Item 4H.
BCWMC 12-19-19

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BARR

Memorandum

To: Bassett Creek Watershed Management Commission (BCWMC)
From: Barr Engineering Co.
Subject: Bassett Creek 2019 Flood Control Project Inspection
Date: December 11, 2019
Project: 23/27-0051.45 2019 4065

In accordance to the Operation and Maintenance Manual for the Bassett Creek Flood Control Project (FCP), an annual inspection is required to review the condition of the FCP features. The FCP was turned over to the local sponsor during 2002. Therefore, inspection of the FCP features was initialized during the fall of 2002, which was the first formal inspection by the Bassett Creek Watershed Management Commission (BCWMC). Except as noted, the annual inspections have been performed from 2002-2019. Inspections were not performed during 2003, 2011, and 2013 due to BCWMC budget considerations. Some of the municipalities have performed independent inspections of several of the FCP structures. The municipalities are responsible for routine maintenance and repair of the BCWMC FCP features located within their city. The municipalities are also responsible for submitting the completed FCP Maintenance Record from the previous year's inspection. It is important that the BCWMC receive these records, as the inspection and reporting are essential to ensure the BCWMC maintains its eligibility to receive federal funds to repair or replace FCP features in the event of a catastrophe.

The municipalities may request reimbursement from the BCWMC for major maintenance and repairs that exceed $25,000. However, the municipalities must perform regular, routine maintenance and submit the required reporting before requesting and receiving BCWMC reimbursement. This will help prevent the situation wherein the BCWMC pays for maintenance work over $25,000 because the municipalities neglected routine maintenance for several years. The BCWMC expects the municipalities to inform the Commission in advance (e.g., two years) of their request for reimbursement. The BCWMC will consider adding maintenance and repair projects that are more than $100,000 to the BCWMC CIP.

Table 1 (at the end of this memo) provides examples of maintenance and repairs that are major or could be major. In addition, the cities (or other road authority) where the FCP features are located are responsible for maintenance, repair and replacement of road crossings, and their corresponding conveyance structures, that were installed as part of the FCP.

In 2019, the Bassett Creek watershed experienced one of the wettest years on record, with high flows resulting from snowmelt and rainfall in the spring, and persistently high water levels throughout the watershed. The following are the 2019 inspection comments and recommendations:

Plymouth Features

Inspection Date: October 9, 2019
Inspection Personnel: Patrick Brockamp and Josh Phillips (Barr); Ben Scharenbroich (Plymouth)
[Medicine Lake Outlet Structure only]

1. **Plymouth Creek Fish Barrier (Constructed 1987)**
    a. The structure appeared to be in satisfactory condition.
    b. The water level at the staff gage was at 0.48 feet and the depth of water flowing over the weir was 0.37 feet at the time of the inspection.
    c. Sediment has accumulated in the pool upstream of the structure and formed a delta, which was overgrown with vegetation. The deposited sediment was generally creating meander in the creek toward the east (left) bank. Deposited sediment has been noted since 2005 and appears to be increasing.
    d. The railings at the upstream end of the structure, on the east (left) and west (right) sides, have rusted off below the water level. This is consistent with previous inspections and has been noted since 2015.
    e. The abutment walls have expansion joints in the middle, just upstream of the weir. The west (right) expansion joint gap was first measured in 2002 at 7/8 inches for comparison with future inspections. The west (right) expansion joint gap was measured at 7/8 inches this year.
    f. Three cracks were observed on the downstream west (right) wing wall. This is consistent with previous inspections and has been noted since 2004.
    g. Seven diagonal cracks were observed on the downstream east (left) wing wall. Three of the cracks are very prominent. Observation of the three prominent cracks is consistent with previous inspections and has been noted since 2002. The other four cracks are minor and less noticeable.
    h. A 12-inch diameter tree was observed growing adjacent to the downstream east (left) wing wall and through the railing.
    i. Small trees and shrubs were observed growing on the embankment and downstream channel banks, including some near the wing walls and railings.

Recommended Action:

- Remove accumulated sediment from the upstream pool. (Note: In 2010, the City of Plymouth submitted an Environmental Assessment Worksheet (EAW) to the Minnesota Pollution Control Agency (MPCA) for a channel improvements project. The MPCA informed the City of Plymouth that the Clean Water Act expressly prohibits the use of creeks, streams, lakes, and wetlands from being used as a pollution treatment system except in the extreme situations, therefore dredging of the sediment upstream of the fish barrier, in order to continue to utilize

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the area upstream of the fish barrier as a sedimentation pond, was prohibited by the MPCA and not permitted. It is recommended that the City of Plymouth coordinate with the MPCA to discuss viable alternatives to remove the sediment since the project intent was not as a sediment basin but as a fish barrier.)

- Repair railings on the upstream side of the structure.
- Remove trees and vegetation on embankment and channel banks. Chemically treat stumps with Garlon 3A herbicide (or other specialty herbicide for use in wetland sites and waterways) to prevent regrowth.
- Monitor concrete cracks and the width of the expansion joints.

2. **Medicine Lake Outlet Structure (Constructed 1996)**
    a. The channel between the Medicine Lake and the outlet structure was clear of debris and flowing full.
    b. The outlet structure appeared to be in satisfactory condition.
    c. The water level at the staff gage was at 1.56 feet and the depth of water flowing over the structure was 0.86 feet.
    d. While not part of the Bassett Creek FCP, there is a large willow tree directly downstream of the South Shore Drive bridge that has begun to fall into the creek and could block or divert flows toward the right bank if it falls completely.

