Regulator R04/1-MN-344
Tunnel Rehabilitation
Facility Plan Amendment
Prepared for
Metropolitan Council
Environmental Services
March 9, 2018
DRAFT
Regulator R04/1-MN-344 Tunnel Rehabilitation
Facility Plan Amendment

Metropolitan Council Environmental Services
March 9, 2018

Contract No. 15P013A; Work Order Release No. 16002037

149113

This is a draft and is not intended to be a final representation of the work done or recommendations made by Brown and Caldwell. It should not be relied upon; consult the final report.
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<tbody>
<tr>
<td>ADF</td>
<td>Average Daily Flow</td>
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<tr>
<td>AOR</td>
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<td>APWWF</td>
<td>Allowable Peak Wet Weather Flow</td>
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<td>AR/AV</td>
<td>Air Release/Air Vacuum Valves</td>
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<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
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<td>ATS</td>
<td>Automatic Transfer Switch</td>
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<td>AWWA</td>
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<td>Brown and Caldwell</td>
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<td>C</td>
<td>Hazen-Williams friction factor</td>
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<td>CAD</td>
<td>Computer-Aided Design</td>
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<td>Closed Circuit Television</td>
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<td>cfs</td>
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<td>MGD</td>
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Executive Summary

This Facility Plan Amendment was developed to describe changes or modifications to the original Facility Plan, entitled the Minneapolis Rehabilitation Phase 2 Facility Plan, dated February 2013 (MPCA Project Number 280213), that was developed for the anticipated improvements at Regulator R04. The original facility plan was a much broader document in that it covered improvements and/or rehabilitation plans for up to seven (7) remaining combined sewer overflow (CSO) regulators in the Metropolitan Council Environmental Services (MCES) interceptor system, located in the City of Minneapolis. Many of the improvements identified in the original facility plan have already been made, or are underway. Because of potential groundwater dewatering risks that arose during the final design work for the Regulator R04/1-MN-344 Tunnel Improvements project, MCES has elected to amend the original facility plan to update both regulatory agencies, stakeholders, and interested parties with the anticipated changes to the plan. The changes that are now planned to the design and construction of the Regulator R04/1-MN-344 Tunnel Rehabilitation project were developed to address the groundwater dewatering risks identified with an earlier approach. The project location is shown in Figure ES-1.
ES1 Basis of Facility Plan Amendment

Metropolitan Council Environmental Services maintains and operates the interceptor sewer system within the seven County metropolitan area, conveying wastewater to eight treatment facilities. Regulator R04, and the associated 1-MN-344 Interceptor downstream of the regulator, need either rehabilitation or replacement based on recent condition assessments performed. Regulator R04 was originally constructed along with the first interceptor sewers in the 1930’s to convey dry weather sanitary flows to the Metropolitan WWTP, while diverting wet weather combined (stormwater and sanitary) flows to the Mississippi River outfall. Improvements were later made in the 1960’s and 1980’s to further reduce the occurrence of overflows. Because of the current design/depth of these facilities, MCES has had difficulty safely inspecting and maintaining the facilities.

The emergency relief location at the existing Regulator R04 site will remain in operation, but will be converted from passive control to active control by replacing the existing overflow weir with a new slide gate above the storm sewer pipe that will be normally closed. Level measurement devices will be installed to assist with determining when the emergency relief gate needs to be operated. The emergency relief gate will only be operated by manual action after consideration of the conditions at hand. Manual action in this case is defined as making a conscious decision by the operator to physically manipulate the emergency relief gate either on-site or remotely, but will not include automatic operation based on level alone.

In addition, this Facility Plan Amendment expands upon the work identified for the rehabilitation of two vortex drop structures located on the 1-MN-340 and 1-MN-346 Interceptors (near E. 50th Street and E. 52nd Street in south Minneapolis, respectively). The original facility plan recommended odor control facilities at these locations. After further investigation, it has been determined that structural rehabilitation of these facilities is also required. Structural rehabilitation improvements are being recommended with odor control facilities being deferred pending future evaluation. This Facility Plan Amendment also describes the work necessary to clean the existing 1-MN-340 Interceptor between Vortex Shaft D1 and MH8 (just downstream of the wye connection between the 1-MN-344/340 interceptors where heavy debris has been observed. Cleaning of the 1-MN-340 Interceptor further downstream between Drop Shaft 1A (where the 1-MN-341 Interceptor connects) to MH1 is also planned.

ES2 Recommended Improvements

Recommended improvements for the Regulator R04/1-MN-344 Tunnel Improvements project include the following:

- Rehabilitate Regulator R04/1-MN-344 Tunnel (Alternative R04-3)
- Rehabilitate Vortex Shaft A1 and Access Shaft A2 (Alternative VSA1-3)
- Rehabilitate Vortex Shaft D1 and Access Shaft D2 (Alternative VSD1-3)
- Clean 1-MN-340 Interceptor between MH9 (near Vortex Shaft D1) downstream to MH8; and from Drop Shaft 1A downstream to MH1

ES3 Cost of Recommended Alternatives

Table ES-1 presents the preliminary opinion of probable construction costs (OPCC) for the Regulator R04/1-MN-344 Tunnel Rehabilitation Project that are identified in this Facility Plan Amendment.
The preliminary OPCC developed for these improvements were developed using cost curves and formulas, past construction projects with proportionality adjustments, approximate ratio methods, best engineering judgment, and other adjustments using a National Engineering News Record (ENR) Construction Cost Index (CCI) for 20 Cities of 10,817, which represents anticipated construction costs in the third quarter of 2017 (October). The OPCC includes a 10 percent value for undeveloped design details, followed by a 20 percent contingency value, which is standard protocol on MCES projects at the planning level. Contractor overhead and profit are included in the individual unit costs, and therefore, are not identified separately. These preliminary numbers are believed to have accuracy to within plus 50 percent to minus 30 percent based on the facilities planning completed to date.

**ES4 Implementation Plan**

The Implementation Plan for moving the Regulator R04/1/MN-344 Tunnel Rehabilitation project forward will include a review of the various construction issues during the development of the final contract documents. These items will include the construction requirements and limitations, anticipated construction sequencing and methods, temporary flow diversion, traffic control, permits, geotechnical considerations, existing utilities, and other items that will need to be considered for each of the major project components. The preliminary project schedule, and a description of the temporary wastewater conveyance system that will be required, are discussed briefly below.

**ES4.1 Preliminary Schedule**

The implementation plan, and/or anticipated schedule, for the improvements identified in this Facility Plan Amendment should be used as a guide for follow-on planning and designing the project only. The preliminary project schedule will be further reviewed/refined during the final design phase to more accurately anticipate the required construction durations. A preliminary schedule for the project is shown in Table ES-2.

### Table ES 1. Summary of Regulator R04/1 MN 344 Tunnel Project Costs

<table>
<thead>
<tr>
<th>No.</th>
<th>Description/Location</th>
<th>Total OPCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reg R04/1-MN-344 Tunnel Rehabilitation (Alternative R04-3)</td>
<td>$17,449,000</td>
</tr>
<tr>
<td>2</td>
<td>Vortex Shaft A1 &amp; Access Shaft A2 Rehab (Alternative VSA1-3)</td>
<td>$3,157,000</td>
</tr>
<tr>
<td>3</td>
<td>Vortex Shaft D1 &amp; Access Shaft D2 Rehab (Alternative VSD1-3)</td>
<td>$3,116,000</td>
</tr>
<tr>
<td>4</td>
<td>Clean 1-MN-340 Interceptor</td>
<td>$2,022,000</td>
</tr>
<tr>
<td></td>
<td>Subtotal A</td>
<td>$25,744,000</td>
</tr>
<tr>
<td>5</td>
<td>Engineering, Administration, &amp; Legal (20% of Subtotal A)</td>
<td>$5,151,000</td>
</tr>
<tr>
<td></td>
<td>Total Preliminary Opinion of Probable Construction Cost</td>
<td>$30,895,000</td>
</tr>
</tbody>
</table>

**Notes:**
1. Total Preliminary OPCCs are based on an ENR CCI of 10,817, October 2017.
2. Total Preliminary OPCCs assumed to have an accuracy of +30% to -15%.

### Table ES 2. Proposed Project Schedule

<table>
<thead>
<tr>
<th>Description</th>
<th>Duration (Work Days)</th>
<th>Estimated Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Planning Amendment Phase:</td>
<td>75</td>
<td>03/2018</td>
</tr>
<tr>
<td>Final Design Phase:</td>
<td>170</td>
<td>10/2018</td>
</tr>
<tr>
<td>Public/Stakeholder Involvement:</td>
<td>170</td>
<td>10/2018</td>
</tr>
<tr>
<td>Bid Phase:</td>
<td>100</td>
<td>03/2019</td>
</tr>
<tr>
<td>Construction Phase:</td>
<td>640</td>
<td>08/2021</td>
</tr>
</tbody>
</table>

**Notes:**
1. The proposed project schedule will need to be refined during final design.
ES4.2 Temporary Wastewater Conveyance
To implement the rehabilitation project, a large, robust temporary wastewater conveyance system is anticipated that will control the flow of wastewater around three (3) of the main construction sites included in the project. A single temporary wastewater conveyance system, as shown in Figure ES-2, is proposed that will address the needs of all project elements.

The contractor selected will be required to install, operate, and maintain temporary (mainly above ground) wastewater pumping equipment and pipelines needed to divert flows from the existing underground interceptors and will be responsible for all intervening flows entering from lateral connections. The contractor will be provided with minimum flow rates, average daily flow rates, and maximum system design capability requirements in the contract documents. Security for the temporary conveyance system will also be a requirement placed on the contractor. Minimum requirements of the temporary conveyance system will include the following:

- Capable of sustained operation at minimum and maximum flow rates.
- Automatic level control to maintain pooled water levels at no greater than 90 percent of the pipe diameter.
- A minimum of one redundant pump and drive providing system capacity capable of sustained operation at the maximum design flow rate with the largest pump and drive out of service.
- A fully redundant power supply capable of full system operation with the primary power supply out of service.
- Dual discharge lines with combined capacity equal to the maximum system flow rate.
- Minimum piping system pressure rating equal to or greater than 2 times the system pressure plus a surge allowance of 100 psi at the maximum system design flow.
- Maximum pipe velocity of 8 fps at the maximum system design flow.
- Pipeline pressure test equal to 1.5 times the maximum system design pressure, or 100 psi, whichever is greater.
Figure ES-2. Proposed Temporary Wastewater Conveyance System
(Numbers within the Circles represent locations for collecting intervening flows)
• Suitable air-vacuum relief valves at all high points in the piping system.
• A full-time dedicated operator at the site to monitor the pumping system at all times (24/7) that the system is in operation.
• Jersey barriers to protect pumping equipment and pipes that are located near roads.
• Appendix B contains preliminary contract drawings that show a larger scale of the proposed temporary wastewater conveyance system.

Figure ES-3 below shows an example of the size pump that will be needed at several pumping locations along the temporary conveyance pipeline alignment. Multiple pumping units are anticipated to be set up at multiple locations along the temporary wastewater conveyance alignment that will transfer flow from the underground sewer/interceptor system to the primarily above ground temporary conveyance system.

![Image of pumps](Image)

The photo on the left of Figure ES-3 shows the pumps enclosed in a sound-mitigating enclosure. It is envisioned that noise abatement will be a requirement placed on the contractor to help minimize disruption to the general public. The photo on the right shows the pump alone without the sound enclosure. It is anticipated that the various temporary wastewater conveyance pumps will be operated primarily with electric power, but also provided with diesel generators as a backup power system.

Table ES-3 shows the location of various temporary pumping systems that will be needed to collect and transfer wastewater flows for the entire project. The seven systems shown in Table ES-3 correspond to the approximate locations, flow rates, number of pumps anticipated, and their individual pump capacity for the layout previously shown in Figure ES-2.

It should be noted that the system is designed to accommodate both average daily dry weather flow and peak wet weather flow. One pipe was sized to handle the average daily flow. Figure ES-4 shows an example of the HDPE above-ground piping system that is anticipated.
Table ES 3. Temporary Diversion Pumping Requirements

<table>
<thead>
<tr>
<th>System</th>
<th>Location</th>
<th>Peak Wet Weather Flow (GPM)</th>
<th>Average Dry Weather Flow (GPM)</th>
<th>Average Daily Wet Weather Flow (GPM)</th>
<th>No. of Pumps Anticipated&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Pump Capacity (GPM each)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MCES MH2 (upstream of R04)&lt;sup&gt;2&lt;/sup&gt;</td>
<td>27,000</td>
<td>5,200</td>
<td>15,300</td>
<td>6</td>
<td>5,500</td>
</tr>
<tr>
<td>2</td>
<td>City MH (9&quot; Dia. from 39&lt;sup&gt;th&lt;/sup&gt; Ave S)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>1,586</td>
<td>400</td>
<td>1,200</td>
<td>2</td>
<td>1,750</td>
</tr>
<tr>
<td>3</td>
<td>City MH (12&quot; Dia. from Nawadaha)&lt;sup&gt;3&lt;/sup&gt;</td>
<td>2,820</td>
<td>705</td>
<td>2,115</td>
<td>2</td>
<td>3,000</td>
</tr>
<tr>
<td>4</td>
<td>MCES 1-MN-346&lt;sup&gt;4&lt;/sup&gt;</td>
<td>17,710</td>
<td>6,805</td>
<td>13,050</td>
<td>4</td>
<td>5,910</td>
</tr>
<tr>
<td>5</td>
<td>War Tunnel (City)&lt;sup&gt;4&lt;/sup&gt;</td>
<td>1,944</td>
<td>625</td>
<td>1,562</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>6</td>
<td>City Trunk Sewer (E. 50&lt;sup&gt;th&lt;/sup&gt; Street)&lt;sup&gt;4&lt;/sup&gt;</td>
<td>1,400</td>
<td>420</td>
<td>1,260</td>
<td>2</td>
<td>200</td>
</tr>
<tr>
<td>7</td>
<td>MPRB Sewer (6&quot; Dia. from East of Hwy 55)&lt;sup&gt;3&lt;/sup&gt;</td>
<td>705</td>
<td>177</td>
<td>531</td>
<td>2</td>
<td>750</td>
</tr>
</tbody>
</table>

Notes:
1. One pump is considered a reserve pump.
2. Peak wet weather flows set at 60 cfs. Flows above 60 cfs will be considered emergency relief flow.
3. Peak wet weather and average dry weather flows set at 8 fps and 2 fps, respectively, for the appropriate pipe diameter.
4. Peak wet weather and average dry weather flows obtained from the 2008 Blue Lake and Metro Plant Service Area Planning Project.

Figure ES-4. Temporary Wastewater HDPE Piping System Example

Risks associated with the large, robust, wastewater conveyance system include:
- Noise and nuisance odor release above the current level.
- Extra fuel consumption and/or operational costs.
- Multiple roadway and park permit requirements.
• Health & safety risks.
• Requires extensive monitoring.
• Increased traffic congestion and travel delays.
• Park use interruption.
• Other

It should be noted that an Emergency Action Plan will be developed for addressing the public safety and environmental impact concerns.

Figure ES-5 shows a graphic example of the above-ground temporary wastewater conveyance system that will be needed at one of the main diversion sites associated with this project. The site shown in Figure ES-5 is near the existing Regulator R04 facilities where a significant portion of the wastewater flows will need to be brought to ground surface with the use of several temporary pumps, and then transported away from the construction site to the best point identified downstream where wastewater flows can be re-introduced back into the interceptor system. This approach, which is believed to be disruptive to the surrounding community will be needed to eliminate the need for Platteville Limestone dewatering and the associated risk of impacting CWS.

Figure ES-5. Graphical Representation of Temporary Pumping System Upstream of Regulator R04

ES5 Regulatory Agency/Stakeholder Coordination
A listing of known regulatory agency, stakeholder, and other interested parties is included in Section 7 for reference. The bulk of these entities have already been contacted about this project, and further coordination is planned prior to initiating construction.
Section 1

Purpose of the Amendment

This Facility Plan Amendment describes modifications to the original Facility Plan completed in February 2013, entitled the Minneapolis Rehabilitation Phase 2 Facility Plan. The facility plan was developed for the anticipated improvements at the Regulator R04 site and several other facilities within the MCES interceptor system in Minneapolis, not covered by the Phase 1 Facility Plan. The Phase 2 Facility Plan covered improvements and/or rehabilitation plans for up to seven (7) remaining combined sewer overflow (CSO) regulators, and one pressure relief facility in the interceptor system located in the City of Minneapolis. Many of the improvements identified in the original facility plan have been completed.

Regulator R04 and 1-MN-344 tunnel improvements original preliminary design revealed the potential to temporarily adversely impact groundwater flow to Coldwater Spring (CWS). The spring has great cultural significance to Native American communities. Reduction of flow to the spring would violate the state law that prohibits any impact (temporary and permanent) to the flow to CWS.

This amendment describes an alternate approach to eliminate the impact on groundwater flow to CWS. This amendment will update regulatory agencies, stakeholders, and interested parties regarding the approach to restore the integrity of the Regulator R04 and downstream 1-MN-344 facilities. Construction of a new regulator vault and a new 1,100 LF parallel tunnel, as described in the original Phase 2 Facility Plan, will be replaced by rehabilitation of the existing flow control structure and the downstream interceptor tunnel. This rehabilitation alternative limits groundwater control to the near-surface soil layer, eliminating the need for dewatering/water diversion from the Platteville limestone that feeds CWS.

Finally, rehabilitation of two badly deteriorated facilities are being added to the Project because of their close proximity. These two vortex drop structures are located along the west side of Hiawatha Avenue (TH 55), just south of the R04 project location.

1.1 Project Location

Regulator R04, and the downstream 1-MN-344 Interceptor, are in a unique setting that provides for several challenging regulatory and public interest issues. Maintaining this portion of the MCES collection system has impacts on highway and rail transportation, Minnehaha Creek, and a very popular recreational park.

Regulator R04 is located on Minneapolis Parks property adjacent to Minnehaha Creek in the City of Minneapolis. See Figure 1-1 for the Regulator R04 and 1-MN-344 Tunnel site plan. The regulator is immediately adjacent to Minnehaha Park, the most visited park in the Minneapolis park system, just upstream of Minnehaha Falls. The Longfellow House, a historical site, is also located across the street from the 1-MN-344 tunnel. The tunnel passes below TH 55 and the Metro Blue Line light rail system, under Minnehaha Creek to its junction with 1-MN-340. The regulator was originally constructed in 1935, and is located on the 1-MN-344 Interceptor approximately 900 feet upstream of the connection to the 1-MN-340 Interceptor.

The regulator structure is configured to protect the interceptor facilities and designed to maximize sanitary flow throughout while protecting interceptor facilities that were not designed to be hydraulically surcharged (pressurized). It also protects against uncontrolled discharges to the environment and backups into local systems, residences and businesses. The facility is located at the optimal location to protect interceptors 1-MN-344 and 1MN-340.
1.1.1 Existing Facilities

Wastewater flows to the regulator through the existing 10'-6" wide by 10'-3" high horseshoe shaped 1-MN-344 Interceptor. As shown in Figures 1-2 and 1-3, the regulator is equipped with a gated orifice that directs flow toward the downstream interceptor system, away from the storm sewer outfall leading to the Mississippi River. The facility originally had a float mechanism, used to control flows at the gate orifice. This orifice gate is inoperable and has been chained up in the open position. Remnants of its operating mechanism remain in the structure. An 8-ft. tall concrete block weir wall immediately downstream of the regulator chamber must be overtopped to reach the storm sewer outfall to the Mississippi River.

