



## Bassett Creek Double Box Culvert Inspection Report



Prepared for  
Bassett Creek Watershed Management Commission

Inspection Date: October 2019

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## Certifications

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

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Joseph Welna  
PE #: 49911

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Date

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# 1.0 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 Culvert (Double Box Culvert) during October 2019. The purpose of the inspection was to compare the current tunnel conditions to past inspections, identify changes in condition over time, and provide recommendations to BCWMC regarding future monitoring and repair.

The Double Box Culvert is part of a system of stormsewer tunnels that convey Bassett Creek flow through downtown Minneapolis to the Mississippi River where it discharges downstream of St. Anthony Falls. The stormsewer system was constructed in three phases including the I-94/2nd Street tunnel (Phase 1), the 3<sup>rd</sup> Avenue tunnel (Phase 2), and the Double Box Culvert (Phase 3), all of which are depicted in Figure 1-1. The I-94 tunnel upstream the 3<sup>rd</sup> 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 2.0.



Figure 1-1 System Overview

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## 1.1 Recommendations

The Double Box Culvert was found to be in “good” condition from a structural standpoint, and “fair” condition from an operations and maintenance standpoint. Changes from the 2014 inspection (Ref. (1)) were observed and are attributed to a combination of factors including minor changes in the NASSCO PACP code severity rating (Section 4.0), 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 liner. Based on the 2019 inspection findings, the following recommendations are provided to the BCWMC for consideration. Further of discussion of these recommendations is provided in Section 6.0.

### 1.1.1 Inspection Recommendations

**Frequency of Inspections:** It is recommended that the BCWMC continue to perform a full NASSCO PACP inspection on a 5-year basis.

**Shear Keys - Structural:** A large portion of 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 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.

### 1.1.2 Monitoring Recommendations

**SWLRT Monitoring Reports:** The southwest light rail transit (SWLRT) project was underway at the time of the inspection, and portions of the alignment run above the Double Box Culvert. Crack gauges were installed at several of the shear keys by others to measure potential displacement related to the construction. It is recommended that the BCWMC request the ongoing monitoring reports generated as part of the Southwest Light Rail Transit (SWLRT) project for engineer review to verify potential impacts to the Double Box Culvert.

### 1.1.3 Repair Recommendations

**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.

**Crack Sealing, Deposit Removal:** Various degrees of infiltration were observed throughout the tunnel, occurring at cracks, joints, and other defects. At four locations, infiltration runners were observed that equate to a grade 4 PACP defect. It is recommended that the BCWMC repair these points of infiltration, and 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.

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**Repair Exposed Reinforcement:** At two locations, exposed reinforcement were observed that equate 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.

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## 2.0 Background

### 2.1 Tunnel System Construction Phases

Construction of the tunnel system was completed by the United States 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-94/2<sup>nd</sup> Street Tunnel

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

- 12-foot-high with varying width outlet structure (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: 3<sup>rd</sup> Avenue Tunnel

The 3<sup>rd</sup> Avenue tunnel was constructed by the USACE in 1990. The 3<sup>rd</sup> 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-94/2<sup>nd</sup> Street tunnel. The 3<sup>rd</sup> Avenue tunnel is approximately 1,456 feet long and generally runs below 3<sup>rd</sup> Avenue. The 3<sup>rd</sup> 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 3<sup>rd</sup> Avenue tunnel and Double Box Culvert are connected by an approximately 30-foot-high drop structure that was constructed as part of Phase 2 in 1990 by the USACE.

#### 2.1.3 Phase 3: Double Box Culvert

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

In accordance with the Operation and Maintenance Manual for the Bassett Creek Flood Control Project (Ref. (2)), the Double Box Culvert is on a 5-year inspection schedule and the Phase 1, 2<sup>nd</sup> Street tunnel and the Phase 2, 3<sup>rd</sup> Avenue tunnel are on 20-year inspection schedules. The City of Minneapolis and/or MnDOT have also performed independent inspections of the Double Box Culvert, 3<sup>rd</sup> Avenue tunnel, and I-94/2nd Street tunnels. The I-94 tunnel above the 3<sup>rd</sup> Avenue tunnel connection is on a separate inspection schedule as determined by the City of Minneapolis and/or MnDOT.

The BCWMC typically coordinates the 5-year inspections with the City of Minneapolis and USACE staff. A history of the Double Box Culvert inspections is provided in Table 2-1. Inspections of the I-94/2nd Street and 3<sup>rd</sup> 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 2-1 Inspection History

Date	Tunnel	Inspection Team	Recommendations	Notes
November 2004	Double 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 Double Box Culvert. Findings are summarized in November 2004 memo. (Ref. (3))
April 2007	Double 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. (4)).
February 2008	I-94/2nd Street Tunnel	MnDOT	Maintenance and repairs recommended.	Findings are summarized in August 2008 Report (Ref. (5)).
February 2008	I-94/2nd Street Tunnel to 3 <sup>rd</sup> Avenue Connection, 3 <sup>rd</sup> 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. (6)).
November 2009	Double 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. (7)).

Date	Tunnel	Inspection Team	Recommendations	Notes
December 2014	Double Box Culvert, 3 <sup>rd</sup> 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. (1)).
October 2019	Double Box Culvert	BCWMC (Barr)	Recommendations for maintenance repairs were identified.	Findings are summarized in June 2020 Report. Inspection did not include single box culvert due to high flows which made approach to drop structure unsafe.

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## 3.0 2019 Inspection Summary

The Double Box Culvert was inspected over two days in October 2019 between Sta. 172+24 and 119+88. The Single Box Culvert between Sta. 119+88 and the drop structure at Sta. 116+73 were not inspected due to high base flow which was determined to create unsafe inspection conditions above the drop structure.

The inspections were conducted with a three-person team in the tunnel and one person performing surface attendant duties. Barr used existing stationing from the 2014 inspection when feasible and established new stationing with survey spray paint (referenced from the 2014 stationing) to document new observations.

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 is referenced herein. Photos were taken during the inspections and are available upon request.

### 3.1 Inspection Approach

The 2019 inspection approach was similar to what was performed in 2014. Barr used the 2014 inspection as a baseline and updated the observations based on changes observed in 2019. Additional discussion regarding the inspection approach and presentation of inspection findings is provided in Section 5.0.

### 3.2 Access Considerations

Due to the depth of the tunnels, and limited available secondary access points, a safety standby contractor (Rescue Resources, Inc.) was onsite to perform emergency rescue if required. The following discussion presents access considerations for future tunnel inspections.

#### 3.2.1 Trash Rack Cleaning

Significant debris buildup was observed on the trash rack at the inlet of the Double Box Culvert, as shown in Figure 3-1. It is recommended that the inspection team coordinate with the City of Minneapolis ahead of the inspection to remove accumulated debris in the trash rack to lower the upstream pool level.



Figure 3-1 Trash Rack Debris

### 3.2.2 Primary Access Point

Access to the Double Box Culvert was achieved through a manhole in the southwest corner of the City of Minneapolis bus garage parking lot as shown in Figure 3-2.

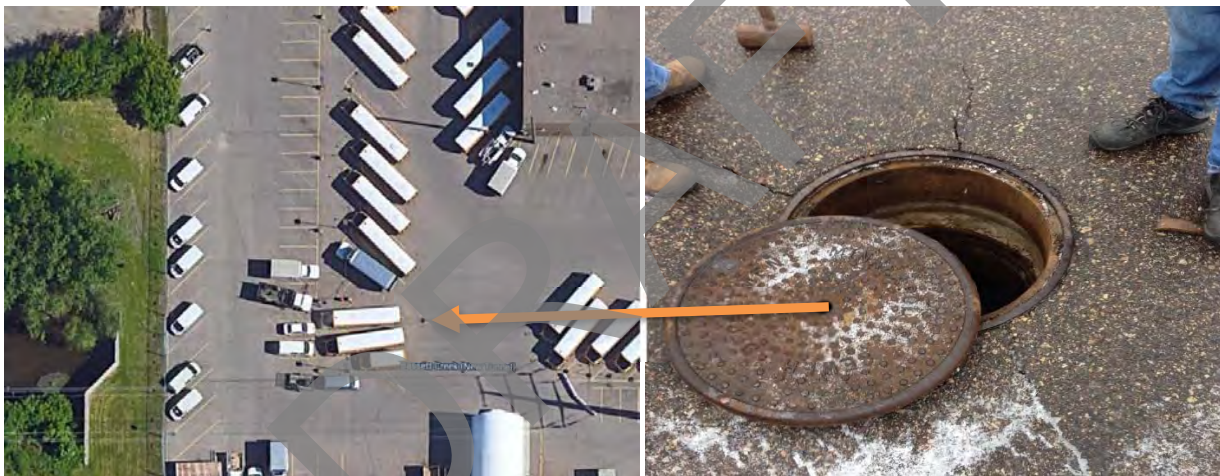


Figure 3-2 Primary Access Point

Coordination with the bus garage supervisor was required in order to utilize this access point. The crew entered the tunnel through a manhole using an extension ladder. A tripod and fall arrester were utilized for fall protection while climbing down the ladder. A surface attendant and Rescue Resources were stationed at this access point during the inspection.

### 3.2.3 Secondary Access

It is recommended that secondary access be considered for future inspections if possible. A feasible option for secondary access is through a manhole located on the Cedar Trail west of the Glenwood Avenue Bridge as shown in Figure 3-3. A tripod and winch is required to enter or exit at this location.





Figure 3-3 Secondary Access

### 3.3 Schedule and Inspection Summary

The Double Box Culvert inspection was completed in two days on October 22 and 24, 2019. Table 3-1 summarizes the inspection extents as well as the time required for each inspection.

Table 3-1 Summary of Tunnel Inspections

Tunnel Segment	Inspection Date	Station Interval Inspected	Length Inspected (ft)	Inspection Hours
Double Box Culvert 11-ft by 11-ft Right Box <sup>1</sup>	10/24/19	Sta. 172+24 to 119+88	5,236	8
Double Box Culvert 11-ft by 11-ft Left Box <sup>1</sup>	10/22/19	Sta. 172+24 to 119+88	5,236	8
Single Box Culvert <sup>2</sup> 15-ft wide by 11-ft high	n/a	Sta. 119+88 to 116+73	<del>315</del> 0	n/a

<sup>1</sup>Left and right relative to facing downstream

<sup>2</sup>Due to high base flow conditions, and slippery invert, it was determined that 315' long segment could not be inspected safely.



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## 4.0 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. (8)). 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 Appendix A for reference.

Note: The 2010 PACP code was utilized for the 2014 inspection, while the 2016 PACP code was utilized for the 2019 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.

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#### 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 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).

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#### 4.1.4 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.

#### 4.1.5 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).

##### 4.1.5.1 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.

##### 4.1.5.2 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.

##### 4.1.5.3 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.

##### 4.1.5.4 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.

##### 4.1.5.5 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.

#### 4.1.6 Lining Features

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

##### 4.1.6.1 Bulges

Bulge (LFBU) refers to intruding defects that when the liner was placed or constructed results in a bulge where the defect is located.

#### 4.1.7 Point Repair

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

#### 4.1.7.1 Patch Repair

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

#### 4.1.7.2 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.

### 4.1.8 Brickwork

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

#### 4.1.8.1 Missing Brick

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

#### 4.1.8.2 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 Water 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.

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#### 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 root 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.

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#### 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 Built Into Structure

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

#### 4.2.4.4 Construction Debris

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

#### 4.2.4.5 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.



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## 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 4.0 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

$$\text{Grade Score} = \text{Defect Rating} \times \text{Total Number of Defects}$$

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**

$$OPR = Grade\ Score_1 + Grade\ Score_2 + Grade\ Score_3 + Grade\ Score_4 + Grade\ Score_5$$

### 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.

## 5.0 Inspection Findings

As discussed in Section 3.1, Barr utilized the 2014 inspection data as a baseline for the 2019 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. Note: observations recorded in the 2014 report that no longer apply are stricken out, and new observations are documented with red text. The updated 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, and 2019 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 10-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 2019 as shown in Figure 5-1.



Figure 5-1 Shear Key 13 Comparison Photos

A comprehensive qualitative comparison of the 2009, 2014, and 2019 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.

### 5.2 Quantitative Analysis

To supplement the qualitative review of inspection findings, a quantitative analysis of the 2019 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 0-5 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	<i>Good:</i> 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	<i>Fair:</i> The tunnel liner is structurally adequate but defects are causing deterioration. The tunnel requires monitoring, but no maintenance or rehabilitation is currently necessary.
4	<i>Poor:</i> The tunnel liner is structurally inadequate and defects have caused advanced deterioration. The tunnel requires rehabilitation.
5	<i>Urgent:</i> 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 both the left and right box culverts with changes between the 2014 and 2019 inspections documented with strikeout and red text. Detailed tables that break down the left and right 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
Double Box Culvert 11-ft by 11-ft (Right Box) Sta. 172+24 to 119+88	1	2	Structural and O&M PRI values remain unchanged.
Double Box Culvert 11-ft by 11-ft (Left Box) Sta. 172+24 to 119+88	1	2	Structural and O&M PRI values remain unchanged.

## 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. A summary of the OPR values for both the left and right box of the Double Box Culvert is included in Table 5-3 with changes between the 2014 and 2019 inspections documented with strikeout and red text. Detailed tables that break down the left and right 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
Double Box Culvert 11-ft by 11-ft (Right Box) Sta. 172+24 to 119+88	<del>532</del> 549	<del>228</del> 241	Increase in Structural and O&M OPR values is attributed to additional defects observed during the 2019 inspection.
Double Box Culvert 11-ft by 11-ft (Left Box) Sta. 172+24 to 119+88	<del>727</del> 738	<del>246</del> 270	

### 5.3 Grade 3 Defects

In total, 13 grade 3 (moderate) defects were observed in the right box and 21 grade 3 defects in the left box. A summary of these defects including the type of defect are provided in Table 5-4 with changes between the 2014 and 2019 inspections documented with strikeout and red text. Detailed tables that break down the left and right boxes into 1,000-foot segments with corresponding number of grade 4 defects are included in Appendix D.

Table 5-4 Summary of Grade 3 Defects

Tunnel Segment & Interval	Grade 3 Defect Quantity	Defect Type	Notes
Double Box Culvert 11-ft by 11-ft (Right Box) Sta. 172+24 to 119+88	<del>12</del> 13	ID	Infiltration Dripper. The infiltration drippers occurred between Sta. <del>160+96 to 128+48</del> 160+72 to 141+70.
Double Box Culvert 11-ft by 11-ft (Left Box) Sta. 172+24 to 119+88	<del>18</del> 21	ID, CM, SAV, FS,	Infiltration Dripper (Sta. 171+10 to 123+46), Multiple Cracks (Sta. 152+04), Surface Aggregate Visible, Spiral Fracture (Sta. 132+52). Infiltration drippers are most occurring. <del>The grade 3 defects occurred between Sta. 160+73 to 128+24.</del>

### 5.4 Grade 4 Defects

In total, 3 grade 4 (significant) defects were observed in the right box and 2 grade 4 defects in left box. A summary of these defects including the type of defect are provided in Table 5-5 with changes between the 2014 and 2019 inspections documented with strikeout and red text. Detailed tables that break down the left and right 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
Double Box Culvert 11-ft by 11-ft (Right Box) Sta. 172+24 to 119+88	4 3	IR	Infiltration Runner at Sta. <del>159+32</del> 159+56, Sta. 148+46, and Sta. 148+04
Double Box Culvert 11-ft by 11-ft (Left Box) Sta. 172+24 to 119+88	0 2	<del>N.A.</del> IR, FM	<del>N.A.</del> Infiltration Runner at Sta. 159+50 and Fracture Multiple at Sta. 151+99

## 5.5 Grade 5 Defects

In total, 2 grade 5 (most significant) defects were observed in the right box, and 0 grade 5 defects in left box. A summary of these defects including the type of defect are provided in Table 5-6 with changes between the 2014 and 2019 inspections documented with strikeout and red text. Detailed tables that break down the left and right boxes 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
Double Box 11-ft by 11-ft (Right Box) Sta. 172+24 to 119+88	2	SRV	Surface Reinforcement Visible at Sta. 165+34 and 154+04
Double Box 11-ft by 11-ft (Left Box) Sta. 172+24 to 119+88	0	N.A.	N.A.

## 5.6 Comparison with Previous Inspections

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

### 5.6.1 Shrinkage Cracks

The previous inspections observed hairline cracking (described as shrinkage cracks) throughout the Double Box Culvert with seepage and accumulation of leachate deposits at some of the cracks. The 2019 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 2019 findings are generally consistent with the previous inspections, however, some of the defects have

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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 2019 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 2019 findings identified two locations with exposed rebar (Sta. 153+75 and 165+34). These findings are consistent with the 2014 inspection.

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## 6.0 Recommendations

Based on the 2019 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 perform a full NASSCO PACP inspection on a 5-year basis.

#### 6.1.2 Shear Keys - Structural

A large portion of 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 Monitoring Recommendations

The southwest light rail transit (SWLRT) project was underway at the time of the inspection, and portions of the alignment run above the Double Box Culvert. Crack gauges were installed at several of the shear keys by others to measure potential displacement related to the construction. It is recommended that the BCWMC request the ongoing monitoring reports generated as part of the Southwest Light Rail Transit (SWLRT) project for engineer review to verify potential impacts to the Double Box Culvert.

### 6.3 Repair Recommendations

#### 6.3.1.1 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.

#### 6.3.1.2 Crack Sealing and Deposit Removal

Various degrees of infiltration were observed throughout the tunnel, occurring at cracks, joints, and other defects. At four locations, infiltration runners were observed that equate to a grade 4 PACP defect. It is recommended that the BCWMC repair these points of infiltration, and 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.

