Attachment B

FINAL

SOUTH CENTRAL WASTEWATER TREATMENT FACILITY HEADWORKS ODOR CONTROL AND STRUCTURAL ASSESSMENTS TECHNICAL MEMORANDUM

Brevard County, Florida

B&V PROJECT NO. 421429

PREPARED FOR

Brevard County, Florida

17 APRIL 2026

Professional Engineer:

Professional Engineer:	______________________ **Signature**	4/17/2026 **Date**
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	77093 **License No.**	

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1.0 Introduction

The South Central Wastewater Treatment Facility (SCWWTF) is an activated sludge advanced wastewater treatment facility with a rated capacity of 12 million gallons per day (MGD) annual average daily flow (AADF). The SCWWTF is located in Viera, Florida, and is owned and operated by Brevard County Utility Services Department (BCUSD).

The SCWWTF service area consists of mainly residential areas with few commercial areas along major thoroughfares. A system of gravity mains, lift stations, and force mains collect and deliver raw wastewater to the SCWWTF for treatment and disposal. Additionally, the facility accepts both septage and landfill leachate.

The existing pretreatment structure at the SCWWTF was completed in 2019 as part of a facility expansion to increase the rated treatment capacity from 5.5 MGD AADF to the current rated capacity of 12 MGD AADF. Flow is sent to the pretreatment structure at SCWWTF via force main from off-site lift stations. The pretreatment structure consists of elevated concrete channels, equipped with mechanical step screens, grit removal system, and mechanical drum screens. The flow channels are covered with fiberglass reinforced polymer panels, and a biological odor control system is utilized to remove and treat sewer gases from the channel headspace.

In 2021, BCUSD operations staff observed what appeared to be significant deterioration of the concrete within the channels of the pretreatment structure. Additionally, the equipment in and around the channels showed signs of corrosion, causing concern regarding ambient concentrations of hydrogen sulfide (H_2S), a corrosive, hazardous gas formed by wastewater.

To achieve a better understanding of the extent of damage, feasibility of repair, and recommendations for repair, BCUSD engaged Black & Veatch to complete a structural condition assessment of the pretreatment structure. To help reduce the extent of future H_2S impacts to the structure, an odor control assessment was also completed to assess the adequacy of ventilation and effectiveness of the existing odor control system and provide recommendations for improvements.

2.0 Odor Control Assessment

2.1 Existing Odor Control Systems

Brevard County currently employs liquid and vapor phase odor control systems to treat odors in the collection systems and headworks. These systems are described in the sections below.

2.1.1 Headworks Odor Control System

An existing biotrickling filter shown on Figure 2-1 is currently used to mitigate odors at the headworks. Table 2-1 summarizes the key features of the existing unit. The unit is monitored and operated by a third party.

Figure 2-1 Existing Odor Control Unit at Headworks

Table 2-1 Odor Control Key Features

Description	Criteria
Technology	Biotrickling filter
Manufacturer	Odyssey Manufacturing Company
Airflow[1] (cfm)	2,000
Average/ Peak H_2S (ppm)	100/500
Irrigation rate[1] (gpm)	40
1. The system was originally designed with a 20 gpm irrigation system and 1,600 cfm and was increased to a 40 gpm irrigation system and 2,000 cfm blower speed.	

As shown in the table, the biotrickling filter currently treats 2,000 cfm. Black & Veatch estimated potential treatment needs for the headworks (assuming a target ventilation rate of 12 air changes per hour in enclosed spaces) and determined that this ventilation rate, overall, is adequate. However, the exhaust rate from individual areas of the headworks (shown on drawings for the system) could not be confirmed in the field. Thus, it is uncertain that the relative balance of air collection from individual areas is adequate.

2.1.2 Collection System Odor Control

BCUSD injects magnesium hydroxide (Thioguard) into wastewater at three lift stations (W-15, T-16, T-07) to reduce odors in their collection system.

In addition to the Thioguard addition, the three lift stations are equipped with biotrickling filters to treat odors from the wet well headspace. BCUSD has not reported issues with the system's performance or maintenance. Figure 2-2 shows the odor control systems installed at each of the three lift stations.

Figure 2-2 Thioguard Addition System (Left) and Biotrickling Filter (Right)

2.2 Odor Monitoring and Field Investigations

To support the assessment of current odor control strategies, Black & Veatch conducted an odor monitoring program at the SCWWTP. Prior to program execution, a sampling plan was developed for BCUSD (refer to Appendix A).

2.2.1 Parameters and Measurement Locations

Table 2-2 highlights the parameters measured during the program, sampling locations, and methods used.

Table 2-2 Odor Monitoring Parameters, Methods, and Locations Summary

Matrix	Parameter	Measurement Method	Locations
Air	Hydrogen sulfide	H_2S Acrulog data loggers	• Headworks (upstream end) • Headworks (downstream end) • Odor control inlet • Odor control outlet
	Methyl mercaptan	Dräger colorimetric tubes	• Odor control inlet • Odor control outlet
	Differential pressure (DP)	DP Acrulog data loggers	• Headworks (downstream end)
Wastewater	Sulfide	LaMotte Sulfide Kit	• Headworks influent (before RAS) • Headworks Influent (after RAS) • Headworks (downstream end) • Lift Station (T-16) • Lift Station (T-07) • Lift Station (W-15)
	pH	Thermo Scientific Orion pH meter	• Headworks influent (before RAS) • Headworks Influent (after RAS) • Headworks (downstream end) • Lift Station (T-16) • Lift Station (T-07) • Lift Station (W-15)

Acrulog data loggers were deployed to continuously monitor H_2S concentrations at the headworks and odor control unit inlet and outlet. In addition, a Acrulog DP logger was deployed at the headworks to continuously monitor DP. Sampling dates and duration are summarized in Table 2-3.

Table 2-3 Acrulog Data Loggers Sampling Dates and Duration

Locations	Install Date	Retrieval Date
Odor Control Inlet	12/10/2024	12/16/2024
Odor Control Outlet	12/10/2024	12/16/2024
Headworks (upstream end)	12/11/2024	12/16/2024
Headworks (downstream end)	12/11/2024	12/16/2024

Grab sampling of methyl mercaptan was conducted as a general indicator of organo-sulfur compounds at the odor control unit. Organo-sulfur compounds can present challenges for odor treatment and are a consideration in odor treatment technology selection and design. Liquid sampling included grab samples for wastewater sulfide. When wastewater undergoes turbulence through conveyance, wastewater sulfide is volatilized from the wastewater into the atmosphere as vapor phase H_2S. Liquid sulfide sampling provides an indication of potential H_2S release from wastewater to the atmosphere.

2.2.2 Headworks Results

2.2.2.1 H2S Monitoring

Two Acrulogs with a range of 0-1000 parts per million (ppm) were suspended inside channels at the upstream and downstream end of the headworks, as illustrated on Figure 2-3. The monitoring results are shown in Table 2-4, Figure 2-4 and Figure 2-5. All Acrulogs graphs are provided in Appendix B.

Figure 2-3 H_2S Datalogger – Headworks Downstream

Table 2-4 Headworks H_2S Datalogging Summary

Locations	Avg H_2S (ppm)	Max H_2S (ppm)
Headworks (upstream end)	11	75[2]
Headworks (downstream end)[1]	178	1,100

1. Acrulog logging interrupted from 12/13/24 – 12/16/24 due to FOG buildup on sensor.
2. The erroneous outlier value was eliminated and not considered in calculating the max H_2S for the headworks (upstream end).

