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Memorandum

To: Bassett Creek Watershed Management Commission (BCWMC)
From: Barr Engineering Co.: Josh Phillips, P.E., Jim Herbert, P.E., Joe Welna, P.E.
Subject: Item 4D: Bassett Creek Box Culvert Inspection Report: Inspection Date: November 2024 - BCWMC February 20, 2025 Meeting Agenda
Date: February 13, 2025
Project: 23270051.65 1080 002

The Bassett Creek Watershed Management Commission (BCWMC) retained Barr Engineering Co. (Barr) to conduct an inspection of the structural and operational conditions of the Bassett Creek Box Culvert in 2024. The purpose of the inspection was to compare the current box culvert conditions to past inspections, identify changes in conditions over time, and provide recommendations to BCWMC regarding future monitoring and repair. A detailed summary of the Bassett Creek tunnel system, previous inspections, the 2024 inspection summary and findings, and recommendations for future inspections and repairs are provided in the enclosed report.

Bassett Creek Double Box Culvert Inspection Report

Prepared for
Bassett Creek Watershed Management Commission

Prepared by
Barr Engineering Co.

Inspection Date: November 2024

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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.

Joshua P. Phillips
PE #: 58685

February 13, 2025
Date

Bassett Creek Double Box Culvert Inspection Report

Inspection Date: November 2024

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1 Executive Summary

The Bassett Creek Watershed Management Commission (BCWMC) retained Barr Engineering Co. (Barr) to conduct a condition inspection of the Bassett Creek Double Box and Single Box Culvert (Box Culvert) in 2024. The purpose of the inspection was to compare the current Box Culvert conditions to past inspections, identify changes in condition over time, and provide recommendations to BCWMC regarding future monitoring and repair.

The 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 Box Culvert (Phase 3), all of which are depicted in Figure 1-1. The I-94 tunnel upstream of the 3rd Avenue tunnel connection is managed by the City of Minneapolis and MnDOT. Further discussion and details regarding each tunnel and phase is provided in Section 2.

1.1 Recommendations

The Box Culvert was found to be in “fair” condition from both a structural and operations and maintenance standpoint during the November 2024 inspection. Changes from the 2019 inspection (Ref. (Barr Engineering Co. 2020)) were observed and are attributed to a combination of factors including minor changes in the NASSCO PACP code severity rating (Section 4), fluctuation in base flow and groundwater levels at the time of the respective inspections, as well as deterioration of the tunnel over time. The inspection included visual observations only, and no destructive or non-destructive methods were utilized to measure potential voids outside the tunnel. Based on the 2024 inspection findings, the following recommendations are provided to the BCWMC for consideration. Further discussion of these recommendations is provided in Section 6.

1.1.1 Inspection Recommendations

Frequency of Inspections: It is recommended that the BCWMC continue to inspect the box culvert based on the regular frequency approved by the BCWMC.

Shear Keys - Structural: A large portion of the identified significant defects, including fractures, spalling, and evidence of differential settlement were observed at the shear keys. Future inspection programs should continue to monitor the shear keys for continued degradation and/or differential settlement.

Infiltration: Infiltration was observed at joints and at most of the shear keys because of missing or degraded joint material. Future inspections should continue to review infiltration, with special consideration for evidence of soil loss through the joints.

1.1.2 Repair Recommendations

Shear Key Joint Repair: It is recommended that the BCWMC repair or replace the shear key joint material to minimize infiltration and potential for soil transport into the tunnel. It is recommended that this work occur in the next 5 years.

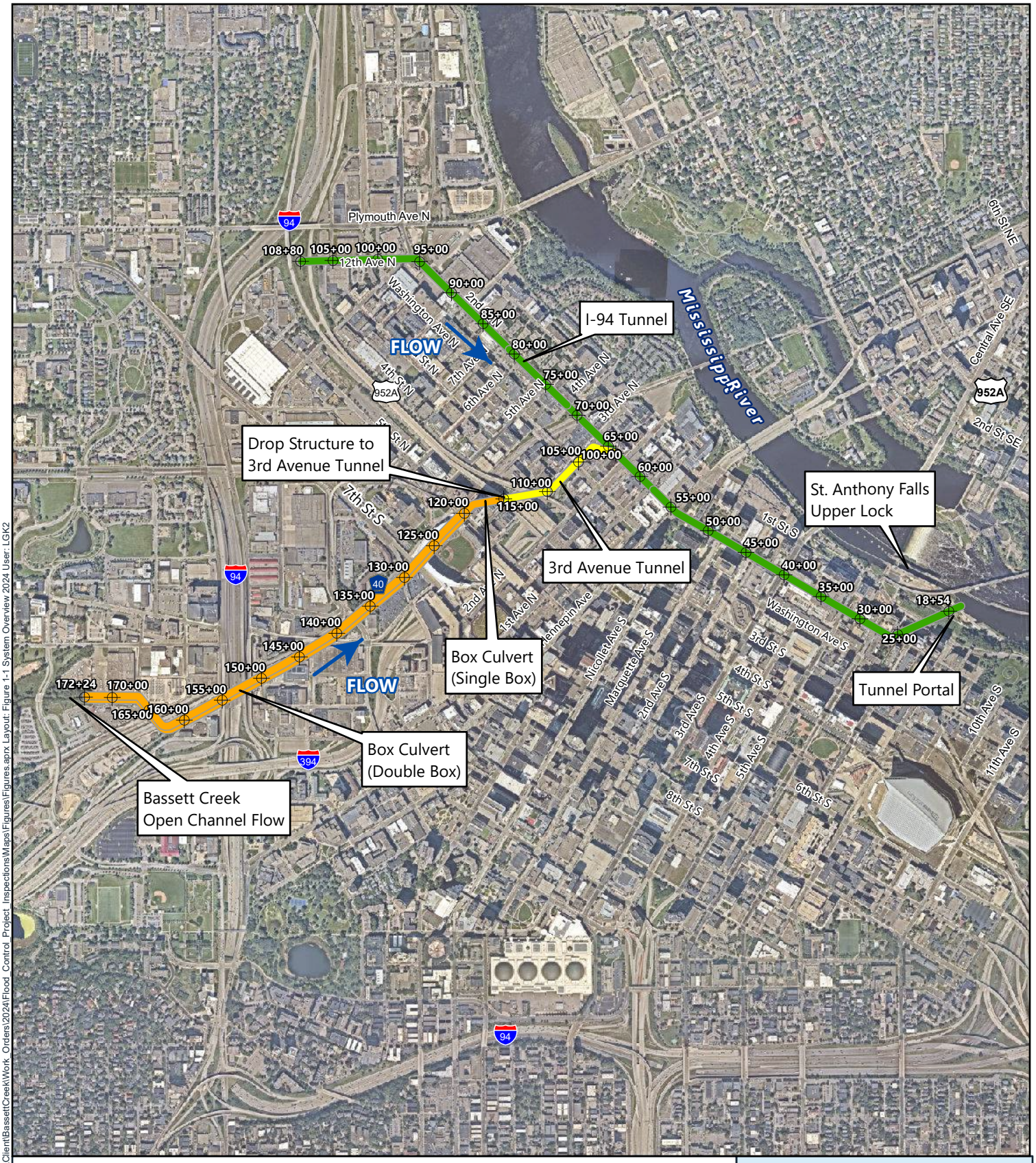
Crack Sealing, Deposit Removal: Various degrees of infiltration were observed throughout the tunnel, occurring at joints, cracks, and other defects. At one location, an infiltration runner was observed that equates to a grade 4 PACP defect, however infiltration can vary depending on rainfall and groundwater

levels. It is recommended that the BCWMC repair points of infiltration, remove deposits as necessary to improve the operational condition of the tunnel, and slow degradation of the concrete. It is recommended that this work be coordinated with the shear key joint repair work.

Repair Exposed Reinforcement: At one location in the right box, exposed reinforcement was observed that equates to a grade 5 PACP defect. It is recommended that the BCWMC repair these areas to minimize further degradation of the reinforcement and concrete. It is recommended that this work be coordinated with the shear key joint repair and crack sealing repair work.

1.1.3 Capital Improvement Program

The BCWMC's 5-year Capital Improvement Program (CIP) 2024-2028 list currently includes a flood control project box culvert repair project (FCP-1) with construction anticipated in 2027-2028. This would likely require a feasibility study in 2025-2026.



Stationing

Phase 1: I-94/2nd Street Tunnel

Phase 2: 3rd Avenue Tunnel

Phase 3: Box Culvert

N

0 750 1,500

Feet

Imagery Source: NearMap, 9-11-2024

SYSTEM OVERVIEW
2024 Bassett Creek
Box Culvert Inspection
Performed for the Bassett Creek
Watershed Management Commission

FIGURE 1-1

BARR

2 Background

2.1 Tunnel System Construction Phases

Construction of the tunnel system was completed by the United States Army Corps of Engineers (USACE) and Minnesota Department of Transportation (MnDOT) between approximately 1979 and 1992 in three phases, working downstream to upstream, as described below.

2.1.1 Phase 1: I-94/2nd Street Tunnel

The I-94/2nd street tunnel was constructed by the MnDOT in 1979. The I-94/2nd Street tunnel was primarily excavated in St. Peter Sandstone approximately 60–100 feet below ground surface and was constructed to convey Bassett Creek flows as well as stormwater runoff from Interstate 94 and 394. The tunnel is approximately 8,900 feet long and primarily runs below 2nd street. The I-94/2nd Street tunnel is comprised of five primary cross sections:

- 12-foot-high flared end outlet structure, consisting of four bays with varying widths (Sta. 18+54 to 19+53)
- 12-foot-diameter circular section (Sta. 19+53 to 22+20)
- 15.5-foot-high by 10.0-foot-wide cathedral arch section (Sta. 22+20 to 64+94)
- 10.5-foot-high by 9.3-foot-wide cathedral arch section (Sta. 65+33 to 69+80 and Sta. 72+20 to 81+90)
- 9-foot-diameter circular section (Sta. 69+80 to 72+20 and Sta. 81+90 to 108+57)

2.1.2 Phase 2: 3rd Avenue Tunnel

The 3rd Avenue tunnel was constructed by the USACE in 1990. The 3rd Avenue tunnel was excavated in St. Peter Sandstone approximately 60-80 feet below ground surface and was constructed to convey Bassett Creek flow from the Double Box Culvert to the I-94/2nd Street tunnel. The 3rd Avenue tunnel is approximately 1,456 feet long and generally runs below 3rd Avenue. The 3rd Avenue tunnel has one primary cross section consisting of a 15-foot-high by 10-foot-wide cathedral arch.

2.1.2.1 Drop Structure

The 3rd Avenue tunnel and Box Culvert are connected by a 30-foot drop structure that was constructed as part of Phase 2 in 1990 by the USACE.

2.1.3 Phase 3: Box Culvert

The Box Culvert was constructed by the USACE in 1992 and was turned over to the local sponsor (City of Minneapolis) in 2002. The Box Culvert was constructed by open cut excavation 0–20 feet below ground surface and was designed to convey Bassett Creek flow to the 3rd Avenue tunnel. The Box Culvert is approximately 5,600 feet long and generally runs parallel with the Cedar Lake Trail. The Box Culvert consists of three primary cross sections:

- 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)

2.2 Inspection History

The Operation and Maintenance Manual for the Bassett Creek Flood Control Project (Ref. (USACE n.d.)) identified an inspection schedule for the Box Culvert, 3rd Avenue tunnel, and I-94/2nd Street tunnels. The BCWMC reviewed and modified its inspection plan as set forth in the December 2021 memorandum in accordance to the schedule in Table 2-1.

Table 2-1 Flood Control Project Inspection Program (Updated December 2021)

Item	Current / Recommended Inspection Cycle
Annual inspection of the FCP features, except double box culvert and the deep tunnel	Annually
Double box culvert inspection (NASSCO) [1]	Every 5 years
Deep tunnel (2nd St. & 3rd Ave.) inspection (NASSCO) [1]	Every 10 years
Additional deep tunnel inspections of 3rd Ave tunnel and unsubmerged portions of 2nd St. tunnel (non-NASSCO) [2]	At 5 years between the 10-year inspections

1 Tunnel condition inspection based on pipeline assessment and certification program developed by the National Association of Sewer Service Companies (NASSCO)
2 Brief tunnel inspections looking for significant changes without coding existing or new defects or preparing detailed report, includes preparation of technical memorandum.

The City of Minneapolis and/or MnDOT have also performed independent inspections of the Box Culvert, 3rd Avenue tunnel, and I-94/2nd Street tunnels. The I-94 tunnel upstream of the 3rd Avenue tunnel connection is on a separate inspection schedule as determined by the City of Minneapolis and/or MnDOT.

The BCWMC typically coordinates their regular inspections with the City of Minneapolis and USACE staff. A history of the Box Culvert inspections is provided in Table 2-2. Inspections of the I-94/2nd Street and 3rd Avenue tunnels are provided for reference, and except for the 2008 MnDOT inspection, events occurring by other entities are not included in this summary.

Table 2-2 Box Culvert Inspection History

Date	Tunnel	Inspection Team	Recommendations	Notes
November 2004	Box Culvert	BCWMC (Barr)/City of Mpls.	Maintenance and repairs recommended, and later completed by the city of Minneapolis in January 2005.	First BCWMC post-construction inspection of Box Culvert. Findings are summarized in November 2004 memo (Ref. (Barr Engineering Co. 2004)).
April 2007	Box Culvert	BCWMC (Barr)/City of Mpls.	Maintenance and repairs recommended.	Pre-construction inspection between Sta. 119+00 and 130+00 prior to Target Field stadium construction. Findings are summarized in April 2007 memo (Ref. (Barr Engineering Co. 2007))
February 2008	I-94/2nd Street Tunnel	MnDOT	Maintenance and repairs recommended.	Findings are summarized in August 2008 Report (Ref. (CNA Consulting Engineers 2008)).
February 2008	I-94/2nd Street Tunnel to 3rd Avenue Connection, 3rd Avenue Tunnel	BCWMC (Barr)/USACE/ City of Mpls.	Objective was to perform a visual inspection. No recommendations were made.	Findings are summarized in February 2008 Memo (Ref. (Barr Engineering Co. 2008)).
November 2009	Box Culvert	BCWMC (Barr)/City of Mpls.	Recommendations to correspond with MN Ballpark authority to repair core hole through tunnel. Continued monitoring of tunnel defects.	Includes Target Field post-construction inspection. Findings are summarized in November 2008 Memo (Ref. (Barr Engineering Co. 2009)).
December 2014	Box Culvert, 3rd Avenue Tunnel, I-94/2nd Street Tunnel	BCWMC (Barr)	Recommendations for ongoing monitoring and inspection were provided.	Findings are summarized in December 2014 Report. I-94 tunnel was only inspected (Ref. (Barr Engineering Co. 2016)).
October 2019	Box Culvert	BCWMC (Barr)	Recommendations for maintenance repairs were identified.	Findings are summarized in June 2020 Report. Inspection did not include single box segment due to high flows which made approach to drop structure unsafe (Ref. (Barr Engineering Co. 2020)).
October 2020	I-94/2nd Street Tunnel	BCWMC (Barr)/City of Mpls.	Maintenance and repairs recommended.	Findings are summarized in January 2021 Report (Ref. (Barr Engineering Co. 2021).
November 2024	Box Culvert	BCWMC (Barr)	Recommendations for ongoing monitoring and maintenance repairs were provided.	Findings are summarized in February 2025 Report.

3 2024 Inspection Summary

In November 2024, the Box Culvert, between the inlet structure at Sta. 172+24 and the drop structure at Sta. 116+73, was inspected over two days. The inspections were conducted with a three-person team in the tunnel and two people performing surface attendant duties. Photos were taken during the inspections and are available upon request.

3.1 Inspection Approach

The 2024 inspection approach was similar to what was performed in 2019 and 2014. Barr used the 2019 inspection as a baseline and updated the observations based on changes observed in 2024.

However, in 2014 and 2019, the inspection stationing started at Sta. 0+00 at the upstream inlet of the double box culvert and ended at Sta. 52+36 at the transition to the single box culvert. The inspection stationing was later converted to plan stationing for this report, and only plan stationing was referenced in the respective reports. In 2024, Barr established new inspection stationing with survey spray paint in the box culvert that matches the plan stationing. Inspection notes from the 2019 summary tables were included in the 2024 summary tables, but in some stretches, the stationing of the notes or defects were shifted slightly based on the corrected tunnel stationing. These shifts were applied consistently between known stations. The vast majority of the notes or defects were shifted less than 10 feet, but a handful of segments had more significant shifts, up to 24 feet in the right box and up to 45 feet in the left box.

Inspection findings are provided in Section 5.

3.2 Access Considerations and Logistics

This section includes access considerations and logistical issues to be addressed as part of the tunnel inspections.

3.2.1 Trash Rack Cleaning

Debris routinely builds up on the trash rack at the inlet of the Box Culvert, as shown in Figure 3-1. Barr coordinated with the City of Minneapolis ahead of the inspection and the City removed accumulated debris in the trash rack to lower the upstream water level, as shown in Figure 3-2.

Figure 3-1 Trash Rack Debris Prior to Cleaning (Typical)

Figure 3-2 Trash Rack Debris Following Cleaning By City of Minneapolis

3.2.2 Primary Access and Egress Location

The primary access and egress location for the Box Culvert inspection was through a catch basin (Sta 170+81) into the left box culvert and a manhole (Sta 170+81) into the right box culvert in the southwest parking lot of the Minneapolis Public School Transportation facility at: 1001 2nd Ave N, Minneapolis, MN 55405, as shown in Figure 3-3. Within the box culverts, the access manhole and access catch basin are approximately 150 feet downstream of the inlet structure. The rims of the access manhole and catch basin are approximately 15 feet above the invert of the tunnel. Inspection staff entered and exited the box culverts at this location using a ladder and fall arrestor.

Figure 3-3 Primary Access and Egress Location

3.2.3 Secondary Access and Emergency Egress Location

The secondary access and emergency egress location used for the inspection is the manhole (Sta 119+59) along Cedar Lake Trail, immediately northeast of Target Field, south of the Northstar Rail's Target Field Station, between 5th Street N and 4th Street N, as shown in Figure 3-4. Within the tunnel, the access manhole is approximately 40 feet downstream of the confluence of the left and right box culverts into the single box culvert. The rim of the access manhole is approximately 30 feet above the invert of the tunnel at this location. A tripod and power winch were available for emergency egress from the tunnel at this location. Egress through the secondary access was not necessary during the inspection.

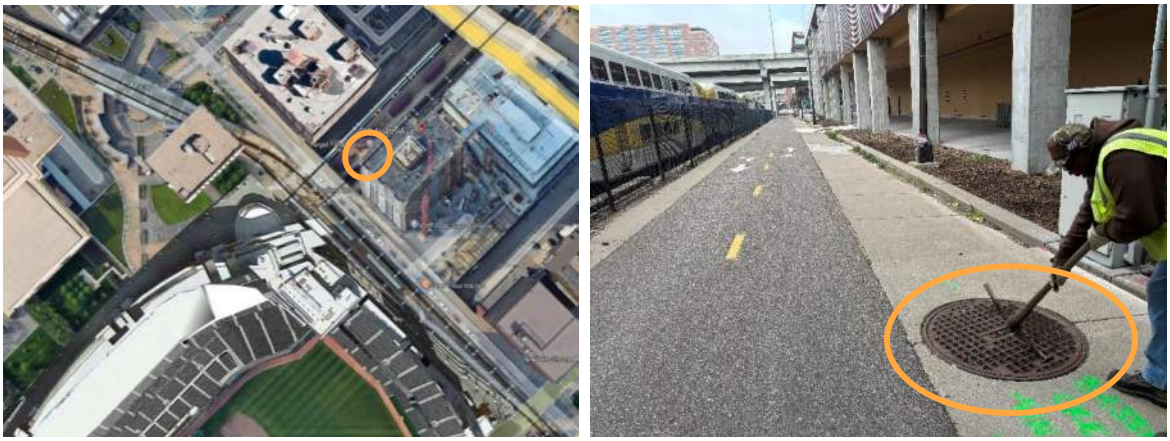


Figure 3-4 Secondary Access and Emergency Egress Location

3.3 Schedule and Inspection Summary

The Box Culvert inspection was completed on November 14-15, 2024. Starting in the morning on November 14th, two teams of two people first updated the inspection stationing throughout the tunnels to match the construction stationing, as described in Section 3.1. Once this was completed, a three-person team started the inspection in the tunnel. Table 3-1 summarizes the extents and time required for each inspection.