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### 6.3.1.3 Repair Exposed Reinforcement

At two locations, exposed reinforcement were observed that equate 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.

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## 7.0 References

1. **Barr Engineering Co.** Bassett Creek Double Box Culvert and 3rd Avenue Tunnel Inspection Report. Inspection Date: December 2014. Prepared for the City of Minneapolis & Bassett Creek Watershed Mnagement Commission. March 2016.
2. **US Army Corps of Engineers**, St. Paul District, Flood Control Project Bassett Creek Local Hennepin County, MN, Operation and Maintenance Manual. June 1997.
3. **Barr Engineering Co.** Memorandum: Double Box Culvert Inspection-Bassett Creek Flood Control Project. Inspection Date: November 9, 2004. 2004.
4. **Barr Engineering Co.** Memorandum: Bassett Creek Double Box Culvert Preconstruction Inspection-Proposed Twins Stadium Site. Inspection Date: April 29, 2007. Prepared for Bassett Creek Watershed Management Commission. 2007.
5. **CNA Consulting Engineers.** I-94 Storm Tunnel System Assessment Report. Prepared for Minnesota Department of Transportation. July 2008.
6. **Barr Engineering Co.** Memorandum: Second Street Tunnel and Third Avenue Tunnel Inspection, Inspection Date: February 20, 2008. Prepared for Bassett Creek Watershed Management Commission. 2008.
7. **Barr Engineering Co.** Memorandum: Bassett Creek Double Box Culvert 5-Year Inspection. Inspection Date: November 19, 2009. Prepared for Bassett Creek Watershed Management Commission. 2009.
8. **NASSCO.** Pipeline Assessment Certification Program. *Reference Manual 7.0.2.* September 2016.

## Appendix A

### PACP Code Summary Charts

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Figure 3-1

## NASSCO'S PIPELINE ASSESSMENT CERTIFICATION PROGRAM® (PACP®)

### Section 4 — Structural Defect Coding

<b>C CRACK 4-3</b> CL Longitudinal CC Circumferential CM Multiple CS Spiral CH Hinge (2, 3, 4)	<b>F FRACTURE 4-9</b> FL Longitudinal FC Circumferential FM Multiple FS Spiral FH Hinge (2, 3, 4)	<b>B BROKEN 4-17</b> BSV Soil Visible BVV Void Visible	<b>H HOLE 4-21</b> HSV Soil Visible HVV Void Visible	<b>D DEFORMED 4-25 (Rigid)</b> DR Deformed Rigid No modifiers used.	<b>D DEFORMED 4-25 (Flexible)</b> DFBR Bulging Round DFBI Bulging Inv.Curv. DFC Creasing DFE Elliptical	<b>D DEFORMED 4-25 (Brick)</b> DTBR Bulging Round DTBI Bulging Inv.Curv.
<b>X COLLAPSE 4-37</b> X Collapse No descriptors and no modifiers used.	<b>J JOINT 4-43</b> JOS Offset Small JOM Offset Medium JOL Offset Large	<b>J JOINT 4-43</b> JOSD Offset Small Defect JOMD Offset Medium Defect JOLD Offset Large Defect	<b>J JOINT 4-43</b> JSS Separation Small JSM Separation Med. JSL Separation Large	<b>J JOINT 4-43</b> JAS Angular Small JAM Angular Medium JAL Angular Large	<b>S SURFACE 4-51 DAMAGE</b> SRI Roughness Increased SAV Aggregate Visible SAP Aggregate Projecting SAM Aggregate Missing	<b>S SURFACE 4-51 DAMAGE</b> SRV Reinforcement Visible SRP Reinforcmt.Projecting SRC Reinforcmt.Corroded SMW Missing Wall
<b>S SURFACE 4-51 DAMAGE</b> SSS Surface Spalling SSC Surface Spalling Coating SCP Chemical Attack SZ Other	<b>LF LINING 4-67 FEATURES</b> LFAC Abdn'd Connection LFAS Annular Space LFB Blistered Lining LFCS Service Cut Shifted	<b>LF LINING 4-67 FEATURES</b> LFD Detached LFDC Discoloration LFDE Defective End LFDL Delamination	<b>LF LINING 4-67 FEATURES</b> LFOC Overcut Service LFRS Resin Slug LFUC Undercut Service LFW Wrinkled LFZ Other	<b>WF WELD FAILURE 4-85</b> WFC Circumferential WFL Longitudinal WFM Multiple WFS Spiral WFZ Other	<b>RP POINT REPAIR 4-89</b> RPL Liner RPLD Liner Defective RPP Patch RPPD Patch Defective	<b>RP POINT REPAIR 4-89</b> RPR Replacement RPRD Replmt. Defective RPZ Other RPZD Other Defective
<b>BRICKWORK 4-97</b> DB Displaced MB Missing DI Dropped Invert	<b>BRICKWORK 4-97</b> MMS Mortar Missing Small MMM Mortar Missing Med. MML Mortar Missing Large					



Figure 3-2

**NASSCO'S PIPELINE ASSESSMENT CERTIFICATION PROGRAM® (PACP)®**

**Section 5 — Operation and Maintenance**

<b>D DEPOSITS 5-3</b> (Attached) DAE Encrustation DAGS Grease DAR Ragging DAZ Other	<b>D DEPOSITS 5-4</b> (Settled) DSF Fine DSGV Gravel DSC Hard/Compact DSZ Other	<b>D DEPOSITS 5-4</b> (Ingress) DNF Fine (silt/sand) DNGV Gravel DNZ Other	<b>R ROOTS 5-11</b> (Fine) RFB Barrel RFL Lateral RFC Connection RFJ Joint	<b>R ROOTS 5-11</b> (Medium) RMB Barrel RML Lateral RMC Connection RMJ Joint	<b>R ROOTS 5-11</b> (Ball) RBB Barrel RBL Lateral RBC Connection RBJ Joint	<b>R ROOTS 5-11</b> (Tap) RTB Barrel RTL Lateral RTC Connection RTJ Joint
<b>I INFILTRATION 5-19</b> IS Stain ISB Barrel ISC Connection ISJ Joint ISL Lateral	<b>I INFILTRATION 5-19</b> IW Weeper IWB Barrel IWC Connection IWJ Joint IWL Lateral	<b>I INFILTRATION 5-19</b> ID Dripper IDB Barrel IDC Connection IDJ Joint IDL Lateral	<b>I INFILTRATION 5-19</b> IR Runner IRB Barrel IRC Connection IRJ Joint IRL Lateral	<b>I INFILTRATION 5-19</b> IG Gusher IGB Barrel IGC Connection IGJ Joint IGL Lateral	<b>OB OBSTACLES 5-31</b> <b>OBSTRUCTIONS</b> OBB Brick or Masonry OBC Object Through Connection OBI Object Intruding Through Wall	<b>OB OBSTACLES 5-31</b> <b>OBSTRUCTIONS</b> OBJ Object in Joint OBM Pipe Material in Invert OBN Construction Debris OBP External Pipe Cable
<b>OB OBSTACLES 5-31</b> <b>OBSTRUCTIONS</b> OBR Rocks OBS Built In Structure OBZ Other	<b>V VERMIN 5-45</b> VR Rat VC Cockroach VZ Other	<b>G GROUT TEST 5-49</b> <b>&amp; SEAL</b> GTP Grout Test Passed GTPJ Joint GTPL Lateral GTF Grout Test Failed GTFJ Joint GTFL Lateral	<b>G GROUT TEST 5-49</b> <b>&amp; SEAL</b> GTU Grout Test Unable GTUJ Joint GTUL Lateral GRT Grout Test Location			

**Section 6 — Construction Features**

<b>T TAP 6-3</b> TB Break-In/Hammer TBI Intruding TBD Defective TBC Capped TBA Activity TBB Abandoned	<b>T TAP 6-3</b> TF Factory Made TFI Intruding TFD Defective TFC Capped TFA Activity TFB Abandoned	<b>T TAP 6-3</b> TR Rehabilitated TRI Intruding TRD Defective TRC Capped TRA Activity TRB Abandoned	<b>T TAP 6-3</b> TS Saddle TSI Intruding TSD Defective TSC Capped TSA Activity TSB Abandoned	<b>IS INTRUDING SEALING MATERIAL 6-15</b> ISSR Sealing Ring ISSRB Broken ISSRH Hanging ISSRL Loose ISGT Grout ISZ Other	<b>M MISCELLANEOUS FEATURES 7-1</b> MCU Camera Underwater MGO General Observation MGP General Photograph MJL Joint Length	
<b>L LINE (of sewer) 6-21</b> LD Down LL Left LLD Left Down LLU Left Up	<b>L LINE (of sewer) 6-21</b> LR Right LRD Right Down LRU Right Up LU Up	<b>A ACCESS POINT 6-25</b> ACB Catch Basin ACO Cleanout ACOM Mainline ACOP Property ACOH House	<b>A ACCESS POINT 6-25</b> ADP Discharge Point AEP End of Pipe AJB Junction Box AM Meter AMH Manhole	<b>A ACCESS POINT 6-25</b> AOC Other Structure ATC Tee Connection AWA Wastewater Access AWW Wetwell AZ Other	<b>M MISCELLANEOUS FEATURES 7-1</b> MLC Lining Change MMC Material Change MSC Shape/Size Change MSA Survey Abandoned MWL Water Level	<b>M MISCELLANEOUS FEATURES 7-1</b> MWLS Water Level Sag MWM Water Mark MY Dye Test MYV Dye Visible MYN Not Visible

**Section 7 — Miscellaneous Features**

## Appendix B

### Inspection Summary Tables

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## Double Box Culvert - Left Box

Inspection Notes - Station 172+24 to 119+88									
Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
172+24		MGO	Misc.	0					10/22/19 9:30 A.M. Start inspection in right (north) box starting at trash rack and walking downstream. Approximately 2-3' of debris built up on trash rack. Inspectors: Joe Welna, Gareth Becker, and Nate Born.
172+24		MSC	Misc.	0					begining of double box culvert 11-ft-high by 11-ft-wide
172+24		MWL	Misc.	0				5	5" 18" water depth
172+22	172+18	CL	Struct.	2	9		4		
172+11		CC	Struct.	1	4	5			
172+10		CC	Struct.	1	7	9			
172+09		CC	Struct.	1	3	5			
171+94		MGO	Misc.	0					shear key K1: up to 2 in. of separation at shear key, bitumastic bond breaker deteriorated Joint Width: K1R: 1.75"-2", K1L: 1.75"-2". Right and left shear keys are referenced walking downstream. Evidence of differential settlement based on measured joint, and defects observed.
171+86		CC	Struct.	1	7	9			
171+83		CC	Struct.	1	3	5			
171+78		CC	Struct.	1	7	10			
171+73		CC	Struct.	1	8	10			
171+67		CC	Struct.	1	7	10			
171+67		CC	Struct.	1	1	5			
171+62		CC	Struct.	1	7	11			
171+55		CC	Struct.	1	1	5			
171+55		CC	Struct.	1	7	11			
171+45		IS	O&M	0	7	8			
171+45		IW	O&M	2	7	1			
171+42		CC	Struct.	1	2	5			
171+39		CC	Struct.	1	7	10			
171+37		CC	Struct.	1	2	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

Inspection Notes - Station 172+24 to 119+88									
Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
171+34		CC	Struct.	1	7	5			
171+24		CC	Struct.	1	1	5			
171+23		IS	O&M	0	7	8			
171+19		CC	Struct.	1	12	5			
171+10		CC	Struct.	1	7	1			
171+10		ID	O&M	3	12				
171+01		CC	Struct.	1	7	1			
170+95		CC	Struct.	1	7	11			
170+95		IS	O&M	0	7				
170+88		CC	Struct.	1	7	11			
170+88		CC	Struct.	1	12	5			
170+83	170+80	CS	Struct.	2	7	8	3		
170+80		RPP	Struct.	0	9	10			5ft x 5ft patch repair below AMH
170+77		CC	Struct.	1	4	5			
170+75		AMH	Const.	0					Minneapolis impound lot manhole at 11 o'clock
170+75		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
170+74		CC	Struct.	1	4	5			
170+73		CC	Struct.	1	4	5			
170+70		CC	Struct.	1	7	11			
170+62		CC	Struct.	1	7	11			
170+55		CC	Struct.	1	1	5			
170+54		CC	Struct.	1	7	11			
170+52		CC	Struct.	1	1	5			
170+49	170+44	CS	Struct.	2	3	5	5		
170+46		CC	Struct.	1	7	8			
170+38		CC	Struct.	1	1	5			
170+38		CC	Struct.	1	7	10			
170+32		CC	Struct.	1	1	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
170+16		CC	Struct.	1	1	5			
170+12		CC	Struct.	1	1	5			
170+12		CC	Struct.	1	7	9			
170+06		CC	Struct.	1	7	10			
169+99	169+95	CL	Struct.	2	9		4		
169+95		MGO	Misc.	0					shear key K2, 1 in. of separation at shear key, bitumastic bond breaker deteriorated <span style="color: red;">Joint Width: K2R: 1.25", K2L: 1.25"</span>
169+84		CC	Struct.	1	2	5			
169+79		CC	Struct.	1	7	10			
169+73		CC	Struct.	1	7	11			
169+73		CC	Struct.	1	2	5			
169+69		CC	Struct.	1	1	5			
169+66		CC	Struct.	1	7	11			
169+63		CC	Struct.	1	3	5			
169+59		CC	Struct.	1	2	5			
169+52		CC	Struct.	1	1	5			
169+52		CC	Struct.	1	7	10			
169+44		CC	Struct.	1	7	11			
169+44		CC	Struct.	1	1	5			
169+44		IW	O&M	2	7	8			
169+37		CC	Struct.	1	1	5			
169+37	169+34	CS	Struct.	2	7	8	3		
169+34		CC	Struct.	1	7	11			
169+34		CC	Struct.	1	1	5			
169+34		IW	O&M	2	7	9			
169+31		CC	Struct.	1	1	5			
169+29		CC	Struct.	1	1	5			
169+27		CC	Struct.	1	7	11			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
169+22		CC	Struct.	1	1	5			
169+19		CC	Struct.	1	7	11			
169+06		CC	Struct.	1	7	12			
169+04		CC	Struct.	1	1	5			
169+00		CC	Struct.	1	7	10			
168+94		CC	Struct.	1	7	11			
168+94		CC	Struct.	1	12	5			
168+86		CC	Struct.	1	7	5			
168+86		IW	O&M	2	12	1			
168+84		CC	Struct.	1	1	5			
168+78		CC	Struct.	1	12	5			
168+76		CC	Struct.	1	7	11			
168+70		CC	Struct.	1	2	5			
168+66		CC	Struct.	1	10	5			
168+64		CC	Struct.	1	7	1			
168+59		CC	Struct.	1	7	11			
168+59		CC	Struct.	1	1	5			
168+52		CC	Struct.	1	8	11			
168+51		CC	Struct.	1	2	5			
168+48		CC	Struct.	1	1	5			
168+45		CC	Struct.	1	7	1			
168+45		IW	O&M	2	7	8			
168+41		CC	Struct.	1	7	11			
168+39		CC	Struct.	1	1	5			
168+21		CC	Struct.	1	4	5			
168+19		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
168+19		CC	Struct.	1	7	10			
168+19		IW	O&M	2	7	9			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.



## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
168+17		CC	Struct.	1	4	7			
168+14	168+11	CS	Struct.	2	7	11	3		
168+08		CS	Struct.	2	3	5			
168+08		CC	Struct.	1	7	11			
167+94		MGO	Misc.	0					shear key K3, 1 in. of separation, bitumastic bond breaker deteriorated <span style="color: red;">Joint Width: K3R: 1/2"-1.25", K3L: 1/2"-1.25"</span>
167+86		CC	Struct.	1	7	10			
167+81		CC	Struct.	1	1	5			
167+60		CC	Struct.	1	7	11			
167+55		CC	Struct.	1	7	11			
167+55		CC	Struct.	1	1	5			
167+51		CC	Struct.	1	1	5			
167+50		CC	Struct.	1	7	11			
167+44		IW	O&M	2	7	9			
167+40		CC	Struct.	1	7	5			
167+34		CC	Struct.	1	2	5			
167+19	166+19	LR	Const.	0			100	80	
167+17		CC	Struct.	1	1	5			
167+15		CC	Struct.	1	7	11			
167+10		CC	Struct.	1	7	11			
167+06		CC	Struct.	1	7	11			
167+06		CC	Struct.	1	1	5			
167+01		TBA	Const.	0	10				2-ft-dia. RCP reinforcement visible around break-in
167+01		AMH	Const.	0					Colfax access manhole at 11 o'clock
167+00	166+97	CS	Struct.	2	7	8	3		
166+98		CC	Struct.	1	1	5			
166+93		CC	Struct.	1	7	11			
166+89		CC	Struct.	1	12	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
166+82		CC	Struct.	1	7	11			
166+71		CC	Struct.	1	7	11			
166+69		CC	Struct.	1	1	5			
166+65		CC	Struct.	1	7	11			
166+63		CC	Struct.	1	1	5			
166+59		CC	Struct.	1	7	11			
166+52		CC	Struct.	1	7	11			
166+52		IW	O&M	2	7	8			
166+50		CC	Struct.	1	1	5			
166+45		MGO	Misc.	0					L-bracket fastened to wall at 9 o'clock
166+42		CC	Struct.	1	7	11			
166+42		CC	Struct.	1	1	5			
166+36		CC	Struct.	1	7	11			
166+33		CC	Struct.	1	1	5			
166+32		CC	Struct.	1	7	11			
166+19		CC	Struct.	1	7	11			
166+14		CC	Struct.	1	7	11			
166+14		CC	Struct.	1	1	5			
166+08		CC	Struct.	1	1	5			
166+07		CC	Struct.	1	7	11			
166+06		CC	Struct.	1	1	5			
166+00		CC	Struct.	1	3	5			
165+97		CC	Struct.	1	7	11			
165+96		CC	Struct.	1	1	5			
165+86		MGO	Misc.	0					Shear key K4, <del>1/2 inch of separation at shear key</del> , bitumastic bond breaker gone, weeping from left joint <b>Joint Width: K4R: 1/2"-1", K4L: 1/2"-1"</b>
165+86		CC	Struct.	1	11	1			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
165+86		FC	Struct.	2	1	2			
165+73		CC	Struct.	1	1	5			
165+66		CC	Struct.	1	7	11			
165+66		CC	Struct.	1	1	5			
165+60		CC	Struct.	1	7	11			
165+56		TFA	Const.	0	11				1-ft-dia. steel
165+56		CC	Struct.	1	1	5			
165+55		CC	Struct.	1	7	11			
165+51		CC	Struct.	1	1	5			
165+47		CC	Struct.	1	1	5			
165+46		CC	Struct.	1	7	11			
165+38		CC	Struct.	1	7	11			
165+35		CC	Struct.	1	1	5			
165+35		IW	O&M	2	7	9			
165+30		CC	Struct.	1	11	5			
165+25		CC	Struct.	1	7	11			
165+25		CC	Struct.	1	1	5			
165+20		CC	Struct.	1	7	1			
165+20		IW	O&M	2	8	10			
165+13		CC	Struct.	1	1	5			
165+11		CC	Struct.	1	7	11			
165+09		CC	Struct.	1	1	5			
165+06		CC	Struct.	1	7	11			
164+96		CC	Struct.	1	4	5			
164+94		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
164+94		CC	Struct.	1	7	1			
164+94		AMH	Const.	0					Colfax access manhole at 11 o'clock
164+92		CC	Struct.	1	4	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
164+84		CC	Struct.	1	7	10			
164+84		CC	Struct.	1	1	5			
164+84		IW	O&M	2	7	9			
164+81		CC	Struct.	1	11	1			
164+81		IS	O&M	0	11	1			
164+73		CC	Struct.	1	7	11			
164+72		CC	Struct.	1	1	5			
164+62		CC	Struct.	1	7	11			
164+62		CC	Struct.	1	1	5			
164+62		IW	O&M	2	7				
164+57		CC	Struct.	1	1	5			
164+53		CC	Struct.	1	7	11			
164+48		CC	Struct.	1	1	5			
164+36		MGO	Misc.	0					Shear key K5, <del>1/2 in. of separation at shear key</del> , majority of bitumastic bond breaker in place, left joint spalling <b>Joint Width: K5R: 1/2"-1", K5L: 1/2"-1"</b>
164+36		SSS	Struct.	2	10				Spalling 12" dia, 3" deep
164+36		FC	Struct.	2	10	11			
164+23		CC	Struct.	1	7	11			
164+12		CC	Struct.	1	3	5			
164+12		MGO	Misc.	0					4-in. bump out on left side of tunnel
164+05		CC	Struct.	1	7	11			
164+00		CC	Struct.	1	1	5			
163+97		CC	Struct.	1	1	5			
163+94		CC	Struct.	1	7	11			
163+92		CC	Struct.	1	11	5			
163+86		CC	Struct.	1	7	11			
163+86		CC	Struct.	1	1	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

Inspection Notes - Station 172+24 to 119+88									
Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
163+83		CC	Struct.	1	1	5			
163+75		CC	Struct.	1	7	1			
163+75		CC	Struct.	1	3	5			
163+71		CC	Struct.	1	11	5			
163+67		CC	Struct.	1	2	5			
163+67		CC	Struct.	1	7	11			
163+62		CC	Struct.	1	7	11			
163+62		CC	Struct.	1	1	5			
163+55		CC	Struct.	1	7	5			
163+55		IS	O&M	0	7	5			
163+53		CC	Struct.	1	1	5			
163+53		ID	O&M	3	12	1			
163+52		CC	Struct.	1	7	9			
163+45		CC	Struct.	1	7	5			
163+35		CC	Struct.	1	12	12			
163+28		CC	Struct.	1	7	11			
163+24		CC	Struct.	1	11	1			
163+22		CC	Struct.	1	7	11			
163+15		CC	Struct.	1	7	1			
163+11		MGO	Misc.	0					end of 4-in. bump out on left side of tunnel
163+07		CC	Struct.	1	11	5			
163+00	162+97	CS	Struct.	2	3	5	3		
162+98		CC	Struct.	1	7	11			
162+84	162+81	CS	Struct.	2	4	5	3		
162+81		MGO	Misc.	0					Shear key K6, <del>1/2-in. of separation at shear key</del> , majority of bitumastic bond breaker in place, staining on left joint <span style="color: red;">Joint Width: K6R: 1/2", K6L: 1/2"</span> . Crack gauges installed at left and right shear key.

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
162+81	161+48	LL	Const.	0			133	100	
162+62		CC	Struct.	1	7	11			
162+46		CC	Struct.	1	12	5			
162+40		CC	Struct.	1	7	1			
162+38	162+35	CS	Struct.	2	7	8	3		
162+33		CC	Struct.	1	11	5			
162+10		CC	Struct.	1	7	5			
161+95		MGO	Misc.	0					Shear key K7, 1/2 in. of separation at shear key, majority of bitumastic bond breaker in place Joint Width: K7R: 1/2"-3/4", K7L: 1/2"-3/4"
161+75		CC	Struct.	1	7	11			
161+59		CC	Struct.	1	7	11			
161+59		CC	Struct.	1	1	5			
161+48		IW	O&M	2	7	8			
161+48		CC	Struct.	1	11	1			
161+48		IW	O&M	2	9				
161+48		IW	O&M	2	11				
161+48		IW	O&M	2	12				
161+44		CC	Struct.	1	7	11			
161+34		CC	Struct.	1	7	11			
161+31		IW	O&M	2	7				
161+25		CC	Struct.	1	11	5			
161+20		CC	Struct.	1	11	1			
161+14		CC	Struct.	1	11	5			
161+12		CC	Struct.	1	7	11			
161+07		CC	Struct.	1	11	5			
160+97		CC	Struct.	1	11	5			
160+97		ID	O&M	3	11				

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
160+91		CC	Struct.	1	7	2			
160+91		IW	O&M	2	7				
160+89	160+84	CS	Struct.	2	9	11	5		
160+87		CC	Struct.	1	7	11			
160+86		CC	Struct.	1	11	5			
160+79		CC	Struct.	1	1	5			
160+78		CC	Struct.	1	7	5			
160+68		CC	Struct.	1	7	11			
160+67		IW	O&M	2	7				
160+64		CC	Struct.	1	7	11			
160+63		CC	Struct.	1	4	5			
160+61		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
160+59		CC	Struct.	1	4	5			
160+59		CC	Struct.	1	7	11			
160+50		CC	Struct.	1	7	5			
160+50		ID	O&M	3	11	1			
160+42		CC	Struct.	1	7	11			
160+39		CC	Struct.	1	1	5			
160+38		CC	Struct.	1	7	11			
160+38		IW	O&M	2	7				
160+34		CC	Struct.	1	1	5			
160+16		CC	Struct.	1	7	11			
160+14		CC	Struct.	1	1	5			
160+00		MGO	Misc.	0					Shear key K8, <del>up to 1 in. of separation at shear key</del> , bitumastic bond breaker deteriorated, <b>Joint Width: K8R: 3/4"-1", K8L: 1"</b>
159+94		CC	Struct.	1	7	8			
159+94		IS	O&M	0	7	5			
159+92		CC	Struct.	1	1	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.



## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
159+85		CC	Struct.	1	7	11			
159+85		IS	O&M	0	7				
159+78		CC	Struct.	1	1	5			
159+76		CC	Struct.	1	7	11			
159+76		IS	O&M	0	7	8			
159+69		CC	Struct.	1	1	5			
159+69		CC	Struct.	1	7	8			
159+64		CC	Struct.	1	1	5			
159+55		CC	Struct.	1	7	11			
159+54		CC	Struct.	1	1	5			
159+50		IS	O&M	0	7	11			
159+50		IR	O&M	4	8	10			
159+43		CC	Struct.	1	1	5			
159+41		CC	Struct.	1	7	11			
159+38		CC	Struct.	1	1	5			
159+25		CC	Struct.	1	7	1			
159+20		CC	Struct.	1	11	5			
159+15		CC	Struct.	1	7	11			
159+15		CC	Struct.	1	3	5			
159+09		CC	Struct.	1	1	5			
159+08		CC	Struct.	1	7	11			
159+08		IS	O&M	0	7	8			
159+00		IW	O&M	2	7	9			
159+00		ID	O&M	3	11	2			
158+93		CC	Struct.	1	11	5			
158+91		CC	Struct.	1	4	5			
158+90		CC	Struct.	1	7	11			
158+90		IW	O&M	2	7	8			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
158+89		CC	Struct.	1	3	5			
158+84		CC	Struct.	1	1	5			
158+80		CC	Struct.	1	1	5			
158+70		ID	O&M	3	11	2			
158+65		IS	O&M	0	11	2			
158+61		CC	Struct.	1	11	1			
158+61		ID	O&M	3	11	1			
158+60		CC	Struct.	1	1	5			
158+60		CC	Struct.	1	7	11			
158+50		IW	O&M	2	7	5			
158+43	158+40	CS	Struct.	2	7	8	3		
158+42		CC	Struct.	1	1	5			
158+39		CC	Struct.	1	7	1			
158+30		CC	Struct.	1	7	11			
158+22		CC	Struct.	1	7	11			
158+19		CC	Struct.	1	7	1			
158+13		CC	Struct.	1	2	5			
158+10		CC	Struct.	1	7	10			
158+10		IW	O&M	2	7				
158+00		MGO	Misc.	0					Shear key K9, 1-in. of separation at shear key, bitumastic bond breaker deteriorated, Joint Width: K9R: 1", K9L: 3/4"-1-1/2"
157+94		CC	Struct.	1	4	5			
157+88		CC	Struct.	1	1	5			
157+77		CC	Struct.	1	1	5			
157+73		CC	Struct.	1	7	11			
157+64		CC	Struct.	1	1	5			
157+60		CC	Struct.	1	7	11			
157+57		CC	Struct.	1	11	1			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
157+55		CC	Struct.	1	7	11			
157+54		CC	Struct.	1	1	5			
157+50		IW	O&M	2	7	12			
157+43		CC	Struct.	1	7	4			
157+34		CC	Struct.	1	7	5			
157+29		CC	Struct.	1	9	3			
157+19		CC	Struct.	1	11	1			
157+00		IW	O&M	2	7	12			
157+00		CC	Struct.	1	7	3			
156+93		CC	Struct.	1	7	11			
156+91		CC	Struct.	1	1	5			
156+86		CC	Struct.	1	7	5			
156+84		CC	Struct.	1	4	8			
156+79		CC	Struct.	1	1	5			
156+77		CC	Struct.	1	1	5			
156+71		CC	Struct.	1	4	5			
156+68		CC	Struct.	1	7	11			
156+68		CC	Struct.	1	1	5			
156+63		CC	Struct.	1	7	11			
156+58		FC	Struct.	2	1	5			
156+58		IS	O&M	0	11	1			
156+54		CC	Struct.	1	7	11			
156+54		IW	O&M	2	7	8			
156+50		IW	O&M	2	7	8			
156+39		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
156+39		AMH	Const.	0					west side I-94 manhole at 11 o'clock
156+35		CC	Struct.	1	7	12			
156+26		CC	Struct.	1	7	10			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
156+20		CC	Struct.	1	1	5			
156+12		CC	Struct.	1	7	11			
156+00		MGO	Misc.	0					Shear key K10, <del>1/2 in. of separation at shear key</del> , bitumastic bond breaker deteriorated, Joint Width: K10R: 3/4"-1-1/4", K10L: 3/4"-1-1/4"
155+86		CC	Struct.	1	7	10			
155+75		CC	Struct.	1	7	11			
155+70		CC	Struct.	1	4	5			
155+68		CC	Struct.	1	7	11			
155+59		CC	Struct.	1	7	11			
155+49		IW	O&M	2	7	9			
155+49		CC	Struct.	1	2	5			
155+45		CC	Struct.	1	11	2			
155+45		ID	O&M	3	11	2			
155+34		CC	Struct.	1	7	5			
155+27		CC	Struct.	1	7	5			
155+19		CC	Struct.	1	7	1			
155+15		CC	Struct.	1	11	5			
155+11		CC	Struct.	1	7	11			
155+11		IW	O&M	2	7	9			
155+06		CC	Struct.	1	10	5			
154+99		CC	Struct.	1	7	2			
154+99		IW	O&M	2	7	9			
154+99		IW	O&M	2	12				
154+89		CC	Struct.	1	7	5			
154+89		IW	O&M	2	10	12			
154+83		IW	O&M	2	7	9			
154+83		CC	Struct.	1	7	1			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
154+83		DAE	O&M	2	7	9			
154+81		CC	Struct.	1	1	5			
154+74		CC	Struct.	1	11	1			
154+69		CC	Struct.	1	7	1			
154+69		IW	O&M	2	7	9			
154+65		CC	Struct.	1	7	11			
154+65		IW	O&M	2	7	9			
154+62		CC	Struct.	1	7	11			
154+62		IW	O&M	2	7	9			
154+62	154+57	CS	Struct.	2	8	11	5		
154+60		CC	Struct.	1	11	5			
154+50		CC	Struct.	1	7	11			
154+50		IW	O&M	2	7	9			
154+50		DAE	O&M	2	7	9			
154+45		CC	Struct.	1	7	11			
154+43		CC	Struct.	1	11	2			
154+27		CC	Struct.	1	11	1			
154+24		CC	Struct.	1	11	1			
154+17		CC	Struct.	1	1	5			
154+13		CC	Struct.	1	7	11			
154+00		MGO	Misc.	0					Shear key K11, <del>1/2 in. of separation at shear key</del> , bitumastic bond breaker deteriorated, Joint Width: K11R: 3/4"-1", K11L: 3/4"-1"
153+72		IW	O&M	2	7	9			
153+72		DAE	O&M	2	7	8			
153+71		CC	Struct.	1	5	5			
153+61		CC	Struct.	1	7	5			
153+61		IW	O&M	2	7	2			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
153+50		IW	O&M	2	7	9			
153+50		CC	Struct.	1	11	2			
153+50		DAE	O&M	2	7	9			
153+45		CC	Struct.	1	7	11			
153+39		CC	Struct.	1	11	2			
153+36		IW	O&M	2	7	9			
153+36		CC	Struct.	1	7	11			
153+26		CC	Struct.	1	11	5			
153+21		IW	O&M	2	7	9			
153+21		CC	Struct.	1	7	12			
153+18		CC	Struct.	1	11	5			
153+13		CC	Struct.	1	7	1			
153+04		IW	O&M	2	7	9			
153+04		CC	Struct.	1	7	2			
152+99		CC	Struct.	1	7	5			
152+94		CC	Struct.	1	11	1			
152+89		CC	Struct.	1	11	1			
152+77		CC	Struct.	1	11	1			
152+67		CC	Struct.	1	11	1			
152+61		CC	Struct.	1	4	5			
152+59		MGO	Misc.	0					4'x 4' wall opening at 3 o'clock
152+54		MSC	Misc.	0					11-ft-wide by 12 ft tall (1-ft taller)
152+49		MGO	Misc.	0					Shear key K12, <del>1 in. of separation at shear key</del> , bitumastic bond breaker deteriorated, joint has staining <b>Joint Width: K12R: 1/2"-1", K12L: 1/2"-1"</b>
152+47		SSS	Struct.	2	7				<b>Spalling at bottom joint.</b>
152+47		MWL	Misc.	0				5	3" water depth
152+34		CC	Struct.	1	7	1			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
152+23		CC	Struct.	1	7	1			
152+21		CC	Struct.	1	7	11			
152+21		CC	Struct.	1	1	5			
152+19	152+16	CS	Struct.	2	7	1	3		
152+04	151+99	CL	Struct.	2	5		5		
152+02	151+99	CS	Struct.	2	7	8	3		
152+02	151+99	IW	O&M	2	7	8	3		
151+99		MGO	Misc.	0					Shear key 13: 1/2 inch of separation at shear key, majority of bitumastic bond breaker in place, significant weeping and minor spalling on left joint. <b>Joint Width: K13R: 0"-1/4", K13L: 0"-1/4"</b> Evidence of differential settlement.
151+99		FM	Struct.	4					Fracture through shear key 13
152+04	151+94	CM	Struct.	3	7	1	10		
151+99		MWLS	Misc.	2				5	8 in. water depth - rise in water level is result of a sag in the tunnel Updated coding to reflect sag.
151+87		CC	Struct.	1	7	11			
151+78		MWL	Misc.	0				5	6 10 in. water depth
151+78		CC	Struct.	1	11	1			
151+69		CC	Struct.	1	7	11			
151+69		CC	Struct.	1	1	5			
151+66		CC	Struct.	1	7	2			
151+61		CC	Struct.	1	7	11			
151+49		MGO	Misc.	0					Shear key K14, 1/2-inch of separation at shear key, bitumastic bond breaker deteriorated. <b>Joint Width: K14R: 0"-1/2", K14L: 0"-1/2"</b>
151+49	150+93	DSF	O&M	2	12		56	5	
151+49	150+49	MWLS	Misc.	2			100	5	10 in. water depth
151+39		CC	Struct.	1	7	11			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.



## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
151+33		CC	Struct.	1	1	5			
151+29		CC	Struct.	1	7	11			
151+21		CC	Struct.	1	7	11			
151+19		CC	Struct.	1	11	1			
151+10		CC	Struct.	1	7	11			
151+07	151+00	CL	Struct.	2	9		7		
151+07	151+00	IS	O&M	0	7	9	7		
151+04	150+99	CS	Struct.	2	1	5	5		
151+03	151+00	CL	Struct.	2	10		3		
150+99		SSS	Struct.	2	3				spalling 10-in x 8-in x 2-in deep
150+99		MGO	Misc.	0					Shear key K15, 1/2-in. of separation at shear key, bitumastic bond breaker deteriorated. Joint Width: K15R: 1/4"-1", K15L: 1/4"-1"
150+96		MGO	Misc.	0	11				Evidence of differential settlement.
150+81		CC	Struct.	1	1	5			4-in-dia. pipe
150+51	150+44	CS	Struct.	2	7	9	7		
150+49		MGO	Misc.	0					Shear key K16, 1/2-in. of separation at shear key, bitumastic bond breaker deteriorated Joint Width: K16R: 0"-1/2", K16L: 0"-1/2", Evidence of differential settlement.
150+29		CC	Struct.	1	7	1			
150+21		CC	Struct.	1	11	1			
149+99		MGO	Misc.	0					Shear key K17, 1/2-inch of separation at shear key, majority of bitumastic bond breaker in place Joint Width: K17R: 1/4"-3/4", K17L: 1/2"-3/4"
149+94		MSC	Misc.	0					11-ft-tall by 11-ft-tall (1 ft lower)
149+94		MWL	Misc.	0				5	3 in. water depth
149+78		SAV	Struct.	2	9				6-in. x 3-in. x 1/2-in. deep
149+70		CC	Struct.	1	1	5			

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## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
149+54		CC	Struct.	1	7	11			
149+47		CC	Struct.	1	7	10			
149+47		IW	O&M	2	7	9			
149+42		CC	Struct.	1	12	5			
149+42		ID	O&M	3	11	12			
149+27		CC	Struct.	1	7	11			
149+25		CC	Struct.	1	1	4			
149+15		CC	Struct.	1	7	9			
149+01	148+98	CS	Struct.	2	9	10	3		
148+99		MGO	Misc.	0					Shear key K18, 1/2 in. of separation at shear key, bitumastic bond breaker deteriorated, left side significant weeping from joint, <b>Joint Width: K18R: 1/4"-1/2"</b> , <b>K18L: 1/4"-3/4"</b> , <b>Evidence of differential settlement.</b>
148+99		IW	O&M	2	7	9			
148+78		CC	Struct.	1	7	11			
148+61		CC	Struct.	1	1	5			
148+59		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
148+57		CC	Struct.	1	1	5			
148+56		CC	Struct.	1	7	11			
148+49		CC	Struct.	1	1	12			
148+48		CC	Struct.	1	7	1			
148+41		IW	O&M	2	7	11			
148+36		CC	Struct.	1	11	5			
148+36		IW	O&M	2	11	1			
148+33		CC	Struct.	1	7	11			
148+23		CC	Struct.	1	11	5			
148+18		CC	Struct.	1	7	5			
148+06		CC	Struct.	1	11	1			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
147+98		CC	Struct.	1	7	1			
147+98		IW	O&M	2	7	11			
147+93		CC	Struct.	1	11	1			
147+93		CS	Struct.	2	2	5			
147+78		CC	Struct.	1	11	5			
147+78		IW	O&M	2	12				
147+74		CC	Struct.	1	3	5			
147+61		CC	Struct.	1	11	1			
147+59		CC	Struct.	1	7	11			
147+49		CC	Struct.	1	7	1			
147+49		IW	O&M	2	7	9			
147+37		CC	Struct.	1	7	1			
146+99		MGO	Misc.	0					Shear key K19, 1-in. of separation at shear key, bitumastic bond breaker deteriorated, weeping from joint. <b>Joint Width: K19R: 3/4", K19L: 3/4". Crack gauges installed at left and right shear keys, and at the 12 o'clock position.</b>
146+49		CC	Struct.	1	1	5			
146+45		CC	Struct.	1	7	1			
146+45		IW	O&M	2	7	12			
146+36		CC	Struct.	1	7	11			
146+33		CC	Struct.	1	3	5			
146+25		CC	Struct.	1	7	12			
146+23		CC	Struct.	1	7	1			
146+21		CC	Struct.	1	1	5			
146+08	146+04	CS	Struct.	2	7	12	4		
145+98		IW	O&M	2	7	9			
145+98		DAE	O&M	2	7	9			
145+88		CC	Struct.	1	1	5			

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## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
145+82		CC	Struct.	1	7	11			
145+78		CC	Struct.	1	1	5			
145+61		CC	Struct.	1	7	11			
145+52		IS	O&M	0	7	9			
145+49		IS	O&M	0	7	9			
145+47		IS	O&M	0	7	9			
145+48		CC	Struct.	1	1	5			
145+44		IS	O&M	0	7	9			
145+34	145+31	CS	Struct.	2	7	9	3		
145+34		CC	Struct.	1	11	5			
145+23		IS	O&M	0	7	9			
145+09		CC	Struct.	1	7	11			
144+98		MGO	Misc.	0					Shear key K20, 1 in. of separation at shear key, bitumastic joint filler deteriorated. <b>Joint Width: K20R: 1/4"-1/2", K20L: 1/4"-3/4". Crack gauges installed at left and right shear keys, and at the 12 o'clock position.</b>
144+98		IS	O&M	0	11	1			
144+88		IS	O&M	0	7	9			
144+80		IS	O&M	0	7	9			
144+64		IS	O&M	0	7	9			
144+59		CC	Struct.	1	4	5			
144+57		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
144+55		CC	Struct.	1	4	5			
144+52		AMH	Const.	0					Glenwood Avenue manhole at 11 o'clock
144+48		IS	O&M	0	7	9			
144+46		IS	O&M	0	7	9			
144+36		CC	Struct.	1	11	5			
144+34		CC	Struct.	1	7	1			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
144+33		CC	Struct.	1	11	1			
144+24		CC	Struct.	1	7	5			
144+24		IS	O&M	0	7	11			
144+20		CC	Struct.	1	12	3			
144+11		CC	Struct.	1	9	3			
144+07		CC	Struct.	1	11	2			
144+04		CC	Struct.	1	11	1			
143+97		CC	Struct.	1	7	11			
143+97		IW	O&M	2	7	11			
143+82		CC	Struct.	1	1	5			
143+75		CC	Struct.	1	7	11			
143+71		CC	Struct.	1	1	5			
143+68		CC	Struct.	1	7	11			
143+61		CC	Struct.	1	7	9			
143+61		IW	O&M	2	7	9			
143+57		CC	Struct.	1	1	5			
143+47		IS	O&M	0	7	9			
143+47		IW	O&M	2	11	1			
143+36		CC	Struct.	1	7	11			
143+35		MGO	Misc.	0					8 - 4" diameter holes through wall (patched)
143+34		CC	Struct.	1	11	5			
143+20		CC	Struct.	1	1	5			
142+98		MGO	Misc.	0					Shear key K21, <del>1/2 in. of separation at shear key</del> , majority of bitumastic joint filler in place. Joint Width: K21R: 1/2"-3/4", K21L: 1/2"-3/4". Crack gauges installed at left and right shear keys, and at the 12 o'clock position.
142+74		CC	Struct.	1	11	1			
142+54		CC	Struct.	1	1	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

Inspection Notes - Station 172+24 to 119+88									
Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
142+48		CC	Struct.	1	7	5			
142+44		CC	Struct.	1	7	1			
142+44		IS	O&M	0	7	9			
142+39		CC	Struct.	1	11	5			
142+24		CC	Struct.	1	12	1			
142+19		CC	Struct.	1	7	1			
142+18		CC	Struct.	1	11	5			
142+09		CC	Struct.	1	7	11			
142+06		CC	Struct.	1	11	1			
142+00		CC	Struct.	1	11	1			
141+98		CC	Struct.	1	11	1			
141+91		ID	O&M	3	11	1			
141+89		CC	Struct.	1	7	11			
141+73		CC	Struct.	1	12	5			
141+71		CC	Struct.	1	11	5			
141+63		CC	Struct.	1	7	2			
141+60		CC	Struct.	1	11	5			
141+56		CC	Struct.	1	7	11			
141+49		IS	O&M	0	11	1			
141+46	141+34	LL	Const.	0			12	10	
141+46		LL	Const.	0				10	
141+44		CC	Struct.	1	7	11			
141+34		CC	Struct.	1	11	1			
141+12		CC	Struct.	1	1	3			
140+98		MGO	Misc.	0					Shear key K22, <del>1/4 in. of separation at shear key,</del> majority of bitumastic bond breakerr in place. Joint Width: K22R: 1/4"-1/2", K22L: 1/4". Crack gauges installed at left and right shear keys, and at the 12 o'clock position.

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
140+84		CC	Struct.	1	1	5			
140+71		CC	Struct.	1	1	5			
140+60		CC	Struct.	1	7	11			
140+55	140+51	CS	Struct.	2	3	5	4		
140+48		CC	Struct.	1	7	11			
140+43		CC	Struct.	1	11	5			
140+41		CC	Struct.	1	7	9			
140+37		CC	Struct.	1	1	5			
140+37		CC	Struct.	1	7	11			
140+33		CC	Struct.	1	11	1			
140+28		CC	Struct.	1	1	5			
140+22		CC	Struct.	1	11	5			
140+17		CC	Struct.	1	7	11			
140+14		CC	Struct.	1	12	2			
140+06		CC	Struct.	1	7	11			
139+98		CC	Struct.	1	7	10			
139+93		CC	Struct.	1	7	1			
139+83		CC	Struct.	1	7	11			
139+81		CC	Struct.	1	1	5			
139+78		CC	Struct.	1	1	5			
139+77	139+74	CS	Struct.	2	11	3	3		
139+63	139+60	CS	Struct.	2	11	5	3		
139+54	139+49	CS	Struct.	2	7	9	5		
139+47	139+16	LL	Const.	0			31	10	
139+47		SSS	Struct.	2	3				Spalling 16-in. x 6-in. x 3-in. deep on key Shear key K23, 1/2-in. of separation at shear key, bitumastic bond breaker deteriorated. <b>Joint Width: K23R: 0"-1-1/2", K23L: 1/4"-3/4".</b>
139+47		MGO	Misc.	0					<b>Evidence of differential settlement.</b>

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
139+34		CC	Struct.	1	1	5			
139+09		CC	Struct.	1	1	5			
138+87		CC	Struct.	1	1	5			
138+85	138+81	CS	Struct.	2	3	5	4		
138+81		CC	Struct.	1	10	11			
138+78		CC	Struct.	1	11	3			
138+78		IS	O&M	0	11	3			
138+74		CC	Struct.	1	1	5			
138+69		CC	Struct.	1	11	5			
138+67		CC	Struct.	1	7	11			
138+65		CC	Struct.	1	1	5			
138+63		CC	Struct.	1	11	5			
138+62		CC	Struct.	1	7	5			
138+55		CC	Struct.	1	1	5			
138+54		CC	Struct.	1	7	5			
138+48		CC	Struct.	1	7	11			
138+48		IS	O&M	0	11	1			
138+42		CC	Struct.	1	11	5			
138+29		CC	Struct.	1	11	5			
138+23		CC	Struct.	1	11	5			
138+15		CC	Struct.	1	7	1			
138+15		ID	O&M	3	12				
138+14		CC	Struct.	1	10	5			
138+09		CC	Struct.	1	11	5			
137+98		IW	O&M	2	11	1			
137+86		CC	Struct.	1	11	5			
137+73		CC	Struct.	1	11	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.



## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
137+48		MGO	Misc.	0					Shear key 24, <del>1/2-inch of separation at shear key</del> , bitumastic bond breaker deteriorated. Joint Width: K24R: 1/2", K24L: 1/2".
137+14		CC	Struct.	1	1	5			
137+00		CC	Struct.	1	11	1			
136+98		CC	Struct.	1	7	11			
136+98		CC	Struct.	1	1	5			
136+95		CC	Struct.	1	11	1			
136+84		CC	Struct.	1	11	5			
136+63		CC	Struct.	1	11	5			
136+48		CC	Struct.	1	7	1			
136+20		CC	Struct.	1	12	5			
136+00		MGO	Misc.						Shear key 25: Joint Width: K25R: 3/4", K25L: 1/4"-1/2".
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	2			
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		IW	O&M	2	11	1			
134+95	134+83	CS	Struct.	2	7	11	12		
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		

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
134+47		IW	O&M	2	11	1			
134+26		CC	Struct.	1	1	5			
134+06		AMH	Const.	0					manhole Between Royalston and 10th St Bridge
134+06		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
133+98		MGO	Misc.	0					Shear key K26: <del>1/4 in. of separation at shear key</del> , bitumastic bond breaker in place. <b>Joint Width: K26R: 3/4", K26L: 0"-1/2"</b> .
133+76		IW	O&M	2	8	9			
133+76		CC	Struct.	1	11	12			
133+64		CC	Struct.	1	11	1			
133+59		CC	Struct.	1	11	1			
133+59		IW	O&M	2	11	1			
133+51		CC	Struct.	1	11	5			
133+51		ID	O&M	3	11	1			
133+48		DAE	O&M	2	7	11		5	
133+48		IW	O&M	2	7	1			
133+40		DAE	O&M	2	7	11		5	
133+40		DAE	O&M	2	1	5		5	
133+40		CC	Struct.	1	11	1			
133+37		CC	Struct.	1	11	1			
133+36		DAE	O&M	2	7	11		5	
133+36		CC	Struct.	1	11	1			
133+30		CC	Struct.	1	10	2			
133+18		CC	Struct.	1	10	2			
133+16		CC	Struct.	1	11	1			
133+16		DAE	O&M	2	7	11		5	
133+12		DAE	O&M	2	7	11		5	
133+12		IW	O&M	2	7	11			
133+12		CC	Struct.	1	11	1			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
132+97		DAE	O&M	2	7	1		5	
132+97		IW	O&M	2	7	11			
132+97		ID	O&M	3	11	1			
132+86		CC	Struct.	1	11	1			
132+86		ID	O&M	3	11	1			
132+84		CC	Struct.	1	11	1			
132+77		CC	Struct.	1	11	1			
132+77		ID	O&M	3	11	12			
132+71		CC	Struct.	1	11	2			
132+63		CC	Struct.	1	1	5			
132+59		CC	Struct.	1	8	11			
132+52		FS	Struct.	3	3	5			
132+47		MGO	Misc.	0					Shear key K27: <del>1/2</del> inch of separation at shear key, bitumastic bond breaker deteriorated, cracks/fractures observed in joints, left key covered by deposits. <b>Joint Width: K27R: 0"-1/2", K27L: 0"-1/2".</b> <b>Evidence of differential settlement.</b>
132+47		CC	Struct.	1	4	5			
132+47		DAE	O&M	2	7	11		5	
132+47		IW	O&M	2	7	11			
132+29		CC	Struct.	1	1	5			
132+22		CC	Struct.	1	7	11			
132+13		MWLS	Misc.	2				5	<del>6</del> in 18" water depth - increase in depth caused by slight sag
132+13		CC	Struct.	1	7	11			
131+98		MWL	Misc.	0				5	<del>9</del> in 21" water depth
131+98		DAE	O&M	2	7	11		5	
131+92		CC	Struct.	1	7	11			
131+66		CC	Struct.	1	7	11			
131+63	131+44	DSF	O&M	2	6		19	5	

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
131+47		MGO	Misc.	0					<del>Shear key K28: up to 2-inch of separation at shear key, bitumastic bond breaker deteriorated, cracks/fractures in joints. Joint Width: K28R: 1/2"-1-1/2", K28L: 1"-1-1/2". Evidence of differential settlement.</del>
131+47		FC	Struct.	2	9	11			
131+47		SSS	Struct.	2	1				Spalling 6-in. x 6-in x 3-in deep
130+97		MGO	Misc.	0					<del>Shear key K29: no separation at shear key, majority of bitumastic bond breaker in place. Joint Width: K29R: 1/2"-1-1/2", K29L: 1/2"-1-1/2".</del>
130+97		MWL	Misc.	0				5	8-in water depth
130+68		CC	Struct.	1	7	11			
130+55		CC	Struct.	1	7	11			
130+47		MGO	Misc.	0					<del>Shear key K30: 1/2-in. of separation at shear key, majority of bitumastic bond breaker in place, left joint has been patched, right joint has a fracture running through it. Joint Width: K30R: 1/4"-1", K30L: 1/4"-1/2". Evidence of differential settlement.</del>
130+47		FC	Struct.	2	1	3			
130+47	130+36	CL	Struct.	2	9		11		
130+33		CC	Struct.	1	7	11			
130+32	130+25	CS	Struct.	2	7	9	7		
130+29		CC	Struct.	1	1	5			
130+23	130+19	CS	Struct.	2	12	5	4		
130+23		MWL	Misc.	0				5	5-in. water depth
130+16		CC	Struct.	1	7	11			
130+14		CC	Struct.	1	11	1			
130+09		CC	Struct.	1	7	11			
130+01		CC	Struct.	1	7	11			
129+90		CC	Struct.	1	10	2			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

