West Basin Facility Plan Project 7054

TECHNICAL MEMORANDUM 13

Hillsboro WRRF Headworks and Grit Removal System Evaluation

FINAL / September 2025

Produced by: carollo

Clean Water Services

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Abbreviations

acph	air changes per hour
C1D1	Class 1 Division 1
C1D2	Class 1 Division 2
cfm	cubic feet per minute
District	Clean Water Services
gpm	gallons per minute
HVAC	heating, ventilation, and air conditioning
IPS	influent pump station
mgd	million gallons per day
TM	technical memorandum
UV	ultraviolet
WRRF	water resource recovery facility

TM 13 HILLSBORO WRRF HEADWORKS AND GRIT REMOVAL EVALUATION

13.1 Introduction and Background

The planning team conducted an evaluation of the existing headworks facility at the Hillsboro Water Resource Recovery Facility (WRRF) as part of the facilities planning process. This technical memorandum (TM) outlines the current condition of the existing facility and presents options for near-term improvements to address existing issues, as well as the potential future replacement of the headworks building. Additionally, this TM includes planning level cost estimates and key considerations for both approaches within the planning horizon through 2045.

13.2 Existing Conditions

The existing headworks facility, constructed in 1992, consists of two Vulcan multi-rake screens with dedicated HUBER screenings washer/compactors, two Jeta 270-degree circular grit traps, and two Krebs grit cyclones, fed by two continuously operating WEMCO grit pumps housed below the grit basins. A common grit dumpster, located in the southwest corner of the building, collects washed and compacted screenings and grit.

The existing headworks was designed to handle peak flows of 19 million gallons per day (mgd), with one screen and one grit basin out of service. However, the channel isolation gates are manually actuated and typically both treatment trains remain in operation unless required by maintenance activities. Although the influent screens and screenings washer compactors were replaced in 2013 and 2019, respectively, the grit removal equipment, including the glass-lined ductile iron grit piping, and most of the ventilation system, including the odor control ductwork, are original. As part of the 2019 Odor Abatement project, the original foul air fan was removed, and the exhaust ductwork was modified to route foul air to new odor control tower via new foul air fans, located between Primary Clarifier 2 and Secondary Clarifier 3, approximately 100 feet to the south of the headworks.

As part of the evaluation, a site visit and interview of facility operations staff were performed to assess the existing conditions, operation, and maintenance requirements of the facility, with the goal of identifying deficiencies or potential improvements. Based on these efforts, the following observations were made.

13.2.1 Operational Reliability and Redundancy

13.2.1.1 Influent Flow Measurement

Influent flow is conveyed to the inlet box of the headworks via a 36-inch gravity line from the north and the influent pump station (IPS) to the south. There is currently no means to measure influent flow from either direction. Total influent flow can be measured in the headworks effluent channel by a laser velocity flow meter, installed in 2019; however, operations staff noted that this meter is temperamental and inaccurate under certain flow conditions and is not trusted to inform flow-related process changes.

Instead, operators currently rely on the magnetic flow meters upstream of the ultraviolet (UV) disinfection process at the end of the treatment process, which is not ideal.

The lack of real-time influent flow data limits operational control in several ways. Downstream of the headworks, gate 72 modulates to maintain a base load to the treatment system; without accurate influent measurement, the control response of this gate lags, increasing the risk of overloading the treatment process, flooding, or permit violations. To mitigate this, operators restrict flow to treatment overnight when the facility is unstaffed, diverting excess flow to the transfer pump station and adding additional load to the Rock Creek WRRF (Rock Creek). During high-flow events, these transfer flows can approach or exceed the transfer pump station's design capacity. The absence of influent measurement also prevents flow-proportional control of return activated sludge, leading to suboptimal mixed liquor suspended solids in the aeration basin and elevated sludge blankets in the secondary clarifiers. Elevated blankets increase the potential of solids carryover at the clarifier effluent weirs, leading to higher effluent TSS and reduced effectiveness of the UV system.

13.2.1.2 Screening Equipment

Operations staff indicated that they are satisfied with the existing Vulcan screens and HUBER washer/compactors, finding them to be mechanically reliable with no recurring issues. However, because each screen is dedicated to a specific compactor, a screen must be taken offline when its corresponding washer/compactor is out of service, and vice versa. This reduces operational redundancy. While each screen can handle the facility's current typical flows, the washer/compactors are cleaned regularly to address grease buildup. If a washer/compactor were to experience a greater failure, one channel could be out of service for an extended period.

13.2.1.3 Grit Removal System

Operations staff reported that the existing equipment performs adequately with no significant grit accumulation up or downstream of the existing grit removal system and the quality of the washed grit is satisfactory. Plugging of the grit piping was not reported; however, thinning of the pipe walls and breakage has been observed. Figure 13.1 shows one segment of the impacted piping. Staff have noted minor grit carryover to the aeration basins and most residual grit, if any, is believed to settle in the primary clarifiers and be conveyed with primary sludge to Rock Creek, which could accelerate wear on sludge and transfer pumps. Targeted monitoring (e.g., periodic grit characterization in primary sludge and tracking of pump wear rates) is recommended to quantify this issue and guide pump maintenance strategies.

Figure 13.1 Existing Grit System Piping

The Jeta grit traps contain a mixer with a top mounted motor that runs continuously. No excessive maintenance activities on this equipment were reported. The two grit pumps that pull settled grit from the bottom of the Jeta grit traps are constant-speed, belt-driven units that run continuously, providing a constant flowrate of 175 gallons per minute (gpm). The volute and impeller on one of the grit pumps was replaced last year (2024); the other equipment is original and at the end of its useful life.

The WEMCO Hydrogritter used for grit washing performs well given its age. The washed grit was observed to be relatively clean, without excessive organics, water, or odor, all of which would be indicative of poorly performing equipment. Likely due to the age of the equipment, the frequency of maintenance activities has increased. Staff reported that the lower bearing on the Hydrogritter requires annual replacement, as compared to the manufacturer's recommended replacement frequency of 10-15 years. Additionally, it was reported that replacement of components (seals and liners) on the grit cyclones is required on a bi-annual basis as compared to the manufacturer-recommended frequency of 1-3 years.

13.2.1.4 Isolation Gate Actuation

Each screening channel and grit basin can be isolated using gates upstream and downstream of the equipment, providing potential operational redundancy by allowing either screen to operate with either grit basin while the redundant unit remains offline. Operations staff noted that they would prefer to run one channel at a time, only operating the redundant equipment during peak flow events. However, these gates are manually actuated and 6 feet tall, making them cumbersome to operate. As a result, all gates remain open unless equipment is taken offline for maintenance, leading to unnecessary runtime accumulation on equipment.

