Double Box Culvert Repair Project (FCP-1) Feasibility Report

Minneapolis, Minnesota

Prepared for
Bassett Creek Watershed Management Commission

June 2025

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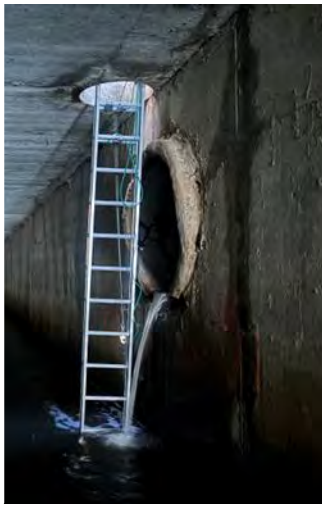

Certification

I hereby certify that this Report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota

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PE #: 58685

June 11, 2025
Date

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Abbreviations

BCWMC	Bassett Creek Watershed Management Commission
BNSF	Burlington Northern Sante Fe Railway Company
BWSR	Minnesota Board of Water and Soil Resources
CIP	capital improvement program
CSW	Construction Stormwater General Permit
EAW	environmental assessment worksheet
EQB	Environmental Quality Board
FCP	flood control project
LGU	local government unit
MEPA	Minnesota Environmental Policy Act of 1973
MnDNR	Minnesota Department of Natural Resources
MPCA	Minnesota Pollution Control Agency
NPDES	National Pollutant Discharge Elimination System/State Disposal System
RGU	responsible government unit
SWPPP	stormwater pollution prevention plan
USACE	U.S. Army Corps of Engineers
WCA	wetland conservation act

1 Executive Summary

1.1 Background

The Bassett Creek Watershed Management Commission's (BCWMC) current Capital Improvement Program (CIP) (Table 5-3 in the 2015-2025 Bassett Creek Watershed Management Plan, as revised) (1) includes the Flood Control Project Double Box Culvert Repairs (CIP #FCP-1). At their February 2025 meeting, the Commission approved the Commission Engineer's proposal to conduct a feasibility study for the Double Box Culvert Repair Project.

As is required for BCWMC CIP projects, a feasibility study must be completed prior to the BCWMC holding a hearing and ordering the project. This feasibility study examines methods and costs to repair the double box culvert. The Commission Engineer investigated one primary option during this feasibility study, with the alternative options being to do nothing or delay the repairs.

If ordered, the BCWMC will utilize the BCWMC CIP funds to implement the proposed project. The current CIP budget earmarks $1,200,000 for this project. The source of these funds is an ad valorem tax levied by Hennepin County over the entire Bassett Creek watershed on behalf of the BCWMC.

1.2 General Description and Site Characteristics

The Double Box Culvert Repair Project is located entirely underground within the "new" stormwater tunnel in the City of Minneapolis. The project will repair defects identified during the 2019 and 2024 tunnel inspections (2) (3).

1.3 Recommendations

The Commission Engineer recommends proceeding with the necessary repairs. This proactive approach is preferred over delaying the work or opting to do nothing. Performing the repairs will help maintain the infrastructure's functionality and prevent further deterioration, which could lead to more significant issues and higher repair costs in the future.

2 Background, Goals and Objectives

The *BCWMC 2015-2025 Watershed Management Plan* (Plan) (1) discusses the Bassett Creek Flood Control Project in Section 2.8.1 (BCWMC Flood Control Project). The Plan identifies the 1.7-mile tunnel through downtown Minneapolis as the principal feature of the BCWMC Flood Control Project.

2.1 Background

The Double Box Culvert is part of a system of storm sewer tunnels that convey Bassett Creek flow through downtown Minneapolis to the Mississippi River, where it discharges downstream of St. Anthony Falls. The storm sewer system was constructed in three phases including the I-94/2nd Street tunnel (Phase 1), the 3rd Avenue tunnel (Phase 2), and the Double Box Culvert (Phase 3), all of which are depicted in Figure 1. The Double Box Culvert was constructed by the USACE in 1992 and it was turned over to the local sponsor (City of Minneapolis) in 2002 (i.e., the City of Minneapolis owns the system). The Double Box Culvert was constructed by open cut excavation 0−20 feet below ground surface and was designed to convey Bassett Creek flows to the 3rd Avenue tunnel, via a 30-foot drop structure. The Double Box Culvert generally runs parallel with the Cedar Lake Trail and consists of three primary cross sections (from upstream to downstream):

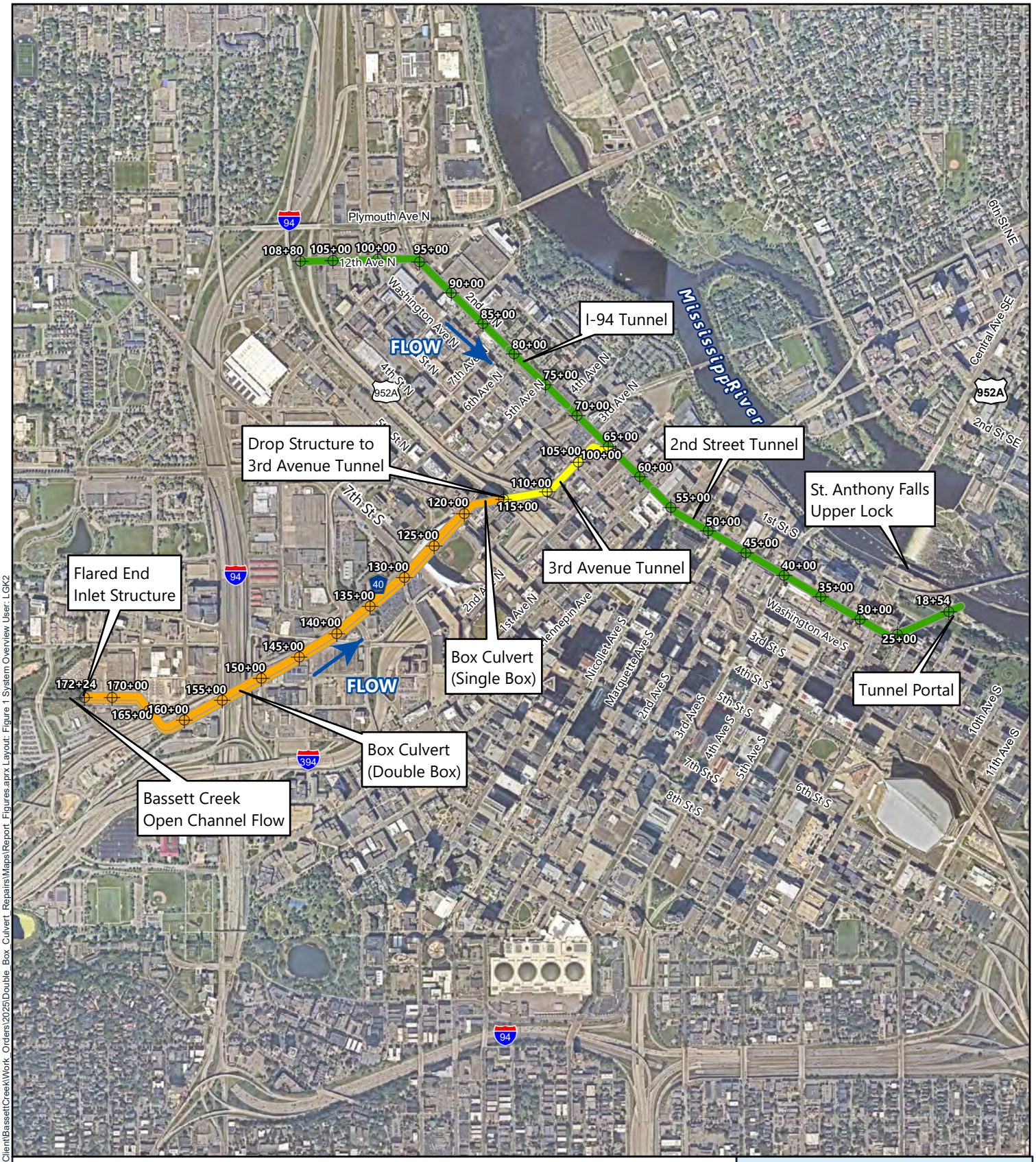
- Flared end inlet structure (Sta. 172+45 to 172+24)
- 11-foot-high by 11-foot-wide double box culverts (Sta. 172+24 to Sta. 119+88)
- 11-foot-high by 15-foot-wide single box culvert (Sta. 119+88 to Sta. 116+73)

The past two Double Box Culvert inspection reports (2019 and 2024) (2) (3) identified both structural and operation and maintenance defects within the box culvert; therefore, the Double Box Culvert Repair project would address needed repairs along the 5,600-foot-long tunnel.