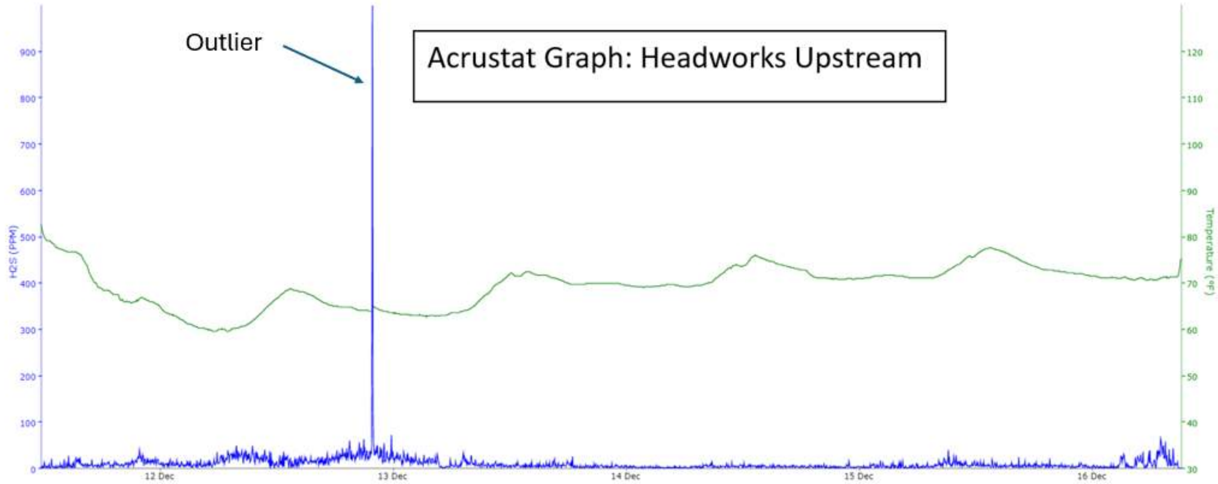

Figure 2-4 Upstream Acrustat Data

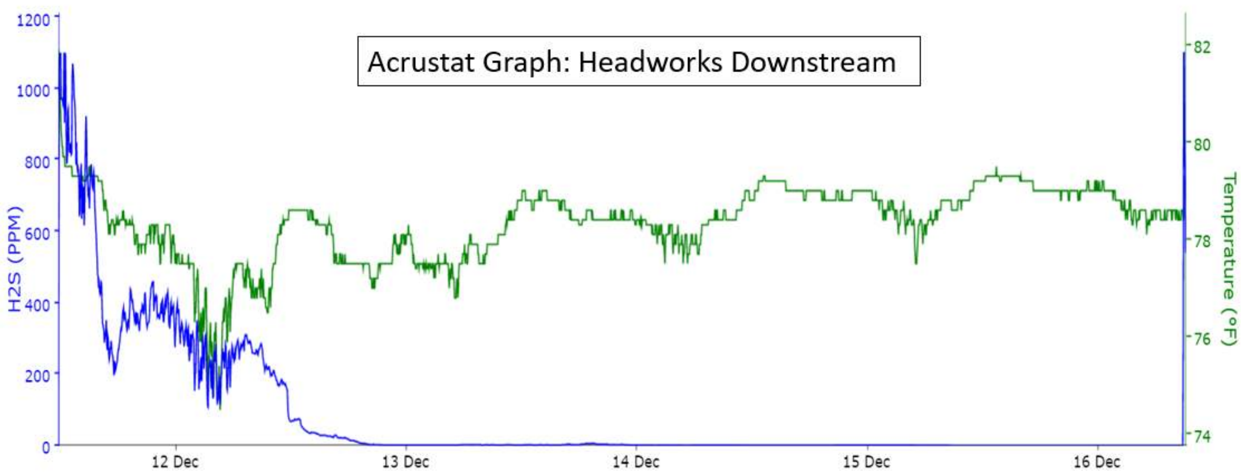

Figure 2-5 Downstream Acrustat Data

As shown in the table, the measured H_2S concentration was much higher in the downstream portion of the headworks, where turbulence and, accordingly, H_2S volatilization are greater. The turbulence in the downstream portion of the headworks resulted in average H_2S higher than 100 ppm. As a result, the downstream area also exhibits the greatest corrosion. Note that H_2S levels in the downstream channel dropped after the first 2 days due to FOG build up on the sensor. This can be seen on the data shown on Figure 2-5 (blue line).

2.2.2.2 Differential Pressure

An Acrulog was installed on the downstream end of the headworks channel to monitor differential pressure (DP), as shown on Figure 2-6. Table 2-5 summarizes minimum, average, and maximum pressures.

Figure 2-6 DP Datalogger at Headworks

Table 2-5 Headworks DP Datalogging Summary

Location	Min DP (inches water column, in WC)	Avg DP (in WC)	Max DP (in WC)
Headworks (downstream end)	-2.529	-0.0163	2.154

As shown in the table, positive pressure – which could result in foul air pushed out of the headworks – was recorded at this location. Note that odor control designs typically target a negative pressure of - 0.1 inch water column (WC) to ensure that odors are effectively collected and to minimize the potential for fugitive (escaping) odors. The values recorded indicate that balancing of the foul air collection system, at minimum, may be required to improve odor collection and headworks ventilation.

2.2.2.3 Wastewater Sulfide and pH

Grab sampling was carried out at the headworks. The testing indicated the presence of sulfide higher than 7 ppm at all locations tested. Sulfide levels higher than 5 mg/L are considered high. Typical control target with liquid phase treatment is to keep sulfide below 0.5 mg/L. The sulfide test kit is an industry standard kit and can measure levels up to 20 mg/L. There is a laboratory method to measure wastewater sulfide, but it is rarely done for wastewater studies and is beyond the needs of our study.

Results are shown in Table 2-6. For reference, waste streams are considered candidates for treatment at around 1 mg/l sulfide.

Table 2-6 Headworks Wastewater Sulfide and pH Summary

Locations	Sulfide (mg/L)	pH
Headworks Influent (before RAS)	>20	7.7
Headworks Influent (after RAS)	>20	7.4
Headworks (downstream end)	>20	8

2.2.3 Odor Control System

2.2.3.1 H2S Monitoring

H_2S Acrulogs were placed at the inlet and outlet of the biotrickling filter unit to assess its performance. The unit demonstrated an average H_2S removal rate of 99.3 percent, a typical removal efficiency for such systems. Results are summarized in Table 2-7.

Table 2-7 Biotrickling Filter H_2S Datalogging Summary

Locations	Avg H_2S (ppm)	Max H_2S (ppm)
Odor Control Inlet	350	695
Odor Control Outlet[1]	2.5	5

1. Data from 12/10/24 – 12/12/2024 was removed from the analysis due to contamination from an open valve connected to the acid water drainpipe. After the valve was closed, the levels dropped to normal range.

2.2.3.2 Methyl Mercaptan

Grab sampling of methyl mercaptan was conducted as a general indicator of organo-sulfur compound presence. Organo-sulfur compounds can present challenges for odor treatment and are an important consideration in odor treatment technology selection and design. An average of 0.25 ppm was measured at the biotrickling filter inlet. This value is not unexpected given the strength (high H_2S) of the airstream.

2.2.4 Collection System

Wastewater sulfide and pH were measured at three lift stations in the collection system. Results are summarized in Table 2-8. Although sulfide values were slightly lower than at the headworks, they are nonetheless considered to be high.

Table 2-8 Lift Station Wastewater Sulfide and pH Summary

Locations	Sulfide (mg/L)	pH
Lift Station (W-15)	17	7.8
Lift Station (T-16)	15	7.5
Lift Station (T-07)	7	7.2

2.2.5 General Field Observations

The following observations were noted by Black & Veatch staff in the field:

- Fugitive odors escaping from openings near the bar screens. Efficient operation of the odor control system relies on effective capture of odorous air. Gaps near the bar screens need to be covered to make odorous air ventilation more efficient.
- Corrosion is extensive on the inner channel walls, depicted on Figure 2-7**Error! Reference source not found.**.

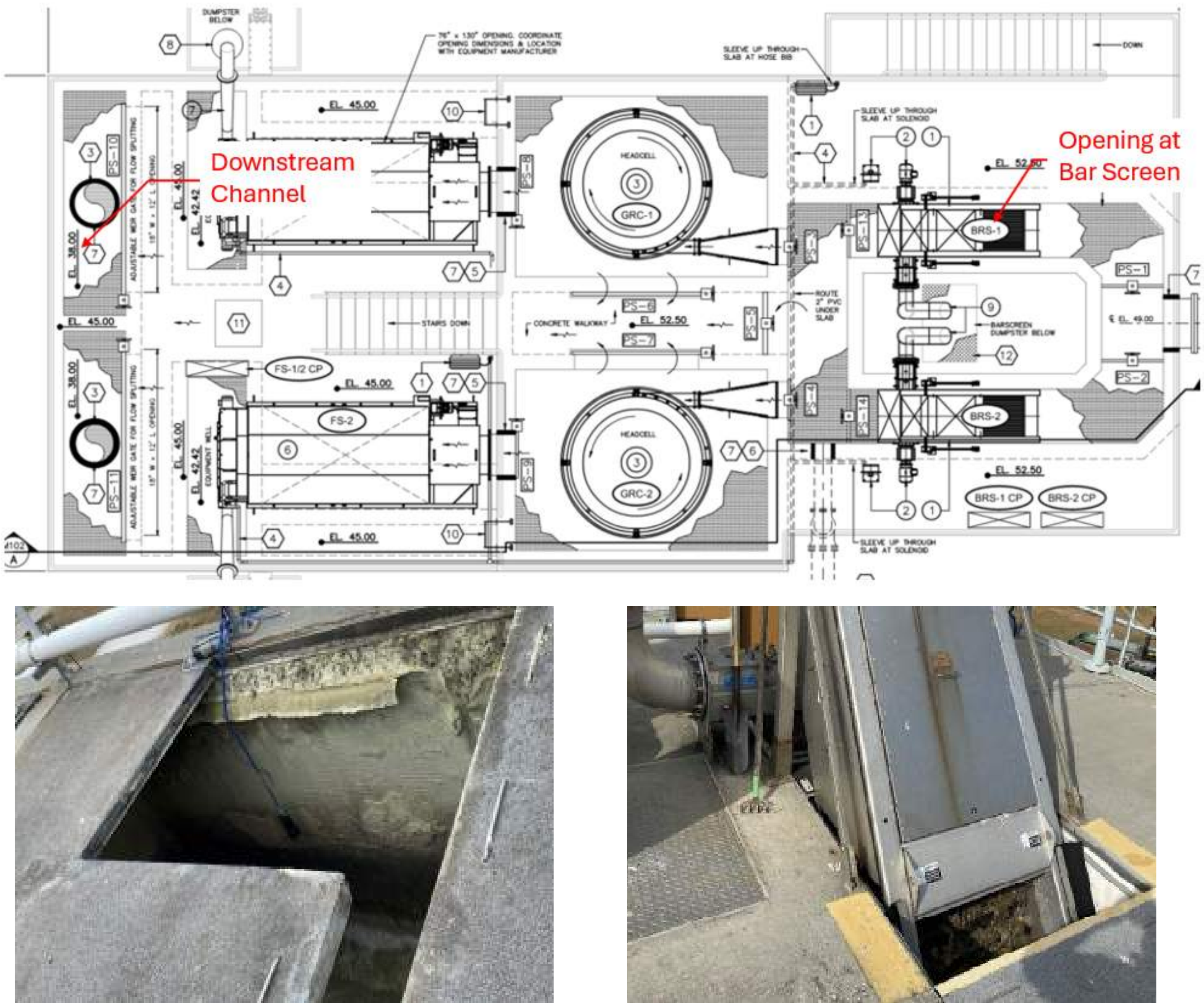

Figure 2-7 Downstream Channel (Left), Opening at Bar Screen (Right)