After exiting the regulator, wastewater travels through a concrete 4'-0" wide by 5'-0" tall horseshoe pipe, constructed in soil and limestone, beneath Minnehaha Creek. This section of pipe is referred to as the “upper tunnel” in this report. A Parshall flume flow meter, not currently utilized by MCES, is located between the creek and Hiawatha Avenue. A drop shaft located on the east side of Hiawatha Avenue drops the flow into a 3'-0" by 6'-0" horseshoe tunnel, constructed in the St. Peter Sandstone, where it travels easterly under Hiawatha Avenue and the Hiawatha Blue Line (light rail) before connecting to the 1-MN-340 Interceptor near the E. Minnehaha Parkway and Minnehaha Avenue roundabout intersection. This section is referred to as the “lower tunnel” in this report.
Figure 1-2. Regulator R04 Chamber Plan View

Figure 1-3. Regulator R04 Chamber Section Views
1.1.2 Coldwater Spring and Area Geology

Coldwater Spring (CWS) is located within the Mississippi National River and Recreational Area, approximately 1.5 miles southeast of the project site. It is a significant cultural and historic resource. Figure 1-4 shows a picture of the CWS headhouse where groundwater from the Platteville Limestone flows to the surface. The upper elements of the geologic profile in the area are depicted in Figure 1.5. The profile consists of 20 to 25 feet of surface soil (overburden), 25 to 30 feet of Platteville Limestone, 2 to 5 feet of Glenwood Shale, and below that the St. Peter Sandstone. The two aquifers (Platteville and St. Peter) are separated by a hydraulic barrier, the Glenwood Shale, and have separate water table elevations. Therefore, dewatering of the St. Peter sandstone, if necessary, would not impact CWS.

Figure 1-6 shows the general location of CWS in relation to the project site. Coldwater Spring was a source of drinking water for Native Americans and later the U.S. military during and after construction of Fort Snelling. Because of its historical and cultural significance, the spring is protected by Minnesota statute.

The basal Magnolia parting, a horizontal gap in the Platteville Limestone, transmits groundwater to CWS. In addition, two hydraulically significant vertical joints (fractures) in the Platteville Limestone have been identified within Minnehaha Regional Park. These joints are believed to be hydraulically connected to the basal Magnolia parting.

By Minnesota Statue, any construction in the project area must not diminish groundwater flow to CWS. The groundwater flow through the parting and vertical joints in this area must be preserved to maintain flow to the spring.

Figure 1-4. Coldwater Spring – Headhouse and Pond
Figure 1-5. Geologic Profile
Figure 1-6. Location of Coldwater Spring in Relation to Project Site
Significant groundwater investigations have been performed recently in the vicinity of the Regulator R04/1-MN-344 Tunnel Rehabilitation project to determine the movement of groundwater through the Platteville Limestone layer, presence of horizontal parting and potential vertical joints, and level of impact to surrounding areas if groundwater dewatering within the limestone was to be performed on this project during construction. From earlier investigations, temporary impact to groundwater flow through the Platteville Limestone was possible under certain scenarios that were reviewed. Thus, MCES has reevaluated the project to determine a method to avoid impacting groundwater flow in the limestone.

1.1.3 Flow to Coldwater Spring

Coldwater Spring is a body of water located on the Fort Snelling property, approximately 1.5 miles southeast of the project site, that is of historical and cultural importance. Coldwater Spring was once used as a source of drinking water by native Americans and soldiers during and after construction of the fort. The basal Magnolia parting, a geological (horizontal) fracture in the Platteville Limestone, has been shown to deliver groundwater flow to CWS. In addition, two hydraulically significant vertical joints in the Platteville Limestone have also been identified in the area of the Minnehaha Regional Park (or project area) that may be hydraulically connected to the basal Magnolia parting as evidenced by pump drawdown testing conducted over 20 years ago. One of these joints trends approximately northwest-southeast and the other joint trends approximately northeast-southwest. Figure 1-7 shows the general locations of these potential vertical joints from that report.21

![Figure 1-7. Locations of Potential Vertical Joint Trends in the Vicinity of Minnehaha Park](image-url)
Construction in this area, therefore, must avoid plugging, or interrupting, groundwater flow through the basal Magnolia parting so that groundwater flow to CWS is not impacted. Likewise, the hydraulically significant vertical joints in this area need to also be preserved to avoid potential disruption of groundwater flow to the parting. It should be noted that dewatering of the St. Peter aquifer below the Platteville Limestone layer will not impact CWS due to the hydraulic separation provided by the Glenwood Shale layer. Dewatering above the limestone, in the overburden, has also been shown to not impact flow through the parting, and down to CWS.26

It should be noted that limestone has many vertical and horizontal fractures or joints. The vast majority of these joints are so tight that groundwater does not flow through them. The geotechnical investigations that were conducted were designed to identify only those joints or fractures that are capable of conveying groundwater, or are “hydraulically significant.” Figure 1-8 shows the relationship of the hydraulically significant vertical joints from Figure 2-1 to the existing 1-MN-344 and 1-MN-340 Interceptors. The two dashed lines running northeast to southwest indicate a range of uncertainty regarding the joint location – a range of approximately 3-degrees from where the pumping test indicated the draw-down alignment. The third dashed line shows another possible hydraulically significant vertical joint running northwest to southeast toward CWS. Ground penetrating radar was also used in an attempt to locate this joint, but it was not found.

Figure 1-8. Possible Vertical Joint Location Boundaries.
These hydraulically significant vertical joints are believed to supply groundwater to the basal Magnolia parting, which is then believed to carry flow to CWS.

1.1.4 Monitoring
Monitoring of flow to CWS is routinely conducted by the National Park Service (NPS). The NPS was contacted to determine their methods of sampling. Statistical analyses were also performed on the NPS data collected to date to identify trends in the groundwater flow. From the statistical analysis, the data appears scattered, with little correlation to short-term or long-term precipitation data. Therefore, during the construction of the Regulator R04/1-MN-344 Tunnel Rehabilitation project, MCES intends to request that the NPS increase their sampling frequency to provide additional information. Additional statistical analysis will then be performed once the NPS data is collected.

1.2 Condition of MCES Facilities
Concrete surfaces in the regulator vault exhibit minor corrosion with exposed aggregate (surface wear) visible. The 4’ x 5’ horseshoe shaped concrete pipe for the upper tunnel between the regulator and the drop shaft is similarly believed to be in a moderately deteriorated condition. Because flow cannot be interrupted, and access difficult, this pipe has been impossible to inspect. Recent inspection of the metering structure downstream of the regulator revealed minor corrosion and exposed aggregate with no visible reinforcement exposure. Inspection further upstream and downstream of the metering structure, however, has not been possible.

The 3’ x 6’ concrete lower (sandstone) tunnel between the drop shaft and the confluence with 1-MN-340 is believed to be in poor condition based on one previous inspection by MCES. The pipe has at least one steep segment, making it unsafe for maintenance workers to safely enter and the access configuration prevents closed circuit television (CCTV) inspection of the tunnel. The 1998 inspection reported the concrete to be in a severely deteriorated condition with significant section loss.

1.3 Conversion of R04 to an Emergency Relief Facility
The present function of the regulator is to passively allow flow into the storm sewer during very high flow events while dry weather flow and flow during less severe storm events is directed to the Metropolitan wastewater treatment plant (WWTP) in St. Paul. Separation of the storm and sanitary sewers and disconnection of rain leaders from the sanitary sewers in Minneapolis has greatly reduced the need for flow diversion to the storm sewer. There has not been an overflow at this location since 2005. However, pressure relief in emergency conditions may still be necessary to prevent facilities damage and to protect the public health, environment, and property from sanitary sewage backups. A backup of sewage in 1-MN-344 upstream of this facility would be released through maintenance holes directly into Minnehaha Creek, or backup into basements of homes connected to the collection system. In addition, excessive flow to the downstream interceptor, 1-MN-340, could result in damage to the surcharged tunnel liner and uncontrolled discharge from shallow maintenance structures located in ravines along the Mississippi River.

A primary objective is to install a gate between the sanitary sewer and the storm sewer outfall that will only be operated by an operator to provide emergency relief for protection of the downstream interceptor and the environment during extreme wet weather flow events.

1.4 Modifications to Existing Facilities
Due to the significant groundwater issues associated with new excavations in the area, the decision has been made to accomplish this objective within the existing structures and pipelines. The existing Regulator vault will be modified/rehabilitated by:

- The existing orifice gate will be removed.
• The opening in the wall will be enlarged to allow more flow to the downstream sewer.
• Orifice plates will be provided to restrict flow to 1-MN-340 until it is rehabilitated or a parallel relief sewer is constructed that can accept higher flow from 1-MN-344.
• A new reinforced concrete wall separating the sanitary sewer from the storm sewer will be constructed equipped with a slide gate that may be opened to allow pressure relief during an extreme event.
• The existing masonry wall will be demolished, and a new reinforced concrete wall constructed.
• The shallow 3’ x 5’ upper tunnel under Minnehaha Creek will be lined; design will have the capacity to handle temporary pressurization.
• The existing drop shaft between the upper and lower tunnels will be lined with a corrosion resistant, fiberglass liner.
• The lower tunnel in the sandstone will be lined; design will have the capacity to handle temporary pressurization. Note that the junction of 1-MN-344 and 1-MN-340 will need to be rehabilitated in a future project.

1.4.1 Necessary Relief

While no passive overflow events have been recorded since 2005, flow level measurement was within 11 inches of the existing weir elevation in 2014. Records indicate that the collection system will not likely have the capacity to safely convey a wide-spread, intense rain (5” intensity, 25-year event) flow event. The variable intensity of rainfall that is the nature of summer rain events, can overwhelm a portion of the collection system while the majority may be relatively unaffected. A storm centered on the 1-MN-344/1-MN-340 sewersheds could overwhelm the capacity of the system.

For these reasons, MCES has revisited the original Facility Plan and developed the following proposed improvements that will eliminate impacts to Coldwater Spring, while addressing the necessary asset preservation needs. Improvements at R04 will include a new slide gate, normally closed, that will prevent overflow to the storm sewer system unless a decision is made by an MCES manager to manually open the gate to relieve pressure needed to protect the facilities and avoid an uncontrolled spill.

1.5 Revised Facilities

The original Facility Plan described the construction of a new flow control facility, drop shaft, and 1-MN-344 tunnel. That approach would have required an extensive excavation site on the west side of the creek which increased the risk of impacts on groundwater flow to the CWS. Therefore, several alternatives have been considered to reduce that risk. The following sections describe the proposed revised facilities.

1.5.1 Reduced Foot Print & Excavation

Rehabilitation and conversion of the existing R04 vault will include a new slide gate separating the sanitary and storm sewers. Temporary pumping of sewage around the vault is necessary during rehabilitation activities within the vault and the shallow pipe under Minnehaha Creek. Since no new flow control vault will be constructed, no additional limestone excavation will be required.

The flow control vault envisioned during previous planning included gates to control the flow to the downstream sanitary sewer, mounted at the invert of the existing sanitary sewer, just upstream of the existing vault. The existing sewer was constructed with the invert approximately 8’ below the top of the Platteville Limestone layer. This is only about one foot above the level of the basal Magnolia parting. In addition, extensive research was done to locate potential hydraulically significant vertical joints in the limestone that transmit groundwater to the horizontal parting. None were found in the proposed excavation area.
Therefore, to avoid both horizontal and vertical hydraulically significant joints in the Platteville Limestone, the revised design proposed underground construction will be entirely contained within existing structures.

1.5.2 Requires Robust Temporary Conveyance System

While the revised approach eliminates impact to Coldwater Spring, it requires that an extensive temporary wastewater conveyance system be implemented during construction to allow for the rehabilitation work to be completed. Section 3 of this Facility Plan Amendment provides a more detailed description of the anticipated temporary wastewater conveyance system, which will be very disruptive and a nuisance to local residents and park patrons. The primarily above ground pipeline creates the potential for wastewater spills from vandalism. Thus, 24/7 security measures will be required to protect the facilities during operation.

Approximately 7,800 +/- LF of exposed, above-ground, double-barrel pipe will run across streets and park property, walking paths, bike trails, and other lands. Much of these areas will require temporary closures during construction. Temporary odor control measures will also be implemented where wastewater is removed from the existing interceptors and discharged. Abatement measures to minimize pumping operation noise will also be implemented through pump enclosures. However, the potential for fugitive odor and noise release still exists.
Section 2

Managing Wastewater Flow

Upstream of Regulator R04, the existing 1-MN-344 Interceptor is a 10'-3" high by 11'-0" wide, horseshoe shaped, cast-in-place, reinforced concrete pipeline. The pipe was originally installed using open cut methods and parts of it are installed on timber piling. The average slope for the interceptor upstream of Regulator R04 is approximately 0.08%.

Wastewater flow from 1-MN-344 to the 1-MN-340 Interceptor is managed through Regulator R04. The purpose of flow management at the regulator is to avoid surcharging the downstream interceptor for high flow events. The regulator gate limits flow to the downstream sanitary sewer until it is near surcharging when it is then released over the passive weir to the storm sewer. Historically the 1-MN-340 Interceptor surcharges during peak events, confirming model predictions. Therefore, the function of restricting flow to 1-MN-340 remains a main objective.

A limited hydraulic review of the 1-MN-344 and 1-MN-340 Interceptor systems was performed to estimate water levels at Regulator R04 and to determine whether downstream surcharge conditions are present under several flow scenarios. The hydraulic analysis is useful for:

1. Determining flow characteristics in 1-MN-344 upstream of R04 for proper design of the rehabilitated regulator structure;
2. Determining proper flow management through Regulator R04 to avoid adverse impacts to 1-MN-340 downstream;
3. Developing temporary wastewater diversion pumping requirements that will be needed during construction; and
4. Determining the pipeline capacity of the rehabilitated 1-MN-344 lower tunnel downstream of R04 to allow for unrestricted flow.

2.1 Service Area and Design Flows

Figure 2-1 shows the existing sewer service area for the 1-MN-344 Interceptor. Regulator R04 is located close to the end of the service area (right side), prior to termination at the 1-MN-340 Interceptor. Because the service area for this project is entirely urban and essentially built out, ultimate flows are anticipated to increase only slightly above their current level as housing density increases. MCES is actively metering and/or monitoring their interceptors, and plans for capacity increases are the topic of another project. Thus, the improvements identified in this Facility Plan Amendment are primarily made to rehabilitate the existing facilities so that wastewater service will not be interrupted.
Figure 2-1. Sewer Service Area for 1-MN-344 Interceptor
Preliminary hydraulic modeling of the existing 1-MN-344 Interceptor system was completed to check the depth of flow in 1-MN-344 at Regulator R04 for average and peak flow conditions. Figure 2-2 provides a snapshot of the hydraulic model that includes the project area. This graphic shows the multiple interceptors contributing to the 1-MN-340 flow prior to crossing the Mississippi River at the Lake Street Siphon. There is not a meter at Regulator R04. Therefore, the flows at this location are determined by modeling with calibration to meter data upstream and downstream of this site.

Table 2-1 provides the estimated current and future flows near the downstream end of 1-MN-344 for existing and future (2030) average and peak 15-minute flow conditions, along with the corresponding modeled depths in the interceptor. Future flows were estimated using the average projected increases from 2005 to 2030 for the 1-MN-344 and 1-MN-345 service areas (City of Minneapolis 2008 Sanitary Sewer Plan).

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Flow, gpm</th>
<th>Resulting depth in 1-MN-344 at R04, ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing average flow</td>
<td>5,200</td>
<td>1.1</td>
</tr>
<tr>
<td>Existing peak flow</td>
<td>15,300</td>
<td>3.3</td>
</tr>
<tr>
<td>Future (2030) average flow</td>
<td>5,500</td>
<td>1.2</td>
</tr>
<tr>
<td>Future (2030) peak flow</td>
<td>16,200</td>
<td>3.7</td>
</tr>
<tr>
<td>10-yr event (2002) peak flow</td>
<td>30,500</td>
<td>8.5</td>
</tr>
<tr>
<td>25-yr event (estimated) peak flow</td>
<td>44,000</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Notes: 1. Flows obtained from MCES Interceptor Master Plan (2002).
These future flows have been carried forward for additional planning and designing of the improvements.

Table 2-2 summarizes the flow data available that was used in the evaluation. The flow meter locations are shown on Figure 2-2.

<table>
<thead>
<tr>
<th>Flow meter</th>
<th>Metering period</th>
<th>Average flow, gpm</th>
<th>Peak flow, gpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>M101</td>
<td>1/1/2003 – 12/4/2012</td>
<td>17,500</td>
<td>52,400</td>
</tr>
<tr>
<td>M130</td>
<td>1/1/2003 – 12/31/2012</td>
<td>5,100</td>
<td>13,000</td>
</tr>
<tr>
<td>M127</td>
<td>1/1/2003 – 12/31/2012</td>
<td>1,000</td>
<td>3,500</td>
</tr>
<tr>
<td>M121</td>
<td>10/1/2005 – 10/31/2005; 1/1/2012 – 12/31/2012</td>
<td>1,400</td>
<td>3,700</td>
</tr>
</tbody>
</table>

Overflows have not occurred at Regulator R04 since 2005.

2.2 Interceptor Cleaning

Recent observations at the connection point of 1-MN-344 with 1-MN-340 show water levels approaching 60 percent of the cross-sectional pipe area during average daily dry weather flows. Sonar data recorded during multi-sensor tunnel inspection of 1-MN-340 in April 2013 were used to determine the debris depths and flow levels within the interceptor. Figure 2-3 shows a longitudinal plot of the 1-MN-340 Interceptor between Vortex Shaft D1 and MH9 (approximately 120 LF) that displays flow level and depth of debris expressed as a percentage of the cross-sectional area. This reach of pipe is 54-inch diameter PVC pipe that was installed in the year 2000.
Figure 2-3. Longitudinal Plot of Vortex Shaft D1 Downstream to MH9
Figure 2-4 shows a longitudinal plot of concrete, horseshoe shaped, pipe between MH 9 and MH 8 (section 27004) displaying flow level and depth of debris expressed as a percentage of the cross-sectional pipe area. Note that the 1-MN-344 connection to 1-MN-340 occurs at approximately 1,297 LF upstream of MH8. Figure 2-5 shows the cross-section of 1-MN-340 at the connection to 1-MN-344 and translates the longitudinal plot into measurable debris and water depth at this location. The sonar data results validate the preliminary model indications that additional storage in 1-MN-340 is limited and that flow restrictions do exist at the connection to downstream 1-MN-340. Figure 2-6 is a still photo inside the 1-MN-340 tunnel looking upstream at the 1-MN-344 connection. The photo was taken from CCTV footage recorded during the same multi-sensor tunnel inspection work and shows turbulent flow conditions at the connection point.
Figure 2-5. 1-MN-340 Cross-Section at the 1-MN-344 Connection

1297.0 ft from MH-8
Restriction: 5.1%
Accumulated Vbl: 0.64 yd^3
From 19.0 ft to 1297.0 ft
Width x Height: 42" x 72"

Figure 2-6. CCTV Inspection Photo of 1-MN-340, April 2013
Figure 2-7 shows a longitudinal plot of the concrete, horseshoe shaped, 1-MN-340 Interceptor between Drop Shaft 1A and MH2 (approximately 1,400 LF) that displays flow level and depth of debris expressed as a percentage of the cross-sectional area. The 1-MN-341 Interceptor connects to 1-MN-340 at Drop Shaft 1A. The sonar data results validate that debris is present in this section of 1-MN-340 Interceptor, which is believed to provide further flow restrictions.
Figure 2-8 shows a longitudinal plot of the concrete, horseshoe shaped, 1-MN-340 Interceptor between MH2 and MH1 (approximately 1,300 LF) that displays flow level and depth of debris expressed as a percentage of the cross-sectional area. Here again, the sonar data results validate that debris is present in this section of 1-M-340 Interceptor, which is believed to provide further flow restrictions.
Figure 2-9 shows the areas of 1-MN-340 that are believed to be needed to be cleaned of debris based on sonar data collected in 2013. The areas to be cleaned include between MH9 and MH8, and then again from Drop Shaft 1A (at the connection with the 1-MN-341 Interceptor) downstream to MH1. It should be noted that MH2 is located in a ravine, and access to this site may be difficult with heavy equipment. The next available access point downstream would then be MH1.
Distances for cleaning the 1-MN-340 Interceptor are shown in Table 2-3.

