Montecito Sanitary District & Montecito Water District
Enhanced Recycled Water Feasibility Analysis

Technical Memorandum 3
CONDITION ASSESSMENT

FINAL | April 2022

carollo
WSC

Montecito Sanitary District & Montecito Water District
Enhanced Recycled Water Feasibility Analysis

Technical Memorandum 3
CONDITION ASSESSMENT

FINAL | April 2022

Digitally signed by Lisa Arroyo
Contact Info: Carollo Engineers, Inc.
Date: 2022.04.14 08:29:20 -07'00'

Contents

Technical Memorandum 3 - Condition Assessment

Appendices

Tables

Figures

Abbreviations

ACH	air changes per hour
ADA	Automatic Dialer Alarm
ASR	alkali-silica reaction
ATS	Automatic Transfer Switch
BFP	belt filter press
CMUs	concrete masonry units
DAFT	dissolved air flotation thickener
DO	dissolved oxygen
EUL	estimated useful life
gpd	gallon(s) per day
H_2S	hydrogen sulfide
I/I	Inflow and Infiltration
IPS	influent pump station
kVA	kilovolt-ampere
MCC	Motor Control Center
mgd	million gallons per day
MSD	Montecito Sanitation District
MWD	Montecito Water District
NPDES	National Pollutant Discharge Elimination System
Project	Enhanced Recycled Water Feasibility Analysis
RAS	return activated sludge
RUL	remaining useful life
SRT	solids retention time
TM	technical memorandum
TWAS	thickened waste activated sludge
VFDs	variable frequency drives
WAS	waste activated sludge
WSE	water surface elevation
WWTP	wastewater treatment plant

-This Page Intentionally Left Blank-

Technical Memorandum 3

CONDITION ASSESSMENT

3.1 Introduction and Purpose

This technical memorandum (TM) presents condition assessment results from an onsite assessment at the Montecito Sanitary District (MSD) Wastewater Treatment Plant (WWTP). The assessment was undertaken to support the larger Enhanced Recycled Water Feasibility Analysis (Project), a joint effort by MSD and Montecito Water District (MWD). The Project analyzes four potential approaches to maximize water reuse from the MSD WWTP, including local non-potable reuse, local potable water reuse, and regional potable water reuse projects (one in Carpinteria and one in Santa Barbara).

To effectively analyze several Project options which include treated effluent from the MSD WWTP, a condition assessment of the MSD WWTP was performed. This was a one-day physical condition assessment conducted by a team of electrical, structural and process mechanical engineers to determine the current condition of the structures, process mechanical equipment, electrical equipment, and ancillary assets. The goal of the condition assessment was to evaluate and document the current state of the WWTP.

This TM highlights the overall condition of the WWTP and identifies major assets determined to be moderately to severely deficient. TM 5 "Cost for Rehabilitation and 30 Year Operations" will use results from both this condition assessment (TM 3) and the performance and capacity evaluation (TM 4) to identify replacement, rehabilitation, and capacity needs over the next 30 years.

3.2 Overview of Facility

MSD is an independent special district in Santa Barbara County that collects, treats, and disposes of wastewater from the unincorporated community of Montecito. Its wastewater stream is predominantly residential with a few larger commercial facilities such as Westmont College and upscale hotels. There are no industrial users in their service area.

Built in 1961, the WWTP was constructed as a 750,000-gallon-per-day (gpd) secondary level treatment plant with discharge via its permitted ocean outfall. In 1983, the WWTP expanded its treatment capacity to 1.5 million gallons per day (mgd). MSD is designed to operate in an extended aeration mode with a solids retention time (SRT) of 20 to 30 days and to fully nitrify.

MSD has consistently made improvements to its facility and treatment processes since the 1983 expansion. The following summarizes the more significant improvements made to the facility:

- Updates to the Administration Building (1988).
- Treatment plant improvements, including a new digester blower building, digester modifications and rehabilitation, and electrical upgrades (1992).
- Sludge dewatering and disinfection upgrades which included a new belt filter press for dewatering biosolids that replaced the sludge beds. The disinfection chemical system

was relocated from the administration building to an outside location and upgraded (1997).
- Influent Pump Station (IPS) project that replaced the three influent pumps, installed a new Motor Control Center (MCC), and installed a new flow meter and vault (2004).
- Construction of a new maintenance building (2006).
- Replacement of the Aeration Header at the aeration basins (2007).
- Construction of a new laboratory building (2010).

Although the WWTP has been consistently improved since its 1961 construction, it lacks preliminary and primary treatment processes commonly found at wastewater treatment plants.

Preliminary treatment processes remove constituents that can disrupt downstream operations and maintenance activities. Bar screens or fine screens are typical preliminary processes used to remove large debris and rags. Grit removal removes coarse, inert suspended solids that can cause wear or clogging of equipment in downstream treatment processes. Debris and grit removed during the preliminary treatment process is typically cleaned of organic material and disposed in a landfill.

Primary treatment removes settleable suspended solids and organic matter, and it is typically accomplished with physical operations such as primary clarifiers. Primary sludge, the solids that settle as part of primary treatment, are usually pumped and processed as part of sludge processing. Effective primary treatment can reduce the size and operating cost of secondary treatment, which is typically one of the most energy intensive treatment processes in a wastewater treatment plant. A disadvantage to having primary treatment, however, is the additional effort and facilities needed to handle and stabilize the highly volatile and odorous primary sludge.

Most wastewater treatment plants with primary treatment choose to use anaerobic digestion for stabilization. While anaerobic digestion is an effective approach for stabilizing primary sludge and offers an opportunity to produce power, it requires many complex mechanical systems including sludge mixing, heating, and handling flammable digester gas. The benefits of anaerobic digestion rarely outweigh the additional complexity unless a facility processes more than a few million gallons per day of wastewater. For this reason, it is rare to see primary treatment and anaerobic digestion at facilities the size of MSD.

MSD's approach to forego primary treatment and operate with a long SRT in the secondary process is more common at small wastewater treatment plants and is recommended moving forward. As noted above, MSD was designed to operate in the extended aeration mode with an SRT of 20 to 30 days and to fully nitrify. Per MSD's Operations Manual, the aerobic digester detention time is approximately 22 days, which is barely adequate for good aerobic digestion or stabilization. A 30-day detention time is recommended for aerobic stabilization and therefore, the secondary treatment process is used to increase the stabilization and reduce solids. The higher SRT in the secondary treatment process means less and more stable solids to the digester as well as increased retention time in the digester. It also helps during periods of "shock" loads such as illegal pool cleanings, heavy BOD loads during holidays, septic conditions during wet weather, etc. It should be noted that MSD's current National Pollutant Discharge Elimination System (NPDES) permit does not require nutrient removal (nitrification).

Over the past few years, MSD staff have noted a significant decrease in flows and loads, partly due to the 2018 Montecito Debris Flow and subsequently the COVID-19 pandemic impacts. MSD

currently discharges approximately 550,000 gpd, and biosolids reduction is estimated at approximately 20 percent over the past few years. Staff noted that a few of the larger hotels in their service area have not reopened from the COVID-19 shutdowns in spring 2020. There is also an effort to convert approximately 300 residential customers from septic to sewer in the future, which will result in a marginal increase in flow.

During the last major rain event (February 2017), staff estimates the rain dependent Inflow and Infiltration (I/I) peaked at approximately 7.5 mgd. This was not a typical rain event, as Montecito received approximately 5.77 inches of rainfall in one day, compared to a typical rain event where they may receive around an inch in a day. Although there were no rain-related collection system overflows, staff noted the plant can be a challenge to operate during rain events. The largest challenge rain poses to MSD operations is sludge washout due to high hydraulic loading or I/I. This can cause an upset to their biological process by having fewer organisms in the secondary process with no time to rebuild their biomass. If this were to happen, it would render MSD less capable of handling organic loading and less resistant to potential toxic loads. However, all past rain events have been managed and not led to permit violations.

MSD staff have set up a bypass pump that is capable of bypassing influent from the manhole just upstream of the IPS directly to the aeration basins, also bypassing the influent grinders. This can be used as a wet-weather strategy to reduce storm water flows into the IPS during rain events; however, the since the IPS pumps were replaced in 2004, the bypass pump has not been needed during wet-weather events. It is used as a redundant pump for the IPS.

It was also noted that MSD's NPDES Permit (No. CA0047899) renewal application contains a storm water management strategy for MSD which says that storm water is collected on-site at the treatment plant facility. It is diverted to the headworks/plant influent via a drain system through the facility. District practice has been to let the storm water drain into the system until staff feels the system is being overloaded with water and treatment processes will be affected in an adverse manner. Once this takes place, the drains are plugged, and the storm water is either gravity drained or pumped offsite to storm water drainage ditches that run to the North and East of the facility.

3.3 Condition Assessment

The following subsections provide a general overview of different levels of condition assessments and the condition assessment process used at MSD.

3.3.1 Condition Assessment Levels

A condition assessment is intended to document the physical deterioration of an asset and its probability of failure due to physical mortality. Physical mortality an asset's physical deterioration to a point where its condition prevents functional performance.