13.2.1.5 Grease Accumulation

During staff interviews, it was noted that significant grease accumulation occurs at the existing headworks and in upstream structures due to numerous restaurant dischargers in the service area. The City of Hillsboro does not have a local pretreatment program in place, nor do they wish to implement one. As a result, grease accumulates upstream of the headworks, in the gravity sewer collection box where outlet piping is continuously submerged and on the surface of the wet well of the IPS, requiring operations staff to vacuum out accumulated grease from these locations monthly.

Additionally, the portion of the grease that is entrained in the influent flow and passes the IPS wet well and influent collection box is caught and carried by the screens to the washer/compactors where it accumulates to the point that a unit must be taken offline once per week to clear it. Because each washer/compactor is dedicated to a specific screen, an entire channel must be taken out of service weekly to accommodate this maintenance.

13.2.2 Ventilation

Operators expressed concerns about the building's ventilation, noting that several of the exhaust air registers are on drop legs at floor level, in inconvenient locations, causing them to occasionally get soaked during washdown events. The heating, ventilation, and air conditioning (HVAC) ductwork in the building is metal and mostly original and utilizes common ducts for both odor control and process area ventilation. Additionally, concerns were raised that the ventilation system was not providing adequate air flow.

The existing headworks equipment is rated for Class 1 Division 1 (C1D1) operation per National Electrical Code standards, which is required for enclosed spaces processing raw wastewater with less than 12 air changes per hour (acph), as specified by National Fire Protection Agency 820. A recent odor abatement project installed new foul air exhaust fans intended to provide a ventilation rate in the headworks of 5,100 cubic feet per minute (cfm) (approximately 12 acph), which would lower the hazardous location classification to Class 1 Division 2 (C1D2). However, an evaluation of the odor control balancing report[1] revealed airflow restrictions at certain exhaust inlets, resulting in a total exhaust flow of 4,935 cfm, about 97 percent of the design flow (Table 13.1). The restricted inlets, which are drawing foul air from the channel headspace (inlets 5, 7, 10, and 11) and would be considered odorous point sources, required additional exhaust air to be drawn from the main process area, likely reducing the overall efficiency of the odor control system (Figure 13.2).

[1] Neudorfer Engineers, (November 2023). CWS Odor Control Air Balance Report. Odor Abatement and Washer/Compactor Replacement Project 6812

Table 13.1 Headworks Exhaust Inlet Summary

Inlet	Design Airflow (cfm)	Final Airflow (cfm)	Final %
3	450	410	91
4	600	1310	218
5	450	225	50
6	475	440	93
7	475	265	56
8	475	435	92
9	475	1285	271
10	850	305	36
11	800	260	33
Total	5,050	4,935	98

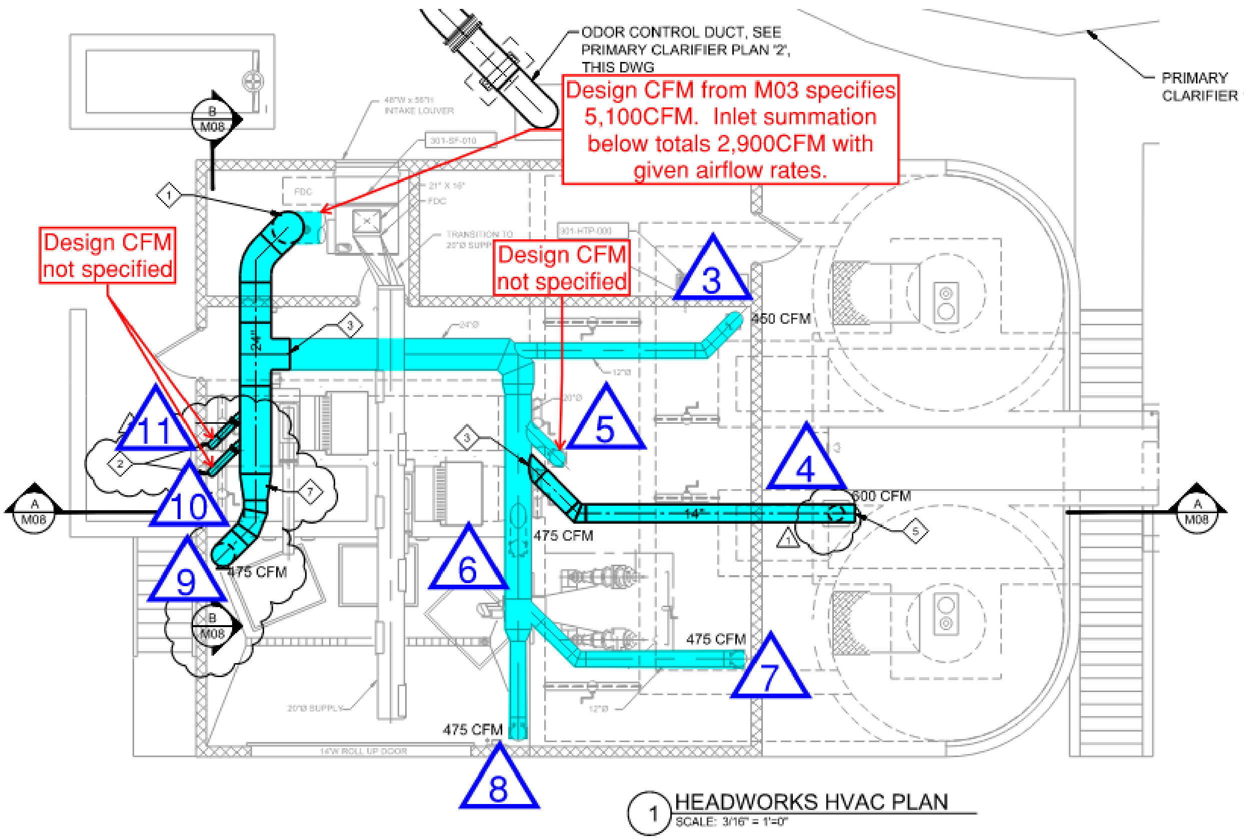

Figure 13.2 Headworks Exhaust Inlet Locations[2]

[2] Neudorfer Engineers, (November 2023). CWS Odor Control Air Balance Report. Odor Abatement and Washer/Compactor Replacement Project 6812

13.2.3 Accessibility and Safety

The layout of the existing headworks facility is highly constrained, with limited walkways around and between the screens, as well as narrow passageways around the slide gate frames, grit washing equipment and exhaust ductwork drop legs. Staff specifically identified space limitations at Screen Channel 2, where the area upstream of Screen 2 is confined by the snorkel of Washer/Compactor 1 to the east, the influent slide gate to the west, Screen 1 to the north, and the lower-level grit dumpster area to the south (Figure 13.3). This tight configuration makes it difficult to set up an appropriate confined space retrieval system for channel maintenance activities.

