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Memorandum

To: Bassett Creek Watershed Management Commission
From: Barr Engineering Company
Subject: Item 6F of BCWMC December 17, 2009 Meeting Agenda
Date: December 9, 2009
Project: 23/27 051 2009 003

6F. 2009 Flood Control Project Inspection and Double Box Culvert Inspection

Summary

Double Box Culvert

The double box was found to be in good condition.

2009 Flood Control Project Inspection

Recommendation:

- a. BCWMC should request that the Minnesota Ballpark Authority investigate and patch the 3-inch hole through the double box culvert, if necessary, to prevent potential loss of material.
- b. Cracks and deficiencies noted in double box culvert do not require immediate attention and should be evaluated during the next 5-year inspection scheduled for 2014.
- c. Double Box Culvert inspection report and notes should be sent to the City of Minneapolis and Corps of Engineers.
- d. The 2009 annual flood control project inspection report will be completed in early 2010 and will be available for the February 2010 BCWMC meeting.

1. Background

In accordance to the Operation and Maintenance Manual for the Bassett Creek Flood Control Project, an annual inspection is required to review the condition of the flood control features. The inspection program covers the flood control project features completed by the Commission between 1974 and 1996. The objective of the inspection program is to address erosion, settlement, sedimentation, and structural issues. The flood control project was turned over to the local sponsor during 2002. Therefore, inspection of the flood control features was initialized during the fall of 2002, which was the first formal inspection by the BCWMC. In 2003 no inspection was made due to budget issues. Annual inspections were performed during 2004-2008. Some of the municipalities have also performed independent inspections of several of the structures. In addition, the double box culvert is on a 5-year periodic inspection program and was previously inspected in 2004. Therefore, the 2009 flood control project inspection included the annual inspection of the flood control features and the 5-year inspection of the double box culvert. Following is a list of project features that are included in the flood control inspection program:

a. Minneapolis:

- Double Box Culvert – inspect double box culvert every five years (2004, 2009, 2014...)
- Deep Tunnel – dewater and inspect tunnel every 20 years. This inspection was performed during 2008; the next inspection is scheduled for 2028
- Old Tunnel (not included in BCWMC inspection program)
- Open Channel (Irving Ave. to double box culvert inlet)

b. Golden Valley

- Highway 55 Control Structure & Ponding Area
- Golden Valley Country Club (Box Culvert, Overflow Weir, and downstream channel)
- Noble Avenue Crossing
- Regent Avenue Crossing
- Westbrook Road Crossing
- Wisconsin Avenue Crossing
- Minnaqua Drive Bridge Removal

c. Crystal

- Box Culvert and Channel Improvements (Markwood Area)
- Edgewood Embankment with Ponding
- Highway 100/Bassett Creek Park Pond
- 32nd Avenue Crossing
- Brunswick Avenue Crossing
- 34th Avenue Crossing
- Douglas Drive Crossing

- Georgia Avenue Crossing
 - 36th-Hampshire Avenue Crossing
 - Channel Improvements
- d. Plymouth
- Medicine Lake Outlet Structure
 - Plymouth Fish Barrier

2. 2009 Double Box Culvert Inspection

The double box culvert was inspected by Barr Engineering (Jim Herbert, Jake Burggraff, Rich Ver Strate) and City of Minneapolis staff (Mike Weeber, Will Schutte) on November 19, 2009. Kevin Danen, P.E. City of Minneapolis coordinated overall planning. Access assistance and surface attendants were provided by City of Minneapolis staff (Irv Woodson, John Engstrom, Matt Stonich). Fall protection was provided in accordance to OSHA requirements and included tripod and winch at entry and at each intermediate access manhole. Surface attendants monitored inspection at surface of access manhole and at manholes along box culvert. Barr and Minneapolis staff completed the confined space entry permit prior to inspection. Oxygen and combustible gas was monitored during the entire inspection.

Inspection began at 9:55 a.m. at box culvert inlet (Sta 172+24). Crew walked downstream along the right box of double box culvert to the edge of drop structure (Sta 116+72.5). Crew turned around and walked upstream along left box culvert from drop structure to box culvert inlet (Sta 172+24). Inspection was completed at 3:20 p.m. The double box culvert transition to single box culvert occurred at Sta 119+88. (Note right and left with respect to facing downstream.)

a. Summary of Observations

- Several hairline shrinkage cracks were observed throughout the culvert sections. Seepage and accumulation of leachate deposits was noted at some of the cracks. The shrinkage cracks are most likely construction related and occurred shortly after construction of the double box culvert.
- Diagonal cracks and concrete deterioration was observed at several shear keys. These cracks and deterioration were also observed during the 2004 inspection and most likely occurred during initial settlement. The cracks and deterioration is consistent with the 2004 observations.
- Gaps have developed ≈ 1 to $1\frac{1}{2}$ inches wide at approximately 70% of the shear keys (joints. Ruler typically extended 1.6 feet through wall at joints. Loss of backfill material was not noted through gaps. Black membrane (5' wide butyl rubber membrane) appeared to protect joints at outside of structure to prevent loss of material. Gaps probably due to shrinkage. Joint filler (1/2" thick bitumastic bond breaker) has deteriorated at several joints.

- New access vaults were installed at Station 128+50 (single box) and Station 119+50 (double box) as part of Twins Stadium construction. The access vault at Station 125+10 was abandoned.
- A 3-inch hole was observed through the box culvert concrete crown at Station 123+19 (right box). The hole appeared to be due to soil borings during construction of Twins Stadium that passed through the concrete crown. The hole should be investigated and patched if necessary.
- Deteriorated/eroded concrete was observed along the base slab at various locations. Generally the eroded areas were located along existing joints, were less than 2-inches deep and ranged in size from (1 ft x 1 ft) to (2 ft x 2 ft). One small scour hole at Station 164+50 (right box) was 3-4" deep. A (1 ft. x 4 ft. long x 1-2 in. deep) eroded area was observed along the base slab joint at Sta 141+00. A (1 ft x 6 ft long x 2 in. deep) eroded area was observed along the base slab joint at Sta 132+50.
- Exposed rebar was observed at RCP inlet between Shear Key 4 (Sta 166+00) and Shear Key 3 (Sta 168+00)

b. Recommendations

- BCWMC should request that the Minnesota Ballpark Authority investigate and patch the 3-inch hole through the double box culvert, if necessary, to prevent potential loss of material.
- Cracks and deficiencies noted in double box culvert do not require immediate attention and should be evaluated during the next 5-year inspection scheduled for 2014.
- Double Box Culvert inspection report and notes should be sent to the City of Minneapolis and Corps of Engineers.

3. Annual Flood Control Project Inspection

The annual flood control project inspection was performed by Barr Engineering (Jake Burggraff, Whitney Eriksson) November 17-18, 24-25, 2009. Although the field inspection has been completed, processing of photographs, review of inspection notes and preparation of the final report has not been completed.

The overall 2009 BCWMC inspection budget is \$18,000 including \$8,000 for watershed inspections and \$10,000 for flood control inspections. The total spent to date is \$17,700, thus adequate inspection budget is not available to complete the annual inspection report. Adequate budget is not available because a portion of the inspection budget was used for post-inspection reporting tasks associated with the 2008 deep-tunnel inspection. Also, the pre-planning time required for the double box culvert inspection, including, coordinating with the City of Minneapolis, preparation of safety plans and addressing confined space issues due to OSHA compliance was greater than anticipated.

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a. Recommendation:

- The 2009 annual flood control project inspection report will be completed in early 2010 and will be available for the February 2010 BCWMC meeting.