There are several types and levels of condition assessments that can be performed, all with a varying degree of tradeoff between level of effort and cost. The following provides a brief description of typical levels of condition assessments that can be performed:

- **Desktop Evaluation.** A desktop assessment is an age-based assessment that uses asset age, estimated useful life (EUL) and remaining useful life (RUL) to correlate age to probability of failure due to physical mortality. The EUL of an asset is the reasonable period it is expected to satisfactorily perform under normal and routine operations and

maintenance practices. The EUL is typically the *starting point* for asset replacement planning.

- **Phase 1 Field Evaluation.** A Phase 1 Field Evaluation is a visual, non-invasive, and non-destructive condition assessment of the assets. A multi-disciplinary engineering team conducts a visual assessment of each asset identified for evaluation. Exterior corrosion, weathering, and deterioration, along with discipline-specific condition and performance issues, such as temperature, notice, vibration, leakage, wiring, foundational, and component concerns are considered when assessing an asset. Assets are scored based on set criteria to ensure consistency of scoring across all disciplines. If an asset is observed to be in a degraded condition or perform outside of an acceptable baseline condition, its EUL can be lowered. Conversely, an older asset that is performing optimally may have its EUL extended.
- **Phase 2 Field Evaluation.** A Phase 2 evaluation is an in-depth and invasive assessment of an asset, based on a specific area of interest, to better understand its condition or degradation. Typical evaluations may include concrete core sampling, petrographic testing, valve removal, electromagnetic pipeline testing, coating thickness measurements, etc.
- **Specialty Assessments.** These are in-depth comprehensive evaluations that provide additional information that may be needed to fully evaluate an asset, such as seismic or geotechnical evaluations, electrical load analysis, etc.

Condition assessment scoring will tend to be more conservative for desktop and Field 1 Evaluations, with the trade-off that they take less effort and cost to perform. As additional evaluations occur and asset deficiencies are studied, condition scores are less conservative. These follow-up evaluations, however, tend to be more effort and costly to perform. Therefore, there is also a tradeoff between the level of conservatism in scoring and type of condition assessment performed.

3.3.2 Condition Assessment Process at MSD

A Phase 1 Field Evaluation was utilized exclusively for this effort, which included only visual inspection; invasive equipment testing procedures used in Phase 2 assessments were not utilized per the scope of work. The intent of this condition assessment was to evaluate and document the current state of the major assets at the WWTP. Recommended follow-up studies and renewal strategies are identified in TM 5.

3.3.2.1 Protocol and Deployment

The condition assessment took place over the course of one day, November 17, 2021, and was conducted by a multi-discipline team of mechanical, structural, and electrical/instrumentation engineers. Exterior corrosion, weathering, and deterioration issues along with discipline-specific condition and performance issues, such as temperature, noise, vibration, leakage, wiring, foundational, and component issues were all considered under the purview of the assessment effort. Additionally, existing as-built drawings were reviewed.

Over the course of the assessment, staff was interviewed to compile a list of known deficiencies, identify operating limitations, and discuss maintenance and operations history of each process area. In addition to what was described by plant staff, the assessment team looked for potential problems such as structural deterioration, electrical and instrumentation issues, and mechanical degradation.

3.3.2.2 Scoring

Asset condition was ranked using a one-through-five scale at both a general level and across a series of discipline specific questions. A score of one represents the best condition assets, while a score of five represents the worst condition assets. The purpose of scoring is to provide a common rating scale so assets can be compared to one another. Table 3.1 provides the general description of the condition associated with each score.

Table 3.1 General Condition Score Descriptions

Condition Score	General Description[1]
1 (Best)	**Excellent** Installed with very little wear. 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 wear. Delivering full efficiency with little or no performance deterioration. Only minor renewal or rehabilitation may be needed.
3	**Moderate** Functionally sound and acceptable and showing normal signs of wear. May have minor failures or diminished efficiency and with some performance deterioration or increase in maintenance cost. Moderate renewal or rehabilitation needed.
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.
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 required.

Notes:
(1) Discipline-specific scores are described in Appendix 3A - MSD Condition Scoring.

Discipline specific condition scores were used to provide further insight into the specific area(s) in which an asset is deficient and gives measure to the repair(s) needed to bring an asset to like-new condition. Table 3.2 provides the condition categories for each discipline.

Table 3.2 Summary of Condition Questions Categories by Discipline

Discipline	Condition Question Categories [1]
Mechanical	• General Condition • Corrosion/Exterior • Vibration • Temperature • Leakage • Components

Discipline	Condition Question Categories [1]
Structural	• General Condition • Surface Deterioration • Coating/Lining/Paint • Leakage • Foundation/Supports • Safety Components
Electrical	• General Condition • Equipment • Enclosure • Temperature/Noise • Wiring/Cable Condition • Components
Instrumentation and Controls	• General Condition • Equipment/Transmitter • Display/Enclosure/Mount • Wiring/Cable Condition • Components
HVAC	• General Condition • Corrosion/Exterior • Vibration • Temperature • Components

Notes:
(1) A more detailed description of discipline-specific scores can be found in Appendix 3A - MSD Condition Scoring.

3.3.2.3 Condition Assessment Locations

The assessment results are separated into MSD's major process areas:

- IPS.
- Secondary Treatment.
- Disinfection.
- Return activated sludge (RAS)/waste activated sludge (WAS) System.
- Thickening, Digestion and Dewatering.
- Control and Administration Building.

Although the some of the newer structures were not formally assessed, such as the laboratory and maintenance buildings, comments received from staff were noted.

Figure 3.1 below is an aerial photograph of MSD with the major process areas identified. Figure 3.2 is MSD's treatment process flow diagram.

Figure 3.1 Condition Assessment Areas

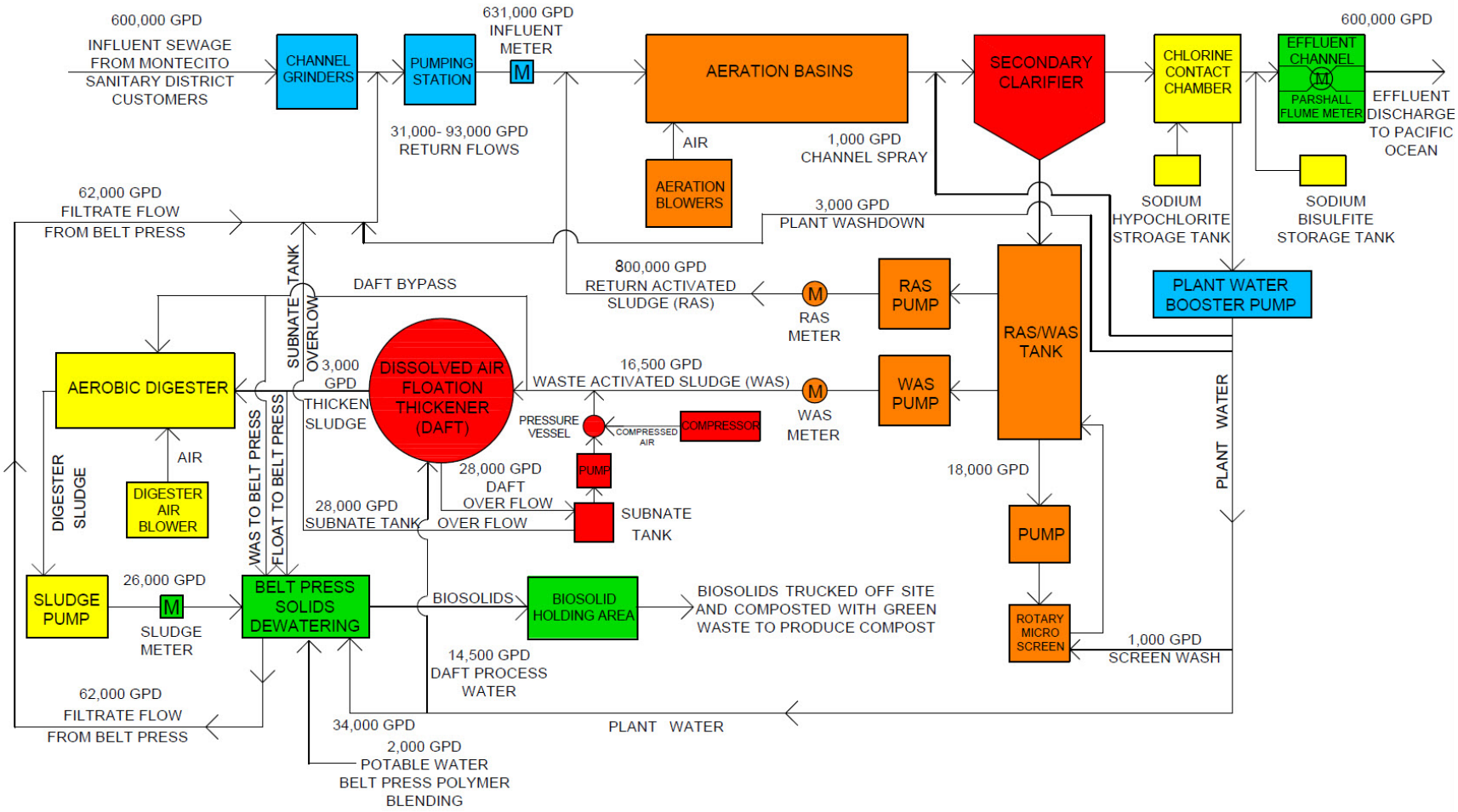


Figure 3.2 Process Flow Diagram

3.4 Observations and Findings

The following sections provide an overview of process area/locations, their relative geographical positions within the grounds of the MSD WWTP, and an overview of each process area. A summary of asset types present, along with notable observations, key photographs, and a summary condition scoring table, follows for each process area.