2.2.6 Summary of Key Findings

The site visit and field testing revealed the following:

- Airstream H_2S concentrations measured in the headworks channels are high and well above the odor detection threshold for H_2S (0.0005 ppm), particularly in the downstream portion of the structure. Levels higher than 50 ppm can be considered high.

- Positive pressure detected at the headworks downstream channel indicates insufficient air collection. Positive pressures allow headspace air to escape to the area above, which leads to fugitive odor emissions.
- Wastewater sulfide was elevated both in the collection system and at the headworks. The high wastewater sulfide contributes to H_2S release at the headworks weir.
- The structure of the headworks promotes wastewater turbulence which likely increases H_2S levels in the off-gas.
- H_2S removal in the treatment vessel is within an acceptable range.

2.3 Conclusion and Next Steps

While this investigation indicated that the existing SCWWTP odor control system had an acceptable H_2S removal and that the overall exhaust rate is adequate, improvements are needed to address near-term and long-term odor mitigation needs are described below.

2.3.1 Near-Term Improvements

Near-term recommendations focus on O&M improvements that can be made within a year or two. The recommendations are listed in order of priority. Table 2-9 summarizes near-term improvements identified for the SCWWTP.

Table 2-9 Recommended Near-Term Improvements Summary

Recommended Improvement	Description
Provide gasketing at openings	This is a simple and inexpensive option to minimize openings at headworks. Cost will vary depending on the size, but ranges between $5-15 /sf.
Test and balance foul air collection	This effort will determine if the air is being collected from individual areas of the headworks as designed – and could identify the reason for positive pressure measured during the field program. The estimated cost is less than $10,000.
Investigate landfill leachate impacts on H_2S generation	This effort would require monitoring of leachate discharge times, leachate characterization and monitoring of impacts at the headworks. If a relationship is identified between H_2S and leachate discharges, mitigation efforts could focus on this waste stream and/or the sewer shed where it discharges. The cost will depend on the scope.
Thioguard vendor coordination to assess a new dosage location	Work with Thioguard vendor to identify a new dosing location with the objective to control odors at the headworks as the existing systems focus is on collection system odor control. The O&M cost for a new dosing system is preliminarily estimated to be $100,000 per year.

2.3.2 Long-Term Improvements

Pending potential modifications to ductwork (if warranted by testing and balancing efforts), long-term improvements focus on reducing H_2S generation. Potentially, the addition of another Thioguard dosing station may accomplish that end. Generally, the high sulfide in collection waste stream is too high to be treated using any chemical other than magnesium hydroxide, but another approach – superoxygenation – could be considered. The following section discusses this technology and its application.

2.3.2.1 Superoxygenation Description

Superoxygenation is designed to dissolve a sufficient amount of oxygen in the wastewater to maintain aerobic conditions in collection systems, preventing sulfide formation. For this study, the assessment of superoxygenation focuses on the system offered by ECO_2.

The ECO_2 system operates by pumping a sidestream of raw, unscreened wastewater through a proprietary conical shaped oxygen transfer device. Gaseous pure oxygen is fed into the cone and completely dissolved due to the large gas/water interface generated by the bubble swarm inside of the cone. The oxygenated sidestream is blended back into mainstream. In addition to odor control, installations of oxygen injection systems have also been associated with reduction in BOD.

A source of oxygen gas is required for this system. The oxygen can be commercially purchased in bulk as liquid oxygen and delivered by truck or generated on-site with an oxygen generator. Figure 2-8 illustrates a superoxygenation system.

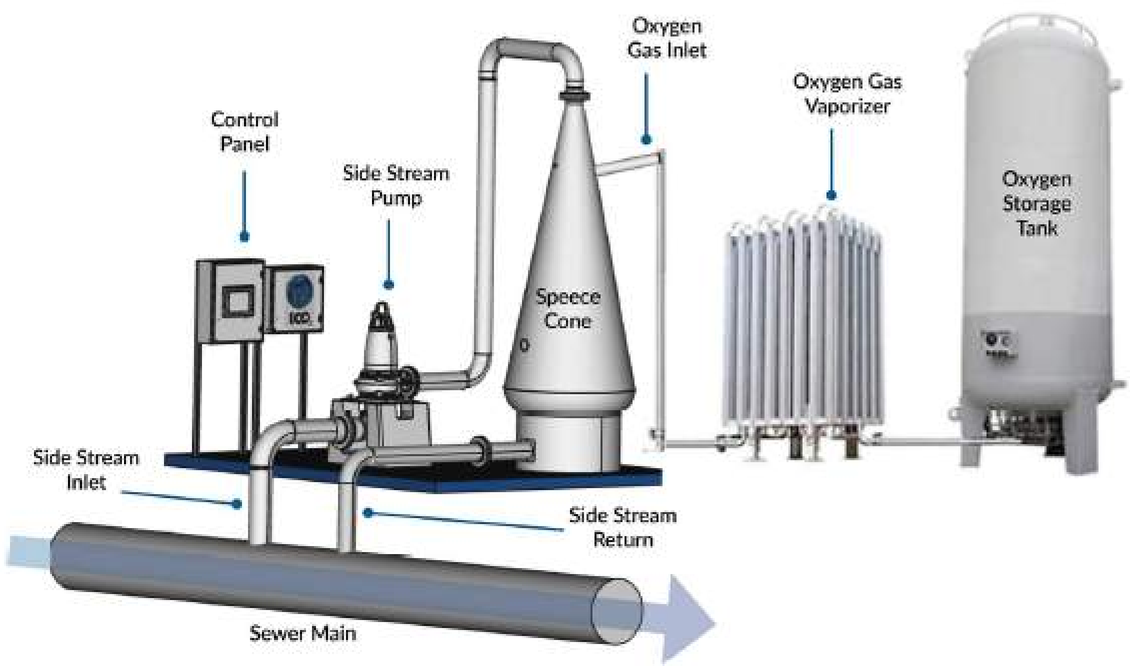

Figure 2-8 ECO_2 Superoxygenation System

2.3.2.2 Design Considerations

A preliminary location for the superoxygenation system is proposed at LS (T-07). A more detailed evaluation involving wastewater characterization and collection system hydraulics is recommended if the BCUSD is interested in this alternative.

For this preliminary recommendation, it is assumed that the superoxygenation system would be located at T-07 to treat odors from the LS to the plant headworks. The superoxygenation system design criteria and sizing are summarized in Table 2-10.

Table 2-10 Superoxygenation System Design Criteria and Sizing

Parameter	Value
Name of Location	T-07
Force Main End Point	SCWWTP
Additional Sewer Lines Tie-in to FM?	Yes
FM Diameter (inch)	36
Average FM Daily Flow Range (mgd)	3-6
FM Length (LF)	7,000
Existing DS at Starting Point (mg/L)	17
BOD	Typical residential
Oxygen Flow, Instantaneous Max Capacity (lb/d)	2,500
Oxygen Flow, Daily Average (lb/d)	1,100
System Size (ft)	4
Sidestream Piping Diameter (inch)	6-8
Sidestream Flow Rate (gpm)	1,400
Sidestream Pump (hp)	25

This system generally offers lower operating and maintenance costs compared to other chemical solutions, although it requires a higher initial capital investment. The estimated installed cost is approximately $1,000,000, with annual operating expenses of $60,000.

3.0 Structural Assessment

Black & Veatch conducted a visual inspection of the Headworks Facility at the Brevard County Wastewater Treatment Plant on January 23, 2025. The goal was to assess its condition and recommend any necessary repairs. After the unit was drained as much as possible, Black & Veatch inspected the condition of surfaces visible from the deck of the headworks structure, as well as the exterior of the structure. On February 17, 2026, BV conducted an additional visual inspection (unit not drained), taking photographs in many of the same areas to allow for the comparison of conditions between the two inspections (approximately one year later).

Figure 3-1 presents the aerial view, highlighting the headworks location with a yellow rectangle.