Table 3-1 Summary of Tunnel Inspections

Tunnel Segment	Inspection Date	Station Interval Inspected	Length Inspected (ft)	Inspection Hours
Box Culvert - Left Box[1] 11-ft by 11-ft	11/14/24	Sta. 172+24 to 120+00	5,224	5
Box Culvert - Right Box[1] 11-ft by 11-ft	11/15/24	Sta. 172+24 to 120+00	5,224	5
Box Culvert – Single Box 15-ft wide by 11-ft high	11/15/24	Sta. 120+00 to 116+73	327	0.5

[1] Left and right relative to facing downstream

4 NASSCO Rating System Definitions

Barr documented tunnel conditions using the Pipeline Assessment Certification Program (PACP) developed by The National Association of Sewer Service Companies (NASSCO) (Ref. (NASSCO n.d.)). PACP coding allows for standardized quantification of tunnel conditions and comparison of past and future inspections. PACP rating recommendations include a numeric value (1, 2, 3, 4, or 5) based on the type of observation, feature, or defect. The advantage of the numeric classification system is a quantifiable rating which can be used to prioritize repair and/or maintenance for each tunnel. Additionally, progressive degradation of a feature (such as an infiltration weeper transitioning into an infiltration gusher) can be tracked in future inspections. The following sections present a description of the observations, features, and defects identified during the inspection. All observations, features and defects fall under one of four categories: structural, operations and maintenance, construction features, or miscellaneous; these categories are included in for reference in Appendix A.

Note: The 2010 PACP code was utilized for the 2014 inspection, the 2016 PACP code was utilized for the 2019 inspection, and the 2020 PACP code was utilized for the 2024 inspection. There are subtle differences between the PACP versions, including changes in defect ratings which affected some of the analysis results between inspections.

All clock positions reported are with 12:00 at the crown and 6:00 at the invert position. All inspections were conducted walking downstream (decreasing plan stationing).

4.1 Structural Defects

The structural category of defects includes various types of defects where the tunnel has been damaged or is otherwise defective. There are 13 groups within the structural defect category, of which 8 were encountered. Only the groups encountered are summarized below.

4.1.1 Cracks

A crack is a break in the tunnel that is visible but not physically open. A crack allows groundwater infiltration and exfiltration. The sections of the tunnel adjacent to the crack are in place and not able to move.

4.1.1.1 Circumferential Cracks

A circumferential crack (CC) is a crack that runs in a circular pattern perpendicular to the axis of the tunnel.

4.1.1.2 Longitudinal Crack

A longitudinal crack (CL) is a crack that runs parallel to the axis of the tunnel.

4.1.1.3 Spiral Crack

A spiral crack (CS) is a crack that changes position as it advances along the tunnel. Spiral cracks often start in a longitudinal direction then change clock orientation.

4.1.1.4 Multiple Cracks

Multiple cracks (CM) are a combination of more than one crack that intersects. The multiple cracks designations are utilized because it is not practical to code each crack separately.

4.1.1.5 Hinge Crack

A hinge crack (CH) occurs when two or more longitudinal cracks occur at the same footage. Hinge cracks are almost always attributed to excessive vertical loading on the tunnel that causes the tunnel to be stressed circumferentially. A number is included after the code that designates how many cracks are included in the hinge crack. For example, a CH3 feature consists of three longitudinal cracks parallel to the axis of the tunnel.

4.1.2 Fractures

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. The sections of the tunnel adjacent to the fracture are in place and not able to move.

4.1.2.1 Circumferential Fracture

A circumferential fracture (FC) is a fracture that runs in a circular pattern perpendicular to the axis of the tunnel.

4.1.2.2 Longitudinal Fracture

A longitudinal fracture (FL) is a fracture that runs parallel to the tunnel axis.

4.1.2.3 Spiral Fracture

A spiral fracture (FS) is an individual fracture that runs both parallel and perpendicular to the tunnel axis.

4.1.2.4 Multiple Fractures

Multiple fractures (FM) are a combination of both longitudinal and circumferential fractures that intersect.

4.1.2.5 Hinge Fracture

A hinge fracture (FH) occurs when two or more longitudinal fractures occur at the same footage. Hinge fractures are almost always attributed to excessive vertical loading on the tunnel that causes the tunnel to be stressed circumferentially. A number is included after the code that designates how many fractures are included in the hinge fracture. For example, a FH2 feature consists of two longitudinal fractures parallel to the axis of the tunnel.

4.1.3 B – Broken

Broken (B) refers to a section or portion of the tunnel where the tunnel material is broken away from the tunnel wall. There are two modifiers used to further describe the broken section: when soil is visible beyond the defect (BSV) and when a void is visible beyond the defect (BVV).

4.1.4 Holes

A hole refers to a section or portion of the tunnel where the tunnel material is missing and pieces have become completely dislodged from the tunnel wall. There are two modifiers used to further describe the hole: when soil is visible beyond the defect (HSV) and when a void is visible beyond the defect (HVV).

4.1.5 Joints

This group is used to describe defects at joints. The codes may be used in conjunction with operational and maintenance codes such as infiltration and cracks. Several modifiers may be used to further describe the extent of the joint: small (S), medium (M), and large (L).

4.1.6 Surface Damage

This group is used to describe a wide range of tunnel material surface damage defects. Additional modifiers may be used to describe the cause of the damage. These modifiers are mechanical (M), chemical (C), and not evident (Z).

4.1.6.1 Aggregate Visible

Aggregate visible (SAV) refers to more serious damage where the tunnel aggregate is visible due to the cement in the concrete tunnel material being worn away exposing the aggregate.

4.1.6.2 Reinforcement Visible

Reinforcement visible (SRV) refers to damaged concrete tunnels where tunnel material is missing or improperly constructed that enable the reinforcement to be visible.

4.1.6.3 Surface Spalling

Surface spalling (SSS) refers to a tunnel that has experienced spalling as a result of tunnel movement or expansion action of corroded reinforcement. Surface spalling may also be the result of defective or damaged tunnel material. Surface spalling is generally shallow in depth and does not expose aggregate.

4.1.6.4 Surface Roughness Increased

Surface roughness increased (SRI) refers to slight surface damage where the surface of the tunnel or brickwork is slightly worn or deteriorated.

4.1.6.5 Surface Aggregate Projecting

Surface aggregate projecting (SAP) refers to surface damage where some of the tunnel aggregate is visible and projecting above the surface of the remaining concrete matrix.

4.1.7 Lining Features

This group of codes is used to describe features of the sewer liner.

4.1.8 Point Repair

This group of codes is used to record where a repair has been made in the tunnel.

4.1.8.1 Patch Repair

Patch repair (RPP) refers to a section of tunnel where a point has been patched or repaired.

4.1.8.2 Patch Repair Defective

Patch repair defective (RPPD) refers to a section of tunnel where a patch was attempted over a hole or other defect and the patch appears to be defective.

4.1.9 Brickwork

This group of codes is used to describe brick tunnel liners.

4.1.9.1 Missing Brick

Missing brick (MB) refers to one or more bricks missing from the tunnel liner.

4.1.9.2 Mortar Missing

Mortar missing (MM) refers to when the mortar used between the brickwork has receded or fallen out. Several modifiers may be used to further describe the extent of the defect: small (S), medium (M), and large (L). Small indicates less than ½ inch of surface loss. Medium indicates ½ to 2 inches of surface loss. Large indicates the loss of total mortar being greater than 2 inches.

4.2 Operations and Maintenance Defects

The operations and maintenance category of defects includes various types of foreign objects and material that are found in tunnels during inspections that may interfere with conveyance performance. There are 6 groups within the structural defect category, of which 5 were encountered. Only the groups encountered are summarized below.

4.2.1 Infiltration

Infiltration is the ingress of groundwater into tunnels through a defect or permeable section of the tunnel wall.

4.2.1.1 Infiltration Stain

An infiltration stain (IS) refers to no moisture present during the time of inspection, but a watermark indicates water has entered in the past.

4.2.1.2 Infiltration Dripper

Infiltration dripper (ID) refers to water dripping through a defect or faulty joint or tunnel wall. Continuous flow is not observed.

4.2.1.3 Infiltration Gusher

Infiltration gusher (IG) refers to water entering a tunnel under pressure through a defect or faulty joint. A solid stream of water is observed flowing out of the defect.

4.2.1.4 Infiltration Runner

Infiltration runner (IR) refers to water running into the tunnel through a faulty joint or defect in the tunnel wall. Continuous flow is observed.

4.2.1.5 Infiltration Weeper

Infiltration weeper (IW) refers to the slow ingress of water through a defective or faulty joint or tunnel wall. No visible drips are observed.

4.2.2 Deposits

This group is used to report a range of deposits that may be found in tunnel systems. Deposits can cause flow turbulence and partial blockages that can result in a decrease of hydraulic capacity.

4.2.2.1 Attached Deposits

Attached deposits (DA) refers to material attached to the wall of the tunnel. Attached deposits can be further broken down into encrustation (DAE) and other deposits (DAZ). Attached encrustations consist of 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. Other deposits (DAZ) refers to deposits which are not suitably classified by the above codes.

4.2.2.2 Settled Deposits

Settled deposits (DS) refer to material that has deposited into the invert of the tunnel. Settled deposits are often distributed throughout a tunnel length and will be most evident in sections with a flatter grade. Settled deposits can be further broken down into fine deposits (DSF), gravel deposits (DSGV), and other deposits (DSZ). Fine deposits consist of sand and silt particles. Gravel deposits consist of coarse sediments and other deposits refers to a settled deposit which is not suitably classified by the above codes.

4.2.3 Roots

This group of codes is used to describe the ingress of roots through defects in the tunnel liner, connections, or manholes. Several modifiers are used to further describe the instances where roots are discovered. Barrel (B) refers to roots entering the pipeline through the main body of the tunnel. Joint (J) refers to the root entering the pipeline through a joint between tunnel sections.

4.2.3.1 Fine

Fine roots (RF) refer to the occasional intrusion of fine roots. Such roots are insufficient to cause a reduction to overall available tunnel cross-sectional area. However, the fine roots are evidence that roots have entered the tunnel and may eventually grow and cause more damage and obstruction.

4.2.4 Obstacles/Obstructions

This group is used to record the presence of large and medium-sized obstacles that are likely to cause a serious obstruction to flow and reduction in hydraulic capacity. Smaller items (gravel) are noted under the ‘Deposits’ category.

4.2.4.1 Tunnel Material in Invert

Tunnel material in invert (OBM) refers to large or medium sections of the tunnel wall lying in the invert.

4.2.4.2 Object Wedged in Joint

Object wedged in joint (OBJ) is used to describe any object that is wedged in the joint of the tunnel.

4.2.4.3 Construction Debris

Construction debris (OBN) refers to construction material being left in the tunnel.

4.2.4.4 Built Into Structure

Built into structure (OBS) is used to describe an object that existed prior to the sewer/manhole being constructed.

4.2.4.5 Rocks

Rocks (OBR) is used to refer to rock obstacles lying in the tunnel.

4.2.4.6 Other Objects

Other objects (OBZ) is used to describe obstacles or obstructions where this is not a code, but are explained in the ‘comments’ of the inspection notes.

4.2.5 Vermin

Vermin (V) is used to record only when vermin are actually observed. Vermin other (VZ) is used to describe vermin observed other than rats or cockroaches, and the details are noted in the “comments.”

4.3 Construction Features

The construction feature codes describe conditions associated with the methods used to construct tunnels. There are 4 groups within the operational and maintenance code, but only the features encountered in the inspection are included below.

4.3.1 Taps

This group describes various types of taps including connections, wyes, and laterals. Modifiers may be added to further describe the tap. These modifiers include intruding (I), active (A), capped (C), abandoned (B), and defective (D). While only one modifier can be used for each observation, additional observations or comments can be added to the notes section.

4.3.1.1 Factory Made

Factory made taps (TF) refer to purpose-made or a pre-formed tunnel fitting that was built into the tunnel during construction.

4.3.1.2 Break-In Hammer Tap

Break-in taps (TB) refer to a rough hole that has been broken in the side of the tunnel and a pipe inserted without use of a special fitting for connecting or sealing the lateral pipe.

4.3.2 Intruding Sealing Material

This group describes situations where the joint sealing material between two tunnel sections is intruding into the sewer. Additional modifiers are used to describe whether or not the intruding sealing ring is Hanging (H), Broken (B), or Loose/Poorly Fitting (L).

4.3.2.1 Sealing Ring

Sealing Rings (ISSR) refers to the sealing ring or gasket between tunnel sections being visible.

4.3.3 Lines

This group of codes is used to describe a visible change in direction of the tunnel.

4.3.3.1 Line Left

Line left (LL) refers to when the tunnel's alignment deviates to the left. The direction is referenced walking upstream.

4.3.3.2 Line Right

Line right (LR) refers to when the tunnel's alignment deviates to the right. The direction is referenced walking upstream.

4.3.3.3 Line Up

Line up (LU) refers to when the tunnel alignment deviates upward. The direction is referenced walking upstream.

4.3.4 Access Points

This group of codes is used to describe access points into the tunnel.

4.3.4.1 Manhole

A manhole (AMH) is a structure designed to provide access to the tunnel for maintenance and inspection.

4.3.4.2 Catch Basin

A catch basin (ACB) is an entry point for water into the tunnel. Catch basins are typically located along the street, curb, or low point in a parking lot.

4.4 Miscellaneous Features

The miscellaneous codes include features and defects that are not included in the other categories. Only codes used in the inspection are included.

4.4.1 Dimension/Diameter/Shape Change

Dimension/Diameter/Shape change (MSC) refers to when the tunnel liner changes cross-section in some way.

4.4.2 General Observation

General observation (MGO) is used in conjunction with the ‘comments’ section to record additional information that is not covered under PACP coding.

4.4.3 Survey Abandoned

Survey abandoned (MSA) is used to describe the instance where the survey could not be completed due to some obstruction or blockage in the tunnel. Further details are recorded in the ‘comments’ section.

4.4.4 Water Level

Water level (MWL) is used to describe the depth of water in the sewer at the time of inspection. After the initial entry, only changes of at least 10% of the cross-section should be recorded. A modifier (S) is used to describe a sag or dip in the tunnel, and if noted, are considered to be a structural defect and rated accordingly.

4.5 PACP Grades

Grades are assigned to the defects described in Section 4 with severity ratings ranging from 1-5 as summarized below:

5 – Most Significant Defect

4 - Significant Defect

3 - Moderate Defect

2 – Minor to Moderate Defect

1 – Minor Defect

4.6 PACP Condition Grading System

The PACP condition grading system is based on the number and severity of defects observed during the inspection. There is no single condition grading system that fully describes all of the important aspects of a tunnel; therefore, the PACP condition grading system uses more than one method of tunnel segment rating. The Overall Pipe Rating (OPR) and the Pipe Rating Index (PRI) were used for this inspection. These two grading methods were selected because they provide a qualitative (PRI) and quantitative (OPR) assessment of the tunnel. Discussion of how the OPR and PRI values are calculated is provided below.

4.6.1 OPR Value

The OPR is a number used to benchmark pipes against past and future inspections. In order to calculate the OPR, the grade score must be calculated. The grade score is calculated for each NASSCO condition

grade by multiplying the number of defect occurrences by the respective condition grade (1, 2, 3, 4, and 5) as shown in Equation 1.

Equation 1

$$Grade\,Score = Defect\,Rating \times Total\,Number\,of\;\;Defects$$

After the grade score is calculated, the OPR can be calculated by summing the grade scores of each condition grade 1 through 5 as shown in Equation 2.

Equation 2

$$OPR = Grade\,Score1 + Grade\,Score2 + Grade\,Score3 + Grade\,Score4 + Grade\,Score5$$

4.6.2 PRI Value

The PRI can be described as a weighted average of the grade scores over the length of pipe of interest. It is calculated by dividing the OPR by the total number of defects as shown in Equation 3. The PRI value has a range of 0 to 5 and the grade definition corresponds to the NASSCO feature grade where 5 is the most severe. This value is used to give a rating of the tunnel. PRI of 0 indicates the pipe has no defects. The OPR and PRI are calculated separately for both structural and O&M defects.

Equation 3

$$PRI = \frac{Overall\,Pipe\,Rating}{Total\,Number\,of\,Defects}$$

4.6.3 Grading of Continuous Defects

The PACP continuous defect feature is used to denote where any defect extends for longer than 3 feet. However, to develop a grade for the pipe segment, a mechanism is needed to translate a continuous defect into an equivalent number of point defects. The equivalent number (quantity) of “uninterrupted” continuous defects is calculated by dividing the length of the continuous defect by five.

5 Inspection Findings

As discussed in Section 3, Barr utilized the 2019 inspection data as a baseline for the 2024 inspection and modified the data based on observed changes. A tabular record of the inspection data for both the left and right box of the Double Box Culvert is included in Appendix B. The inspection data was then evaluated from both a qualitative and quantitative perspective discussed herein.

5.1 Qualitative Evaluation

Qualitative evaluation of change in tunnel condition between the 2009, 2014, 2019, and 2024 inspections was performed by comparing representative photos of the same area of concern. Because the majority of significant defects was observed at the shear keys, special emphasis was made in comparing them. Noticeable changes were observed over the 15-year duration in some areas. For example, at shear key 13, varying degrees of infiltration were observed between the inspections, with minor infiltration observed in 2009, more significant infiltration in 2014, and less infiltration in both 2019 and 2024, as shown in Figure 5-1. A comprehensive qualitative comparison of the 2009, 2014, 2019, and 2024 inspection photos for the left box culvert shear keys is provided in Appendix C. Because defects and observations were fairly consistent between the left and right box culverts, this comparison is considered representative of both tunnels.

Figure 5-1 Shear Key 13 Comparison Photos

5.2 Quantitative Analysis

To supplement the qualitative review of inspection findings, a quantitative analysis of the 2024 inspection data was performed including calculation of pipe rating index values and overall pipe rating values, which are described in detail below.

5.2.1 Pipe Rating Index

Pipe rating index (PRI) values range from 0 to 5 and correspond to condition descriptors ranging from good to urgent as outlined in Table 5-1. A description of the PRI values and how they are calculated is found in Section 4.6.

Table 5-1 Pipe Rating Index (PRI) Condition Descriptor Summary

PRI Value	Tunnel Condition Descriptor
0-1	Good: The tunnel liner is structurally adequate and defects are not causing deterioration. The tunnel requires monitoring but no maintenance or rehabilitation is currently necessary.
2-3	Fair: The tunnel liner is structurally adequate but defects are causing deterioration. The tunnel requires monitoring, but no maintenance or rehabilitation is currently necessary.
4	Poor: The tunnel liner is structurally inadequate and defects have caused advanced deterioration. The tunnel requires rehabilitation.
5	Urgent: The tunnel liner is structurally inadequate or has a service-impending defect. The tunnel requires immediate rehabilitation.

PRI values were calculated for both structural and O&M categorized defects. Table 5-2 summarizes the PRI values for the left, right, and single boxes of the Box Culvert for the 2024 inspections. Detailed tables that break down the left, right, and single boxes into 1,000-foot segments with corresponding PRI values are included in Appendix D. A graphical representation of the PRI values from a structural and O&M perspective is provided in Appendix E.

Table 5-2 Summary of PRI Values

Tunnel Segment & Interval	Structural PRI	O&M PRI	Discussion
Box Culvert 11-ft by 11-ft (Right Box) - Sta. 172+24 to 120+00	1	2	Structural and O&M PRI values remain unchanged from 2019.
Box Culvert 11-ft by 11-ft (Left Box) - Sta. 172+24 to 120+00	1	2	Structural and O&M PRI values remain unchanged from 2019.
Box Culvert 15-ft by 11-ft (Single Box) - Sta. 120+00 to 116+73	1	2	Structural and O&M PRI values remain unchanged from 2014.

5.2.2 Overall Pipe Rating

The overall pipe rating (OPR) is another method of evaluating the condition of a tunnel. A description of the OPR and how it is calculated is included in Section 4.6. The OPR is most beneficial when used as a comparison to past and future inspection OPR values. Table 5-3 summarizes the OPR values for the left, right, and single boxes of the Box Culvert for the 2024 inspections. Detailed tables that break down the left, right, and single boxes into 1,000-foot segments with corresponding OPR values are included in Appendix D.

Table 5-3 Summary of Overall Pipe Rating (OPR) Values

Tunnel Segment & Interval	Structural OPR	O&M OPR	Notes
Box Culvert 11-ft by 11-ft (Right Box) - Sta. 172+24 to 120+00	593	240	Increase in Structural and O&M OPR values is attributed to additional defects observed during the 2024 inspection.
Box Culvert 11-ft by 11-ft (Left Box) - Sta. 172+24 to 120+00	772	313	Increase in Structural and O&M OPR values is attributed to additional defects observed during the 2024 inspection.
Box Culvert 15-ft by 11-ft (Single Box) - Sta. 120+00 to 116+73	46	32	Increase in Structural and O&M OPR values is attributed to additional defects observed during the 2024 inspection.

5.3 Grade 3 Defects

In total, 21 grade 3 (moderate) defects were observed in the right box, 26 grade 3 defects were observed in the left box, and one grade 3 defect was observed in the single box. A summary of these defects including the type of defect are provided in Table 5-4. Detailed tables that break down the box culverts into 1,000-foot segments with corresponding number of grade 3 defects are included in Appendix D.