Each summary condition table identifies assets by asset name, provides the maximum condition score received, and lists the category or categories attributing to the maximum condition score for assets receiving a score of three or larger. The maximum value from both the general and discipline-specific questions represent the overall asset condition score and is what is presented in the findings below. The full list of assets assessed is in Appendix 3B.

3.4.1 Influent Pump Station

The IPS is a three-level process area located on the northern end of the Control and Administration Building. All MSD influent flows into a manhole just east of the IPS, and its approximate location is identified on Figure 3.1.

MSD influent enters the IPS via the influent wet well and flows through the channel grinders. Just downstream of the channel grinders, return flows from the various plant process areas are combined with plant influent for treatment. See Figure 3.2 for an overview of MSD's treatment process. The combined flow is lifted approximately 24.5 feet to street level where it continues via gravity through the influent meter.

The following notable observations were made about assets at the IPS area.

- Influent Wet Well, Gate, and Channels: The influent wet well, gate, and channels were evaluated to be in overall poor condition. The influent gate is very corroded, but staff noted it is still serviceable (Photo 3.2). Staff exercises the main influent gate regularly and they feel it is in good condition mechanically. The channels have concrete surface loss with exposed aggregate. There is concrete spalling from the side of the frame and severe corrosion of the grating supports including spalled concrete at the grating support locations (Photos 3.3 and 3.4). The stop plates used to take channels in and out of service for maintenance are operational but very corroded (Photo 3.5). There is a lot of corrosion in the channels, gates, and grating framing that supports the grating. Rehabilitation or replacement of concrete may be warranted for safety and should be carefully monitored (Photo 3.5). Staff switches channels each week to clean and de-grit the channel. Corrosion is severe at equipment conduits (grinders, Photo 3.6), and the floor coating is in poor condition.
- Influent Grinders 1 and 2: Influent Grinders 1 and 2 were evaluated to be in overall poor condition. Although the grinder units have some RUL, they are in a highly corrosive environment and require frequent maintenance and replacement approximately every 5 to 7 years. Grinder 1 was replaced this year; however, the motor was not replaced. Control panels are in a different room, which is not ideal for safety but does protect the electrical panels from corrosion.
- Influent Pumps 1 through 3: Influent Pumps 1 through 3 were evaluated to be in overall good condition. The pumps are 16 years old and are submersible pumps in a dry-well (basement level/IPS pump room). This type of pump was specifically selected so they are

protected in the event of flooding. They appear to be in good condition with minor corrosion of the exterior coating in some areas.

- IPS Pump Room (basement level): The basement level of the IPS pump room was evaluated to be in overall moderate condition. The coating on the floor is poor, and the coating has failed at the wall where the pipes penetrate. There is minor cracking and deterioration at the wall/floor joint interface.
- Influent Dry Well Sump Pump: The influent dry well sump pump was evaluated to be in overall good condition based largely on age. It was installed in 2014 and was difficult to observe during the condition assessment.
- Plant Water Pumps and Motors (intermediate level): The intermediate level plant water pumps and motors were evaluated to be in overall good condition. They are well-maintained but aged. There is corrosion on the floor and equipment baseplates, which appear to be older than some of the equipment anchored to it. In some cases, anchorage may be compromised. The pumps are not large pumps, so anchorage may not have been an issue to date. However, this could become an issue if there is a change, such as pump vibration or a seismic event.
- Froth Sprayer Pumps and Motors (intermediate level): The intermediate level froth sprayer pumps and motors were evaluated to be in overall moderate condition. There is corrosion on the floor and equipment baseplates, which appear to be older than some of the equipment anchored to it. In some cases, anchorage may be compromised. The pumps are not large pumps, so anchorage may not have been an issue to date. However, this could become an issue if there is a change, such as pump vibration or a seismic event.
- IPS (intermediate level): The intermediate level of the IPS room interior was evaluated to be in overall poor condition. It shows signs of corrosion and age. Anchorage for some pumps appear to be insufficient (Photo 3.10). Mechanical piping shows some corrosion and signs of wear. The gas monitor did not appear to be functional during the site visit, so a portable gas monitor was used. The gas monitor has since been replaced and is functioning properly. There is a drainage channel at the floor slab that is corroded with spalled concrete (Photo 3.9). The floor coating is delaminating, and the equipment hatch is damaged at the floor (hinge).
- IPS Control Panel: The IPS control panel was evaluated to be in overall good condition. Although the IPS control panel is more than 10 years old, it is in good condition with normal wear.
- IPS Variable Frequency Drives (VFDs): The IPS VFDs were evaluated to be in overall good condition with moderate rusting. They were replaced in the early 2006, but currently past their EUL. They are performing well, however, experiencing rust and corrosion inside and out. This could be due to moisture and potentially hydrogen sulfide (H_2S).
- IPS Ventilation: IPS ventilation was not formally evaluated using air changes per hour (ACH) calculations but is considered in poor condition. The space, especially in the wet well area, had strong H_2S odor, which is typical of headworks/influent wet well areas. Foul air is currently routed to the intake of the aeration blowers, which contributes to accelerated wear for the blowers, air distribution system and diffusers. More ACH would be desirable to reduce H_2S levels and corrosion in the wet well room. Staff noted that

the intake ducting is scheduled for replacement in 2022. This will be an in-kind replacement and the foul air will not be rerouted.

- Backup Generator: The backup generator was evaluated to be in overall good condition. The generator was installed in 2010 and is used as temporary or emergency power. The generator can provide power needed to operate the plant during power outages. The generator itself was found to be in good condition; however, it is aging and is the only form of redundancy for the WWTP during a power outage.
- Emergency Distribution Panel: The emergency distribution panel was evaluated to be overall good condition. The distribution panel is over 10 years old, but otherwise showing typical signs of use. Like the backup generator, this distribution panel is the only form of redundancy for the WWTP during a power outage.
- Influent Meter Vault: The influent meter vault was evaluated to be in overall moderate condition. Some corrosion was observed on the piping exterior (surface corrosion) with flaking metal. The sump pump condition was not observed but was installed in 2005.
- MCC No. 4: MCC No. 4 was evaluated to be in overall good condition. While over 10 years old, wear is typical for this asset.

Table 3.3 summarizes the condition scores for the assets at the IPS location.

Table 3.3 Condition Assessment Summary - IPS location

Condition Score	Asset Name	Reason
4 - Poor	Influent Wet Well, Gate, and Channels	• Surface Deterioration • Supports • Coating • Corrosion
4 - Poor	Influent Grinders 1 and 2	• Corrosion
2 - Good	Influent Pumps 1 through 3	
3 - Moderate	IPS Pump Room (Basement)	• General Condition • Coating
2 - Good	Influent Dry Well Sump Pump	
2 - Good	Plant Water Pumps/Motors 1 and 2	
3 - Moderate	Froth Sprayer Pumps/Motors 1 and 2	• General Condition • Corrosion
4 - Poor	IPS Intermediate Level	• General Condition • Corrosion • Coating
2 - Good	IPS Control Panel	
2 - Good	IPS VFDs	• Corrosion
4 - Poor	IPS Ventilation	• General Condition
2 - Good	Backup Generator	
2 - Good	Emergency Distribution Panel	
3 - Moderate	Influent Meter Vault, Meter and Sump Pump	• Corrosion
2 - Good	MCC No. 4	

Photo 3.1 Influent Wet Well Overview

Photo 3.2 Influent Gate

Photo 3.3 Influent Channel

Photo 3.4 Influent Stop Plate

Photo 3.5 Influent Grating

Photo 3.6 Influent Grinder

Photo 3.7 Wet Well Levels

Photo 3.8 Influent Pumps/IPS Pump Room (Basement Level)

Photo 3.9 IPS Pump Room (Intermediate Level)

Photo 3.10 IPS Pump Room (Equipment Baseplate)

Photo 3.11 IPS Control Panel

Photo 3.12 IPS VFDs

Photo 3.13 Backup Generator

Photo 3.14 Emergency Distribution Panel

Photo 3.15 Influent Meter Vault

Photo 3.16 MCC No. 4

3.4.2 Secondary Treatment

Flow continues via gravity from the influent meter to the aeration basins. MSD has two aeration basins, approximately 22.5 feet wide by 126 feet long by 16.25 feet deep. Air is supplied via blowers located in the blower room, just east of the IPS at the northerly end of the Control and Administration Building. All blowers are positive displacement. The blowers are designed for constant-speed duty, which means the only control is with turning units on and off manually. MSD typically runs Unit 1 during off-peak hours and Units 2 and 3 during peak hours to balance run times. Only one unit was operating at the time of the condition assessment. The sound level was not uncomfortable in the room. Each blower had a filter silencer; however, it is unknown if the silencers were working properly during the assessment.