In late May 2019, City of Plymouth staff observed water flowing over the east side, but not the west side, of the Medicine Lake Outlet Structure. The city surveyed the dam in the summer of 2019 and found that the east side of the dam was 0.15 feet lower than the west side.

Recommended Action:

- Although not part of the Bassett Creek FCP, consider removing the large willow tree directly downstream of the South Shore Drive bridge that has begun to fall into the creek to prevent a potential future flow blockage or erosion.

Golden Valley Features

Inspection Date: October 9, 2019
Inspection Personnel: Patrick Brockamp and Josh Phillips (Barr); Drew Chirpich (Golden Valley)

1. **Wisconsin Avenue Control Structure (Constructed 1987)**
    a. Inspection staff were unable to fully inspect the culvert this year due to high water levels and high flows. From a visual inspection at the downstream end, the culvert appeared to be in satisfactory condition.
    b. The water level at the staff gage was at 881.88 feet upstream of the culvert and 881.85 feet downstream of the culvert.

Note: references to "right" and "left" are with respect to facing downstream.

c. The flood gate was open (raised) at the time of the inspection and appeared to be in satisfactory condition.
d. In previous years, deposited sediment was observed in the bottom of the culvert, ranging from 0-2 inches deep, but inspection staff were unable to fully inspect the culvert this year. The previously observed deposited sediment is consistent with previous inspections and has been noted since 2006.
e. Some of the gabion baskets upstream and downstream of the culvert have deteriorated or broken and riprap had fallen out of the baskets at some locations. Although the gabion baskets are no longer functioning as installed, no significant erosion was observed.
f. The railings at the upstream and downstream ends of the culvert were in satisfactory condition.
g. Small trees and brush are growing around the downstream end of the culvert.

Recommended Action:

- Cut and remove trees and brush near culvert ends. Chemically treat stumps with Garlon 3A herbicide (or other specialty herbicide for use in wetland sites and waterways) to prevent regrowth.
- Monitor deposited sediment in the culvert.
- Monitor upstream and downstream banks for erosion.

3. Golden Valley Country Club – Box Culvert, Overflow Weir, and Downstream Channel (Constructed 1994)

a. The channel and riprap armoring from Pennsylvania Avenue to the box culvert appeared to be in satisfactory condition.
b. The box culvert, joints, and railings appeared to be in satisfactory condition.
c. The overflow weir (earth berm) appeared to be in satisfactory condition and has been maintained by the Golden Valley Country Club staff as manicured fairway turf.
d. Some sediment deposition was observed on the north (left) bank just upstream of the box culvert.

Recommended Action:

- Monitor sediment deposition on the north (left) bank just upstream of the box culvert.

4. Westbrook Road Crossing (Constructed 1993)

a. The concrete Bebo culvert appeared to be in satisfactory condition.
b. The water level at the staff gage was at 854.45 feet.

Note: references to "right" and "left" are with respect to facing downstream.

c. Spalled concrete and exposed rebar was observed around the storm sewer pipe entering the culvert on the west (left) side.
d. Longitudinal hairline cracks were observed on the top of sections of the Bebo culvert, extending across the entire section (pre-cast section) width. The cracks are approximately 2 feet off-center of the structure. These cracks are consistent with previous inspections and have been noted since 2002.
e. A joint gap and separation was observed between the two furthest downstream sections of the culvert and there are signs of pressure points where the last section has pushed against the top of the two wing walls. Fractured concrete was observed on the east (right) side of the culvert, potentially due to the movement. This is consistent with previous inspections and has been noted since 2015.
f. Spalled concrete was observed at multiple locations upstream and downstream of the culvert at the top of the wing walls and head wall. This is consistent with previous inspections and has been noted since 2007.
g. Cracks were observed in the road pavement above the structure. This is consistent with previous inspections and has been noted since 2010. Crack sealant was applied to the road surface in 2019.
h. The railings appeared to be in satisfactory condition.

Recommended Action:

- Repair spalled concrete and exposed rebar at storm sewer connection on west (left) side of culvert.
- Provide grout at the downstream east (right) catch basin to prevent further deterioration of the concrete adjusting rings resulting in potential damage to the road or culvert.
- Monitor cracks in the culvert.
- Monitor joint gap and fractured concrete at pressure points.
- Monitor spalled concrete at wing walls and head walls.
- Monitor cracks in the road.

5. Regent Avenue Crossing (Constructed 1981-1984)

a. The concrete Bebo culvert appeared to be in satisfactory condition.
b. The channel bottom was very soft and mucky and the water level was below the bottom of the staff gauge and not measured.
c. Spalled concrete was observed at the middle joint of the upstream north (left) wing wall. This in consistent with previous inspections and has been noted since 2002.
d. A crack was observed at the upstream, north (left) wing wall. The crack was near the top of the wing wall and travels at a 45 degree angle down to the headwall. This in consistent with previous inspections and has been noted since 2002.