<table>
<thead>
<tr>
<th>Upstream MH</th>
<th>Downstream MH</th>
<th>Approximate Length (LF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MH9</td>
<td>MH8</td>
<td>3,001</td>
</tr>
<tr>
<td>Drop Shaft 1A</td>
<td>MH1</td>
<td>~2,700</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>~5,701</td>
</tr>
</tbody>
</table>

Notes: 1. 1-MN-340 pipe areas to be cleaned were identified from sonar data collected in 2013.
2. For interceptor cleaning, it is assumed that most operations will be conducted insert the equipment upstream/against flow to aid in the cleaning operation.

### 2.3 Infiltration/Inflow

Infiltration and inflow (I/I) undoubtedly exists through leaking joints and cross-connections with the storm sewer in the 1-MN-344 Interceptor as evidenced by the relatively high peak to average flow ratio. MCES is always evaluating their pipe and making improvements. The City of Minneapolis is also actively working to identify and eliminate sources of inflow in their system that connects to 1-MN-344. MCES has also rehabilitated much of their interceptor system upstream of Regulator R04.

MCES has demonstrated in a number of places that I&I removal efforts have reduced the quantity of clear water entering the system. As these efforts continue, it is expected that peak flows will be reduced and dry weather (base) flow increases may be offset by clear water removal.
Section 3

Wastewater Flow and Odor Management During Construction

The management of wastewater flows and odors during construction will be a major activity that will require much planning, discussion with neighborhood groups, and coordination with regulatory agencies and project stakeholders. The temporary wastewater conveyance system is anticipated to be large and disruptive, as wastewater flows must be diverted around multiple facilities to be rehabilitated.

The proposed temporary wastewater conveyance system preliminary layout is shown in Figure 3-1 on the following page. Appendix B provides preliminary contract drawings of the robust temporary wastewater conveyance system providing more detail.

3.1 Rehabilitation Project

To implement the rehabilitation project, a large, robust temporary wastewater conveyance system is anticipated that will control the flow of wastewater around three (3) of the main construction sites included in the project. A single temporary wastewater conveyance system is proposed that will address the needs of all elements.

The contractor selected will be required to install, operate, and maintain temporary (mainly above ground) wastewater pumping equipment and pipelines needed to divert flows from the existing underground interceptors and will include responsibility for all intervening flows entering from lateral connections. The contractor will be provided with minimum flow rates, average daily flow rates, and maximum system design capability requirements in the contract documents. Minimum requirements of the temporary conveyance system will include the following:

- Capable of sustained operation at minimum and maximum flow rates.
- Automatic level control to maintain pooled water levels at no greater than 90 percent of the pipe diameter.
- A minimum of one redundant pump and drive providing system capacity capable of sustained operation at the maximum design flow rate with the largest pump and drive out of service.
- A fully redundant power supply capable of full system operation with the primary power supply out of service.
- Dual discharge lines with combined capacity equal to the maximum system flow rate.
- Minimum piping system pressure rating equal to or greater than 2 times the system pressure plus a surge allowance of 100 psi at the maximum system design flow.
- Maximum pipe velocity of 8 fps at the maximum system design flow.
- Pipeline pressure test equal to 1.5 times the maximum system design pressure, or 100 psi, whichever is greater.
- Suitable air-vacuum relief valves at all high points in the piping system.
• A full-time dedicated operator at the site to monitor the pumping system at all times (24/7) that the system is in operation.
• Jersey barriers to protect pumping equipment and pipes that are located near roads.

Figure 3-1. Proposed Temporary Wastewater Conveyance System
(Numbers within the circles represent locations for collecting intervening flows.)
Appendix B contains preliminary contract drawings that show a larger scale, and more detail, of the proposed temporary wastewater conveyance system. Figure 3-2 at right shows the area in Minnehaha Regional Park where large above-ground pumps, and large piping are anticipated to be located. At this site, upstream of the existing Regulator R04, a minimum of six (6) large centrifugal pumps are anticipated to be located that will each have suction lines bored into the top of the existing 1-MN-344 Interceptor. Discharge lines will be manifolded together as soon as practical, which will then carry wastewater flows around the construction areas, and down to a safe discharge location back into the existing 1-MN-340 Interceptor.

3.1.1 Regulator R04/1-MN-344 Tunnel Rehabilitation

Diversion of the flow from within the existing 1-MN-344 Interceptor upstream of Regulator R04, and other local sewer connections, will be required to rehabilitate the Regulator R04 structure and 1-MN-344 tunnel downstream of the regulator. Some issues specific to diversion around R04 include:

- Up to six pumps will be needed to convey the flow, each with its own suction pipe installed into 1-MN-344. An area, just downstream from MH 2 (shown in Figure 3-2), approximately 50’ x 100’, will be needed for the temporary pumps. Some tree removal (with the permission of MPRB) will be necessary. Figures 3-3, 3-4, and 3-5 show an example layout of large temporary diversion pumping systems.
Surge valves and catch barrels on temporary conveyance pipes enable the pipes to breathe.

Figure 3-4. Example of a Large Conveyance Pipe with Drawoff

The temporary pipe is buried at road crossings, railways, and driveways to limit road blockages and to protect the pipe.

Figure 3-5. Example of a Large Conveyance Pipe Housed in Carrier Pipe

- Holes will be drilled in the top of interceptor 1-MN-344 to provide access for the suction pipes
- After manifolding the 6 discharge lines together, two 24" diameter HDPE pipelines are expected to be needed to carry the flow to the downstream discharge MH 8, which is located along Godfrey Parkway. However, after connecting to the temporary flow conveyance system from the...
south, the lines will be increased to 30” diameter pipes to account for the added flow that could be transferred at the same time from the south.

- The existing pedestrian trail and sidewalk will be temporarily closed and/or re-routed around the construction site.
- The temporary conveyance system will be monitored 24/7 when in operation. Additional security personnel may be required to prevent vandalism.
- The pipes will cross the East Minnehaha Parkway bridge over the creek, closing the sidewalk on the north side. Jersey barriers will be required to protect the pipes from traffic on the bridge. Figure 3-6 shows an example of a large HDPE diversion system.
- The pipes are expected to follow Minnehaha Parkway to the east, crossing Minnehaha Avenue just north of the roundabout. A decision to tunnel or open cut across Minnehaha Avenue will be made during final design.
- The conveyance pipes will be manifolded with the pipes from the Vortex Shaft A1 and D1 sites and up-sized to 2-30” diameter pipes, necessary when all three systems are operating simultaneously.
- The pipe alignment to MH 8 (along Godfrey Parkway) is expected to run between trees on park property along the south side of Nawadaha Avenue.
- Noise from the pumps and diesel generator will need to be mitigated to contain the impact to the residents nearby. Some type of containment will be determined during final design.
- Odors will also need to be mitigated by sealing up suction pipe holes around the pipes, or by another acceptable method.
- Access to MH 8 will be through the parking lot off of Godfrey Avenue, which will remove a few parking spaces from service.
- Pipes and pumps may need to be secured with temporary fencing and/or structures to prevent the public from tampering with the system.

Other attributes of the temporary conveyance system will be identified during final design.

### 3.1.2 Vortex Shaft A1 & Access Shaft A2
Diversion of the flow from within the existing 1-MN-346 interceptor, Fort Snelling interceptor (War Tunnel), and other local sewer connections, will be required to facilitate improvements to the Vortex
Shaft A1 & Access Shaft A2 structures just west of the intersection of East 52nd Street and Hiawatha Avenue. Some issues specific to the Vortex Shaft A1 work include the following:

- A minimum of four (4) pumps are anticipated to be necessary for diverting flow from 1-MN-346 so that the drop shaft can be worked on. The pumps will be located at the intersection of South 47th Avenue and East 52nd Street, as shown in Figure 3-7. One lane of traffic will be maintained.
- Two 24” diameter HDPE pipelines will be routed along the east side of 47th avenue running North. The light rail tracks will be to the west.
- Residential and business parking will be eliminated along 47th Avenue along the east side of the street. Access to businesses on foot will be restricted.
- Noise from the pumps and diesel generator will need to be mitigated to minimize the impact to the residents nearby. Some type of containment will be determined during final design.
- Odors will need to be mitigated by sealing up suction pipe holes around the pipes, or by another acceptable method.
- Some utility relocations are likely at this site.
- Flow from the “war tunnel” will be managed by a flow-through plug at the bottom of Vortex Shaft A-1.
- Pipes and pumps may need to be secured with temporary fencing and/or structures to prevent the public from tampering with the system.

3.1.3 Vortex Shaft D1 & Access Shaft D2
Diversion of the flow from within the existing Minneapolis trunk sewer on East 50th Street and other local sewer connections, will be required to facilitate improvements to the Vortex Shaft D1 & Access Shaft D2 structures just west of the intersection of East 50th Street and Hiawatha Avenue. Some issues specific to the Vortex Shaft D1 work include the following:
• A minimum of four (4) pumps are anticipated as necessary for diverting flow from the city trunk sewer so that work on the drop shaft can be conducted. They will be located at the northwest intersection of the frontage road of Hiawatha Avenue and East 50th Street. Figure 3-8 provides a preliminary layout of the pumps anticipated at the intersection of E. 50th Street and Hiawatha Avenue.

• Access to the trunk sewer will be accomplished in overnight closures (two are anticipated) of East 50th Street and the residential alley to the south. Suction pipes will be buried and paved over.

• Many utility relocations are likely at this site.

• Tunneling is being considered for the pipes from Vortex Shaft A1. The tunneled portion would run from 44th Street to the north side of 50th Street. Risks associated with tunneling have not been fully evaluated.

• If tunneling is determined to be not feasible, the parking lot (within existing highway/transit right-of-way) at Caps Restaurant will be impacted significantly with the loss of up to 50% of their parking during the construction duration. The Caps Restaurant sign will also need to be temporarily relocated for the routing of the temporary diversion pipes from Vortex Shaft A1.

• Temporary conveyance pipes from Vortex Shaft A1 will be buried under East 50th Street during a temporary road closure, just west of the intersection with Hiawatha Avenue.

• Access to the light rail station will need to be maintained over the diversion pipes from Vortex Shaft A1. Other temporary sidewalk closures will also be necessary.

• Sewage from the John H. Stevens House (located on the east side of TH55) in the Minnehaha Regional Park discharges at Vortex Shaft D1 which will need to be handled by either pumping or trucking – means to be determined during final design.

• Two 24” diameter pipes will be routed along the Hiawatha Avenue frontage road running north, manifolded with the two pipes from Vortex Shaft A1. The light rail tracks will be to the west on the other side of the existing sound wall.

• Parking will be eliminated along the west side of Hiawatha Avenue frontage road. This one-way street will have a single lane open during construction.

• Noise from the pumps and diesel generator will need to be mitigated to contain the impact to the residents nearby. Some type of containment will be determined during final design.

• Odors will need to be mitigated by sealing up suction pipe holes around the pipes, or by another acceptable method.
• Flow from the “war tunnel,” now carried by 1-MN-340, will be managed by a flow-through plug at the bottom of Vortex Shaft D1.

• The temporary pipes will cross Minnehaha Creek adjacent to the Hiawatha Avenue bridge. The contractor’s engineer will be required to design a temporary bridge over the creek.

• Temporary conveyance pipes will be routed behind the Longfellow House and Gardens, adjacent to a walking trail.

• The pipes will pass under Minnehaha Parkway at the bridge over Minnehaha Creek, on the pedestrian trail, turn to the east and be manifolded with the system previously described for temporary conveyance of flow around R04. Figure 3-9 shows the path under the Minnehaha Creek bridge where the diversion pipe will be routed.

• Pipes and pumps may need to be secured with temporary fencing and/or structures to prevent the public from tampering with the system.

3.2 1-MN-340 Interceptor Cleaning
For the 1-MN-344 Interceptor cleaning operations, it is anticipated that temporary wastewater conveyance will not be needed unless the flow exceeds the quantity that the cleaning contractor can manage. The cleaning method currently being utilized under a separate MCES project in the City of Minneapolis utilizes the normal sewage flow to help deliver debris to the set-up manhole for removal. The contractor will be given the option of utilizing the temporary conveyance system to reduce the flow, or to shut it off if the quantity is manageable.

3.3 Odor Management during Construction
Odor management during construction is often related to the design and/or layout of the temporary wastewater conveyance system that is needed to allow for access to the construction areas. It is first important to understand the layout and aspects of the temporary wastewater conveyance system. Then developing odor management, or mitigation, plans can be developed.

3.3.1 Temporary Wastewater Conveyance
It is intended that MCES will require the contractor(s) to establish an odor management, and/or mitigation, strategy and means to address possible odors escaping from interceptor systems during temporary wastewater conveyance operations. Prior to establishing temporary flow diversion system(s), the contractor(s) will be required to submit a detailed plan for providing the temporary conveyance of wastewater from the existing interceptor systems, around and through the areas where flows are to be
impacted by construction. The submittal requested from the contractor(s) will be requested to contain the following information, as a minimum:

- System layout including the means, methods and materials for bulkheading the existing interceptor pipe(s), and the material and size of the proposed conveyance piping.
- Pumping equipment and capacity including the required redundancy, pump and system curves.
- Professional Engineer certified design packages for each temporary conveyance system.
- Discharge conditions and details of the end assembly (to submerge the end).
- Noise Mitigation procedures and devices to ensure compliance with local noise ordinances.
- Traffic control plans (signing and barricades) including blocking of business access or streets and schedule for closures approved by local authorities.
- Submit copies of all permits issued by the City, county, and/or state having jurisdiction.
- Schedule for flow transfers and/or facility shutdowns.
- Emergency Spill Response Plan.
- Contractor shall provide mufflers, temporary enclosures, or sound baffles as required to comply with local and State Noise Ordinances.

Odor management, and/or mitigation plans, will be developed concurrently with the temporary wastewater conveyance system plans.

### 3.3.2 Odor Mitigation

Odor mitigation measures will be required from the contractor(s) during all temporary wastewater conveyance, or flow diversion, during construction. The contractor(s) will be directed to conduct their work in a manner that reduces odor nuisance to the public. The following minimum steps shall be taken:

- For temporary wastewater conveyance piping over 1,000-feet long, the contractor(s) shall develop and install an assembly or feature at the end of the forcemain piping, in order to submerge the discharge end. The contractor(s) is responsible to develop the proper sizing, shape and features of the assembly.
- For all temporary wastewater conveyance piping that will sit idle for more than four (4) hours full of wastewater, the contractor(s) will also be required to inject potable water at an upstream point of the temporary piping adequate to displace the wastewater in the pipe.
- For all temporary wastewater conveyance piping, the contractor(s) shall seal all penetrations into the existing interceptor at suction and discharge pipes.

Odor mitigation plans will be outlined in the technical specifications. Constructed systems will be inspected and monitored during construction. If determined to be needed during construction, temporary odor control units can also be installed. These are typically trailer-mounted systems with flexible ducting that allows the interceptors to be evacuated and treated for a finite period of time.
Section 4

Regulator R04/1-MN-344 Tunnel Improvement Alternatives

The original facility plan evaluated the need for improvements at various MCES regulators. This section of the report evaluates the alternatives considered (after significant groundwater modeling and evaluations was performed) to provide a positive shut-off gate to the storm sewer that are linked with remote operational control.

4.1 Groundwater Modeling

Groundwater modeling was performed following submittal of the original facility plan to identify potential impacts from the project. Ground Penetrating Radar (GPR) testing were also performed at the project site to evaluate the bedrock for anomalies as they may pertain to known fractures in the area. These groundwater modeling and GPR activities have indicated that no permanent, or long-term impact to CWS would result from temporary dewatering during construction from this project. These impacts from temporary dewatering activities associated with construction were found to be minimal to non-existent.

From the results of the groundwater modeling conducted, it was also concluded that hydraulically significant vertical joint(s) do not appear to exist within the immediate vicinity of the project. This conclusion was reached after studying the Platteville limestone from the vertically and diagonally drilled cores that were collected during the investigation. This work corroborated by the results of on-site groundwater flow observations in the core holes.

However, contingency plans were being developed to address the potential for groundwater flow to be disrupted temporarily during construction. This effort will continue under any alternative selected for the project. Monitoring of flows at CWS have already been increased by the NPS, and will be increased throughout the construction of a future project. If groundwater flows to CWS are determined to be impacted during the initial stages of construction, then these contingency plans that will be developed during the design stages of this project will be implemented. Should problems arise, contingency plans specific to the situation that are acceptable to all parties will be developed jointly with MCWD staff, MCES staff, MRPB staff, NPS staff, and consultants. Potential contingency plans that may be implemented include:

- Construction activities postponed
- Revised dewatering approach will be reviewed
- Additional or alternative temporary earth sheeting will be deployed
- Movement of potential vent hole locations

4.2 Rehabilitation Methods

Several alternatives were considered for improving Regulator R04 and the downstream 1-MN-344 Tunnel. These alternatives include:

- Alternative R04-1. Maintain Status Quo (do nothing)
- Alternative R04-2. Construct New Regulator Vault and Tunnel (abandon existing facilities)
- Alternative R04-3. Rehabilitate the Existing Regulator Vault and 3’x6’ Tunnel
4.2.1 Alternative R04-1. Maintain Status Quo (do nothing)
The maintain status quo, or “do nothing” alternative, is identified only as a baseline option and is not regarded as a viable alternative. Failing to address the regulator flow control and pipeline condition problems will lead to eventual failure and/or collapse of the facilities resulting in significant environmental and economic consequences.

4.2.2 Alternative R04-2: Construct New Regulator Vault and Tunnel
Because of the difficulties identified with trying to rehabilitate the existing regulator and downstream 1-MN-344 piping, constructing a new regulator and tunnel was initially the recommended alternative for the original facility plan. This alternative was identified as being advantageous because the new regulator could be constructed without significant disruption to wastewater flows in the existing pipe, and corrosion resistant materials could be easily employed for the new drop shaft and tunnel. This essentially meant that minimal above ground temporary wastewater conveyance facilities would be needed to construct the improvements. A new tunnel under Minnehaha Creek, Hiawatha Avenue, and the Hiawatha Line (METRO Blue Line) would also be configured to be less complex and easier to inspect and maintain in the future. The drop structure for the new facilities would be located on the west side of the creek near the new regulator structure. Access at the downstream end of the new pipe would be provided by a large (10’ diameter) access shaft near the confluence of 1-MN-344 and 1-MN-340.

Figure 4-1 illustrates the site layout of the proposed new regulator and tunnel relative to the existing facilities. The new tunnel is located approximately 10 ft. horizontally from the existing tunnel. Once constructed and operational, the existing regulator and tunnel would be abandoned. The new tunnel would be approximately 1,100 LF between shafts and would be constructed as a two-pass tunnel with initial support and a reinforced polymer mortar pipe (RPMP) carrier pipe.

Through additional hydrogeological investigation and groundwater modeling, it was determined that CWS could potentially be impacted, on a temporary basis only, from a minimal to no impact determination under this alternative. Thus, this alternative was considered to not be a viable alternative. Reconsideration of the rehabilitation of the existing facilities was then further evaluated to determine if the risk of impact to CWS could be reduced.
Figure 4-1. Alternative R04-2 New Tunnel Alignment
4.2.3 Alternative R04-3: Rehabilitate Existing Regulator Vault and 3’x6’ Tunnel

Extensive demolition of the existing regulator structure would be necessary to provide new control of the flows under varying conditions. One “modifiable” orifice plate would be installed that would transfer all dry weather (sanitary) flow to the downstream interceptor system. This orifice opening would be sized to transfer flows from the upper 1-MN-344 Interceptor to the tunnel system that eventually connects to the 1-MN-340 Interceptor system downstream. This opening would be covered with an orifice plate that could be enlarged in the future as the flows increase.