Air intake comes from the influent wet well as a means of odor control. Foul air high in H_2S has caused a lot of corrosion of the inlet filter silencers and likely in the air distribution piping. An uninstalled standby blower is stored in the blower room. MSD is planning to replace the motors with units suitable for use with VFDs as part of the upcoming electrical project. They are also planning to incorporate dissolved oxygen (DO) control.

Each aeration basin has seven retrievable headers mounted on one side the aeration tank. Aeration Basins are on a three- to four-year service schedule where they are drained, and grit and debris is removed. Diffusers are checked every couple of months since swing-arm diffusers are in place.

Flow continues via gravity from the aeration basins through a concrete channel to the secondary clarifiers. Two of the secondary clarifiers were constructed in 1961, and two newer clarifiers were added as part of the 1982 plant expansion project. Flow is split between clarifiers with submerged gates. Flow split is largely accomplished with influent gates (operated fully open) and effluent weirs. Scum troughs are located at the end of each clarifier and are manually opened and closed to remove floatable material.

The following notable observations were made about assets at the secondary treatment area:

- Aeration Basin 1: Aeration Basin 1 was evaluated to be in overall moderate-to-poor condition. At the time of the condition assessment, the basin was in service so only the exterior was assessed. The west, east, and middle struts have heavy cracking on the north side and spalling is imminent (Photo 3.17). There is significant amount of cracking at the north side walkway with evidence of previous crack injection repairs and core sampling, presumably to investigate the cause of cracking (Photo 3.18). The extensive cracking observed at the top side of concrete members may be related to alkali-silica reaction (ASR), which is a long-term chemical reaction within the concrete that creates internal volumetric expansive stresses that can exceed the concrete tensile strength, resulting in cracking. Spalling was observed at the top of the east wall. Petrographic testing of the concrete can be performed to confirm this is the cause of the observed damage.
- Aeration Basin 2: Aeration Basin 2 was evaluated to be in overall moderate-to-poor condition. This basin was out of service and was entered for detailed condition assessment in addition to visual assessment. The top surface of the concrete was chipped with a chipping tool to determine the depth of deterioration (depth to sound concrete). The pH of the concrete was measured at the depth of sound concrete using a pH pencil. Typically, the pH of concrete is high (10 and higher). In addition to the

concrete cover on the reinforcement rebar, the high pH of the concrete protects the rebar from corrosion damage. A pH value of 7 and lower indicates high likelihood of corrosion damage to the reinforcement rebar, and a pH value of 8 and higher indicates low likelihood of corrosion damage to the rebar.

- Exterior Assessment: The assessment found typical concrete cracking on the top concrete walking surfaces at the guardrail post embeds (Photo 3.19). The guardrail is a z-rail with coating that has local fractures throughout. The concrete beams that span over the top of the basin generally have numerous longitudinal concrete cracks with heavier cracking observed at the middle and east beams. The west cross beam has a patch of exposed rebar but no spalled concrete (Photo 3.21). It also has large cracks similar to the middle beam (Photo 3.20). There was pervasive cracking at the south top slab with evidence of prior repairs. The south top slab appears to have structural flexure cracks at the cantilever, but these cracks might also be due to ASR. The southeast corner top slab has exposed rebar with spalled concrete. Concrete cracking was observed at the outlet windows/channels, which could be a result of rebar corrosion. The west weir plate is severely corroded and in poor condition (Photo 3.23).
- Interior Assessment: This basin was taken out of service for an interior assessment. The condition is good-to-moderate below the water line and in moderate-to-poor condition above the water surface elevation (WSE) with pervasive cracking at the top slab and bracing beams. The concrete is sound below the water line. This means the cement paste has not deteriorated. Some exposed aggregate was observed at the north side of bottom of the tank immediately adjacent to the aerators, but the concrete is sound. The north side has large (3-inch diameter) embedded steel that is exposed and has biological overgrowth. This steel is corroded at the surface, but no signs of associated cracking or spalling was observed. This steel is likely the cut anchor supports from a previously abandoned air header support system. Elsewhere, similar biological overgrowth and corrosion was observed in smaller sized pockets. There was longitudinal cracking of the bottom side of the west two bracing beams that was observed from below. Some exposed aggregate on the west wall was also observed; however, this appears to be due to poor consolidation when the concrete was originally placed. The pH of the concrete was tested at the east and west walls and was measured to be around 7. This indicates that there is a potential for the concrete to be damaged chemically, and there is a high likelihood of corrosion damage to the reinforcement rebar.

- Air Diffuser System: The air diffuser system was evaluated to be in overall poor condition due to performance issues. While the exterior of the air distribution piping and headers appeared to be in moderate condition, there were significant challenges in the performance, control, and operation of the aeration system. The diffusers were installed around 2017 and are Wyss sock-type diffusers. There are a lot of challenges with air distribution. Each aeration tank has seven retrievable headers mounted on one side of the aeration tank. This configuration results in a strong spiral roll recirculation pattern, and currently, all drop-leg valves (which are gate valves) are wide open. There are areas of excessive surface turbulence, which are indications of more air being discharged in some areas than in others. Headers 2 and 4 (out of seven) appear to have the worst air control and therefore experience the largest surface turbulence. This could be caused by

torn or damaged diffusers or restrictions in the headers that limit air flow. In addition, the manual isolation valves are gate valves, which are not very good for throttling or controlling airflow. More positive air distribution control is desirable. While diffusers are routinely replaced and in good condition, grid configuration is not optimal, air distribution system lacks sufficient control to optimize the process, and the air header interior is likely severely corroded due to foul air service. MSD should consider replacing diffusers with more energy efficient types (such as a membrane disc) with a fixed header to save power and improve performance. Staff noted that after the assessment, they air scoured the aeration basin headers and air distribution has been balanced since.

- Secondary Clarifiers Structures: The secondary clarifiers structures were evaluated to be in overall moderate-to-poor condition. Two of the secondary clarifier structures were installed in 1961 and the other two were installed in 1982. They are approximately 40 and 60 years old, had coating failure throughout the walls, and pervasive cracking at the wall tops (possible ASR cracking). Petrographic testing of the concrete can be performed to confirm the root cause of the damage. Moderate-to-severe corrosion was observed at the launder support channel. Minor aggregate corrosion and spalled concrete was observed at the east and west ends of the Secondary Clarifier No. 2. The mixed liquor gates (clarifier inlet) appear to be original, and Gates 1 through 4 (Clarifier Nos. 1 and 2) are significantly more aged than Gates 5 through 8 (Clarifier Nos. 3 and 4). Corrosion damage was observed at the base plate of the light pole.
- Secondary Treatment Clarifier Mechanical Components: The secondary treatment clarifier mechanical components were evaluated to be in moderate condition. The mechanical components, chains and scrapers are approximately 10 years old while the drives are approximately 40 years old. The drives are well maintained and utilize non-metallic parts, which helps prolong their useful life. The mixed liquor feed gates were heavily corroded, and unsubmerged metallic components are in poor condition. The scum troughs are manually operated and are in poor condition. The scum troughs have been budgeted for replacement in 2022.
- Aeration Blowers and Motors 1 through 3: Aeration Blowers and Motors 1 through 3 were evaluated to be in moderate condition. Given the age and foul air service, the blowers are in remarkable condition and have been well maintained. They appear to have useful life remaining. Insulation on discharge piping is sufficient to protect staff, and noise levels are bearable. The inlet ducting is likely very corroded and contributing to accelerated wear of the blowers, air distribution system, and diffusers. It is also recommended that the blower inlet is moved from the influent wet well to an alternate location where the H2S levels are not as high. This would trigger other improvements to handle the foul air in the influent wet well. It was also noted that Blower 3 leaks oil. All aeration blowers have been budgeted and scheduled to be replaced in 2022 as part of the Electrical Rehabilitation Project.

Photo 3.17 Aeration Basin 1 Strut Cracking

Photo 3.18 Aeration Basin 1 Walkway

Photo 3.19 Aeration Basin Cracking at Guard Post

Photo 3.20 Aeration Basin 2 Cross Beam Longitudinal Cracking

Photo 3.21 Aeration Basin 2 Exposed Rebar

Photo 3.22 Aeration Basin 2 Evidence of Repairs

Photo 3.23 Aeration Basin 2 Wier Plate

Photo 3.24 Aeration Basin 2 Channel Gate

Photo 3.25 Aeration Basin 2

Photo 3.26 Air Diffuser System

Photo 3.27 Secondary Clarifier

Photo 3.28 Secondary Clarifier

Photo 3.29 Secondary Clarifiers

Photo 3.30 Secondary Clarifiers

Photo 3.31 Aeration Basin Blowers

Photo 3.32 Aeration Basin Filter Silencer

Table 3.4 Condition Assessment Summary - Secondary Treatment

Condition Score	Asset Name	Reason
3.5 - Moderate-to-Poor	Aeration Basin 1: Overall	
4 - Poor	Aeration Basin 1: Struts and Walkways	• Damaged concrete: spalling is imminent; significant cracking
3 - Moderate	Aeration Basin 1: Walls	• Spalled concrete
3.5 - Moderate-to-Poor	Aeration Basin 2: Overall	
4 - Poor	Aeration Basin 2: Exterior	• Damaged concrete: spalled concrete, significant cracking • Possible overstress in structural components
3.5 - Moderate-to-Poor	Aeration Basin 2: Interior, above the WSE	• Possible overstress in structural components • Potential corrosion damage to the reinforcement rebar
3 - Moderate	Aeration Basin 2: Interior, below the WSE	
4 - Poor	Air Diffuser System	• Components • Performance
3.5 - Moderate-to-Poor	Secondary Clarifiers 1 through 4	• Damaged concrete • Corroded gates
3 - Moderate	Secondary Treatment Clarifier Mechanical Components	• Corrosion
3 - Moderate	Aeration Blowers and Motors 1 through 3	• Corrosion

3.4.3 Disinfection

Treated secondary effluent flows via gravity to the chlorine contact chambers where it is disinfected using sodium hypochlorite. MSD has two chlorine contact chambers, which are not symmetrical and there are flow imbalances between the two tanks.