Note: references to “right” and “left” are with respect to facing downstream.

e. Multiple cracks were observed at the upstream south (right) wing wall. This consistent with previous inspections and has been noted since 2008.
f. Spalled concrete was observed around the storm sewer pipe entering the culvert on the north (left) side.
g. A crack was observed at the downstream south (right) wing wall. The crack was near the top of the wing wall and travels at a 45 degree angle down to the headwall. This is consistent with previous inspections and has been noted since 2002.
h. Flows appeared to have scoured the north (left) side of the creek bottom and deposited sediment on the south (right) side of the creek bottom.
i. A few trees are beginning to grow adjacent to the downstream north (left) wing wall.
j. The paint on the railings is chipping, peeling, and coming off in a few places.

Recommended Action:

- Repair spalled concrete at storm sewer connection on north (left) side of culvert.
- Add a new coat of primer and paint to the railings.
- Remove trees beginning to grow adjacent to the downstream north (left) wing wall.
- Monitor spalled concrete at the upstream north (left) wing wall.
- Monitor crack at the upstream north (left) wing wall.
- Monitor cracks at the upstream south (right) wing wall.
- Monitor crack at the downstream south (right) wing wall.
- Monitor creek bottom for scouring and deposition and, as needed, armor creek bottom along culvert foundation.

6. Noble Avenue Crossing (Constructed 1981-1984)

a. The concrete Bebo culvert appeared to be in satisfactory condition.
b. Longitudinal hairline cracks were observed throughout the length of the top of the culvert, extending across the entire section (pre-cast section) width. The cracks were either in the center of the structure or approximately 2 feet off-center of the structure. This is consistent with previous inspections and has been noted since 2002.
c. Spalled concrete and exposed plastic joint material was observed approximately two feet either side of center throughout the length of the top of the culvert. The cement paste covering the plastic joint material has separated and exposed the plastic. This is consistent with previous inspections and has been noted since 2002.
d. Spalled concrete and exposed rebar was observed around the storm sewer pipe entering the culvert on the north (left) side.
e. Spalled concrete was observed at the downstream north (left) wing wall. This is consistent with previous inspections and has been noted since 2002.

Note: references to “right” and “left” are with respect to facing downstream.

f. Multiple cracks and spalling were observed at the top of downstream north (left) wing wall. The cracking is consistent with previous inspections and has been noted since 2007.
g. The downstream south (right) wing wall was slightly leaning toward creek. Inspection staff have monitored the offset between the upper portion of the wing wall and the lower portion of the wing wall, which is leaning toward the creek, since 2002 to document movement. The inspection staff's measurements are listed below:

Year	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Offset	5/8″	N/A [1]	5/8″	11/16″	1″	1″	1″	1-1/8″	1-1/8″
Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Offset	N/A [1]	1-1/8″	N/A [1]	1-1/8″	1-1/8″	1-1/8″	1-1/8″	1-1/8″	1-3/16″

[1] FCP inspection was not performed due to budget considerations.

h. Minor bank erosion and scour was observed on both sides of the downstream wing walls. This is consistent with previous inspections and has been noted since 2002.
i. Flows appeared to be scouring the north (left) side of the creek bottom.
j. The paint on the railings is chipping and coming off in a number of locations.
k. The City of Golden Valley installed riprap in 2018 to reinforce the bank and minimize continued erosion at the outside edge of the upstream south (right) wing wall, however some erosion has perpetuated upstream.

Recommended Action:

- Repair spalled concrete and exposed rebar at storm sewer connection on north (left) side of culvert.
- Add new coat of primer and paint to railings.
- Monitor cracks and spalled concrete in the culvert and wing walls.
- Monitor bank erosion at downstream wing walls and upstream of installed riprap at upstream south (right) wing wall.
- Monitor creek bottom for scouring and, as needed, armor creek bottom along culvert foundation.

Golden Valley / Minneapolis Features

Inspection Date: October 9, 2019
Inspection Personnel: Patrick Brockamp and Josh Phillips (Barr); Drew Chirpich (Golden Valley)

1. Highway 55 Control Structure (Constructed 1987)

a. The concrete control structure appeared to be in satisfactory condition.

Note: references to "right" and "left" are with respect to facing downstream.

b. A hairline crack was observed in the east (left) wall of the inlet structure, although it appears that the crack may have been previously sealed with caulk. The crack is positioned in the middle of the wall extending full height. This is consistent with previous inspections and has been noted since 2002.
c. Erosion was observed around both the east (left) and west (right) sides of the structure, likely from road runoff. This is consistent with previous inspections and has been noted since 2004. The erosion on the east (left) side is more significant and appears to be worsening.

Recommended Action:

- Armor the sides of the structure to protect against additional erosion, or divert road runoff away from the structure.
- Monitor hairline crack in the control structure.

Crystal Features

Inspection Date: October 9, 2019
Inspection Personnel: Patrick Brockamp and Josh Phillips (Barr)

1. **Markwood Open Channel – Gabion Section (Constructed 1981-1984)**
    a. The channel appeared to be in satisfactory condition.
    b. Some vegetation growth was observed along the gabion section of the channel.

Recommended Action:

- Clear woody vegetation in the channel. Consider 3-5 year vegetation clearing interval to maintain flow capacity, maintain channel access, and protect gabion baskets.