2.2 Goals and Objectives

The project is consistent with the goals (Section 4.1) and policies (Section 4.2.2) for flooding and rate control in the Plan (1) and is consistent with the BCWMC's subsequent Flood Control Project policies, adopted in 2016, and updated in 2021. As is required for BCWMC CIP projects, a feasibility study must be completed prior to the BCWMC holding a hearing and ordering the project. This study examines the feasibility, methods, and costs of repairing the Double Box Culvert, which is proposed to be included for design and construction in the BCWMC's 2026 CIP - Double Box Culvert Repair Project (FCP-1).

Furthermore, as listed in the Operation and Maintenance Manual (4) for the Flood Control Project, "prior approval by the USACE District Engineer is required for any proposed improvement or change in any feature within the project limits. Before starting construction on such improvements or changes, the City of Minneapolis Superintendent shall submit a written request with two complete sets of the proposed plans for consideration to the USACE District Engineer... Construction of any alterations to the project shall not begin until written approval has been received from the USACE District Engineer." The Commission Engineer will continue to seek confirmation from the USACE regarding whether they consider the Double Box Culvert Repair Project an "improvement" to the FCP that requires USACE approval.



Stationing

Phase 1: I-94/2nd Street Tunnel

Phase 2: 3rd Avenue Tunnel

Phase 3: Double Box Culvert

N

0 750 1,500

Feet

Imagery Source: NearMap, 9-11-2024

SYSTEM OVERVIEW
Double Box Culvert
Repair Project (FCP-1)
Bassett Creek Watershed
Management Commission

FIGURE 1

BARR

3 Stakeholder Engagement

3.1 Kickoff Meeting with BCWMC Staff and City of Minneapolis

A virtual project kickoff meeting with the BCWMC administrator, Commission Engineer staff, and City of Minneapolis staff occurred on April 16, 2025. USACE and MnDNR staff were invited but did not attend. At this meeting, the project scope, schedule and key tasks were discussed, and data needs were identified.

3.2 Technical Stakeholder / Agency Meeting

The Commission engineer contacted the USACE and MnDNR representatives and discussed the project.

- MnDNR: Staff provided an email on March 17, 2025 stating that the box culvert segment is not considered a public water, and no MnDNR authorization or further review is needed. The MnDNR requested the project to be compliant with local floodplain regulations.
- USACE: No feedback has been received as of June 10, 2025. The Commission Engineer will continue to reach out to USACE staff, incorporate any of their comments into the final project, and determine whether any approvals will be required for this repair project.

3.3 Site Meeting and Contractor Input

On April 17, 2025, key members of the Commission Engineer's project team (Jim Herbert, Joe Welna, Josh Phillips, and Andrew Lund) met with the City of Minneapolis (Joe Klejwa) and a contractor experienced in tunnel rehabilitation projects. The objective of the site meeting was to walk through the Double Box Culvert to review the defects and discuss repair options and constructability.

Andrew Lund (Commission Engineer) served as a surface attendant, while the rest of the group entered the box culvert through a catch basin at Sta. 170+81 in the southwest parking lot of the Minneapolis Public School Transportation facility at 1001 2nd Ave N, Minneapolis, MN 55405, which is approximately 150 feet downstream of the inlet structure. The invert of the double box culvert is approximately 15 feet below the surface at this location; therefore, the group entered and exited the box culverts at this location using a ladder, harnesses and fall arrestor. While in the box culverts, the group walked upstream in the left box culvert to the inlet structure, then walked downstream in the right box culvert and through the single box culvert to the drop structure (that discharges into the 3rd Avenue Tunnel), then turned around and walked back upstream in the left box culvert to the same catch basin access location. [Note: left & right are referenced with respect to facing downstream.]

A summary of the key discussion items amongst the project team, city staff and contractor includes:

1. Shear keys repairs: consider one of several options to seal open joints and minimize the migration of water and soil particles into the tunnel, such as (1) full depth repairs with flexible chemical grout, (2) near surface repair consisting of placing backing bar and flexible seal, or (3) placement of oakum soaked in hydrophilic chemical grout in open joints that expands and seals the joints to minimize migration of soil particles.

2. Damaged concrete in tunnel walls and at shear keys: consider repairing spalled and fractured concrete. Consider if a structural repair is required (i.e. epoxy injection, removal of unsound

concrete and placement of new repair mortar) or if repairs are more related to operations and maintenance (i.e. infiltration sealing/chemical grout injection)

3. Deposited sediment: remove the sediment, particularly at sags in the invert. Removal of sediment and debris will allow inspection of the invert. As a result of tunnel operation, the sags are likely to fill with sediment again over time.

4. Attached deposits: although not excessive, remove attached deposits as necessary to inspect and repair (if necessary) underlying concrete.

5. Invert repairs: One invert repair area was identified during the 2024 inspection and two additional invert repair areas were identified during the April 17, 2025 site meeting (3 total). It is anticipated additional invert repairs will be found during construction after box culverts are dewatered.

6. Water control: the contractor typically controls the means and methods for water control. Water control is anticipated to include construction of a bulkhead at the inlet of one box culvert and diverting water to the other box culvert during construction. The contractor may need to seal the shared wall joints to minimize flow from one box culvert to the other during construction.

7. Construction access: it may be feasible to remove the inlet grate to provide construction access into both the left and right box culverts. The project team will meet with the bus garage staff to discuss temporary use of its property for staging. It is anticipated the contractor would use other manhole access locations for ventilation, access, or emergency egress. Additionally, an access vault is located directly over the drop structure that would allow equipment to be lowered into the tunnel; however, this vault would be better used for work in the deep tunnel and would not likely be used for the double box culvert repairs.

3.4 Constructability Meeting

On May 29, 2025, after developing preliminary repair plans and a cost estimate, Commission Engineers (Jim Herbert, Joe Welna, and Josh Phillips) had a follow up meeting with the contractor to discuss constructability and cost feedback. Overall, the contractor generally concurred with the Commission Engineer's design and approach but provided additional feedback on water control that was incorporated into this report.

3.5 Public Engagement

Typically, BCWMC feasibility studies include gathering public input on proposed projects. However, because this project is all underground and contained within the box culvert, and due to the time constraints, this study did not include a public engagement task.

4 Project Elements

4.1 General

4.1.1 Mobilization

Mobilization includes mobilizing to the project site the personnel, equipment, supplies and incidentals necessary to complete the work. Also, as part of mobilization, the contractor will establish above-ground staging areas, develop access locations, provide temporary utilities, and site safety elements.

4.1.2 Water Management

Water management will be required and is anticipated to include construction of a bulkhead at the inlet of one box culvert and diverting water to the opposite box culvert during construction. The contractor may need to seal the shared wall joints to minimize flow from one box culvert to the other during construction. The contractor will also need to address water seeping into the tunnel through the base slab joints, active taps, and other existing penetrations. Sandbag dikes and a pump will likely be used to augment water management in localized areas. Another option that should be considered during final design is potentially diverting low flows into the old Bassett Creek tunnel, thereby eliminating creek flows into the Double Box Culvert.

4.1.3 Erosion Control

Erosion control will be required and includes methods to prevent sediment and construction-related debris from leaving the site. Erosion control typically consists of sandbag settling basins (or similar) at the downstream end of the project. Materials collected will be removed from the tunnel and disposed of off-site.

4.1.4 Traffic Control

Traffic control will be required and includes providing materials, equipment and labor to control traffic (both vehicular and pedestrian traffic) on or near the site, including obtaining necessary permits for road closings, work in the right-of-way, and detours. Significant traffic control is not anticipated for this project and may vary depending upon the contractor's proposed access.

4.2 Repairs

This section introduces the primary repairs proposed as part of the repair project.

4.2.1 Shear Key Joint Repair

The Double Box Culvert was constructed with shear key joints at 35 locations along the Double Box Culvert alignment. The purpose of the shear keys is to transfer load between culvert segments and minimize differential settlement. During the 2019 and 2024 inspections (2) (3), the Commission Engineer observed infiltration, deposits, and concrete deterioration at many of the shear key joints. In addition, approximately 70% of the shear keys had missing or deteriorated bitumastic material within the 1- to 1.5-inch-wide joints. These defects and observations indicate some level of differential settlement has occurred at the shear keys since construction. In addition, water and soil intrusion through these joints could lead to void spaces developing outside of the box culvert walls, which can lead to settlement or sinkholes at the ground surface above the box culvert.