A new storm weather outlet (SWO) gate to the downstream storm sewer would be installed to allow for pressure relief under emergency flow conditions. To install the gate, extensive demolition inside the 1-MN-344 Interceptor would be required, and construction of a new weir wall that could handle the structural forces from the gate would be required. For this reason, it is believed that a new cast-in-place reinforced concrete wall located inside the existing interceptor would need to be installed for the new gate. This gate would be monitored and controlled remotely by MCES personnel.

For this alternative to be constructed, complete flow diversion of all wastewater flows around the construction area would be needed. Section 3 of this Facility Plan Amendment outlines the robust temporary wastewater conveyance system that would be required for this alternative to be implemented.

Figure 4-2 shows the approximate location of the existing Regulator R04 vault and the 1-MN-344 Tunnel downstream. Figure 4-3 shows a plan view of the preliminary layout of the revised Regulator R04 vault with the planned orifice plate and stormwater gate. Figure 4-4 shows the preliminary section view of the Regulator R04 vault with the new orifice plate and stormwater gate.

The modifications to this facility would primarily be undertaken within the walls of the existing structure, except that overburden dewatering would be required to some extent to prevent groundwater from entering through the top slab openings and to avoid excessive buoyancy on the structure during construction. Around the existing regulator vault, a temporary shoring system would be required to control the excavation.

The Parshall flume on the east side of the creek is also in an area difficult to access and very close to the Creek. The condition of this Parshall flume structure was investigated separately, and it was determined to be in relatively good condition. While it was impossible to enter the flume structure, visual observation identified that minimal concrete corrosion has occurred. It should be noted that the pipe immediately upstream, and/or downstream, of the Parshall flume could not be inspected, and therefore, its condition is unknown.

The existing lower 3’ x 6’ interceptor in the sandstone, as shown in Figure 4-5, may be rehabilitated using several different construction methods. Four methods are being considered with a final decision on the technology to be made during final design of the project. The criteria for selecting a rehabilitation technology includes:

- The technology must be able to conform closely to the horseshoe shape of the existing tunnel
- The liner must be corrosion resistant
- The liner must be structurally sufficient to carry design loads without depending on the corroded concrete tunnel liner (installed in the 1930’s), or
- The tunnel liner may be non-structural if the concrete liner can be rehabilitated to carry the design loads, and the liner/concrete rehab system is economically competitive
- All of the materials and equipment for the rehab must be inserted to the tunnel through two existing shafts – the drop shaft between the creek and the highway, and the active Minneapolis sewer connection on Nawadaha Avenue.
- Capability of withstanding surcharge of 10 feet.
Figure 4-2. Plan View of Rehabilitated Regulator R04 Site
Figure 4-3. Plan View of Rehabilitated Regulator R04 Structure

Figure 4-4. Section View of Rehabilitated Regulator R04 Structure
Figure 4-5. Existing 1-MN-344 Horseshoe Tunnel Section
The four (4) tunnel lining systems being considered are:

- Carbon Fiber and Resin
- FRP Segmental Liner System (Channeline)
- Geopolymer
- Spiral Wound PVC

The new gate actuator, electrical gear, and other equipment needed to operate the modified regulator structure, would be housed in the existing electrical MH. The rough dimensions of the existing underground rectangular Electrical MH are 5'-0" wide x 9'-0" long x 6'-6" high. Figure 4-6 shows a photograph inside the existing electrical MH.

A Whipps Gates representative indicated that their HPU and accumulator tank would fit within the existing electrical MH. The dimensions of this HPU and accumulator are shown in Figure 4-7.

### 4.3 Use of Existing Structures

This section of the Facility Plan Amendment is intended to describe the use of the existing structures in an effort to minimize the construction of new facilities.
4.3.1 Tunnel Rehabilitation Work Through Existing Shafts
Access to the lower tunnel is anticipated to be through the two existing drop/access shafts. Figure 4-8 shows a graphic of the existing shaft to the lower tunnel along Nawadaha Boulevard where the City of Minneapolis sewer connects. The drop shaft upstream, as shown in Figure 4-9, is similar in construction. The shafts are generally circular in dimension with an upper diameter of 6'-0" in the overburden, 4'-0" in diameter through the limestone (with cast iron pipe), followed by 5'-9" diameter in the lower St. Peter sandstone. Thus, to utilize these shafts for rehabilitation of the tunnel, all materials, equipment and labor must be able to transcend through the 4 ft diameter middle section of these shafts. This is considered tight, or limiting, but sufficient per discussions with a local contractor.

Figure 4-8. Shaft at Nawadaha Boulevard
4.3.2 Need for Two (2) Utility Holes

In an effort to minimize the use of apparatus, equipment, and labor access through the existing shafts adjacent the 1-MN-344 Interceptor, it has been determined that 2-3 ventilation shafts will also need to be installed to allow for fresh air to be transferred into the deep tunnel system for workers' safety. These ventilation shafts will be approximately 18-24" in finished diameter that will need to be drilled from ground surface to the existing tunnel. These ventilation shafts can be drilled without dewatering. Once installed, fresh air will then be transferred down into the existing tunnel through mechanical means, with foul air being exhausted. Figure 4-10 shows the proposed locations of the vent holes.
One additional benefit of drilling these shafts for rehabilitation of the deep tunnel is that they are believed that they can be used to transfer foul air to a future odor control facility being considered to be located in this area.

4.3.3 Existing Parshall Flume Meter Structure

The existing meter structure located on the upper tunnel portion of the 1-MN-344 Interceptor, downstream of Regulator R04, was evaluated and inspected to determine its condition. The concrete associated with this Parshall flume structure was inspected and it was determined that the facility is in relatively poor condition with exposed aggregate. Figures 4-11 and 4-12 show the condition of the concrete both downstream and upstream of the MH located directly above the Parshall flume. While aggregate appears to be exposed, no visual reinforcement steel was noted.
During the hydraulic modeling activities described in Section 3, it is believed that lining of the 2'-0" wide concrete Parshall flume can occur without greatly impacting the flow capacity through the structure. Because of the close proximity of the drop shaft immediately downstream of the existing Parshall flume, it has been modeled that lining of this structure can occur without significant impact. During design and construction, however, further investigation will be made to determine if some of the existing concrete can be removed without significantly impacting groundwater behind the walls.
4.4 Operation Functional Description of Proposed Facilities

The following is a brief description of the functional operation of the proposed facilities. It does not cover every possible scenario, including various emergency conditions.

4.4.1 Gate Operations Philosophy

Since wastewater will necessarily pass through the facility at all times, design of the flow control devices, whether they be isolation gate(s), or orifice plate(s), must accommodate a wide range of flow conditions. Project requirements include optimizing flow through-put while limiting upstream and downstream surcharging, as well as allowing relief to the storm sewer only when absolutely necessary. Flow control may be accomplished with slide gates, or by the use of orifice plates. These considerations led to the decision to install the largest practical orifice opening, for flow through the facility to the downstream interceptor and a (normally closed) gate for pressure relief to the storm sewer.

The orifice to the downstream sanitary sewer would throttle the flow with the ability to upsize the orifice to allow more through-put, should that be desired. A number of orifice plates would be provided with multiple sized openings that would be used to throttle flow to the downstream 1-MN-340 Interceptor under various flow conditions. For constructability considerations, one opening each are provided for normal flow through the facility (dry weather outlet) and pressure relief to the storm sewer (overflow gate) to be used only for emergency relief. It should be noted that only a gate is being considered for pressure relief as it will need to operate only under emergency conditions.

A hydraulic cylinder gate actuator for the pressure relief gate would be utilized for gate operation. Operation of the orifice plate(s) and/or gate(s) is further described below.

4.4.1.1 Dry Weather Operation

During normal operation, an appropriately sized orifice plate will be installed to allow for free-surface flow of the sewage at all times through the facility. The top of the orifice opening will be set above the elevation of the minimum daily dry-weather flow (diurnal peak) to allow floating material to continue unimpeded through the regulator chamber at least on a daily basis. The bottom of the emergency relief gate will be set above the daily peak flow to allow for exercising during dry weather without passing flow to the storm sewer. This gate will remain closed at all times during dry weather, opening only under emergency conditions as previously described.

4.4.1.2 Wet Weather Operation

In order to control high wet-weather flows, operation of the orifice plate (for dry weather flow) and emergency relief gate (for wet weather flow) at Regulator R04 need to be coordinated with the goal of maximizing the storage capacity within 1-MN-344, thus avoiding surcharging of 1-MN-340 downstream while minimizing relief at the downstream storm sewer. Gate control is planned to be available both locally at the site, and remotely at the Regional Maintenance Facility (RMF) in Eagan, Minnesota. Opening the emergency relief gate will not be automatic or preprogrammed, but will be manually opened based on observation of the level in the upstream sewer and downstream interceptors. This will allow relief of the minimum volume of combined sewage to the river only when necessary to prevent upstream sewer backups and protect infrastructure.

4.4.2 Dry Weather Orifice Plate(s)

The orifice plate will be installed to control the normal, dry-weather flow through the Regulator R04 facility. The existing orifice gate opening is 2'-10.5" wide by 1'-4" high allowing for approximately 25,000 gpm of flow without spilling. New orifice plates would be designed to install over an enlarged opening to all multiple ranges of flow through the opening depending on which orifice plate is inserted. The plate(s) will be constructed from 316 stainless steel. The storage capacity (without surcharging) of 1-MN-344 upstream of Regulator R04 is limited, and thus regulating the flow through the facility may be possible using a single orifice plate opening. If it is desired to store flow during wet or dry weather, then
an orifice plate with a smaller opening can be inserted by the operator to control the flow in 1-MN-344. However, the upstream level must be monitored closely to avoid surcharging the interceptor.

4.4.3 Dry Weather Gate Operation
Alternatively, one or two stainless steel slide gates could also be used for dry weather flow control through the regulator. Two gates would be sized at 48” wide by 36” high, with 12” of concrete wall between them. The gates would be constructed from 316 stainless steel and are upward opening. The gates are operated by hydraulic cylinder actuators. Each gate has an estimated capacity of approximately 51,500 gpm at a wastewater depth of 797.0’ (elevation of the bottom of the emergency relief gate) which allows flow from the 25-year event to pass through a single gate. This provides a redundant gate system that will allow for routine maintenance activities. Under normal conditions, one gate is fully open and the other gate is closed. The gate controls are configured with set limits to allow the operators the ability to choose the opening height, and thus flow rate being released downstream. Set limits are established at the 10%, 25%, 50% and full open positions to provide operators with the flexibility to set the gate opening at multiple operating heights in an effort to control the flow. This control scheme allows the operators the ability to regulate the flow to the downstream interceptor in order to prevent damage to the downstream interceptor by surcharging. Again, the upstream level must be monitored closely to prevent an upstream surcharge condition.

4.4.4 Emergency Relief Control
A single emergency relief gate will be installed adjacent to, and at a higher elevation than, the dry weather flow orifice plate in the R04 diversion chamber and will normally remain in the closed position, directing flow through the orifice plate and downstream to the upper tunnel, dropshaft, and lower tunnel. The emergency relief gate has a determined size of 60” wide by 36” high, set at an invert elevation of 797.00, or approximately 6 inches above the peak dry weather flow level that is anticipated through the regulator structure in 2030. This allows the gate to be opened for scheduled maintenance purposes without additional measures to prevent relief to the river. The gate will allow approximately 98 cubic feet per second (cfs) to be discharged to the Mississippi River. This flow rate represents more than the average flow of 1-MN-344 during dry weather for year 2030, which was predicted at 77 cfs. Although this amount of flow far exceeds what would be expected to be relieved even during a 10-year, 6-hour rain event, this arrangement also allows the operators the ability to discharge all of the dry weather interceptor flow to the river in case of a catastrophic failure somewhere downstream of Regulator R04 in the MCES interceptor system.

The emergency relief gate will be constructed of 316 stainless steel. Gate actuator will be located within the existing electrical MH, and underground 5’ x 9’ vault that is located near Regulator R04.
Section 5

Vortex Shaft A1 & Access Shaft A2

MCES operates a vortex drop facility where Interceptor 1-MN-346 ends and 1-MN-340 begins in the area of Minnehaha Avenue (E 52nd Street) and Hiawatha Avenue (Highway 55) in south Minneapolis. Under the Deep Interceptor Inspection Project\(^{23}\) conducted in 2013-2014, it was determined that this facility was badly corroded and in need of structural rehabilitation. In the original facility plan, this site was noted as receiving new odor control equipment only.

The Vortex Shaft A1 drop structure, and the associated Access Shaft A2 adjacent to the drop shaft, were originally constructed under the Southwest Interceptor Emergency Repair Project (MCES 9520/70030) in 1998. This emergency project included:

- Replacement of the existing 1936 plunge drop shafts at E 52\(^{nd}\) Street (Vortex A1 location) and E 50\(^{th}\) Street (Vortex D1 location).
- Construction of approximately 1,800 LF of interceptor paralleling the existing 1-MN-340 between the two new vortex shafts.
- Abandonment of the existing 1-MN-340 between E 52\(^{nd}\) Street and E 50\(^{th}\) Street.

The emergency project was necessary in 1998 to address a breach in the existing 1-MN-340 pipe wall and heavy corrosion in the plunge drop shafts. Since that time, deterioration of the new structures has occurred. Figure 5-1 provides an aerial map of the Vortex Shaft A1 Rehabilitation Project area, and shows how the structures are configured relative to other MCES facilities and local features.

5.1 Existing Conditions

As shown in the report entitled “Vortex Shaft A1 Condition Assessment and Rehabilitation Alternatives”\(^{15}\) dated December 30, 2015, the vortex facility at E 52\(^{nd}\) Street consists of two separate shafts, A1 and A2, which extend vertically through the soil and limestone into the sandstone to an approximate depth of 68 feet (EI 750.15) below grade. Vortex Shaft A1 contains a vortex insert and a 32” diameter HDPE drop pipe that conveys flow from the upstream Interceptor 1-MN-346 into Interceptor 1-MN-340. Access Shaft A2 provides a 6 ft diameter concrete shaft that allows MCES service workers the ability to access the lower connection chamber. The lower connection chamber consists of a 12 ft diameter cast-in-place concrete vault that connects the vortex drop pipe, access shaft, and the upstream Fort Snelling Interceptor (“War Tunnel”). It should be noted that the War Tunnel is not owned or maintained by MCES. Figures 5-2 through 5-5 provide site plan elevation, plan, and section views of the as-constructed shaft configuration. Note that the emergency project was constructed prior to the METRO Blue Line, which is parallel to Hiawatha Avenue at this location.

Inspection of Access Shaft A2 and the connection chamber under the Deep Interceptor Inspection Project in 2013 revealed that both are heavily corroded with significant areas of spalling concrete. The concrete platform above the Fort Snelling Interceptor has two large holes and the metal support beams are visible. The handrail is also missing. Inspection of the downstream 1-MN-340 pipe shows numerous large air bubbles developing on the surface of the flowing wastewater, indicating that air is entrained through the drop and is being released in the connection chamber and the downstream interceptor.
Figure 5-1. Vortex Shaft A1 Rehabilitation Project Area
Entries into the structure were performed on 4/27/2013 and 7/16/2014 under the inspection project. It was found that a screwdriver could achieve 1- to 2-inches of penetration into the concrete shaft walls, with areas near the joints approaching 3-inches. Wall penetration values in the connection chamber were significantly less, approximately ¼” to ½” inch in areas reachable from the platform. Connection chamber walls away from the platform could not be safely accessed under live flow conditions; however, several areas of exposed reinforcement were observed on the chamber walls near the drop pipe. It was noted that the platform support beam below the missing handrail deflected noticeably under foot and it was deemed not safe for the platform to bear the full weight of the entrant during field inspection activities. It should be noted that the weir wall between the vortex discharge sump and interceptor flow channel cannot be inspected until the structure is dewatered.

Another site visit was performed on 10/29/2015 to document the condition of the vortex insert maintenance hole and existing site conditions. Surface observations revealed that the concrete walls of the structure are in poor condition. It appears that a coating was applied to the walls as there is evidence of pin-holing and coating failure throughout the structure.

Maintenance access structure MH-1 was not found during the site visit. By approximate measurement, it is likely buried just outside of the concrete curb at the edge of the light rail track bed. Since it was not located, the existence and condition of MH-1 could not be confirmed, and may have been abandoned or removed. The abandoned access shaft B through which Interceptor 1-MN-346 was extended with the 36” PVC pipe is most likely located under the light rail track bed.

The condition of the reinforced concrete transition box upstream of the vortex maintenance hole is unknown. The record drawings indicate that the interior surfaces of the transition box were to receive a protective coating. It is assumed that the interior of the transition box will also need to be rehabilitated along with the maintenance hole surfaces.

In addition, the condition of the junction structure below the water surface, including the vortex drop sump and drop pipe attachment bracket, is unknown. The estimated rehabilitation costs will assume renewal of the complete structure surface and replacement of the submerged bracket.

Figure 5-2. As-Constructed Site Plan at E 52nd Street and Hiawatha Avenue
Figure 5-3. Vortex Shaft A1 & A2 Elevation
Figure 5-4. Vortex Shaft A1 & A2 Plan

Figure 5-5. Vortex Shaft A1 & A2 Section
5.2 Future Conditions
Because the service area for this project is essentially built out, ultimate flows through the Vortex Shaft A1 and the 1-MN-340 Interceptor downstream are not anticipated to increase significantly. MCES is actively metering and/or monitoring their interceptors, and plans for capacity increases are the topic of another project. Thus, the improvements identified in this Facility Plan Amendment are primarily made to rehabilitate the existing facilities so that continued wastewater service can be provided.

5.3 Alternative Identification, Screening, and Development
The following alternatives to rehabilitate Vortex Shaft A1 and Access Shaft A2 have been identified:

3. Alternative VSA1-3. Fiberglass Panels in Connection Chamber, FRP or Polymer Concrete Inserts in Riser, or Riser Replacement.
4. Alternative VSA1-4. Concrete Repair and Corrosion Resistant Coating System in Connection Chamber, FRP or Polymer Concrete Inserts in Riser, or Riser Replacement.

Each of these alternatives are briefly described below.

5.3.1 Alternative VSA1-1. Maintain Status Quo (do nothing)
Both structures associated with the vortex drop are in an advanced state of deterioration. The protective coating system previously applied has failed. Even with supplied air or special ventilation measures, access for maintenance is dangerous due to the poor structural condition. Turbulence related to the drop arrangement will continue to generate a corrosive atmosphere and conditions for microbiologically induced corrosion. The structures are already compromised which could lead to failure, sewage spill and an emergency repair project. This approach, the “run to fail” approach, could end up being a very expensive choice and is not considered to be acceptable. Therefore, Alternative VSA1-1, or the maintain status quo alternative, is not recommended for further consideration.

5.3.2 Alternative VSA1-2. Complete Replacement of Structures
Alternative VSA1-2 assumes that the principal structures at this site need rehabilitation, which include Shafts A1 and A2, the connection chamber at the bottom of Shaft A2, and the concrete transition structure immediately upstream of Vortex Shaft A1. Replacement of Shaft A1 and the transition structure would require an excavation nearly 25 feet deep along the highway. This alternative would require significant temporary shoring to protect the existing nearby light rail track and retaining wall. The shoring system would be complicated due to the proximity of Shaft A2 and the existing natural gas line that runs through the site, which is likely to be above the vortex transition structure. A light rail control enclosure has also been constructed on the site. The temporary diversion system for interceptor 1-MN-346 will also require space on the work site.

Total replacement of the Shaft A2 will require an excavation to nearly 75 feet below grade. This is a challenging prospect considering the adjacent facilities mentioned above. Bedrock will allow the shaft excavation to be self-supporting; in fact, the previous emergency project has already performed the excavation. However, no specific information on backfill materials and procedures is available for the emergency project.