2. **Markwood Open Channel (Constructed 1981-1984)**
    a. The channel appeared to be in satisfactory condition.
    b. Significant vegetation growth was observed along the side slopes of the channel.
    c. Erosion was observed along the toe of the north (left) and south (right) banks. This is consistent with previous inspections and has been noted since 2006.
    d. Some homeowner retaining walls and fences along the channel were leaning toward the channel and, in some cases, appeared to be failing. This is consistent with previous inspections and has been noted since 2009.
    e. The city's corrugated metal pipe (CMP) storm sewer, discharging into the channel between 6833 and 6825 Markwood Drive, was in poor condition. The pipe bottom was corroded and there was erosion and undercutting around the pipe end. The pipe was exposed 8 feet, 3 inches, measured on the downstream side.

Note: references to "right" and "left" are with respect to facing downstream.

Recommended Action:

- Clear woody vegetation in the channel. Consider 3-5 year vegetation clearing interval to maintain flow capacity and access through the open channel.
- Monitor erosion along the toe of the channel banks.
- Although not part of flood control project, monitor retaining walls and fences for potential failure and obstruction of flow through the channel.
- Although not part of flood control project, City may want to consider repairing or replacing the CMP storm sewer.

3. 36th Avenue and Hampshire Avenue Crossing - 8 feet x 6 feet Double Box Culverts (Constructed 1981-1984)

a. The concrete box culverts, joints and tie bars appeared to be in satisfactory condition.
b. Some riprap has deposited in the box culverts.
c. Sediment has deposited in the box culverts, mostly in the downstream half of the box culverts. This is consistent with previous inspections and has been noted since 2016.
d. On both culverts, the fifth joint from the downstream end had a 2 ½ inch gap, which is a larger gap than the rest of the joints. This is consistent with previous inspections and has been noted since 2010.
e. Inspection staff performed a more detailed inspection of the culverts in 2019. While additional structural, and operation and maintenance defects are noted for the first time in this section, these defects did not appear to be new in 2019. In the north (left) culvert, inspection staff observed the following:
    i. An Infiltration weeper, or slow ingress of water (with no visible drips) through a defective or faulty joint or culvert wall at the culvert inlet upstream of the first culvert bend.
    ii. Spalled concrete at two joints at the first culvert bend on the left side (outside of bend).
    iii. Exposed reinforcing at the first culvert bend on the right side (inside of bend).
    iv. Spalled concrete at three joints between the first culvert bend and the second culvert bend. The spalled concrete appeared to have resulted from random defects or damage from debris rather than a pattern of stress on the culvert or joints.
    v. Spalled concrete at one joint downstream of the second culvert bend on the left side near the culvert bottom.
f. Inspection staff performed a more detailed inspection of the culverts in 2019. While additional structural defects are noted for the first time in this section, these defects did not appear to be new in 2019. In the south (right) culvert, inspection staff observed:

Note: references to “right” and “left” are with respect to facing downstream.

i. Spalled concrete at one joint downstream of the second culvert bend on the right side, halfway up the culvert.
ii. Spalled concrete at two joints between the first culvert bend and the second culvert bend, on the right side, halfway up the culvert. The spalled concrete appeared to have resulted from random defects or damage from debris rather than a pattern of stress on the culvert or joints.
iii. A crack at the top of the culvert across a joint at approximately the fifth section downstream of the inlet. This is consistent with previous inspections and has been noted since 2002. The crack may have formed during construction.

Recommended Action:

- Remove deposited riprap in the box culverts.
- Monitor sediment in the box culverts.
- Monitor the joint gaps in the box culverts.
- Monitor infiltration weeper, spalled concrete, and exposed reinforcing in the north (left) box culvert.
- Monitor spalled concrete and crack in the south (right) box culvert.

4. Markwood Downstream Overflow (Constructed 1981-1984)

a. The overflow was in satisfactory condition.

5. Markwood 8 feet x 4 feet Box Culvert (Constructed 1981-1984)

a. The culvert was only visually inspected from the outside at the downstream end. No obstructions or sedimentation was observed and the box culvert appeared to be in satisfactory condition.

Recommended Action:

- None

6. Georgia Avenue Crossing (Constructed 1981-1984)

a. The concrete culverts appeared to be in satisfactory condition.
b. Cracking and potential spalling was observed in the south (right) culvert at the second and fourth joints at approximately the five o'clock position.
c. Minor erosion was observed between the concrete culverts at the upstream end.
d. The riprap on the downstream end has been slightly redistributed to create a channelized flow path.

Recommended Action:

Note: references to "right" and "left" are with respect to facing downstream.

- Monitor cracking and potential spalling in the south (right) culvert.
- Monitor minor erosion between the concrete culverts on the upstream end.
- Monitor riprap on the downstream end to ensure it continues to provide adequate energy dissipation.

7. Edgewood Embankment (Constructed 1981-1984)

a. The concrete culvert appeared to be in satisfactory condition.
b. The embankment appeared to be in satisfactory condition.
c. No visible settlement or erosion was observed along the embankment.
d. Small trees and shrubs were observed growing on the embankment.
e. The natural boulder riprap between the Edgewood embankment and Douglas Drive crossing is significantly overgrown with vegetation.
f. Spalled concrete was observed at the fifth joint from the upstream end at approximately the 7 o'clock position.

Recommended Action:

- Remove small trees and shrubs growing on the embankment.
- Clear woody vegetation in the channel between the Edgewood Embankment and Douglas Drive crossing as needed to maintain a clear flow path through the channel.
- Monitor spalled concrete at the fifth joint from the upstream end in the culvert.