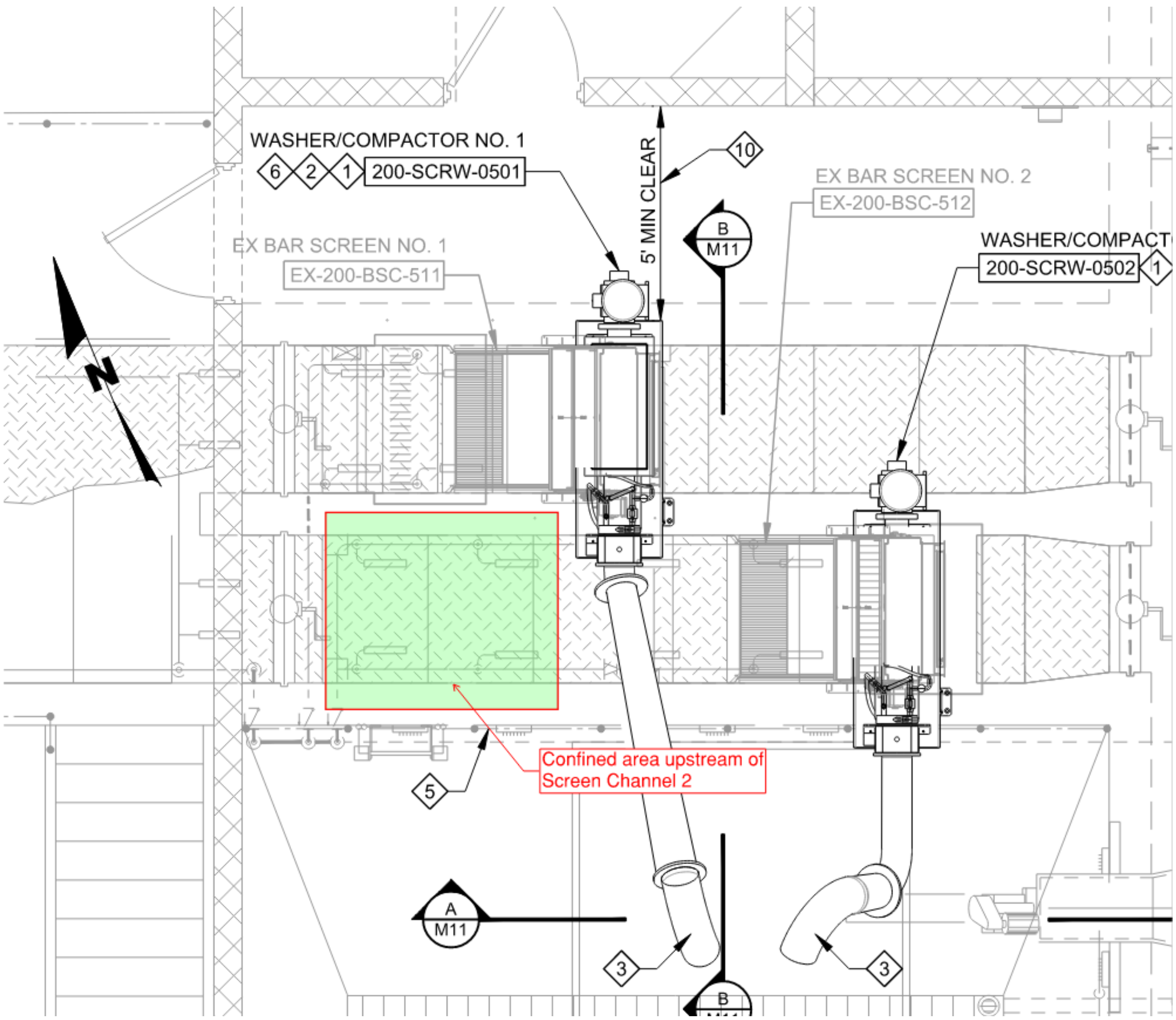

Figure 13.3 Confined Space Upstream of Screen Channel 2

Furthermore, as part of a recent project, the former primary access to the mechanical room through the electrical room was eliminated, shifting the primary point of entry to a door on the east side of the building. This entrance lacks controls for the process area lighting and exterior gas-detection status indication (go/no-go lights and safety beacons), which poses a clear safety hazard.

The grit pumping room below the grit basins was also identified as particularly tight, with very little room to perform maintenance but no easy means of removing equipment from the room via the deep/narrow stairwell to conduct maintenance in an alternate location (Figure 13.4).

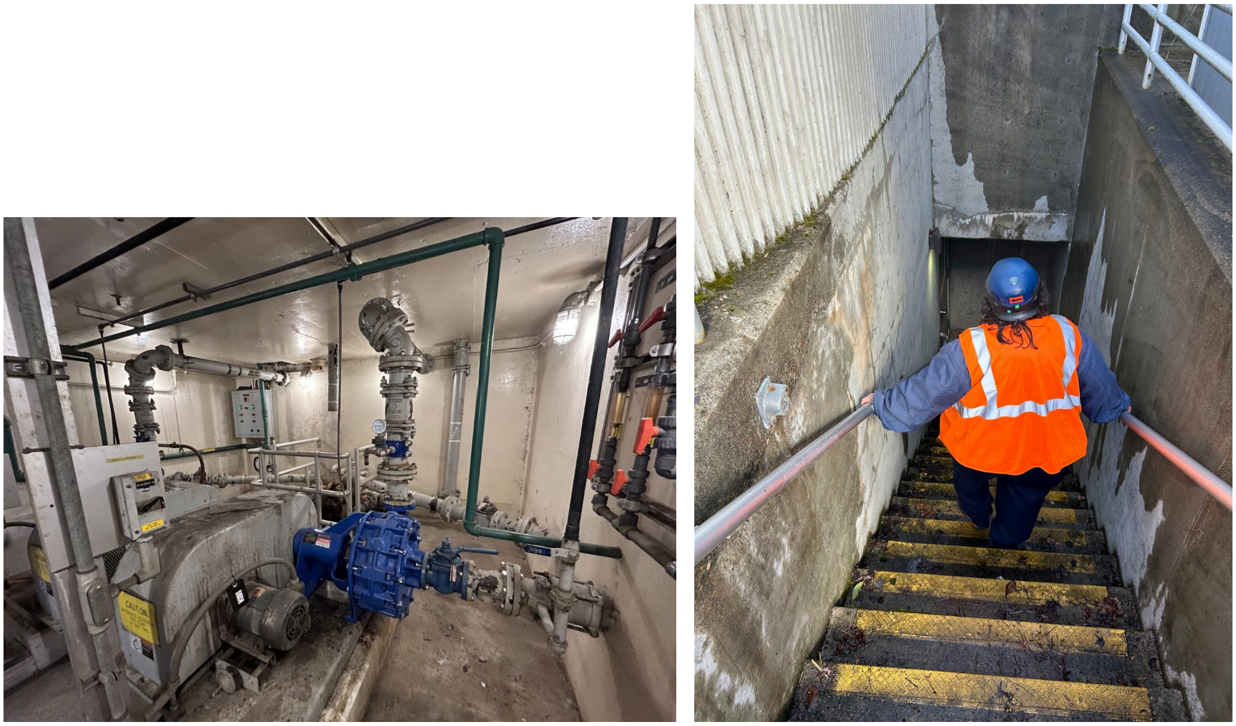

Figure 13.4 Grit Pumping Room and Access Stairwell

13.2.4 Headworks Treatment Capacity

The existing headworks has sufficient capacity to treat peak hour flows through at least 2039 as detailed in the Hillsboro WRRF Capacity Assessment[3], based on the design criteria summarized in Table 13.2.