The primary objective of this repair is to replace deteriorated joint filler material to minimize potential migration of water and soil particles into the tunnel. Shear keys that are experiencing concrete deterioration will be repaired under “concrete surface repair,” “crack repair,” or “fracture repair” as noted in the subsections below. The approach to repair the shear key joints includes installing oakum, soaked in a hydrophilic chemical grout, to seal the joints and fractures. This would minimize water and soil intrusion and reduce the risk of void spaces developing outside of the box culvert. Photos showing typical shear key joints recommended for repair are included in Figure 2.

Figure 2 Typical Shear Keys Recommended for Repair

4.2.2 Crack Repair

During the 2019 and 2024 inspections (2) (3), the Commission Engineer observed approximately 18,000 linear feet of cracks in the Double Box Culvert. A crack is a defined as a break in a culvert or tunnel that is visible but not physically open. The majority of the cracks are fine “hairline” shrinkage and temperature cracks in the concrete that likely developed shortly after initial construction. However, some cracks are more prominent and are allowing water infiltration into the box culvert. Water infiltration through cracks can advance concrete and steel reinforcement deterioration and cause the formation of mineral encrustation within the tunnel. The Commission Engineer estimates that approximately 10% of the identified cracks warrant repairs as part of the project. To repair these cracks, a contractor would remove mineral deposits, drill holes that intercept the cracks and inject chemical grout to seal the cracks. Photos showing typical cracks recommended for repair are included in Figure 3. Note, some cracks recommended for repair occur along construction joints.

Figure 3 **Typical Cracks Recommended for Repair**

4.2.3 Fracture Repair

During the 2019 and 2024 inspections (2) (3), the Commission Engineer observed a total of approximately 100 linear feet fractures within the double box culvert that warrant repairs, most commonly at the shear key locations as a result of potential differential settlement occurring at that joint. A fracture is a crack that has become visibly open, and a gap can be seen. A fracture allows more groundwater infiltration/exfiltration than a crack. Similar to crack repairs, to repair fractures, a contractor would remove mineral deposits (if present), drill holes that intercept the fracture and inject epoxy into the fracture to complete the structural repair. Photos showing typical fractures recommended for repair are included in Figure 4.

Figure 4 **Typical Fractures Recommended for Repair**

4.2.4 Concrete Surface Repair

During the 2019 and 2024 inspections (2) (3), the Commission Engineer observed approximately 34 locations of concrete surface defects and concrete spalling that warrant repair in the double box culvert. A contractor would perform concrete surface repairs by saw cutting a perimeter around the proposed repair, removing loose concrete, installing corrosion inhibitor on any exposed reinforcement, placing new reinforcement and anchorages as necessary, and placing repair mortar material to repair the defects. Photos showing typical concrete areas recommended for repair are included in Figure 5.

Figure 5 Typical Concrete Areas Recommended for Repair

4.2.5 Tap Repair

During the 2019 and 2024 inspections (2) (3), the Commission Engineer observed one tap location with a defective connection with the double box culvert. The defective connection is a source for infiltration and concrete degradation. The repair will include removing unsound material, repairing exposed reinforcement, and installing new repair mortar around the tap. A photo showing the tap recommended for repair is included in Figure 6.

Figure 6 Tap Recommended for Repair

4.2.6 Invert Repair

During the 2024 inspections (2) (3), the Commission Engineer observed three locations in the invert where the concrete appeared to be buckling and spalling. It is anticipated that additional invert deficiencies may be identified during construction when the tunnel is dewatered. The identified invert deficiencies were located at an existing invert joint. The invert repair work will include saw cutting and removing the deficient concrete, drilling and anchoring reinforcement and placing new concrete. A photo showing an invert area recommended for repair is included in Figure 7.

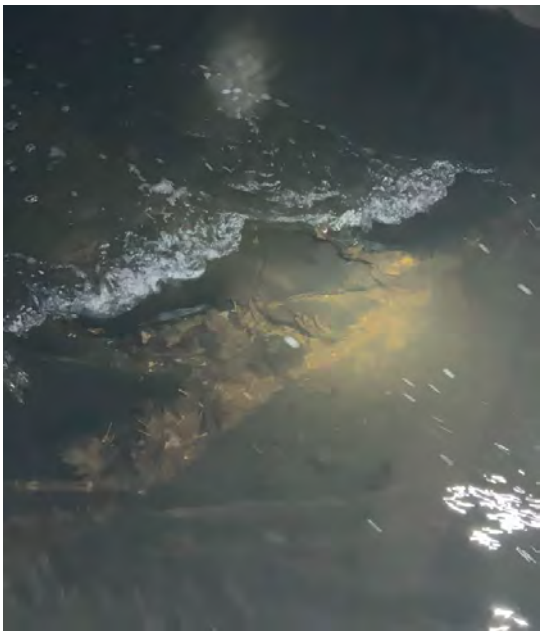


Figure 7 Invert Area Recommended for Repair

4.2.7 Reinforcement Spacer Repair

As part of the original Double Box Culvert construction, the structural reinforcement was placed on steel spacers to provide the specified concrete cover between the formwork and reinforcement. During the 2024 inspections (2) (3), the Commission Engineer observed that at various locations within the right box culvert, the reinforcement spacers along the ceiling of the tunnel were visible and corroding. The corrosion pattern was generally linear and often visible at multiple locations along the ceiling of the tunnel within select segments. For example, the pattern may be visible along the ceiling near the left wall, in the middle, and near the right wall within the same reach of the tunnel. In total, the Commission Engineer quantified approximately 1,200 feet of visible corrosion of the reinforcement spacers. This corrosion can contribute to concrete degradation over time; therefore, the Commission Engineer recommends repairs for the full extent of the visible corrosion. Anticipated repairs include removing the corrosion, installing a corrosion inhibitor over the exposed steel, and placing a skim coat of repair mortar over the affected area. Photos showing typical reinforcement spacer repair areas are included in Figure 8.

Figure 8 Typical Reinforcement Spacers Recommended for Repair

4.2.8 Remove Attached Encrustations

During the 2024 inspections (2) (3), the Commission Engineer observed 34 locations of attached, encrusted deposits. Attached encrustations consist of mineral deposits left by the partial evaporation of infiltrating groundwater containing dissolved salts. These deposits will normally be concentrated alongside weeping or dripping joints or fractures. If left unchecked, attached deposits can hide other defects and eventually build up and reduce the cross-section area and capacity of the Double Box Culvert. Deposits are typically removed by a contractor using water blasting, chipping hammers and grinding wheels. Photos showing typical attached deposits recommended for removal are included in Figure 9.

Figure 9 Typical Attached Deposits Recommended for Removal

4.2.9 Remove Sediment and Debris

Settled deposits are often distributed throughout a box culvert length and will be most evident in sections with a flatter grade or sag. Fine deposits consisting of sand and silt particles were most prevalent in the following Double Box Culvert sections:

- Sta. 151+75 to Sta. 150+99 (approximately 76 feet)
- Sta. 132+04 to Sta. 131+10 (approximately 94 feet)

A contractor would use equipment, such as a skid steer and bucket, to scrape up the settled deposits, then load and bring them to the surface, and then haul the material to a landfill for disposal.

Debris, including miscellaneous bricks, concrete parts, rocks and other debris (including 4-foot by 8-foot sheet of plywood lodged in the left box culvert at the connection from the double box culvert to the single box culvert), will be removed and hauled away for disposal.

4.2.10 Access Improvements

Manhole Step Installation: Commission Engineers noted that the access manholes do not have steps. A bid item has been included in the cost estimate for adding steps to these access locations for ease of future inspection and maintenance. The project team will coordinate with City staff regarding this item because some municipalities discourage manhole steps (due to potential step failure and to discourage unauthorized entry). Authorized tunnel entrants will always be connected to fall protection equipment during tunnel access or egress, regardless of if steps are in place.

Fall Protection Anchorage: In addition, the 30-foot drop structure from the single box culvert to the 3rd Avenue tunnel poses significant safety risks to inspection staff. Therefore, similarly, a bid item has been included in the cost estimate for providing fall protection anchorage near the drop structure for staff to use during inspections. This would allow inspection staff to tie off and use fall resistors to approach closer to the drop structure and safely inspect the single box culvert.