8. Douglas Drive Crossing (Constructed 1981-1984)

a. The concrete box culvert appeared to be in satisfactory condition.
b. The grouted riprap installed on either side of the box culvert outlet has started to deteriorate, and a gap has opened between the grout and the wall of the box culvert. This is consistent with previous inspections and has been noted since 2016.
c. Spalled concrete was observed at the downstream north (left) wing wall.
d. On the downstream end of the culvert, settling was observed in the sidewalk on either side of the culvert.
e. Small trees were observed growing adjacent to the structure at the downstream end.
f. Although not part of the flood control project, the privately-owned CMP culvert downstream of the Douglas Drive crossing is in poor condition. Sagging of this culvert has been observed during inspections since 2009 and appears to be worsening. The culvert is significantly bowing and settling has occurred on either side of the culvert, which is evident in the road pavement above the structure.

Recommended Action:

- Monitor grouted riprap at the downstream end of the box culvert.

Note: references to "right" and "left" are with respect to facing downstream.

- Monitor spalled concrete at the downstream north (left) wing wall.
- Monitor settling in the sidewalk at the downstream end of the culvert.
- Although not part of the flood control project, it is recommended that the City coordinate with the property owner to repair or replace the culvert downstream of Douglas Drive.

9. 34th Avenue Crossing (Constructed 1981-1984)

a. The concrete culvert appeared to be in satisfactory condition.
b. Some riprap has deposited in the culvert.
c. Sediment has deposited in the bottom of the culvert, ranging from 0-4 inches deep. This is consistent with previous inspections and 0-12 inches of sediment has been noted in the culvert since 2002.
d. The tie bars directly upstream and downstream of the manhole connection to the culvert were rusty and flaking. This is consistent with previous inspections and has been noted since 2008.
e. A BCWMC stage monitor and automated stormwater sampler were installed downstream of the culvert in May 2018 as part of the Commission's plan for water quality monitoring.

Recommended Action:

- Remove riprap from the culvert.
- Monitor accumulated sediment in the culvert.
- Monitor tie bars directly upstream and downstream of the manhole connection to the culvert.

10. Brunswick Avenue Crossing (Constructed 1981-1984)

a. The north (left) culvert is at a slightly lower elevation at the upstream end, therefore the north (left) culvert was conveying a majority of the base flow at the time of the inspection.
b. Strained and detached tie bars were observed in the north (left) culvert. One joint with broken tie bars was previously re-grouted by the City of Crystal, but the joint reopened and a 1-1/2 inch gap in the joint was observed during the 2008 inspection. A 3 inch gap in the joint has been noted since 2009.
c. Spalled concrete and exposed reinforcing was observed in various locations in the south (right) culvert.
d. Fractured pieces of concrete and grout were observed at various joints in both culverts.
e. Longitudinal and circumferential cracks were observed in both culverts.
f. Cracks were observed in the road pavement above the structure.
g. Sediment has deposited in the channel between Brunswick Avenue crossing and 32nd Avenue crossing and created two deltas in the channel. The channel was armored with boulder riprap in 2014. The sediment delta has been observed since 2017.

Note: references to "right" and "left" are with respect to facing downstream.

h. Two boulders had fallen out of place on the south (right) side of the natural boulder wall, between Brunswick Avenue crossing and 32nd Avenue crossing, and were deposited in the channel bottom.

Recommended Action:

- Repair detached tie bars.
- Repair fractured concrete and grout at joints in the culverts.
- Replace bounders into the natural boulder wall between Brunswick Avenue crossing and 32nd Avenue crossing.
- Remove deposited sediment and vegetation in the channel between Brunswick Avenue crossing and 32nd Avenue crossing.
- Monitor spalled concrete and exposed reinforcing in the culverts.
- Monitor minor cracks in the culverts and road.

11. 32nd Avenue Crossing (Constructed 1981-1984)

a. The southwest (right) culvert is at a slightly lower elevation at the upstream end, therefore the southwest (right) culvert was conveying all the base flow at the time of the inspection.
b. The concrete culverts appeared to be in satisfactory condition. The culverts were only visually inspected from the outside at the upstream and downstream ends due to low clearance and high water levels.
c. Water was observed seeping into the north (left) culvert through the bottom of the joint between the first and second upstream sections of the culvert.

Recommended Action:

- Monitor the joint between the first and second upstream sections of the north (left) culvert.

12. Bassett Creek Park Pond and Outlet (Constructed 1995)

a. Bassett Creek Park Pond appeared to be in satisfactory condition.
b. Sediment has deposited in the northwest corner of Bassett Creek Park Pond and formed multiple deltas, which are overgrown with trees and vegetation. This has been noted since 2006 and the sediment deposition appears to be increasing.
c. The outlet pipes appeared to be in satisfactory condition.

Recommended Action:

- Dredging of Bassett Creek Park Pond and upstream channel improvements (BCP-2) is included in the BCWMC CIP Table 5-3. The BCWMC completed a feasibility study for the dredging of Bassett Creek Park Pond and Winnetka Pond in May 2017. The City of Crystal

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dredged Winnetka Pond East in 2019. Bassett Creek Park Pond Dredging project is included in future CIP planning, pending funding.

13. **Detention Pond and Outlet Structure (Constructed 1995)**
    a. The outlet structure appeared to be in satisfactory condition.
    b. The detention pond appeared to be in satisfactory condition, but a survey is needed to assess accumulated sediment.

