CONSULTING ENGINEERS

SITE LOCATION APPLICATION

FOR THE

WM DENVER EAST

LIFT STATION

WASTE MANAGEMENT

AUGUST 2022

SITE LOCATION APPLICATION

FOR THE

WM DENVER EAST
LIFT STATION

JVA, Inc.

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JVA Project No. 1155e

AUGUST 2022

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SECTION 1 – EXECUTIVE SUMMARY

The City of Aurora provides centralized sewage collection and treatment to residential and commercial customers within its service area. Currently, the City of Aurora encompasses 163 square miles of developed and undeveloped properties in Adams, Arapahoe and Douglas County, Colorado. The Waste Management Denver East (WM) material recovery facility (MRF) and shop will be located on the same property in unincorporated Arapahoe County within one mile of the City of Aurora boundary. A forcemain connection will be constructed between the new private lift station for WM and the Murphy Creek lift station owned and operated by the City of Aurora. The City is prepared to accept wastewater flow and loading from the WM property.

The City of Aurora sanitary sewer tie-in lies approximately 0.6 miles south of the WM lift station location. Wastewater will be pumped through the forcemain along South Harvest Road and discharged into the existing sanitary manhole at the Murphy Creek lift station. From there, the wastewater will be conveyed to the Robert W. Hite Treatment Facility in Denver, Colorado. The WM property is projected to have a buildout average daily sewer flow of 4,000 gallons per day (gpd) and a peak hour design flow of 16,000 gpd. Buildout conditions and flows will be accounted for in lift station design.

The City of Aurora and Robert W. Hite Treatment Facility have confirmed acceptance to treat the wastewater from the lift station at the peak flow rate. Upon construction and completion, WM will immediately take full ownership and operation of the lift station. No easements are required for the lift station but one from Public Service Company of Colorado will be required for the forcemain. The lift station will be located on WM property and the forcemain will be located in the road right of way.

Construction of the WM lift station is scheduled to begin in the second quarter of 2023 and reach substantial completion in the third quarter of the same year. WM has budgeted funding for the design and construction of the lift station in 2022 and 2023. The entire lift station project cost will be covered by WM.

SECTION 2 – PLANNING CONDITIONS

INTRODUCTION AND REPORT STRUCTURE

The following report was prepared in accordance with the CDPHE Site Location Application for a new lift station. Therefore, the structure of this report generally follows the CDPHE Regulation 22 Section 22.9 guidelines regarding lift stations. This engineering report is a requirement for Site Application approval. The Site Application form and signature sheets are included in Appendix A. This report will be reviewed by CDPHE, the City of Aurora, Tri-County Health Department, and Arapahoe County. All comments received from the agencies will be addressed before the design phase for the lift station.

PLANNING AREA

SITE LOCATION

The WM lift station will serve the new WM property that will be located at 24755 East Quincy Avenue in Aurora, Colorado. Wastewater will be collected from the MRF, vehicle wash, and joint administrative and shop building. The wastewater will then be conveyed via sanitary sewer service lines to the lift station northeast of the buildings and 0.2 miles directly north of the intersection of South Harvest Road and East Quincy Avenue. The property is just under 140-acres in an unincorporated section of Arapahoe County. However, once developed the location will likely be zoned as general industrial. Full ownership and operational responsibility for the lift station will belong to WM. A forcemain, 3,216 feet in length, will connect the WM lift station to the Murphy Creek lift station along South Harvest Road. The lift station location and service area, topography, and proposed forcemain alignment is shown in Figure 1. The 1-mile and 5-mile radius maps of the lift station and its respective service area are displayed in Figure 2 and Figure 3.

FLOODPLAIN

The most recent 100-year floodplain map for this area from the Federal Emergency Management Agency (FEMA) is dated October 2020. According to this map, the proposed lift station facility is not located within a 100-year or 500-year floodplain. The planned lift station is approximately 500 feet west of Murphy Creek and its 100-year floodplain boundary. A Flood Insurance Rate Map (FIRM) showing the WM lift station site is located in Appendix B.