Chlorinated effluent is dechlorinated using sodium bisulfite and discharged through a Parshall flume meter. It is then discharged to the Pacific Ocean via MSD's approximately 1,550-linear-foot ocean discharge pipeline. MSD's final effluent sampling location is just upstream of the Parshall flume.

To provide additional contact time and redundancy, and to minimize algae growth, staff has moved the original bisulfite feed location downstream from its original location. They also have added an emergency bisulfite feed in the event of a power outage.

The hypochlorite and bisulfite chemical storage areas have multiple points of failure (electrically), and this area could use an electrical overhaul. There are several junction boxes within the containment area with conduit runs embedded within the slab. The hypochlorite tank is oversized and, when full, can distribute solution by gravity to the chlorine contact tanks in an emergency.

The following notable observations were made about disinfection system assets:

- Chlorine Contact Basin Nos. 1 and 2: Chlorine Contact Basin Nos. 1 and 2 were evaluated to be in moderate condition. The coating at the basins has failed and some cracks at the top of the walls were observed. The cracks could be related to ASR. The tank coating has failed in a few locations, and staff have noticed a difference in coliforms upstream and downstream of the failure. The sampling and compliance point has also been moved upstream to allow for a more representative effluent sample point. The previous location allowed analyzer discharge flow to comingle with effluent and had the potential to skew the results. Grease and floatable material collect in the chlorine contact basins.
- Chlorine Contact Basin Mechanical Equipment: The chlorine contact basin mechanical equipment was evaluated to be in moderate condition. Some equipment shows signs of wear and corrosion, which is typical of facilities that use hypochlorite. The metallic parts and supports have significant corrosion; however, it appears to be superficial.
- Sodium Hypochlorite Storage Facility: The sodium hypochlorite storage facility was evaluated to be in poor condition. Although well maintained, there is a lot of corrosion. The diaphragm metering pumps work well and are easy to replace at the end of their useful life. The floor coating has failed. The coating is beginning to peel off the metal canopy. Moderate to minor steel surface corrosion was observed as observed as shown in (Photo 3.38). There is no longitudinal bracing, and the canopy has insufficient separation from the adjacent canopy. This condition can allow structural pounding to occur during an earthquake, which can damage the supporting columns and framing.
- Sodium Bisulfite Storage Facility: The sodium bisulfite storage facility was evaluated to be in moderate condition. The tank and piping have insulation and heat tracing to prevent freezing. There is some corrosion within the area. The containment area liner is corroded and largely non-functional. The coating is beginning to peel off the metal canopy. Moderate-to-minor steel surface corrosion was observed. There is no longitudinal bracing, and the canopy has insufficient separation from the adjacent canopy. This condition can allow structural pounding to occur during an earthquake, which can damage the supporting columns and framing.
- Analyzer Shed: The analyzer shed was not formally evaluated. MSD should continue maintaining and replacing as needed. Equipment in the shed is critical for disinfection compliance.
- Chemical Storage Canopy (west of Aeration Basin 2): The chemical storage canopy was evaluated to be in moderate condition. This single canopy metal building has a few local areas of severe corrosion. The coating is mostly intact, but severe corrosion was observed at the connections.

Photo 3.33 Chlorine Contact Basins

Photo 3.34 Chlorine Contact Basin Mechanical Equipment

Photo 3.35 Sodium Hypochlorite Storage Facility

Photo 3.36 Sodium Bisulfite Storage Facility

Photo 3.37 Chemical Storage Area Canopy

Photo 3.38 Sodium Hypochlorite Storage Facility Canopy

Table 3.5 Condition Assessment Summary - Disinfection

Condition Score	Asset Name	Reason
3 - Moderate	Chlorine Contact Basins 1 and 2	
3 - Moderate	Chlorine Contact Basin Mechanical Equipment	• Corrosion
4 - Poor	Sodium Hypochlorite Storage Facility	• Corrosion • Coating Failure
3 - Moderate	Sodium Bisulfite Storage Facility	• Corrosion • Coating Failure
3 - Moderate	Chemical Storage Canopy	• Corrosion

3.4.4 Return Activated Sludge/Waste Activated Sludge System

Telescoping valves are used to adjust RAS flow from individual clarifiers into the RAS channel, which flows to the RAS/WAS wet well. Staff measures sludge blanket levels daily and use them as a guide to adjust valves and RAS flow rate. While working, RAS control is not automated, and RAS flow pacing cannot be practiced.

RAS pumps are controlled off a level setpoint in the RAS/WAS well, while WAS flow is controlled from a flow setpoint. WAS is typically wasted 6 to 7 hours a day.

The following notable observations were made about the RAS/WAS system assets:

- RAS/WAS Wet Well and Sump Pump: The RAS/WAS wet well and sump pump were evaluated to be in overall moderate condition with very poor condition locally. The concrete is in good condition and the metal canopy/cover was rated as in moderate condition overall, and in poor condition locally. The steel tube supports for the cover beams are severely corroded and should be replaced. The anchors, metal skid, and concrete housekeeping pad for the east pump were rated at very poor condition.
- RAS Pumps and Motors: The RAS pumps and motors were evaluated to be in overall good condition. There are two RAS pumps and motors that have acceptable wear and corrosion given their age.
- WAS Pump and Motor: The WAS pump and motor were evaluated to be in overall moderate condition. The WAS pump shows more wear and corrosion on the equipment and baseplate and anchorage. The pump pad and skid are in very poor condition. The WAS pump motor, base and piping is scheduled to be replaced in 2022. There is an uninstalled spare for redundancy, and wasting can also be accomplished via the RAS pumps.
- Rotary Microscreen and Pump: The rotary microscreen and pump were evaluated to be in excellent condition. The rotary drum thickener and feed pump were replaced approximately one year ago. The unit was designed to remove grit and debris, but staff has noted that it does not remove a lot of material.
- RAS/WAS VFDs: The RAS/WAS VFDs were evaluated to be in overall good condition. VFDs were added to the RAS and WAS pumps six to seven years ago. The panels in the area look new and are in good shape. One of the RAS VFDs kept failing but was replaced three years ago.

- RAS Dry Well Sump Pump: The RAS dry well sump pump was not evaluated. The sump pump and control is budgeted and scheduled for replacement in 2022.
- MCC No. 2: MCC No. 2 was evaluated to be in overall good condition. While more than 10 years old, it is in good condition with typical wear for its age.
- MCC No. 2 Control Panel: MCC No. 2 Panel was evaluated to be in overall good condition. It is more than 10 years old. It is showing typical aging but is in overall good condition.
- Distribution Panels: The distribution Panels by MCC2 were evaluated to be in very poor condition. This pertains to distribution panels A1, B1, the 45 kilovolt-ampere (kVA) transformer and 5-kVA transformer and disconnect. This electrical equipment is more than 20 years old and is deteriorated and obsolete. The blower distribution panels have been budgeted and scheduled for replacement in 2022.

Photo 3.39 RAS/WAS Wet Well

Photo 3.40 RAS/WAS Pumps

Table 3.6 Condition Assessment Summary - RAS/WAS System

Condition Score	Asset Name	Reason
3 - Moderate	RAW/WAS Wet Well and Pump	• Corrosion
2 - Good	RAS Pumps and Motors	
3 - Moderate	WAS Pump and Motor	• Corrosion
1 - Excellent	Rotary Micro Screen and Pump	
2 - Good	RAS/WAS VFDs	
NA	RAS Dry Well Pump	
2 - Good	MCC No. 2	
2 - Good	MCC No. 2 Control Panel	• Obsolete
5 - Very Poor	Distribution Panels	• Overall Condition • Deterioration • Obsolete

3.4.5 Thickening, Digestion, and Dewatering

WAS is pumped to the new dissolved air flotation thickener (DAFT). The DAFT achieves 3 to 3.5 percent thickened solids. The same polymer is being used for both the DAFT and belt filter press (BFP). Thickened waste activated sludge (TWAS) is pumped to the aerobic digester.

MSD has one aerobic digester with two blowers housed in the digester blower building. Digesters are continuously aerated with a target DO above 0.3 milligrams per liter, or just enough to keep it aerobic and prevent odors. WAS can be pumped directly to the digester if the DAFT is out of service. There is adequate storage in the digester to hold approximately 2 to 3 weeks of TWAS if empty.

The sludge dewatering area was constructed in 1997 and overhauled in 2013. The BFP achieves 17 to 18 percent thickened solids, and it uses the same polymer as the DAFT. Jar testing was performed as part of polymer selection.