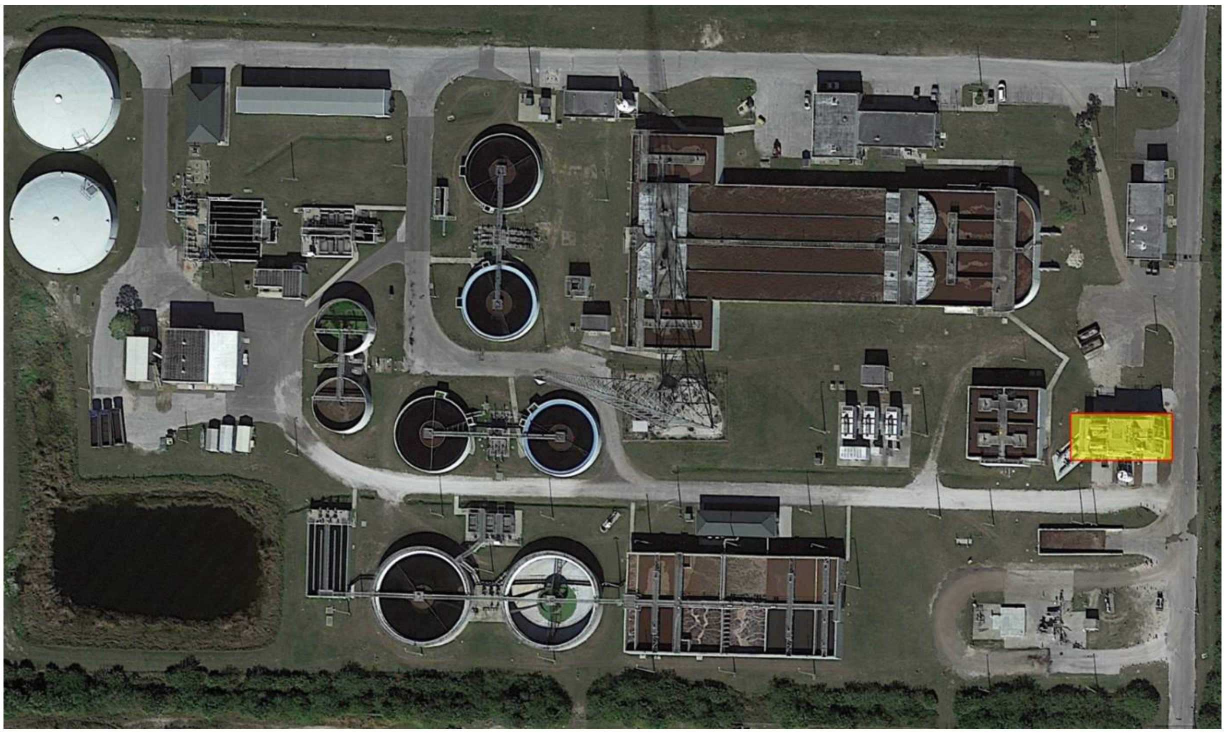

Figure 3-1 Aerial View

Environmental structures, including headworks per the American Concrete Institute (ACI) 350, are engineered to contain liquids and gases from water and wastewater treatment plants, storage tanks, reservoirs, and similar facilities. Concrete corrosion in these structures increases with higher concentrations of aggressive chemicals, lower hydroxide ion levels, elevated temperatures, and moisture. To ensure durability, these structures must adhere to strict standards outlined in ACI 350. Chemical agents present can range from benign to highly aggressive, potentially damaging hardened concrete surfaces.

One common source of concrete surface deterioration and reinforcing steel corrosion is microbial induced corrosion (MIC). MIC occurs when hydrogen sulfide accumulates on the surface of concrete combined with high moisture. Microbes on the surface living in these moist conditions feed on the hydrogen sulfide and convert it to sulfuric acid. The acid reacts and dissolves the cement paste leaving a much weaker and lower pH substance behind. Eventually this process continues deeper and deeper into the concrete and leads to concrete deterioration. Once the concrete cover is diminished, the passive protective layer between the concrete and steel will be destroyed and eventually lead to accelerated corrosion of the reinforcing steel. If high-strength, high-durability concrete is left uncoated and there are high concentrations of H_2S (Refer to Group 3C, Table 1) being converted to sulfuric acid, the entire concrete surface and interior layers of reinforcing steel can be deteriorated and corroded.

3.1 Findings

Based on the odor control investigation conducted on December 10, 2024, extremely high sulfides were encountered throughout the headworks structure; refer to Figure 3-3. Hydrogen Sulfides are categorized by the American Concrete Institute (ACI) as a Group 3A – “Slow Corrosion” corrosive chemical.

> **ACI 350-20 R4.8.1.4** – *Concrete exposed to any Group 3 chemicals shall be given a protective lining or corrosion resistant topping in accordance with 4.9. The concentrations shown are weight percent and are the typical maximum concentration of the chemical delivered and used at the facility.*

Hydrogen Sulfides (H_2S) that are oxidized and exposed to moisture become Sulfuric Acid (H_2SO_4) which ACI 350 designates as a Group C3 – “Rapid Corrosion of Concrete”. This acid breaks down the calcium hydroxides within the concrete and reduces the protective alkaline environment around the reinforcing steel.

ACI 350-20 R4.8.1.4 – Hydrogen sulfide gases are oxidized aerobically to sulfates, which in the presence of moisture and oxygen form sulfuric acid. The sulfuric acid then attacks the calcium hydroxide in the concrete to form calcium sulfate (gypsum), which usually has the effect of reducing the pH of the surface concrete, thereby reducing the protective alkaline environment around the reinforcing steel or metals, thus allowing the corrosion process to proceed.

Table 3-1 Wastewater Sulfides and pH

Location	Sulfide (mg/L)	pH
Headworks		
Headworks Influent (before RAS)	>20	7.7
Headworks Influent (after RAS)	>20	7.4
Headworks (downstream end)	>20	8
Downstream End		
Lift Station (W-15)	17	7.8
Lift Station (T-16)	15	7.5
Lift Station (T-07)	7	7.2

From the tests that were run, the structure is experiencing extremely high levels of Sulfides, H_2S (>20ppm). When combined with air, H_2SO_4 (Sulfuric Acid) is created, causing alkaline components of the cement paste to break down with exposure to sulfuric acid.

In addition, the reaction between sulfuric acid and the calcium compounds in concrete will form calcium salts, which are soluble in water. These water-soluble salts leach away, causing loss of volume and cohesion of the cement paste. Once there is enough concrete degradation, sulfuric acid will also cause rapid corrosion of the steel reinforcement in the concrete. This corrosion of the reinforcing steel results in rusting at the rebar/concrete interface and may produce a volume of 2 to 6 times the size of the original rebar diameter, thus causing macro-level concrete cracking and spalling.

During the examination of the existing structure that occurred on February 17, 2026, it was observed that reinforcement could be seen for the concrete walls of the North Flow Split Chamber (PS-10). It was also noted by the Lead Operator that the concrete consistency at the top of the wall was very soft (see Figure 18A & Figure 19).

An operator with the county also noted that the crack shown in Figure 14 and Figure 14A is continuing to leak on high temperature days. This crack is located on the wall supporting the South Grit Removal Unit. This indicates that there is an active crack within the chamber. At this time, we do not have any photographs of that interior area, but it is assumed that it would have damage due to sulfides and lining failure as well.

It was also observed that the concrete beams supporting the concrete panels over the North and South Flow Split chambers appear to be in poor shape. At this time no reinforcement can be observed; however, based on the surrounding conditions, it is likely that the reinforcement in the concrete beams may also be subject to the harsh conditions (See Figure 17 & 17A).

Figure 3-2 below shows location and direction photos were taken for many of the figures presented in this section.