Because of the deep excavation requirements, significant dewatering would be required. Recent findings concerning the Coldwater Spring (CWS) area, which is a protected area, may be feed from groundwater within the Platteville limestone in the area of Vortex Shaft A1. Thus, any excavation plan would need to be designed to avoid dewatering. This could be a significant, complicated, and expensive issue to resolve.
The project record drawings indicate that the connection structure at the interceptor tunnel elevation was cast-in-place concrete. Replacement of the connection structure would require the impractical demolition of the 14-foot OD by 15-foot-deep main structure plus the semi-circular vortex sump which is another 5 feet deeper. The operating platform and supporting structural elements are severely deteriorated. The weir wall between the vortex discharge sump and interceptor flow channel cannot be inspected until the structure is dewatered.

The alternative of complete replacement of the structures is not recommended for further consideration because of the depth of construction, dewatering complications, and other issues associated with construction. However, certain elements of the connection chamber will need to be demolished and reconstructed, it must be noted that access for rehabilitation of the vortex transition structure will require excavation at least to the top of the transition structure. Since this alternative was considered not feasible, the estimated construction cost was not calculated.

5.3.3 Alternative VSA1-3. Fiberglass Panels in Connection Chamber, FRP or Polymer Concrete Inserts in Riser, or Riser Replacement

Alternative VSA1-3 for rehabilitation of the structures is to provide fiberglass, or polymer concrete, structural liners to cover the existing surfaces of the connection chamber. This concept includes cylindrical liners for the six-foot diameter access shafts, and panel segments for the connection chamber and vortex transition structure. All lining elements would be designed for the structural loads. This alternative requires removal of what remains of the original coatings, cleaning, and stabilizing the existing structure surfaces for installation of structural lining elements. The work platform and support structure in the connection chamber would be completely removed and replaced with corrosion-resistant materials.

There are several challenges in implementing this alternative.

- The flow from Interceptor 1-MN-346 and the Ft. Snelling tunnel will need to be diverted as described above.
- Access to the transition structure on Interceptor 1-MN-346 upstream of the vortex drop is limited, and will require excavation approximately 14 feet deep in a shored pit and removal of the top of the structure.
- There is an existing natural gas pipeline in the vicinity.
- Design of lining elements would be based on record drawing information. Detailed measurements prior to construction for some of the structures will be very difficult to obtain due to limited access and hazardous conditions.

The proposed installation sequence for this alternative is as follows:

1. Setup of the flow diversion system(s).
2. Clean existing structure surfaces to sound material, and the cleaned surfaces verified as being in the neutral pH range to halt further corrosion.
3. The damaged maintenance platform in the connection chamber will be removed. The vortex drop pipe mounting base will also be inspected and replaced if necessary.
4. The fiberglass panels are then installed in the connection chamber and transition structure, seams between panels are sealed and the annular space between the panels and structure walls is grouted.
5. The new maintenance platform is installed.
6. The access shaft liners are installed and grouted.
An advantage with this approach as well, is no impact to the downstream Coldwater Spring from limestone dewatering, in comparison to the complete structure replacement alternative, due to the limited excavation required.

This alternative would provide long-lasting and corrosion-free internal surfaces for the vortex and maintenance access structures, and is recommended for further consideration.

5.3.4 Alternative VSA1-4. Concrete Repair and Corrosion-Resistant Coating System in Connection Chamber, FRP or Polymer Concrete Inserts in Riser, or Riser Replacement

Alternative VSA1-4 is similar to the FRP lining alternative described for Alternative VSA1-3 above, except that the damaged surfaces of the connection chamber and vortex transition structure would be repaired and protected with an applied corrosion-resistant coating system. The maintenance platform in the connection chamber would be removed and replaced, again as described for the FRP lining alternative.

Implementation of this alternative would face the same challenges as enumerated above for the FRP lining installation. In addition, the condition of the existing structure is not completely defined, since only visual inspections have been made. The condition assessment of the connection chamber performed during the Deep Tunnel Inspection project noted exposed reinforcing steel on some of the chamber surfaces, but the entire structure was not accessible for direct probing. It must be assumed that all surfaces would require application of repair mortar to reestablish sufficient concrete cover on the reinforcing steel to restore and preserve the structural capabilities of the concrete structure. Following the repairs, the coating system would be installed. It is recommended that the access shafts be lined with FRP cylinders, since this is easily accomplished from the surface, and seams between the corrosion-resistance coating and the FRP elements can be reliably sealed.

The design life of the repair and corrosion-resistant coating system is not likely to be as long as the total FRP lining alternative, but this may be improved by rigorous inspection during installation. There may also be cost and time advantages to the use of this alternative for the irregularly-shaped vortex and connection chamber portions of the structures. This alternative is recommended for further consideration.

5.4 Summary

From this non-economic evaluation, the best methods for rehabilitating the Vortex Shaft A1 and Access Shaft A2 appear to be Alternatives VSA1-3 and VSA1-4. Section 8 later in this Facility Plan Amendment identifies the costs for these two alternatives.
Section 6

Vortex Shaft D1 & Access Shaft D2

MCES also operates another vortex drop facility further downstream on the 1-MN-340 Interceptor. Access to, and rehabilitation of, the existing Vortex Shaft D1 and the associated Access Shaft D2, at East 50th Street and Hiawatha Avenue was evaluated as part the 1-MN-340/340R Junction Structure/1-MN-340 Cleaning and Rehabilitation Feasibility Study, dated February 6, 2017. Vortex Shaft D1 accepts flows from the City of Minneapolis sewers from the west on East 50th Street and from the east serving a small portion of Minnehaha Regional Park. The vortex structure is adjacent to Access Shaft D2 which is located directly over the 1-MN-340 Interceptor. The location of these facilities, which are within Minnesota Trunk Highway (TH) 55 ROW, and close to the Blue Line light rail tracks and station at E. 50th Street, will make rehabilitation activities difficult. The condition of these facilities, and the extent of rehabilitation required will be reviewed, and recommendations for moving forward will be presented.

As part of this work, the rehabilitation of the existing Vortex Shaft D1 and Access Shaft D2 should be considered if major temporary wastewater diversion is already being provided around these facilities from other activities. Each of these facilities are discussed below.

6.1 Existing Conditions

MCES operates a vortex drop facility where flows from the City of Minneapolis sewer system enter the 1-MN-340 Interceptor near East 50th Street and Hiawatha Avenue (TH 55). The location of this facility is within the TH 55 right-of-way, very close to the pedestrian loading station for the Metro Transit Blue Line light rail. It has been determined that the Vortex Shaft D1 facility is badly corroding and in need of structural rehabilitation. The Vortex Shaft D1, and the associated Access Shaft D2 adjacent to the drop shaft, were originally constructed under the Southwest Interceptor Emergency Repair Project (MCES 9520/70030) in 1998. This report describes a strategy for access to, and rehabilitation of Vortex Drop Structure D1 and the associated Access Shaft D2, and includes:

- Determining the space for access and for construction activities.
- Determining a method to maintain access to LRT passenger platform during construction.
- Evaluates alternatives for rehabilitation of the shaft/vault and vortex insert.
- Identifies a recommended alternative.

The emergency project was necessary in 1998 to address a breach in the existing 1-MN-340 Interceptor pipe wall and to address heavy corrosion in the plunge drop shafts. Since that time, deterioration of the new structures has occurred. This section of the report summarizes the existing condition and structural rehabilitation alternatives for Vortex Shaft D1 and Access Shaft D2. Figure 6-1 provides a map of the Vortex Shaft D1 Rehabilitation Project area, and shows how the structures are configured relative to other facilities.
Figure 6-1. Vortex Shaft D1 Rehabilitation Project Area
The existing Vortex Shaft D1 and Access Shaft D2 were constructed under an emergency project in 1998 prior to installation of the light rail system. The drop shaft delivers flows from the City of Minneapolis sewer system down into the MCES 1-MN-340 Interceptor using a vortex insert. The vortex shaft receives wastewater flows from the City of Minneapolis at E. 50th Street, drops and combines with flows already in the 1-MN-340 Interceptor. The structure is located within TH 55 ROW and has deteriorated over the past several years and needs rehabilitation.

The vortex facility at East 50th Street and TH 55 consists of two separate shafts, D1 and D2, which extend vertically through the soil and limestone into the sandstone to an approximate depth of 67.40 feet (El 746.50) below grade. Vortex Shaft D1 contains a vortex insert and an 18” diameter HDPE drop pipe that conveys flow from the upstream City of Minneapolis sewer system into Interceptor 1-MN-340. Access Shaft D2 provides a 60-inch inside diameter concrete shaft that allows MCES service workers the ability to access the lower connection chamber. The lower connection chamber consists of a 13 ft diameter cast-in-place concrete vault that connects the vortex drop pipe, access shaft, and the upstream 1-MN-340 Interceptor. Figures 6-2 through 6-5 provide site plan elevation, plan and section views of the as-constructed shaft configuration. Note that the emergency project was constructed prior to the Blue Line LRT, which is parallel to Hiawatha Avenue at this location.

Figure 6-2. As-Constructed Site Plan at E 50th Street and Hiawatha Avenue
Figure 6-3. Vortex Shaft D1 & Access Shaft D2 Elevation
Figure 6-4. Vortex Shaft D1 & Access Shaft D2 Plan @ EL 755.50

Figure 6-5. Vortex Shaft D1 & Access Shaft D2 Section
Panorama SI® camera Inspection of Access Shaft D2 and the connection chamber under the Deep Interceptor Inspection Project in 2013 revealed moderate corrosion increasing with depth, pin holing, and other coating failures. The concrete platform directly above the 1-MN-340 Interceptor, as well as the handrail, are covered with rags suggesting that the interceptor may surcharge from time to time under certain flow conditions.

A site visit was performed on 10/29/2015 to document the condition of the vortex insert, maintenance hole D1, and existing site conditions. Surface observations revealed that the concrete walls of the structure are in poor condition. It appears that a coating system was once applied to the walls as there is evidence of pin-holing and coating failure throughout the structure.

Maintenance access structure MH-2 was not found during the site visit. By approximate measurement, it is likely buried just outside of the concrete curb at the edge of the light rail track bed. Since it was not located, the existence and condition of MH-2 could not be confirmed, and may have been abandoned or removed. Access Shaft C is also most likely located under the light rail track bed.

The condition of the reinforced concrete transition box upstream of the vortex maintenance hole is unknown. The record drawings indicate that the interior surfaces of the transition box were to receive a protective coating. It is assumed that the interior of the transition box will also need to be rehabilitated along with the maintenance hole surfaces.

In addition, the condition of the junction structure below the water surface, including the vortex drop sump and drop pipe attachment bracket, is unknown. The estimated rehabilitation costs will assume renewal of the complete structure surface and replacement of the submerged bracket.

6.2 Future Conditions
Because the service area for this project is essentially built out, ultimate flows through the Vortex Shaft D1 and the 1-MN-340 Interceptor are not anticipated to increase significantly. MCES is actively metering and/or monitoring their interceptors, and plans for capacity increases are the topic of another project. Thus, the improvements identified in this Facility Plan Amendment are primarily made to rehabilitate the existing facilities so that continued wastewater service can be provided.

6.3 Alternative Identification, Screening, and Development
The following alternatives have been identified:

3. Alternative VSD1-3. Fiberglass Panels in Connection Chamber, FRP or Polymer Concrete Inserts in Riser, or Riser Replacement.
4. Alternative VSD1-4. Concrete Repair and Corrosion Resistant Coating System in Connection Chamber, FRP or Polymer Concrete Inserts in Riser, or Riser Replacement.

6.3.1 Alternative VSD1-1. Maintain Status Quo (do nothing)
Both structures associated with the vortex drop are in an advanced state of deterioration. The protective coating system applied at the time of construction has failed. Even with supplied air or special ventilation measures, access for maintenance is dangerous due to the poor structural condition. Turbulence related to the drop arrangement will continue to generate a corrosive atmosphere and conditions for microbiologically induced corrosion. The structures are already compromised which could lead to failure, sewage spill and an emergency repair project. This approach, the “run to fail” approach, could end up being a very expensive choice and is not considered to be acceptable. Therefore, Alternative VSD1-1, or the maintain status quo alternative, is not recommended for further consideration.
6.3.2 Alternative VSD1-2. Complete Replacement of Structures.
Alternative VSD1-2 assumes that the principal structures at this site need replacement, including Shafts D1 and D2, the connection chamber at the bottom of Shaft D2, and the concrete transition structure immediately upstream of Vortex Shaft D1. Replacement of Shaft D1 and the transition structure would require an excavation nearly 20 feet deep. This alternative would require temporary shoring to protect the light rail tracks, passenger platform, and retaining wall. The shoring system would be complicated due to the proximity of Shaft D2 and the passenger platform and tracks, which is likely to be above the vortex transition structure. The temporary diversion system for the Minneapolis sewers will also require space on the work site.

Total replacement of Shaft D2 will require an excavation to nearly 70 feet below grade. This is a challenging prospect considering the adjacent LRT facilities mentioned above. Bedrock will allow the shaft excavation to be self-supporting; in fact, the previous emergency project has already performed the excavation, but prior to the LRT installation. However, no specific information on backfill materials and/or procedures was available from the emergency project.

Because of the deep excavation requirements, significant dewatering would be required. Recent findings concerning the CWS area, which is a protected area, may be feed from groundwater in the area of Vortex Shaft D1. Thus, any excavation plan would need to be designed to avoid dewatering. This could be a significant, complicated, and an expensive issue to resolve.

The project record drawings indicate that the connection structure at the interceptor tunnel elevation was cast-in-place concrete. Replacement of the connection structure would require the impractical demolition of the 14-foot OD by 15-foot-deep main structure plus the semi-circular vortex sump which is another 5 feet deeper. The operating platform and supporting structural elements are severely deteriorated. The weir wall between the vortex discharge sump and interceptor flow channel cannot be inspected until the structure is dewatered.

The alternative of complete replacement of the structures is not recommended for further consideration because of the depth of construction, dewatering complications, and other issues associated with nearby by facilities. However, certain elements of the connection chamber will need to be demolished and reconstructed, it must be noted that access for rehabilitation of the vortex transition structure will require excavation at least to the top of the transition structure.

6.3.3 Alternative VSD1-3. Fiberglass Panels in Connection Chamber, FRP or Polymer Concrete Inserts in Riser, or Riser Replacement

Alternative VSD1-3 for rehabilitation of the structures is to provide fiberglass structural liners to cover the existing surfaces in the connection chamber. This concept includes the cylindrical liners for the 60” diameter access shaft, and panel segments for the connection chamber and vortex transition structure. All lining elements would be designed for structural loads. This alternative requires removal of what remains of the previously applied coatings, cleaning, and stabilizing the existing structure surfaces for installation of all structural lining elements. The work platform and support structure in the connection chamber would be completely removed and replaced with corrosion-resistant materials.

There are several challenges in implementing this alternative.

- The flow from Interceptor 1-MN-340 will be diverted (assuming this project is conducted in combination with the work at Vortex Shaft A1).
- Access to the transition structure upstream of the vortex drop is limited due to the LRT facilities, and any excavation will require tight temporary shoring systems for removal of the top of the structure.
- Closing one lane of traffic on TH 55 will be required.
• Design of lining elements would be based on record drawing information. Detailed measurements prior to construction for some of the structures will be very difficult to obtain due to limited access and hazardous conditions.

The proposed installation sequence for Alternative VSD1-3 is as follows:
• Setup of the flow diversion system(s).
• Clean existing structure surfaces to sound material, and the cleaned surfaces verified as being neutral pH range to halt further corrosion.
• The damaged maintenance platform in the connection chamber will be removed. The vortex drop pipe mounting base will also be inspected and replaced if necessary.
• The fiberglass panels are then installed in the connection chamber and transition structure, seams between panels are sealed as required, and the annular space between the panels and surface walls are grouted.
• The new maintenance platform is installed.
• The access shaft liners are installed and grouted.

An advantage with this approach is the reduced potential impact to CWS from no limestone dewatering, in comparison to the complete structure replacement alternative, due to the limited excavation required.

6.3.4 Alternative VSD1-4. Concrete Repair and Corrosion Resistant Coating System in Connection Chamber, FRP or Polymer Concrete Inserts in Riser, or Riser Replacement

Alternative VSD1-4 is similar to the FRP lining alternative described for Alternative VSD1-3 above, except that the damaged surfaces of the connection chamber and vortex transition structure would be repaired and protected with a corrosion-resistant coating system. The maintenance platform in the connection chamber would be removed and replaced as described in Alternative VSD1-3.

Implementation of this alternative would face the same challenges enumerated above for Alternative VSD1-3. In addition, the condition of the existing structure is not completely defined, since only visual inspections have been made at this time. The condition assessment of the connection chamber performed during the Deep Tunnel Inspection project noted that exposed reinforcing steel on some of the chamber surfaces, but the entire structure was not accessible for direct probing. It must be assumed that all surfaces would require application of repair mortar to reestablish sufficient concrete cover on the reinforcing steel to restore and preserve the structural capabilities of the concrete structures. Following the repairs, the coating system would be installed. It is recommended that the access shaft be lined with FRP cylinders, since this is more easily accomplished from the surface, and seams between the corrosion-resistance coating and the FRP elements can be reliably sealed.

The design life of the repair and corrosion-resistance coating system is not likely to be as long as the FRP lining alternative, but this may be improved by rigorous inspection during installation. There may also be cost and time advantages to the use of this alternative for the irregularly-shaped vortex and connection chamber portions of the structures. This alternative is recommended for further consideration.

6.4 Summary
From this non-economic evaluation, the best methods identified for rehabilitating Vortex Shaft D1 and Access Shaft D2 appear to be Alternatives VSD1-3 and VSD1-4. Section 8 provided later in this Facility Plan Amendment identifies the costs associated with these two alternatives.
Section 7

Stakeholders

Improvements to Regulator R04/1-MN344 Tunnel system will require the coordination with various federal, state, and local government agencies, as well as some utility and private entities. The stakeholders identified for this project may have an interest and/or legal relationship with the project in accordance with their authority and requirements.

In preparing this Facility Plan Amendment, over twenty-eight (28) government agencies, utilities, stakeholders, and/or private entities potentially having jurisdiction over and/or an interest in this Project were identified. The stakeholders identified are permitting agencies, non-permitting agencies, utilities, local community organizations, Section 106 parties, tribal communities, and others. Each of the identified stakeholders are listed below.

7.1 Permitting Agencies

The relevant permitting authorities are listed below along with the type of permit required.

- Minnesota Pollution Control Agency (MPCA)
  - Presumed Construction Stormwater Permit (SWPPP)
- Minnesota Department of Health (MDH)
  - Temporary Dewatering Well Permit(s)
- Minnesota Department of Natural Resources (MnDNR)
  - Utility License Permit, Temporary Water Appropriations Permit for Dewatering
- Minnesota Department of Transportation (Mn/DOT)
  - Form 2525 (Long Form) Utility Accommodation on Trunk Highway, Drainage Permit
- United States Army Corps of Engineers (USACOE)
  - USACOE has indicated that no permitting is required at this point
- City of Minneapolis
  - ROW Excavation Permit, Utility Connection Permit(s), ROW Obstruction Permit(s), Erosion & Sediment Control Plan, Soil Erosion Permit, Temporary Water Discharge Permit, Hydrants Permit(s), and After Hours Work Permits (some of these permits are coordinated with MPRB)
- Minnehaha Creek Watershed District (MCWD)
  - MCWD Permit for Erosion and Sediment Control, Water Body Crossing and Structure, and Wetland Delineation approval.

7.2 Non-Permitting Agencies

Non-permitting agencies include those agencies that have a special interest in the Project, but do not have a specific permit application process. It should be noted that some of these agencies may have permitting authority in general, but improvements to the Regulator R04/1-MN-344 Tunnel system are unlikely to require such permits. The non-permitting agencies identified to have an interest in this project are listed below.

- Minneapolis Parks and Recreation Board (MPRB)
- Metro Transit – METRO Blue Line
7.3 Utilities
Several utility companies with facilities located within the construction limits have been identified. These include electrical, gas, water, local sewer, fiber optic, and other utilities. All of these entities will need to be coordinated with during design and construction.

7.4 Local Community Organizations
Several local neighborhood or community organizations will be impacted by this project. A brief description of the local community organizations that may be directly impacted by this project are identified below.