Recommended Action:

- Survey the detention pond to determine if the pond has accumulated sediment.

Crystal / Golden Valley Features

Inspection Date: October 9, 2019
Inspection Personnel: Patrick Brockamp and Josh Phillips (Barr)

1. **Highway 100 Double Box Culverts (Constructed 1930s, and 2001) and Inlet Structure (Constructed 1995)**
    a. The concrete box culverts and concrete inlet structure appeared to be in satisfactory condition.
    b. Longitudinal cracks, circumferential cracks, and areas of spalled concrete were observed along the top of the south (right) box culvert. MnDOT performed repairs to the culverts in 2007, but cracks have been noted since 2008 and areas of concrete spalling have been noted since 2014.
    c. Deposited sediment was observed in the north (left) box culvert, generally ranging from 8 to 12 inches deep. High flows in 2019 appeared to have more evenly redistributed sediment throughout the north (left) box culvert. This is consistent with previous inspections and 6-24 inches of deposited sediment has been observed in the north (left) box culvert since 2002.
    d. A large branch was stuck on the wall between the double box culverts in the inlet structure.
    e. The outlet portion of the structure appeared to be in satisfactory condition.

Recommended Action:

- Remove the large branch between the double box culverts in the inlet structure (Recommended by Crystal due to location of debris).
- Monitor accumulated sediment in north (left) box culvert and consider future removal.
- Monitor cracking and spalling concrete in the south (right) box culvert.

Note: references to "right" and "left" are with respect to facing downstream.

Minneapolis Features

Inspection Date: October 25, 2018
Inspection Personnel: Patrick Brockamp and Josh Phillips (Barr)

1. **Open Channel (Constructed 1992)**
    a. The open channel, from Van White Memorial Boulevard to the inlet structure, appeared to be in satisfactory condition.
    b. The banks were generally covered with brush and trees about 3-4 feet above the channel bottom. Below the level of the trees and brush, the banks were bare soil on both sides for most of the length of the channel, however no obvious signs of bank erosion were noted.
    c. A dead tree had partially fallen into the channel just downstream of Van White Memorial Boulevard and was collecting debris.
    d. Sediment has deposited and formed a delta on the south (right) side of the channel between the debris barrier and inlet structure. Vegetation was growing on the delta and approximately one-quarter of the channel was blocked by the sediment, debris, and vegetation.

Recommended Action:

- Remove accumulated sediment and debris on the south (right) side of the channel between the inlet structure and debris barrier.
- Monitor downed tree(s) and debris and remove as needed.
- Bassett Creek Main Stem Erosion Repair Project (CIP 2017 CR-M) is included in the BCWMC CIP Table 5-3. The BCWMC completed a feasibility study for the project in May 2016, and ordered construction of the project at their September, 2016 meeting. The project was originally scheduled for construction during the summer of 2018, but due to permitting issues with the US Army Corps of Engineers and the State Historic Preservation Office, it was postponed to the winter of 2019/2020. The resultant construction project should minimize future erosion concerns at some sections of the creek and reduce the amount of sediment depositing near the inlet structure.

2. **Debris Barrier (Constructed 1992)**
    a. The debris barrier piles appeared to be in satisfactory condition.
    b. The cable was missing or broken in the center portion of the channel. The cable is should extend from end to end, attached at each post.

Recommended Action:

- Repair or replace the steel cable on debris barrier.
- Monitor for debris and remove as needed.

Note: references to “right” and “left” are with respect to facing downstream.

3. Inlet Structure (Constructed 1992)

a. The concrete inlet structure appeared to be in satisfactory condition.
b. Vertical cracks were observed in the concrete on either side of the structure.
c. Cracks were observed near where the handrail posts are embedded.
d. The railings and vertical bars appeared to be in satisfactory condition.
e. The inlet structure had recently been cleared of debris.

Recommended Action:

- Monitor for debris and clear as needed.
- Monitor cracks in the concrete inlet structure.

4. Double Box Culvert (Constructed 1992)

a. The 5-year double box culvert inspection was performed on October 22-23, 2019. The BCWMC will prepare a separate report for the 2019 double box culvert inspection. The next inspection will be performed in 2024.

5. 3rd Avenue Tunnel (Constructed 1990) and 2nd Street Tunnel (Constructed 1979)

a. Inspection of the Third Avenue and Second Street deep tunnel are on a 10 year inspection interval. The inspection of the deep tunnel was last performed during 2008. An inspection was scheduled for 2018 but has been delayed due to Army Corps of Engineers coordination.

Note: references to "right" and "left" are with respect to facing downstream.