The BFP typically operates once per week, and cake is stored in roll-off bins under a canopy. Biosolids are hauled off to a facility that further processes it for reuse in the community as composting.

The following notable observations were made about the biosolids handling assets:

- DAFT: The DAFT was evaluated to be in excellent condition. Although it is new (2018), some pitting and rust was observed on the outside of the stainless-steel piping, particularly at joints and welds. Continue monitoring minor rust and corrosion on new stainless-steel piping.
- TWAS Pumps: The TWAS pumps are in moderate condition. Staff is experiencing performance and reliability issues with these pumps. They are expensive to maintain, for example, the wear plate and lobe are replaced every six months and cost approximately $5,000 per unit. It may be more economical to purchase a new progressive cavity pump. The wearing of the TWAS pumps is believed to be due to grit and debris.
- Aerobic Digester: The aerobic digester was evaluated to be in good condition. The coated concrete is in good condition with minor defects in the coating. Severe corrosion was observed at one pipe support on the east side.
- Digester Blowers 1 and 2: Digester Blowers 1 and 2 were evaluated to be in overall good condition. The DO probes in the digester do not work properly; however, DO is monitored daily by Operations using handheld probes. The digester uses the same diffusers as in the aeration basins and have manual valves for air distribution and control. The blowers are over 25 years old and are expected to need replacement or rehabilitation in the next 5 to 15 years. They are currently budgeted and scheduled for replacement in 2022.
- Polymer Mix Area: The polymer mix area was not formally assessed. New in 2018, it was assumed to be in similar condition as the DAFT.
- BFP: The BFP was evaluated to be in good overall condition. Although in good condition, new rollers are needed. The belts are replaced every six to seven years. The incline conveyor works well and is able to keep cake on the conveyor and the surrounding area clean. The facility is aging well given its limited use and robust maintenance.
- Digester Blower Building: The Digester Blower Building was evaluated to be in moderate condition. The door has minor-to-moderate corrosion at the hardware. The roofing is in

fair condition. The walls are concrete masonry units (CMUs) with a wood-framed roof comprised of pre-engineered trusses overlain with a plywood diaphragm. No wall anchorage was visible at the north and south walls. This indicates a possible incomplete load transfer in the lateral force resisting system and could be a potential seismic deficiency.

- MCC No. 3: MCC No. 3 was evaluated to be in very poor condition. It is more than 30 years old, and while still functioning, the equipment is obsolete.
- Annunciator Panel: The annunciator panel was evaluated to be in very poor condition. It is more than 20 years old, deteriorating, and in very poor condition. It is also obsolete.

Photo 3.41 DAFT

Photo 3.42 Aerobic Digester

Photo 3.43 Belt Filter Press

Photo 3.44 Blower Room Distribution Panels

Photo 3.45 MCC No. 3

Photo 3.46 Annunciator Panel

Table 3.7 Condition Assessment Summary - Thickening

Condition Score	Asset Name	Reason
1 - Excellent	DAFT	
3 - Moderate	TWAS Pumps	• Performance • Reliability
2 - Good	Aerobic Digester	
2 - Good	Digester Blowers 1 and 2	
1 - Excellent	Polymer Mix Area	
2 - Good	Belt Filter Press	
	Digester Blower Building	
5 - Very Poor	MCC No. 3	• Overall Condition • Deterioration • Obsolete
5 - Very Poor	Annunciator Panel	• Overall Condition • Deterioration • Obsolete

3.4.6 Control and Administration Building

This building is on the eastern side of MSD property and houses administrative staff, the board room, and kitchen on the south side. The operations equipment room is in the middle, and the aeration blower room and IPS are north of the operations equipment room. Inside the operations equipment room is the main switchboard and MCC No. 1.

The existing electrical system is NOT grounded. In the operations building, staff are near panels and switchgear, which may be a safety hazard. There is a near-term project that will replace the aeration basin blowers and motors and various electrical equipment in the operations building.

- Control and Administration Building: The Control and Administration Building was evaluated to be in moderate condition. It is suspected that most of the electrical equipment is not anchored. Most of the electrical panels will be replaced as part of the upcoming electrical project. It is suspected that the east side has no defined lateral load resisting system. The roof diaphragm consists of steel framing. There is separation occurring at the CMU wall intersection north of the electrical panels. The ceiling panels appear worn with some water stains and loose panels. Uncommon diaphragm construction was observed above the ceiling; this could possibly be gypcrete, which is an obsolete diaphragm system that has minimal strength for resisting seismic loads. The monorail braces are missing anchorage to the CMU wall. Dry rot was observed at the northeast corner low roof eave. There is no clear lateral load resisting system at the north end of the building. The west side has CMU that could brace the building if proper connections are present. The diaphragm connections are unknown at the transverse CMU walls. **Based on structural conditions observed, a seismic evaluation is recommended.**
- MCC No. 1: MCC No. 1 was evaluated to be in very poor condition. This is due to its overall age, condition, deterioration, and obsolescence. It is scheduled for replacement in the upcoming electrical project.
- Newer Automatic Transfer Switch (ATS): The newer ATS was evaluated to be in overall good condition. Although more than 10 years old, it is in good condition with wear that is typical for its age. It is scheduled to be replaced in conjunction with the upcoming electrical project.
- Old ATS: The old ATS was evaluated to be in very poor condition. This asset is past its useful life, in very poor condition, deteriorated, and obsolete. This ATS is on the upcoming electrical project for replacement.
- Old Control and Automatic Dialer Alarm (ADA) Alarm Panel: The old control and ADA alarm panel was evaluated to be in very poor condition. This asset is past its useful life, in very poor condition, deteriorated, and obsolete. While the ADA system is currently functioning properly and has not had any failures in the past, it is recommended to replace it due to its age. Staff noted that the ADA system is currently used in other locations throughout MSD. The control panel is on the upcoming electrical project for replacement.

- Service and Metering Cabinet: The service and metering cabinet was evaluated to be in very poor condition. This asset is past its useful life, in very poor condition, deteriorated, and obsolete. This metering cabinet is on the upcoming electrical project for replacement.
- Distribution Panels: The distribution panels were evaluated to be in very poor condition. These panels are located outside of the office building or inside the Control and Administration Building and consist of Panel LP-D, the 10-kVA transformer, Transformer E, Panel E, and Panels A and B. These assets are more than 20 years old, in very poor condition, deteriorated, and obsolete. Some of these panels will be replaced in conjunction with the upcoming electrical project.

Photo 3.47 MCC No. 1

Photo 3.48 Old ATS

Photo 3.49 Old Control and ADA Alarm Panel

Photo 3.50 Service and Metering Cabinet

Photo 3.51 Distribution Panels

Table 3.8 Condition Assessment Summary - Control and Administration Building

Condition Score	Asset Name	Reason
3 - Moderate	Control and Administration Building	
5 - Very Poor	MCC No. 1	• Age • Condition • Deterioration • Obsolete
2 - Good	Newer ATS	
5 - Very Poor	Old ATS	• Age • Condition • Obsolete
5 - Very Poor	Old Control and ADA Alarm Panel	• Age • Condition • Deterioration • Obsolete
5 - Very Poor	Service and Metering Cabinet	• Age • Condition • Deterioration • Obsolete
5 - Very Poor	Distribution Panels	• Age • Condition • Deterioration • Obsolete

3.4.7 Laboratory and Maintenance Buildings

The laboratory is a newer building, constructed in 2010. The building was not formally assessed as part of this scope of work due to its age.

The maintenance building was put in service in 2007. It was not formally assessed and is assumed to be in excellent condition due to its age. It is desirable to have one additional toilet in the men's locker area. Currently there is one toilet for women, and that is sufficient at this time. Staff would benefit from a "mud" room that could be separate from the clean area.

Trailers were brought in to provide staff separation during the COVID-19 pandemic.

3.4.8 Ancillary Structures/Miscellaneous Assets

The following are notable observations regarding ancillary structures/miscellaneous assets:

- Storage Canopy: The storage canopy was evaluated to be in poor condition. There is severe local corrosion on the steel members at the base of the columns. The coating has failing on the underside of the deck, and there is no longitudinal bracing on the north side. The southeast column is damaged by impact, and there is a hole in the ridge at the east end. This is possibly due to corrosion damage.
- Lighting: Lighting was evaluated to be in overall very poor condition. The lighting is more than 20 years old and is in very poor condition, deteriorated, and obsolete.

- Pipes and Manholes: Pipes and manholes were not formally evaluated. A record drawing review revealed that most of the WWTP pipes and manholes appear to be either constructed as part of the WWTP original construction (1961) or constructed during the 1982 upgrade. These structures would be 40 to 60 years old. It is recommended that staff perform manhole and pipeline inspections (where feasible) to get a baseline condition assessment of all in-plant pipelines and manholes.
- Ocean Outfall: A desktop evaluation was performed on the ocean outfall. It was constructed in and is approximately 60 years old. The outfall is approximately 1,550 linear feet and is constructed of 18-inch cast iron pipe with a 90-foot diffuser section at the end.

  In 2003, a report by Brown and Caldwell estimated that the EUL of the outfall pipe was 75 years. They also recommended to replace the diffusers and re-ballast the outfall every 15 years. That same year, a contractor replaced the outfall diffusers with Tideflex valves. Tideflex valves are anticipated to have an EUL of 30 years. Additionally, the contractor installed a concrete saddle at an unsupported span of pipe in the surf zone.