Table 13.2 Headworks Major Equipment Design Criteria Summary

Equipment	Unit Capacity(1)	Number of Units	Redundancy Criteria
Bar Screens	19 mgd	2	1 unit out of service
Grit Chambers	20 mgd	2	1 unit out of service

Notes:
(1) Projected peak hour flow exceeds 19 mgd in 2040.[4].

[3] Carollo Engineers, Inc., (August 2025). TM 11 - Hillsboro WRRF Capacity Assessment. West Basin Facility Plan Project 7054
[4] Carollo Engineers, Inc., (June 2025). TM 10 - Forest Grove WRRF Capacity Evaluation. Appendix 10A - West Basin Facility Plan Project 7054

13.3 Recommended Near-term Improvements to Existing Facilities

13.3.1 Operational Reliability and Redundancy Improvements

13.3.1.1 Improved Influent Flow Measurement

Potential locations between the headworks and the primary clarifiers were evaluated to meter the combined screened and degritted flow using either a magnetic flow meter or a flume. Due to congestion downstream of the headworks, no locations provide the straight-run pipe lengths required for accurate magnetic flow measurement, and no open channel has sufficient width/depth to accommodate a flume sized for the full facility flow range without unacceptable headloss. As a result, metering in this reach is not feasible.

To achieve influent flow measurement, the installation of magnetic flow meters on the 14-inch and 20-inch discharge lines from the IPS was considered. A new precast vault would be installed to house the meters at the approximate location shown in Figure 13.5, where the discharge pipes approach finished grade, minimizing associated excavation and site work, and allowing for the meters to be powered out of the existing headworks building. Flow from the IPS constitutes 70 percent of the total influent flow, with the remaining flow entering the facility via the gravity system to the north.

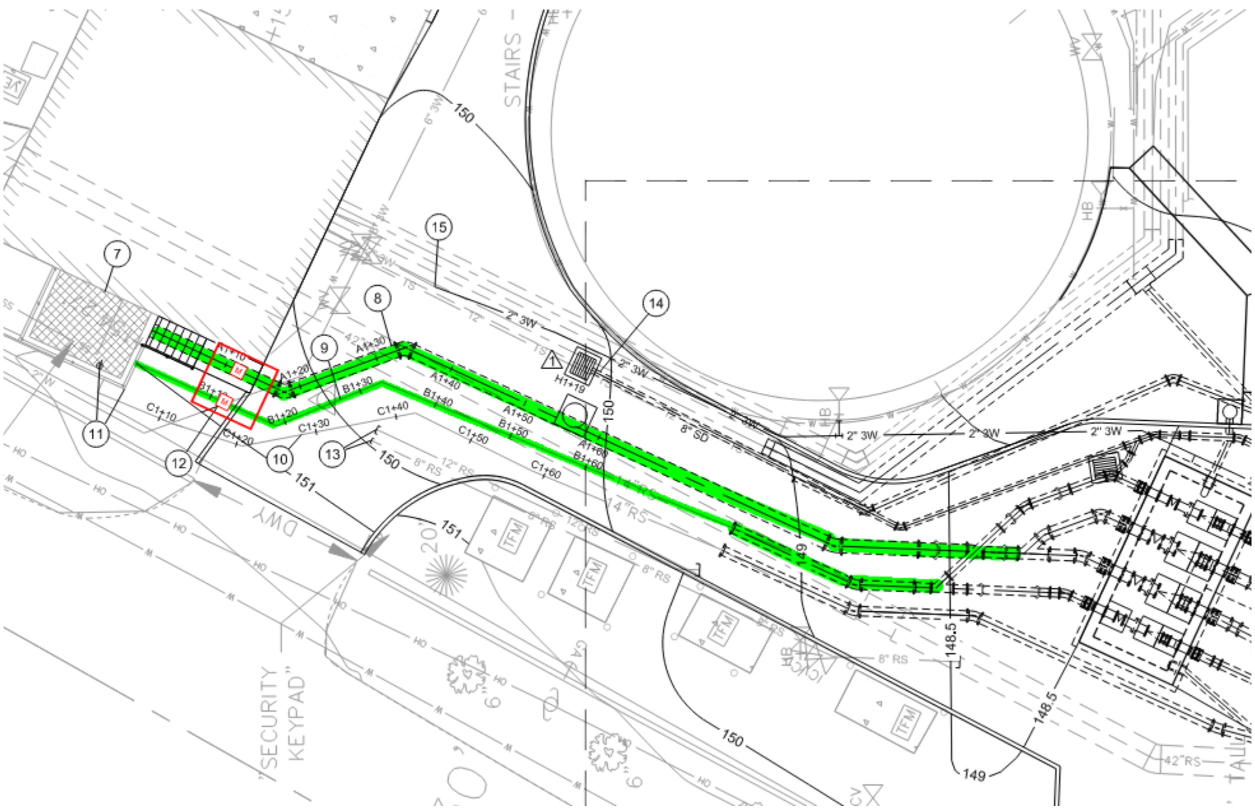

Figure 13.5 Proposed Flow Meter Vault Location

The gravity influent is currently unmetered. To provide an integrated total influent flow measurement, a magnetic flow meter could be installed in the 36-inch gravity influent line upstream of the headworks inlet box, and the resulting measurements totalized with data from the new IPS meters. A flume option was not advanced for this location due to anticipated headloss, submergence sensitivity, and potential upstream hydraulic impacts.

A conceptual vault location to house this new meter is shown in Figure 13.6, where this reach of pipe is expected to flow full. This approach carries notable constraints; magnetic flow meters achieve the highest accuracy within the manufacturer's recommended flow velocity range and with adequate straight run of pipe up and downstream. Reducing the diameter of the influent line to achieve this preferred velocity is not recommended, as it could create a hydraulic bottleneck under peak hour flow conditions. Given these limitations, some loss of accuracy and/or operational impacts should be anticipated. This option is retained as a future near-term alternative and should be further evaluated during preliminary design to confirm feasibility.

