th Street, Suite 1000
Phoenix, Arizona 85008

Prepared by:

Matt Stone, SE
Senior Project Manager

Reviewed by:

Guy Kelsey, SE
Principal Engineer

KELSEY STRUCTURAL
8064 Allison Ave. No. 1706
La Mesa, CA 91942
Phone: 619.920.1262
www.kelseystructural.com

Table of Contents

List of Tables

List of Figures

1 Executive Summary

1.1 Introduction

The United States Section of the International Boundary and Water Commission (USIBWC) has retained the engineering services of Arcadis, Inc. (Arcadis) to perform an assessment of the existing South Bay International Wastewater Treatment Plant (SBIWTP) as part of USIBWC's goal to expand the existing facility and increase its daily treatment capacity. Kelsey Structural has been hired as a subconsultant to Arcadis to perform the structural assessment of the existing facility and provide improvement recommendations for critical structural repairs and rehabilitation necessary to facilitate the future plant expansion. This technical memorandum (TM) has been prepared by Kelsey Structural to document the assessment findings and provide improvement recommendations pertaining to the structural assets at the SBIWTP.

1.2 Structural Assessment Approach

As part of the structural assessment of the SBIWTP, Kelsey Structural has performed the following scope of work:

- Data Collection and Review
- Site Investigations at the SBIWTP
- Preparation of Structural Assessment Technical Memorandum

A total of 125 structural assets were assessed as part of this project including various treatment process and administration facilities that were constructed at the SBIWTP over the past 25 years. Of these assets, 77 had been previously identified and documented during past assessment work, while an additional 48 structures were added to the total structural asset count during this project. The structural assessment of these assets was completed by Kelsey Structural during site investigations performed in November, 2022. The assessment consisted of visual observations and nondestructive investigations of each structural asset at the SBIWTP with the findings documented using the Fulcrum asset scoring and management tool provided for use by Arcadis. An average condition rating of 1 to 5 was assigned to each structural asset based on observed levels of damage and deterioration, with a score of 1 indicating an asset that was observed to be in overall good condition with no signs of damage or deterioration and a score of 5 indicating an asset that was observed to be in overall poor condition with severe damage and deterioration that may compromise the structure's integrity or function. It is our understanding that the raw data and photos documented within the Fulcrum software application will be made available to the USIBWC and this data has, therefore, not been included within this TM.

1.3 Structural Assessment Findings and Recommendations

[redacted]

Table 1.1 Structural Condition Assessment Summary

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Appendix D

2023 to 2027 Capital Improvements Projects

[redacted]

[redacted]

[redacted]

[redacted]

Arcadis U.S., Inc.

530 B Street, Suite 1000
San Diego
California 92101
Phone: 602 438 0883
www.arcadis.com