  A review of the 2021 dive survey performed by Aquatic Bioassay Consulting showed the Tideflex valves functioning properly. There was a considerable amount of biological growth on the valves and outfall pipe itself. The shallow section had sections of unsupported pipe.

  It is recommended that MSD perform a condition assessment of the interior of the outfall pipe. This does not appear to have been previously done, and with the outfall undermined twice in the past 20 years, plus its overall age (60 years), a better understanding potential damage that cannot be observed from a dive survey is recommended.

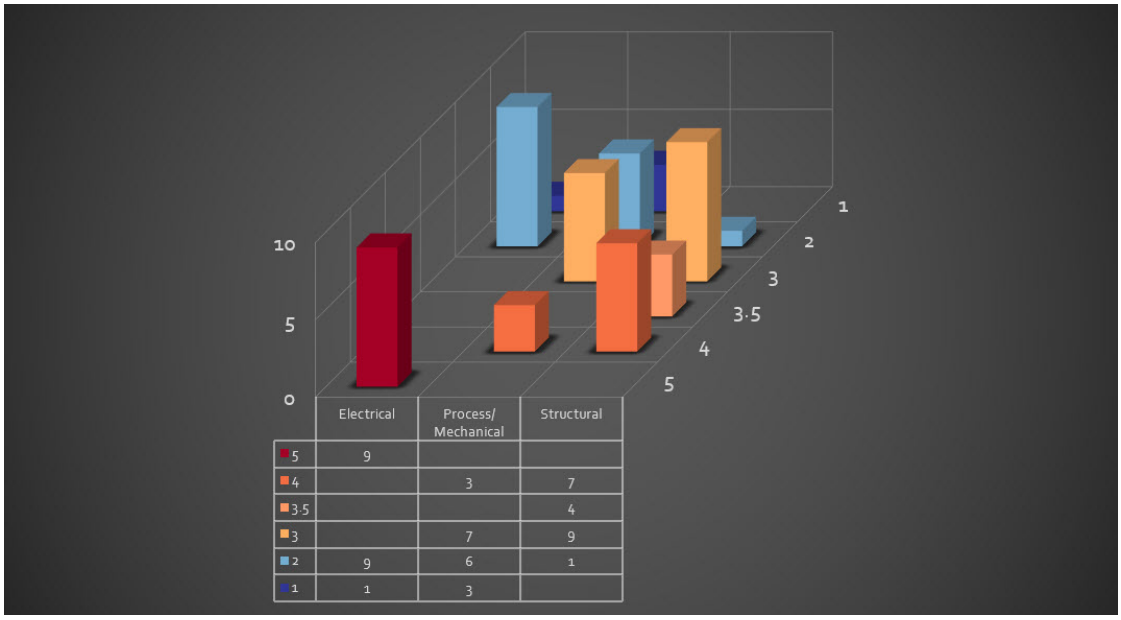
  It is recommended that MSD perform an assessment of the outfall so that condition can be correlated with age. This will allow MSD to better plan for the timing and extent of the outfall repairs or rehabilitation.

Table 3.9 Condition Assessment Summary - Ancillary Structures/Miscellaneous Assets

Condition Score	Asset Name	Reason
4 - Poor	Storage Canopy	• Corrosion • Condition • Coating
5 - Very Poor	Lighting	• Age • Condition • Obsolete
Not Evaluated	Pipes and Manholes	
4 - Poor	Ocean Outfall	• Age • Condition

3.5 Conclusion

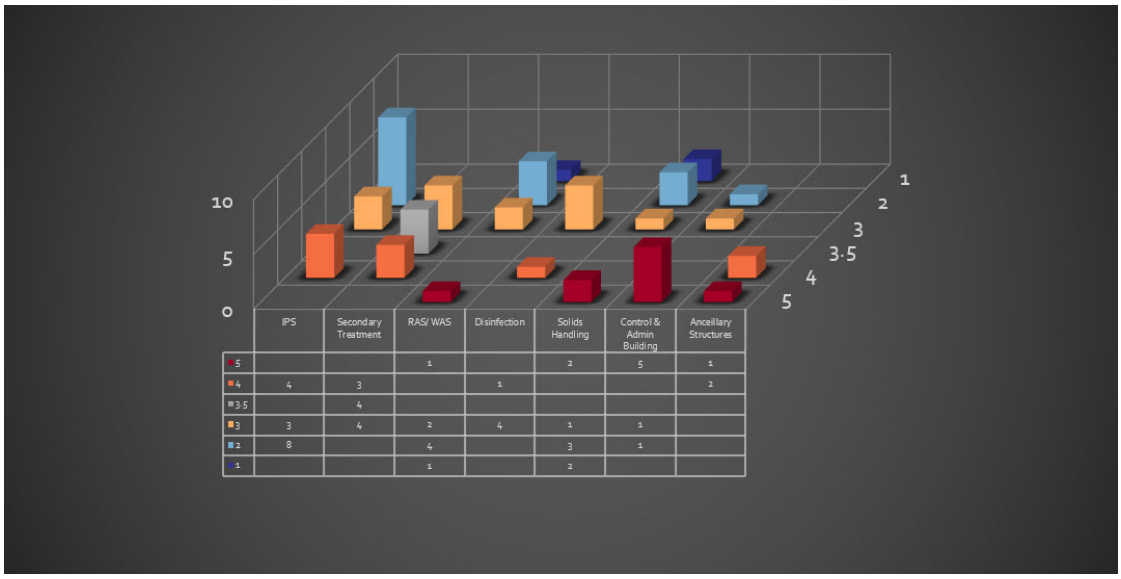
This TM presents the condition assessment results for the MSD WWTP. The results are summarized by discipline in Figure 3.3. Overall, electrical assets were the only assets that scored in very poor condition, and most of these assets are scheduled for replacement in 2022. Structural assets had the most assets scoring in the moderate to poor range.



	Electrical	Process/ Mechanical	Structural
5	9		
4		3	7
3.5			4
3		7	9
2	9	6	1
1	1	3	

Figure 3.3 Condition Assessment Scores by Discipline

Scores by process area show are illustrated in Figure 3.4 below. It shows that assets in the poor to very poor are throughout the WWTP and can affect nearly all process areas.



	IPS	Secondary Treatment	RAS/ WAS	Disinfection	Solids Handling	Control & Admin Building	Ancillary Structures
5			1		2	5	1
4	4	3		1			2
3.5		4					
3	3	4	2	4	1	1	
2	8		4		3	1	
1			1		2		

Figure 3.4 Condition Assessment Scores by Process Area

The results from this condition assessment will be used along with results from an upcoming performance and capacity evaluation to identify replacement, rehabilitation, and capacity needs over the next 30 years.

-This Page Intentionally Left Blank-

Appendix 3A

MSD CONDITION SCORING

Montecito Sanitary District

Condition Scoring (Vertical Assets)

Mechanical						
	Condition Score					
	0 NOT APPLICABLE	**1 EXCELLENT**	**2 GOOD**	**3 MODERATE**	**4 POOR**	**5 VERY POOR**
General Condition	N/A	New or excellent condition and no observed defects.	Well maintained with some wear. No rehabilitation or repair needed.	Functionally acceptable with minor wear. Minor repair or rehabilitation should be planned.	Significant wear or degradation. Requires a high level of maintenance to remain operational. Repair or major rehabilitation needed.	Expected life exceeded and high likelihood breakdown or failure. Immediate replacement or rehabilitation required.
Corrosion/ Exterior	N/A	No deterioration, wear or damage.	Minor and localized coating loss, rust or corrosion.	Moderate corrosion, coating loss or damage requiring maintenance.	Significant or wide-spread corrosion, damage or wear not affecting operation.	Severe corrosion, damage, or wear or impacts to operation.
Vibration	N/A	No observable.	Minor vibration, typical of equipment.	Moderate vibration, clearly visible.	Significant vibration, clearly visible and audible.	Excessive vibration, clearly visible with loud rattling.
Temperature	N/A	Equipment is reported to operate within temperature tolerances.	Equipment is reported to operate outside temperature tolerances, but nothing inhibiting functionality.	Equipment sometimes overheats and requires frequent maintenance.	Equipment often overheats and is not reliable.	Equipment rapidly overheats and is not capable of continuous running.
Leakage	N/A	No evidence of leakage.	Evidence of history of minor leaks.	Evidence of leakage or observed minor leaks.	Actively leaking more than is designed, in need of seal replacement.	Excessively leaking or seals deteriorated.
Components	N/A	No observed defects.	Minor wear, maintenance needed.	Significant wear or moderate corrosion, repair should be planned.	Significant damage or corrosion, repair or rehabilitation needed.	Severe degradation, deterioration or component failure.