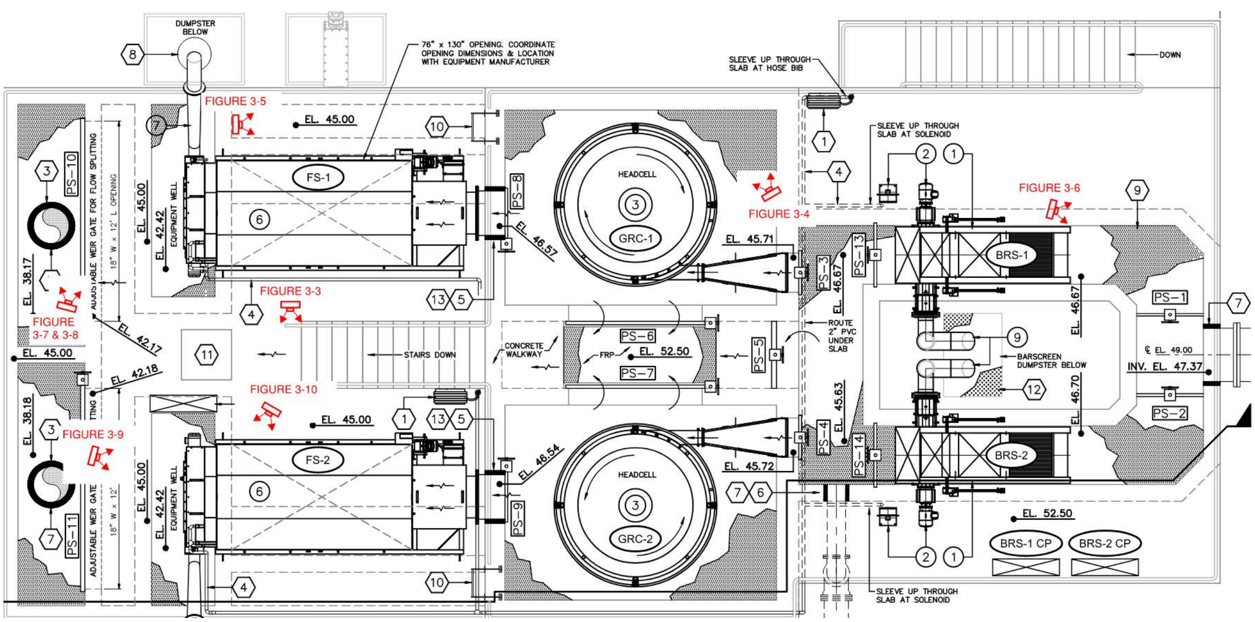

Figure 3-2 **Location of Photos**

Figure 3-3 Photo 1 - Wastewater Sulfides and pH

Photos from the site visit reveal that the existing lining system in the end chamber of the headworks structure has failed. The lining appears discolored and is peeling away from the concrete wall and exposing the concrete surfaces against aggressive chemicals. Refer to the photos in Figure 3-4, Figure 3-5, Figure 3-7, Figure 3-8, Figure 3-9, and Figure 3-10. Figure 3-6 shows the lining within the bar screen chamber; the lining appears in better shape and is intact.

Figure 3-4 Photo 2 - Lining System Failure

Black & Veatch reviewed the documents provided by Brevard County, including the division 2-15 Specification package. Within specification section 09800 – Corrosion Protection of Wastewater

Concrete Structures, the lining system should be a 100 percent solid, solvent-free, ultra-high building epoxy coating to be spray applied to all interior surfaces of exposed concrete above the spring line as otherwise detailed.

- The manufacturers listed are the Raven Lining Systems, Mainstay or approved equal. The mechanical drawings have a reference to the Madewell Mainstay Lining (Refer to Drawing M-103).
- The Madewell Mainstay products installed within the pretreatment structure, based on file notes from the onsite construction inspector, included two applied coats of Mainstay ML-72 followed by a top coat of Mainstay DS-5. The original intent per the approved shop drawing was to apply these two products in a manner that would create a "Mainstay Composite Liner". However, inspection notes show that the DS-5 top coat was not applied per the specification sheet, which requires a maximum of two hours from the application of Mainstay ML-72. Thus, the resulting coatings would not be considered a "Mainstay Composite Liner". Furthermore, the Mainstay DS-5 product does not meet the specification requirements for compressive or tensile strengths identified in 09800, 2.2.D.
- The Raven Lining System, Raven 405, does meet the specification. It is possible that the specification language was originally a Raven Lining System specification and was modified to include other manufacturers.

Lining systems for sulfate and sulfide resistance are required for structures with high sulfates and sulfide exposures (per ACI 350). These systems help prevent the anerobic bacteria that create H_2SO_4 (Sulfuric Acid) affecting concrete that is exposed to air and moisture. When there is a holiday (a hole, a rip, or tear) in the lining system, it provides a haven for the bacteria to sit and grow. As the bacteria thrives in this environment, bubbles form in the coating as the bacteria creates backfill and pushes the lining out. This appears to be what has happened to the lining in Figure 3-4, Figure 3-5, Figure 3-7, Figure 3-8, Figure 3-9, and Figure 3-10.

Figure 3-5 Photo 3 - Lining Failure at Weir Chamber

Figure 3-6 Photo 4 - Lining at Bar Screen

Figure 3-7 Photo 5 - Grease Accumulation at Weir Chamber

Figure 3-8 Photo 6 - Grease Accumulation at Weir Chamber

Figure 3-9 Photo 7 – Lining Failure at Concrete Beam

Figure 3-10 Photo 8 – Lining Failure Under Rotoshear Equipment

3.2 Update of Analysis (February 2026 Information Comparison)

The following notes summarize the findings from the February 2026 site visit, as compared to observations from January 2025. Note: For clarity, where photos are taken in the same location during the two site visits, the photos from January 23, 2025 are labeled as Figures 11, 12, 13…, and the corresponding photos from February 17, 2026 are labeled with the suffix “A” as Figure 11A, 12A, 13A…

1. The Pretreatment Structure was built in 2020. The structure consists of cast in place concrete walls, slabs, columns, and beams. The roof consists of concrete beams and what appears to be concrete panels acting as hatches. The exterior of the building exhibits some cracking and discoloration, see Figure 13 and Figure 13A.

2. Figure 12 and Figure 12A show the corrosion of a steel drain cap plate at the south dumpster. The corrosion of the steel cap has increased as shown in Figure 12A.

3. Figures 15, 15A, 16, 16A Show the conditions at the South Flow Splitting area. The concrete at the top of the wall shows significant deterioration due to liner failure.

4. It is notable that even in photos where the lining appears to have not been degraded significantly from 2025 to 2026, considerable degradation of the concrete in the spaces between the aggregate can be clearly seen, indicating impacts could be occurring deeper into the concrete than the surface photos suggest.

5. In Figure 18, the concrete towards the top of the wall can be seen to appear as a foam/slurry. The aggregate in the concrete appears to be missing.

6. In Figure 19, it was observed that the vertical reinforcement was broadcasting through the thin layer of concrete cover. The concrete clear cover, as indicated in the drawings, was designed as 2” from face of the wall.

Figure 3-11 below shows location and direction photos were taken for the figures presented in this section.

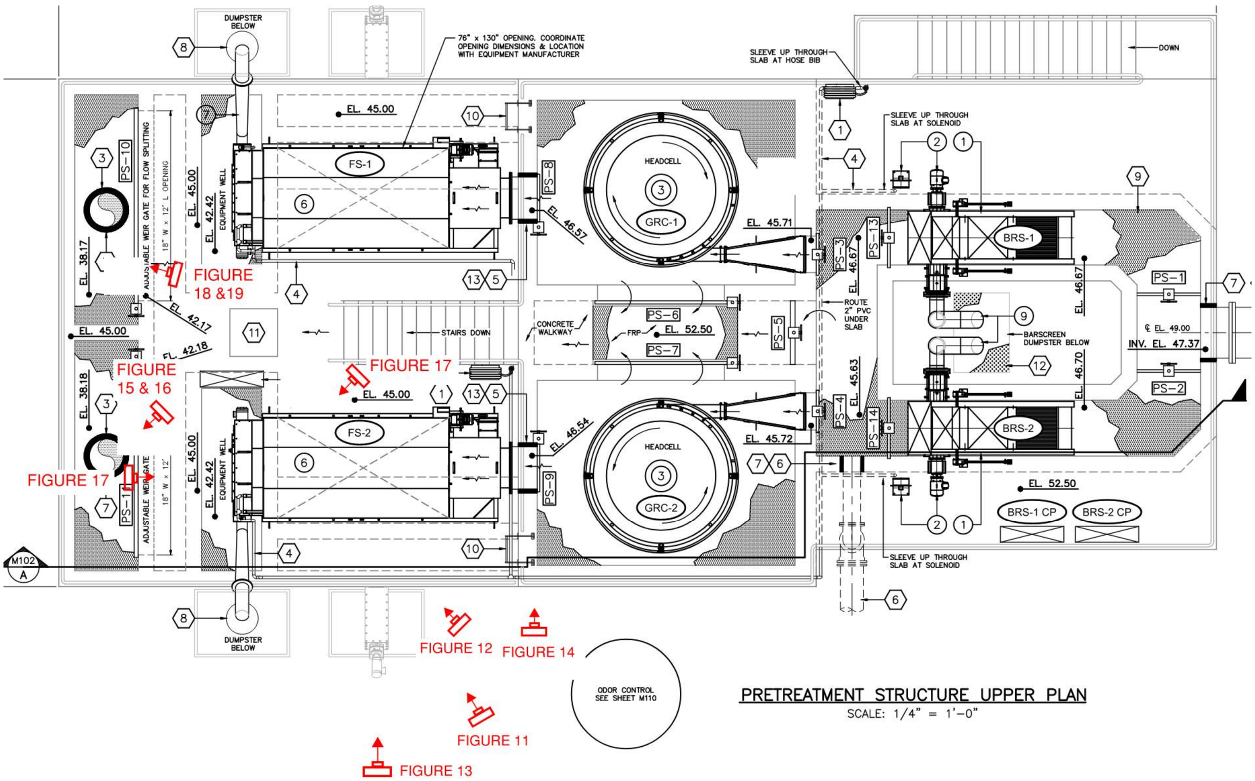

Figure 3-11 Location of Photos

Table 3-2 below shows the side-by-side observed condition of the structure from 2025 and 2026.