Table 5-4 Summary of Grade 3 Defects

Tunnel Segment & Interval	Grade 3 Defect Quantity	Defect Type	Notes
Box Culvert 11-ft by 11-ft (Right Box) - Sta. 172+24 to 120+00	21	SAV, ID, CM	Surface Aggregate Visible (Sta 166+77 and Sta. 154+04), Infiltration Drippers between Sta. 163+95 to 128+48, Multiple Cracks (Sta. 120+98)
Box Culvert 11-ft by 11-ft (Left Box) - Sta. 172+24 to 120+00	26	ID, CM, SAV, FS, FL	Infiltration Dripper (Sta. 171+11 to 123+49), Multiple Cracks (Sta. 152+10), Surface Aggregate Visible (Sta. 149+86), Spiral Fracture (Sta. 132+56), Longitudinal Fracture (Sta. 130+53 and 126+50).
Box Culvert 15-ft by 11-ft (Single Box) - Sta. 120+00 to 116+73	1	SAP	Surface Aggregate Projecting (Sta. 119+82).

5.4 Grade 4 Defects

In total, three grade 4 (significant) defects were observed in the right box, four grade 4 defects were observed in left box, and no grade 4 defects were observed in the single box. A summary of these grade 4 defects, including the type of defect, are provided in Table 5-5. Detailed tables that break down the boxes into 1,000-foot segments with corresponding number of grade 4 defects are included in Appendix D.

Table 5-5 Summary of Grade 4 Defects

Tunnel Segment & Interval	Grade 4 Defect Quantity	Defect Type	Notes
Box Culvert 11-ft by 11-ft (Right Box) - Sta. 172+24 to 120+00	3	IR, FM	Infiltration Runner (Sta. 159+56), Fracture Multiple (Sta. 152+06 and 120+98)
Box Culvert 11-ft by 11-ft (Left Box) - Sta. 172+24 to 120+00	4	FM	Fracture Multiple (Sta. 152+05, 132+53, 131+53, and 121+00)
Box Culvert 15-ft by 11-ft (Single Box) - Sta. 120+00 to 116+73	0	N.A.	N.A.

5.5 Grade 5 Defects

In total, one grade 5 (most significant) defect was observed in the right box, and no grade 5 defects were observed in left box or single box. A summary of these defects, including the type of defect, are provided in Table 5-6. Detailed tables that break down the box culverts into 1,000-foot segments with corresponding number of grade 5 defects are included in Appendix D.

Table 5-6 Summary of Grade 5 Defects

Tunnel Segment & Interval	Grade 5 Defect Quantity	Defect Type	Notes
Box Culvert 11-ft by 11-ft (Right Box) - Sta. 172+24 to 120+00	1	SRV	Surface Reinforcement Visible (Sta. 165+10)
Box Culvert 11-ft by 11-ft (Left Box) - Sta. 172+24 to 120+00	0	N.A.	N.A.
Box Culvert 15-ft by 11-ft (Single Box) - Sta. 120+00 to 116+73	0	N.A.	N.A.

5.6 Comparison with Previous Inspections

Previous inspections of the Box Culvert were conducted in 2004, 2009, 2014, 2019, and 2024 and are summarized in Section 2.2. A comparison of the past inspections with the 2024 inspections is provided below.

5.6.1 Shrinkage Cracks

The previous inspections observed hairline cracking (described as shrinkage cracks) throughout the Box Culvert with seepage and accumulation of leachate deposits at some of the cracks. The 2024 findings are consistent with the previous inspections.

5.6.2 Cracking and Concrete Deterioration at Shear Keys

The previous inspections observed cracking and concrete deterioration at several of the shear keys. The 2024 findings are generally consistent with the previous inspections, however, some of the defects have further deteriorated. For example, cracks have widened, and varying degrees of infiltration were

observed. It is evident that differential settlement has occurred or is actively continuing to some degree at the shear keys.

- **Shear Key Gaps:** The previous inspections observed 1- to 1.5-inch-wide gaps at approximately 70% of the shear key joints as well as deterioration of the bitumastic bond breaker seal. The 2024 findings are generally consistent with the previous inspections. Roughly 70–75% of the joints were separated with missing or deteriorated bitumastic seal. Infiltration was commonly observed on the outside wall of the tunnel with a few areas where soil was observed in the joint.

- **Exposed Rebar:** The 2024 findings identified one location in the right box (Sta. 165+10) with exposed rebar.

5.7 Monitoring

The southwest light rail transit (SWLRT) project was underway at the time of the inspection. Portions of the SWLRT alignment is located above the Box Culvert. Crack gauges were installed at several of the shear keys by others to measure potential displacement related to the construction. The SWLRT project office has been providing monitoring data to the City of Minneapolis staff and the City has periodically been providing the monitoring data to Barr.

6 Recommendations

Based on the 2024 inspection observations, and evaluation of tunnel condition over time, Barr recommends BCWMC consider the following recommendations categorized by inspection, monitoring and repairs.

6.1 Inspection Recommendations

6.1.1 Inspection Frequency

It is recommended that the BCWMC continue to inspect the box culvert based on the regular frequency approved by the BCWMC.

6.1.2 Shear Keys – Structural

A large portion of the identified significant defects, including fractures, spalling, and evidence of differential settlement were observed at the shear keys. Future inspection programs should continue to monitor the shear keys for continued degradation and/or differential settlement.

6.1.3 Infiltration

Infiltration was observed at joints, and a large portion of the shear keys as a result of missing or degraded joint material. Future inspections should continue to review infiltration, with special consideration for evidence of soil loss through the joints.

6.2 Repair Recommendations

6.2.1.1 Shear Key Joint Repair

It is recommended that the BCWMC repair the shear key joint material to minimize infiltration and potential for soil transport into the tunnel. It is recommended that this work occur in the next 5 years.

6.2.1.2 Crack Sealing and Deposit Removal

Various degrees of infiltration were observed throughout the tunnel, occurring at joints, cracks, and other defects. At one location, an infiltration runner was observed that equates to a grade 4 PACP defect. It is recommended that the BCWMC repair these points of infiltration, remove deposits as necessary to improve the operational condition of the tunnel, and slow degradation of the concrete. It is recommended that this work be coordinated with the shear key joint repair work.

6.2.1.3 Repair Exposed Reinforcement

At one location in the right box, exposed reinforcement was observed that equates to a grade 5 PACP defect. It is recommended that the BCWMC repair these areas to minimize further degradation of the reinforcement and concrete. It is recommended that this work be coordinated with the shear key joint repair and crack sealing repair work.

6.3 Capital Improvement Program

The BCWMC's 5-year Capital Improvement Program (CIP) 2024-2028 list currently includes a flood control project box culvert repair project (FCP-1) with construction anticipated in 2027-2028. This would likely require a feasibility study in 2025-2026.

7 References

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Appendix A

PACP Code Summary Charts

NASSCO'S PIPELINE ASSESSMENT CERTIFICATION PROGRAM (PACP)

Section 5 — Operation and Maintenance

D DEPOSITS 5-3 (Attached)
DAE Encrustation
DAGS Grease
DAR Ragging
DAZ Other

D DEPOSITS 5-4 (Settled)
DSF Fine
DSGV Gravel
DSC Hard/Compact
DSZ Other

D DEPOSITS 5-4 (Ingress)
DNF Fine (silt/sand)
DNGV Gravel
DNZ Other

R ROOTS 5-11 (Fine)
RFB Barrel
RFL Lateral
RFC Connection
RFJ Joint

R ROOTS 5-11 (Medium)
RMB Barrel
RML Lateral
RMC Connection
RMJ Joint

R ROOTS 5-11 (Ball)
RBB Barrel
RBL Lateral
RBC Connection
RBJ Joint

R ROOTS 5-11 (Tap)
RTB Barrel
RTL Lateral
RTC Connection
RTJ Joint

I INFILTRATION 5-19 (Stain)
ISB Barrel
ISC Connection
ISJ Joint
ISL Lateral

I INFILTRATION 5-19 (Weeper)
IWB Barrel
IWC Connection
IWJ Joint
IWL Lateral

I INFILTRATION 5-19 (Dripper)
IDB Barrel
IDC Connection
IDJ Joint
IDL Lateral

I INFILTRATION 5-19 (Runner)
IRB Barrel
IRC Connection
IRJ Joint
IRL Lateral

I INFILTRATION 5-19 (Gusher)
IGB Barrel
IGC Connection
IGJ Joint
IGL Lateral

OB OBSTACLES 5-31 OBSTRUCTIONS
OBB Brick or Masonry
OBC Object Through Connection
OBI Object Intruding Through Wall

OB OBSTACLES 5-31 OBSTRUCTIONS
OBJ Object in Joint
OBM Pipe Material in Invert
OBN Construction Debris
OBP External Pipe Cable

OB OBSTACLES 5-31 OBSTRUCTIONS
OBR Rocks
OBS Built In Structure
OBZ Other

V VERMIN 5-45
VR Rat
VC Cockroach
VZ Other

G GROUT TEST & SEAL 5-49
GTP Grout Test Passed
GTPJ Joint
GTPL Lateral
GTF Grout Test Failed
GTFJ Joint
GTFL Lateral

G GROUT TEST & SEAL 5-49
GTU Grout Test Unable
GTUJ Joint
GTUL Lateral
GRT Grout Test Location

Section 6 — Construction Features

T TAP 6-3 (Break-In/Hammer)
TBI Intruding
TBD Defective
TBC Capped
TBA Activity

T TAP 6-3 (Factory Made)
TFI Intruding
TFD Defective
TFC Capped
TFA Activity
TFB Abandoned

T TAP 6-3 (Rehabilitated)
TRI Intruding
TRD Defective
TRC Capped
TRA Activity
TRB Abandoned

T TAP 6-3 (Saddle)
TSI Intruding
TSD Defective
TSC Capped
TSA Activity

IS INTRUDING SEALING MATERIAL 6-15
ISSR Sealing Ring
ISSRB Broken
ISSRH Hanging
ISSRL Loose
ISGT Grout
ISZ Other

L LINE 6-21 (of sewer)
LD Down
LL Left
LLD Left Down
LLU Left Up

L LINE 6-21 (of sewer)
LR Right
LRD Right Down
LRU Right Up
LU Up

A ACCESS POINT 6-25
ACB Catch Basin
ACO Cleanout
ACOM Mainline
ACOP Property
ACOH House

A ACCESS POINT 6-25
ADP Discharge Point
AEP End of Pipe
AJB Junction Box
AM Meter
AMH Manhole

A ACCESS POINT 6-25
AOC Other Structure
ATC Tee Connection
AWA Wastewater Access
AWW Wetwell
AZ Other

Section 7 — Miscellaneous Features

M 7-1 MISCELLANEOUS FEATURES
MCU Camera Underwater
MGO General Observation
MGP General Photograph
MJL Joint Length

M 7-1 MISCELLANEOUS FEATURES
MLC Lining Change
MMC Material Change
MSC Shape/Size Change
MSA Survey Abandoned
MWL Water Level

M 7-1 MISCELLANEOUS FEATURES
MWLS Water Level Sag
MWM Water Mark
MY Dye Test
MYV Dye Visible
MYN Not Visible

NASSCO'S PIPELINE ASSESSMENT CERTIFICATION PROGRAM (PACP)

Section 4 — Structural Defect Coding

C CRACK 4-3

CL Longitudinal
CC Circumferential
CM Multiple
CS Spiral
CH Hinge (2, 3, 4)

F FRACTURE 4-9

FL Longitudinal
FC Circumferential
FM Multiple
FS Spiral
FH Hinge (2, 3, 4)

B BROKEN 4-17

B Broken

BSV Soil Visible
BVV Void Visible

H HOLE 4-21

H Hole

HSV Soil Visible
HVV Void Visible

D DEFORMED 4-25 (Rigid)

DR Deformed Rigid

No modifiers used.

D DEFORMED 4-25 (Flexible)

DFBR Bulging Round
DFBI Bulging Inv.Curv.
DFC Creasing
DFE Elliptical

D DEFORMED 4-25 (Brick)

DTBR Bulging Round
DTBI Bulging Inv.Curv.

X COLLAPSE 4-37

X Collapse

No descriptors and no modifiers used.

J JOINT 4-43 (Offset)

JOS Offset Small
JOM Offset Medium
JOL Offset Large

J JOINT 4-43 (Offset)

JOSD Offset Small Defect
JOMD Offset Medium Defect
JOLD Offset Large Defect

J JOINT 4-43 (Separated)

JSS Separation Small
JSM Separation Med.
JSL Separation Large

J JOINT 4-43 (Angular)

JAS Angular Small
JAM Angular Medium
JAL Angular Large

S SURFACE DAMAGE 4-51

SRI Roughness Increased
SAV Aggregate Visible
SAP Aggregate Projecting
SAM Aggregate Missing

S SURFACE DAMAGE 4-51

SRV Reinforcement Visible
SRP Reinforcemt.Projecting
SRC Reinforcemt.Corroded
SMW Missing Wall

S SURFACE DAMAGE 4-51

SSS Surface Spalling
SSC Surface Spalling Coating
SCP Surface Damage Corrosion
SZ Other

LF LINING FEATURES 4-67

LFAC Abdn'd Connection
LFAS Annular Space
LFB Blistered Lining
LFCS Service Cut Shifted

LF LINING FEATURES 4-67

LFD Detached
LFDC Discoloration
LFDE Defective End
LFDL Delamination

LF LINING FEATURES 4-67

LFOC Overcut Service
LFRS Resin Slug
LFUC Undercut Service
LFW Wrinkled
LFZ Other

WF WELD FAILURE 4-85

WFC Circumferential
WFL Longitudinal
WFM Multiple
WFS Spiral
WFZ Other

RP POINT REPAIR 4-89

RPL Liner
RPLD Liner Defective
RPP Patch
RPPD Patch Defective

RP POINT REPAIR 4-89

RPR Replacement
RPRD Replmt. Defective
RPZ Other
RPZD Other Defective

BRICKWORK 4-97

DB Displaced
MB Missing
DI Dropped Invert

BRICKWORK 4-97

MMS Mortar Missing Small
MMM Mortar Missing Med.
MML Mortar Missing Large

Appendix B

Inspection Summary Tables

Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
172+25		MGO	Misc.	0					11/14/24 1:00 P.M. Start inspection in left (south) box starting at trash rack and walking downstream. Trash rack clear of debris. Inspectors: Joe Welna, Josh Phillips, and Jack Mettlach.
172+25		MSC	Misc.	0					Begining of double box culvert 11-ft-high by 11-ft-wide
172+25		MWL	Misc.	0				5	6" water depth
172+23	172+18	CL	Struct.	2	9		4		
172+12		CC	Struct.	1	4	5			
172+11		CC	Struct.	1	7	9			
172+10		CC	Struct.	1	3	5			
171+95		MGO	Misc.	0					Shear key K1. Right and left shear keys are referenced walking downstream. Bitumastic bond breaker deteriorated. Joint Width: K1R: 1.5"-2", K1L: 2". Evidence of differential settlement based on measured joint, and defects observed.
171+87		CC	Struct.	1	7	9			
171+84		CC	Struct.	1	3	5			
171+79		CC	Struct.	1	7	10			
171+74		CC	Struct.	1	8	10			
171+68		CC	Struct.	1	7	10			
171+68		CC	Struct.	1	1	5			
171+63		CC	Struct.	1	7	11			
171+56		CC	Struct.	1	1	5			
171+56		CC	Struct.	1	7	11			
171+46		IS	O&M	0	7	8			
171+46		IW	O&M	2	7	5			
171+43		CC	Struct.	1	2	5			
171+40		CC	Struct.	1	7	10			

1 The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

2 Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
171+38		CC	Struct.	1	2	5			
171+35		CC	Struct.	1	7	5			
171+25		CC	Struct.	1	1	5			
171+24		IS	O&M	0	7	8			
171+20		CC	Struct.	1	12	5			
171+11		CC	Struct.	1	7	1			
171+11		ID	O&M	3	12				
171+02		CC	Struct.	1	7	1			
170+96		CC	Struct.	1	7	11			
170+96		IS	O&M	0	7				
170+89		CC	Struct.	1	7	11			
170+89		CC	Struct.	1	12	5			
170+84	170+81	CS	Struct.	2	7	8	3		
170+82		RPP	Struct.	0	9	10			5ft x 5ft patch repair below AMH
170+81		CC	Struct.	1	4	5			
170+80		AMH	Const.	0					Minneapolis impound lot manhole at 11 o'clock
170+80		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
170+79		CC	Struct.	1	4	5			
170+78		CC	Struct.	1	4	5			
170+75		CC	Struct.	1	7	11			
170+67		CC	Struct.	1	7	11			
170+60		CC	Struct.	1	1	5			
170+59		CC	Struct.	1	7	11			
170+57		CC	Struct.	1	1	5			
170+54	170+49	CS	Struct.	2	3	5	5		
170+51		CC	Struct.	1	7	8			
170+43		CC	Struct.	1	1	5			
170+43		CC	Struct.	1	7	10			
170+35		IW	O&M	2	7	5			

1 The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

2 Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
170+37		CC	Struct.	1	1	5			
170+21		CC	Struct.	1	1	5			
170+17		CC	Struct.	1	1	5			
170+17		CC	Struct.	1	7	9			
170+11		CC	Struct.	1	7	10			
170+04	170+00	CL	Struct.	2	9		4		
170+00		MGO	Misc.	0					Shear key K2: bitumastic bond breaker deteriorated. Joint Width: K2R: 3/4"-1/2", K2L: 1"
169+89		CC	Struct.	1	2	5			
169+84		CC	Struct.	1	7	10			
169+78		CC	Struct.	1	7	11			
169+78		CC	Struct.	1	2	5			
169+74		CC	Struct.	1	1	5			
169+71		CC	Struct.	1	7	11			
169+68		CC	Struct.	1	3	5			
169+64		CC	Struct.	1	2	5			
169+57		CC	Struct.	1	1	5			
169+57		CC	Struct.	1	7	10			
169+49		CC	Struct.	1	7	11			
169+49		CC	Struct.	1	1	5			
169+49		IW	O&M	2	7	8			
169+42		CC	Struct.	1	1	5			
169+42	169+39	CS	Struct.	2	7	8	3		
169+39		CC	Struct.	1	7	11			
169+39		CC	Struct.	1	1	5			
169+39		IW	O&M	2	7	9			
169+36		CC	Struct.	1	1	5			
169+34		CC	Struct.	1	1	5			
169+32		CC	Struct.	1	7	11			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
169+27		CC	Struct.	1	1	5			
169+24		CC	Struct.	1	7	11			
169+11		CC	Struct.	1	7	12			
169+09		CC	Struct.	1	1	5			
169+05		CC	Struct.	1	7	10			
168+99		CC	Struct.	1	7	11			
168+99		CC	Struct.	1	12	5			
168+91		CC	Struct.	1	7	5			
168+91		IS	O&M	0	12	1			
168+89		CC	Struct.	1	1	5			
168+83		CC	Struct.	1	12	5			
168+81		CC	Struct.	1	7	11			
168+75		CC	Struct.	1	2	5			
168+71		CC	Struct.	1	10	5			
168+69		CC	Struct.	1	7	1			
168+64		CC	Struct.	1	7	11			
168+64		CC	Struct.	1	1	5			
168+57		CC	Struct.	1	8	11			
168+56		CC	Struct.	1	2	5			
168+53		CC	Struct.	1	1	5			
168+50		CC	Struct.	1	7	1			
168+50		IW	O&M	2	7	8			
168+46		CC	Struct.	1	7	11			
168+44		CC	Struct.	1	1	5			
168+26		CC	Struct.	1	4	5			
168+24		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
168+24		CC	Struct.	1	7	10			
168+24		IW	O&M	2	7	9			
168+22		CC	Struct.	1	4	7			

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2 Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
168+19	168+16	CS	Struct.	2	7	11	3		
168+13		CS	Struct.	2	3	5			
168+13		CC	Struct.	1	7	11			
167+99		MGO	Misc.	0					Shear key K3: bitumastic bond breaker deteriorated. Joint Width: K3R: 1", K3L: 1"-1.5"
167+91		CC	Struct.	1	7	10			
167+86		CC	Struct.	1	1	5			
167+65		CC	Struct.	1	7	11			
167+60		CC	Struct.	1	7	11			
167+60		CC	Struct.	1	1	5			
167+56		CC	Struct.	1	1	5			
167+55		CC	Struct.	1	7	11			
167+49		IW	O&M	2	7	9			
167+45		CC	Struct.	1	7	5			
167+39		CC	Struct.	1	2	5			
167+24	166+24	LR	Const.	0			100	80	
167+22		CC	Struct.	1	1	5			
167+20		CC	Struct.	1	7	11			
167+15		CC	Struct.	1	7	11			
167+11		CC	Struct.	1	7	11			
167+11		CC	Struct.	1	1	5			
167+06		TBA	Const.	0	10				2-ft-dia. RCP reinforcement visible around break-in.
167+06		AMH	Const.	0					Colfax access manhole at 11 o'clock.
167+05	167+02	CS	Struct.	2	7	8	3		
167+03		CC	Struct.	1	1	5			
166+98		CC	Struct.	1	7	11			
166+94		CC	Struct.	1	12	5			
166+87		CC	Struct.	1	7	11			
166+76		CC	Struct.	1	7	11			