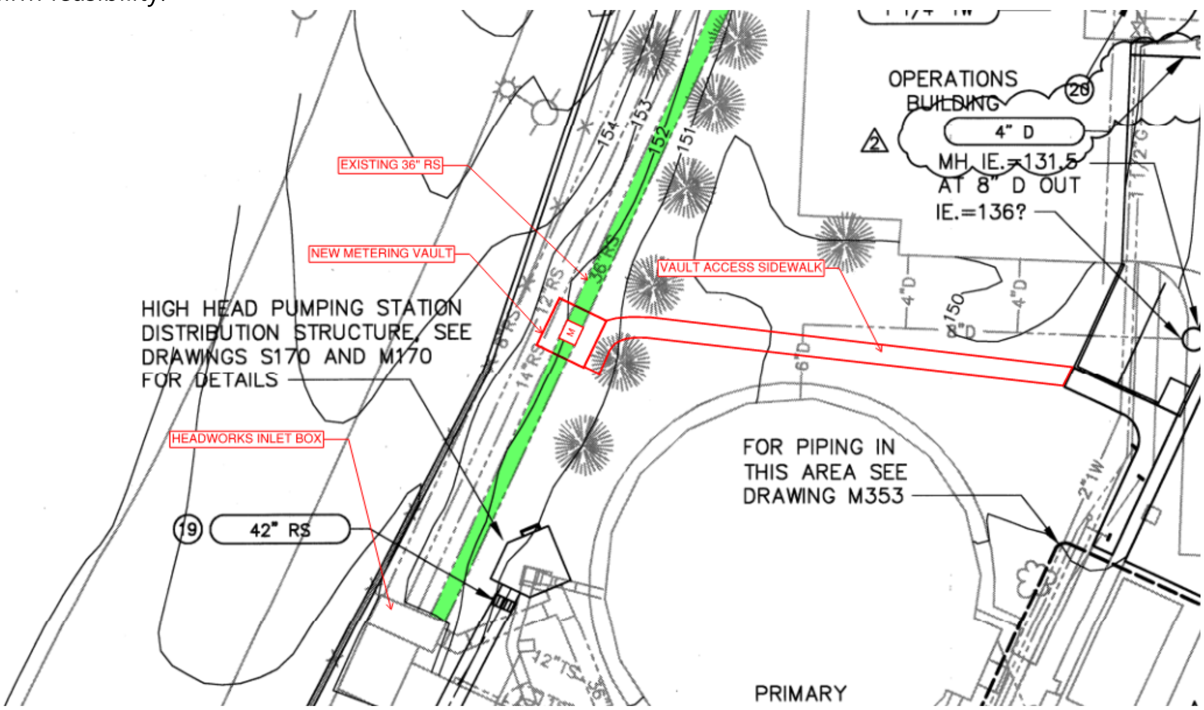

Figure 13.6 Potential Location for New Gravity Metering Vault

13.3.1.2 Installation of Screen Diverter Gates

Given the potential loss of redundancy resulting from the dedicated nature of the washer/compactors and screens, it is recommended to consider the installation of a diverter gate on the influent screens. This would allow screenings to be diverted directly into a bin, enabling the screens to continue operating when the dedicated washer/compactor is out of service. Figure 13.7 shows a screen installation with a comparable diverter gate set to divert screenings to a dumpster; Figure 13.8 shows the same installation with the gate in the normal position, directing screenings to the washer/compactors.

Figure 13.7 Screenings Diverter Gate in Divert Position (Screenings to Dumpster)

Figure 13.8 Screenings Diverter Gate in Normal Position (Screenings to Washer/Compactor)

This solution would improve operational flexibility by reducing downtime during washer/compactor maintenance, ensuring uninterrupted screening operations. However, given the space constraints within the facility, adding another screenings bin to the space may not be a practical option.

It's important to note that the system is designed so that one screen can handle a peak flow event, and the screen/compactor issue is not currently considered a major concern by operations staff. As such, while the diverter gate offers a straightforward solution, its necessity should be further evaluated in the context of the overall facility needs and priorities.

13.3.1.3 Replacement of Aging Grit Equipment

The existing grit piping, grit basins, and grit washer are at the end of their useful life, requiring increased maintenance and repair. As such, replacement of this system is recommended. Given that operations staff have been satisfied with the performance and operation of the existing equipment and it fits within the existing space, an in-kind replacement was considered.

Portions of the existing grit piping run beneath the building and are inaccessible for replacement. Therefore, it is proposed that this piping be capped where it daylights in the process area and grit pumping room. New glass-lined ductile iron piping would then be routed from the new Hydrogritter to the grit pumping room, through the existing channels, and through the floor of the headworks effluent channel, as shown in Figure 13.9.

Additional consideration should be given to the flowrate of the new grit cyclones and grit pump. The existing pumps and cyclones are sized for 175 gpm each, but the recommended flowrate in a 4-inch grit line to minimize the risk of clogging is 250 gpm. A 250 gpm grit pump by the same manufacturer would not require a larger horsepower motor or additional floor space. Although plugging of the grit piping has not been an issue historically, if the facility shifts to operating with one duty and one standby unit, a single pump will handle more grit, increasing the potential for plugging of the pipe. Costs developed for this option include 250 gpm replacements for both existing grit pumps and hydro-cyclones.