Table 3-2 Photo Comparison

		
Figure 11		**Figure 11A**

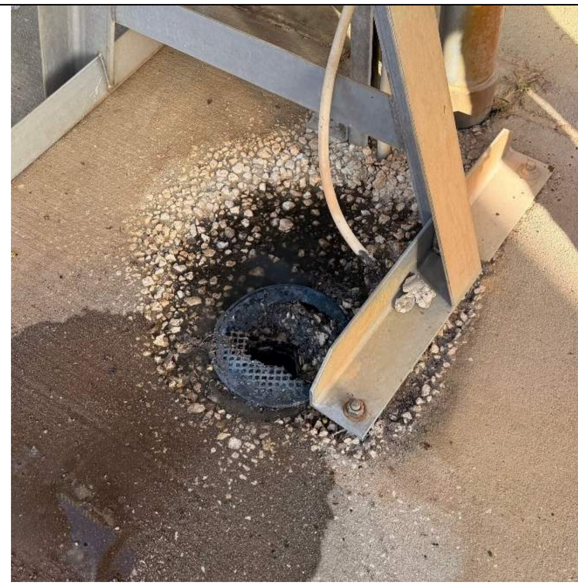

Figure 12		Figure 12A

Figure 13		Figure 13A

		
Figure 14		**Figure 14A**
		
Figure 15		**Figure 15A**

Figure 16

Figure 16A

Figure 17

Figure 17A

Figure 18

Figure 18A

Figure 19

3.3 Recommendations and Next Steps

The inspected concrete pre-treatment structure shows more significant deterioration than expected for its' age and exposure, mainly due to sulfuric acid attack. There are currently signs of section loss in the concrete members. Reduced concrete cover will accelerate reinforcing corrosion.

The deterioration to the walls of the pre-treatment structure is likely due to a lining failure which resulted in exposure to H_2S and sulfuric acid to the concrete structure. Partial or localized repairs of the existing lining are not recommended, as the lining could obscure degraded or otherwise weakened concrete. Preparation methods exist which would qualify remaining material as tightly adherent but would not address contamination of the underlying concrete. Due to the accelerated nature of the initial failure, full removal and replacement of lining is recommended after the necessary concrete repairs are completed.

Reinforced concrete depends on the reliability of both the concrete and the reinforcement to act together. Since concrete is a brittle material and offers no ductility, a properly reinforced section can resist tensile and flexural forces and is able to display ductile behavior, meaning overstressed components that show significant displacement before failure can give occupants time to evacuate.

If either material is compromised, the structure loses its ability to resist loads as designed. In other words, a reduction in section properties leads to diminished bond strength, ductility, and load-carrying capacity. Failures in concrete can be abrupt and severe, often occurring without warning.

For these reasons and observing the significant loss of concrete cover over the given time frame, we cannot confirm that the structure is currently safe for personnel access, and we have significant concerns regarding the safe continued use of the structure.

Relative to the potential to repair and retain the structure, current information suggests that options do exist to potentially repair the structure, though it may require significant investment. Concrete structures affected by corrosion may be repairable depending on severity of damage. The recommended repair approach depends on the extent of the damage, to both the concrete and lining, and further investigation would need to occur to determine the limits of repair.

Another option is to remove those concrete sections that are irreparable and preserve the sound parts of the structure. After a thorough evaluation is performed, an assessment can be made whether repairs are cost-effective or if rebuilding is the preferred option. The ability to remove the pretreatment structure from service for an extended period of time, given process operational limitations, should be part of that analysis.

The next steps required to determine a final conclusion on structure recovery are to bypass the headworks structure and send flows to the oxidation ditch BNR trains, drain the structure, and clean the structure. After structure is clean, we recommend a thorough investigation to quantify the full extent of the lining failure limits, and concrete soundness can be performed. The level of degradation in the structure of the concrete will determine the recommended repairs. Concrete core-sampling is not required at this time; however, it may be recommended after structure is investigated.

Appendix A. Odor Control Sampling Plan

Final

ODOR SAMPLING PLAN

South Central WWTF Headworks Structural and Odor Control Assessments

BLACK & VEATCH PROJECT NO. 421429
BLACK & VEATCH FILE NO. 40.0100

PREPARED FOR

Brevard County

6 DECEMBER 2024

BLACK & VEATCH

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1.0 Background

The Brevard County Utilities (County) operates the South Central Wastewater Treatment Facility (SCWWTF) in Viera, Florida. County staff have observed significant deterioration of concrete at the facility's headworks, and the County commissioned a study to perform both structural and odor control assessments for the headworks.

An odor sampling program is a critical first step for the odor control assessment, and this document sets forth a sampling plan to gather needed information. Specifically, this document defines the parameters to be sampled and the basis for their selection, and sets forth the location, methods, and duration of sampling for each parameter.

1.1 Sampling Program Overview

The objectives of the sampling program are:

- Define odorant concentrations that may be contributing to corrosion and/or odors.
- Assess adequacy of headworks ventilation rate based upon a target of 0.1" negative pressure within the structure.
- Determine odor control system inlet/outlet concentrations as part of an overall assessment of the system's capabilities to meet treatment needs.
- Determine wastewater sulfide concentrations at the headworks and select locations upstream to define a basis for potential liquid stream treatments to reduce odor.

Both air stream and wastewater sampling will be performed to meet these objectives.

Airstream measurements will include:

- Hydrogen sulfide (H_2S) – this compound is typically a dominant odorant in wastewater systems which can be detected at very low odor concentrations and typically described as smelling like "rotten eggs."
- Methyl mercaptan (MM) – this odorant has a disagreeable odor sometimes described as "rotten cabbage" and, if present at high enough concentrations, can drive treatment technology selection and/or impact odor control effectiveness.
- Differential pressure (DP) – DP is measured to determine whether the odorous air exhaust rate from a space is sufficient to maintain negative pressure in the space and prevent fugitive odors.

Wastewater sulfide will also be measured.

Black & Veatch staff plan to execute the sampling program over a period of 7 days in mid-December 2024. It should be noted that sampling should be performed during a period of relatively dry weather (no extended periods of intense rainfall predicted the day before or during the sampling program). The program may need to be rescheduled if extended heavy rainfall is predicted.

SCWWTF staff assistance will be required to open hatches/manhole covers as needed to conduct the sampling program.

Proposed sampling locations and parameters to be monitored at each location are summarized in Table 1-1. Measurement details are further described later in this document.

Table 1-1 Sampling Location and Parameter Summary

Location	Air Stream Measurements			Wastewater Sulfide
	Hydrogen Sulfide	Methyl Mercaptan	Differential Pressure	
Headworks (upstream end)	Continuous logging/one week			1 grab
Headworks (downstream end)	Continuous logging/one week		Continuous logging/one week	1 grab
Odor control inlet	Continuous logging/one week	1 grab		
Odor control outlet	Continuous logging/one week	1 grab		
HW Influent (before RAS)				1 grab
HW Influent (after RAS)				1 grab
HW Influent (downstream end)				1 grab
Lift Station (W-15)				1 grab
Lift Station (T-16)				1 grab
Lift Station (T-07)				1 grab

2.0 Sampling Methods

Table 2-1 summarizes methods for proposed vapor phase and liquid phase measurements.

Table 2-1 Sampling Program Measurement Methods

Matrix	Parameter	Measurement Method
Air	Hydrogen sulfide	H_2S Acrulog data loggers
	Methyl mercaptan	Dräger colorimetric tubes
	Differential pressure	DP Acrulog data loggers
Wastewater	Sulfide	LaMotte Sulfide Kit

2.1 H_2S and Pressure Datalogging

2.1.1 H_2S Datalogging

H_2S Acrulogs will be deployed on the first day of the sampling program and picked up approximately 1 week later. Deployment and retrieval times will be recorded in the AcruLog Deployment Log (Appendix A).

2.1.1.1 Headworks Structure

Because of concerns regarding potentially high H_2S concentrations, Acrulogs with a measurement range of 0-1,000 ppm will be deployed for measurements within the headworks. One Acrulog will be located near the upstream end of the headworks and a second unit downstream of the weir (refer to Figure 2-1).

The units will be dropped through hatches and suspended from a neon rope attached to piping or other proximate supports and should be placed as close to the water surface as practicable, while avoiding the risk of submergence. Covers must be replaced after the Acrulogs are placed.