4.3 Access Locations

As shown in the following table, several manholes are located along the entire length of the Double Box Culvert that can be used for access into the system. Removing the inlet grate would likely work best for construction access into both the left and right box culverts. The contractor noted that temporary use of other manholes may be needed for ventilation, equipment staging, product delivery, or emergency egress. but did not anticipate any other locations would be needed for primary construction access. The project team considered installing a new access vault as part of the project that could accommodate larger construction equipment but decided to forego a new vault and utilize the inlet for access. This may be reconsidered during final design if restrictions are identified with removing the inlet grate. Outreach to, and coordination with, landowners regarding temporary site access easements will occur during project design.

Table 4-1 Box Culvert Access Locations

Station	Feature	Access Into	Location
172+25	Inlet Structure	Left Box & Right Box	West of Minneapolis Public Schools Transportation facility parking lot
170+80	Manhole	Left Box & Right Box	Minneapolis Public Schools Transportation facility parking lot
167+06	Manhole	Left Box	Colfax Avenue
165+18	Manhole	Right Box	Colfax Avenue
165+10	Manhole	Left Box	Colfax Avenue
156+50	Manhole	Left Box & Right Box	Cedar Lake Trail, west side of I-94
149+50	Manhole	Right Box	Chestnut Avenue
147+51	Manhole	Right Box	
144+60	*Abandoned*	*Left Box*	*Cedar Lake Trail, near Glenwood Avenue (abandoned)*
144+59	Manhole	Right Box	Cedar Lake Trail, near Glenwood Avenue
134+10	Manhole	Left Box & Right Box	Twins Stadium Champions Club Parking Lot, between Royalston Avenue and 10th Street bridges
128+50	Manhole	Left Box	Twins Stadium Champions Club Parking Lot, between 10th Street and 7th Street bridges
128+45	Manhole	Right Box	Twins Stadium Champions Club Parking Lot, between 10th Street and 7th Street bridges
125+10	*Abandoned*	*Left Box*	*Below Twins Stadium at 6th Street (abandoned)*
125+06	*Abandoned*	*Right Box*	*Below Twins Stadium at 6th Street (abandoned)*
119+59	Manhole	Single Box	Cedar Lake Trail, between 5th Street and 4th Street bridges
116+50	Access Vault over drop structure	3rd Avenue Tunnel	Inside North Loop Green 360 Building

[Note: left & right with respect to facing downstream]

4.4 Easement Acquisition

In general, most of the project reach is adjacent to the BNSF railway, the Cedar Lake Trail bike/pedestrian path in the City of Minneapolis, and existing easements that can be used for access to the Double Box Culvert. However, temporary easements may be required to provide contractor staging, equipment storage and access. As noted in Section 4.3, removing the inlet grate would likely work best for construction access into both the left and right box culverts. The inlet grate is most easily accessed from the Minneapolis Public Schools Transportation facility parking lot; therefore, coordination with the Minneapolis Public Schools Transportation facility staff will be required for construction access and temporary construction easement acquisition near the box culvert inlet. Also, temporary easements may need to be acquired for other access areas due to the proposed length of the project work.

5 Permits, Approvals, and Environmental Reviews

5.1 Approvals Required for the Project

The proposed project is expected to require approval from and compliance to requirements from the following entities:

- City of Minneapolis
- BCWMC

5.1.1 City of Minneapolis Requirements

The proposed project includes work in the City of Minneapolis; therefore, the proposed project must adhere to the City of Minneapolis' requirements. The contractor will need to obtain construction permits required by the City of Minneapolis.

5.1.2 BCWMC Requirements

The proposed project includes work in the BCWMC's 100-year floodplain; therefore, the proposed project must adhere to the BCWMC's floodplain requirements. Due to the nature of the proposed work, the main requirements from the BCWMC are that the project must maintain no net loss in floodplain storage, and no increase in flood level at any point along the trunk system. The flood levels for the BCWMC are managed to a precision of 0.00 feet. The BCWMC flood levels will not be impacted because the project will not result in cross-sectional changes to the tunnel. Temporary construction impacts may include loss of tunnel capacity if temporary bulkheads are utilized for water control. Typically, a bulkhead system would be limited to a few feet in height to allow overtopping during higher flow events.

The proposed project will include surface staging for equipment and personnel near the proposed site access locations. Land disturbance that triggers the BCWMCs erosion and sediment control requirements is not anticipated as part of the project. However, sediment control requirements will be incorporated to minimize downstream soil transport in the double box culvert and tunnel system.

5.2 Permits and Environmental Reviews Not Required for the Project

5.2.1 Minnesota Wetland Conservation Act

The Minnesota Wetland Conservation Act (WCA) regulates the filling and draining of wetlands and excavation within Type 3, 4, and 5 wetlands—and may regulate any other wetland type if fill is proposed. The project will not impact wetlands, therefore WCA approvals are not required.

5.2.2 Public Waters Work Permit

The MnDNR regulates projects constructed below the ordinary-high-water level of public waters, watercourses, or wetlands, which alter the course, current, or cross-section of the waterbody. Coordination with MnDNR staff confirmed that the Bassett Creek tunnel is not considered a public water, and no MnDNR authorization or further review is needed. However, the project must comply with local floodplain regulations.

5.2.3 Environmental Assessment Worksheet

The Minnesota Environmental Policy Act of 1973 (MEPA) established the Environmental Quality Board (EQB), which oversees the formal environmental review process for the state of Minnesota. An Environmental Assessment Worksheet (EAW) is a screening tool used to determine whether a full environmental impact statement is needed. The MnDNR does not consider the Bassett Creek Tunnel a public water and the project will not change or diminish the course, current, or cross-section. Therefore, an EAW is not required.

5.2.4 Minnesota Pollution Control Agency Permits

This project will not create more than one acre of land disturbance, therefore a SWPPP and compliance with the CSW General Permit are not required.

5.2.5 USACE Section 401 and Section 404 Permits

Since this project is maintenance of a previously constructed project rather than construction of a new project, Section 401 and Section 404 permits are not anticipated to be needed. As noted in Section 2.2 and Section 3.2, the Commission Engineer will continue to reach out to USACE staff, incorporate any of their comments into the final project, and seek confirmation from the USACE regarding whether they consider the Double Box Culvert Repair Project an “improvement” to the FCP that requires USACE approval.

5.2.6 Cultural Resources and Threatened & Endangered Species Reviews

Except for staging areas and access, the project will be performed underground within the existing Double Box Culvert. Therefore, a cultural resources literature review and threatened and endangered species review do not appear to be necessary.

6 Cost and Schedule Considerations

6.1 Alternatives

This study focuses on maintaining Double Box Culvert functions and presents two primary alternatives:

- Option 1: Perform Repairs: This option involves addressing the identified issues. By undertaking the necessary repairs, the BCWMC can maintain the continued functionality of the Double Box Culvert infrastructure. This proactive approach helps prevent further deterioration, potentially reducing long-term costs and avoiding more extensive damage.
- Option 2: Do Nothing /Delay Repairs: Choosing this alternative means postponing the repairs or opting not to perform them at all. While this might save immediate costs, it carries the risk of exacerbating the existing problems. Delaying repairs can lead to more significant issues in the future, potentially resulting in higher repair costs and compromised infrastructure integrity and safety.

6.2 Opinion of Cost

The Commission Engineer's opinion of cost is a Class 3 feasibility-level cost estimate as defined by the American Association of Cost Engineers International (AACE International) (5) and includes the assumptions listed below and detailed in the following sections.

- The cost estimate assumes a 25% construction contingency. This contingency may be utilized for additional repairs that may be identified following dewatering of the box culvert and removal of attached encrustations,
- Costs associated with design, permitting, bidding, and construction observation and other services (collectively "engineering") are assumed to be 25% of the estimated construction costs (excluding contingency).
- Construction easements will be limited to existing City of Minneapolis property or existing easements along the box culvert as necessary to construct the project; however, the costs were not estimated as part of this study

The Class 3 level cost estimates have an acceptable range of between -10% to -20% on the low range and +10% to +30% on the high range. We assume the final costs of construction may range between -15% and +20% of the estimated construction budget. The assumed contingency for the project (25%) incorporates the potential high end of the cost estimate range.

Table 6-1 summarizes the feasibility-level total construction cost estimates and the 30-year annualized total construction cost estimates. Appendix B provides a detailed cost-estimate table for Option 1: Perform Repairs.