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2 Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
166+74		CC	Struct.	1	1	5			
166+70		CC	Struct.	1	7	11			
166+68		CC	Struct.	1	1	5			
166+64		CC	Struct.	1	7	11			
166+57		CC	Struct.	1	7	11			
166+57		IW	O&M	2	7	8			
166+55		CC	Struct.	1	1	5			
166+50		MGO	Misc.	0					L-bracket fastened to wall at 9 o'clock.
166+47		CC	Struct.	1	7	11			
166+47		CC	Struct.	1	1	5			
166+41		CC	Struct.	1	7	11			
166+38		CC	Struct.	1	1	5			
166+37		CC	Struct.	1	7	11			
166+24		CC	Struct.	1	7	11			
166+19		CC	Struct.	1	7	11			
166+19		CC	Struct.	1	1	5			
166+13		CC	Struct.	1	1	5			
166+12		CC	Struct.	1	7	11			
166+11		CC	Struct.	1	1	5			
166+05		CC	Struct.	1	3	5			
166+02		CC	Struct.	1	7	11			
166+01		CC	Struct.	1	1	5			
165+70		MGO	Misc.	0					Shear key K4: bitumastic bond breaker gone. Joint Width: K4R: 1/4"-1/2", K4L: 1/2"-1". Right shear key is dry.
165+70		IS	O&M	0	9				Staining at left shear key.
165+70		IW	O&M	2	9				Weeping at left shear key.
165+70		CC	Struct.	1	11	1			
165+70		FC	Struct.	2	1	2			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
165+57		CC	Struct.	1	1	5			
165+50		CC	Struct.	1	7	11			
165+50		CC	Struct.	1	1	5			
165+44		CC	Struct.	1	7	11			
165+70		TFA	Const.	0	11				1-ft-dia. steel
165+70		CC	Struct.	1	1	5			
165+69		CC	Struct.	1	7	11			
165+65		CC	Struct.	1	1	5			
165+61		CC	Struct.	1	1	5			
165+60		CC	Struct.	1	7	11			
165+52		CC	Struct.	1	7	11			
165+49		CC	Struct.	1	1	5			
165+49		IW	O&M	2	7	9			
165+44		CC	Struct.	1	11	5			
165+39		CC	Struct.	1	7	11			
165+39		CC	Struct.	1	1	5			
165+34		CC	Struct.	1	7	1			
165+34		IW	O&M	2	8	10			
165+27		CC	Struct.	1	1	5			
165+25		CC	Struct.	1	7	11			
165+23		CC	Struct.	1	1	5			
165+20		CC	Struct.	1	7	11			
165+10		CC	Struct.	1	4	5			
165+10		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock.
165+10		CC	Struct.	1	7	1			
165+10		AMH	Const.	0					Colfax access manhole at 11 o'clock.
165+08		CC	Struct.	1	4	5			
165+00		CC	Struct.	1	7	10			
165+00		CC	Struct.	1	1	5			

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2 Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
165+00		IW	O&M	2	7	9			
164+97		CC	Struct.	1	11	1			
164+97		IS	O&M	0	11	1			
164+89		CC	Struct.	1	7	11			
164+88		CC	Struct.	1	1	5			
164+78		CC	Struct.	1	7	11			
164+78		CC	Struct.	1	1	5			
164+78		IW	O&M	2	7				
164+73		CC	Struct.	1	1	5			
164+69		CC	Struct.	1	7	11			
164+64		CC	Struct.	1	1	5			
164+65		MGO	Misc.	0					Shear key K5: majority of bitumastic bond breaker in place. Joint Width: K5R: 1/2"-1", K5L: 1".
164+65		SSS	Struct.	2	10				Spalling 12" dia, 3" deep at left shear key.
164+65		FC	Struct.	2	10	11			
164+52		CC	Struct.	1	7	11			
164+41		CC	Struct.	1	3	5			
164+40		MGO	Misc.	0					4-in. bump out on left side of tunnel.
164+33		CC	Struct.	1	7	11			
164+28		CC	Struct.	1	1	5			
164+25		CC	Struct.	1	1	5			
164+22		CC	Struct.	1	7	11			
164+20		CC	Struct.	1	11	5			
164+14		CC	Struct.	1	7	11			
164+14		CC	Struct.	1	1	5			
164+11		CC	Struct.	1	1	5			
164+03		CC	Struct.	1	7	1			
164+03		CC	Struct.	1	3	5			
163+99		CC	Struct.	1	11	5			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
163+95		CC	Struct.	1	2	5			
163+95		CC	Struct.	1	7	11			
163+90		CC	Struct.	1	7	11			
163+90		CC	Struct.	1	1	5			
163+83		CC	Struct.	1	7	5			
163+83		IS	O&M	0	7	5			
163+81		CC	Struct.	1	1	5			
163+81		ID	O&M	3	10	2			
163+80		CC	Struct.	1	7	9			
163+73		CC	Struct.	1	7	5			
163+63		CC	Struct.	1	12	12			
163+56		CC	Struct.	1	7	11			
163+52		CC	Struct.	1	11	1			
163+50		CC	Struct.	1	7	11			
163+43		CC	Struct.	1	7	1			
163+35		MGO	Misc.	0					End of 4-in. bump out on left side of tunnel
163+31		CC	Struct.	1	11	5			
163+24	163+21	CS	Struct.	2	3	5	3		
163+22		CC	Struct.	1	7	11			
163+08	163+05	CS	Struct.	2	4	5	3		
163+05		MGO	Misc.	0					Shear key K6: majority of bitumastic bond breaker in place. Joint Width: K6R: 1/8"-1/2", K6L: 1/4"-1/2". Crack gauges installed by others at left and right shear key.
163+05		SSS	Struct.	2	2.5				Spalling
163+05		SSS	Struct.	2	9.5				Spalling
163+05		IS	O&M	0	9				Staining of left shear key.
163+05	161+72	LL	Const.	0			133	100	
162+86		CC	Struct.	1	7	11			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
162+70		CC	Struct.	1	12	5			
162+64		CC	Struct.	1	7	1			
162+62	162+59	CS	Struct.	2	7	8	3		
162+57		CC	Struct.	1	11	5			
162+34		CC	Struct.	1	7	5			
162+20	162+13	CC	Struct.	1	12				
162+15		MGO	Misc.	0					Shear key K7: majority of bitumastic bond breaker in place. Joint Width: K7R: 1", K7L: 3/4"
162+15		IS	O&M	0	9				Staining at left shear key.
161+95		CC	Struct.	1	7	11			
161+79		CC	Struct.	1	7	11			
161+79		CC	Struct.	1	1	5			
161+68		IW	O&M	2	7	8			
161+68		CC	Struct.	1	11	1			
161+68		IW	O&M	2	9				
161+68		IW	O&M	2	11				
161+68		IW	O&M	2	12				
161+64		CC	Struct.	1	7	11			
161+54		CC	Struct.	1	7	11			
161+51		IW	O&M	2	7				
161+45		CC	Struct.	1	11	5			
161+40		CC	Struct.	1	11	1			
161+34		CC	Struct.	1	11	5			
161+32		CC	Struct.	1	7	11			
161+27		CC	Struct.	1	11	5			
161+17		CC	Struct.	1	11	5			
161+17		ID	O&M	3	11				
161+11		CC	Struct.	1	7	2			
161+11		IW	O&M	2	7				

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2 Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
161+09	161+04	CS	Struct.	2	9	11	5		
161+07		CC	Struct.	1	7	11			
161+06		CC	Struct.	1	11	5			
160+99		CC	Struct.	1	1	5			
160+98		CC	Struct.	1	7	5			
160+88		CC	Struct.	1	7	11			
160+87		IW	O&M	2	7				
160+84		CC	Struct.	1	7	11			
160+83		CC	Struct.	1	4	5			
160+72		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
160+70		CC	Struct.	1	4	5			
160+70		CC	Struct.	1	7	11			
160+61		CC	Struct.	1	7	5			
160+60		DAE	O&M	2	11	1			
160+52		CC	Struct.	1	7	11			
160+49		CC	Struct.	1	1	5			
160+48		CC	Struct.	1	7	11			
160+50		IS	O&M	0	7				
160+46		CC	Struct.	1	1	5			
160+28		IW	O&M	2	7				
160+28		CC	Struct.	1	7	11			
160+26		CC	Struct.	1	1	5			
160+12		MGO	Misc.	0					Shear key K8: bitumastic bond breaker deteriorated, Joint Width: K8R: 1", K8L: 1" Exterior liner in place.
160+12		OBZ	O&M	2					Crayfish observed in joint
160+06		CC	Struct.	1	7	8			
160+06		IS	O&M	0	7	5			
160+04		CC	Struct.	1	1	5			
159+97		CC	Struct.	1	7	11			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
159+97		IS	O&M	0	7				
159+90		CC	Struct.	1	1	5			
159+88		CC	Struct.	1	7	11			
159+88		IS	O&M	0	7	8			
159+81		CC	Struct.	1	1	5			
159+81		CC	Struct.	1	7	8			
159+76		CC	Struct.	1	1	5			
159+67		CC	Struct.	1	7	11			
159+66		CC	Struct.	1	1	5			
159+60		IS	O&M	0	7	11			
159+60		IW	O&M	2	8	10			
159+53		CC	Struct.	1	1	5			
159+51		CC	Struct.	1	7	11			
159+48		CC	Struct.	1	1	5			
159+35		CC	Struct.	1	7	1			
159+30		CC	Struct.	1	11	5			
159+25		CC	Struct.	1	7	11			
159+25		CC	Struct.	1	3	5			
159+19		CC	Struct.	1	1	5			
159+18		CC	Struct.	1	7	11			
159+18		IS	O&M	0	7	8			
159+15		IW	O&M	2	7	9			
159+15		DAE	O&M	2	2				
159+08		CC	Struct.	1	11	5			
159+06		CC	Struct.	1	4	5			
159+05		CC	Struct.	1	7	11			
159+00		IW	O&M	2	7	8			
158+99		CC	Struct.	1	3	5			
158+94		CC	Struct.	1	1	5			

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2 Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
158+90		CC	Struct.	1	1	5			
158+80		ID	O&M	3	11	2			
158+75		IS	O&M	0	11	2			
158+71		CC	Struct.	1	11	1			
158+71		ID	O&M	3	11	1			
158+70		CC	Struct.	1	1	5			
158+70		CC	Struct.	1	7	11			
158+60		IW	O&M	2	7	5			
158+53	158+50	CS	Struct.	2	7	8	3		
158+52		CC	Struct.	1	1	5			
158+49		CC	Struct.	1	7	1			
158+40		CC	Struct.	1	7	11			
158+32		CC	Struct.	1	7	11			
158+29		CC	Struct.	1	7	1			
158+23		CC	Struct.	1	2	5			
158+20		CC	Struct.	1	7	10			
158+20		IW	O&M	2	7				
158+10		MGO	Misc.	0					Shear key K9: bitumastic bond breaker deteriorated. Joint Width: K9R: 3/4"-1", K9L: 3/4"-1"
158+04		CC	Struct.	1	4	5			
157+98		CC	Struct.	1	1	5			
157+87		CC	Struct.	1	1	5			
157+83		CC	Struct.	1	7	11			
157+74		CC	Struct.	1	1	5			
157+70		CC	Struct.	1	7	11			
157+67		CC	Struct.	1	11	1			
157+65		CC	Struct.	1	7	11			
157+64		CC	Struct.	1	1	5			
157+60		IW	O&M	2	7	10			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
157+50		IW	O&M	2	7	9			
157+53		CC	Struct.	1	7	4			
157+44		CC	Struct.	1	7	5			
157+39		CC	Struct.	1	9	3			
157+29		CC	Struct.	1	11	1			
157+10		ID	O&M	3	7	10			
157+10		CC	Struct.	1	7	3			
157+03		CC	Struct.	1	7	11			
157+01		CC	Struct.	1	1	5			
156+96		CC	Struct.	1	7	5			
156+94		CC	Struct.	1	4	8			
156+89		CC	Struct.	1	1	5			
156+87		CC	Struct.	1	1	5			
156+81		CC	Struct.	1	4	5			
156+78		CC	Struct.	1	7	11			
156+78		CC	Struct.	1	1	5			
156+73		CC	Struct.	1	7	11			
156+68		FC	Struct.	2	1	5			0.7 mils
156+68		IS	O&M	0	11	1			
156+64		CC	Struct.	1	7	11			
156+62		IW	O&M	2	7	8			
156+60		IW	O&M	2	7	8			
156+50		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
156+50		AMH	Const.	0					West side I-94 manhole at 11 o'clock
156+50		TFA	Const.	0	11				30" HDPE at manhole
156+46		CC	Struct.	1	7	12			
156+37		CC	Struct.	1	7	10			
156+31		CC	Struct.	1	1	5			
156+23		CC	Struct.	1	7	11			

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2 Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
156+05		MGO	Misc.	0					Shear key K10: bitumastic bond breaker deteriorated. Joint Width: K10R: 1/2"-1", K10L: 1/2"-1"
156+05		SSS	Struct.	2					6" diameter, 2" deep at right shear key.
156+05		IW	O&M	2					At joint
155+91		CC	Struct.	1	7	10			
155+80		CC	Struct.	1	7	11			
155+75		CC	Struct.	1	4	5			
155+73		CC	Struct.	1	7	11			
155+64		CC	Struct.	1	7	11			
155+54		IW	O&M	2	7	9			
155+54		CC	Struct.	1	2	5			
155+50		CC	Struct.	1	11	2			
155+50		ID	O&M	3	12	1			
155+39		CC	Struct.	1	7	5			
155+32		CC	Struct.	1	7	5			
155+24		CC	Struct.	1	7	1			
155+20		CC	Struct.	1	11	5			
155+16		CC	Struct.	1	7	11			
155+16		IW	O&M	2	7	9			
155+11		CC	Struct.	1	10	5			
155+04		CC	Struct.	1	7	2			
155+04		DAE	O&M	2	7	9			
155+04		DAE	O&M	2	12				
154+94		CC	Struct.	1	7	5			
154+94		IW	O&M	2	10	12			
154+88		IW	O&M	2	7	9			
154+88		CC	Struct.	1	7	1			
154+88		DAE	O&M	2	7	9			
154+86		CC	Struct.	1	1	5			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
154+79		CC	Struct.	1	11	1			
154+74		CC	Struct.	1	7	1			
154+74		IW	O&M	2	7	9			
154+70		CC	Struct.	1	7	11			
154+70		IW	O&M	2	7	9			
154+67		CC	Struct.	1	7	11			
154+67		IW	O&M	2	7	9			
154+67	154+62	CS	Struct.	2	8	11	5		
154+65		CC	Struct.	1	11	5			
154+55		CC	Struct.	1	7	11			
154+55		IW	O&M	2	7	9			
154+55		DAE	O&M	2	7	9			
154+50		CC	Struct.	1	7	11			
154+48		CC	Struct.	1	11	2			
154+32		CC	Struct.	1	11	1			
154+29		CC	Struct.	1	11	1			
154+22		CC	Struct.	1	1	5			
154+18		CC	Struct.	1	7	11			
154+05		MGO	Misc.	0					Shear key K11: bitumastic bond breaker deteriorated. Joint Width: K11R: 1/2"-1", K11L: 1/2"-1"
154+05		IS	O&M	0					Left shear key
153+77		IW	O&M	2	7	9			
153+77		DAE	O&M	2	7	8			
153+76		CC	Struct.	1	5	5			
153+66		CC	Struct.	1	7	5			
153+55		DAE	O&M	2	7	9			
153+55		CC	Struct.	1	11	2			
153+55		DAE	O&M	2	7	9			
153+50		CC	Struct.	1	7	11			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
153+44		CC	Struct.	1	11	2			
153+41		IW	O&M	2	7	9			
153+41		CC	Struct.	1	7	11			
153+31		CC	Struct.	1	11	5			
153+26		IW	O&M	2	7	9			
0+05		DAE	O&M	2	7	9			
153+26		CC	Struct.	1	7	12			
153+23		CC	Struct.	1	11	5			
153+18		CC	Struct.	1	7	1			
153+09		IW	O&M	2	7	9			
0+05		IW	DAE	2	7	9			
153+09		CC	Struct.	1	7	2			
153+04		CC	Struct.	1	7	5			
152+99		CC	Struct.	1	11	1			
152+94		CC	Struct.	1	11	1			
152+82		CC	Struct.	1	11	1			
152+72		CC	Struct.	1	11	1			
152+66		CC	Struct.	1	4	5			
152+63		MGO	Misc.	0					4'x 4' wall opening at 3 o'clock
152+58		MSC	Misc.	0					11-ft-wide by 12 ft tall (1-ft taller)
152+53		MGO	Misc.	0					Shear key K12: bitumastic bond breaker deteriorated. Joint Width: K12R: 3/4"-1", K12L: 3/4"-1"
152+53		IS	O&M	0	9				Staining at left shear key
152+51		SSS	Struct.	2	7				Spalling at bottom joint
152+51		MWL	Misc.	0				5	5" water depth
152+38		CC	Struct.	1	7	1			
152+27		CC	Struct.	1	7	1			
152+25		CC	Struct.	1	7	11			
152+25		CC	Struct.	1	1	5			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
152+23	152+20	CS	Struct.	2	7	1	3		
152+08	152+03	CL	Struct.	2	5		5		
152+06	152+03	CS	Struct.	2	7	8	3		
152+06	152+03	IW	O&M	2	7	8	3		
152+05		MGO	Misc.	0					Shear key 13: majority of bitumastic bond breaker in place. Joint Width: K13R: 1/2", K13L: 0"-1/4". Evidence of of differential settlement.
152+05		IW	O&M	2	9				Significant weeping at left shear key.
152+05		SSS	Struct.	2	9				Minor spalling at left shear key.
152+05		FM	Struct.	4	7	8			Fracture through shear key 13.
152+10	152+00	CM	Struct.	3	7	1	10		
152+05		MWLS	Misc.	2				5	9" water depth - rise in water level is result of a sag in the tunnel Updated coding to reflect sag.
151+93		CC	Struct.	1	7	11			
151+84		MWL	Misc.	0				5	12" water depth
151+84		CC	Struct.	1	11	1			
151+75		CC	Struct.	1	7	11			
151+75		CC	Struct.	1	1	5			
151+72		CC	Struct.	1	7	2			
151+67		CC	Struct.	1	7	11			
151+55		MGO	Misc.	0					Shear key K14: bitumastic bond breaker deteriorated. Joint Width: K14R: 3/4", K14L: 1/4"-1/2"
151+55		IS	O&M	0					Staining on left shear key.
151+55	150+99	DSF	O&M	2	12		56	5	
151+55	150+55	MWLS	Misc.	2			100	5	12" water depth
151+45		CC	Struct.	1	7	11			
151+39		CC	Struct.	1	1	5			
151+35		CC	Struct.	1	7	11			
151+27		CC	Struct.	1	7	11			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
151+25		CC	Struct.	1	11	1			
151+16		CC	Struct.	1	7	11			
151+13	151+06	CL	Struct.	2	9		7		
151+13	151+06	IS	O&M	0	7	9	7		
151+10	151+05	CS	Struct.	2	1	5	5		
151+09	151+06	CL	Struct.	2	10		3		
151+05		SSS	Struct.	2	3				spalling 10-in x 8-in x 2-in deep
151+10		MGO	Misc.	0					Shear key K15: bitumastic bond breaker deteriorated. Joint Width: K15R: 1/2"-1", K15L: 1/2"-3/4" Evidence of differential settlement.
151+07		MGO	Misc.	0	11				3" dia. pipe
150+92		CC	Struct.	1	1	5			
150+62	150+55	CS	Struct.	2	7	9	7		
150+55		MGO	Misc.	0					Shear key K16: bitumastic bond breaker deteriorated. Joint Width: K16R: 0"-3/4", K16L: 1/4"-3/4", Evidence of differential settlement.
150+35		CC	Struct.	1	7	1			
150+27		CC	Struct.	1	11	1			
150+07		MGO	Misc.	0					Shear key K17: majority of bitumastic bond breaker in place. Joint Width: K17R: 1/2"-3/4", K17L: 1/4"-3/4"
150+07		IW	O&M	2	9				At left shear key.
150+02		MSC	Misc.	0					11-ft-tall by 11-ft-tall (1 ft lower)
150+02		MWL	Misc.	0				5	6" water depth
149+86		SAV	Struct.	3	9				6-in. x 3-in. x 1/2-in. deep
149+78		CC	Struct.	1	1	5			
149+62		CC	Struct.	1	7	11			
149+55		CC	Struct.	1	7	10			
149+55		DAE	O&M	2	7	9			
149+50		CC	Struct.	1	12	5			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
149+50		DAE	O&M	2	11	12			
149+35		CC	Struct.	1	7	11			
149+33		CC	Struct.	1	1	4			
149+23		CC	Struct.	1	7	9			
149+09	149+06	CS	Struct.	2	9	10	3		
149+07		MGO	Misc.	0					Shear key K18: bitumastic bond breaker deteriorated. Joint Width: K18R: 0"-1/4", K18L: 1/4"-1/2", Evidence of differential settlement.
149+07		IW	O&M	2					Significant weeping from left shear key
149+07		IS	O&M	0	7	9			
148+86		CC	Struct.	1	7	11			
148+69		CC	Struct.	1	1	5			
148+66		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
148+64		CC	Struct.	1	1	5			
148+63		CC	Struct.	1	7	11			
148+56		CC	Struct.	1	1	12			
148+55		CC	Struct.	1	7	1			
148+48		DAE	O&M	2	7	11			
148+43		CC	Struct.	1	11	5			
148+43		ID	O&M	3	11	1			
148+40		CC	Struct.	1	7	11			
148+30		CC	Struct.	1	11	5			
148+25		CC	Struct.	1	7	5			
148+13		CC	Struct.	1	11	1			
148+05		CC	Struct.	1	7	1			
148+05		IS	O&M	0	7	11			
148+03		DAE	O&M	2	11	1			
148+00		CC	Struct.	1	11	1			
148+00		CS	Struct.	2	2	5			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
147+85		CC	Struct.	1	11	5			
147+85		DAE	O&M	2	12				
147+81		CC	Struct.	1	3	5			
147+68		CC	Struct.	1	11	1			
147+66		CC	Struct.	1	7	11			
147+56		CC	Struct.	1	7	1			
147+56		IW	O&M	2	7	9			
0+07		DAE	O&M	2	11	1			
147+44		CC	Struct.	1	7	1			
147+07		MGO	Misc.	0					Shear key K19: bitumastic bond breaker deteriorated. Joint Width: K19R: 1", K19L: 3/4"-1". Crack gauges installed by others at left and right shear key and at 12 o'clock position.
147+07		IW	O&M	2					Weeping from joint
147+07	147+00	IW	O&M	2	8	9			
146+57		CC	Struct.	1	1	5			
146+53		CC	Struct.	1	7	1			
146+53		IW	O&M	2	7	12			
146+44		CC	Struct.	1	7	11			
146+41		CC	Struct.	1	3	5			
146+33		CC	Struct.	1	7	12			
146+31		CC	Struct.	1	7	1			
146+29		CC	Struct.	1	1	5			
146+16	146+12	CS	Struct.	2	7	12	4		
146+16		IW	O&M	2	7	9			
146+06		IW	O&M	2	7	9			
146+06		DAE	O&M	2	7	9			
146+05		DAE	MGO	2					Construction equipment heard above. Sounded like vibratory compactor.