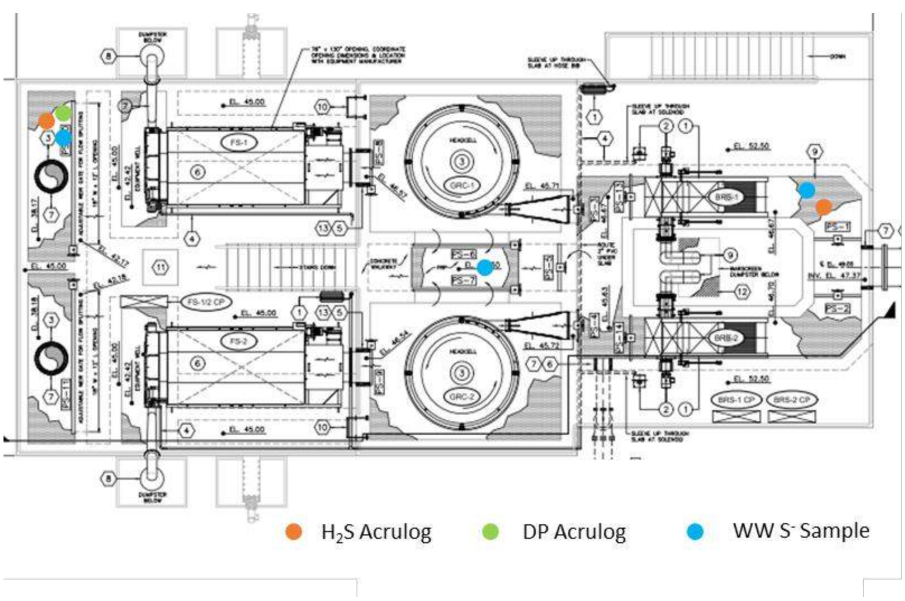


Figure 2-1 Headworks H_2S and DP Acrulog Expected Deployment Locations

2.1.1.2 Odor Control System

A 0-1,000 ppm unit will be used to measure inlet concentrations of the odor control system and a 0-200 ppm unit will be used for outlet measurements. Note that selection of a 0-200 ppm unit for the outlet is unusual but reflects reported concentrations as high as 45 ppm at the outlet. The units will be housed in an LRSS-2 system, which includes external moisture removal traps and a dual-headed pump to ensure that the sampled airstreams are delivered to the Acrulogs at the proper flow rate and pressure.

A County operator will be responsible check the traps daily for any signs of moisture build-up and empty them as required during testing. Black & Veatch will provide instructions on this procedure when in the field.

Figure 2-2 LRSS-2 System with AcruLogs

2.1.2 Differential Pressure Datalogging

An Acrulog specifically designed to measure pressure inside of structures will be installed outside of the headworks structure, with a sensor extending into a hatch for measurements. The unit will be placed where shown on Figure 2-1, and like H_2S AcruLogs, will be anchored in place with neon rope and left in place for approximately 1 week.

To gather effective data, the hatch or location where the sensor extends into the headworks should be closed as much as possible without pinching the sensor. Duct tape should be placed around the sensor to seal the opening.

Deployment and retrieval times will be recorded in the AcruLog Deployment Log (Appendix A).

2.2 Methyl Mercaptan Measurements

Methyl mercaptan will be measured using colorimetric tubes manufactured by Dräger that provide a measurement ranger of 0.1 to 15 ppm and an Accuro bellows pump designed to be used with the tubes. Measurements should be performed, at minimum, at the headworks odor control system inlet and outlet.

To use the tubes, the tube ends are broken first off, and the tube is then inserted in a bellows pump (refer to Figure 2-3), with the arrow on the tube pointing toward the pump. The bellows pump is compressed to take a measurement, with the number of compressions required shown on the tube.

Figure 2-3 Dräger Tube and Pump

The tube will change color if the sampled odorant is present, with the color change/concentrations shown on the tube gradations.

Dräger tube readings on the In-Situ Measurements Log contained in Appendix A.

Tubes should be safely discarded at the completion of sampling.

2.3 Wastewater Sulfide Measurements

Wastewater samples will be collected from the locations described in Table 1-1. Figure 2-1 shows specific sampling locations in the headworks structure. Additionally, samples will be collected from the two lift stations that directly contribute influent flow. The locations of these facilities and access for sampling will be provided by County staff.

In all cases, the sampling team should note whether or not leachate is being received when recording sulfide measurements.

Sampling supplies needed for liquid measurements include:

- Impervious gloves
- Disposable PVC bailer
- 500 ml (min) plastic beaker
- LaMotte Sulfide Test Kit (Model 4456-01)
- Distilled water

Like the Drager tubes, the LaMotte kit is a colorimetric test.

Samples are collected by lowering the bailer into the liquid being sampled, and then and carefully pouring the bailer contents into the plastic beaker or, if possible, directly into the vial provided with the LaMotte kit. The kit provides explicit instructions on the steps to estimate wastewater S-.

Upon the completion of each measurement, the data must be recorded on the log attached in Appendix A. All sampling equipment should then be rinsed (bailer, beaker, and LaMotte vial) with distilled water before moving to another sampling location.

Appendix A. Field Log Sheets

Brevard County – Acrulog H2S Deployment Log

Deployed by: Retrieved by:

Weather conditions: Deployment (________________________), Retrieval (____________________________)

Deployment		Retrieval		Location	Acrulog		Notes
Date	Time	Date	Time		Range (ppm)	Serial Number	

Deployment		Retrieval		Location	Acrulog		Notes
Date	Time	Date	Time		Range (ppm)	Serial Number	

Deployment		Retrieval		Location	Acrulog		Notes
Date	Time	Date	Time		Range (ppm)	Serial Number	

Deployment		Retrieval		Location	Acrulog		Notes
Date	Time	Date	Time		Range (ppm)	Serial Number	

Brevard County – Acrulog Differential Pressure Deployment Log

Deployed by: Retrieved by:

Weather conditions: Deployment (________________________), Retrieval (___________________________)

Deployment		Retrieval		Location	Acrulog		Notes
Date	Time	Date	Time		Range (inWC)	Serial Number	

Brevard County – Grab Sample Log

Weather:

Date/Time:

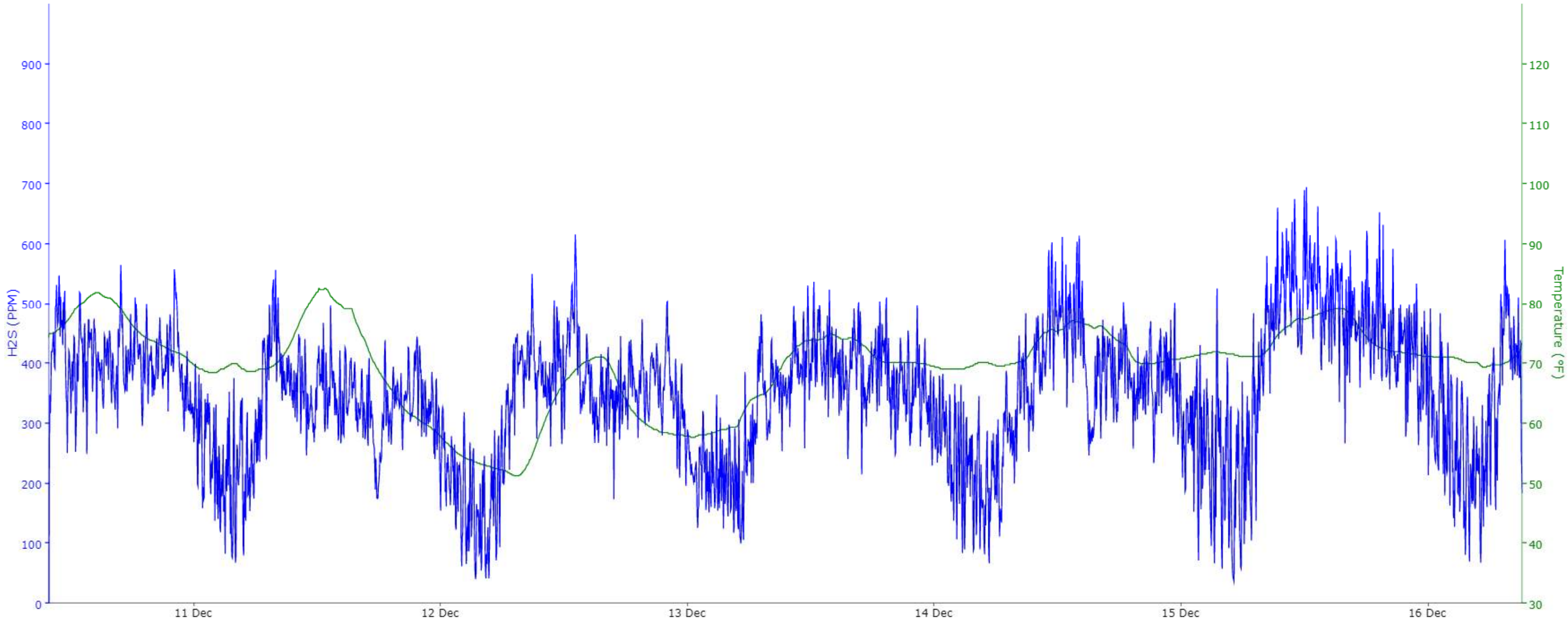
Wastewater Sulfide (LaMotte)		
Location	Concentration (mg/L)	Time