Table 6-1 Double Box Culvert Repair Project Cost Summary

Option Description	Cost Estimate [1,3]	Annualized Cost [2]
Option 1: Perform Repairs	$1,410,000 ($1,199,000–$1,692,000)	$96,000
Option 2: Do Nothing / Delay Repairs	$0	$0

(1) A Class 3 screening-level opinion of probable cost, as defined by the American Association of Cost Engineers International (AACE International), has been prepared for these options. The opinion of probable construction cost provided in this table is based on the Commission Engineer's experience and qualifications and represents our best judgment as experienced and qualified professionals familiar with the project. The cost opinion is based on project-related information available to the Commission Engineer at this time and includes a conceptual-level design of the project. It includes 25% project contingency and 25% for planning, engineering, design, and construction administration. The lower bound is assumed at -15%, and the upper bound is assumed at +20%.
(2) Assumed to be 1% of the total project cost for annual maintenance, plus the initial project cost distributed evenly over a 30-year project lifespan.
(3) Costs do not include easements, construction access routes, or legal expenses for construction contracting.

6.3 Funding Sources

As noted in the Plan's Flooding and Rate Control Policies, the BCWMC would finance the project:

> *The BCWMC will finance major maintenance and repair of water level control and conveyance structures that were part of the original BCWMC Flood Control Project on the same basis as the original project. New road crossings of the creek that were installed as part of the project will be maintained by the city where the structure is located. (policy 23)*

In addition, the BCWMC's updated Flood Control Project Policies (2021) include this policy:

> *3. Maintenance Funding*
>
> *The Commission will add the identified FCP major repairs, rehabilitation and replacement projects to the BCWMC CIP and will fund the projects using the BCWMC's ad valorem levy (via Hennepin County). The Commission will need to amend the BCWMC plan to add these projects to the CIP and to change (or add to) the funding mechanisms for project implementation.*

If ordered, the BCWMC will utilize the BCWMC CIP funds to implement the proposed project. The current CIP budget earmarks $1.2 million for this project. The source of these funds is an ad valorem tax levied by Hennepin County over the entire Bassett Creek watershed on behalf of the BCWMC.

6.4 Schedule

The BCWMC will hold a public hearing for this project in September 2025. Pending the outcome of the hearing, the BCWMC will consider officially ordering the project, and certifying to Hennepin County a final 2026 tax levy for this project.

If approved, final design and development of plans and specifications will likely begin during the first quarter of 2026. Bidding is anticipated to occur during the third quarter of 2026. The construction work would likely begin in winter 2026/2027, during low flow periods in the Double Box Culvert. The BCWMC or the City of Minneapolis would lead the project.

7 Recommendation

The Commission Engineer recommends proceeding with the necessary repairs. This proactive approach is preferred over delaying the work or opting to do nothing. Performing the repairs will help maintain the infrastructure's functionality and prevent further deterioration, which could lead to more significant issues and higher repair costs in the future.

8 References

1. **Bassett Creek Watershed Management Commission.** 2015 Watershed Management Plan. September 2015.

2. **Barr Engineering Co.** *Bassett Creek Double Box Culvert Inspection Report. Inspection Date: December 2019. Prepared for the City of Minneapolis and Bassett Creek Watershed Management Commission.* 2020.

3. —. *Bassett Creek Double Box Culvert Inspection Report. Inspection Date November 2024. Prepared for the Bassett Creek Watershed Management Commission.* 2025.

4. **US Army Corps of Engineers - St Paul District.** *Operation and Maintenance Manual for Bassett Creek Flood Control Project.* 1997.

5. **Peter Christensen, CCE and Larry R Dysert, CCC.** *Cost Estimate Classification System.* s.l. : AACE, Inc, 2005. AACE International Recommended Practices. No. 18R-97.

6. **Bassett Creek Watershed Management Commission.** Resource Management Plan for Basset Creek Watershed Management Commission Proposed Water Quality Improvement Projects 2010 - 2016. 2009.

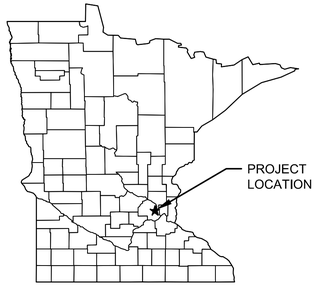
Appendix A

30% Design Plans for Repairs

BASSETT CREEK DOUBLE BOX CULVERT REPAIRS

BASSETT CREEK WATERSHED MANAGEMENT COMMISSION

MINNEAPOLIS, MINNESOTA



LOCATION MAP
NOT TO SCALE

VICINITY MAP
0 1000 2000
SCALE IN FEET

SHEET INDEX

REFERENCING

LIMITS OF SECTION CUT

SECTION IDENTIFIER

SECTION REFERENCES
(SHEET SECTION IS
LOCATED ON)

SECTION IDENTIFIER

1 SECTION: SECTION TITLE
C-02

SECTION REFERENCES
(SHEET SECTION IS CALLED OUT)

DETAIL IDENTIFIER

DETAIL REFERENCES
(SHEET DETAIL IS
LOCATED ON)

DETAIL IDENTIFIER

1 DETAIL: DETAIL TITLE
C-02

DETAIL REFERENCES
(SHEET DETAIL IS CALLED OUT)

ABBREVIATIONS AND SYMBOLS

APPROX	APPROXIMATE
AVE	AVENUE
CC	CLEAR COVER
CONC	CONCRETE
EL	ELEVATION
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
MAX	MAXIMUM
MIN	MINIMUM
MN	MINNESOTA
NAVD	NORTH AMERICAN VERTICAL DATUM
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NO.	NUMBER
OC	ON CENTER
ROW	RIGHT-OF-WAY
ST	STREET
STA	STATION
TBD	TO BE DETERMINED
TYP	TYPICAL
@	AT
Ø	DIAMETER

NOTES:

1. COMPLY WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL CODES, PERMITS, AND REGULATIONS.
2. VERIFY ALL QUANTITIES, GRADES, AND DIMENSIONS.
3. FIELD-LOCATE ALL SITE UTILITIES (PRIVATE AND PUBLIC) PRIOR TO STARTING THE WORK. ALL UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. ANY UTILITIES DAMAGED BY CONTRACTOR SHALL BE REPAIRED TO THE SATISFACTION OF UTILITY OWNER AT CONTRACTOR'S COST.