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
145+96		CC	Struct.	1	1	5			
145+90		CC	Struct.	1	7	11			
145+86		CC	Struct.	1	1	5			
145+69		CC	Struct.	1	7	11			
145+60		IS	O&M	0	7	9			
145+57		IS	O&M	0	7	9			
145+55		IS	O&M	0	7	9			
145+56		CC	Struct.	1	1	5			
145+52		IS	O&M	0	7	9			
145+42	145+39	CS	Struct.	2	7	9	3		
145+42		CC	Struct.	1	11	5			
145+31		IS	O&M	0	7	9			
145+17		CC	Struct.	1	7	11			
145+05		MGO	Misc.	0					Shear key K20: bitumastic joint filler deteriorated. Joint Width: K20R: 1", K20L: 1". Crack gauges installed by others at left and right shear key and at 12 o'clock position.
145+05		IW	O&M	2	9				At left shear key
145+05		IS	O&M	0	11	1			
144+95		IS	O&M	0	7	9			
144+87		IS	O&M	0	7	9			
144+71		IS	O&M	0	7	9			
144+66		CC	Struct.	1	4	5			
144+65		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
144+63		CC	Struct.	1	4	5			
144+60		AMH	Const.	0					Glenwood Avenue manhole at 11 o'clock. Appears abandoned.
0+08		DSGV	O&M	2	7				Directly below manhole.
144+56		IS	O&M	0	7	9			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
144+54		IS	O&M	0	7	9			
144+44		CC	Struct.	1	11	5			
144+42		CC	Struct.	1	7	1			
144+41		CC	Struct.	1	11	1			
144+32		CC	Struct.	1	7	5			
144+32		IS	O&M	0	7	11			
144+28		CC	Struct.	1	12	3			
144+19		CC	Struct.	1	9	3			
144+15		CC	Struct.	1	11	2			
144+12		CC	Struct.	1	11	1			
144+05		CC	Struct.	1	7	11			
144+05		IS	O&M	0	7	11			
143+90		CC	Struct.	1	1	5			
143+83		CC	Struct.	1	7	11			
143+79		CC	Struct.	1	1	5			
143+76		CC	Struct.	1	7	11			
143+69		CC	Struct.	1	7	9			
143+69		IW	O&M	2	7	9			
143+65		CC	Struct.	1	1	5			
143+55		IW	O&M	2	7	1			
143+44		CC	Struct.	1	7	11			
143+43		MGO	Misc.	0					8 - 4" diameter holes through wall (patched)
143+42		CC	Struct.	1	11	5			
143+28		CC	Struct.	1	1	5			
143+05		MGO	Misc.	0					Shear key K21: majority of bitumastic joint filler in place. Joint Width: K21R: 1/2"-3/4", K21L: 1/2"-3/4". Crack gauges installed by others at left and right shear key and at 12 o'clock position.
143+05		IS	O&M	0	9				Staining at left shear key

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
143+05		IS	O&M	0	3				Staining at right shear key
142+81		CC	Struct.	1	11	1			
142+61		CC	Struct.	1	1	5			
142+55		CC	Struct.	1	7	5			
142+51		CC	Struct.	1	7	1			
142+51		IS	O&M	0	7	9			
142+46		CC	Struct.	1	11	5			
142+31		CC	Struct.	1	12	1			
142+26		CC	Struct.	1	7	1			
142+25		CC	Struct.	1	11	5			
142+16		CC	Struct.	1	7	11			
142+13		CC	Struct.	1	11	1			
142+07		CC	Struct.	1	11	1			
142+05		CC	Struct.	1	11	1			
141+98		ID	O&M	3	12	1			
141+96		CC	Struct.	1	7	11			
141+80		CC	Struct.	1	12	5			
141+78		CC	Struct.	1	11	5			
141+70		CC	Struct.	1	7	2			
141+67		CC	Struct.	1	11	5			
141+63		CC	Struct.	1	7	11			
141+56		IS	O&M	0	7	1			
141+53	141+41	LL	Const.	0			12	10	
141+53		LL	Const.	0				10	
141+51		CC	Struct.	1	7	11			
141+41		CC	Struct.	1	11	1			
141+19		CC	Struct.	1	1	3			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
141+05		MGO	Misc.	0					Shear key K22: majority of bitumastic bond breaker in place. Joint Width: K22R: 1/4", K22L: 0"-1/4". Crack gauges installed by others at left and right shear key and at 12 o'clock position.
140+91		CC	Struct.	1	1	5			
140+78		CC	Struct.	1	1	5			
140+67		CC	Struct.	1	7	11			
140+62	140+58	CS	Struct.	2	3	5	4		
140+55		CC	Struct.	1	7	11			
140+50		CC	Struct.	1	11	5			
140+48		CC	Struct.	1	7	9			
140+44		CC	Struct.	1	1	5			
140+44		CC	Struct.	1	7	11			
140+40		CC	Struct.	1	11	1			
140+35		CC	Struct.	1	1	5			
140+29		CC	Struct.	1	11	5			
140+24		CC	Struct.	1	7	11			
140+21		CC	Struct.	1	12	2			
140+13		CC	Struct.	1	7	11			
140+05		CC	Struct.	1	7	10			
140+00		CC	Struct.	1	7	1			
139+90		CC	Struct.	1	7	11			
139+88		CC	Struct.	1	1	5			
139+85		CC	Struct.	1	1	5			
139+84	139+81	CS	Struct.	2	11	3	3		
139+70	139+67	CS	Struct.	2	11	5	3		
139+61	139+56	CS	Struct.	2	7	9	5		
139+54	139+23	LL	Const.	0			31	10	
139+54		SSS	Struct.	2	3				Spalling 16-in. x 6-in. x 3-in. deep on key

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
139+50		MGO	Misc.	0					Shear key K23: bitumastic bond breaker deteriorated. Joint Width: K23R: 0"-1.5", K23L: 1/4"-3/4". Evidence of differential settlement. Crack gauges installed by others at left and right shear key and at 12 o'clock position.
139+37		CC	Struct.	1	1	5			
139+12		CC	Struct.	1	1	5			
138+90		CC	Struct.	1	1	5			
138+88	138+84	CS	Struct.	2	3	5	4		
138+84		CC	Struct.	1	10	11			
138+81		CC	Struct.	1	11	3			
138+81		IS	O&M	0	11	3			
138+77		CC	Struct.	1	1	5			
138+72		CC	Struct.	1	11	5			
138+70		CC	Struct.	1	7	11			
138+68		CC	Struct.	1	1	5			
138+66		CC	Struct.	1	11	5			
138+65		CC	Struct.	1	7	5			
138+58		CC	Struct.	1	1	5			
138+57		CC	Struct.	1	7	5			
138+51		CC	Struct.	1	7	11			
138+51		IS	O&M	0	11	1			
138+45		CC	Struct.	1	11	5			
138+32		CC	Struct.	1	11	5			
138+26		CC	Struct.	1	11	5			
138+18		CC	Struct.	1	7	1			
138+18		ID	O&M	3	12	2			
138+17		CC	Struct.	1	10	5			
138+12		CC	Struct.	1	11	5			

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2 Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
138+01		ID	O&M	3	11	2			
137+89		CC	Struct.	1	11	5			
137+76		CC	Struct.	1	11	5			
137+52		MGO	Misc.	0					Shear key 24: bitumastic bond breaker deteriorated. Joint Width: K24R: 1/2", K24L: 1/4".
137+52		IS	O&M	0	9				Staining observed on left side of shear key.
137+52		SSS	Struct.	2	2				4" by 18" by 2" deep
137+18		CC	Struct.	1	1	5			
137+04		CC	Struct.	1	11	1			
137+02		CC	Struct.	1	7	11			
137+02		CC	Struct.	1	1	5			
136+99		CC	Struct.	1	11	1			
136+88		CC	Struct.	1	11	5			
136+67		CC	Struct.	1	11	5			
136+52		CC	Struct.	1	7	1			
136+24		CC	Struct.	1	12	5			
136+00		MGO	Misc.	0					Shear key 25: Joint Width: K25R: 1/4", K25L: 0"-1/2".
136+00		SSS	Misc.	2	7				3" by 4" by 3" deep
135+65		CC	Struct.	1	11	5			
135+54	135+48	CS	Struct.	2	7	1	6		
135+48		CC	Struct.	1	7	2			
135+48		IW	O&M	2	7				
135+31		CC	Struct.	1	11	5			
135+21	135+14	CS	Struct.	2	7	3	7		
135+12		CC	Struct.	1	1	5			
135+09	135+03	CS	Struct.	2	7	1	6		
134+98		IW	O&M	2	7	9			
134+98		IS	O&M	0	11	1			
134+95	134+83	CS	Struct.	2	7	11	12		

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
134+80		IW	O&M	2	7				
134+79		CC	Struct.	1	1	5			
134+77		CC	Struct.	1	7	1			
134+67	134+60	CS	Struct.	2	7	1	7		
134+61	134+51	CS	Struct.	2	7	9	10		
134+47		IW	O&M	2	11	1			
134+26		CC	Struct.	1	1	5			
134+10		AMH	Const.	0					manhole Between Royalston and 10th St Bridge
134+10		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
134+05		MGO	Misc.	0					Shear key K26: bitumastic bond breaker in place. Joint Width: K26R: 0"-1/4", K26L: 0"-1/4".
133+79		IS	O&M	0	8	9			
133+79		CC	Struct.	1	11	12			
133+70		ID	O&M	3	7	10			
133+70		IW	O&M	2	2	5			
133+67		CC	Struct.	1	11	1			
133+62		CC	Struct.	1	11	1			
133+60		IW	O&M	2	11	1			
133+60		CC	Struct.	1	11	5			
133+60		ID	O&M	3	11	12			
133+53		DAE	O&M	2	7	11		5	
133+53		IW	O&M	2	7	1			
133+45		DAE	O&M	2	7	11		5	
133+43		DAE	O&M	2	1	5		5	
133+43		CC	Struct.	1	11	1			
133+40		CC	Struct.	1	11	1			
133+39		DAE	O&M	2	7	11		5	
133+39		CC	Struct.	1	11	1			
133+33		CC	Struct.	1	10	2			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
133+27		CC	Struct.	1	10	2			
133+24		CC	Struct.	1	11	1			
133+24		DAE	O&M	2	7	11		5	
133+22		DAE	O&M	2	7	11		5	
133+22		ID	O&M	3	7	11			
133+17		CC	Struct.	1	11	1			
133+02		DAE	O&M	2	7	1		5	
133+02		IW	O&M	2	7	11			
133+02		ID	O&M	3	11	1			
133+02		IW	O&M	2	7	5			
132+90		CC	Struct.	1	11	1			
132+90		ID	O&M	3	11	1			
132+88		CC	Struct.	1	11	1			
132+81		CC	Struct.	1	11	1			
132+81		ID	O&M	3	11	12			
132+75		CC	Struct.	1	11	2			
132+67		CC	Struct.	1	1	5			
132+63		CC	Struct.	1	8	11			
132+56		FS	Struct.	3	3	5			
132+53		MGO	Misc.	0					Shear key K27: bitumastic bond breaker deteriorated. Joint Width: K27R: 0"-1/2", K27L: unable to measure. Evidence of differential settlement.
132+53		FM	Struct.	4					Cracks/fractures observed in joints
132+53		DAE	O&M	2	9				Left shear key covered by deposits
132+53		SSS	Struct.	2	3				At right shear key, 3" by 4" by 1/2" deep
132+53		CC	Struct.	1	4	5			
132+53		DAE	O&M	2	7	11		5	
132+53		IW	O&M	2	7	11			
132+35		CC	Struct.	1	1	5			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
132+28		CC	Struct.	1	7	11			
132+05		MWLS	Misc.	2				5	13" water depth - increase in depth caused by slight sag
132+19		CC	Struct.	1	7	11			
132+02		MWL	Misc.	0				5	15" water depth
132+02		DAE	O&M	2	7	11		5	
131+98		CC	Struct.	1	7	11			
131+72		CC	Struct.	1	7	11			
131+75	131+10	DSF	O&M	2	6		19	5	
131+53		MGO	Misc.	0					Shear key K28: bitumastic bond breaker deteriorated, exterior wrap visible. Joint Width: K28R: 1"-1.5", K28L: 1/2"-1.5". Evidence of differential settlement. Joint 1'-6" deep.
131+53		FM	Struct.	4					Cracks/fractures observed in joints
131+53		IS	O&M	0	9				Staining at left shear key
131+53		FC	Struct.	2	9	11			
131+53		SSS	Struct.	2	1				Spalling 6-in. x 6-in x 3-in deep
131+05		MWL	Misc.	0					13"
131+05		MGO	Misc.	0					Shear key K29: majority of bitumastic bond breaker in place. Joint Width: K29R: 0"-1/4", K29L: 0"-1/4".
131+05		MWL	Misc.	0				5	8-in water depth
130+76		CC	Struct.	1	7	11			
130+63		CC	Struct.	1	7	11			
130+53		MGO	Misc.	0					Shear key K30: majority of bitumastic bond breaker in place, left joint has been patched. Joint Width: K30R: 0-1", K30L: 0"-1/4". Evidence of differential settlement.
130+53		FL	Struct.	3	3	3			Right joint has a fracture
130+53		FC	Struct.	2	1	3			2.5mm wide

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
130+53	130+42	CL	Struct.	2	9		11		
130+39		CC	Struct.	1	7	11			
130+38	130+31	CS	Struct.	2	7	9	7		
130+35		CC	Struct.	1	1	5			
130+29	130+25	CS	Struct.	2	12	5	4		
130+29		MWL	Misc.	0				5	6-in. water depth
130+22		CC	Struct.	1	7	11			
130+20		CC	Struct.	1	11	1			
130+15		IW	O&M	2	7				
130+15		CC	Struct.	1	7	11			
130+07		CC	Struct.	1	7	11			
130+05		IW	O&M	2	7				
129+96		CC	Struct.	1	10	2			
129+92		CC	Struct.	1	10	2			
129+92		CC	Struct.	1	7	5			
129+92		ID	O&M	3	11	2			
129+87		CC	Struct.	1	11	2			
129+86		IW	O&M	2	7	9			
129+86		CC	Struct.	1	11	1			
129+80		CC	Struct.	1	11	3			
129+77	129+66	LL	Const.	0			11	10	IW(?)
129+76		CC	Struct.	1	11	1			IW(?)
129+76		IW	O&M	2	12	2			IW(?)
129+66		CC	Struct.	1	1	5			IW(?)
129+54		IW	O&M	2	11	2			IW(?)
129+39		CC	Struct.	1	1	5			IW(?)
129+30		CC	Struct.	1	1	5			IW(?)
129+14		CC	Struct.	1	1	5			IW(?)
128+88		CC	Struct.	1	7	12			

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
128+75		CC	Struct.	1	7	11			
128+57		MGO	Misc.	0					Shear key K31: bitumastic bond breaker deteriorated. Joint Width: K31R: 1/2"-3/4", K31L: 1/2"-3/4".
128+57		IW	O&M	2	9				Weeping at left shear key
128+57		IW	O&M	2	7	5			Weeping at right shear key
128+57		ID	O&M	3	10	2			
128+50		AMH	Const.	0					new Twins Stadium (7th St) manhole at 12 o'clock
128+50		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
128+48		CC	Struct.	1	5	6			
128+39		CC	Struct.	1	7	11			
127+85		CC	Struct.	1	1	5			
127+83		MGO	Misc.	0					L-bracket fastened to wall
127+77		CC	Struct.	1	1	5			
127+71		CC	Struct.	1	7	12			
127+70		CC	Struct.	1	1	5			
127+67		CC	Struct.	1	7	11			
127+67		CC	Struct.	1	1	5			
127+30		CC	Struct.	1	12	5			
127+20	127+03	CL	Struct.	2	9		11		
127+15	126+98	CL	Struct.	2	10		11		
127+12		CC	Struct.	1	11	1			
127+12		IS	O&M	0	11	1			
127+04		IS	O&M	0	7	8			
126+98	126+84	CL	Struct.	2	9		8		
126+97		CC	Struct.	1	7	11			
126+97		CC	Struct.	1	1	5			
126+76		CC	Struct.	1	1	5			
126+75		IW	O&M	2	7				

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2 Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
126+50		MGO	Misc.	0					Shear key K32: majority of bitumastic bond breaker in place. Joint Width: K32R: 0"-1/4", K32L: 0"-1/4".
126+50		FL	Struct.	3	8				2.5mm left joint
126+50		SSS	Struct.	2	9				fractured but in place
126+50		ID	O&M	3	11	2			
126+50		FC	Struct.	2	10	11			
126+20		CC	Struct.	1	7	11			
126+13		CC	Struct.	1	1	1			
126+12		CC	Struct.	1	11	1			
126+07		CC	Struct.	1	1	5			
125+90		CC	Struct.	1	7	11			
125+86		CC	Struct.	1	11	5			
125+74		CC	Struct.	1	12	5			
125+72	125+69	CS	Struct.	2	7	12	3		
125+69		CC	Struct.	1	11	1			
125+64		CC	Struct.	1	7	11			
125+61	125+58	CS	Struct.	2	10	1	3		
125+57		CC	Struct.	1	11	5			
125+49		IS	O&M	0	11	1			
125+41	125+29	CS	Struct.	2	7	4	12		
125+37		CC	Struct.	1	1	5			
125+35		CC	Struct.	1	1	5			
125+33		CC	Struct.	1	1	5			
125+30		CC	Struct.	1	7	1			
125+25		CC	Struct.	1	11	1			
125+16		CC	Struct.	1	7	11			
125+15		CC	Struct.	1	1	5			
125+10		CC	Struct.	1	4	5			
125+10		AMH	Const.	0					Abandoned 6th Street manhole at 11 o'clock.