Methyl Mercaptan (Draeger)		
Location	Concentration (ppm)	Time

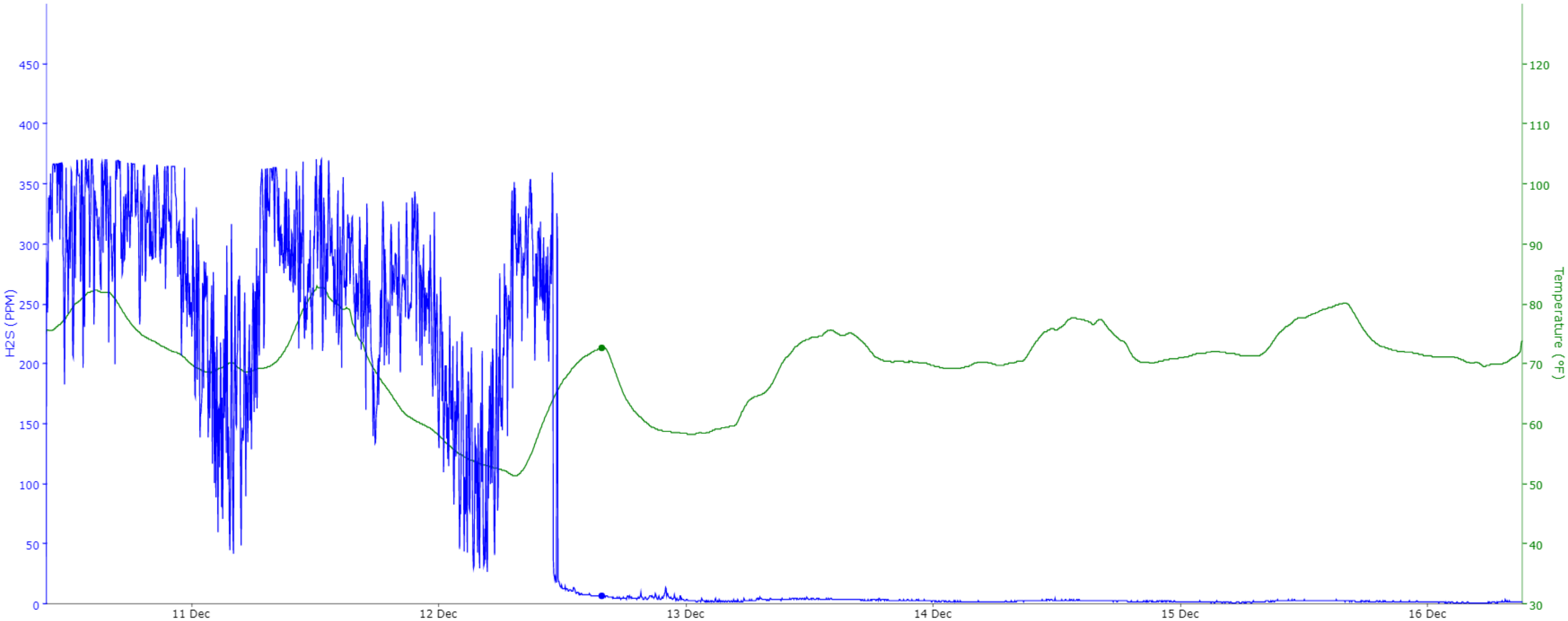
pH, ORP			
Location	pH	ORP (mV)	Time

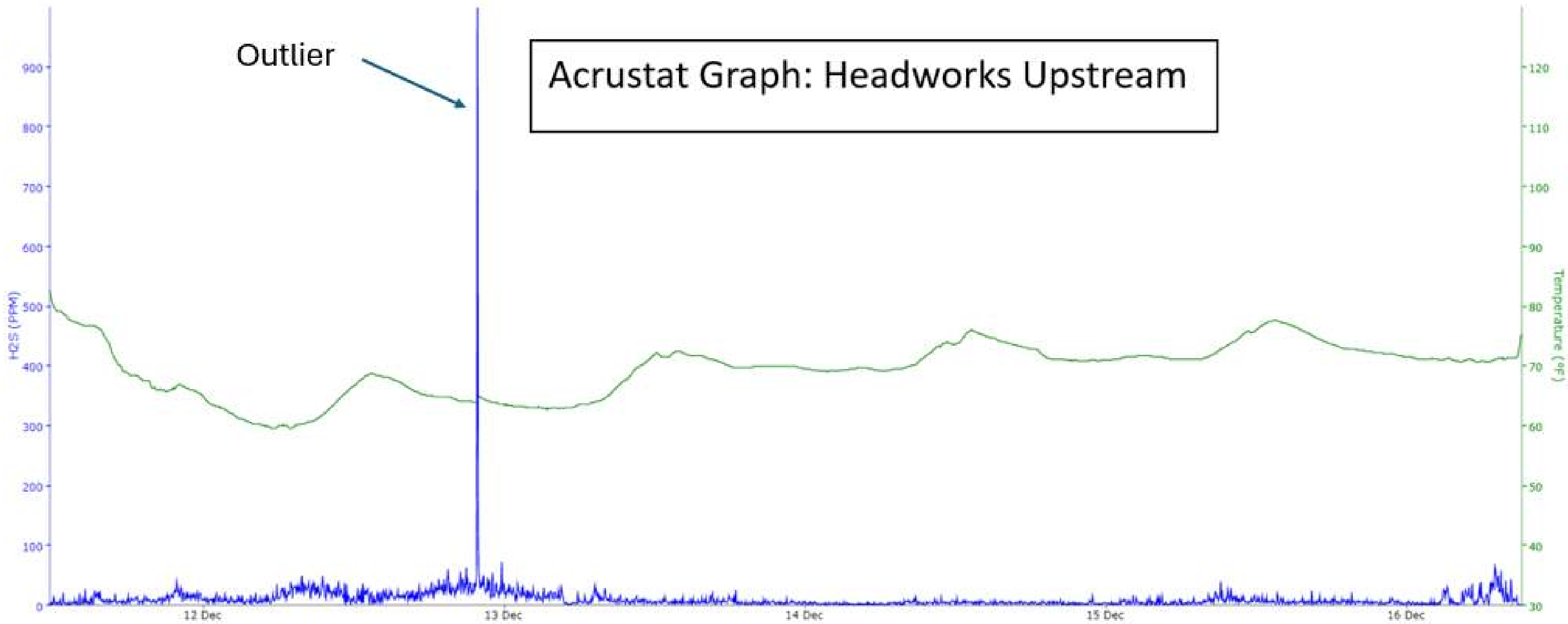
Appendix B. Acrustat Graphs

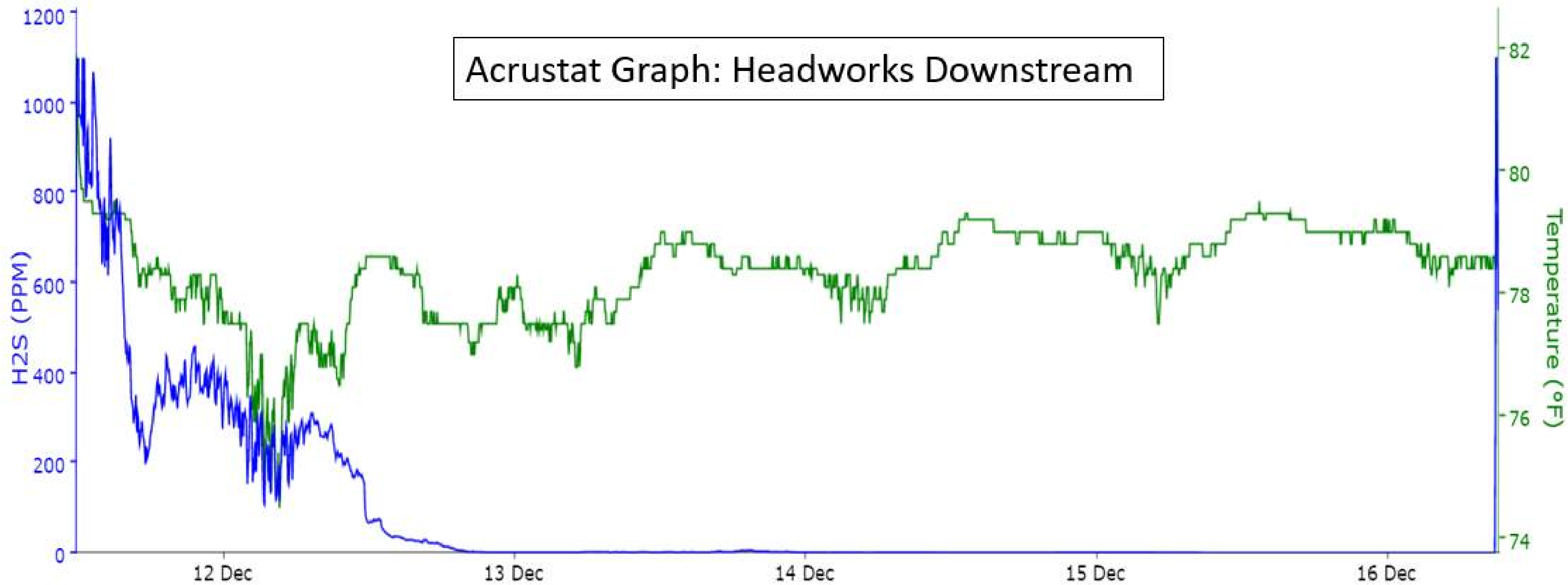
Acrustat Graph: Odor Control Inlet



Acrustat Graph: Odor Control Outlet




Outlier
Acrustat Graph: Headworks Upstream
H2S (PPM)
Temperature (°F)
12 Dec
13 Dec
14 Dec
15 Dec
16 Dec



Acrustat Graph: Headworks Downstream
1200
1000
800
600
400
200
0
H2S (PPM)
12 Dec
13 Dec
14 Dec
15 Dec
16 Dec
82
80
78
76
74
Temperature (°F)