Table 1: Routine vs. Major Maintenance and Repairs Items

Item #	Routine vs. Major Maintenance and Repairs – as Recommended by the TAC[1] and approved by the BCWMC[2]
Routine	
1	Vegetation: removal of trees, removal of brush, chemical treatment of stumps, control of noxious weeds, establish vegetation on bare areas
2	Removal of debris: woody debris, riprap, trash from channel, inlets, culverts
3	Repair erosion; channels, inlet and outlet structures, culvert ends
4	Repair/replace riprap: on inlet and outlet ends of culverts, channels, banks
6	Remove sediment from channels, structures, culverts, etc.
10	Repair/maintain guard rails, hand rails and fencing: remove rust, prime and paint, repair damaged rails and posts, replace rusted-out sections, repair cables, replace posts, repair chain link fence
12	Repair concrete pipe: repair joints, tie-bolts, spalling, connection to culverts, breakage
13	Repair/replace catch basins, manholes, casting assemblies, grates
14	Repair/maintain debris barrier: removal of debris, repair cables, replace poles
15	Repair/maintain tunnel inlet trash rack: repair/replace trash rack rods (loose or broken, vandalized, bent)
16	Street repairs: pavement, curb and gutter, cracks, depressions, settlement
Major	
5	Repair/replace gabion baskets
7	Remove sediment/dredge ponds, basins, etc.
17	Tunnel repairs: concrete and other repairs to the new Bassett Creek tunnel
Could be major depending on extent	
8	Repair scouring/undercutting at structures and culvert outlets
9	Repair concrete structures: cracking, spalling, breakage
11	Culverts/Bebo sections: joints, settlement, separation, concrete spalling, wing walls – movement and breakage

[1] Based on needed repairs identified during 2016 FCP inspection.
[2] Per BCWMC actions at their May 19, 2016 and July 21, 2016 meetings.

Note: references to "right" and "left" are with respect to facing downstream.

Attachment

Photographs of Bassett Creek Flood Control Project Features

October 9, 2019

Plymouth Creek Fish Barrier (Plymouth)

Plymouth Creek Fish Barrier (Plymouth), continued

Plymouth Creek Fish Barrier (Plymouth), continued

Medicine Lake Outlet (Plymouth)

Medicine Lake Outlet (Plymouth), continued

Wisconsin Avenue Control Structure (Golden Valley)

Wisconsin Avenue Control Structure (Golden Valley), continued

Golden Valley Country Club (Golden Valley)

Golden Valley Country Club (Golden Valley), continued

Westbrook Road Crossing (Golden Valley)

Westbrook Road Crossing (Golden Valley), continued

Regent Avenue Crossing (Golden Valley)

Regent Avenue Crossing (Golden Valley), continued

Noble Avenue Crossing (Golden Valley)

Noble Avenue Crossing (Golden Valley), continued

Noble Avenue Crossing (Golden Valley), continued

Highway 55 Control Structure (Golden Valley/Minneapolis)

Highway 55 Control Structure (Golden Valley/Minneapolis)

36th Avenue and Hampshire Avenue Crossing (Crystal)

36th Avenue and Hampshire Avenue Crossing (Crystal), continued

Markwood Open Channel (Crystal)

Markwood Open Channel (Crystal), continued

Markwood Open Channel (Crystal), continued

Markwood Open Channel – Gabion Section (Crystal)

Markwood 8 feet x 4 feet Box Culvert (Crystal)

Georgia Avenue Crossing (Crystal)

Edgewood Embankment (Crystal)

Edgewood Embankment (Crystal), continued

Douglas Drive Crossing (Crystal)

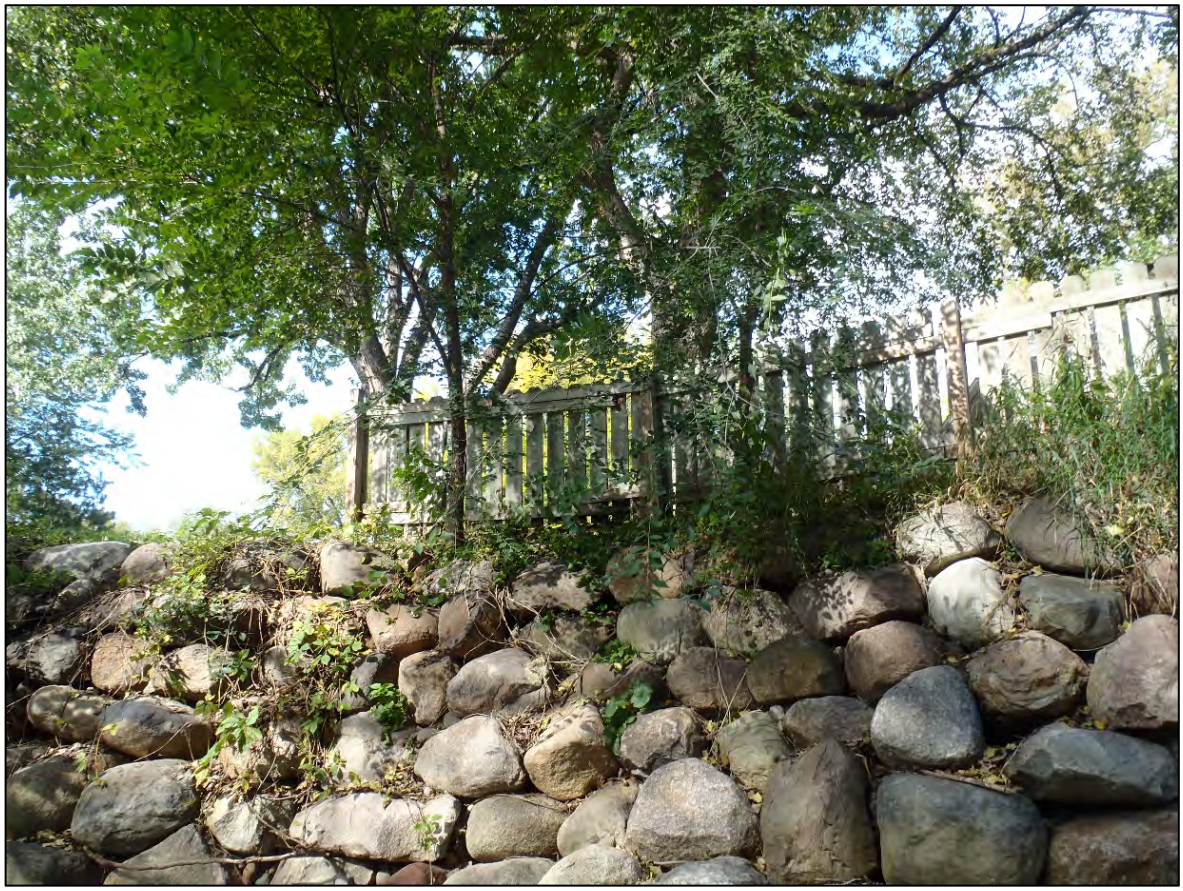
Douglas Drive Crossing (Crystal), continued