7.4.1 Longfellow Community Council (LCC)
The Longfellow Community Council (LCC) represents the greater Longfellow community, which is located near the project site. The LCC is made up of four individual neighborhoods, including Longfellow, Cooper, Howe, and Hiawatha. The LCC is estimated to represent over 21,000 residents and more than 400 businesses, making it a large neighborhood organization in the City of Minneapolis. This project primarily affects the Howe and Hiawatha neighborhoods within the LCC boundaries, however, other neighborhoods could be affected by construction traffic.

7.4.2 Nokomis East Neighborhood Association (NENA)
The Nokomis East Neighborhood Association (NENA) represents the four southeast Minneapolis neighborhoods of Keewaydin, Minnehaha, Morris Park, and Wenonah. This project primarily affects only the Minnehaha neighborhood within the NENA boundaries, however, other neighborhoods could be affected by construction traffic.

7.4.3 Standish-Ericsson Neighborhood Association (SENA)
The Standish-Ericsson Neighborhood Association (SENA) represents two neighborhoods, including Standish and Ericsson. Portions of the project are located in the southeast corner of the Ericsson neighborhood, however, Standish may also be affected by construction traffic.

7.5 Section 106 Process
Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies and their applicants to consider the effects of the proposed project on historic properties listed in or eligible for listing in the National Register of Historic Places. If adverse effects are identified, Section 106 requires the federal agencies and their applicants to avoid, minimize or mitigate the adverse effects on historic properties. Section 106 review is required for projects pursuing funding through the CWSRF that do not meet a condition of the Section 106 Review Exemption Checklist. Project applicants should plan ahead to have Section 106 review work completed early in the process, specifically before any environmental review documents are to be publicly noticed.

Agencies that have a special interest in the Project due to responsibilities associated with the federal Section 106 and state historic review process include:

• Advisory Council on Historic Preservation/Department of Interior (ACHP)
• Minnesota Historic Preservation Office (MnHPO)
• Minneapolis Heritage Preservation Commission (HPC)
• Minnesota Indian Affairs Council (MIAC)

Following the submittal of this draft Facility Plan Amendment to the MPCA, a decision will be determined as to the appropriateness, and level of activity needed, for a Section 106. A preliminary communication plan is included in Appendix C.

7.6 Tribal Communities
Several federally-recognized American Indian communities have been identified as having potential interest in this project.

7.6.1 Federally-Recognized American Indian Communities
There are four (4) federally-recognized American Indian Communities with potential interest in this project, including:

- Lower Sioux Indian Community
- Prairie Island Indian Community
- Shakopee Mdewakanton Sioux Community
- Upper Sioux Indian Community

7.6.2 Other Native Communities
The Mendota Mdewakanton Dakota Tribal Community, although not a federally recognized American Indian community, has indicated an interest in this project.

7.7 Other Interested Parties
Other interested parties that may be impacted by the Project include school districts, the general public, Friends of the Mississippi River, and Friends of Coldwater Spring.

7.7.1 General Public
The general public will be impacted by this project primarily from construction activity and traffic that will occur in and around the construction site(s). In addition, park users of the Minnehaha Regional Park will be impacted from the temporary wastewater conveyance system (pipelines and pumps) that will be needed to transfer flow around construction areas.

7.7.2 Friends of the Mississippi River
The Friends of the Mississippi River engages people to protect, restore, and enhance the Mississippi River and its watershed in the Twin Cities. While this project is not located directly adjacent the river, MCES wants to acknowledge the Friends of the Mississippi River.

7.7.3 Friends of Coldwater Spring
The Friends of Coldwater Spring consider the Coldwater Spring site historic and seek to preserve the spring.

7.7.4 Other
Other interested parties may be identified as the project progresses. MCES has procedures in place for communicating with the public and giving them an opportunity to discuss a project.

7.8 Summary
Coordination with the various permitting, non-permitting, and other interested parties will be a requirement for successful completion of this project. Permitting agencies should be made aware of the project early in the process, and required permits should be obtained during the design process to avoid construction delays. Therefore, it is recommended that MCES maintain open dialog with the various...
stakeholders in an effort to expedite the Project. A meeting, or series of meetings, with the permitting and non-permitting agencies is recommended in the early stages of preliminary design to identify critical issues and develop the appropriate approach to avoid, minimize, or mitigate impacts that would require permits.
Section 8

Costs

This section of the Facility Plan Amendment presents a comparative cost evaluation of the viable alternatives in order to identify the most cost-effective alternatives from an economic basis. Capital costs were developed in this section for all alternatives that were previously developed and not eliminated for some non-economic (or technical) reason. Thus, the costs developed herein are primarily for those alternatives determined to be “viable” that could be selected by MCES moving forward. Estimated capital costs are described below.

8.1 Capital Costs

Preliminary total opinion of probable construction cost (OPCC) estimates were developed for the alternatives considered and determined to be viable. The OPCCs were developed using capacity cost curves and formulas, past construction projects with proportionality adjustments, approximate ratio methods, and adjustments using a National Engineering News Record Construction Cost Index (ENR CCI) of 10,817 to represent construction costs in the third Quarter (October) of 2017. These capital cost estimates have been developed based on adjustments made to the recommended alternatives and are believed to represent a total preliminary project cost estimate that is considered accurate to within plus 50 percent to minus 30 percent of the actual costs based on the Order of Magnitude category (See Table 9-1) established by the American Association of Cost Engineers (AACE). The preliminary OPCCs were developed to identify the initial costs required for budgeting purposes only and should not be considered as detailed construction cost estimates since no plans and/or specifications have been developed at this time. These costs therefore, will be refined as the Project develops through final design.

To account for some of the unknowns, a standard percentage of 10 percent was applied to the subtotals of base construction costs to estimate undeveloped design details. A contingency factor of 20 percent was then applied to the sum of all base construction cost items to estimate a total construction cost, which includes costs for various incidentals. Additional costs for engineering, administrative, and legal, estimated at 20%, was then applied to the total estimated construction cost to determine a total project cost, or total preliminary OPCC. It should be noted that land acquisition was also not included in the estimates.

This range of accuracy is typical at the level of facilities planning associated with these types of improvements, as defined by the AACE. The AACE has developed the guidelines shown in Table 8-1 for preparing cost estimates for projects such as this:

<table>
<thead>
<tr>
<th>Type of Estimate</th>
<th>Stage of Project</th>
<th>Anticipated Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order of Magnitude</td>
<td>Facilities Planning</td>
<td>+50% to -30%</td>
</tr>
<tr>
<td>Budget Estimate</td>
<td>Pre-Design Report</td>
<td>+30% to -15%</td>
</tr>
<tr>
<td>Definitive Estimate</td>
<td>Pre-Bid</td>
<td>+15% to -5%</td>
</tr>
</tbody>
</table>

The preliminary OPCC for the major components of the project are identified below.
### 8.1.1 Regulator R04/1-MN-344 Tunnel Rehabilitation

The preliminary OPCC, or estimated capital cost, for the two viable Regulator R04/1-MN-344 Rehabilitation alternatives (Alternatives R04-2 and R04-3) are provided in Tables 8-2 and 8-3.

<table>
<thead>
<tr>
<th>Bid Item</th>
<th>Description</th>
<th>Est Qty</th>
<th>Units</th>
<th>Unit Cost ($/unit)</th>
<th>Total Cost ($)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization &amp; Initial Activities (5% of OPCC)</td>
<td>1</td>
<td>LS</td>
<td>$1,312,000</td>
<td>$1,312,000</td>
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<td>2</td>
<td>Utility Relocation Allowance</td>
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<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>3</td>
<td>Additional Excavation/Support Allowance</td>
<td>1</td>
<td>LS</td>
<td>$250,000</td>
<td>$250,000</td>
</tr>
<tr>
<td>4</td>
<td>Pavement Restoration Allowance</td>
<td>1</td>
<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>5</td>
<td>Directed Time &amp; Material Allowance</td>
<td>1</td>
<td>LS</td>
<td>$150,000</td>
<td>$150,000</td>
</tr>
<tr>
<td>6</td>
<td>Site Preparation, Tree Removal</td>
<td>1</td>
<td>LS</td>
<td>$135,000</td>
<td>$135,000</td>
</tr>
<tr>
<td>7</td>
<td>Street Sweeping &amp; Sediment Removal</td>
<td>100</td>
<td>HRS</td>
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<td>8</td>
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<td>9</td>
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<tr>
<td>10</td>
<td>Traffic Control/Signage</td>
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<td>Temporary Fencing/Site Security</td>
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<td>LS</td>
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<td>$30,000</td>
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<tr>
<td>12</td>
<td>Dewatering (Deep Sandstone, Overburden)</td>
<td>1</td>
<td>LS</td>
<td>$1,300,000</td>
<td>$1,300,000</td>
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<tr>
<td>13</td>
<td>Temporary Wastewater Conveyance</td>
<td>1</td>
<td>LS</td>
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<td>$1,000,000</td>
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<tr>
<td>14</td>
<td>New Regulator Vault (Structure, Gates, Diversion)</td>
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<td>$3,200,000</td>
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<td>15</td>
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<td>16</td>
<td>Xcel – Provide 480V, 3 Ph Power South of Creek</td>
<td>1</td>
<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
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<td>17</td>
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<td>LS</td>
<td>$175,000</td>
<td>$175,000</td>
</tr>
<tr>
<td>18</td>
<td>Re-establish City Tunnel Connections</td>
<td>3</td>
<td>EA</td>
<td>$175,000</td>
<td>$525,000</td>
</tr>
<tr>
<td>19</td>
<td>2-Pass Tunnel, 60&quot; Dia. Finished ID</td>
<td>1,100</td>
<td>LF</td>
<td>$3,300</td>
<td>$3,630,000</td>
</tr>
<tr>
<td>20</td>
<td>18' Dia Upstream Drop Shaft (EL 812.5 to 791.2)</td>
<td>21.3</td>
<td>VLF</td>
<td>$16,900</td>
<td>$360,000</td>
</tr>
<tr>
<td>21</td>
<td>15' Dia. Initial Shaft (EL 791.2 to 744.5)</td>
<td>46.7</td>
<td>VLF</td>
<td>$16,500</td>
<td>$771,000</td>
</tr>
<tr>
<td>22</td>
<td>15' Dia. x 2'-0&quot; Thick Reinforced Concrete Base Slab</td>
<td>8</td>
<td>CY</td>
<td>$3,500</td>
<td>$28,000</td>
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<tr>
<td>23</td>
<td>12' Dia. Finished Shaft (EL 791.2 to 746.5)</td>
<td>44.7</td>
<td>VLF</td>
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<tr>
<td>24</td>
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<td>VLF</td>
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<td>$432,000</td>
</tr>
<tr>
<td>25</td>
<td>18' Dia. Downstream Shaft (EL 798.0 to 747.5)</td>
<td>50.5</td>
<td>VLF</td>
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<td>26</td>
<td>5' Dia. Polymer Concrete MH to Surface</td>
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<td>VLF</td>
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<td>$878,000</td>
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<td>27</td>
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<td>28</td>
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<td>29</td>
<td>Tree Replacement Allowance</td>
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<tr>
<td>30</td>
<td>Restoration and Cleanup</td>
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<td>LS</td>
<td>$368,000</td>
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</table>

Subtotal A $16,810,000

31 Undeveloped Design Details (10% of Subtotal A) $1,681,000

32 Contingency (20% of Subtotal A) $3,362,000

Subtotal B $21,853,000

Engineering, Administration, & Legal (20% of Subtotal B) $4,371,000

Total Preliminary Opinion of Probably Capital Cost (OPCC) $26,224,000

Notes: 1. Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 10,817, October 2017.
2. Total Preliminary Opinion of Probable Construction Costs is assumed to have an accuracy of +50% to -30%.
3. Costs were rounded up to the nearest $1,000 for convenience.
Table 8.3. Preliminary OPCC for Alternative R04 3

<table>
<thead>
<tr>
<th>Bid Item</th>
<th>Description</th>
<th>Est Qty</th>
<th>Units</th>
<th>Unit Cost ($/unit)</th>
<th>Total Cost ($)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization &amp; Initial Activities (5% of OPCC)</td>
<td>1</td>
<td>LS</td>
<td>$873,000</td>
<td>$873,000</td>
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<td>Utility Relocation Allowance</td>
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<td>LS</td>
<td>$250,000</td>
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<tr>
<td>4</td>
<td>Pavement Restoration Allowance</td>
<td>1</td>
<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
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<td>5</td>
<td>Directed Time &amp; Material Allowance</td>
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<td>LS</td>
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<td>Dewatering (Deep Sandstone, Overburden)</td>
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<td>LS</td>
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<td>$1,150,000</td>
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<td>LS</td>
<td>$3,500,000</td>
<td>$3,500,000</td>
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<tr>
<td>14</td>
<td>Rehabilitate Regulator Vault (Structures &amp; Gates)</td>
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<td>LS</td>
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<td>$2,500,000</td>
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<tr>
<td>15</td>
<td>New Mechanical Vault (20’ x 24’)</td>
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<td>16</td>
<td>Mechanical/Plumbing/HVAC</td>
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<tr>
<td>17</td>
<td>Xcel – Provide 480V, 3 Ph Power South of Creek</td>
<td>1</td>
<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>18</td>
<td>Electrical, Instrumentation, and Communication</td>
<td>1</td>
<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>19</td>
<td>Re-establish City Tunnel Connections</td>
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<td>EA</td>
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<td>$150,000</td>
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<td>LS</td>
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<td>25</td>
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<td>Subtotal A</td>
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<td>Subtotal B</td>
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<td>Engineering, Administration, &amp; Legal (20% of Subtotal B)</td>
<td></td>
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</tbody>
</table>

Notes: 1. Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 10,817, October 2017.
2. Total Preliminary Opinion of Probable Construction Costs is assumed to have an accuracy of +50% to -30%.
3. Costs were rounded up to the nearest $1,000 for convenience.

8.1.2 Vortex Shaft A1 & Access Shaft A2 Rehabilitation

Tables 8-4 and 8-5 present the preliminary opinion of probable construction cost (OPCC) developed for Alternatives VSA1-3 and VSA1-4. Alternative VSA1-1 was the “Maintain Status Quo” alternative, which would not have a computable cost, and Alternative VSA1-2 was eliminated from further consideration due to technical issues and/or impacts associated with new construction. Cost for implementation of the odor control facilities under either of the remaining alternatives were also not calculated at this time.
### Table 8.4. Preliminary OPCC for Alternative VSA 13

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Unit</th>
<th>Qty</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobilization &amp; Initial Activities (5% of OPCC)</td>
<td>LS</td>
<td>1</td>
<td>$158,000</td>
<td>$158,000</td>
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<tr>
<td>Utility Relocation Allowance</td>
<td>LS</td>
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<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>Additional Excavation/Support Allowance</td>
<td>LS</td>
<td>1</td>
<td>$100,000</td>
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</tr>
<tr>
<td>Pavement Restoration Allowance</td>
<td>LS</td>
<td>1</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>Directed Time &amp; Material Allowance</td>
<td>LS</td>
<td>1</td>
<td>$100,000</td>
<td>$100,000</td>
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<td>Site Preparation &amp; Field Surveying</td>
<td>LS</td>
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</tr>
<tr>
<td>Project Documentation</td>
<td>LS</td>
<td>1</td>
<td>$20,000</td>
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<tr>
<td>Erosion Control</td>
<td>LS</td>
<td>1</td>
<td>$50,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>Temporary Rock Construction Entrance</td>
<td>EA</td>
<td>1</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Storm Drain Inlet Protection</td>
<td>EA</td>
<td>5</td>
<td>$1,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Dewatering</td>
<td>LS</td>
<td>1</td>
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<td>$150,000</td>
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<tr>
<td>Traffic Control/Signage</td>
<td>LS</td>
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<td>$135,000</td>
<td>$135,000</td>
</tr>
<tr>
<td>Temporary Wastewater Conveyance</td>
<td>LS</td>
<td>1</td>
<td>$750,000</td>
<td>$750,000</td>
</tr>
<tr>
<td>Interceptor Cleaning &amp; Debris Disposal</td>
<td>LF</td>
<td>300</td>
<td>$100</td>
<td>$30,000</td>
</tr>
<tr>
<td>Vortex Shaft A1 FRP Lining</td>
<td>LS</td>
<td>1</td>
<td>$90,000</td>
<td>$90,000</td>
</tr>
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<td>Access Shaft A2 FRP Lining</td>
<td>LS</td>
<td>1</td>
<td>$250,000</td>
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<tr>
<td>Vortex Drop Insert &amp; Transition</td>
<td>LS</td>
<td>1</td>
<td>$150,000</td>
<td>$150,000</td>
</tr>
<tr>
<td>Restoration: Bituminous Pavement</td>
<td>SY</td>
<td>1,200</td>
<td>$75</td>
<td>$90,000</td>
</tr>
<tr>
<td>Restoration: Curb &amp; Gutter</td>
<td>LF</td>
<td>1,000</td>
<td>$45</td>
<td>$45,000</td>
</tr>
<tr>
<td>Restoration: Seed &amp; Mulch</td>
<td>SY</td>
<td>3,000</td>
<td>$25</td>
<td>$75,000</td>
</tr>
<tr>
<td>Subtotal A</td>
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<td>Undeveloped Design Details (10% of Subtotal A)</td>
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<td>$3,789,000</td>
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</tbody>
</table>

**Notes:**
1. Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 10,817, October 2017.
2. Total Preliminary Opinion of Probable Construction Costs are assumed to have an accuracy of +50% to -30%.
3. Costs were rounded up to the nearest $1,000 for convenience.
### Table 8 5. Preliminary OPCC for Alternative VSA1 4
Concrete Repair and Corrosion Resistant Coating System

<table>
<thead>
<tr>
<th>Bid Item</th>
<th>Description</th>
<th>Est Qty</th>
<th>Units</th>
<th>Unit Cost ($/unit)</th>
<th>Total Cost ($)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization &amp; Initial Activities (5% of OPCC)</td>
<td>1</td>
<td>LS</td>
<td>$169,000</td>
<td>$169,000</td>
</tr>
<tr>
<td>2</td>
<td>Utility Relocation Allowance</td>
<td>1</td>
<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>3</td>
<td>Additional Excavation/Support Allowance</td>
<td>1</td>
<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
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<tr>
<td>4</td>
<td>Pavement Restoration Allowance</td>
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<td>LS</td>
<td>$100,000</td>
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<tr>
<td>5</td>
<td>Directed Time &amp; Material Allowance</td>
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<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>6</td>
<td>Site Preparation &amp; Field Surveying</td>
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<td>$25,000</td>
<td>$25,000</td>
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<tr>
<td>7</td>
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<td>1</td>
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<td>$20,000</td>
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<tr>
<td>8</td>
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<td>LS</td>
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<td>$50,000</td>
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<td>9</td>
<td>Temporary Rock Construction Entrance</td>
<td>1</td>
<td>EA</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>10</td>
<td>Storm Drain Inlet Protection</td>
<td>5</td>
<td>EA</td>
<td>$1,000</td>
<td>$5,000</td>
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<tr>
<td>11</td>
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<td>$150,000</td>
</tr>
<tr>
<td>12</td>
<td>Traffic Control/Signage</td>
<td>1</td>
<td>LS</td>
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<td>$135,000</td>
</tr>
<tr>
<td>13</td>
<td>Temporary Wastewater Conveyance</td>
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<td>LS</td>
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<td>$750,000</td>
</tr>
<tr>
<td>14</td>
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<td>LF</td>
<td>$100</td>
<td>$30,000</td>
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<tr>
<td>15</td>
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<td>16</td>
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<td>$150,000</td>
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<td>19</td>
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<td>SY</td>
<td>$75</td>
<td>$90,000</td>
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<tr>
<td>20</td>
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<td>LF</td>
<td>$45</td>
<td>$45,000</td>
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<tr>
<td>21</td>
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<td>SY</td>
<td>$25</td>
<td>$75,000</td>
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<tr>
<td>24</td>
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</tbody>
</table>

**Notes:**
1. Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 10,817, October 2017.
2. Total Preliminary Opinion of Probable Construction Costs are assumed to have an accuracy of +50% to -30%.
3. Costs were rounded up to the nearest $1,000 for convenience.
8.1.3 Vortex Shaft D1 & Access Shaft D2 Rehabilitation

Tables 8-6 and 8-7 present the preliminary OPCC, or estimated capital costs, developed for Alternatives VSD1-3 and VSD1-4.