Montecito Sanitary District

Condition Scoring (Vertical Assets)

Structural	Condition Score					
	0 NOT APPLICABLE	**1 EXCELLENT**	**2 GOOD**	**3 MODERATE**	**4 POOR**	**5 VERY POOR**
General Condition	N/A	New or excellent condition and no observed defects.	Well maintained with some wear. No rehabilitation or repair needed.	Functionally acceptable with minor wear. Minor repair or rehabilitation should be planned.	Significant wear or degradation. Requires a high level of maintenance to remain operational. Repair or major rehabilitation needed.	Expected life exceeded and high likelihood breakdown or failure. Immediate replacement or rehabilitation required.
Surface Deterioration	N/A	No observed defects.	Minor cracking, localized corrosion or surface wear. No repairs needed.	Moderate cracking or corrosion, minor surface spalling, repairs needed.	Major cracking, surface aggregate showing, exposed rebar, delaminated concrete, significant corrosion.	Major cracking or corrosion, corroded rebar, deterioration affecting structural integrity.
Coating/ Lining/ Paint	N/A	Recently applied.	Minor deterioration or wear.	Visible deterioration, cracking, bubbling, or peeling.	Widespread or large areas of failure, reapplication needed soon.	Significant areas or complete system failure, no longer protecting structure.
Leakage	N/A	No evidence of leakage.	Evidence of past leakage.	Observed leakage or moist surface.	Active leakage, repair needed.	Excessive leakage, emergency repair needed.
Foundation/ Supports	N/A	No observed defects.	Minor defects, evidence of minor movement from construction.	Observed defects, visible movement with no impact on structure.	Significant defects, measurable displacement impacting structure.	Severe defects, major movement affecting structural integrity.
Components	N/A	No observed defects.	Minor deterioration, maintenance needed.	Significant deterioration, repair should be planned.	Significant damage or deterioration, repair or rehabilitation needed.	Severe degradation, deterioration or component failure.

Montecito Sanitary District

Condition Scoring (Vertical Assets)

Electrical						
	Condition Score					
	0 NOT APPLICABLE	**1 EXCELLENT**	**2 GOOD**	**3 MODERATE**	**4 POOR**	**5 VERY POOR**
General Condition	N/A	New or excellent condition and no observed defects.	Well maintained with some wear. Not rehabilitation or repair needed.	Functionally acceptable with minor wear. Minor repair or rehabilitation should be planned	Significant wear or degradation. Requires a high level of maintenance to remain operational. Repair or major rehabilitation needed.	Expected life exceeded and high likelihood breakdown or failure. Immediate replacement or rehabilitation required.
Equipment	N/A	Fully operable, no issues.	Minor defects or issues.	Intermittent or inconsistent issues.	Components malfunctioning or inoperable, equipment nearing expected life.	Not operable, equipment beyond expected life and in need of replacement.
Enclosure	N/A	No observed defects.	Minor wear or dirt buildup.	Moderate wear or corrosion, air vents dirty.	Significant corrosion, door hard to open or close, obstructed.	Enclosure not adequate, excessive corrosion or holes, indicators not working.
Temperature/ Noise	N/A	No observed heat or noise.	Heat or noise levels within expected operating ranges	Occasional overheating or abnormal noise, requires maintenance.	Often overheats or makes excessive noise, not reliable.	Rapidly overheats, makes alarming noises or is not capable of continuous operation.
Wiring/ Cable Condition	N/A	Excellent condition, no observed defects.	Good condition with minor defects.	Moderate condition, but requires significant maintenance.	Poor condition and requires rehabilitation.	Very poor condition and requires replacement.
Components	N/A	No observed defects.	Some corrosion or wear.	Parts missing.	Excessive corrosion or wear.	Not functional.

Montecito Sanitary District

Condition Scoring (Vertical Assets)

Instrumentation & Controls						
	Condition Score					
	0 NOT APPLICABLE	**1 EXCELLENT**	**2 GOOD**	**3 MODERATE**	**4 POOR**	**5 VERY POOR**
General Condition	N/A	New or excellent condition and no observed defects.	Well maintained with some wear. Not rehabilitation or repair needed.	Functionally acceptable with minor wear. Minor repair or rehabilitation should be planned.	Significant wear or degradation. Requires a high level of maintenance to remain operational. Repair or major rehabilitation needed.	Expected life exceeded and high likelihood breakdown or failure. Immediate replacement or rehabilitation required.
Equipment/ Transmitter	N/A	Fully operable, no issues.	Minor defects or issues.	Intermittent or inconsistent issues.	Components malfunctioning or inoperable, no longer compatible with other equipment.	Not operable, equipment beyond expected life and in need of replacement.
Display/ Enclosure/ Mount	N/A	No observed defects.	Minor wear or deterioration.	Moderate wear or corrosion, display hard to read.	Significant corrosion, display cannot be read, interface issues.	Not adequate, excessive corrosion or holes, indicators not working.
Wiring/ Cable Condition	N/A	Excellent condition, no observed defects.	Good condition with minor defects.	Moderate condition but requires significant maintenance.	Poor condition and requires rehabilitation.	Very poor condition and requires replacement.
Components	N/A	No observed defects.	Some corrosion or wear.	Parts missing.	Excessive corrosion or wear.	Not functional.

Appendix 3B

SUMMARY TABLE OF SCORES

Condition Score	Asset Name	Reason
4 - Poor	Influent Wet Well, Gate, and Channels	• Surface Deterioration • Supports • Coating • Corrosion
4 - Poor	Influent Grinders 1 and 2	• Corrosion
2 - Good	Influent Pumps 1 through 3	
3 - Moderate	IPS Pump Room (Basement)	• General Condition • Coating
2 - Good	Influent Dry Well Sump Pump	
2 - Good	Plant Water Pumps/Motors 1 and 2	
3 - Moderate	Froth Sprayer Pumps/Motors 1 and 2	• General Condition • Corrosion
4 - Poor	IPS Intermediate Level	• General Condition • Corrosion • Coating
2 - Good	IPS Control Panel	
2 - Good	IPS VFDs	• Corrosion
4 - Poor	IPS Ventilation	• General Condition
2 - Good	Backup Generator	
2 - Good	Emergency Distribution Panel	
3 - Moderate	Influent Meter Vault, Meter and Sump Pump	• Corrosion
2 - Good	MCC No. 4	

Condition Score	Asset Name	Reason
3.5 - Moderate-to-Poor	Aeration Basin 1: Overall	
4 - Poor	Aeration Basin 1: Struts and Walkways	• Damaged concrete: spalling is imminent; significant cracking
3 - Moderate	Aeration Basin 1: Walls	• Spalled concrete
3.5 - Moderate-to-Poor	Aeration Basin 2: Overall	
4 - Poor	Aeration Basin 2: Exterior	• Damaged concrete: spalled concrete, significant cracking • Possible overstress in structural components
3.5 - Moderate-to-Poor	Aeration Basin 2: Interior, above the WSE	• Possible overstress in structural components • Potential corrosion damage to the reinforcement rebar
3 - Moderate	Aeration Basin 2: Interior, below the WSE	
4 - Poor	Air Diffuser System	• Components • Performance
3.5 - Moderate-to-Poor	Secondary Clarifiers 1 through 4	• Damaged concrete • Corroded gates
3 - Moderate	Secondary Treatment Clarifier Mechanical Components	• Corrosion
3 - Moderate	Aeration Blowers and Motors 1 through 3	• Corrosion
3 - Moderate	Chlorine Contact Basins 1 and 2	
3 - Moderate	Chlorine Contact Basin Mechanical Equipment	• Corrosion
4 - Poor	Sodium Hypochlorite Storage Facility	• Corrosion • Coating Failure
3 - Moderate	Sodium Bisulfite Storage Facility	• Corrosion • Coating Failure
3 - Moderate	Chemical Storage Canopy	• Corrosion
3 - Moderate	RAW/WAS Wet Well and Pump	• Corrosion
2 - Good	RAS Pumps and Motors	
3 - Moderate	WAS Pump and Motor	• Corrosion
1 - Excellent	Rotary Micro Screen and Pump	
2 - Good	RAS/WAS VFDs	
NA	RAS Dry Well Pump	
2 - Good	MCC No. 2	
2 - Good	MCC No.2 Control Panel	• Obsolete

Condition Score	Asset Name	Reason
5 - Very Poor	Distribution Panels	• Overall Condition • Deterioration • Obsolete
1 - Excellent	DAFT	
3 - Moderate	TWAS Pumps	• Performance • Reliability
2 - Good	Aerobic Digester	
2 - Good	Digester Blowers 1 and 2	
1 - Excellent	Polymer Mix Area	
2 - Good	Belt Filter Press	
	Digester Blower Building	
5 - Very Poor	MCC No. 3	• Overall Condition • Deterioration • Obsolete
5 - Very Poor	Annunciator Panel	• Overall Condition • Deterioration • Obsolete
3 - Moderate	Control and Administration Building	
5 - Very Poor	MCC No. 1	• Age • Condition • Deterioration • Obsolete
2 - Good	Newer ATS	
5 - Very Poor	Old ATS	• Age • Condition • Obsolete
5 - Very Poor	Old Control and ADA Alarm Panel	• Age • Condition • Deterioration • Obsolete
5 - Very Poor	Service and Metering Cabinet	• Age • Condition • Deterioration • Obsolete

Condition Score	Asset Name	Reason
5 - Very Poor	Distribution Panels	• Age • Condition • Deterioration • Obsolete
4 - Poor	Storage Canopy	• Corrosion • Condition • Coating
5 - Very Poor	Lighting	• Age • Condition • Obsolete
Not Evaluated	Pipes and Manholes	
4 - Poor	Ocean Outfall	• Age • Condition