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
125+10		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock.
125+08		CC	Struct.	1	4	5			
125+01		IW	O&M	2	11	1			
124+96		CC	Struct.	1	1	5			
124+92	124+85	CS	Struct.	2	7	9	3		
124+86		CC	Struct.	1	1	5			
124+84		CC	Struct.	1	3	5			
124+79		CC	Struct.	1	7	10			
124+79		CC	Struct.	1	7	8			
124+50		MGO	Misc.	0					Shear key K33: majority of bitumastic bond breaker in place. Joint Width: K33R: 1/2"-3/4", K33L: 1/2".
124+17		CC	Struct.	1	8	11			
124+00		IW	O&M	2	11	1			
123+88		CC	Struct.	1	7	11			
123+84		CC	Struct.	1	1	5			
123+51		IW	O&M	2	1	5			
123+49		ID	O&M	3	11	1			
123+43		CC	Struct.	1	11	1			
123+38		CC	Struct.	1	11	2			
123+37	123+21	LR	Const.	0			16	10	
123+37		LR	Const.	0				10	
123+30		CC	Struct.	1	11	1			
123+25		IW	O&M	2	7				
123+25		CC	Struct.	1	9	2			
123+22		CC	Struct.	1	7	1			
122+99		IW	O&M	2	7				
122+95		CC	Struct.	1	11	1			
122+88		CC	Struct.	1	7	10			
122+78		CC	Struct.	1	7	10			

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2 Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
122+77		IW	O&M	2	7	8			
122+52		MGO	Misc.	0					Shear key K34: bitumastic bond breaker deteriorated, left key has patch repair. Joint Width: K34R: 3/4"-1", K34L: 3/4".
122+35		MGO	Misc.	0					Two L-brackets fastened to wall
122+23		CC	Struct.	1	2	5			
122+16		MGO	Misc.	0					L-bracket fastened to wall at 3 o'clock
122+11		CC	Struct.	1	1	4			
121+89		CC	Struct.	1	11	4			
121+78		CC	Struct.	1	9	1			
121+75		CC	Struct.	1	7	5			
121+55	121+52	CS	Struct.	2	7	10	3		
121+34		CC	Struct.	1	11	5			
121+04	121+01	CS	Struct.	2	4	5	3		
121+00		SSS	Struct.	2	11				Spalling 2-in x 4-in x 2-in deep left joint
121+00		MGO	Misc.	0					Shear key K35: majority of bitumastic bond breaker in place. Joint Width: K35R: 1/4"-1/2", K35L: 1/4"-1/2". Evidence of differential settlement.
121+00		FM	Struct.	4	9				Fractures observed at left shear key
121+00		IS	O&M	0	9				Staining observed at left shear key
120+61		CC	Struct.	1	7	9			
120+59		CC	Struct.	1	7	9			
120+50		CC	Struct.	1	7	9			
120+50		IW	O&M	2	7	8			
120+32		CC	Struct.	1	7	9			
120+31	120+24	CS	Struct.	2	7	10	7		
120+22		CC	Struct.	1	3	5			
120+20		RPP	Struct.	0	9				2-ft x 2-ft patch repair

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Box Culvert - Left Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
120+09	120+01	OBZ	O&M	2	6				4' by 8' piece of plywood in invert, catching some minor debris
120+00		MSA	Misc.	0					Beginning of 11-ft tall by 15-ft-wide single box culvert. See separate notes for single box culvert inspection.

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2 Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
172+25		MGO	Misc.	0					11/15/24 10:15 A.M. Start inspection in right (north) box starting at trash rack and walking downstream. Inspectors: Josh Phillips, Jack Mettlach, and Hannah Bruce.
172+25		MSC	Misc.	0					Begining of double box culvert 11-ft-high by 11-ft-wide.
172+25		MWL	Misc.	0					6" water depth
172+25		CC	Struct.	1	2	5			
172+02		CC	Struct.	1	7	10			
172+02		CC	Struct.	1	1	5			
172+00		MGO	Misc.	0					Shear key K. Right and left shear keys are referenced walking downstream. Majority of bitumastic bond breaker in place. Joint width: K1R: 1-1/2"-2", K1L: 2". Evidence of differential settlement.
172+00		IS	O&M	0	3				Staining observed on right shear key.
172+00		SSS	Struct.	2	12				
172+00		CC	Struct.	1	7	5			
171+95		CC	Struct.	1	3	5			
171+92		CC	Struct.	1	2	5			
171+85		CC	Struct.	1	2	5			
171+80		CC	Struct.	1	1	5			
171+75		CC	Struct.	1	1	5			
171+74		CC	Struct.	1	7	11			
171+64		CC	Struct.	1	2	5			
171+56		CC	Struct.	1	1	5			
171+56		CC	Struct.	1	7	11			
171+50		IW	O&M	2	7	9			
171+50		IS	O&M	0	9	5			
171+50		CC	Struct.	1	7	11			
171+45		CC	Struct.	1	7	11			
171+43		CC	Struct.	1	2	5			
171+40		CC	Struct.	1	7	11			
171+37		CC	Struct.	1	9	11			
171+28		CC	Struct.	1	1	5			
171+24		IW	O&M	2	10	11			

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[2] Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
171+15		CC	Struct.	1	4	5			
171+11		CC	Struct.	1	7	1			
171+05		CC	Struct.	1	7	8			
171+04		CC	Struct.	1	11	1			
171+04		CC	Struct.	1	7	8			
170+80		TFA	Const.	0	3				4-ft-dia. RCP
170+80		AMH	Const.	0					Dupont access manhole
170+80		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock.
170+80		CC	Struct.	1	7	8			
170+79		CC	Struct.	1	7	8			
170+71		CC	Struct.	1	12	1			
170+68		CC	Struct.	1	7	10			
170+50		CC	Struct.	1	7	9			
170+36		CC	Struct.	1	1	5			
170+05		MGO	Misc.	0					Shear key K2: majority of bitumastic bond breaker in place but crumbling. Joint Width: K2R: 1/2"-1", K2L: 1/2"-1".
169+79		CC	Struct.	1	2	5			
169+71		CC	Struct.	1	2	5			
169+64		CC	Struct.	1	7	10			
169+64		CC	Struct.	1	1	5			
169+56		CC	Struct.	1	7	11			
169+51		IW	O&M	2	5				
169+42		CC	Struct.	1	3	5			
169+36		CC	Struct.	1	1	5			
169+36		CC	Struct.	1	8	11			
169+30		CC	Struct.	1	1	5			
169+30		IW	O&M	2	3	5			
169+26		CC	Struct.	1	2	5			
169+24		CC	Struct.	1	7	9			
169+11		CC	Struct.	1	1	5			
169+04		CC	Struct.	1	9	11			
169+00		IW	O&M	2	5				
168+92		CC	Struct.	1	2	5			

[1] The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

[2] Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
168+87		CC	Struct.	1	1	5			
168+86		CC	Struct.	1	8	1			
168+81		CC	Struct.	1	3	5			
168+79		CC	Struct.	1	7	10			
168+78		CC	Struct.	1	1	4			
168+73		CC	Struct.	1	1	5			
168+70		CC	Struct.	1	7	11			
168+45		CC	Struct.	1	3	5			
168+45		IW	O&M	2	5				
168+40		CC	Struct.	1	11	1			
168+37		CC	Struct.	1	7	11			
168+32		CC	Struct.	1	1	5			
168+24		CC	Struct.	1	1	5			
168+26		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock.
168+25		CC	Struct.	1	7	8			
168+19		CC	Struct.	1	11	1			
168+18		CC	Struct.	1	3	5			
168+12		CC	Struct.	1	7	11			
168+11		CC	Struct.	1	3	5			
168+02		MGO	Misc.	0					Shear key K3: majority of bitumastic bond breaker in place. Joint Width: K3R: 3/4"-1", K3L: 1/2"-3/4".
168+02		SSS	Struct.	2	8				3" by 2" by 1/2" deep at shear key.
167+70		IS	O&M	0	4	5			
167+49		CC	Struct.	1	2	5			
167+42		IS	O&M	0	5	6			
167+42		CC	Struct.	1	7	9			
167+28		CC	Struct.	1	3	5			
167+24		CC	Struct.	1	7	1			
167+17		LR	Const.	0				50	45 degree bend right.
167+09		IS	O&M	0	5	6			
167+04		CC	Struct.	1	7	9			
166+99		CC	Struct.	1	1	5			
166+86		CC	Struct.	1	7	5			

[1] The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

[2] Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
166+81		CC	Struct.	1	10	5			
166+77		SAV	Struct.	3	8				
166+75		CC	Struct.	1	1	5			
166+63		IS	O&M	0	3	5			
166+63		CC	Struct.	1	7	10			
166+54		CC	Struct.	1	10	5			
166+47		CC	Struct.	1	7	11			
166+47		CC	Struct.	1	2	5			
166+37		CC	Struct.	1	2	5			
166+37		CC	Struct.	1	7	10			
166+32		CC	Struct.	1	7	11			
166+31		CC	Struct.	1	2	5			
166+23		CC	Struct.	1	1	5			
166+08		MGO	Misc.	0					Shear key K4: majority of bitumastic bond breaker in place. Joint Width: K4R: 1/2"-1", K4L: 1/4"-3/4". Evidence of soil intrusion through joint. Uneven joint at bottom.
166+08		IW	O&M	2	3				Weeping on right side at shear key
166+08		FC	Struct.	2	11				
166+08		DSGV	O&M	2	6			5	Gravel in invert
165+90		CC	Struct.	1	7	11			
165+90		CC	Struct.	1	1	5			
165+82		CC	Struct.	1	7	11			
165+82		CC	Struct.	1	2	5			
165+70		CC	Struct.	1	7	9			
165+68		CC	Struct.	1	2	5			
165+57		CC	Struct.	1	1	5			
165+57		IS	O&M	0	3	5			
165+46		CC	Struct.	1	7	8			
165+43		CC	Struct.	1	7	1			
165+37		CC	Struct.	1	1	5			
165+31		CC	Struct.	1	7	11			
165+31		CC	Struct.	1	1	5			
165+18		AMH	Const.	0					Colfax access manhole at 2 o'clock.

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
165+10		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock.
165+10		CC	Struct.	1	1	5			
165+10		CC	Struct.	1	7	8			
165+10		SRV	Struct.	5	12				
165+09		CC	Struct.	1	7	8			
165+00		CC	Struct.	1	1	5			
164+97		CC	Struct.	1	7	1			
164+76		CC	Struct.	1	1	5			
164+74		MGO	Misc.	0					Shear key K5: majority of bitumastic bond breaker in place but crumbling. Joint Width: K5R: 1/2"-1", K5L: 1/2"-3/4".
164+65		CC	Struct.	1	2	5			
164+64		CC	Struct.	1	1	5			
164+59		CC	Struct.	1	1	5			
164+49		MSC	Misc.	0					2-in. bump out on left side of tunnel, same as left side.
164+44		CC	Struct.	1	1	5			
164+36		CC	Struct.	1	1	5			
164+28		CC	Struct.	1	1	5			
164+22		CC	Struct.	1	1	5			
164+22		CC	Struct.	1	7	11			
164+19		CC	Struct.	1	7	11			
164+14		CC	Struct.	1	7	11			
164+12		CC	Struct.	1	1	5			
164+11		CC	Struct.	1	7	11			
164+04		CC	Struct.	1	1	5			
164+00		CC	Struct.	1	7	11			
163+95		CC	Struct.	1	1	5			
163+85		ID	O&M	3	11	1			
163+83		CC	Struct.	1	7	10			
163+72		CC	Struct.	1	7	9			
163+72		CC	Struct.	1	1	5			
163+61		CC	Struct.	1	11	5			
163+60		IS	O&M	0	1	5			
163+48		CC	Struct.	1	7	1			

[1] The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
163+46		CC	Struct.	1	1	5			
163+43		CC	Struct.	1	11	12			
163+43		CC	Struct.	1	1	5			
163+42		MSC	Misc.	0					End of 2-in. bump out, same as left box
163+37		CC	Struct.	1	7	11			
163+35		CC	Struct.	1	1	5			
163+32		CC	Struct.	1	7	10			
163+27		CC	Struct.	1	1	5			
163+11		CC	Struct.	1	7	8			
163+12		MGO	Misc.	0					Shear key K6: majority of bitumastic bond breaker in place. Joint Width: K6R: 1/2"-3/4", K6L: 1/2"-3/4". Evidence of differential settlement. Crack gauges installed by others at left and right shear key, and at the 12 o'clock position.
163+12	161+30	LL	Const.	0			182	100	
163+12		SAV	Struct.	3	6				
163+12		DSGV	O&M	2	6			5	
163+12	162+25	MGO	Misc.	0	11		87		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
163+12	160+35	MGO	Misc.	0	12		277		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
163+18	161+25	MGO	Misc.	0	1		193		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
163+01		CC	Struct.	1	1	5			
162+92		CC	Struct.	1	2	5			
162+91		CC	Struct.	1	7	11			
162+81		CC	Struct.	1	1	5			
162+75		OBZ	O&M	2	6			5	2' by 3' by 1/2" steel plate in invert
162+62		CC	Struct.	1	1	5			
162+61		CC	Struct.	1	7	12			
162+24		CC	Struct.	1	1	5			

[1] The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
162+08		MGO	Misc.	0					Shear key K7: majority of bitumastic bond breaker in place. Joint Width: K7R: 3/4", K7L: 3/4".
162+08		IS	O&M	0	3				Staining observed on right shear key
161+98		CC	Struct.	1	1	5			
161+93		CC	Struct.	1	1	5			
161+86		CC	Struct.	1	1	5			
161+86		CC	Struct.	1	7	9			
161+72		CC	Struct.	1	1	5			
161+54		CC	Struct.	1	3	5			
161+54		IW	O&M	2	3	5			
161+54		CC	Struct.	1	7	11			
161+40		CC	Struct.	1	7	11			
161+34		CC	Struct.	1	2	4			
161+34		CC	Struct.	1	11	1			
161+33		IW	O&M	2	5				
161+24		CC	Struct.	1	9	1			
161+13		CC	Struct.	1	11	5			
161+06		CC	Struct.	1	1	5			
161+06		CC	Struct.	1	7	11			
161+02		DAE	O&M	2	11				
161+01		CC	Struct.	1	7	1			
160+96		CC	Struct.	1	11	5			
160+96		DAE	O&M	2	11				
160+89		CC	Struct.	1	2	5			
160+84		CC	Struct.	1	7	11			
160+76		IW	O&M	2	4	5			
160+66		CC	Struct.	1	7	8			
160+72		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock.
160+72		CC	Struct.	1	7	8			
160+70		CC	Struct.	1	7	8			
160+70		CC	Struct.	1	1	5			
160+60		IW	O&M	2	4	5			
160+60		IW	O&M	2	7	10			

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
160+60		ID	O&M	3	12	2			
160+49		CC	Struct.	1	1	5			
160+49		CC	Struct.	1	7	11			
160+44		CC	Struct.	1	1	5			
160+38		CC	Struct.	1	1	5			
160+38		CC	Struct.	1	7	10			
160+25		IW	O&M	2	5				
160+25		CC	Struct.	1	1	5			
160+25		CC	Struct.	1	7	11			
160+09		MGO	Misc.	0					Shear key K8: majority of bitumastic bond breaker in place. Joint Width: K8R: 3/4"-1", K8L: 1"-1-1/2". External liner wrap visible through the right shear key.
159+96		CC	Struct.	1	1	5			
159+91		CC	Struct.	1	7	10			
159+89		CC	Struct.	1	1	5			
159+87		CC	Struct.	1	7	11			
159+75		CC	Struct.	1	7	11			
159+68		CC	Struct.	1	7	11			
159+66		CC	Struct.	1	1	5			
159+63		CC	Struct.	1	1	5			
159+63		CC	Struct.	1	2	5			
159+62		CC	Struct.	1	7	11			
159+56		IR	O&M	4	3	5			
159+56		CC	Struct.	1	7	9			
159+50		CC	Struct.	1	8	11			
159+44		CC	Struct.	1	1	5			
159+44		CC	Struct.	1	7	11			
159+38		CC	Struct.	1	2	5			
159+32		CC	Struct.	1	1	5			
159+22		CC	Struct.	1	3	5			
159+21		CC	Struct.	1	7	11			
159+15		CC	Struct.	1	7	9			
159+10		CC	Struct.	1	2	5			

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
159+10	158+12	MGO	Misc.	0	12		98		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
159+06		DAE	O&M	2	2	5			
159+06		ID	O&M	3	11	12			
158+98		CC	Struct.	1	1	5			
158+98		CC	Struct.	1	7	9			
158+96		CC	Struct.	1	7	10			
158+91		IS	O&M	0	7	1			Looks black, like mold
158+88		CC	Struct.	1	7	11			
158+85		ID	O&M	3	11				
158+85		CC	Struct.	1	11	1			
158+75		ID	O&M	3	2				
158+74		CC	Struct.	1	1	5			
158+72		CC	Struct.	1	11	5			
158+72		IW	O&M	2	1	5			
158+68		ID	O&M	3	11	12			
158+67		CC	Struct.	1	7	1			
158+64		CC	Struct.	1	11	5			
158+60		ID	O&M	3	11	1			
158+54		CC	Struct.	1	11	1			
158+54		CC	Struct.	1	1	5			
158+47		CC	Struct.	1	11	1			
158+44		CC	Struct.	1	1	5			
158+12		MGO	Misc.	0					Shear key K9: majority of bitumastic bond breaker in place, but starting to fall out. Joint Width: K9R: 1/2"-3/4", K9L: 3/4"-1".
158+12		IS	O&M	0	3				Staining at the right shear key.
157+98		CC	Struct.	1	7	11			
157+96		IW	O&M	2	3				
157+86		CC	Struct.	1	3	5			
157+68		CC	Struct.	1	1	5			
157+62		CC	Struct.	1	4	5			

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
157+53		CC	Struct.	1	12	5			
157+50		CC	Struct.	1	11	1			
157+48		CC	Struct.	1	12	1			
157+46		CC	Struct.	1	11	12			
157+44		CC	Struct.	1	11	12			
157+37		CC	Struct.	1	2	5			
157+31		CC	Struct.	1	11	1			
157+27		CC	Struct.	1	11	1			
157+21		CC	Struct.	1	7	11			
157+13		IW	O&M	2	3	5			
157+10		DAE	O&M	2	3	5			
157+07		CC	Struct.	1	2	5			
157+02		CC	Struct.	1	7	11			
157+01		CC	Struct.	1	2	5			
156+93		CC	Struct.	1	7	11			
156+93		CC	Struct.	1	1	5			
156+91		CC	Struct.	1	7	10			
156+81		CC	Struct.	1	7	11			
156+71		CC	Struct.	1	7	5			
156+71		IW	O&M	2	3	5			
156+61		IW	O&M	2	3	5			
156+61		CC	Struct.	1	11	12			
156+55		CC	Struct.	1	7	8			
156+50		AMH	Const.	0					West side I-94 manhole at 1 o'clock.
156+50		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock.
156+50		CC	Struct.	1	7	8			
156+50		CC	Struct.	1	12	2			
156+48		CC	Struct.	1	7	8			
156+48		CC	Struct.	1	9	11			
156+32		CC	Struct.	1	2	5			
156+30		CC	Struct.	1	7	11			
156+22		OBR	O&M	2	5				5" diameter

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
156+05		MGO	Misc.	0					Shear key K10: bitumastic bond breaker is deteriorated. Joint Width: K10R: 1/2"-3/4", K10L: 1/4"-3/4". Evidence of differential settlement.
156+05		SSS	Struct.	2	4	5			7" by 3" by 1/2" deep at shear key
156+05		IW	O&M	2	4	5			
155+92		CC	Struct.	1	1	5			
155+78		CC	Struct.	1	1	5			
155+72	154+95	MGO	Misc.	0	12		77		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
155+70		CC	Struct.	1	11	1			
155+67		CC	Struct.	1	1	5			
155+55		CC	Struct.	1	7	11			
155+55		CC	Struct.	1	1	5			
155+50		CC	Struct.	1	10	1			
155+50		ID	O&M	3	11	1			
155+41		CC	Struct.	1	7	11			
155+41		ID	O&M	3	11	12			
155+37		CC	Struct.	1	1	5			
155+34		CC	Struct.	1	7	5			
155+34		ID	O&M	3	11	12			
155+24		CC	Struct.	1	11	1			
155+18		CC	Struct.	1	11	1			
155+11		CC	Struct.	1	11	1			
155+05		CC	Struct.	1	1	5			
154+97		CC	Struct.	1	7	5			
154+97		IS	O&M	0	11	1			
154+88		CC	Struct.	1	11	5			
154+81		CC	Struct.	1	11	5			
154+81		IS	O&M	0	12	1			
154+73		CC	Struct.	1	12	1			
154+73		IS	O&M	0	1				
154+69		CC	Struct.	1	1	5			