FIGURE 1 - SERVICE AREA

WM DENVER EAST
LIFT STATION
AUGUST 2022

JVA, Inc.
1319 Spruce Street
Boulder, CO 80302
303.444.1951
www.jvajva.com
Boulder • Fort Collins • Winter Park
Glenwood Springs • Denver

C:\Users\CSJ\appdata\local\temp\AcPublish_11880\1155e – WME Lift Station – 1 Mile AND 5 Mile Map.dwg, 8/19/2022 – 11:24 AM, CSJ

FIGURE 2 - 1 MILE RADIUS MAP

WM DENVER EAST
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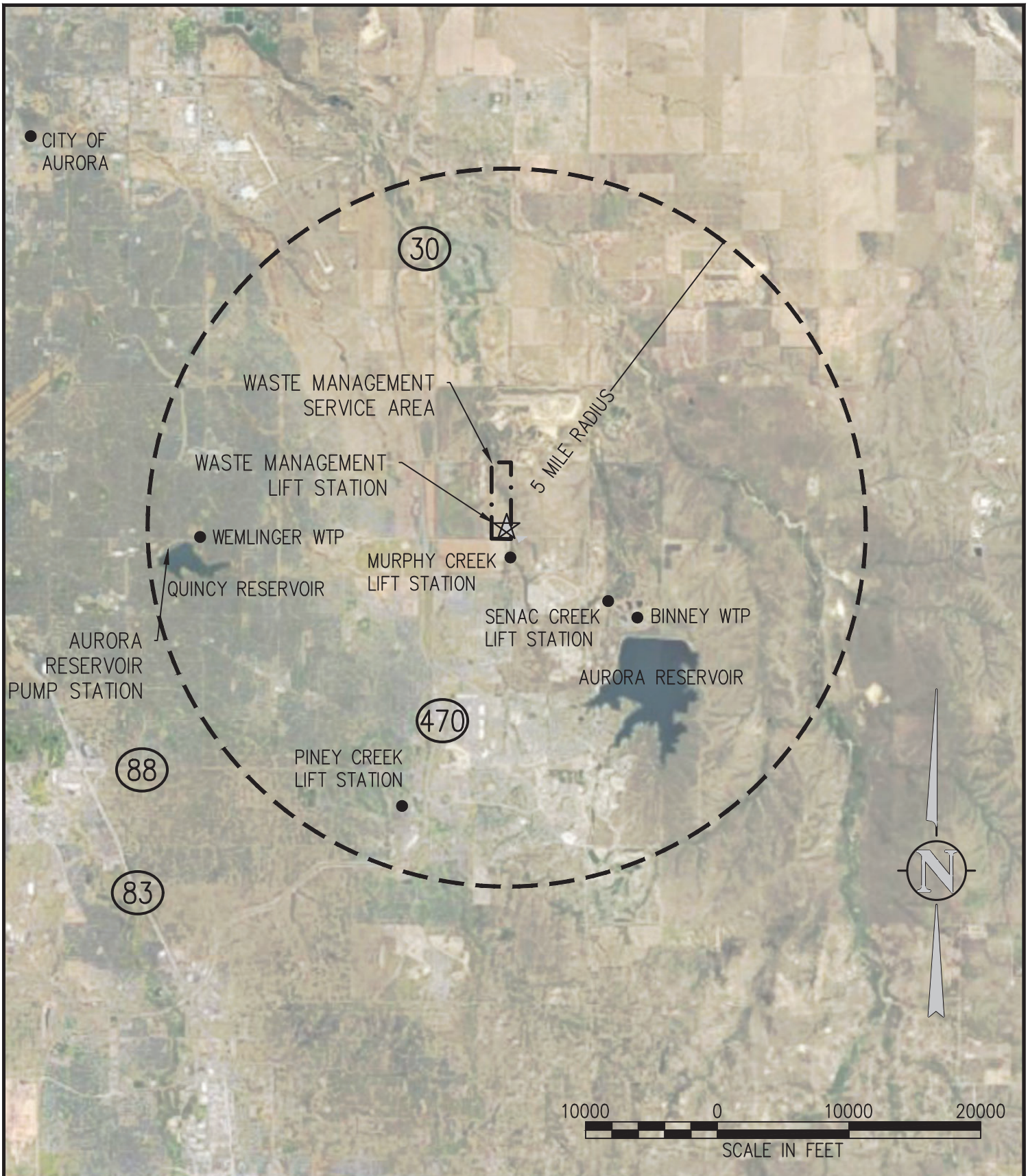

FIGURE 3 - 5 MILE RADIUS MAP

WM DENVER EAST
LIFT STATION
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Wetlands

According to the National Wetlands Inventory, neither the lift station or the proposed forcemain are located in a delineated wetland. A wetlands map in the site vicinity from the U.S. Fish and Wildlife Service is located in Appendix C.