34th Avenue Crossing (Crystal)

Brunswick Avenue Crossing (Crystal)

Brunswick Avenue Crossing (Crystal), continued

Downstream of Brunswick Avenue Crossing (Crystal)



32nd Avenue Crossing (Crystal)

32nd Avenue Crossing (Crystal), continued

Bassett Creek Park Pond and Outlet (Crystal)

Bassett Creek Park Pond and Outlet (Crystal), continued

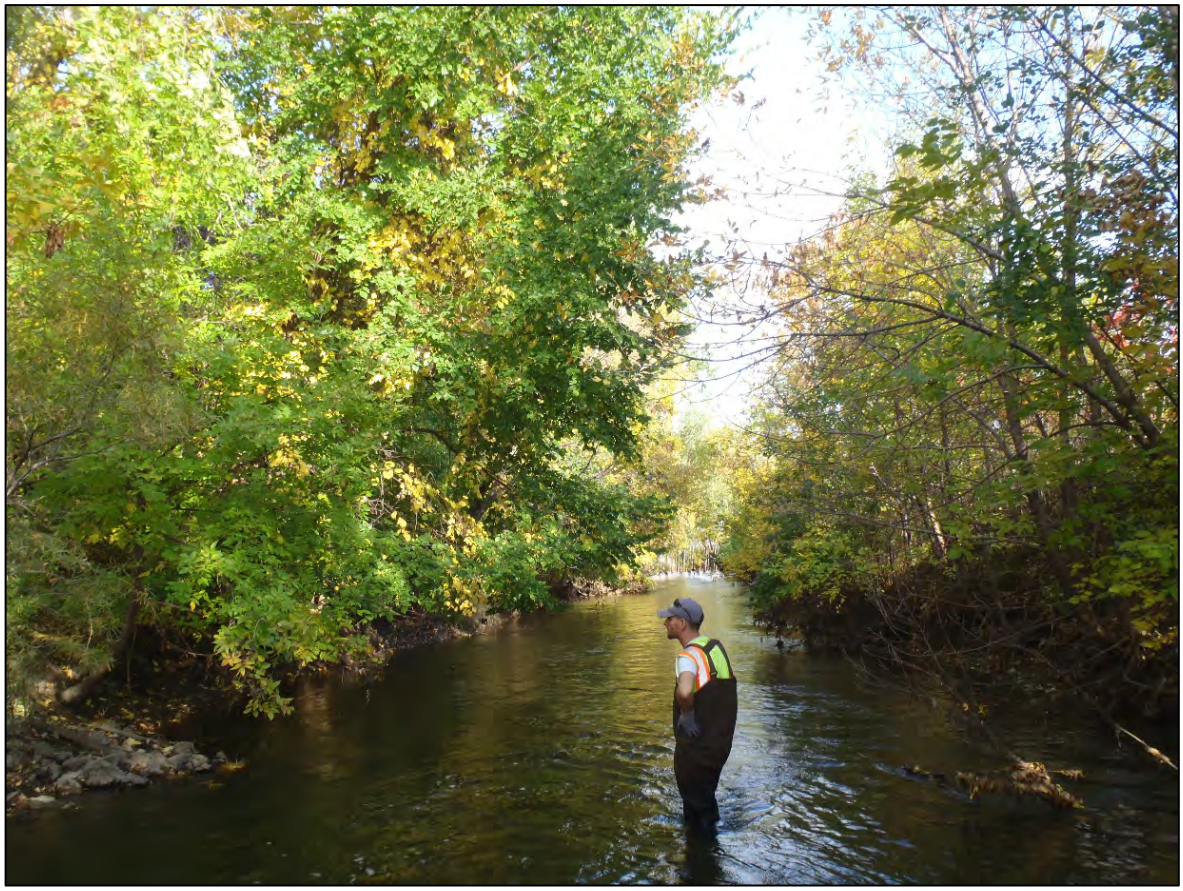
Detention Pond and Outlet Structure (Crystal)

Highway 100 Double Box Culverts (Crystal/Golden Valley)

Highway 100 Double Box Culverts (Crystal/Golden Valley), continued

Highway 100 Double Box Culverts (Crystal/Golden Valley), continued

Open Channel (Minneapolis)



Open Channel (Minneapolis), continued

Debris Barrier (Minneapolis)

Inlet Structure (Minneapolis)

Inlet Structure (Minneapolis), continued