Inspection Notes - Station 172+24 to 119+88									
Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
129+86		CC	Struct.	1	10	2			
129+86		CC	Struct.	1	7	5			
129+86		ID	O&M	3	11	2			
129+81		CC	Struct.	1	11	2			
129+80		IW	O&M	2	7	11			
129+80		CC	Struct.	1	11	1			
129+74		CC	Struct.	1	11	3			
129+71	129+60	LL	Const.	0			11	10	
129+70		CC	Struct.	1	11	1			
129+70		IW	O&M	2	12	2			
129+60		CC	Struct.	1	1	5			
129+48		IW	O&M	2	11	2			
129+33		CC	Struct.	1	1	5			
129+24		CC	Struct.	1	1	5			
129+08		CC	Struct.	1	1	5			
128+82		CC	Struct.	1	7	12			
128+69		CC	Struct.	1	7	11			
128+48		MGO	Misc.	0					Shear key K31: <del>1 in. of separation at shear key</del> , bitumastic bond breaker deteriorated, weeping from both joints. <b>Joint Width: K31R: 1/4"-3/4", K31L: 1/4"-1"</b> .
128+48		IW	O&M	2	7	5			
128+48		ID	O&M	3	10	2			
128+44		AMH	Const.	0					new Twins Stadium (7th St) manhole at 12 o'clock
128+44		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
128+42		CC	Struct.	1	5	6			
128+33		CC	Struct.	1	7	11			
127+98		IS	O&M	0	12	2			
127+79		CC	Struct.	1	1	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

Inspection Notes - Station 172+24 to 119+88									
Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
127+77		MGO	Misc.	0					L-bracket fastened to wall
127+71		CC	Struct.	1	1	5			
127+65		CC	Struct.	1	7	12			
127+64		CC	Struct.	1	1	5			
127+61		CC	Struct.	1	7	11			
127+61		CC	Struct.	1	1	5			
127+24		CC	Struct.	1	12	5			
127+14	127+03	CL	Struct.	2	9		11		
127+09	126+98	CL	Struct.	2	10		11		
127+06		CC	Struct.	1	11	1			
127+06		IW	O&M	2	11	1			
126+98		IS	O&M	0	7	8			
126+92	126+84	CL	Struct.	2	9		8		
126+91		CC	Struct.	1	7	11			
126+91		CC	Struct.	1	1	5			
126+70		CC	Struct.	1	1	5			
126+48		MGO	Misc.	0					Shear key K32: up to 1/2 in. of separation at shear key, majority of bitumastic bond breaker in place, left joint has fracture running through it. <b>Joint Width: K32R: 1/4"-3/4", K32L: 1/2"</b> .
126+48		IW	O&M	2	11	2			
126+48		FC	Struct.	2	10	11			
126+18		CC	Struct.	1	7	11			
126+11		CC	Struct.	1	1	1			
126+10		CC	Struct.	1	11	1			
126+05		CC	Struct.	1	1	5			
125+97		IS	O&M	0	11	1			
125+88		CC	Struct.	1	7	11			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

Inspection Notes - Station 172+24 to 119+88									
Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
125+84		CC	Struct.	1	11	5			
125+72		CC	Struct.	1	12	5			
125+70	125+67	CS	Struct.	2	7	12	3		
125+67		CC	Struct.	1	11	1			
125+62		CC	Struct.	1	7	11			
125+59	125+56	CS	Struct.	2	10	1	3		
125+55		CC	Struct.	1	11	5			
125+47		IS	O&M	0	11	1			
125+39	125+27	CS	Struct.	2	7	4	12		
125+35		CC	Struct.	1	1	5			
125+33		CC	Struct.	1	1	5			
125+31		CC	Struct.	1	1	5			
125+28		CC	Struct.	1	7	1			
125+23		CC	Struct.	1	11	1			
125+14		CC	Struct.	1	7	11			
125+13		CC	Struct.	1	1	5			
125+08		CC	Struct.	1	4	5			
125+06		AMH	Const.	0					abandoned 6th Street manhole at 11 o'clock
125+06		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 3 o'clock
125+04		CC	Struct.	1	4	5			
124+97		IW	O&M	2	11	1			
124+92		CC	Struct.	1	1	5			
124+88	124+85	CS	Struct.	2	7	9	3		
124+82		CC	Struct.	1	1	5			
124+80		CC	Struct.	1	3	5			
124+75		CC	Struct.	1	7	10			
124+75		CC	Struct.	1	7	8			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Left Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
124+47		MGO	Misc.	0					Shear key K33: <del>up to 1 in. of separation at shear key</del> , majority of bitumastic bond breaker in place. <b>Joint Width: K33R: 1/4"-3/4", K33L: 1/4"-3/4"</b> .
124+14		CC	Struct.	1	8	11			
123+97		IW	O&M	2	11	1			
123+85		CC	Struct.	1	7	11			
123+81		CC	Struct.	1	1	5			
123+46		ID	O&M	3	11	1			
123+40		CC	Struct.	1	11	1			
123+35		CC	Struct.	1	11	2			
123+34	123+18	LR	Const.	0			16	10	
123+34		LR	Const.	0				10	
123+27		CC	Struct.	1	11	1			
123+22		CC	Struct.	1	9	2			
123+19		CC	Struct.	1	7	1			
122+96		IS	O&M	0	12	2			
122+92		CC	Struct.	1	11	1			
122+85		CC	Struct.	1	7	10			
122+75		CC	Struct.	1	7	10			
122+74		IW	O&M	2	7	8			
122+47		MGO	Misc.	0					Shear key K34: <del>up to 1 in. of separation at shear key</del> , bitumastic bond breaker deteriorated, left key has patch repair. <b>Joint Width: K34R: 1/2"-1", K34L: 3/4"-1-1/4"</b> .
122+30		MGO	Misc.	0					2 L-brackets fastened to wall
122+18		CC	Struct.	1	2	5			
122+11		MGO	Misc.	0					L-bracket fastened to wall at 3 o'clock
122+06		CC	Struct.	1	1	4			
121+84		CC	Struct.	1	11	4			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.



## Double Box Culvert - Left Box

Inspection Notes - Station 172+24 to 119+88									
Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
121+73		CC	Struct.	1	9	1			
121+70		CC	Struct.	1	7	5			
121+50	121+47	CS	Struct.	2	7	10	3		
121+29		CC	Struct.	1	11	5			
120+99	120+96	CS	Struct.	2	4	5	3		
120+99		SSS	Struct.	2	11				Spalling 2-in x 4-in x 2-in deep
120+97		MGO	Misc.	0					Shear key K35: <del>1/2 in of separation at shear key</del> , majority of bitumastic bond breaker in place, spalling on left joint. <b>Joint Width: K35R: 1/2", K35L: 1/4". Evidence of differential settlement.</b>
120+58		CC	Struct.	1	7	9			
120+56		CC	Struct.	1	7	9			
120+47		CC	Struct.	1	7	9			
120+47		IW	O&M	2	7	8			
120+29		CC	Struct.	1	7	9			
120+28	120+21	CS	Struct.	2	7	10	7		
120+19		CC	Struct.	1	3	5			
120+14		RPP	Struct.	0	9				2-ft x 2-ft patch repair
120+04		MSC	Misc.	0					beginning of single 11-ft tall by 11-ft-wide single box culvert

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
172+24		MGO	Misc.	0					10/24/19 9:00 A.M. Start inspection in right (north) box starting at trash rack and walking downstream. Approximately 2-3' of debris built up on trash rack. Inspectors: Joe Welna, Gareth Becker, and Nate Born.
172+24		MSC	Misc.	0					begining of double box culvert - right box - 11-ft-high by 11-ft-wide
172+24		CC	Struct.	1	2	5			
172+01		CC	Struct.	1	7	10			
172+01		CC	Struct.	1	1	5			
171+94		MGO	Misc.	0					shear key K1: <del>1 in. of separation at shear key</del> , majority of bitumastic bond breaker in place. Joint Width: K1R: 0"-2", K1L: 0"-1-1/2". Evidence of differential settlement.
171+94		CC	Struct.	1	7	5			
171+89		CC	Struct.	1	3	5			
171+86		CC	Struct.	1	2	5			
171+79		CC	Struct.	1	2	5			
171+74		CC	Struct.	1	1	5			
171+69		CC	Struct.	1	1	5			
171+68		CC	Struct.	1	7	11			
171+58		CC	Struct.	1	2	5			
171+50		CC	Struct.	1	1	5			
171+50		CC	Struct.	1	7	11			
171+44		CC	Struct.	1	7	11			
171+39		CC	Struct.	1	7	11			
171+37		CC	Struct.	1	2	5			
171+34		CC	Struct.	1	7	11			
171+31		CC	Struct.	1	9	11			
171+22		CC	Struct.	1	1	5			
171+09		CC	Struct.	1	4	5			
171+05		CC	Struct.	1	7	1			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
170+99		CC	Struct.	1	7	8			
170+98		CC	Struct.	1	11	1			
170+98		CC	Struct.	1	7	8			
170+94		TFA	Const.	0	3				4-ft-dia. RCP
170+94		AMH	Const.	0					Dupont access manhole
170+94		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
170+94		CC	Struct.	1	7	8			
170+93		CC	Struct.	1	7	8			
170+85		CC	Struct.	1	12	1			
170+82		CC	Struct.	1	7	10			
170+64		CC	Struct.	1	7	9			
170+50		CC	Struct.	1	1	5			
170+24		MGO	Misc.	0					shear key K2: 1/2 in. of separation at shear key, majority of bitumastic bond breaker in place. Joint Width: K2R: 1/2"-1", K2L: 1/2"-1".
169+98		CC	Struct.	1	2	5			
169+90		CC	Struct.	1	2	5			
169+83		CC	Struct.	1	7	10			
169+83		CC	Struct.	1	1	5			
169+75		CC	Struct.	1	7	11			
169+61		CC	Struct.	1	3	5			
169+55		CC	Struct.	1	1	5			
169+55		CC	Struct.	1	8	11			
169+49		CC	Struct.	1	1	5			
169+45		CC	Struct.	1	2	5			
169+43		CC	Struct.	1	7	9			
169+30		CC	Struct.	1	1	5			
169+23		CC	Struct.	1	9	11			
169+11		CC	Struct.	1	2	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
169+06		CC	Struct.	1	1	5			
169+05		CC	Struct.	1	8	1			
169+00		CC	Struct.	1	3	5			
168+98		CC	Struct.	1	7	10			
168+97		CC	Struct.	1	1	4			
168+92		CC	Struct.	1	1	5			
168+89		CC	Struct.	1	7	11			
168+64		CC	Struct.	1	3	5			
168+64		IW	O&M	2	5				
168+59		CC	Struct.	1	11	1			
168+56		CC	Struct.	1	7	11			
168+51		CC	Struct.	1	1	5			
168+43		CC	Struct.	1	1	5			
168+39		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
168+38		CC	Struct.	1	7	8			
168+32		CC	Struct.	1	11	1			
168+31		CC	Struct.	1	3	5			
168+25		CC	Struct.	1	7	11			
168+24		CC	Struct.	1	3	5			
168+24		MGO	Misc.	0					shear key K3: 1/2 in, of separation, majority of bitumastic bond breaker in place. Joint Width: K3R: 3/4"-1", K3L: 1/2"-3/4".
167+92		IS	O&M	0	4	5			
167+71		CC	Struct.	1	2	5			
167+64		IS	O&M	0	5	6			
167+64		CC	Struct.	1	7	9			
167+50		CC	Struct.	1	3	5			
167+46		CC	Struct.	1	7	1			
167+39		LR	Const.	0				50	45 degree bend right

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
167+31		IS	O&M	0	5	6			
167+26		CC	Struct.	1	7	9			
167+21		CC	Struct.	1	1	5			
167+08		CC	Struct.	1	7	5			
167+03		CC	Struct.	1	10	5			
166+97		CC	Struct.	1	1	5			
166+85		IS	O&M	0	3	5			
166+85		CC	Struct.	1	7	10			
166+76		CC	Struct.	1	10	5			
166+69		CC	Struct.	1	7	11			
166+69		CC	Struct.	1	2	5			
166+59		CC	Struct.	1	2	5			
166+59		CC	Struct.	1	7	10			
166+54		CC	Struct.	1	7	11			
166+53		CC	Struct.	1	2	5			
166+45		CC	Struct.	1	1	5			
166+24		MGO	Misc.	0					shear key K4: 1/2 in. of separation, majority of bitumastic bond breaker in place. Joint Width: K4R: 1/4"-1/2", K4L: 1/2"-1". Evidence of soil intrusion through joint.
<del>166+24</del>		<del>FC</del>	<del>Struct.</del>	<del>2</del>	<del>11</del>				
166+24		OBZ	O&M	2	6			5	debris in tunnel
166+06		CC	Struct.	1	7	11			
166+06		CC	Struct.	1	1	5			
165+98		CC	Struct.	1	7	11			
165+98		CC	Struct.	1	2	5			
165+86		CC	Struct.	1	7	9			
165+84		CC	Struct.	1	2	5			
165+73		CC	Struct.	1	1	5			
165+73		IW	O&M	2	3	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
165+62		CC	Struct.	1	7	8			
165+59		CC	Struct.	1	7	1			
165+53		CC	Struct.	1	1	5			
165+47		CC	Struct.	1	7	11			
165+47		CC	Struct.	1	1	5			
165+34		AMH	Const.	0					Colfax access manhole at 2 o'clock
165+34		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
165+34		CC	Struct.	1	1	5			
165+34		CC	Struct.	1	7	8			
165+34		SRV	Struct.	5	12				
165+33		CC	Struct.	1	7	8			
165+24		CC	Struct.	1	1	5			
165+21		CC	Struct.	1	7	1			
165+00		CC	Struct.	1	1	5			
164+89		CC	Struct.	1	2	5			
164+74		MGO	Misc.	0					shear key K5: <del>1/2 in. of separation</del> , majority of bitumastic bond breaker in place. Joint Width: K5R: 3/4", K5L: 1/2"-1".
164+64		CC	Struct.	1	1	5			
164+59		CC	Struct.	1	1	5			
164+49		MSC	Misc.	0					4-in. bump out on left side of tunnel
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			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
164+04		CC	Struct.	1	1	5			
164+00		CC	Struct.	1	7	11			
163+95		CC	Struct.	1	1	5			
163+95		IW	O&M	2	11	1			
163+93		CC	Struct.	1	7	10			
163+82		CC	Struct.	1	7	9			
163+82		CC	Struct.	1	1	5			
163+71		CC	Struct.	1	11	5			
163+71		IW	O&M	2	1	5			
163+59		CC	Struct.	1	7	1			
163+57		CC	Struct.	1	1	5			
163+54		CC	Struct.	1	11	12			
163+54		CC	Struct.	1	1	5			
163+49		MSC	Misc.	0					end of 4-in. bump out
163+44		CC	Struct.	1	7	11			
163+42		CC	Struct.	1	1	5			
163+39		CC	Struct.	1	7	10			
163+34		CC	Struct.	1	1	5			
163+18		CC	Struct.	1	7	8			
163+18		MGO	Misc.	0					shear key K6: <del>1/2 in. of separation</del> , majority of bitumastic bond breaker in place. Joint Width: K6R: 1/4"-1", K6L: 3/4"-1". Evidence of differential settlement. Crack gauges installed at left and right shear key, and at the 12 o'clock position.
163+18	161+30	LL	Const.	0			164	100	
163+07		CC	Struct.	1	1	5			
162+98		CC	Struct.	1	2	5			
162+97		CC	Struct.	1	7	11			
162+87		CC	Struct.	1	1	5			
162+68		CC	Struct.	1	1	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
162+67		CC	Struct.	1	7	12			
162+30		CC	Struct.	1	1	5			
162+08		MGO	Misc.	0					shear key K7: 1/2 in. of separation, majority of bitumastic bond breaker in place. Joint Width: K7R: 1/2"-3/4", K7L: 1/2"-3/4".
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+01		CC	Struct.	1	7	1			
160+96		CC	Struct.	1	11	5			
160+96		ID	O&M	3	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+64		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.



## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
160+64		CC	Struct.	1	7	8			
160+62		CC	Struct.	1	7	8			
160+62		CC	Struct.	1	1	5			
160+56		IW	O&M	2	4	5			
160+56		IS	O&M	0	7	10			
160+56		ID	O&M	3	12	2			
160+45		CC	Struct.	1	1	5			
160+45		CC	Struct.	1	7	11			
160+40		CC	Struct.	1	1	5			
160+34		CC	Struct.	1	1	5			
160+34		CC	Struct.	1	7	10			
160+21		IW	O&M	2	5				
160+21		CC	Struct.	1	1	5			
160+21		CC	Struct.	1	7	11			
160+09		MGO	Misc.	0					shear key K8: <del>1/2 in. of separation at shear key</del> , majority of bitumastic bond breaker in place. Joint Width: K8R: 3/4"-1", K8L: 3/4"-1".
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			

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## Double Box Culvert - Right Box

### Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
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			
159+06		IW	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			
158+88		CC	Struct.	1	7	11			
158+85		ID	O&M	3	11				
158+85		CC	Struct.	1	11	1			
158+74		CC	Struct.	1	1	5			
158+72		CC	Struct.	1	11	5			
158+72		IW	O&M	2	1				
158+67		CC	Struct.	1	7	1			
158+64		CC	Struct.	1	11	5			
158+64		ID	O&M	3	11	12			
158+54		CC	Struct.	1	11	1			
158+54		IW	O&M	2	1	5			
158+54		CC	Struct.	1	1	5			
158+47		CC	Struct.	1	11	1			
158+44		CC	Struct.	1	1	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

Inspection Notes - Station 172+24 to 119+88									
Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
158+05		MGO	Misc.	0					shear key K9: <del>1 in. of separation</del> , majority of bitumastic bond breaker in place. <span style="color: red;">Joint Width: K9R: 3/4"-1", K9L: 1/2"-1".</span>
157+91		CC	Struct.	1	7	11			
157+89		IW	O&M	2	3				
157+79		CC	Struct.	1	3	5			
157+61		CC	Struct.	1	1	5			
157+55		CC	Struct.	1	4	5			
157+46		CC	Struct.	1	12	5			
157+43		CC	Struct.	1	11	1			
157+41		CC	Struct.	1	12	1			
157+39		CC	Struct.	1	11	12			
157+37		CC	Struct.	1	11	12			
157+30		CC	Struct.	1	2	5			
157+24		CC	Struct.	1	11	1			
157+20		CC	Struct.	1	11	1			
157+14		CC	Struct.	1	7	11			
157+06		IS	O&M	0	3	5			
157+00		CC	Struct.	1	2	5			
156+95		CC	Struct.	1	7	11			
156+94		CC	Struct.	1	2	5			
156+86		CC	Struct.	1	7	11			
156+86		CC	Struct.	1	1	5			
156+84		CC	Struct.	1	7	10			
156+74		CC	Struct.	1	7	11			
156+64		CC	Struct.	1	7	5			
156+64		IW	O&M	2	4	5			
156+54		IW	O&M	2	4	5			
156+54		CC	Struct.	1	11	12			
156+48		CC	Struct.	1	7	8			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
156+46		AMH	Const.	0					west side I-94 manhole at 1 o'clock
156+46		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
156+46		CC	Struct.	1	7	8			
156+46		CC	Struct.	1	12	2			
156+44		CC	Struct.	1	7	8			
156+44		CC	Struct.	1	9	11			
156+28		CC	Struct.	1	2	5			
156+26		CC	Struct.	1	7	11			
156+05		MGO	Misc.	0					shear key K10: 1/2 in. of separation at shear key, bitumastic bond breaker is deteriorated. Joint Width: K10R: 1/2"-3/4", K10L: 1/4"-3/4". Evidence of differential settlement.
156+05		IW	O&M	2	3				
155+92		CC	Struct.	1	1	5			
155+78		CC	Struct.	1	1	5			
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	1			
155+37		CC	Struct.	1	1	5			
155+34		CC	Struct.	1	7	5			
155+34		ID	O&M	3	11	1			
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			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
154+97		CC	Struct.	1	7	5			
154+97		IW	O&M	2	11	1			
154+88		CC	Struct.	1	11	5			
154+81		CC	Struct.	1	11	5			
154+81		IW	O&M	2	12	1			
154+73		CC	Struct.	1	12	1			
154+73		IW	O&M	2	1				
154+69		CC	Struct.	1	1	5			
154+66		CC	Struct.	1	7	1			
154+66		IW	O&M	2	1				
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+29		CC	Struct.	1	1	5			
154+29		IW	O&M	2	5				
154+24		CC	Struct.	1	7	11			
154+19		CC	Struct.	1	1	5			
154+15		CC	Struct.	1	1	5			
154+04		MGO	Misc.	0					shear key K11: <del>1/2 in. of separation</del> , majority of bitumastic bond breaker in place. Joint Width: K11R: 1/2"-3/4", K11L: 1/2"-3/4".
154+04	153+75	SRV	Struct.	5	12		5		
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			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
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		MGO	Misc.	0	6				uneven invert, 1-2" offset at joint
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+91		OBZ	O&M	2	6			0	4-ft-long timber in invert
152+89		CC	Struct.	1	11	1			
152+66		IW	O&M	2	5				
152+63		CC	Struct.	1	7	8			
152+61		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
152+59		MSC	Misc.	0					11-ft-wide by 12 ft tall (1-ft taller)
152+54		MGO	Misc.	0					shear key K12: <del>1/2 in. of separation</del> , bitumastic bond breaker deteriorated, some spalling at 3 o'clock at joint. Joint Width: K12R: 1/2"-3/4", K12L: 1/2"-1". Weeping and soil observed at joint.
152+28		CC	Struct.	1	10	1			
152+27		CC	Struct.	1	7	12			
152+22		CC	Struct.	1	12	5			
152+20		CC	Struct.	1	11	1			
152+09	151+76	CC	Struct.	1	7	9	9		
152+07		CC	Struct.	1	5	4			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
152+05		MGO	Misc.	0					shear key K13: <del>no separation at shear key</del> , majority of bitumastic bond breaker in place. <b>Joint Width: K13R: 0"-1/4", K13L: 1/4"-1". Evidence of differential settlement.</b>
152+05	151+72	CL	Struct.	2	3		9		
151+99		MWLS	Misc.	2				5	<del>6 inches of water</del> <b>12 inches of water observed in 2019</b>
<del>151+94</del>	<del>150+72</del>	<del>DSF</del>	<del>O&amp;M</del>	<del>2</del>	<del>6</del>		<del>98</del>	<del>5</del>	<del>fine grained settled deposits.</del> <b>deposits not observed in 2019</b>
151+72		CC	Struct.	1	1	5			
151+65		CC	Struct.	1	3	5			
151+64	151+31	CS	Struct.	2	2	3	9		
151+55		MGO	Misc.	0					shear key K14: <del>1/2 in. of separation</del> , majority of bitumastic bond breaker in place. <b>Joint Width: K14R: 1/4"-3/4", K14L: 1/2". Evidence of differential settlement.</b>
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: <del>1/2 in. of separation</del> , bitumastic bond breaker deteriorated, cracks in joints. <b>Joint Width: K15R: 1/4"-1", K15L: 1/4"-1". Evidence of differential settlement. Some soil observed at joint.</b>
151+02	150+72	CL	Struct.	2	3		6		
150+89		CC	Struct.	1	7	11			
150+55		MGO	Misc.	0					shear key K16: <del>1/2 in. of separation</del> , majority of bitumastic bond breaker in place. <b>Joint Width: K16R: 1/4"-1/2", K16L: 1/4"-1". Evidence of differential settlement.</b>

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## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
150+49		MWL	Misc.	0				5	<del>3 inches of water</del> 8" of water observed in 2019
150+11	149+81	CL	Struct.	2	3		6		
150+05		MGO	Misc.	0					shear key K17: 1/2 in. of separation, majority of bitumastic bond breaker in place, infiltration of right joint. Joint Width: K17R: 1/4"-1", K17L: 3/4"-1-1/2". Evidence of differential settlement. Some soil and staining observed at joint. Slight buckling of invert observed.
150+05		IW	O&M	2	11	5			
150+04		MSC	Misc.	0					11-ft-tall by 11-ft-tall (1 ft lower)
149+89		CC	Struct.	1	11	1			
149+80		CC	Struct.	1	11	1			
149+71		CC	Struct.	1	11	1			
149+52		CC	Struct.	1	7	11			
149+49		AMH	Const.	0					Chestnut Street manhole at 2 o'clock
149+49		CC	Struct.	1	2	5			
149+45		CC	Struct.	1	7	1			
149+45		ID	O&M	3	11	2			
149+05		MGO	Misc.	0					shear key K18: 1/2 in. of separation, majority of bitumastic bond breaker in place. Joint Width: K18R: 1/4"-1/2", K18L: 1/2"-1".
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+64		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
148+62		CC	Struct.	1	7	8			
148+62		CC	Struct.	1	11	2			
148+62		IW	O&M	2	3	5			
148+54		CC	Struct.	1	7	11			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.



## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
148+54		CC	Struct.	1	2	5			
148+46		IR	O&M	4	1	5			changed from IW to IR
148+36		CC	Struct.	1	1	5			
148+31		CC	Struct.	1	7	11			
148+04		IR	O&M	4	2	5			changed from IW to IR
147+97		CC	Struct.	1	11	2			
147+94		CC	Struct.	1	1	5			
147+77		CC	Struct.	1	11	1			
147+71		CC	Struct.	1	11	5			
147+64		CC	Struct.	1	10	2			
147+54		IW	O&M	2	2	5			
147+49		AMH	Const.	0					access manhole at 10 o'clock
147+26		CC	Struct.	1	7	11			
147+05		MGO	Misc.	0					shear key K19: <del>1/2-in. of separation</del> , bitumastic bond breaker deteriorated. Joint Width: K19R: 1/2"-1", K19L: 1/2"-1". Crack gauges installed at right shear key, and at the 12 o'clock position. Invert is offset approximately 1/2".
147+05		FC	Struct.	2	5	6			
146+77		CC	Struct.	1	2	5			
146+54		CC	Struct.	1	7	10			
146+51		IS	O&M	0	2	5			
146+39		CC	Struct.	1	7	11			
146+34		CC	Struct.	1	3	5			
146+27		CC	Struct.	1	7	5			
146+10		CC	Struct.	1	2	5			
146+09		CC	Struct.	1	7	1			
146+04		IW	O&M	2	2	5			
146+02		CC	Struct.	1	7	9			
145+97		CC	Struct.	1	1	5			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
145+96		IS	O&M	0	11	1			
145+83		CC	Struct.	1	1	5			
145+73		CC	Struct.	1	1	5			
145+66		CC	Struct.	1	1	5			
145+54		IS	O&M	0	2	5			
145+43		CC	Struct.	1	1	5			
145+34		CC	Struct.	1	7	11			
145+32		CC	Struct.	1	3	5			
145+05		MGO	Misc.	0					shear key K20: 1/2 in. of separation, bitumastic bond breaker deteriorated. Joint Width: K20R: 0"-1", K20L: 1/2"-1". Crack gauges installed at right shear key, and at the 12 o'clock position. Invert is offset approximately 1/2". Weeping observed at joint.
144+66		CC	Struct.	1	7	8			
144+64		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
144+62		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		IW	O&M	2	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			
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			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

Inspection Notes - Station 172+24 to 119+88									
Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
144+01		CC	Struct.	1	7	11			
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: 1/4 in. of separation, majority of bitumastic bond breaker in place. Joint Width: K21R: 1/2", K21L: 1/2". Crack gauges installed at right shear key, and at the 12 o'clock position.
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+79		IS	O&M	0	11	2			
141+71		CC	Struct.	1	7	5			
141+68		CC	Struct.	1	11	12			
141+63		CC	Struct.	1	11	1			
141+61		CC	Struct.	1	11	2			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
141+54		CC	Struct.	1	7	5			
141+45		CC	Struct.	1	1	5			
141+41		IS	O&M	0	1	5			
141+41		CC	Struct.	1	11	2			
141+04		MGO	Misc.	0					shear key K22: <del>1/2 in. of separation</del> , majority of bitumastic bond breaker in place, infiltration from right joint. Joint Width: K22R: 1/4" w/ weeping observed, K22L: 1/4"-1/2". Crack gauges installed at right shear key, and at the 12 o'clock position.
141+04		IW	O&M	2	2	5			
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: <del>1/4 in. of separation</del> , majority of bitumastic bond breaker in place. Joint Width: K23R: 0"-3/4", K23L: 1/4"-1/2". Crack gauges installed at right shear key, and at the 12 o'clock position.
139+46		LL	Const.	0				10	
139+36		CC	Struct.	1	7	11			
138+98		IW	O&M	2	11	1			
138+88		CC	Struct.	1	7	11			
138+84		CC	Struct.	1	1	5			
138+80		CC	Struct.	1	9	11			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
138+80		IW	O&M	2	11	1			
138+70		CC	Struct.	1	11	1			
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+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: <del>1/2 in. of separation</del> , majority of bitumastic bond breaker in place: Joint Width: K24R: 1/4"/1/2", 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		IW	O&M	2	11	1			
136+01		MGO	Misc.	0					shear key K25: <del>1/2 in. of separation</del> , majority of bitumastic bond breaker in place. Joint Width: K25R: 1/4"/1/2", K25L: 1/4"-1", minor spalling observed. Patch in invert.
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+50		IW	O&M	2	5				

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
135+49		IW	O&M	2	7	11			
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
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+09		AMH	Const.	0					manhole Between Royalston and 10th St Bridge
134+09		MGO	Misc.	0					4-ft-tall by 4-ft-wide wall opening at 9 o'clock
134+09		CC	Struct.	1	7	8			
134+01		MGO	Misc.	0					shear key K26: <del>1/4 in. of separation</del> , majority of bitumastic bond breaker in place, infiltration in left joint. Joint Width: K26R: 0"/1/2", K26L: 1/4". Spalling observed at invert.
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		ID	O&M	3	12				
133+39		CC	Struct.	1	11	1			
133+35		CC	Struct.	1	11	1			

\*Defect ratings of 4 and 5 are shaded orange and red respectively. Observations from the 2014 inspection that no longer apply are stricken out. New observations from the 2019 inspection are documented in red text.

## Double Box Culvert - Right Box

## Inspection Notes - Station 172+24 to 119+88

Begin Station	End Station	Code	Family	Rating	Clock From	Clock To	Length (ft.)	Percent (%)	Comment
133+32		CC	Struct.	1	11	1			
133+23		CC	Struct.	1	11	1			
132+99		IW	O&M	2	11	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			
132+74		IW	O&M	2	12				
132+66		CC	Struct.	1	2	5			
132+66		IW	O&M	2	5				
132+51		MGO	Misc.	0					shear key K27: 1/2 in. of separation, bitumastic bond breaker deteriorated, infiltration from right joint. Joint Width: K27R: 1/4"-3/4", K27L: 1/4"-3/4". Evidence of differential settlement. Minor buckling of invert observed.
132+51		IW	O&M	2	10	1			
132+49		MWL	Misc.	0				5	<del>7 inches of water</del> 12 inches of water observed in 2019
132+34		CC	Struct.	1	7	11			
132+24		MWLS	Misc.	2	6				
132+15		IS	O&M	0	1	5			
132+04		DSGV	O&M	2	5			5	
132+04		MWL	Misc.	0				10	<del>10 inches of water</del> 16 inches of water measured in 2019
132+04		IW	O&M	2	4	5			
131+99		MGO	Misc.	0					drop in invert, some concrete rubble observed
131+86	130+87	DSGV	O&M	2	6		75	5	changed coding from DSF to DSGV, 3-4 inches of sand and gravel
131+52	131+48	CL	Struct.	2	9		6		

## Appendix C

### Shear Key Comparison Photos

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Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K1L