Environmental Components

A geotechnical investigation was performed by CTL Thompson in November 2021. The report is attached in Appendix D. Based on the available information, the site location is suitable for a lift station.

Feasibility of Consolidation of Facilities

The WM Denver East site is located less than one mile from the City of Aurora Murphy Creek lift station. Tying into the City of Aurora existing sanitary sewer infrastructure was deemed the best wastewater handling option due to proximity and negligible flow and loading impacts to the existing collection network.

Growth Areas and Population Trends

WM is developing the property to buildout condition. Increased population or growth rate is not anticipated.

Wastewater Flow & Loading

Projected Flows

The design capacity for the lift station is based on the peak hour flow that the facility is capable of conveying. This wastewater design capacity was calculated from the maximum number of daily staff, associated per capita flowrates from the Tri-County Health Department OWTS Regulations, and anticipated truck wash daily flowrates. The wastewater generated by the onsite employees falls under the office buildings per employee per eight-hour shift category, which has a per capita flowrate of 15 gallons per capita per day (gpcd). The transient visitors include the truck drivers, who will be picking up and dropping off their trucks and using the facilities sporadically, and minimal visitors. This type of use is representative of facilities with short-term or transient visitors, which has a per capita flowrate of 5 gpcd. Truck wash daily flowrates are derived from the wash bay manufacturer, see Table 1 below.

Truck washing will account for most of the lift station wastewater flow. The lift station will be sized to accommodate buildout conditions of the WM Service Area. Total buildout is anticipated at 4,000 gpd with a peaking factor of 4.0. Because the new Facility is being designed, no influent flow data is available. As a result, the 2014 Edition of the "Recommended Standard for Wastewater Facilities" (10 State Standards) was used for the determination of peak hour factors based on the ratio of peak hourly flow to design average flow, tracked against population. Using the expected population on-site, the recommended peaking factor to determine peak hour flow is 4.0. It is assumed that since the collection system is new the peaking factor will account for any minor

Inflow & Infiltration (I&I) over the next 20 years. The peak hour flow is expected to be 11 gpm to the wet well. The pump design flow is set higher at 80 gpm to meet 2 feet per second in the 4-inch forcemain.

Table 1: Design Capacity Flow Calculation

Building	Category	Quantity	Flowrate per quantity (gpd/quantity)	Number of Shifts	Design Capacity (gpd)
Shop	[1]Onsite Employees	42	15	1	630
Shop	[2]Transient Visitors	188	5	1	940
Shop	[3]Truck Wash	15	125	1	1,875
MRF	[1]Onsite Employees	28	15	1	420
MRF	[2]Transient Visitors	14	5	1	70
Total Buildout (gpd)					3,935
Peaking Factor					4
Peak Hour Flow (gpd)					15,740
Peak Hour Flow (gpm)					11
[4]Pump Design Flow (gpm)					80

[1]Tri County Health per capita flowrate for office buildings per employee per eight-hour shift
[2]Tri County Health per capita flowrate for transient visitors
[3]Truck wash flowrate provided by ET
[4]Pump design flowrate calculated from minimum velocity requirement of 2 ft/s in a 4-inch diameter line

Projected Loading

Metcalf and Eddy's *Wastewater Treatment, Fifth Edition* provides a typical influent BOD_5 concentration of 200 to 400 mg/L for medium to high strength domestic wastewater. Therefore, an estimate of 300 mg/L BOD_5 is estimated as the loading to the WM lift station, as well as loading for the 20-year planning projections. Using this estimated concentration and the projected flow rates, the loading to the lift station will be approximately 10 pounds of BOD_5 per day.

Design Criteria

The influent design parameters shown in Table 2 below form the basis of design for the lift station.

Table 2: Influent Design Parameters

Influent Parameters	Value
Buildout Maximum Monthly Average Flow (MGD)	0.004
Buildout Peak Hour Flow (MGD)	0.016
Average BOD_5 (mg/L)	300

The lift station will be designed in accordance with the Site Location and Design Approval Regulations for Domestic Wastewater Treatment Works, Regulation 22, set by CDPHE.

OPERATIONAL PLAN

Two above grade self-priming suction lift pumps will convey wastewater from the wet well through the 4-inch forcemain to the City of Aurora's sanitary collection system. The pumps will be housed in an above grade fiberglass enclosure and will operate in a duty/standby configuration. Within the wet well, a level transmitter will control when the pumps turn on and off. Additionally, timer settings will cycle the pumps to turn over the wet well. The minimum lift station pump flowrate is 80 gpm to ensure a minimum velocity of 2.0 ft/s is maintained in the 4-inch forcemain. See Table 3 for a summary of velocities through the forcemain.