PROJECT DATUM:
HORIZONTAL: MINNESOTA STATE PLANE SOUTH ZONE, US FT
VERTICAL: NAVD 88

811 Know what's **below.** **Call 811** before you dig.

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NUMBER 10104111545

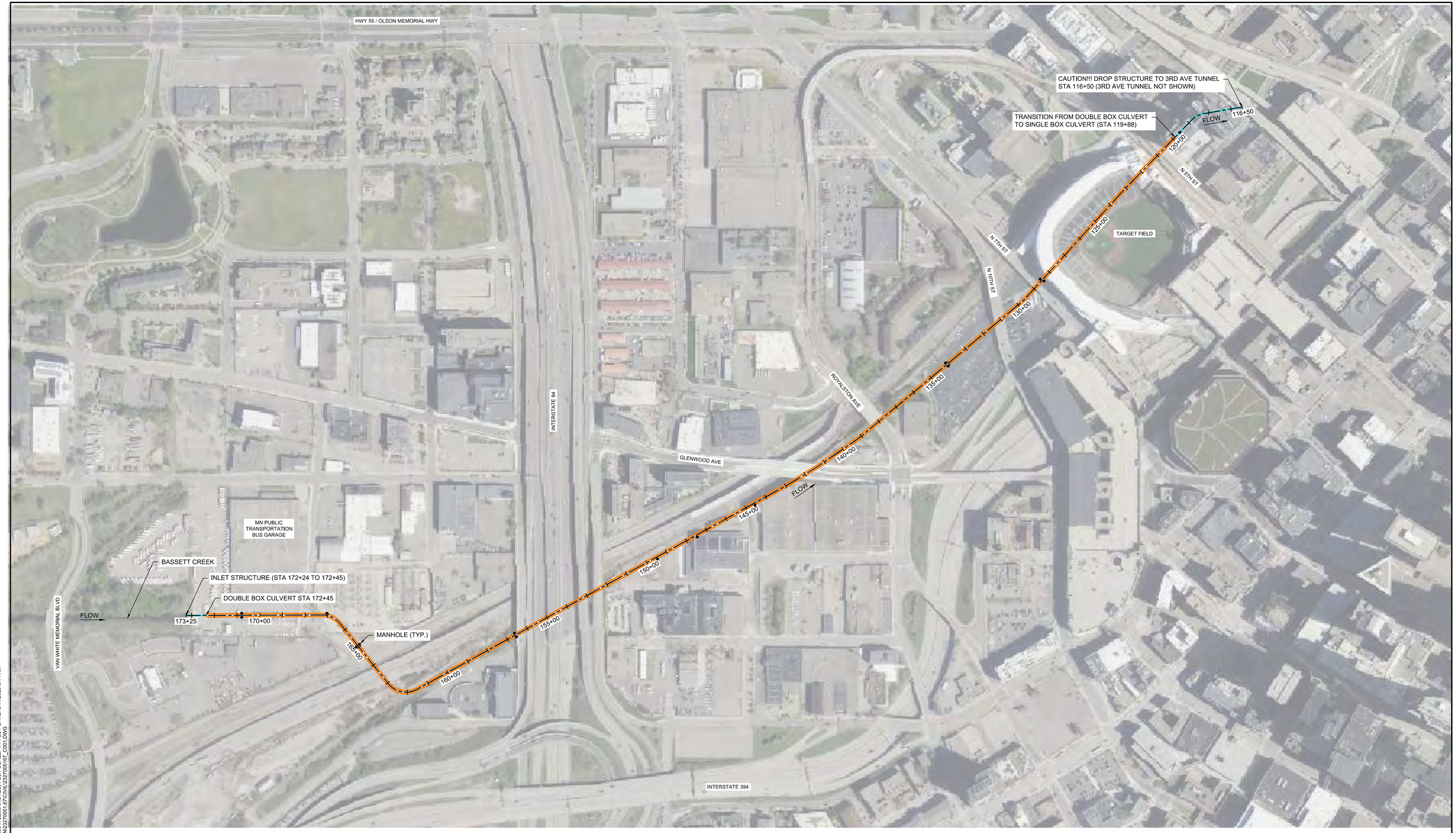
BASSETT CREEK WATERSHED
MANAGEMENT COMMISSION

CLIENT PROJECT # -

BASSETT CREEK DOUBLE BOX CULVERT REPAIRS
MINNEAPOLIS, MINNESOTA

INDEX, LOCATION MAP, AND VICINITY MAP

BARR PROJECT # 2327005167
DWG # G001
REV # A



1 / - PLAN: SITE PLAN

0 250 500

SCALE IN FEET

PRELIMINARY DRAFT
NOT FOR CONSTRUCTION

PROJECT DATUM:
HORIZONTAL: MINNESOTA STATE PLANE SOUTH ZONE, US FT
VERTICAL: NAVD 88

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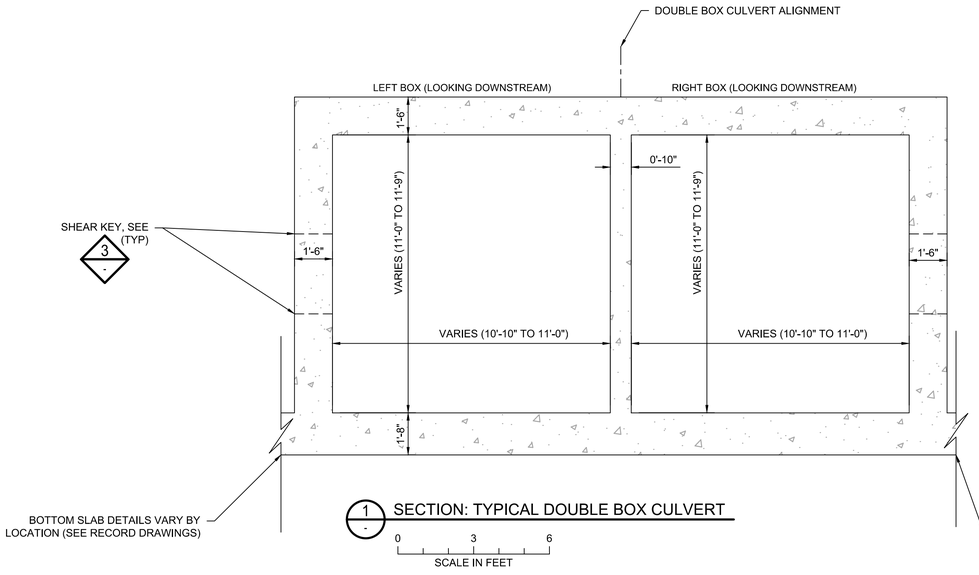
BASSETT CREEK WATERSHED
MANAGEMENT COMMISSION

CLIENT PROJECT # -

BASSETT CREEK DOUBLE BOX CULVERT REPAIRS
MINNEAPOLIS, MINNESOTA

SITE PLAN

BARR PROJECT # 2327005167
DWG # C001
REV # A



1/- SECTION: TYPICAL DOUBLE BOX CULVERT

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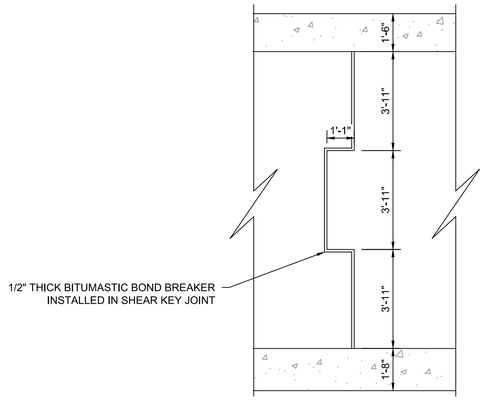
SCALE IN FEET

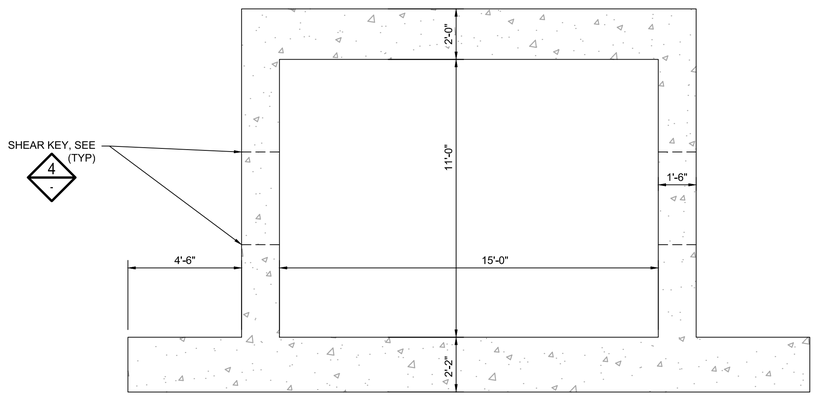


3/- DETAIL: TYPICAL SHEAR KEY (DOUBLE BOX CULVERT)

0 3 6
SCALE IN FEET

SHEAR KEY	LEFT BOX STATION	RIGHT BOX STATION	SINGLE BOX STATION
K1	171+95	172+00	N/A
K2	170+00	170+05	N/A
K3	167+99	168+02	N/A
K4	165+70	166+08	N/A
K5	164+65	164+74	N/A
K6	163+05	163+12	N/A
K7	162+15	162+08	N/A
K8	160+12	160+09	N/A
K9	158+10	158+12	N/A
K10	156+05	156+05	N/A
K11	154+05	154+04	N/A
K12	152+53	152+53	N/A
K13	152+05	152+05	N/A
K14	151+55	151+55	N/A
K15	151+10	151+05	N/A
K16	150+55	150+55	N/A
K17	150+07	150+06	N/A
K18	149+07	149+05	N/A
K19	147+07	147+06	N/A
K20	145+05	145+05	N/A
K21	143+05	143+05	N/A
K22	141+05	141+04	N/A
K23	139+50	139+52	N/A
K24	137+52	137+52	N/A
K25	136+00	136+01	N/A
K26	134+05	134+01	N/A
K27	132+53	132+51	N/A
K28	131+53	131+50	N/A
K29	131+05	130+99	N/A
K30	130+53	130+55	N/A
K31	128+57	128+52	N/A
K32	126+50	126+48	N/A
K33	124+50	124+48	N/A
K34	122+52	122+47	N/A
K35	121+00	120+98	N/A
K36	N/A	N/A	119+82
K37	N/A	N/A	118+00
K38	N/A	N/A	116+80
K39	N/A	N/A	116+74