Shear Key: K1R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K2L



Shear Key: K2R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K3L



Shear Key: K3R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K4L



Shear Key: K4R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K5L



Shear Key: K5R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K6L



Shear Key: K6R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K7L



Shear Key: K7R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K8L



Shear Key: K8R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos

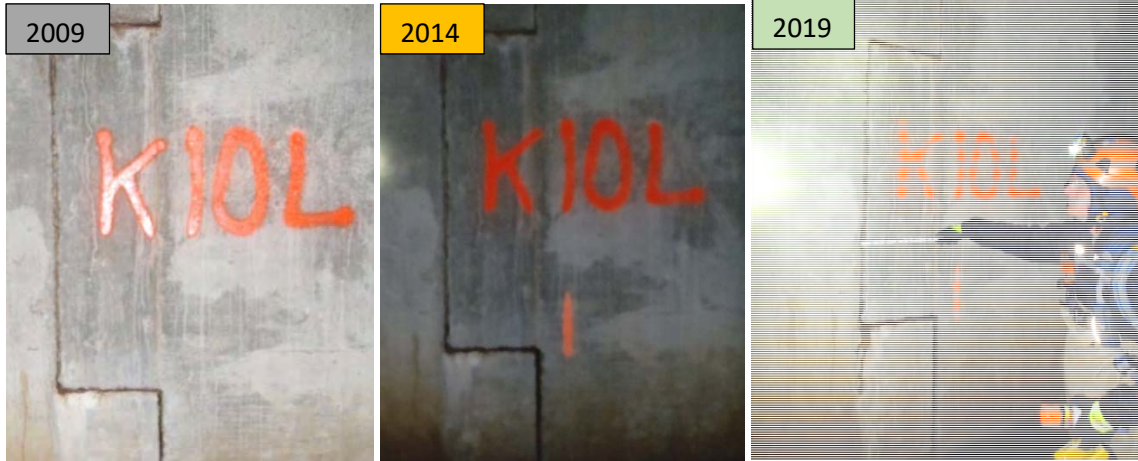


Shear Key: K9L



Shear Key: K9R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos

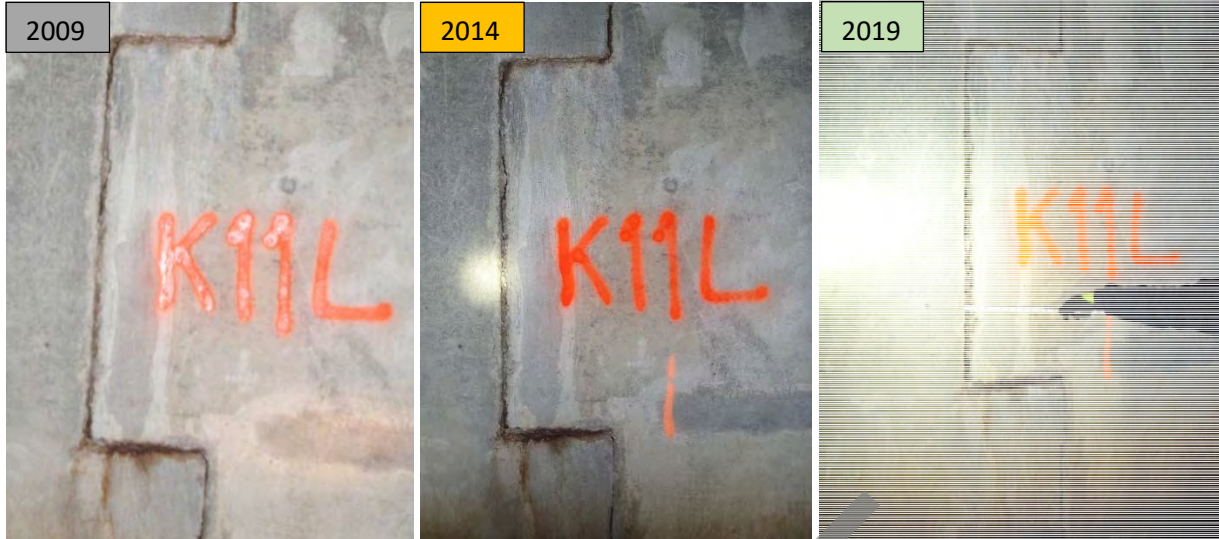


Shear Key: K10L



Shear Key: K10R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K11L



Shear Key: K11R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K12L



Shear Key: K12R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K13L



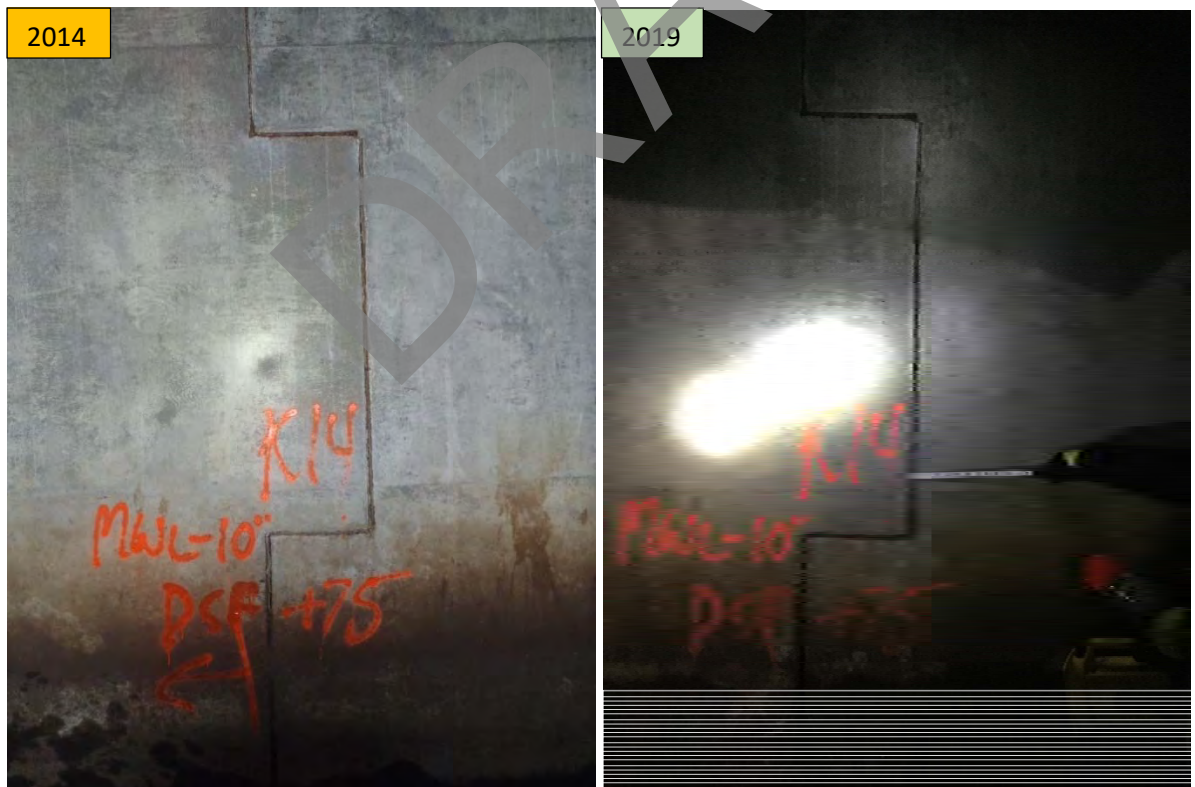
Shear Key: K13R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K14L