<table>
<thead>
<tr>
<th>Bid Item</th>
<th>Description</th>
<th>Estimated Qty</th>
<th>Units</th>
<th>Unit Cost ($/unit)</th>
<th>Total Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization &amp; Initial Activities (5% of OPCC)</td>
<td>1</td>
<td>LS</td>
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<td>$156,000</td>
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<tr>
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<td>1</td>
<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>3</td>
<td>Additional Excavation/Support Allowance</td>
<td>1</td>
<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>4</td>
<td>Pavement Restoration Allowance</td>
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<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
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<td>5</td>
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<td>$100,000</td>
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<tr>
<td>6</td>
<td>Site Preparation &amp; Field Surveying</td>
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<td>$25,000</td>
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<tr>
<td>7</td>
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<td>$20,000</td>
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<td>8</td>
<td>Erosion Control</td>
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<td>$50,000</td>
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<tr>
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<td>Temporary Rock Construction Entrance</td>
<td>1</td>
<td>EA</td>
<td>$5,000</td>
<td>$5,000</td>
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<tr>
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<td>Storm Drain Inlet Protection</td>
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<td>$5,000</td>
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<tr>
<td>11</td>
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<td>LS</td>
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<td>$150,000</td>
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<tr>
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<td>Traffic Control/Signage</td>
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<td>$135,000</td>
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<td>13</td>
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<tr>
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<td>LF</td>
<td>$100</td>
<td>$30,000</td>
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<tr>
<td>15</td>
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<td>$250,000</td>
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<td>17</td>
<td>Vortex Drop Insert &amp; Transition</td>
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<td>LS</td>
<td>$150,000</td>
<td>$150,000</td>
</tr>
<tr>
<td>18</td>
<td>Restoration: Bituminous Pavement</td>
<td>1,200</td>
<td>SY</td>
<td>$75</td>
<td>$90,000</td>
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<tr>
<td>19</td>
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<tr>
<td>20</td>
<td>Restoration: Seed &amp; Mulch</td>
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<td>$25</td>
<td>$75,000</td>
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Subtotal A  $2,396,000

Undeveloped Design Details (10% of Subtotal A)  $240,000

Contingency (20% of Subtotal A)  $480,000

Subtotal B  $3,116,000

Engineering, Administration, & Legal (20% of Subtotal B)  $624,000

Total Opinion of Probable Construction Cost (OPCC)  $3,740,000

Notes:
1. Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 10,817, October 2017.
2. Total Preliminary Opinion of Probable Construction Costs are assumed to have an accuracy of +50% to -30%.
3. Costs were rounded up to the nearest $1,000 for convenience.
### Table 8.7: Preliminary OPCC for Alternative VSD 14
Concrete Repair and Corrosion Resistant Coating System

<table>
<thead>
<tr>
<th>Bid Item</th>
<th>Qty</th>
<th>Unit</th>
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<th>Total Cost ($)</th>
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<td>$169,000</td>
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<td>Utility Relocation Allowance</td>
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<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>Additional Excavation/Support Allowance</td>
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<td>LS</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>Pavement Restoration Allowance</td>
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<td>$100,000</td>
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<tr>
<td>Directed Time &amp; Material Allowance</td>
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<td>LS</td>
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<td>$100,000</td>
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<td>Site Preparation &amp; Field Surveying</td>
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<td>LS</td>
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<tr>
<td>Project Documentation</td>
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<td>LS</td>
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<tr>
<td>Erosion Control</td>
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<td>LS</td>
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<td>$50,000</td>
</tr>
<tr>
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<td>$5,000</td>
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<tr>
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<td>Temporary Wastewater Conveyance</td>
<td>1</td>
<td>LS</td>
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<td>$750,000</td>
</tr>
<tr>
<td>Interceptor Cleaning &amp; Debris Disposal</td>
<td>300</td>
<td>LF</td>
<td>$100</td>
<td>$30,000</td>
</tr>
<tr>
<td>Vortex Shaft A1 MH Concrete Rehabilitation</td>
<td>1</td>
<td>LS</td>
<td>$150,000</td>
<td>$150,000</td>
</tr>
<tr>
<td>Access Shaft A2 Concrete Rehabilitation</td>
<td>1</td>
<td>LS</td>
<td>$250,000</td>
<td>$250,000</td>
</tr>
<tr>
<td>A1 &amp; A2 Protective Coating Application</td>
<td>2</td>
<td>EA</td>
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<td>$90,000</td>
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<td>Vortex Drop Insert &amp; Transition</td>
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<td>LS</td>
<td>$150,000</td>
<td>$150,000</td>
</tr>
<tr>
<td>Restoration: Bituminous Pavement</td>
<td>1,200</td>
<td>SY</td>
<td>$75</td>
<td>$90,000</td>
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<tr>
<td>Restoration: Curb &amp; Gutter</td>
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<td>LF</td>
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<td>$45,000</td>
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<td>Restoration: Seed &amp; Mulch</td>
<td>3,000</td>
<td>SY</td>
<td>$25</td>
<td>$75,000</td>
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</tbody>
</table>

**Subtotal A**                                                                     | $2,589,000

| Undeveloped Design Details (10% of Subtotal A)                           | 22  |      |                    | $259,000        |
| Contingency (20% of Subtotal A)                                          | 23  |      |                    | $518,000        |

**Subtotal B**                                                          | $3,366,000

Engineering, Administration, & Legal (20% of Subtotal B)                           | $674,000

**Total Opinion of Probable Construction Cost (OPCC)**                      | $4,040,000

**Notes:**
1. Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 10,817, October 2017.
2. Total Preliminary Opinion of Probable Construction Costs are assumed to have an accuracy of +50% to -30%.
3. Costs were rounded up to the nearest $1,000 for convenience.
### 8.1.4 1-MN-340 Interceptor Cleaning

Table 8-8 provides a preliminary OPCC, or estimated capital cost, for the cleaning of the 1-MN-340 Interceptor from MH9 downstream to MH8, and then again from Drop Shaft 1A to MH1.

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**Notes:**
1. Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 10,817, October 2017.
2. Total Preliminary Opinion of Probable Construction Costs are assumed to have an accuracy of +50% to -30%.
3. Costs were rounded up to the nearest $1,000 for convenience.
Section 9

Recommendations

This section of the Facility Plan Amendment provides a summary of the recommended improvements that were identified during the previous evaluation.

9.1 Regulator R04/1-MN-344 Tunnel Rehabilitation

Because of the high value of Coldwater Spring (CWS) and the desire to have no impact on groundwater flow, the recommended plan is to move forward with the rehabilitation of the existing Regulator R04 structure and 1-MN-344 Tunnel, or Alternative R04-3. While Alternative R04-3 may not be as advantageous to MCES for future inspection and maintenance as constructing a new regulator and tunnel, this alternative was chosen to eliminate dewatering of the Platteville Limestone, which is believed to feed into CWS via the basal Magnolia parting.

Sequencing of the construction activities around the existing regulator structure will be critical to meet the intent of no impact to CWS. To accomplish this goal, the following steps must be performed, which are also shown graphically in Figure 9-1:

- Install temporary shoring system down to approximately EL 794.00.
- No dewatering below EL 800.00.
- Remove the top of the existing 10'-3"H x 11'-0" W horseshoe interceptor above EL 800.50.
- Manage the buoyant forces on the existing regulator during construction.
- Install HPU and accumulator tank inside the existing Electrical MH.
- Perform preliminary testing and monitoring of ventilation shafts and other facilities that will be required for safe construction practices.

![Figure 9-1. Existing Regulator Construction Sequencing](image-url)
In addition, construction of the two anticipated 18”-24” finished inside diameter ventilation shafts to the existing sandstone tunnel will be constructed in the wet without dewatering, using the same method used for drilling similar wells in the metropolitan area. It is anticipated that initial testing and/or screening will be conducted during the initial construction activities to confirm that the ventilation shafts are not constructed where an existing major joint in the Platteville Limestone may be present. This will be accomplished by first installing up to 4” diameter test borings to determine if major joints are present. Following the determination that no major joints are present, the final 18-24” finished diameter holes will be drilled and prepared to be used for ventilation shafts during construction.

**9.1.1 Summary of Alternative R04-3**

Plan and section views of the modifications to Regulator R04 under Alternative R04-3 are shown in Figures 9-2 and 9-3, respectively. Other modifications may also be identified and/or deemed appropriate during final design.

![Figure 9-2. Plan View of Modified Regulator R04](image-url)
9.1.2 Benefits for Alternative R04-3
It is believed that moving forward with Alternative R04-3 will allow MCES to rehabilitate the structures identified in this Facility Plan Amendment without risk of impacting CWS. It is also believed that moving forward with Alternative R04-3 over Alternative R04-2 will reduce the associated construction costs by over $4.0 million by 1) eliminating the need to dewater groundwater passing through the Platteville Limestone that is believed to feed CWS; 2) eliminating the need to construct a new regulator and tunnel; 3) reducing associated mechanical/HVAC and electrical equipment; and 4) other miscellaneous activities.

9.2 Vortex Shaft A1 & Access Shaft A2 Rehabilitation
The recommended plan for moving forward for the rehabilitation of Vortex Shaft A1 and Access Shaft A2 is Alternative VSA1-3. Alternative VSA1-3 includes the installation of new fiberglass panels in the Connection Chamber, FRP or polymer concrete inserted in the risers, and/or riser replacement. The upper transition structure and access chamber will be lined with fiberglass, or polymer concrete, structural liners. The vortex structure itself will be replaced with a new PVC type structure that is fastened inside the newly lined transition structure and connected to the existing 32" OD HDPE drop pipe. The access shaft will also be lined.

The lower connection chamber will be lined with fiberglass panels that are corrosion resistant as commonly provided by Channeline and others. In the interceptor, the sewer gases may contain high levels of H₂S which may be high enough to attack polyester resin, so vinyl ester resin would be specified. The panels are typically ribbed, providing space behind the panels for grout. This method of rehabilitation is accomplished by the following steps:

1. Take accurate measurements of the chamber walls.
2. Fabrication of fiberglass panels that fit through the access manhole.
3. Concrete surfaces are prepared by water or sand blasting to remove loose and corroded material.
4. Panels and are lowered and assembled in the chamber. The panels are bonded together with resin in place.
5. Wall panels and ceiling panels are installed and secured in place and grout is pumped into the void between the panel and the concrete structure.
6. The invert will be lined similarly with fiberglass panels.

The vortex drop pipe is HDPE material, and will not require rehabilitation. However, the aluminum support frame is assumed to have corroded and will be reconstructed using Type 316 stainless steel members.

The concrete platform will be removed and replaced with a platform above the crown of the interceptor pipe using all Type 316 stainless steel members, adhesive bolts, and grating.

9.3 Vortex Shaft D1 & Access Shaft D2 Rehabilitation

The recommended plan for moving forward for the rehabilitation of Vortex Shaft D1 and Access Shaft D2 is Alternative VSD1-3. Alternative VSD1-3 includes the installation of new fiberglass panels in the Connection Chamber, FRP or polymer concrete inserted in the risers, and/or riser replacement. The upper transition structure and access chamber will be lined with fiberglass structural liners. The vortex structure itself will be replaced with a new PVC-type structure that is fastened inside the newly lined transition structure and connected to the existing 18’ OD HDPE drop pipe. The access shaft will also be lined.

The lower connection chamber with 1-MN-340 will be lined with fiberglass panels that are corrosion resistant as commonly provided by Channeline and others. In the interceptor, the sewer gases may contain high levels of H2S which may be high enough to attack polyester resin, so vinyl ester resin would be specified. The panels are typically ribbed, providing space behind the panels for grout. This method of rehabilitation is accomplished by the following steps:

1. Take accurate measurements of the chamber walls.
2. Fabrication of fiberglass panels that fit through the access manhole.
3. Concrete surfaces are prepared by water or sand blasting to remove loose and corroded material.
4. Panels and are lowered and assembled in the chamber. The panels are bonded together with resin in place.
5. Wall panels and ceiling panels are installed and secured in place and grout is pumped into the void between the panel and the concrete structure.
6. The invert will be lined similarly with fiberglass panels.

The vortex drop pipe is HDPE material, and will not require rehabilitation. However, the aluminum support frame is assumed to have corroded and will be reconstructed using Type 316 stainless steel members.

The concrete platform will be removed and replaced with a platform above the crown of the interceptor pipe using all Type 316 stainless steel members, adhesive bolts, and grating.

9.4 1-MN-340 Interceptor Cleaning

The recommended plan for the 1-MN-340 Interceptor cleaning activities is to clean essentially from the existing Vortex Shaft D1 structure downstream to the connection with the 1-MN-341 Interceptor near intersection of 38th Street E and West River parkway. This work will be conducted when the majority of
the flow (from 1-MN-344, 1-MN-346, and local City of Minneapolis flows) are being temporarily conveyed around the project sites. The remaining flow that will be present during the cleaning operations will primarily be from the Fort Snelling Interceptor (War Tunnel) that was not diverted.

9.5 Combined Project Capital Costs

Table 9-1 presents a summary of the recommended costs from the preliminary opinion of project construction costs (OPCC) from Section 10 for the regulator (modified), tunnel, Vortex Shaft A1, Vortex Shaft D1, and 1-MN-340 Interceptor cleaning, or the initial project.

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Notes: 1. Costs are based on an Engineering News Record Construction Cost Index (ENR CCI) of 10,817, October 2017.
2. Total Preliminary Opinion of Probable Construction Costs are assumed to have an accuracy of +50% to -30%.
3. Costs were rounded up to the nearest $1,000 for convenience.
Section 10

Implementation

This section of the Facility Plan Amendment outlines the conclusions required for implementing Alternative R04-3 for the rehabilitation of the existing Regulator R04 and downstream 1-MN-344 Interceptor. Based on groundwater modeling that has been done to date, this alternative results in no impact to Coldwater Spring. This section also outlines the conclusions required for implementing the preferred alternative, or Alternative VSA1-3, for Vortex Shaft A1 & Access Shaft A2. This section also outlines the conclusions required for implementing the preferred alternative, or Alternative VSD1-3, for Vortex Shaft D1 & Access Shaft D2. Conclusions for the cleaning of the 1-MN-340 Interceptor are also identified. Temporary wastewater flow diversion, that will be a combined system for all project components identified in the project are also presented.

10.1 Construction Issues

Several construction issues related to the various improvements have been identified. The identified issues are listed below for each major component.

10.1.1 Construction Requirements/Limitations

The construction requirements for rehabilitating the Regulator R04 underground vault and the downstream 1-MN-344 Tunnel will include the following:

Regulator R04/1-MN-344 Tunnel Rehabilitation:
- Field verification of actual inside underground vault dimensions, elevations, and connection pipe diameters, including ovality determination of each pipeline. Information collected in the field by the contractor during this step shall be submitted to the CAR for documentation.
- Clean interior of the pipes and structures to remove mineral deposits, grease, sand, gravel, and other matter that will inhibit liner installation.
- Grout, seal and/or repair leaking joints and/or seams.
- Construct new internal walls for gates and suspended slabs with new access hatches.
- Construct new mechanical vault for regulator equipment.
- Field verification of existing tunnel dimensions, service connection locations, and other parameters that are important to rehabilitating the tunnel.
- Install ventilation shafts (24" diameter maximum) for the safety of construction workers.
- Rehabilitate 1-MN-344 tunnel by installing new structural liner and filling existing voids.
- Re-establish all local service connections.

Vortex Shaft A1 & Access Shaft A2:
- Field verification of actual inside MH diameter and connection pipe diameters, including ovality determination of each pipeline. Information collected in the field by the contractor during this step shall be submitted to the CAR for documentation.
- Clean interior of the pipe and MH structures to remove mineral deposits, grease, sand, gravel, and other matter that will inhibit liner installation.
- Grout, seal and/or repair leaking joints.
- CCTV inspect the pipeline prior to initiation of the MH liner installation work to confirm that the existing conditions are suitable for liner installation.
- Replace and/or rehabilitate MH structures.
CCTV inspect the pipeline and MH structures upon completion of the work to provide a record of the completed work.

**Vortex Shaft D1 & Access Shaft D2:**
- Field verification of actual inside MH diameter and connection pipe diameters, including ovality determination of each pipeline. Information collected in the field by the contractor during this step shall be submitted to the CAR for documentation.
- Clean interior of the pipe and MH structures to remove mineral deposits, grease, sand, gravel, and other matter that will inhibit liner installation.
- Grout, seal and/or repair leaking joints.
- CCTV inspect the pipeline prior to initiation of the MH liner installation work to confirm that the existing conditions are suitable for liner installation.
- Replace and/or rehabilitate MH structures.

CCTV inspect the pipeline and MH structures upon completion of the work to provide a record of the completed work.

**1-MN-340 Interceptor Cleaning:**
- Determination of the equipment access points.
- Estimating the amount of debris that needs to be removed from the interceptor.

Open-cut excavation is anticipated at each underground vault, MH structure that will be replaced/rehabilitated. Installation of the structure replacement work will require temporary wastewater flow diversion around the work activities. Because the improvements are primarily located within the Minnehaha Park Area, coordination with the MPRB, MCWD, BOWSR, and other agencies will be required. In addition, coordination with Mn/DOT, Hennepin County, light rail, and the City of Minneapolis will also be required because of the project sites’ proximity to existing street/highway ROWs, including Highway 55 (Hiawatha Avenue), and other local streets/roadways.

### 10.1.2 Construction Sequencing and Methods
A suggested construction sequence for the rehabilitation of the existing Regulator R04 and downstream 1-MN-344 Tunnel, Vortex Shaft A1 & Access Shaft A2, and Vortex Shaft D1 & Access Shaft A2, are outlined below. It is noted that the contractor will be afforded as much flexibility as possible in order for MCES to benefit from the lowest cost approach that accomplishes the work.

- Obtain all permits and approvals to conduct the work
- Lay out temporary conveyance piping from upstream diversion MH(s) to downstream receiving MH(s).
- Rehabilitate underground structures, access structures, and pipelines.
- Clean and televise all pipe connections and rehabilitated MHs.

### 10.1.3 Temporary Flow Diversion
A large, robust, temporary wastewater flow conveyance system will be needed around the various construction sites for this project. See Section 3 of this Facility Plan Amendment for information pertaining to this subject.

### 10.1.4 Traffic Control
Special provisions will be required to ensure vehicular traffic has access during construction activities, especially where diversion pipes cross roads and where maintenance holes are close to the street. Traffic control plans will be prepared for those specific locations. Some construction activities will be near to the light rail tracks. Rail traffic cannot be interrupted. The contractor will be required to meet all RR requirements including hiring of flag men as needed.
10.1.5 Permits
It is recommended that the contractor be responsible for obtaining the majority of required permits necessary for completing this project. A few permits will be required to be obtained by MCES. While every effort will be made during design to coordinate and communicate with the regulatory agencies up front, the final permit application, including fees, will need to be coordinated between MCES and the contractor. Section 6 of this Facility Plan Amendment lists the anticipated regulatory agency involvement along with the specific permits.