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
154+66		CC	Struct.	1	7	1			
154+66		IW	O&M	2	3				
154+57		CC	Struct.	1	1	5			
154+45		CC	Struct.	1	11	1			
154+39		CC	Struct.	1	7	11			
154+35		CC	Struct.	1	7	11			
154+32		IW	O&M	2	5				
154+29		CC	Struct.	1	1	5			
154+29		IW	O&M	2	5				
154+24		CC	Struct.	1	7	11			
154+20	154+00	MGO	Misc.	0	12		0+20		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
154+19		CC	Struct.	1	1	5			
154+15		CC	Struct.	1	1	5			
154+04		MGO	Misc.	0					Shear key K11: majority of bitumastic bond breaker in place. Joint Width: K11R: 1/2"-3/4", K11L: 1/4"-1/2".
154+04		SSS	Struct.	2	12				
154+04		SAV	Struct.	3	4				
153+90		CC	Struct.	1	1	5			
153+78		CC	Struct.	1	1	5			
153+76		CC	Struct.	1	7	11			
153+66		CC	Struct.	1	1	5			
153+48		IS	O&M	0	5				
153+44		CC	Struct.	1	7	1			
153+39		CC	Struct.	1	1	5			
153+30		CC	Struct.	1	7	12			
153+22		CC	Struct.	1	11	5			
153+18		CC	Struct.	1	11	1			
153+07		IW	O&M	2	2	5			
153+07		CC	Struct.	1	11	1			
153+04		CC	Struct.	1	7	1			
153+04	152+94	MGO	Misc.	0	6				Steeper invert for 10 feet

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
152+98		CC	Struct.	1	11	5			
152+98		IW	O&M	2	3	5			
152+95		CC	Struct.	1	11	2			
152+92		CC	Struct.	1	11	1			
152+89		CC	Struct.	1	11	1			
152+66		IW	O&M	2	5				
152+63		CC	Struct.	1	7	8			
152+60		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
152+58		MSC	Misc.	0					11-ft-wide by 12 ft tall (1-ft taller)
152+53		MGO	Misc.	0					Shear key K12: bitumastic bond breaker deteriorated. Joint Width: K12R: 1/2"-3/4", K12L: 1/2". Soil observed at joint.
152+53		SSS	Struct.	2	3				At right shear key
152+53		IW	O&M	2	3				At right shear key
152+53		IS	O&M	0	3				At right shear key
152+27		CC	Struct.	1	10	1			
152+26		CC	Struct.	1	7	12			
152+21		CC	Struct.	1	12	5			
152+19		CC	Struct.	1	11	1			
152+08	151+75	CC	Struct.	1	7	9	9		
152+06		CC	Struct.	1	5	4			
152+06		FM	Struct.	4	8				
152+05		MGO	Misc.	0					Shear key K13: majority of bitumastic bond breaker in place. Joint Width: K13R: 0"-1", K13L: 0"-1". Evidence of differential settlement.
152+05	151+72	CL	Struct.	2	3		9		
151+99		MWLS	Misc.	2				5	10 inches of water observed in 2024
151+75	151+00	DSF	O&M	2	6		75	5	
151+72		CC	Struct.	1	1	5			
151+65		CC	Struct.	1	3	5			
151+64	151+31	CS	Struct.	2	2	3	9		

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
151+55		MGO	Misc.	0					Shear key K14: majority of bitumastic bond breaker in place. Joint Width: K14R: 0"-1/2", K14L: 1/2". Evidence of differential settlement.
151+39		CC	Struct.	1	1	5			
151+28		CC	Struct.	1	1	5			
151+24		CC	Struct.	1	7	1			
151+24		CC	Struct.	1	11	12			
151+21		CC	Struct.	1	1	5			
151+09	150+81	CL	Struct.	2	3		4		
151+09	150+81	CS	Struct.	2	1	11	4		
151+07	150+78	CS	Struct.	2	2	3	5		
151+05		MGO	Misc.	0					Shear key K15: bitumastic bond breaker deteriorated. Joint Width: K15R: 1/4"-3/4", K15L: 1/4"-1". Evidence of differential settlement. Some soil observed at joint.
151+05		CL	Struct.	2					Cracks in joints.
151+05		IS	O&M	0	3				Staining was observed at the right shear key.
151+05		SSS	Struct.	2	10				6" by 6" by 1" deep at shear key
151+05		SSS	Struct.	2	2				6" by 6" by 1" deep at shear key
151+02	150+72	CL	Struct.	2	3		6		
150+89		CC	Struct.	1	7	11			
150+55		MGO	Misc.	0					Shear key K16: majority of bitumastic bond breaker in place. Joint Width: K16R: 0"-1/2", K16L: 0"-3/4". Evidence of differential settlement.
150+55		SSS	Struct.	2	2				4" by 2" by 2" deep
150+49		MWL	Misc.	0				5	6" of water observed in 2024
150+11	149+81	CL	Struct.	2	3		6		
150+06		MGO	Misc.	0					Shear key K17: majority of bitumastic bond breaker in place. Joint Width: K17R: 0"-1/2", K17L: 1/2". Evidence of differential settlement. Some soil observed at joint. Slight buckling of invert observed.
150+06		IS	O&M	0					Staining observed at joint.
150+06		IW	O&M	2	3				Weeping observed on right joint.
150+06		B	Struct.	4					Pipe invert broken

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
150+06		IW	O&M	2	11	5			
150+05		MSC	Misc.	0					11-ft-tall by 11-ft-tall (1 ft lower)
149+90		CC	Struct.	1	11	1			
149+81		CC	Struct.	1	11	1			
149+72		CC	Struct.	1	11	1			
149+54	149+50	MGO	Misc.	0	12		4		Pattern of surficial corrosion for two rows every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
149+53		CC	Struct.	1	7	11			
149+50		AMH	Const.	0	1				Chestnut Street manhole at 1 o'clock
149+50		CC	Struct.	1	2	5			
149+46		CC	Struct.	1	7	1			
149+46		ID	O&M	3	11	2			
149+05		MGO	Misc.	0					Shear key K18: majority of bitumastic bond breaker deteriorated. Joint Width: K18R: 0"-1/2", K18L: 1/4"-1/2".
149+05		MGO	IS	0	3				Staining on right key.
148+84		CC	Struct.	1	1	5			
148+79		CC	Struct.	1	7	1			
148+74		CC	Struct.	1	2	5			
148+66		CC	Struct.	1	7	8			
148+66		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
148+64		CC	Struct.	1	7	8			
148+64		CC	Struct.	1	11	2			
148+64		IS	O&M	0	3	5			
148+56		CC	Struct.	1	7	11			
148+56		CC	Struct.	1	2	5			
148+48		IW	O&M	2	2	5			Changed from IR to IW
148+38		CC	Struct.	1	1	5			
148+33		CC	Struct.	1	7	11			
148+06		IW	O&M	2	2	5			Changed from IR to IW
147+99		CC	Struct.	1	11	2			
147+96		CC	Struct.	1	1	5			
147+79		CC	Struct.	1	11	1			

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
147+73		CC	Struct.	1	11	5			
147+70		OBR	O&M	2	6				7" diameter
147+66		CC	Struct.	1	10	2			
147+56		IW	O&M	2	2	5			
147+54	147+06	MGO	Misc.	0	12		48		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
147+54	147+25	MGO	Misc.	0	1		29		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
147+51		AMH	Const.	0					Access manhole at 11 o'clock
147+28		CC	Struct.	1	7	11			
147+06		MGO	Misc.	0					Shear key K19: bitumastic bond breaker deteriorated and missing. Joint Width: K19R: 1/4"-3/4", K19L: 1/4"-1". Invert is offset approximately 1/2".
147+06		MGO	Misc.	0	3				Crack gage installed at right shear key
147+06		MGO	Misc.	0	12				Crack gage installed on ceiling
147+06		IS	O&M	0	3				Staining observed at right shear key
147+06		FC	Struct.	2	5	6			
146+78		CC	Struct.	1	2	5			
146+55		CC	Struct.	1	7	10			
146+52		IW	O&M	2	2	5			
146+40		CC	Struct.	1	7	11			
146+35		CC	Struct.	1	3	5			
146+28		CC	Struct.	1	7	5			
146+11		CC	Struct.	1	2	5			
146+10		CC	Struct.	1	7	1			
146+05		IW	O&M	2	2	5			
146+04		DAE	O&M	2	3	5			
146+03		CC	Struct.	1	7	9			
145+98		CC	Struct.	1	1	5			
145+84		CC	Struct.	1	1	5			
145+74		CC	Struct.	1	1	5			

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
145+67		CC	Struct.	1	1	5			
145+55		IS	O&M	0	2	5			
145+44		CC	Struct.	1	1	5			
145+36	145+05	MGO	Misc.	0	1		31		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
145+35		CC	Struct.	1	7	11			
145+33		CC	Struct.	1	3	5			
145+28	145+05	MGO	Misc.	0	11		23		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
145+25	145+05	MGO	Misc.	0	12		20		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
145+05		MGO	Misc.	0					Shear key K20: bitumastic bond breaker deteriorated. Joint Width: K20R: 0"-3/4", K20L: 1/2"-3/4". Invert is offset approximately 1/2".
145+05		MGO	Misc.	0	3				Crack gage installed at right shear key
145+05		MGO	Misc.	0	12				Crack gage installed on ceiling
145+05		IW	O&M	2	3				Weeping observed at right shear key
144+66		CC	Struct.	1	7	8			
144+63		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
144+61		CC	Struct.	1	7	8			
144+59		AMH	Const.	0					Glenwood Avenue manhole at 2 o'clock
144+52		IS	O&M	0	2	5			
144+52		CC	Struct.	1	7	10			
144+50		ID	O&M	3	11	1			
144+42		CC	Struct.	1	1	5			
144+39		IS	O&M	0	11	1			
144+32	144+04	CL	Struct.	2	4		4		
144+28		CC	Struct.	1	9	5			
144+20		CC	Struct.	1	11	1			

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
144+14		CC	Struct.	1	11	1			
144+10		CC	Struct.	1	11	1			
144+01		IW	O&M	2	11	12			
144+01		CC	Struct.	1	1	5			
144+01		CC	Struct.	1	7	11			
144+01		IW	O&M	2	3	5			
143+86		CC	Struct.	1	10	12			
143+54		IS	O&M	0	11	1			
143+54		IS	O&M	0	3	5			
143+48		CC	Struct.	1	7	1			
143+44		CC	Struct.	1	2	5			
143+05		MGO	Misc.	0					Shear key K21: majority of bitumastic bond breaker in place but deteriorating. Joint Width: K21R: 1/2", K21L: 1/4"-1/2".
143+05		MGO	Misc.	0	3				Crack gage installed at right shear key
143+05		MGO	Misc.	0	12				Crack gage installed on ceiling
142+87		LL	Const.	0					
142+85		CC	Struct.	1	1	5			
142+62		CC	Struct.	1	1	5			
142+57		CC	Struct.	1	1	5			
142+54		CC	Struct.	1	7	11			
142+49		IS	O&M	0	3	5			
142+43		CC	Struct.	1	7	11			
142+39	142+10	CL	Struct.	2	3		5		
142+32		CC	Struct.	1	1	5			
142+23	141+95	CC	Struct.	1	7	5	4		
142+14		CC	Struct.	1	8	1			
142+10		CC	Struct.	1	3	5			
141+94		CC	Struct.	1	7	1			
141+94		ID	O&M	3	11	12			
141+84		CC	Struct.	1	2	5			
141+71		CC	Struct.	1	7	5			
141+68		CC	Struct.	1	11	12			

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
141+63		CC	Struct.	1	11	1			
141+61		CC	Struct.	1	11	2			
141+54		CC	Struct.	1	7	5			
141+45		CC	Struct.	1	1	5			
141+41		CC	Struct.	1	11	2			
141+04		MGO	Misc.	0					Shear key K22: majority of bitumastic bond breaker in place. Joint Width: K22R: 0"-3/4", K22L: 1/8"-1/2". Crack gauges installed at right shear key, and at the 12 o'clock position.
141+04		DAE	O&M	2					
141+04		IW	O&M	2	2	5			Weeping observed at right shear key
140+62		CC	Struct.	1	7	11			
140+46		CC	Struct.	1	7	1			
140+20		CC	Struct.	1	8	1			
139+94		CC	Struct.	1	7	10			
139+84		CC	Struct.	1	1	5			
139+79		CC	Struct.	1	9	1			
139+79		CC	Struct.	1	7	11			
139+70		CC	Struct.	1	7	11			
139+55		CC	Struct.	1	7	10			
139+52		MGO	Misc.	0					Shear key K23: majority of bitumastic bond breaker deteriorated and partially missing. Joint Width: K23R: 0"-1/2", K23L: 1/4"-1/2".
139+52		MGO	Misc.	0	3				Crack gage installed at right shear key
139+52		MGO	Misc.	0	12				Crack gage installed on ceiling
139+46		LL	Const.	0				10	
139+36		CC	Struct.	1	7	11			
138+98		IS	O&M	0	11	1			
138+88		CC	Struct.	1	7	11			
138+84		CC	Struct.	1	1	5			
138+80		CC	Struct.	1	9	11			
138+80		IS	O&M	0	11	1			
138+70		CC	Struct.	1	11	1			

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
138+64		CC	Struct.	1	11	3			
138+55		CC	Struct.	1	7	1			
138+51		IW	O&M	2	11	1			
138+45		CC	Struct.	1	7	1			
138+35		CC	Struct.	1	7	5			
138+20		ID	O&M	3	11				
138+18		CC	Struct.	1	7	5			
138+13		CC	Struct.	1	7	11			
137+89		CC	Struct.	1	7	1			
137+84		TFA	Const.	0	2				12-in-dia. RCP
137+77		CC	Struct.	1	7	11			
137+52		MGO	Misc.	0					Shear key K24: majority of bitumastic bond breaker in place but deteriorating. Joint Width: K24R: 1/2"-3/4", K24L: 1/4"-1".
137+16		CC	Struct.	1	7	11			
137+02		MGO	Misc.	0					Steel L bracket attached to wall at 4 o'clock
137+01		CC	Struct.	1	7	9			
136+99		MGO	Misc.	0					Steel L bracket attached to wall at 4 o'clock
136+74		CC	Struct.	1	11	5			
136+67		CC	Struct.	1	9	5			
136+49		ID	O&M	3	11	1			
136+01		MGO	Misc.	0					Shear key K25: majority of bitumastic bond breaker in place but deteroirating. Joint Width: K25R: 1/4"-1/2", K25L: 0"-1/2". Patch in invert.
136+01		SSS	Struct.	2	9				Minor spalling observed on left side
135+86		MGO	Misc.	0					1/2-in. by 1/2-in. L-bracket attached to wall
135+63		CC	Struct.	1	7	11			
135+55		CC	Struct.	1	7	5			
135+45		CC	Struct.	1	9	3			
135+36		CC	Struct.	1	7	11			
135+26	134+95	CL	Struct.	2	3		7		
135+18		CC	Struct.	1	7	11			
135+00		MWL	Misc.	0				5	5-inches of water

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
135+00		CC	Struct.	1	7	5			
134+96		CC	Struct.	1	7	9			
134+85		CC	Struct.	1	7	11			
134+77		IW	O&M	2	11	1			
134+75		CC	Struct.	1	3	5			
134+32		OBZ	O&M	2	6			5	Concrete debris in invert
134+30		CC	Struct.	1	7	11			
134+11		CC	Struct.	1	7	8			
134+10		AMH	Const.	0					Manhole Between Royalston and 10th St Bridge
134+10		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
134+10		CC	Struct.	1	7	8			
134+01		MGO	Misc.	0					Shear key K26: majority of bitumastic bond breaker in place. Joint Width: K26R: 1/4"-1/2", K26L: 1/4"-1/2".
134+01		IW	O&M	2	9				Infiltration in left joint
134+01		SSS	Struct.	2	6				Spalling observed at invert of joint
134+01		SSS	Struct.	2	3				4" by 4" by 1" deep
134+01		IW	O&M	2	10	2			
133+99		MGO	Misc.	0					12-in. by 12-in. by 3 in-deep scour hole
133+70		CC	Struct.	1	7	1			
133+55		CC	Struct.	1	8	12			
133+50		IW	O&M	2	7	1			
133+39		ID	O&M	3	11				
133+39		IW	O&M	2	7	10			
133+39		CC	Struct.	1	11	1			
133+35		CC	Struct.	1	11	1			
133+32		CC	Struct.	1	11	1			
133+23		CC	Struct.	1	11	1			
132+99		IW	O&M	2	7	5			
132+99		MWL	Misc.	0				5	2-inches of water
132+92		CC	Struct.	1	7	1			
132+86		IS	O&M	0	11	1			
132+86		CC	Struct.	1	1	5			
132+78		CC	Struct.	1	11	1			

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
132+66		CC	Struct.	1	2	5			
132+66		IW	O&M	2	5				
132+51		MGO	Misc.	0					Shear key K27: bitumastic bond breaker deteriorated and falling out. Joint Width: K27R: 0"-1/2", K27L: 0"-1/2". Evidence of differential settlement. Minor buckling of invert observed.
132+51		IW	O&M	2	3				Infiltration from right joint
132+51		SSS	Struct.	2	6				15" by 15" by 2" deep
132+51		IW	O&M	2	10	1			
132+49		MWL	Misc.	0				5	
132+34		CC	Struct.	1	7	11			
132+24		MWLS	Misc.	2	6				10" water
132+15		IS	O&M	0	1	5			
132+04	131+75	DSGV	O&M	2	5			5	
131+75	131+25	DSF	O&M	2	6			10-May	
132+04		MWL	Misc.	0				10	
132+04		IW	O&M	2	4	5			
131+99		MGO	Misc.	0					Drop in invert
131+52	131+48	CL	Struct.	2	9		6		
131+50		MGO	Misc.	0					Shear key K28: bitumastic bond breaker deteriorated. Joint Width: K28R: 1/2"-1-1/2", K28L: 1/4"-1-1/2". Evidence of differential settlement. External liner visible at right joint.
130+99		MGO	Misc.	0					Shear key K29: majority of bitumastic bond breaker in place. Joint Width: K29R: 1/4", K29L: 0".
130+70		CC	Struct.	1	4	5			
130+67		CC	Struct.	1	7	9			
130+61		CC	Struct.	1	3	5			
130+53		CL	Struct.	2	2		3		
130+49		MWL	Misc.	0				5	6 inches of water measured in 2024
130+55		MGO	Misc.	0					Shear key K30: bitumastic bond breaker deteriorated. Joint Width: K30R: 0"-1", K30L: 0"-1". Evidence of differential settlement.
130+55		CL	Struct.	2	3				Cracking at right shear key

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Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
130+55		IS	O&M	0	3				Staining at right shear key
130+55		FC	Struct.	2	8	11			3/8" max
130+55		FC	Struct.	2	2	4			10mm opening max
130+55		IS	O&M	0	3				
130+44		CC	Struct.	1	1	5			
130+39		CC	Struct.	1	7	11			
130+34		CC	Struct.	1	2	5			
130+32		CC	Struct.	1	7	1			
130+20	129+91	CS	Struct.	2	7	5	5		
130+15		CC	Struct.	1	7	11			
130+14		IW	O&M	2	3	5			
130+13		CC	Struct.	1	7	9			
130+12		CC	Struct.	1	7	5			
130+10		CC	Struct.	1	7	12			
130+08		CC	Struct.	1	12	5			
130+05		CC	Struct.	1	1	5			
130+05		IW	O&M	2	3	5			
130+02		CC	Struct.	1	7	5			
129+98		CC	Struct.	1	7	5			
129+94		CC	Struct.	1	7	5			
129+94		IW	O&M	2	1				
129+91		CC	Struct.	1	7	1			
129+86		CC	Struct.	1	9	5			
129+86		IS	O&M	0	1				
129+77		IW	O&M	2	4	5			
129+80	129+31	LL	Const.	0			25	10	
129+78	129+29	CC	Struct.	1	10	1	25		
129+69		CC	Struct.	1	3	5			
129+68		CC	Struct.	1	7	11			
129+54		IS	O&M	0	12	5			
129+38		CC	Struct.	1	7	11			
129+30		CC	Struct.	1	3	5			
129+16		CC	Struct.	1	8	11			

[1] The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

[2] Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
128+90		CC	Struct.	1	1	5			
128+79		CC	Struct.	1	1	5			
128+52		MGO	Misc.	0					Shear key K31: bitumastic bond breaker deteriorated. Joint Width: K31R: 0"-3/4", K31L: 0"-3/4".
128+52		IW	O&M	2	3				Infiltration of right joint
128+52		IW	O&M	2	9				Infiltration of left joint
128+52		ID	O&M	3	11	1			
128+52		IW	O&M	2	7	5			
128+46		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
128+45		AMH	Const.	0					New Twins Stadium (7th St) manhole at 1 o'clock
128+44		CC	Struct.	1	7	8			
127+83		CC	Struct.	1	7	1			
127+80		CC	Struct.	1	1	5			
127+76		CC	Struct.	1	7	11			
127+65		CC	Struct.	1	7	1			
127+59		CC	Struct.	1	7	1			
127+59		IS	O&M	0	5				
127+51		IS	O&M	0	11	1			
127+51		CC	Struct.	1	1	4			
127+30		CC	Struct.	1	1	5			
127+28		CC	Struct.	1	7	11			
127+22		CC	Struct.	1	1	5			
127+18		CC	Struct.	1	12	2			
127+15		OBZ	O&M	2	13				Concrete debris in invert, pipe plug or core.
127+14	126+85	CS	Struct.	2	8	11	5		
127+12		IW	O&M	2	11	1			
126+86		CC	Struct.	1	7	11			
126+75		CC	Struct.	1	7	11			
126+59		CC	Struct.	1	1	5			
126+59	126+24	CL	Struct.	2	3		7		
126+48		MGO	Misc.	0					Shear key K32: majority of bitumastic bond breaker in place. Joint Width: K32R: 0"-1/4", K32L: 0"-1/2". Evidence of differential settlement.