Table 3: WM Forcemain Velocities

Flow Rate Out (gpm)	4-inch HDPE DR14		
	Velocity	Pump Discharge Pressure (TDH)	
	(ft/s)	(ft)	(psi)
80 [1]	2.0	28	12
160 [2]	4.1	74	32

1. Minimum flow needed to achieve 2 ft/s velocity in 4-inch forcemain
2. Minimum flow needed to achieve 4 ft/s velocity in 4-inch forcemain

The working volume of the WM lift station wet well is approximately 294 gallons. Table 4 below summarizes pump cycle scenarios at the average daily flow and peak hourly flow.

Table 4: Lift Station Pump Cycles

Average Daily Flow (gpd)	Lift Station Influent (gpm)	Lift Station Pumping Rate (w/ VFDs) (gpm)	Time to Fill 294 gal Wet Well (minutes)	Pump Run Time per cycle (minutes)	Number of Pump Cycles per Day	Number of Pump Starts per Hour
4,000	2.8	80	106*	2.1	23**	1*
16,000	11.1	80	26	3.7	48	2

*Pumps will be cycled every hour at a minimum
**At 2.8 gpm constant flow into the wet well, 23 pump cycles per day is based on the maximum allowable fill time of one hour resulting in 167 gallons to pump, pumped at 80 gpm for 2.1 minutes

The *Colorado Design Criteria for Domestic Wastewater Treatment Works, WPC-DR-1* specifies "the wet well operating level shall be sized to provide a maximum detention time of one hour at average daily flow" to reduce the potential for odors due to a long hydraulic residence time. To fulfill this requirement at initial flows and ensure the detention time does not exceed one hour, the pumps will be set to cycle hourly regardless of level. The 4-inch forcemain would experience a complete volume change approximately every 12 hours.

In addition to the timer, the pumps will operate based on wet well level, as measured by a hydrostatic transducer or backup floats. Check valves will be installed downstream of each pump

to prevent wastewater from flowing back into the wet well. Wastewater from the forcemain will be discharged into a manhole.

Wet well level set points may be adjusted if needed to reduce the wet well working volume and increase the pump frequency. The minimum pump run frequency of one hour will be maintained to help reduce the potential for odors due to a long hydraulic residence time. If wet well level adjustments do not suffice to limit odors, odor control equipment may be installed at the lift station building. Odor control equipment will be explored further in the detailed design stage.

SECTION 3 – LIFT STATION OPERATION

LEGAL CONTROL OF SITE

WM will own and operate the lift station as a private entity.

WASTEWATER TREATMENT ENTITY STATEMENT

The lift station will send the WM wastewater to the City of Aurora Murphy Creek lift station. Wastewater treatment will be conducted by the City of Aurora, as well.

EMERGENCY OPERATIONS AND MAINTENANCE

The general emergency operations and maintenance procedures required by the *Colorado Design Criteria for Domestic Wastewater Treatment Works, WPC-DR-1* for lift stations includes the following:

- **Flood Protection** – Protection from physical damage resulting from 100-year flood conditions and the capability to operate during 100-year flood conditions
- **Security –** Locked structures and/or security fencing as required to restrict unauthorized access
- **Alarms –** Self activated alarm system to monitor power failure, high wet well water level, or other pump station malfunction
- **Back-up Power –** Power provided from two independent sources unless adequate overflow storage is provided and the local operating agency can provide portable backup power generation equipment and/or temporary pumping capability
- **Overflow Storage** – Overflow storage volume sufficient to contain all wastewater during the period of time required to restore pump station operation, install temporary pumping equipment or haul wastewater to an acceptable point of discharge

Discussion of each of these requirements are addressed in the following sub-sections:

FLOOD PROTECTION

The WM lift station is located outside of the 100-year floodplain and does not require special protection in order to operate during 100-year flood conditions.

SECURITY

The lift station will be an above grade package on the WM property. The pumps and motors will be contained in a fiberglass enclosure that is resistant to corrosion, mildew, fungus, mold, and uv rays. Two removable side door panels will provide access to the motors and pumps. Split opening doors that are hinged to open overhead will go to the pump suction and controls. The upper door will have a support to provide an awning during maintenance. Vandalism resistance is inherent in

the enclosure's design. The lift station wet well will be installed with a lockable hatch, and all electrical and control equipment will be located within the pump station enclosure which will be lockable.