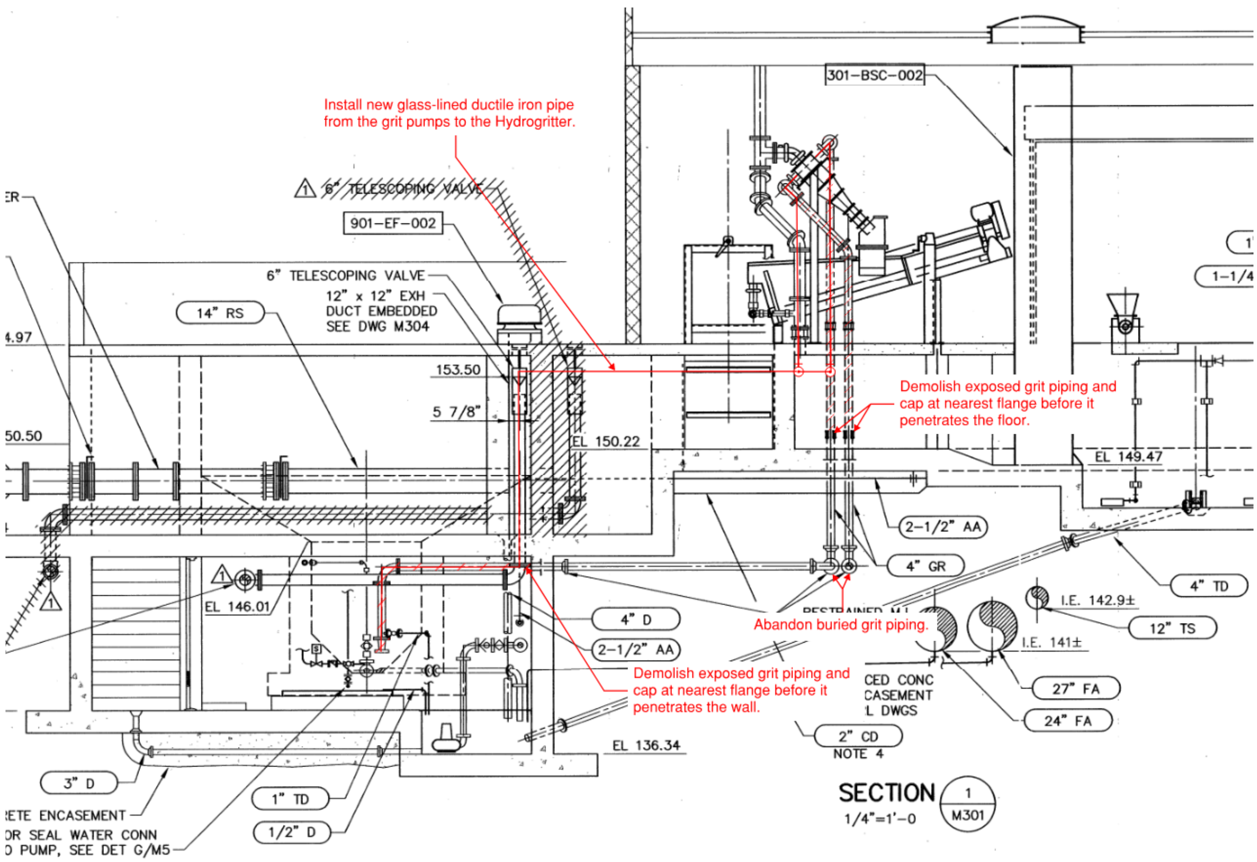

Figure 13.9 Proposed Grit Piping Replacement

13.3.1.4 Motorized Actuation of Channel Gates

To improve the operability of the existing gates and allow for isolation of each screening channel for duty/standby operation of the influent screens and grit basins, motorized actuation of the gates was evaluated. There are eight channel isolation gates, 6 feet tall and ranging in width from 3-6 feet, and each would be electrically actuated with remote operators provided for the screen channel influent gates, where the frame extends higher than 4 feet above the finished floor elevation.

For conservatism, it was assumed that the hazardous area classification will remain C1D1 and actuators would require an explosion-proof rating. However, should improvements to the building ventilation be completed, and the space reclassified to C1D2, this rating may not be necessary, which could reduce both the space required for installation and the cost of the electrical actuators. As demonstrated in Figure 13.10, two of the gates are located close to the wall and coordination with actuator manufacturers will be required to configure the actuators so that they fit in the given space.

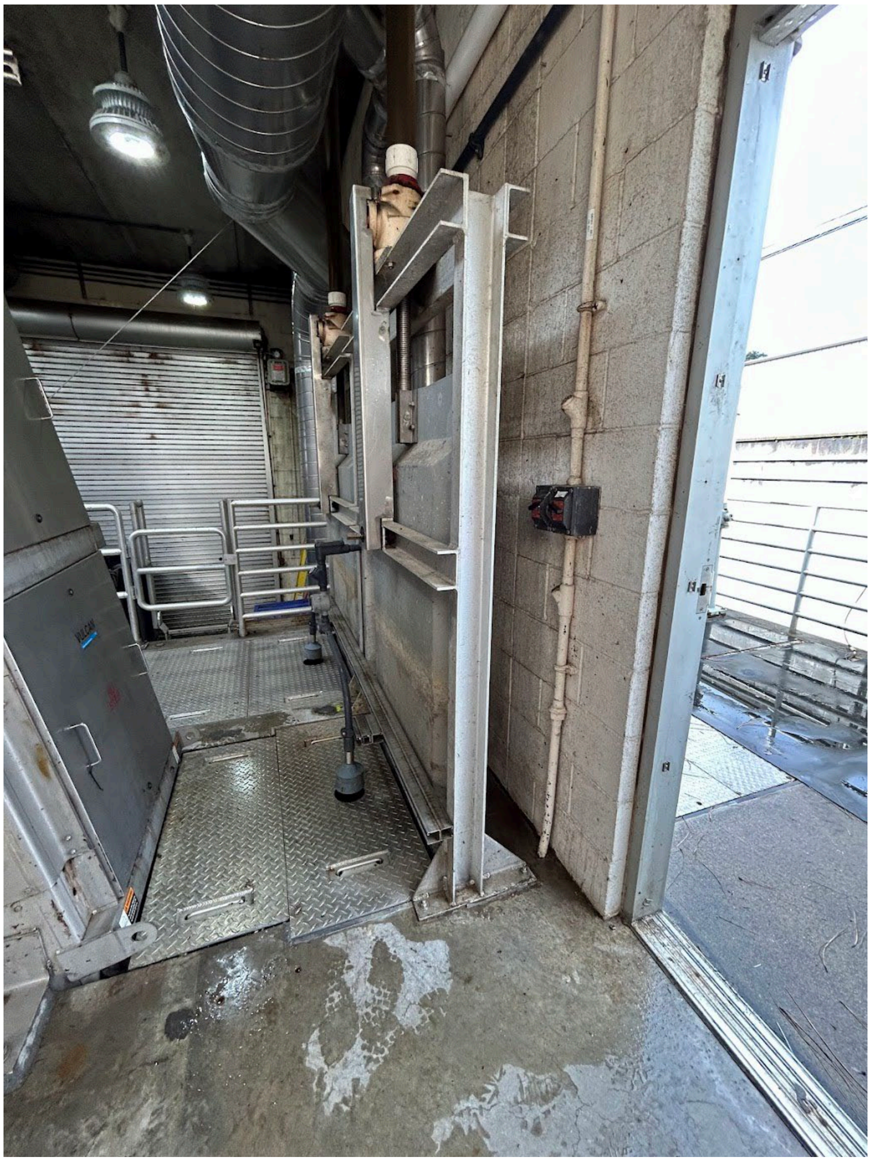

Figure 13.10 Existing Channel Gate

13.3.1.5 Reduction of Grease Accumulation

Several factors may contribute to the buildup of grease on the washer/compactors and in structures upstream of the headworks. Given that each screen is sized for the peak flow of 19 mgd, during lower, more typical operating flows the velocity through the channels may be low enough to cause grease to float to the surface, allowing it to be caught by the screens. In the IPS and gravity collection box, the submerged pumps and outlet piping do not provide a path for grease to exit, trapping it on the water surface in the structure.

While source control is the most effective method for reducing grease accumulation, possible approaches for addressing grease accumulation within the facility are to either ensure it stays entrained in the flow, allowing it to pass through preliminary treatment to the primary clarifiers where it can be removed, or create a trap to remove grease upstream of the headworks. Given the existence of submerged outlets in structures between the headworks and the primaries, the second alternative was identified as the most effective for reducing the grease accumulation in the headworks at Hillsboro.

Operations staff reported that most of the grease enters the facility via the gravity flow from the north. Accordingly, the installation of a grease interceptor vault on the 36-inch gravity line upstream of the collection box was considered. While this will not address grease in the pumped influent and still requires periodic management of collected grease, collection would be localized to minimize required effort. Installing a dedicated trap upstream of the IPS was not considered feasible given the depth of the 36-inch influent line, and the IPS will continue to require periodic grease removal.