[1] The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

[2] Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
126+48		SSS	Struct.	2					Spalling observed at right joint, hasn't fallen off yet
126+19		MGO	Misc.	0					1" pipe intruding
126+48		IW	O&M	2	11	12			
126+10		CC	Struct.	1	11	5			
126+05		CC	Struct.	1	7	5			
125+85		CC	Struct.	1	7	5			
125+82		CC	Struct.	1	7	5			
125+73		CC	Struct.	1	7	5			
125+61		CC	Struct.	1	1	5			
125+58		CC	Struct.	1	7	5			
125+48		CC	Struct.	1	1	5			
125+48		IW	O&M	2	11	1			
125+39		CC	Struct.	1	9	1			
125+38		CC	Struct.	1	7	11			
125+38		CC	Struct.	1	1	5			
125+36		CC	Struct.	1	7	5			
125+30		CC	Struct.	1	10	1			
125+23		CC	Struct.	1	11	5			
125+08		CC	Struct.	1	7	8			
125+06		AMH	Const.	0					Abandoned 6th Street manhole at 1 o'clock
125+06		CC	Struct.	1	1	5			
125+06		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
125+04		CC	Struct.	1	7	8			
124+98		IS	O&M	0	7	1			
124+92		CC	Struct.	1	7	11			
124+85		CC	Struct.	1	1	5			
124+76		CC	Struct.	1	3	5			
124+61		CC	Struct.	1	1	5			
124+48		MGO	Misc.	0					Shear key K33: majority of bitumastic bond breaker in place. Joint Width: K33R: 1/4"-3/4", K33L: 1/4"-3/4". Evidence of differential settlement.
124+29		CC	Struct.	1	7	11			
124+11		CC	Struct.	1	7	11			

[1] The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

[2] Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
124+06		CC	Struct.	1	1	5			
123+97		IW	O&M	2	5				
123+81		CC	Struct.	1	1	5			
123+72	123+43	CL	Struct.	2	3		5		
123+67	123+40	CS	Struct.	2	3	5	3		
123+62		CC	Struct.	1	7	1			
123+60		CC	Struct.	1	7	10			
123+50	123+47	MGO	Misc.	0	11		3		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
123+48	123+47	MGO	Misc.	0	12		1		Pattern of surficial corrosion every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
123+48		ID	O&M	3	11	1			
123+48		IW	O&M	2	2	5			
123+48		IW	O&M	2	7	5			
123+42		CC	Struct.	1	11	1			
123+25		CC	Struct.	1	12	5			
123+12		CC	Struct.	1	7	1			
122+86		CC	Struct.	1	11	5			
122+50		CC	Struct.	1	4	5			
122+47		MGO	Misc.	0					Shear key K34: majority of bitumastic bond breaker in place: Joint Width: K34R: 1/2"-1", K34L: 1/2"-1".
122+22		CC	Struct.	1	1	5			
122+06		CC	Struct.	1	1	5			
121+97		CC	Struct.	1	11	5			
121+87		CC	Struct.	1	7	2			
121+64		CC	Struct.	1	11	5			
121+47		CC	Struct.	1	1	5			
121+36		CC	Struct.	1	8	5			
121+31		CC	Struct.	1	7	1			
121+25		CC	Struct.	1	1	5			
121+03		CC	Struct.	1	7	8			

[1] The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

[2] Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Right Box

Inspection Notes - Station 172+25 to 120+00

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
120+98		MGO	Misc.	0					Shear key K35: bitumastic seal in place. Joint Width: K35R: 1/4", K35L: 1/2"-1". Evidence of differential settlement.
120+98		FM	Struct.	4					Fractures on right joint
120+98		CM	Struct.	3					Cracking on left joint
120+98		FC	Struct.	2	5	6			
120+98		IW	O&M	2	11	12			
120+82		CS	Struct.	2	3	5			
120+68		CC	Struct.	1	3	5			
120+57		CC	Struct.	1	3	5			
120+46		CC	Struct.	1	3	5			
120+31		CC	Struct.	1	3	5			
120+18		RPP	Struct.	0	3				4-ft by 4-ft patch repair
120+00		MSC	Misc.						Beginning of single 11-ft tall by 11-ft-wide single box culvert
120+00		MSA	Misc.						Beginning of 11-ft tall by 15-ft-wide single box culvert. See separate notes for single box culvert inspection.

[1] The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

[2] Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Single Box

Inspection Notes - Station 120+00 to 116+74

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
120+00		MGO	Misc.	0					11/15/24, afternoon, start inspection of 11-ft tall by 15-ft-wide single box culvert, walking downstream. Inspectors: Josh Phillips, Jack Mettlach, Hannah Bruce. Single box culvert inspection performed following completion of right box inspection.
120+00		MWL	Misc.	0					5" deep
119+85		MGO	Misc.	0	3				Crack gage installed 12/9/2021 by the North Loop Green development contractor.
119+82		MGO	Misc.	0					Shear key K36: majority of bitumastic bond breaker in place, cracking in left side joint. Width: K36R: 0"-1/2", K36L: 0"-1/4".
119+82		CC	Struct.	1	9				
119+82		SAP	Struct.	3					Spalling 4" x 4" x 3" deep at two locations.
119+82		SSS	Struct.	2	3				4" x 4" x 2" deep
119+69		CC	Struct.	1	2	5			
119+59		AMH	Const.	0	1				New Twins stadium connection access manhole at 1 o'clock.
119+59	116+74	MGO	Misc.	0	11	1	285		Pattern of five rows of surficial corrosion visible every 4 inches or so. Likely construction forming steel or chairs, unlikely concrete reinforcement.
119+48		IW	O&M	2	5				
119+48		CC	Struct.	1	1	5			
119+48		CC	Struct.	1	7	5			
119+47		IW	O&M	2	5				
119+46		IW	O&M	2	5				
119+44		CC	Struct.	1	3	5			
119+40		IW	O&M	2	5				
119+40		CC	Struct.	1	2	5			
119+40		CC	Struct.	1	2	5			
119+39		IW	O&M	2	1	5			
119+30		IW	O&M	2	5				
119+27		IW	O&M	2	5				
119+26		CS	Struct.	2	1	5			

[1] The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

[2] Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Single Box

Inspection Notes - Station 120+00 to 116+74

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
119+24		CC	Struct.	1	7	11	5		
119+05		IW	O&M	2	5				
119+04		CC	Struct.	1	2	5			
118+99		CS	Struct.	2	1	5			
118+99		CC	Struct.	1	7	11	5		
118+95		IW	O&M	2	7	11			
118+93		CC	Struct.	1	7	11			
118+85		LR	Const.	0	2	5			
118+77		CC	Struct.	1	7	11	70	70	
118+65		CC	Struct.	1	9	11			
118+60		CC	Struct.	1	1	5			
118+56		CC	Struct.	1	4	5			
118+52		IW	O&M	2	4	5			
118+49		CC	Struct.	1	7	1			
118+41		CC	Struct.	1	7	8			
118+31		CC	Struct.	1	11	1			
118+21		MGO	Misc.	0	9				Crack gage installed 12/9/2021 by the North Loop Green development contractor.
118+00		MGO	Misc.	0	7	8			Shear key K37: majority of bitumastic bond breaker in place. Width: K37R: 1/4"-1/2", K37L: 3/4". Three crack gages installed on 12/9/2021 by the North Loop Green development contractor, two at 9 oclock position and one at 3 o'clock position.
117+79		CC	Struct.	1					
117+68		CC	Struct.	1					
117+56		CC	Struct.	1	7	8			
117+55		IW	O&M	2	7	8			
117+55		SSS	Struct.	2	3				
117+55		MGO	Misc.	0	3				Crack gage installed 12/9/2021 by the North Loop Green development contractor.
117+35		CC	Struct.	1	7	10			
117+27		MGO	Misc.	0	9				Crack gage installed 12/9/2021 by the North Loop Green development contractor.

[1] The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

[2] Defect ratings of 4 and 5 are shaded orange and red respectively.

Box Culvert - Single Box

Inspection Notes - Station 120+00 to 116+74

Begin Station [1]	End Station [1]	Code [2]	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comments
117+27		IW	O&M	2	7	9			
117+26		IW	O&M	2	5				
117+18		IW	O&M	2	7	8			
117+03		IW	O&M	2	7	8			
116+80		MGO	Misc.	0	2	5			Shear key K38: too close to drop structure to thoroughly inspect. weeping on left side.
116+80		MGO	Misc.	0	3				Crack gage installed 12/9/2021 by the North Loop Green development contractor.
116+80		MGO	Misc.	0	9				Crack gage installed 12/9/2021 by the North Loop Green development contractor.
116+80		IW	O&M	2	9				
116+74		MGO	Misc.	0					Shear key k39: too close to drop structure to inspect.
116+74		MSA	Misc.	0	7	10			Drop structure to 3rd Avenue Tunnel.

[1] The in-tunnel stationing marks used for the 2024 inspection of the tunnel were updated prior to the inspection. See additional detail in report.

[2] Defect ratings of 4 and 5 are shaded orange and red respectively.

Appendix C

Shear Key Comparison Photos

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K1L				
K1R				

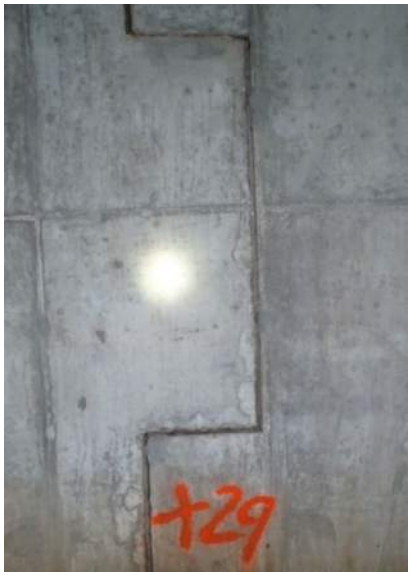
Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K2L				
K2R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K3L				
K3R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K4L				
K4R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K5L				
K5R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K6L				
K6R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K7L				
K7R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K8L				
K8R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K9L				
K9R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K10L				
K10R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K11L				
K11R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K12L				
K12R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K13L				
K13R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K14L				
K14R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K15L				
K15R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K16L				
K16R				

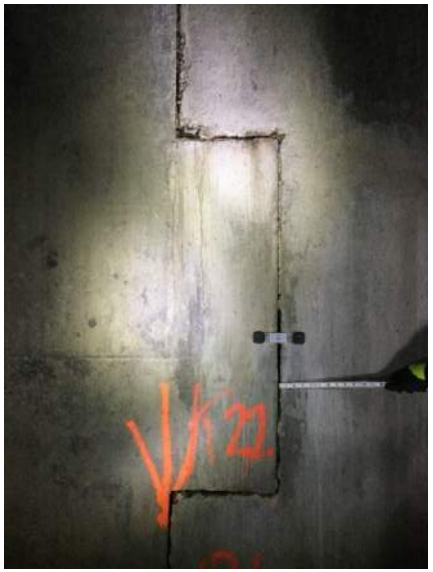
Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K17L				
K17R				

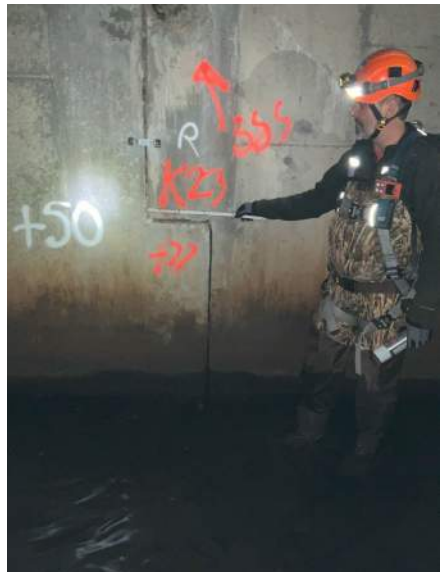
Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K18L				
K18R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K19L				
K19R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K20L				
K20R				

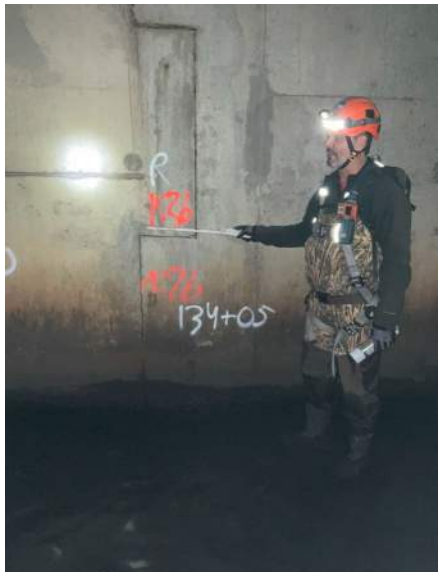
Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K21L				
K21R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K22L				
K22R				

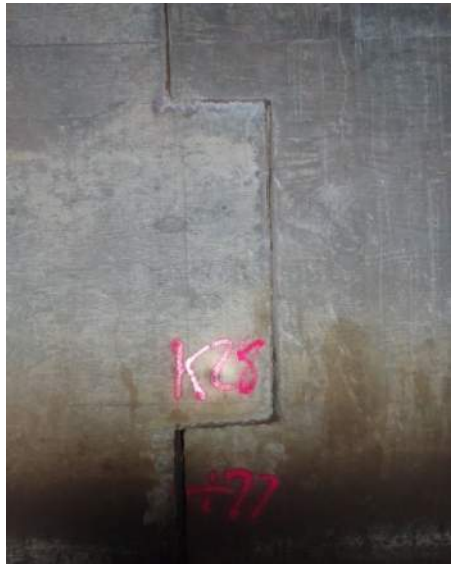
Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K23L				
K23R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K24L				
K24R				

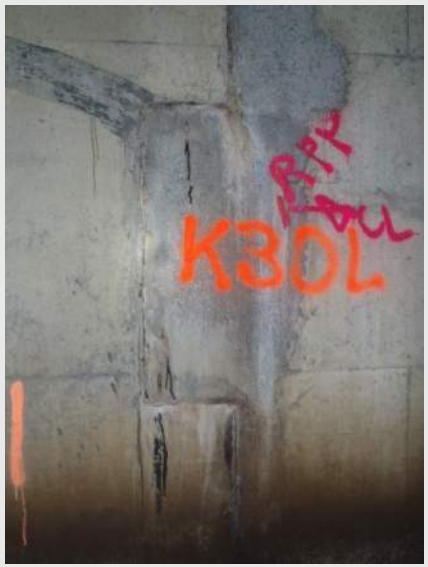
Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K25L				
K25R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K26L				
K26R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K27L				
K27R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K28L				
K28R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K29L				
K29R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K30L				
K30R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K31L				
K31R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K32L				
K32R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K33L				
K33R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K34L				
K34R				

Shear Key	Double Box Culvert (Left Box) Comparison Photos			
	2009	2014	2019	2024
K35L				
K35R				

Appendix D

OPR and PRI Rating Tables

Bassett Creek Box Culvert Inspection
23/27-051
Inspection Date: 11/14/2024

Box Culvert - Left Box

Station 172+25 to 120+00 (Entire Length)					Overall Segment (Entire Length)			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	0	0	0	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	4	0	16	0				
3	6	21	18	63				
2	75	125	150	250	772	313	1	2
1	588	0	588	0				
Total	673	146	772	313				

Station 172+25 to 162+00					Overall Segment			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	0	0	0	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	0	0	0	0				
3	0	2	0	6				
2	16	12	32	24	221	30	1	2
1	189	0	189	0				
Total	205	14	221	30				

Station 162+00 to 152+00					Overall Segment			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	0	0	0	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	1	0	4	0				
3	2	5	6	15				
2	10	43	20	86	175	101	1	2
1	145	0	145	0				
Total	158	48	175	101				

Station 152+00 to 142+00					Overall Segment			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	0	0	0	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	0	0	0	0				
3	1	1	3	3				
2	9	30	18	60	106	63	1	2
1	85	0	85	0				
Total	95	31	106	63				

Box Culvert - Left Box

Station 142+00 to 132+00					Overall Segment			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	0	0	0	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	1	0	4	0				
3	1	9	3	27	126	67	1	2
2	16	20	32	40				
1	87	0	87	0				
Total	105	29	126	67				

Station 132+00 to 120+00					Overall Segment			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	0	0	0	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	2	0	8	0				
3	2	4	6	12	144	52	1	2
2	24	20	48	40				
1	82	0	82	0				
Total	110	24	144	52				

Bassett Creek Box Culvert Inspection
23/27-0051
Inspection Date: 11/15/2024

Box Culvert - Right Box

Station 172+25 to 120+00 (Entire Length)					Overall Segment (Entire Length)			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	1	0	5	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	2	1	8	4				
3	3	18	9	54				
2	41	91	82	182	593	240	1	2
1	489	0	489	0				
Total	536	110	593	240				

Station 172+25 to 162+00					Overall Segment			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	1	0	5	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	0	0	0	0				
3	1	1	3	3				
2	3	9	6	18	146	21	1	2
1	132	0	132	0				
Total	137	10	146	21				

Station 162+00 to 152+00					Overall Segment			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	0	0	0	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	1	1	4	4				
3	1	9	3	27				
2	5	24	10	48	159	79	1	2
1	142	0	142	0				
Total	149	34	159	79				

Station 152+00 to 142+00					Overall Segment			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	0	0	0	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	0	0	0	0				
3	0	2	0	6				
2	15	27	30	54	97	60	1	2
1	67	0	67	0				
Total	82	29	97	60				

Box Culvert - Right Box

Station 142+00 to 132+00					Overall Segment			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	0	0	0	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	0	0	0	0				
3	0	4	0	12	68	40	1	2
2	5	14	10	28				
1	58	0	58	0				
Total	63	18	68	40				

Station 132+00 to 120+00					Overall Segment			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	0	0	0	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	1	0	4	0				
3	1	2	3	6	123	40	1	2
2	13	17	26	34				
1	90	0	90	0				
Total	105	19	123	40				

Bassett Creek Box Culvert Inspection
23/27-0051
Inspection Date: 11/15/2024

Box Culvert - Single Box

Station 120+00 to 116+74 (Entire Length)					Overall Segment (Entire Length)			
Defect Rating	No. of Struct. Defects	No. of O & M Defects	Struct. Grade Score	O & M Grade Score	Overall Pipe Rating		Pipe Rating Index	
5	0	0	0	0	Struct. O.P.R.	O & M O.P.R.	Struct. P.R.I.	O & M P.R.I.
4	0	0	0	0				
3	1	0	3	0	46	32	1	2
2	4	16	8	32				
1	35	0	35	0				
Total	40	16	46	32				

Appendix E

PRI Figures

Stationing

Tunnel Condition

- Good
- Fair
- Poor
- Not Inspected

Notes:
1. Legend represents tunnel conditions from an operations and maintenance standpoint.

0 375 750
Feet

Imagery Source: NearMap, 9-11-2024

PIPE RATING INDEX ASSIGNMENT OPERATIONS AND MAINTENANCE
2024 Bassett Creek
Box Culvert Inspection
Performed for the Bassett Creek Watershed Management Commission

FIGURE 1

BARR

Stationing

Tunnel Condition

- Good
- Fair
- Poor
- Not Inspected

Notes:
1. Legend represents tunnel conditions from a structural standpoint.

N

0 375 750
Feet

Imagery Source: NearMap, 9-11-2024

PIPE RATING INDEX ASSIGNMENT STRUCTURAL
2024 Bassett Creek
Double Box Culvert Inspection
Performed for the Bassett Creek Watershed Management Commission

FIGURE 2

BARR

Barr Footer: ArcGISPro 3.3.1, 2025-01-31 09:28 File: I:\Client\BassettCreek\Work_Orders\2024\Flood_Control_Project_Inspections\Maps\Figures\Figures.aprx Layout: Fig 2 Pipe Rating Index Assignment Structural 2024 User: LGK2