Alarms

The WM lift station will include an alarm system with alarms for power failure, high wet well water level, low wet well water level, and pump failure alarms.

Alarm Transmittal

The lift station will communicate via the WM site's telemetary system. There will not be a SCADA system designated to the lift station. A mission telemetary system will be installed if the lift station cannot tie into the site's system.

Backup Power

The WM site will be equipped with a backup generator and the lift station will be tied into the system. The generator will be sized to sufficiently provide backup power for the lift station pumps, instrumentation, controls, and other vital equipment.

Emergency Storage

Emergency storage will be provided in the wet well. Certified operator response time for the WM lift station will typically be less than 60 minutes since WM will run daily operations. At the buildout peak hour flowrate of 11 gpm, a minimum of 660 gallons of storage is required to allow for 60 minutes of operator response time. Emergency storage is provided in the wet well above the high-water alarm float (approximately 690 gallons) and in the gravity sewer collection system (approximately 190 gallons), for a total of approximately 880 gallons of emergency storage. Utilizing this volume would result in a 4.7-foot rise in the wastewater elevation above the high-water alarm float in the wet well. Under these conditions, the sewage surcharge in the wet well would rise to no more than 5-feet below grade within the 60-minute response time required.

Management Capability

WM will have ownership and operation and maintenance responsibilities for the lift station, while the City of Aurora will be responsible for the forcemain once construction is complete. The City will not provide operation and maintenance services for the lift station. However, the City staff currently operate and maintain four lift stations within the City of Aurora service area and there is flexibility to assist in operation and management of the private lift station.

Financial Capability

Capital Improvement Plan

WM plans to pay the full cost of the lift station, forcemain and sanitary sewer lines.

SECTION 4 – IMPLEMENTATION SCHEDULE

IMPLEMENTATION SCHEDULE

The implementation schedule for the WM Denver East lift station project is shown in Table 5 below. Design of the lift station, forcemain, and gravity sewer are scheduled for 2022. The forcemain and gravity sewer are planned for construction as separate projects in early 2023. Construction of the lift station is planned for mid-2023. Substantial completion for the entire project is anticipated by the end of November 2023.

Table 5: Implementation Schedule

Milestone	Anticipated Date
Submit Site Application and Engineering Report	August 2022
Submit Preliminary Design and Basis of Design Report	September 2022
Site Application Approval from CDPHE	October 2022
BDR Approval from CDPHE	November 2022
Submit Final Lift Station Design	Fourth Quarter 2022
Advertisement to Bid	First Quarter 2023
Start Construction	Second Quarter 2023
Construction Substantial Completion	Fourth Quarter 2023

SITE APPLICATION NOTICE SIGN

A 3-foot by 4-foot sign was posted at the edge of the WM lift station tract as public notice of the planned lift station. A photo of this sign, installed, is included in Appendix E .

NOTIFICATION LETTERS

Notification letters were sent to the following agencies: Arapahoe County, City of Aurora, and Tri-County Health Department. Copies of each letter can be found in Appendix F.

SECTION 5 – COST

COST ESTIMATE

The preliminary opinion of probable cost (OPC) for this alternative is $354,464. This cost is summarized in Table 6. A detailed breakdown of this estimate is provided in Appendix G.

Table 6: Cost Estimate for the WM Lift Station

Description	Quantity	Unit	Installed Cost
Division 00 and 01 – General Conditions and Requirements	1	LS	$15,000
Division 02 – Site Work	1	LS	$16,000
Division 03 – Concrete	1	LS	$31,000
Division 05 – Miscellaneous Metals	1	LS	$4,000
Division 11 – Equipment	1	LS	$83,000
Division 15 - Mechanical	1	LS	$5,000
Division 16 – Electrical	1	LS	$59,800
Subtotal			**$213,800**
Total (including Contingency, O&P, Design, CA, and Site App and Review Fees)			**$354,464**

SUMMARY OF COST ESTIMATES

The combined capital value and 20-year O&M cost projections for the lift station is provided in Table 7 below. The present worth O&M costs have been determined through a detailed analysis including energy requirements and operator salary.

Table 7: Summary of Capital and O&M Costs for Each Alternative

Item	Description	Lift Station
1	Capital (2023 Construction Costs)	$354,464
2	20 Year O&M Cost (2022 Present Worth)	$200,000
3	Capital and 20 Year O&M Costs	$554,464