5/- TABLE: SHEAR KEY LOCATIONS



2/- SECTION: TYPICAL SINGLE BOX CULVERT

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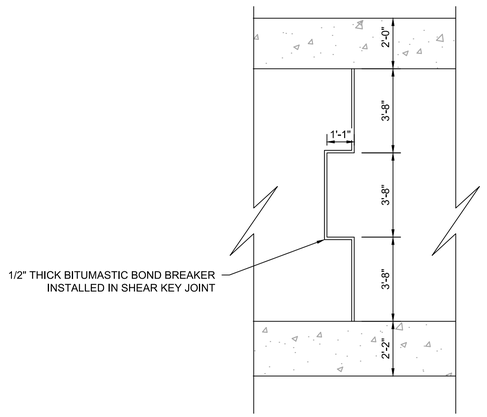

4/- DETAIL: TYPICAL SHEAR KEY (SINGLE BOX CULVERT)

0 3 6
SCALE IN FEET

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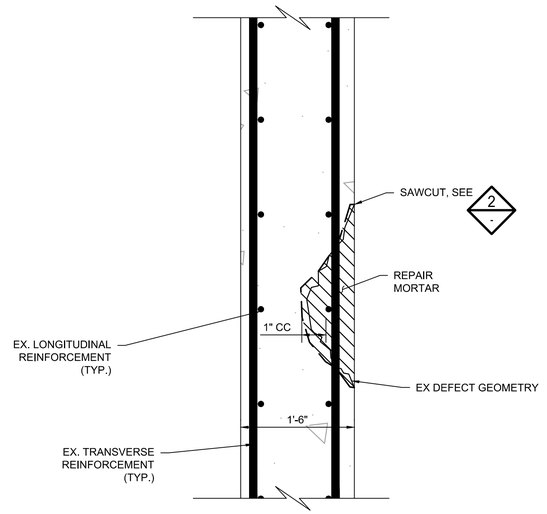
BASSETT CREEK WATERSHED MANAGEMENT COMMISSION

CLIENT PROJECT # -

BASSETT CREEK DOUBLE BOX CULVERT REPAIRS
MINNEAPOLIS, MINNESOTA

TYPICAL SECTIONS

BARR PROJECT # 2327005167
DWG # C002
REV # A

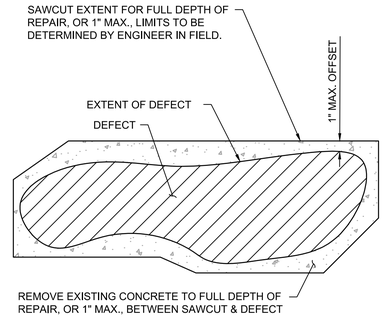


1 - DETAIL: TYPE 1 - CONCRETE SURFACE REPAIR, 1/2" TO 2-1/2" OVERLAY

0 1 2
SCALE IN FEET

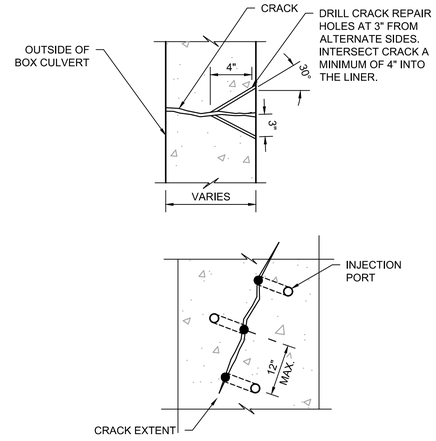
NOTES:

1. SAW CUT THE PERIMETER OF THE DEFECT.
2. PREPARE EXISTING CONCRETE SURFACE.
3. IF REINFORCEMENT IS ENCOUNTERED IN REPAIR AREA, DEMO CONCRETE BEHIND REINFORCEMENT TO PROVIDE 1" MIN CLEAR COVER (ALL SIDES).
4. REMOVE CORROSION FROM REINFORCEMENT (IF PRESENT) AND INSTALL CORROSION INHIBITOR.
5. INSTALL REPAIR MORTAR.



2 - DETAIL: TYPE 2 - CONCRETE SURFACE REPAIR - SAWCUT

N.T.S.

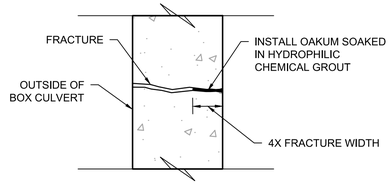


3 - DETAIL: TYPE 3 - CRACK REPAIR

N.T.S.

NOTES:

1. UTILIZE HYDROPHILIC GROUT AS REQUIRED IN THE SPECIFICATIONS.
2. HYDROPHILIC GROUT MATERIAL IS PAID UNDER A SEPARATE BID ITEM (HYDROPHILIC CHEMICAL GROUT).

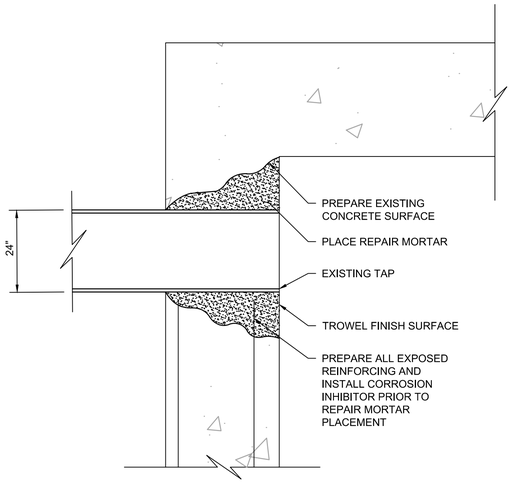


4 - DETAIL: TYPE 4 - FRACTURE REPAIR

N.T.S.

NOTES:

1. INSTALL OAKUM AND CHEMICAL GROUT IN ACCORDANCE WITH AVANTI INTERNATIONAL'S EXPANDED GASKET PLACEMENT (EGP) TECHNIQUE.
2. TRIM EGP MATERIAL FLUSH WITH TUNNEL LINER AFTER EGP MATERIAL HAS CURED PER MANUFACTURER'S RECOMMENDATIONS.

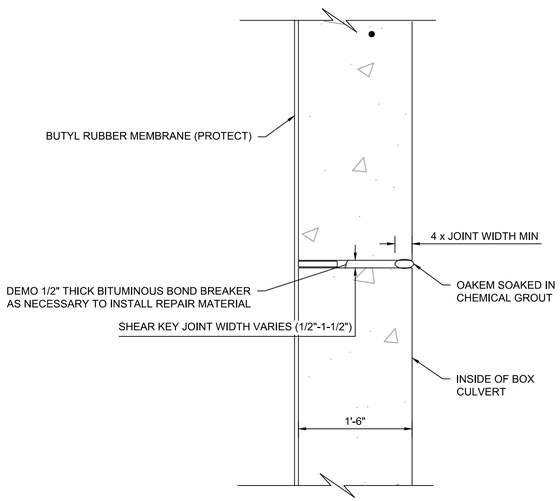


5 - DETAIL: TYPE 5 - TAP REPAIR

0 1 2
SCALE IN FEET

NOTES:

1. USE CHEMICAL GROUT TO STOP INFILTRATION PRIOR TO PERFORMING REPAIR, IF REQUIRED.
2. MATERIAL MORTAR TYPE DEPENDS UPON APPLICATION. SEE SPECIFICATIONS.

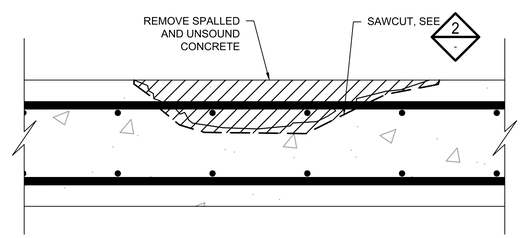


6 - DETAIL: TYPE 6 - SHEAR KEY REPAIR

0 1 2 3 4
SCALE IN FEET

NOTE:

1. PERFORM REPAIR ALONG FULL SHEAR KEY JOINT EXTENT, ALONG FULL WALL HEIGHT.



7 - DETAIL: TYPE 7 - INVERT REPAIR

0 1 2
SCALE IN FEET

NOTES:

1. SAW CUT THE PERIMETER OF THE DEFECT.
2. PREPARE EXISTING CONCRETE SURFACE.
3. IF REINFORCEMENT IS ENCOUNTERED IN REPAIR AREA, DEMO CONCRETE BEHIND REINFORCEMENT TO PROVIDE 1" MIN CLEAR COVER (ALL SIDES).
4. REMOVE CORROSION FROM REINFORCEMENT (IF PRESENT) AND INSTALL CORROSION INHIBITOR.
5. INSTALL CAST-IN-PLACE CONCRETE.