10.1.6 Geotechnical Considerations

Regulator R04/1-MN-344 Tunnel Rehabilitation:
Rock and groundwater can be expected at or close to the surface at the Regulator R04 site. Overburden soil is approximately 14' thick over the limestone bedrock. Groundwater can be expected anywhere within the upper 3 to 4 feet of the surface depending on the time of year, and the water level in nearby Minnehaha Creek. Groundwater in the overburden will impact the contractor when constructing improvements to the existing Regulator R04 vault and building the new mechanical vault. Deep groundwater in the St. Peter sandstone may also need to be addressed during the rehabilitation of the 1-MN-344 tunnel, which can be managed with deep wells. Dewatering of the Platteville limestone layer, between the overburden and the deeper St. Peter, will not be allowed, as this is the area that is believed to feed into CWS. Localized dewatering sump pumps within the temporary shoring systems may also be required in some cases, which will not affect Coldwater Spring. Similarly, dewatering in the underlying St. Peter sandstone, being separated hydraulically from the Platteville Limestone, has no impact on CWS.

Vortex Shaft A1 & Access Shaft A2 Rehabilitation:
Rock and groundwater can be expected at or close to the surface at the Vortex Shaft A1 site. Rock generally occurs at between 4 and 8 feet below the ground surface. Groundwater can be expected anywhere within the upper 4 feet of the surface depending on the time of year. Groundwater will primarily impact the contractor when removing cone sections for the inversion process, and when rehabilitating MHs. Temporary shoring systems along with localized dewatering sump pumps may be required in some cases. Dewatering operations under Alternative VSA1-3 will not affect Coldwater Spring because only sump dewatering for lining, or replacement of, the upper transition structure is anticipated.

Vortex Shaft D1 & Access Shaft D2 Rehabilitation:
Rock and groundwater can be expected at or close to the surface at the Vortex Shaft D1 site. Rock generally occurs at between 4 and 8 feet below the ground surface. Groundwater can be expected anywhere within the upper 4 feet of the surface depending on the time of year. Groundwater will primarily impact the contractor when removing cone sections for the inversion process, and when rehabilitating MHs. Temporary shoring systems along with localized dewatering sump pumps may be required in some cases. Dewatering operations under Alternative VSD1-3 will not affect Coldwater Spring because only sump dewatering for lining, or replacement of, the upper transition structure is anticipated.

10.1.7 Existing Utilities
The location of existing buried utilities, such as gas lines, water, sewer, storm water, fiber optic, etc., will need to be identified prior to any open excavations occurring on the project site. Overhead utilities, such as power lines, should also be identified. Contacting Gopher 1 should be used by the contractor to aid in the identification of existing utilities.
10.2 Schedule

The proposed project schedule in Table 10-1 was developed for the recommended alternatives. The design and construction activities are planned to be implemented consecutively beginning in 2018.

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<tr>
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<td>Tribal Communities</td>
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<td>Other Interested Parties</td>
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<td><strong>Bid Phase:</strong></td>
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<tr>
<td>Advertisement for Bids</td>
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<tr>
<td>Receive Bids</td>
<td>35</td>
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<tr>
<td>Notice of Award</td>
<td>30</td>
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<td>Conformed Documents</td>
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<tr>
<td><strong>Construction Phase:</strong></td>
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<td>Notice to Proceed</td>
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<tr>
<td>Shop Drawing Approval</td>
<td>240</td>
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<tr>
<td>Construction Activities/Monthly Progress Meetings</td>
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<tr>
<td>Substantial Completion</td>
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<tr>
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</tr>
<tr>
<td>Record Drawings</td>
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</table>

Notes: 1. The project schedule will need to be refined during final design.

Final design is anticipated to take 8 months from the completion of this Facility Plan Amendment. Bid phase activities are anticipated to take approximately 3 months from the Advertisement for Bids through the Notice of Award. Construction phase services are then anticipated to take approximately 20 months from the Notice to Proceed through Final Completion. Record Drawings would then be completed following receipt of acceptable redline drawings from the contractor.
Section 11

References


4. Environmental Information Worksheet (EIW) Form, Minneapolis Interceptor Rehab Phase 2, Metropolitan Council Environmental Services, EVS, February 11, 2013.


6. Phase I Cultural Resources Survey for the MCES Interceptor Rehabilitation, Phase 2 Regulator R04 Project, Minneapolis, Hennepin County, Minnesota, Two Pines Resource Group, LLC, August 2014.

7. Regulator R04/1-MN-344 Tunnel Improvements Project; Camp Coldwater Spring, Submittal to SHPO, Metropolitan Council Environmental Services, March 9, 2015.


12. Ground Penetrating Radar Survey, MCES Regulator R04 Rehabilitation – Minnehaha Park, Minneapolis, Minnesota, Metropolitan Council Environmental Services,
Braun Intertec, March 26, 2015.

13. **Feasibility Study for Odor Control Facility at 4757 Hiawatha Ave (Bridgeman’s Ice Cream),** Technical Memorandum, Metropolitan Council Environmental Services, Brown and Caldwell, June 30, 2015.


25. **MCES Shaft Inspection, Field Notes at Hiawatha Ave. & Nawadaha Blvd. Shaft, Minneapolis, Minnesota**
   CNA Consulting Engineers, September 16, 2016.


27. **Deep Interceptor Inspection Report, Metropolitan Council Environmental Services,**
Appendix A: Summary of Public Hearing
Appendix B: Preliminary Temporary Wastewater Conveyance System Design
GENERAL NOTES:
1. All information on these sheets was obtained from record documents from several sources and GIS parcel information.
2. Provide temporary conveyance for Interceptor and City Service connections. See Section 01569 for General Temporary Conveyance Notes and System Performance Requirements.
3. All temporary street or lane closures subject to City of Minneapolis ROW Permit Requirements.
4. See CS sheets for Topography, Erosion and Sediment Control Measures.

KEY NOTES:
1. See CS sheets for Topography, Erosion and Sediment Control Measures.
2. Subject to City of Minneapolis ROW Permit Requirements.
3. All temporary street or lane closures.
4. See Section 01569 for General Temporary Conveyance Notes and System Performance Requirements.

LEGEND:
- Construction Limits
- Existing MCES Interceptor
- 24 in Dia HDPE Temporary Conveyance System for Site 4
- 24 in Dia HDPE Temporary Conveyance System for Site 5
- Buried Temporary Conveyance Pipe for Site 4
- Buried Temporary Conveyance Pipe for Site 5
- MCES Pumping Location
- City Service Pumping Location
- Site Number, See Enlarged Plan for Pump Configuration

NOT FOR CONSTRUCTION
GENERAL NOTES:
1. SEE GENERAL NOTES 1-4 ON SHEET GC1 FOR INFORMATION REPRESENTED HEREIN.

KEY NOTES:
1. FORT SNELLING INTERCEPTOR FLOW TO BE FLUMED THROUGH VORTEX STRUCTURE A1 DURING CONSTRUCTION. SEE SF4 SHEETS FOR DETAILS.
2. KEEP REQUIRED TO MAINTAIN ONE LANE OF TRAFFIC.
3. MAINTAIN ACCESS TO ALLEY DURING CONSTRUCTION.
4. PLUG LINE FOR TEMPORARY CONVEYANCE.

LEGEND:
- CONSTRUCTION LIMITS
- EXISTING MCES INTERCEPTOR
- 24 IN DIA HDPE TEMPORARY CONVEYANCE SYSTEM FOR SITE 4
- BURIED TEMPORARY CONVEYANCE PIPE FOR SITE 4
- MCES PUMPING LOCATION
- S = SITE NUMBER
- X = PUMP NUMBER

NOT FOR CONSTRUCTION

FILE NAME:
GC00003.DWG

PROJECT:
REGULATOR RX REHABILITATION/1-MN-344 TUNNEL IMPROVEMENTS
TEMPORARY CONVEYANCE - SITE 4

807629
GC00003

SCALE:
1" = 0' - 60"
GENERAL NOTES:

1. SEE GENERAL NOTES 1-4 ON SHEET GC1 FOR INFORMATION REPRESENTED HEREIN.

KEY NOTES: 

1. LOCATION OF PRIVATE ELECTRIC UNKNOWN
2. KEEP ACCESS TO TRAIL OPEN DURING CONSTRUCTION
3. 20 FT x 40 FT TUNNEL LAUNCHING/RETLREIVING PITS FOR EXIT OF TEMP CONDUIT UNDER MINNEHAHA AVE. SEE GC9 FOR ADDITIONAL INFORMATION
4. ACCESS TUNNEL AT SHAFT 1. SEE GC3.1.
5. CLOSE AND DETOUR PEDESTRIAN PATHS AND SIDEWALKS DURING CONSTRUCTION
6. REHABILITATE UPPER AND LOWER TUNNELS INCLUDING MINNEHAHA CREEK CROSSING PER CS3.X AND CS4.X SHEETS.

LEGEND:

- CONSTRUCTION LIMITS
- EXISTING MCES FORCE MAIN
- (3) 36-IN HERE TEMPORARY CONVEYANCE SYSTEM FOR COMBINED SITES
- BURIED TEMPORARY CONVEYANCE PIPE FOR COMBINED SITES
- CITY PUMPING LOCATION S = SITE NUMBER
- X = PUMP NUMBER

NOT FOR CONSTRUCTION
1. DUE TO RECENT CONSTRUCTION, UTILITY INFORMATION IS LIKELY OUT OF DATE OR INCOMPLETE. SURVEYS ARE NECESSARY PRIOR TO EXCAVATION IN THIS AREA.

2. LOCATION OF PRIVATE ELECTRIC UNKNOWN.

3. KEEP ACCESS TO TRAIL OPEN DURING CONSTRUCTION.

4. 35 FT x 40 FT TUNNEL LAUNCHING/RETRIEVING PITS FOR BURIED MCES TEMPORARY CONVEYANCE.

5. REMOVE TEMPORARY CONVEYANCE PIPE AND FILL CASING WITH FLOWABLE FILL FOR ABANDONMENT UPON COMPLETION.

KEY NOTES:

GENERAL NOTES:

1. (3)-36 IN HDPE PIPES IN HDD ACROSS MINNEHAHA AVENUE. PROVIDE PROPER SEPARATION.

2. LOCATION OF PRIVATE ELECTRIC UNKNOWN.

3. KEEP ACCESS TO TRAIL OPEN DURING CONSTRUCTION.

4. 35 FT x 40 FT TUNNEL LAUNCHING/RETRIEVING PITS FOR BURIED MCES TEMPORARY CONVEYANCE.

5. REMOVE TEMPORARY CONVEYANCE PIPE AND FILL CASING WITH FLOWABLE FILL FOR ABANDONMENT UPON COMPLETION.
KEY NOTES:
1. GEOTEXTILE FABRIC PER MnDOT 3733 TYPE III.
2. CLASS I REPAIR DEPTH OF ROAD AS NEEDED FOR CONSTRUCTION EQUIPMENT. REMOVE ROAD AND FILTER FABRIC AT PROJECT COMPLETION.

TEMPORARY ACCESS ROAD FOR CONSTRUCTION
NO SCALE

TEMPORARY ROAD/TRAIL RESTORATION TEMP CONVEYANCE CROSSING
NO SCALE

NOT FOR CONSTRUCTION

1. GEOTEXTILE FABRIC PER MnDOT 3733 TYPE III.
2. MIXED-BATCH BITUMINOUS WEAR COURSE (SPWEB340F) PLACED IN 2" LIFTS.
3. TEMPORARY DIVERSION PIPE LINES

NOTE:
TYPICAL CROSS-SECTION FOR RESIDENTIAL STREETS SHALL BE 4" OF BITUMINOUS OVER 12" OF CLASS 5 PLACED IN 2" LIFTS.

NOTE:
MIN TRAIL WIDTH IS 8 FEET.
INTRODUCTION

The Metropolitan Council Environment Services (MCES) is planning to make repairs to the existing wastewater interceptor system in the Minnehaha Park/Longfellow Garden area of Minneapolis. Proposed improvements include rehabilitating the existing tunnel under Minnehaha Creek, Hiawatha Avenue and the METRO Blue Line LRT. The project is located approximately 1 ½ miles to the northwest of Coldwater Spring, a national historic site with spiritual, cultural and historic significance. The proposed project will include:

- The existing tunnel and regulator will be rehabilitated to house new flow gates, and the tunnel will be rehabilitated.
- Surface soils will be excavated to remove the top of the tunnel and regulator for interim pumping and the rehabilitation work.
- A new shallow vault (in the soil above the Platteville Limestone) will be built to house electrical and control equipment.
- One or more 30-foot ventilation shafts may be drilled based on the final design.
- Rehabilitation of tunnel drop shafts along Hiawatha Avenue at 50th and 52nd Streets.
- Temporary wastewater conveyance – mainly above ground – will be installed around three of the main construction sites along with multiple pumping units.

There is a long-term environmental risk to water resources in the area if these improvements are not made, including impacts to Minnehaha Creek, the Mississippi River, and many park and natural resources in the immediate area. This approach, which requires a large temporary wastewater conveyance system, eliminates the need for Platteville Limestone dewatering and the associated risk of impacting Coldwater Spring.

Coldwater Spring

Given the hydrology and geologic characteristics of the area, there has been concern about the potential for dewatering that might impact water flow to Coldwater Spring. State law prohibits impacts to Coldwater Spring, which is a national historic site and is considered a sacred site by many people.

MCES recently conducted hydrology and geotechnical studies to better understand water flows in the area. Based on the results of these studies, it was determined that the existing tunnel should be rehabilitated rather than replaced to avoid the potential for impacts to water flows to Coldwater Spring.

Since Coldwater Spring is a national historic site and the project is funded, in part, with federal funds, research and consultation is required by Section 106 of the National Historic Preservation Act. This includes formal consultation with federally recognized tribes and other potential consulting parties when there is a determination of effect on eligible or listed properties. A determination of effect will be made by the Minnesota Pollution Control Agency, which has been delegated authority by the Environmental Protection Agency, following the public hearing on the Metropolitan Council’s Facility
Plan Amendment. Since the amended facility plan significantly reduces the risk of impacts to Coldwater Spring, a formal federal consultation may not be required. However, MPCA and MCES will still consult informally with Minnesota Historic Preservation Office and will implement a robust communications effort with all interested parties including neighborhoods, tribes, advocacy groups, public agencies and the general public.

**Key Stakeholders**

We anticipate that the key stakeholders will include at least the following:

**Public Agencies:**
- City of Minneapolis
- Minneapolis Parks and Recreation Board
- Minneapolis Heritage Preservation Commission
- Minnehaha Watershed District
- Environmental Protection Agency (EPA)
- National Park Service/Department of Interior (NPS)
- Advisory Council on Historic Preservation/Department of Interior (ACHP)
- Minnesota Historic Preservation Office (MnHPO)
- Minnesota Department of Natural Resources
- Minnesota Pollution Control Agency (MPCA)
- Minnesota Department of Transportation (MnDOT)
- Metro Transit/Metropolitan Council
- Hennepin County
- Office of the State Archaeologist (OSA)
- Minnesota Indian Affairs Council (MIAC)

**Federally Recognized Tribes:**
- Shakopee Mdewakanton Sioux (Dakota) Community
- Prairie Island Indian Community
- Lower Sioux Indian Community
- Upper Sioux Community

**Community Organizations:**
- Mendota Mdewakanton Dakota Tribal Community
- Longfellow Community Council
- Standish-Ericsson Neighborhood Organization
- Nokomis East Neighborhood Organization

**Advocacy Groups:**
- Minnesota Center for Environmental Advocacy
- Freshwater Society
- Minnesota Clean Water Action
- Preserve Coldwater Coalition
- Friends of Coldwater

**Phases for Implementation of Communications Plan**

We are proposing to implement communications in two separate phases, as described in the following sections. These phases are:

- Phase 1A – Final Design (2017-2018) – Regulatory Process
- Phase 1B – Final Design (2018-2019) – Neighborhood Communications
- Phase 2 – Construction (2019-2022)
**FINAL DESIGN**

**Phase 1A – Final Design (2017-2018) – Regulatory Process**

Phase 1A is currently underway and is focused on the environmental (cultural resources/Section 106 consultation) regulatory process, supplemented by complementary community outreach activities. Specific tasks include the following:

1. Clarify regulatory requirements, including process for state requirements and applicability of federal requirements.
   a. MCES submits facility plan amendment to MPCA
   b. MPCA confirms Section 106 status – exemption or no exemption
2. Clarify agency roles and responsibilities with MPCA including:
   a. MPCA leads initial agency coordination
   b. MCES coordinates with other agencies, as needed
   c. Responsibilities for coordination with tribes
3. Initiate or reinitiate agency and tribal consultation per resolution of above items. State-level consultation has already been initiated with MnHPO but needs to be initiated with others, and federal Section 106 has not been initiated.
   a. Letter to agencies and tribes with project update, from MPCA, clarifying whether the project fulfills Section 106 and/or state law and inviting consultation
      i. States whether Section 106 exemption or not (if Section 106 applies, follow MPCA CWSRF Section 106 Guidance Document for agency coordination)
      ii. Includes project design and impacts analysis
   b. Agency coordination and consulting parties meetings/communications, as needed
4. Complete additional cultural resources compliance as needed based on resolution of above consultation, to identify historic properties and assess and resolve effects.
   a. May include monitoring or mitigation agreement
   b. Cultural resources process must be resolved before public notice of environmental documentation

**Phase 1B – Final Design (2018-2019) – Neighborhood Communications**

1. Following agency outreach, prepare communications to key stakeholders regarding the project’s current status, ongoing design activities, and future process and schedule.
   a. Letter from Metropolitan Council Chair to community organizations and other key stakeholders
   b. Public meeting to explain project, ongoing design activities and future consultation and communications process
2. Prepare and update talking points about the project as design progresses and determination of effects is completed.
3. Prepare project information for posting on website(s) – at least the Metro Council website and others, as appropriate. This information may also be provided via social media and GovDelivery.
4. Prepare and make presentations to each of the neighborhood organizations and to other organizations if requested. The purpose of these meetings will be to describe the proposed
project and its benefits, the anticipated construction schedule and construction impacts, and to answer questions as needed.

5. Hold a public meeting for the general public to share information about the proposed project, project benefits, the construction schedule, and potential impacts and mitigation measures. The purpose of this meeting will be to share information with the general public about the proposed project, its benefits, the construction schedule and construction impacts.

6. Hold additional meetings with stakeholders, agencies and consulting parties, if needed, to reach resolution of design issues.

7. Provide periodic information updates for the Metro Council website as well as other websites, as appropriate. These updates will also be available for distribution by social media and GovDelivery.

8. Refine the communications plan, as needed, for the construction phase of the project. The degree of communication that will be needed during construction will be dependent on the determination of effects and whether any mitigation is required.

CONSTRUCTION

Phase 2 – Construction (2019-2022)

The degree of communications during construction, particularly with the tribes, will depend on results of state level and Section 106 compliance. Construction communications needs will also be influenced by the fact that there are very few properties that will be directly impacted by the proposed project.

Specific tasks recommended for communications during construction include the following:

1. Prepare and distribute periodic updates of construction activities – whether weekly, bi-weekly or monthly will depend on the determination of effect and the mitigation strategies that are agreed to during construction – updates will be distributed by GovDelivery, email and/or door-to-door distribution as needed.

2. Offer on-site meetings to key project stakeholders/community leaders on a bi-monthly basis, to allow stakeholders to see the progress, ask specific questions and become more familiar and comfortable with the process.

3. Prepare monthly (or more frequent) updates of information for websites, social media and GovDelivery.

4. Manage a project hotline and email contact for receipt and response to complaints, comments and questions.

5. Design and implement site signs or site wraps that communicate the long-term environmental benefits of the project.

6. Prepare and make presentations to neighborhood organizations (and tribes, if desired) at the start and conclusion of each construction season to provide an update on construction activities, schedule, monitoring results, and answer questions about the project. Presentations to other organizations will be made upon request.

7. Prepare and distribute doorknob hangers as needed for communication of utility shutoffs, traffic changes, or other last-minute construction impacts.

8. Hold public meetings at the start of each construction season to provide the general public with information about upcoming construction activities and impacts and about the project and its
long-term environmental benefits. Information about Coldwater Spring and efforts to protect the spring will also be provided.

9. Prepare news releases at project milestones providing status reports about the construction progress.

10. Prepare a summary report at the completion of the project to document communications activities, including the Section 106 consultation process (if required) and any ongoing work with the tribes.