Further evaluation of the nature of the grease build-up on the washer/compactors could be done to determine if alternate methods for management would be effective.

13.3.2 Ventilation Improvements

Improvements to the ventilation system should be made to enhance the efficiency of the odor control system and optimize the ductwork layout, with the goal of reducing the hazardous classification of the building. It is recommended that the odor control ductwork be reconfigured to prioritize exhaust from odorous point sources, such as the screens and the downstream channel, and to be separated from the ductwork and fans serving the rest of the process space. This reconfiguration would significantly improve the efficiency of the odor control system.

In addition, the ductwork layout should be redesigned to reduce the number of drop legs required for handling heavier-than-air gases. These drop legs should be relocated to the perimeter of the building to minimize obstructions in the already limited space. As part of this redesign, the existing metal ductwork should be replaced with fiberglass reinforced plastic ductwork, which has proven to be more durable and resilient in headworks environments, ensuring long-term reliability and reduced maintenance needs.

13.3.3 Improvements to Facility Access and Safety

To address operators' concerns with the narrow and challenging access to the northern channel closer to the dumpsters, it is recommended for the facility to purchase a portable confined-space access system similar to the integrated adjustable barrel mount sleeve shown in Figure 13.11.

Source: Grainger, DBI-SALA

Figure 13.11 Integrated Adjustable Barrel Mount Sleeve

This sleeve can be mounted on the narrow strip of concrete between the channel opening and the guardrail and attached to a Davit mast extension and upper mast to be paired with a winch and harness for lowering and raising personnel in and out of the channel. Lifting cables should be rated for wastewater service, and the appropriate length to reach the base of the channel. Should work be required along the length of the channel, this portable system can be shifted along the channel for access to different segments. Fall protection for the attendant should also be considered, such as an edge-rated self-retracting lifeline attached to the ceiling or another structurally sound element in the room.

Additionally, it is recommended that light switches and go/no go lights be added at the new primary point of entry on the east side of the building.

13.3.4 Capital Costs of Near-term Improvements

The conceptual improvements presented above were used to develop the planning level opinions of probable cost for all recommended near-term improvements to the existing headworks facility. Table 13.3 shows an abbreviated summary of the estimated costs associated with these upgrades, rounded up to the nearest $10,000. Refer to Appendix 13A for a more detailed breakdown of estimated costs.

Table 13.3 Near-term Improvements Planning Level Cost

Item	Total Cost Direct	Construction(1)	Project(2)
Flow Measurement	$410,000	$650,000	$780,000
Replacement of Grit Equipment	$1,170,000	$1,870,000	$2,250,000
Motorized Gate Actuation	$160,000	$260,000	$310,000
Grease Mitigation	$120,000	$200,000	$240,000
Ventilation	$80,000	$120,000	$140,000
Access and Safety	$30,000	$40,000	$50,000
Total Cost(3)	$1,940,000	$3,110,000	$3,730,000
Expected Range(4)	$970,000 to $3,880,000	$1,560,000 to $6,220,000	$1,865,000 to $7,460,000

Notes:
(1) Construction costs include a 30% estimating contingency, 10% markup for general conditions, and 12% markup for contractor overhead and profit.
(2) Project costs include a 20% markup for total construction costs for engineering, legal, and administration fees.
(3) Total costs may differ slightly from cost reported in Appendix 13A due to rounding.
(4) Class 5 costs per American Association of Cost Engineers have an expected accuracy range of -50% to +100%.

13.4 New Headworks Facility

As many of the existing concerns in the existing facility are related to the layout of the process equipment and footprint of the building, the construction of a new headworks facility was considered. It is expected that this new headworks would be located to the north of the existing structure where the existing administration building is located (Figure 13.12).

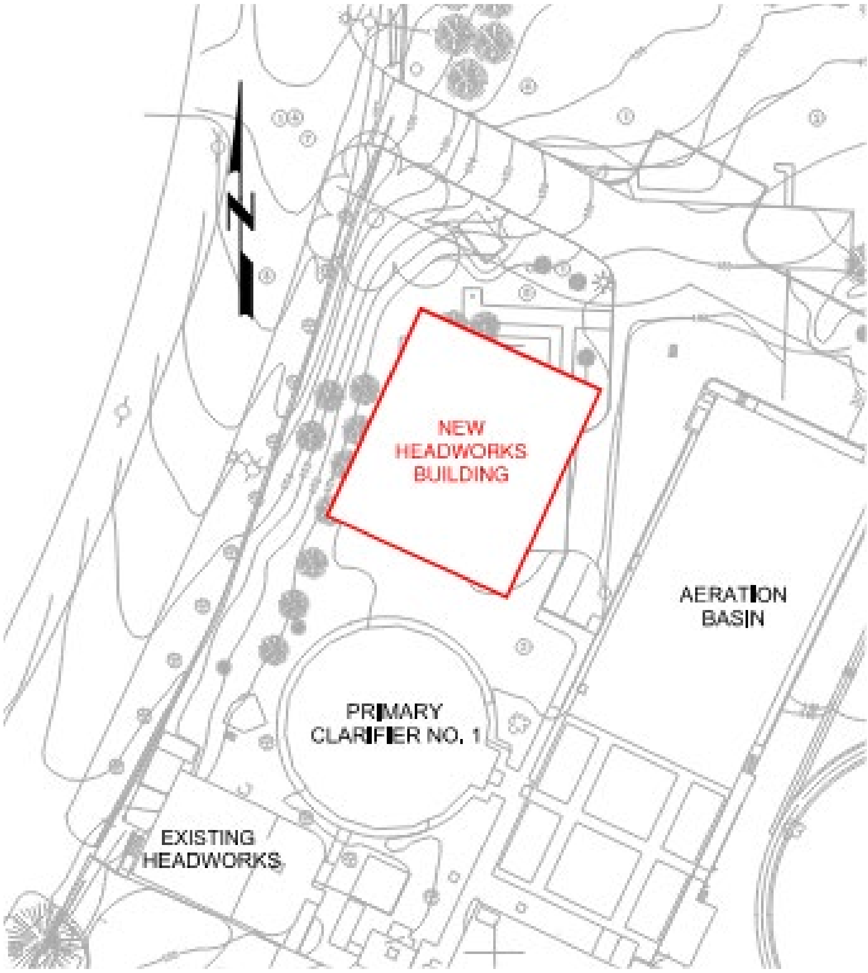

Figure 13.12 New Headworks Building Location

For the purposes of estimating the project cost, it was assumed the new structure would be designed with a firm capacity of 20 mgd, equal to the existing headworks, but with a footprint of 4,875 square feet, approximately twice the size of the operational footprint of the existing structure. The new building would house two influent screens, two grit basins with dedicated grit pumps and grit classifiers. Cost has been included for dedicated HVAC and odor control; however, the potential to integrate this building into the centralized odor control system should be evaluated during the pre-design process.