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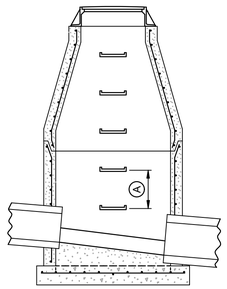
BASSETT CREEK WATERSHED MANAGEMENT COMMISSION

CLIENT PROJECT # -

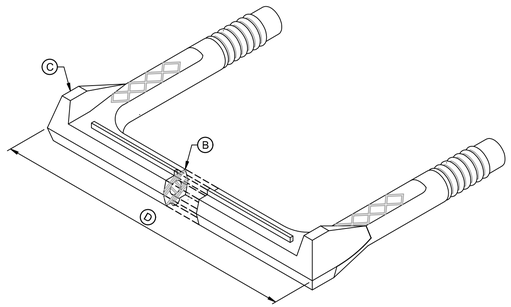
BASSETT CREEK DOUBLE BOX CULVERT REPAIRS
MINNEAPOLIS, MINNESOTA

REPAIR DETAILS

BARR PROJECT # 2327005167
DWG # C003
REV # A



TYPICAL STEP ALIGNMENT



TYPICAL REINFORCED PLASTIC STEP

NOTES:

(A) STEPS SHALL BE SPACED AT A MAXIMUM DESIGN DISTANCE OF 16 IN. APART.

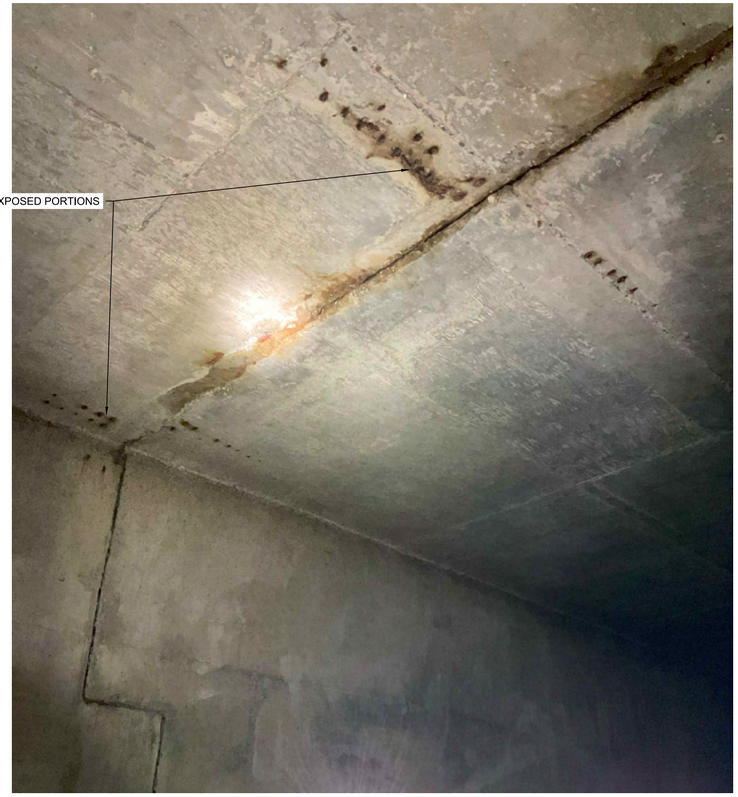
(B) STEPS SHALL HAVE A MINIMUM CROSS SECTION DIMENSION OF 1 IN.

(C) MINIMUM VERTICAL SIDE DIMENSION TO PREVENT FOOT FROM SLIPPING OFF IS 1/2".

(D) THE MINIMUM WIDTH OF RUNGS OR CLEATS SHALL BE 10 IN.

1. STEPS SHOWN ARE BASIC DESIGNS ONLY. FINAL CONFIGURATIONS MAY VARY FROM THESE DRAWINGS.
2. VARIATIONS IN THE ABOVE DESIGNS WHICH WILL NOT DECREASE STRENGTH WILL BE PERMITTED.
3. THE MNDOT OFFICE OF MATERIALS, RESEARCH AND ENGINEERING WILL MAINTAIN A LISTING OF APPROVED MANHOLE STEPS. STEEL REINFORCED PLASTIC STEPS ARE REQUIRED FOR THIS PROJECT.
4. EXCEPT AS OTHERWISE NOTED ON THIS PLATE, STEPS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C478
5. STEPS SHALL BE EMBEDDED IN THE RISER OR CONICAL TOP SECTION WALL A MINIMUM DISTANCE OF 3 IN.
6. THE RUNG OR CLEAT SHALL PROJECT A MINIMUM CLEAR DISTANCE OF 4 IN. FROM THE WALL OF THE RISER OR CONE SECTION MEASURED FROM THE POINT OF EMBEDMENT.
7. THE MIN. CLEAR DISTANCE BETWEEN THE RUNG OR CLEAT AND THE OPOSITE WALL OF THE MANHOLE RISER OR CONE SHALL BE 18 IN. MEASURED AT THE CENTER FACE OF THE STEP.

1 - DETAIL: TYPE 7 - INSTALL MANHOLE STEP
N.T.S. MN/DOT STD. PLATE 4180J



2 - DETAIL: TYPE 8 - REINFORCEMENT SPACER
N.T.S.

NOTES:

1. REMOVE CORROSION FROM REINFORCEMENT SPACERS.
2. INSTALL CORROSION INHIBITOR.
3. INSTALL SKIM COAT OF REPAIR MORTAR OVER REINFORCEMENT SPACERS.

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BASSETT CREEK WATERSHED MANAGEMENT COMMISSION

CLIENT PROJECT # -

BASSETT CREEK DOUBLE BOX CULVERT REPAIRS
MINNEAPOLIS, MINNESOTA

REPAIR DETAILS

BARR PROJECT # 2327005167
DWG # C004
REV # A

Appendix B

Cost Estimate

PREPARED BY: BARR ENGINEERING CO.

30% Design Level

ENGINEER'S OPINION OF PROBABLE COST

PROJECT: Bassett Creek Double Box Culvert Repairs

LOCATION: Minneapolis, Minnesota

PROJECT #: 2327051.67

CLIENT: Bassett Creek Watershed Management Commission

ESTIMATED COSTS[1,2]

Item No:	Item Description	Unit	Estimated Quantity	Unit Cost	Total Cost
GENERAL ITEMS					
A	Mobilization	LS	1	$ 150,000	$ 150,000
B	Water Management	LS	1	$ 100,000	$ 100,000
C	Erosion Control	LS	1	$ 20,000	$ 20,000
D	Traffic Control	LS	1	$ 10,000	$ 10,000
E	Shear Key Repair	LF	700	$ 200	$ 140,000
F	Crack and Fracture Repair	LF	2,000	$ 80	$ 160,000
G	Hydrophilic Grout	GAL	200	$ 160	$ 32,000
H	Concrete Surface Repair	SF	100	$ 110	$ 11,000
I	Tap Repair	EA	1	$ 3,000	$ 3,000
J	Invert Repair	LS	5	$ 20,000	$ 100,000
K	Reinforcment Spacer Repair	LF	1,200	$ 50	$ 60,000
L	Remove Debris	LS	1	$ 10,000	$ 10,000
M	Sediment Removal	LF	500	$ 200	$ 100,000
N	Sediment Hauling and Disposing	TON	9	$ 1,000	$ 9,000
O	Intall Manhole Step	EA	189	$ 130	$ 24,570
P	Fall Protection Anchorage	LS	1	$ 10,000	$ 10,000
				SUBTOTAL	**$ 939,570**
TOTALS[3]					
				25% Construction Contingency	$ 235,000
				25% Engineering	$ 235,000
				TOTAL	**$ 1,410,000**
				Low Range Estimate (-15%)	$ 1,199,000
				High Range Estimate (+20%)	$ 1,692,000

Notes:

[1] Design Work Completed to Approximately 30% Design Level.

[2] This 30% Design Level (Class 3 per ASTM E 2516-11) cost estimate is based on designs, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -10% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[3] Totals rounded to nearest $1,000.