Shear Key: K14R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K15L



Shear Key: K15R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K16L



Shear Key: K16R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos

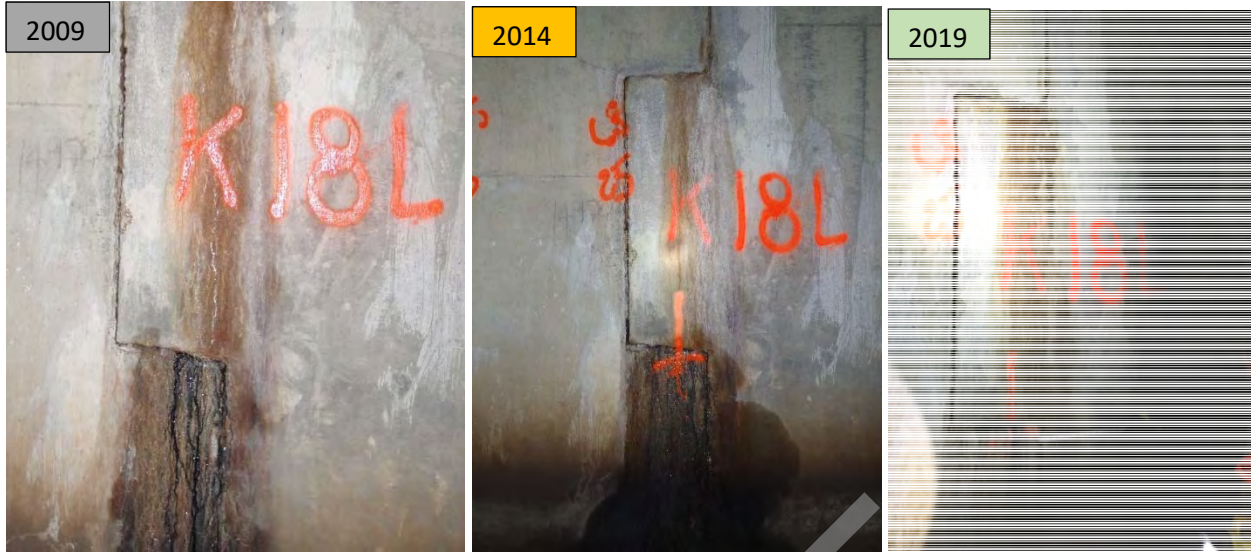


Shear Key: K17L



Shear Key: K17R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos

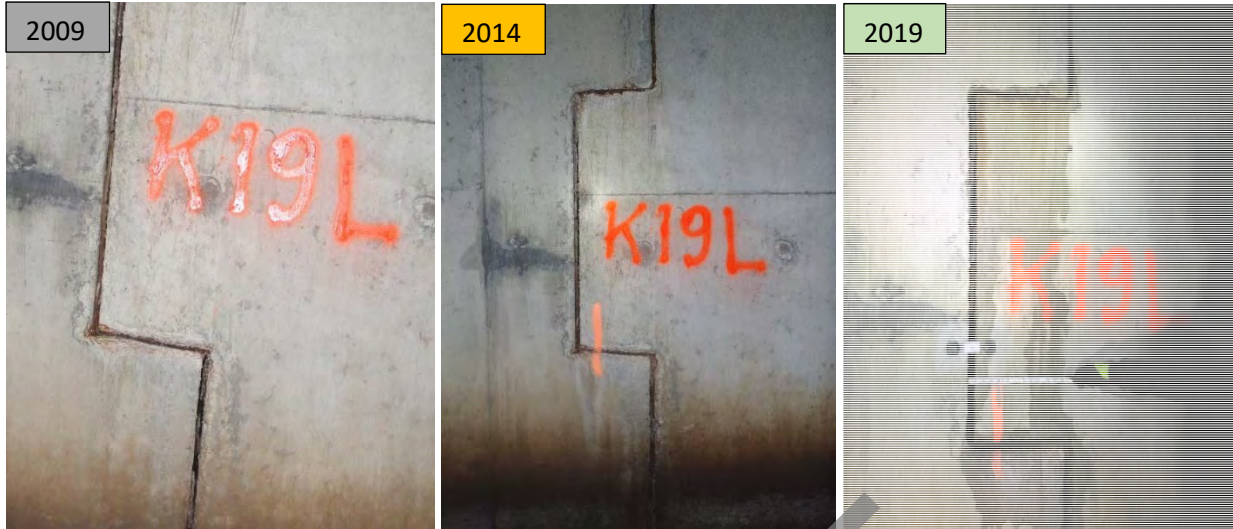


Shear Key: K18L



Shear Key: K18R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K19L



Shear Key: K19R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K20L



Shear Key: K20R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



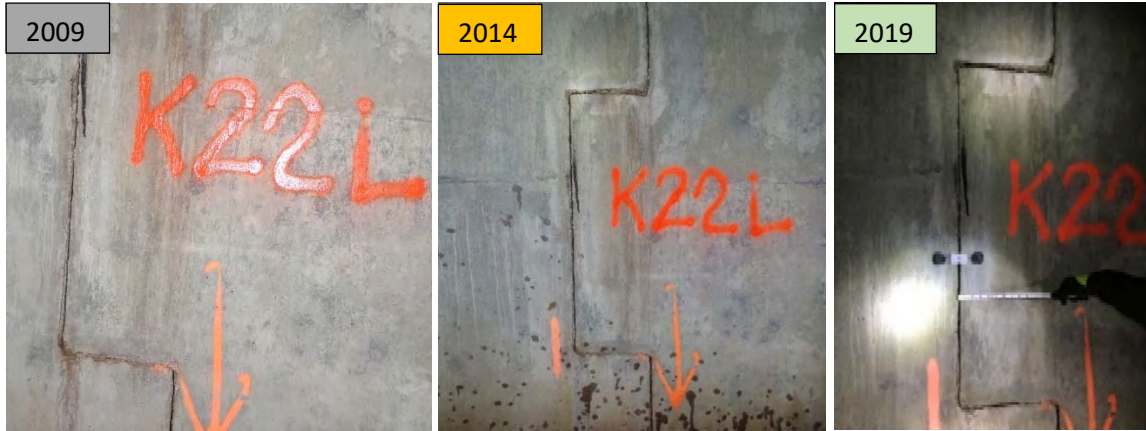
Shear Key: K21L



Shear Key: K21R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K22L

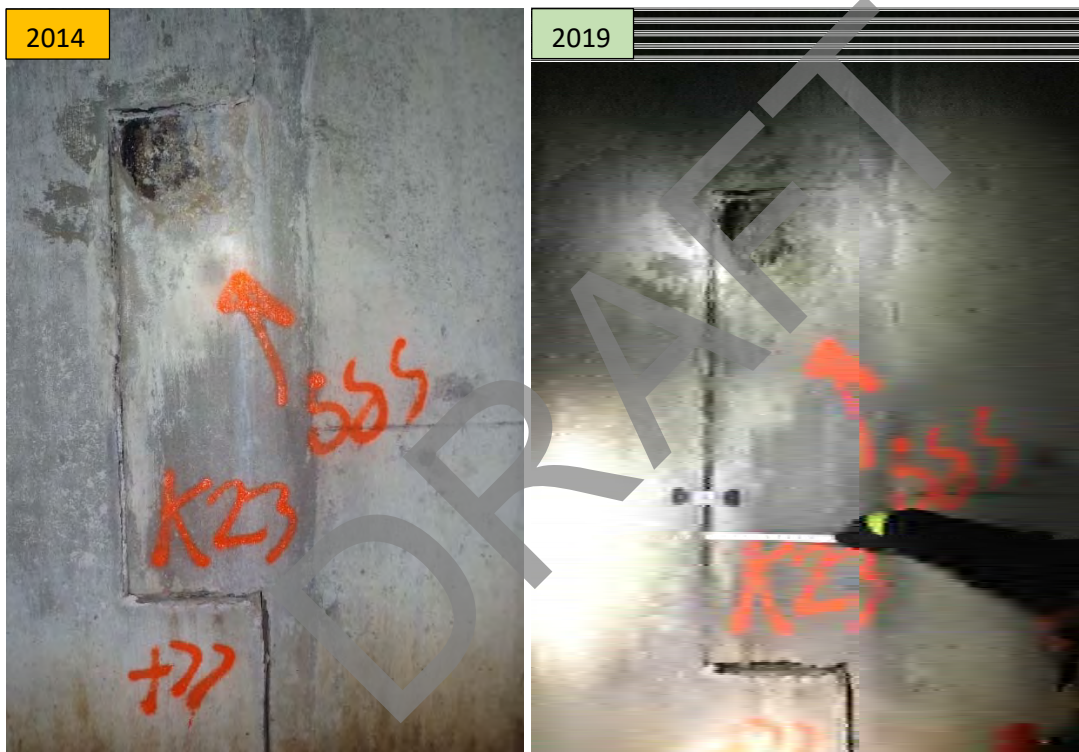


Shear Key: K22R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos

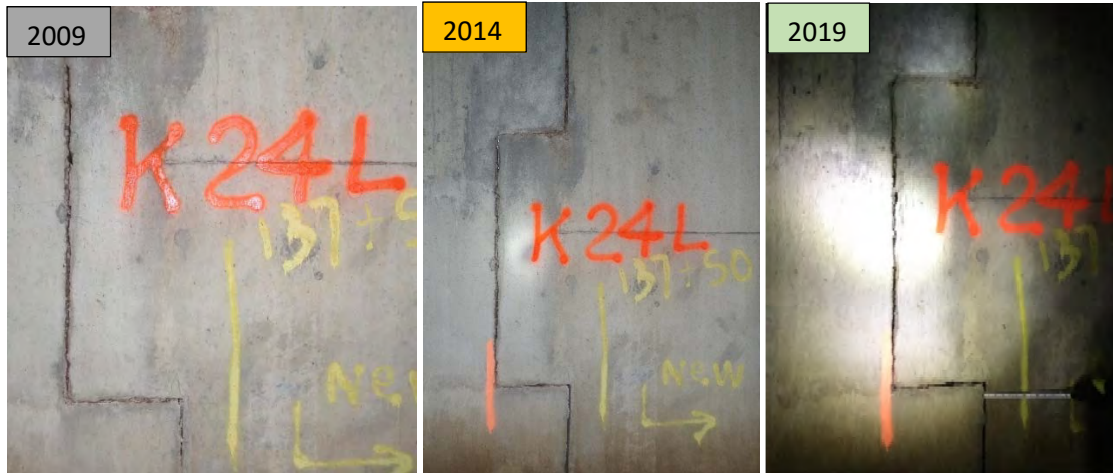


Shear Key: K23L



Shear Key: K23R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



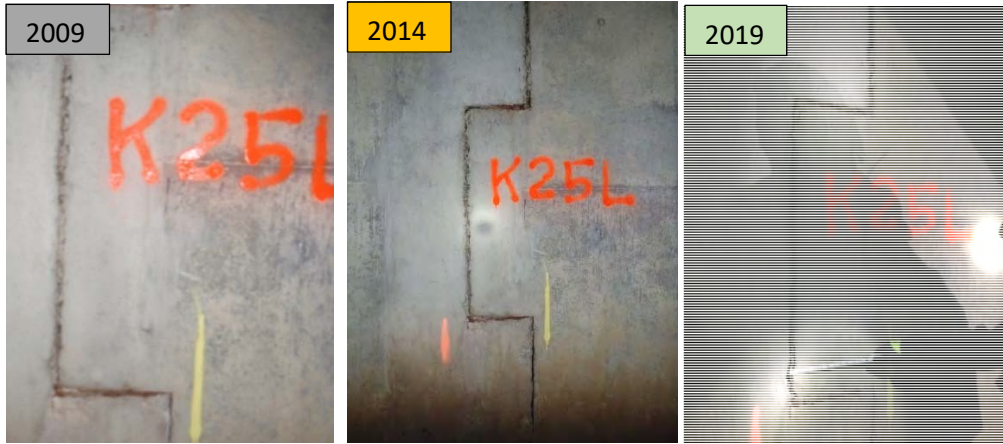
Shear Key: K24L



Shear Key: K24R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K25L



Shear Key: K25R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos

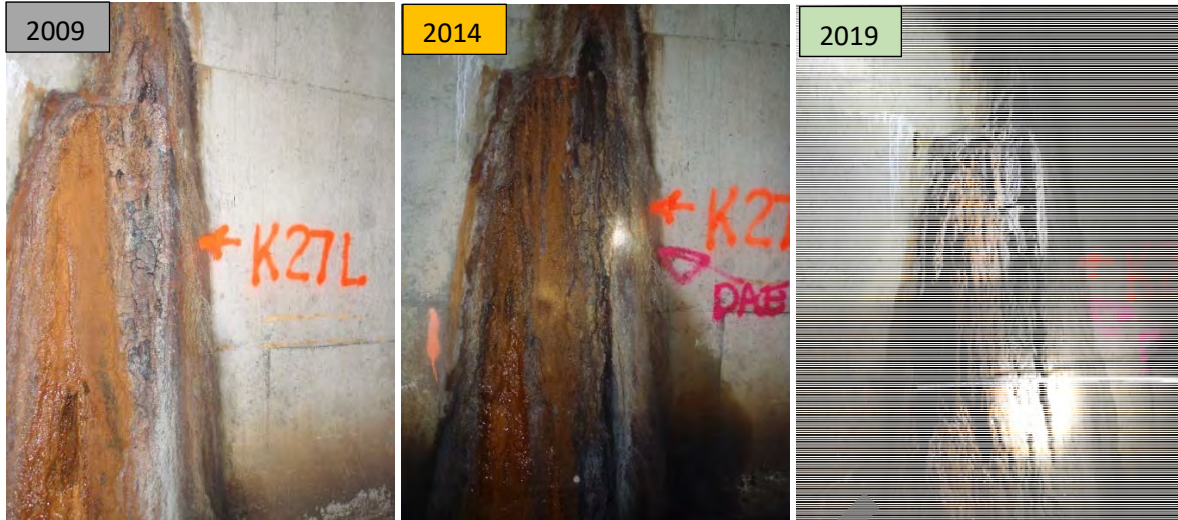


Shear Key: K26L



Shear Key: K26R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



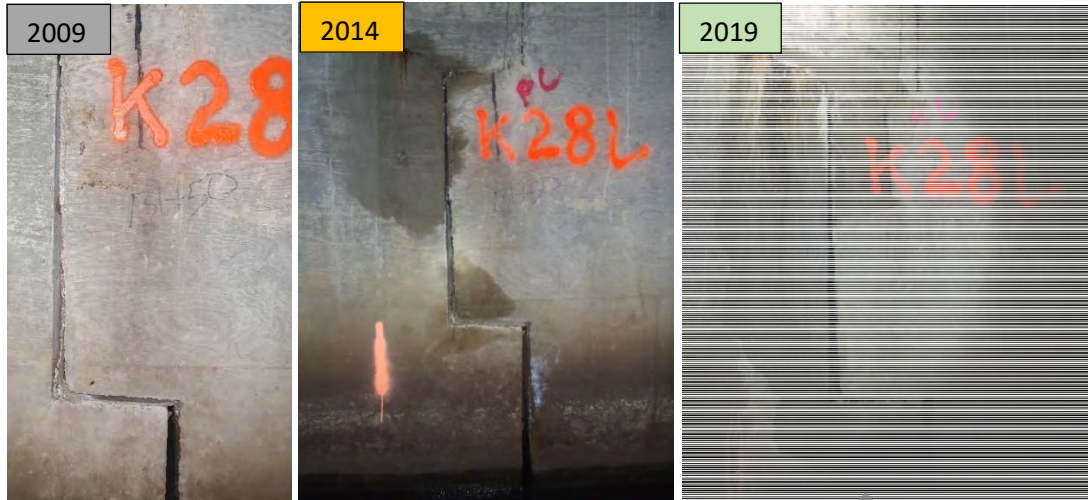
Shear Key: K27L



Shear Key: K27R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos

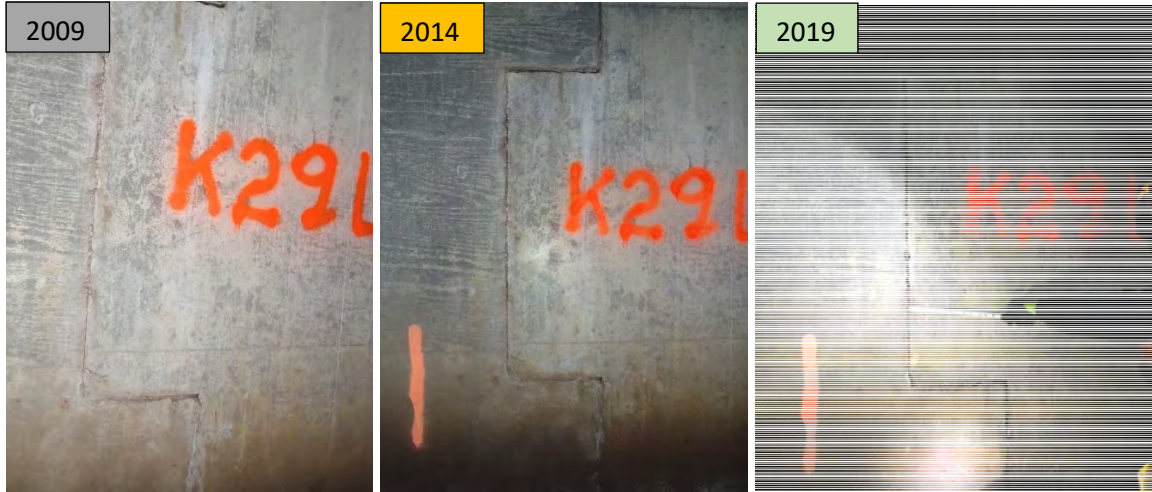


Shear Key: K28L



Shear Key: K28R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



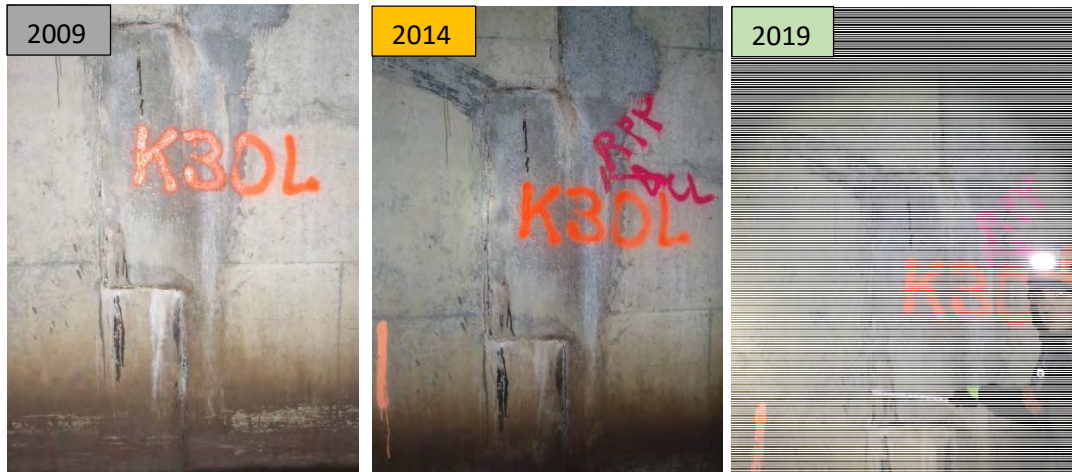
Shear Key: K29L



Shear Key: K29R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K30L



Shear Key: K30R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



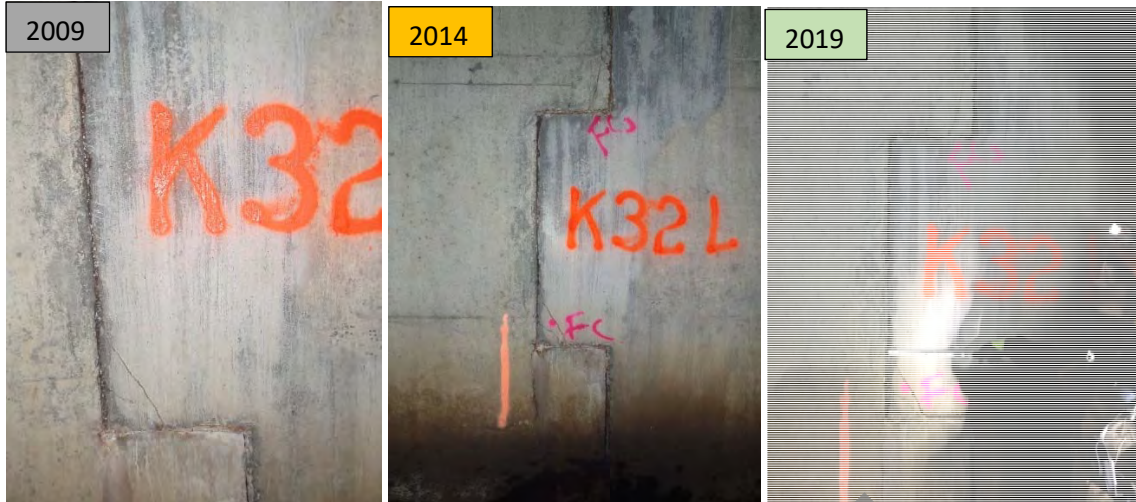
Shear Key: K31L



Shear Key: K31R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



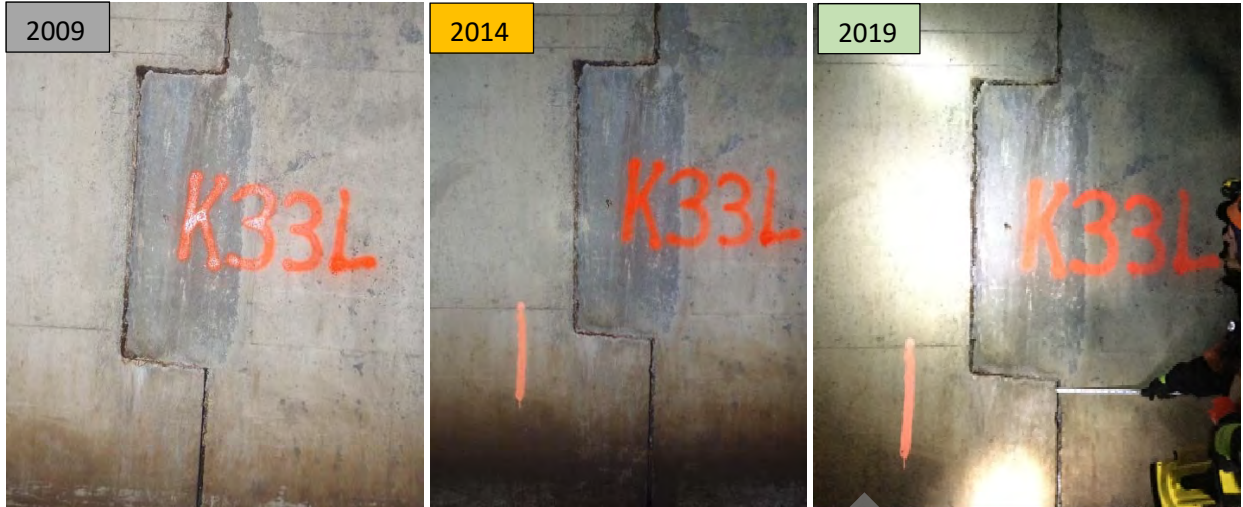
Shear Key: K32L



Shear Key: K32R



Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos

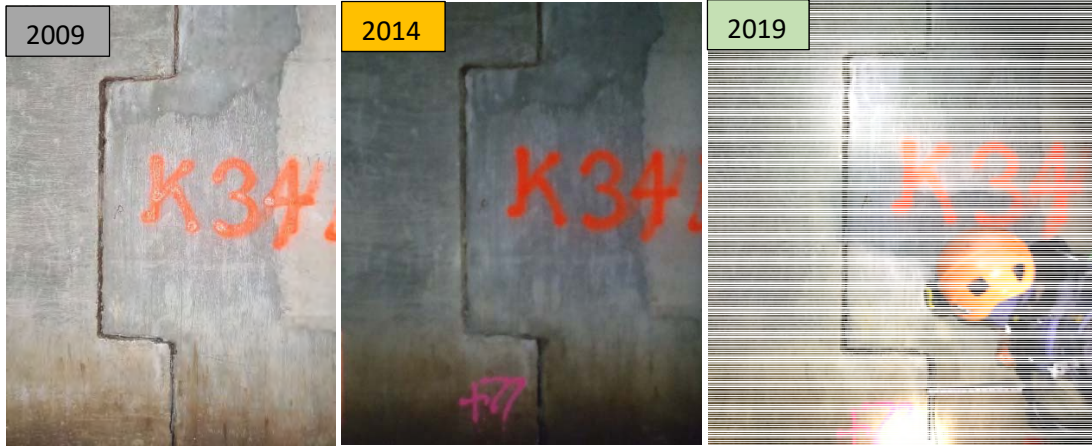


Shear Key:0 K33L



Shear Key: K33R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K34L



Shear Key: K34R

Double Box Culvert (Left Box) – 2009, 2014 & 2019 Shear Key Comparison Photos



Shear Key: K35L



Shear Key: K35R

## Appendix D

### OPR and PRI Rating Tables

DRAFT



### Double Box Culvert - Left Box

Station 172+44 to 119+88 (Entire Length)					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 & M	Struct.	O & M
4	<del>0</del> 1	<del>0</del> 1	<del>0</del> 4	<del>0</del> 4	O.P.R.	O.P.R.	P.R.I.	P.R.I.
3	4 3	16 18	12 9	48 54	727 738	246 270	1	2
2	66 69	99 106	132 138	198 212				
1	583 587	0	583 587	0				
Total	653 660	115 125	727 738	246 270				
Station 172+00 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 & M	Struct.	O & M
4	0	0	0	0	O.P.R.	O.P.R.	P.R.I.	P.R.I.
3	0	2	0	<del>0</del> 6	213 209	20 30	1	2
2	14 13	10 12	28 26	20 24				
1	185 183	0	185 183	0				
Total	199 196	10 14	213 209	20 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 & M	Struct.	O & M
4	0	<del>0</del> 1	0	<del>0</del> 4	O.P.R.	O.P.R.	P.R.I.	P.R.I.
3	0	6	0	18	149 150	82 92	1	2
2	4 5	32 35	8 10	64 70				
1	141 140	0	141 140	0				
Total	145	38 42	149 150	82 92				
Sta 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 & M	Struct.	O & M
4	<del>0</del> 1	0	<del>0</del> 4	0	O.P.R.	O.P.R.	P.R.I.	P.R.I.
3	3 2	1	9 6	3	113 117	51 49	1	2
2	11 14	24 23	22 28	48 46				
1	82 79	0	82 79	0				
Total	96	25 24	113 117	51 49				

### Double Box Culvert - Left Box

Station 172+24 to 119+88 (Entire Length)					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	2	0	10	0	Struct.	O & M	Struct.	O & M
4	0	1 3	0	4 12	O.P.R.	O.P.R.	P.R.I.	P.R.I.
3	0	12 13	0	36 39	532 549	228 241	1	2
2	20 25	94 95	40 50	188 190				
1	482 489	0	482 489	0				
Total	504 516	107 111	532 549	228 241				
Station 172+24 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 & M	Struct.	O & M
4	0	0	0	0	O.P.R.	O.P.R.	P.R.I.	P.R.I.
3	0	0	0	0	134 133	8 10	1	2
2	0 1	4 5	0 2	8 10				
1	129 126	0	129 126	0				
Total	130 128	4 5	134 133	8 10				
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	1	0	5	0	Struct.	O & M	Struct.	O & M
4	0	1	0	4	O.P.R.	O.P.R.	P.R.I.	P.R.I.
3	0	8	0	24	142 145	70 68	1	2
2	0	21 20	0	42 40				
1	137 140	0	137 140	0				
Total	138 141	30 29	142 145	70 68				
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 & M	Struct.	O & M
4	0	0 2	0	0 8	O.P.R.	O.P.R.	P.R.I.	P.R.I.
3	0	1	0	3	94 89	59 65	1	2
2	11	28 27	22	56 54				
1	69 67	0	69 67	0				
Total	80 78	29 30	94 89	59 65				



### Double 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 & M	Struct.	O & M
4	0	0	0	0	O.P.R.	O.P.R.	P.R.I.	P.R.I.
3	0	3	0	9	61 66	37 33	1	2
2	1 2	14 12	2 4	28 24				
1	59 62	0	59 62	0				
Total	60 64	17 15	61 66	37 33				
Station 132+00 to 119+88					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 & M	Struct.	O & M
4	0	0	0	0	O.P.R.	O.P.R.	P.R.I.	P.R.I.
3	0	0 1	0	0 3	105 117	54 65	1	2
2	8 11	27 31	16 22	54 62				
1	89 95	0	89 95	0				
Total	97 106	27 32	105 117	54 65				

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### Double 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 & M	Struct.	O & M
4	0	0	0	0	O.P.R.	O.P.R.	P.R.I.	P.R.I.
3	<del>1</del> 0	<del>6</del> 3	<del>3</del> 0	<del>18</del> 9	122 121	54 43	1	2
2	14	18 17	28	36 34				
1	91 93	0	91 93	0				
Total	106 107	24 20	122 121	54 43				

Station 132+00 to 119+88					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 & M	Struct.	O & M
4	0	0	0	0	O.P.R.	O.P.R.	P.R.I.	P.R.I.
3	<del>0</del> 1	<del>3</del> 6	<del>0</del> 3	<del>9</del> 18	130 141	39 56	1	2
2	23	15 19	46	30 38				
1	84 92	0	84 92	0				
Total	107 116	18 25	130 141	39 56				

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## Appendix E

### PRI Figures

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Barr Footer: ArcGIS 10.7.1, 2020-05-01 12:22 File: I:\Client\BassettCreek\Work\_Orders\2020\Flood Control Inspections\Fig 1 Pipe Rating Index Assignment O&M.mxd User: cm13



⊕ Stationing

Tunnel Condition

- █ Good
- █ Fair
- █ Poor
- █ Not Inspected

Notes:

- Legend represents tunnel conditions from an operations and maintenance standpoint.

N

0      750      1,500

Feet

**PIPE RATING INDEX ASSIGNMENT  
OPERATIONS AND MAINTENANCE**  
2019 Bassett Creek  
Double Box Culvert Inspection  
Performed for the Bassett Creek  
Watershed Management Commission

FIGURE 1



Aerial Image: USDA FSA 2019