It was also assumed that facility maintenance and administration activities would be relocated to a different location, one option being an existing building north of the active facility site. It is likely that some improvements to this existing building will be required, including the retrofit of a lab and a maintenance shop; however, the extent of these improvements is currently unknown. As such, an allowance for the construction of these improvements has been factored into the overall opinion of probable costs summarized in Table 13.4. Refer to Appendix 13A for a more detailed breakdown of estimated costs.

Table 13.4 New Headworks Facility Planning Level Cost Estimate

Item	Total Direct Cost	Total Construction Cost(1)	Total Project Cost(2)
New Headworks	$21,500,000	$34,500,000	$41,300,000
Allowance for Operations/ Administration Improvements	-	$5,000,000	$6,000,000
Total Cost(3)(4)	$21,500,000	$39,500,000	$47,300,000

Notes:
(1) Construction costs include a 30% estimating contingency, 10% markup for general conditions, and 12% markup for contractor overhead and profit.
(2) Project costs include a 20% markup for total construction costs for engineering, legal, and administration fees.
(3) Total costs may differ slightly from cost reported in Appendix 13A due to rounding.
(4) Class 5 costs per American Association of Cost Engineers have an expected accuracy range of -50% to +100%.

13.5 Conclusions

To address the most pressing concerns with the existing facility in the near-term, Clean Water Services (District) may consider targeted improvements to ventilation, replacement of grit piping and equipment at the end of its useful life, motorized actuation of gates and improvements to facility access and safety outlined in Section 13.3, in 2025.

Within the planning horizon, the District may consider constructing a new headworks facility as outlined in Section 13.4 to address the remaining issues of flow monitoring and optimize both process efficiency and operator safety.

The total project cost of near-term improvements discussed herein is approximately $1.7 million. The total project cost of a new headworks is expected to be approximately $47 million. The accuracy range of these estimates are -50 percent to + 100 percent, based on the definition of a Class 5 Estimate per Association for the Advancement of Cost Engineering.

The District may wish to evaluate how targeted near-term improvements can be integrated into more significant improvements in the long term, including the following:

Consider relocation of new grit removal equipment installed in the existing headworks to the new facility.

Incorporate lessons learned regarding ductwork layout and design and safety improvements in the design of the new building.

APPENDIX 13A PRELIMINARY COST INFORMATION

carollo

	Near Term Improvements to Existing	Estimate Class:	5
Project:	7054 WBMP - HB Headworks & Grit Removal Evaluation	PM:	BRM
Client:	Clean Water Services	Date:	5/28/2025
Location:	Hillsboro, OR	By:	SEW
Carollo Job #	200908	Reviewed:	ERA

NO.	DESCRIPTION			TOTAL
1	**Improved Influent Flow Measurement**			
1.1	*IPS Flow Measurement*			
	Magnetic Flow Meter - 14-inch		$	22,500
	Magnetic Flow Meter - 20-inch		$	30,100
	Pre-cast Concrete Vault		$	15,000
	Flow Meter Installation Adder (60% of equipment)		$	31,600
	Civil/Earthwork Adder		$	50,000
	EI&C Adder (20%)		$	29,900
	Subtotal		$	179,100
1.2	*Gravity Flow Measurement*			
	Magnetic Flow Meter - 36-inch		$	45,000
	Pre-cast Concrete Vault		$	15,000
	Flow Meter Installation Adder (60%)		$	27,000
	Civil/Earthwork Adder		$	100,000
	EI&C Adder (20%)		$	37,400
	Subtotal		$	224,400
	Subtotal		**$**	**403,500**
2	**Replacement of Aging Grit Equipment**			
	Mechanical Equipment		$	521,400
	Mechanical Piping (GLDI)		$	86,300
	Installation Adder (60% of Direct cost)		$	364,700
	EI&C Adder (20%)		$	194,500
	Subtotal		**$**	**1,166,900**
3	**Motorized Actuation of Channel Gates**			
	Gate Actuators (8 total)		$	81,700
	Installation Adder (60%)		$	49,100
	EI&C Adder (20%)		$	26,200
	Subtotal		**$**	**157,000**
4	**Grease Mitigation**			
	Interceptor Vault		$	25,000
	Civil Earthwork		$	75,000
	EI&C Adder (20%)		$	20,000
	Subtotal		**$**	**120,000**
5	**Ventilation Improvements**			
	Separate Building Exhaust Fan		$	10,500
	FRP Ductwork		$	26,000
	Installation Adder (60%)		$	21,900
	EI&C Adder (20%)		$	11,700
	Subtotal		**$**	**70,100**
6	**Improvements to Access and Safety**			
	Light Switches and Go/No Go Indication		$	3,500
	Installation Adder (60%)		$	2,100
	EI&C Adder (20%)		$	1,120
	Barrel Mounted Confined Space Access Device & Appurtenances		$	16,433
	Subtotal		**$**	**23,153**
	TOTAL DIRECT COST			**$1,940,000**
	Contingency	30.0%		$582,000
	ESCALATED DIRECT COST WITH CONTINGENCY			**$2,522,000**
	General Conditions	10.0%		$252,000
	Subtotal			**$2,774,000**
	General Contractor Overhead and Profit	12.0%		$333,000
	Subtotal			**$3,107,000**
	TOTAL ESTIMATED CONSTRUCTION COST			**$3,107,000**
	Engineering, Legal & Administration Fees	20.0%		$621,000
	TOTAL ESTIMATED PROJECT COST			**$3,730,000**

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. Carollo Engineers have no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. Carollo Engineers cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented as shown.

Headworks Replacement

Project:	**7054 WBMP - HB Headworks & Grit Removal Evaluation**	**Estimate Class:**	**5**
Client:	**Clean Water Services**	**PIC:**	**BRM**
Location:	**Hillsboro, OR**	**PM:**	**BRM**
Zip Code:	**97123**	**Date:**	**6/10/2025**
		By:	**ERA**
Carollo Job #	**200908**	**Reviewed:**	**WK**

NO.	DESCRIPTION		TOTAL
1	Headworks Building + Mechanical		$ 14,700,000
2	E&IC (of Above Costs)	20.0%	$ 3,000,000
3	Yard Piping	10.0%	$ 1,800,000
4	Sitework	10.0%	$ 2,000,000
	TOTAL DIRECT COST		**$21,500,000**
	Contingency	30.0%	$6,450,000
	ESCALATED DIRECT COST WITH CONTINGENCY		**$27,950,000**
	General Conditions	10.0%	$2,800,000
	Subtotal		**$30,750,000**
	General Contractor Overhead and Profit	12.0%	$3,690,000
	Subtotal		**$34,440,000**
	Allowance for Operations/Administration Improvements		$5,000,000
	TOTAL ESTIMATED CONSTRUCTION COST		**$39,440,000**
	Engineering, Legal & Administration Fees	20.0%	$7,890,000
	TOTAL ESTIMATED PROJECT COST		**$47,300,000**

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