Globeville Landing Outfall Project

June 2018 Storm Event Assessment, Modeling Validation and Channel Protection Modification

August 21, 2018
Introduction

- Storm events occurred in June 2018 which caused erosion to the GLO channel at the Arkins outlet
- Modeling was performed to confirm the design, design modification, and interim measures needed to protect the channel from erosion
- Modifications to the GLO channel have increased the factor of safety for the liner, reducing the potential for future erosion
- Subsequent storm events have confirmed the design modification and interim measures are working as modeled
GLO Conduit System
June 19, 2018 Storm Event

Conditions
• Upstream stormwater diverted to the north cell of the Arkins triple box culvert
• Water at the outlet flowed directly to the GLO channel

Outcome
• Concentrated flow in the north cell created a high velocity jet
• Riprap and soil were not eroded to the depth of the liner

Temporary Protection
• 2’-3’ boulders were placed on the western side of the channel in the scoured area
June 24, 2018 Storm Event

Conditions
• Greater amount of rainfall than the June 19 storm
• Similar constructability conditions existed
• Displaced jersey barriers channeled high velocity jet of water to the eastern side of the channel
• Water marks indicated peak flows in the range of 600-800 cubic feet per second (cfs) in the north cell with about 1080 cfs total

Outcome
• Riprap and soil was eroded to the depth of the liner
• Water was temporarily diverted back to the original Arkins outfall channel
• Evaluation of design and hydraulic conditions commenced
• Electrical leak location survey performed in the scoured area, no leaks were detected

Temporary Protection
• All soils were replaced and recompacted in the channel
• Temporary 2’-3’ boulders were placed in the scour area to protect clay fill and liner
• Water remained diverted to the original Arkins outfall channel
Modeling Validation – 100-year storm

1. FLOW 3D model calibration run was done to replicate the original design condition for the 100-year storm condition of 1200 cfs in the Arkins conduits with ultimate buildout of the conduit system. Original design was confirmed.

2. Model was modified to replicate the Arkins conduit modified design condition and the interim buildout condition (low tailwater)

3. Model was modified to replicate the Arkins conduit modified design condition with ultimate buildout of the conduit system (high tailwater)
Results showed high velocity stream of water (12-15 fps) at the end of the concrete apron that continued downstream along the channel centerline.
Modeling – Arkins Modified Design Condition and Full Buildout Condition

Results showed high velocity stream of water (8-12 fps) at the end of the concrete apron that continued downstream along the channel centerline.
Arkins Outlet Channel Protection Modification

- Placement of grouted boulders across the channel for 26’ beyond the outlet concrete apron
- Installed three sets of deflector boulders to break up high velocity jet of water
- Placement of buried rock, 9-12” in diameter, for 15’ beyond the grouted boulders
Modeling – Channel Protection Modification, Arkins Modified Design and Full Buildout Conditions

- 100-year storm modeled
- Water velocities at the channel centerline downstream of the buried rock were 7-8 fps
- Design criteria: average of 7 fps across the channel
Modeling – Channel Protection Modification, Arkins Modified Design and Interim Buildout

- 100-year storm modeled
- Remnant stream of water (10-11 fps) downstream of the buried rock
- Additional measures needed in the interim to reduce velocity to be non-erosive

Figure 5
Modified Design Condition with Low Tailwater & Channel Protection
Cover all holes in 195 Lateral Drain Box sections as shown on Sheet S15.

Cover all holes in 12 N. Lateral Drain Box sections as shown on Sheet S15.

1/2" to 3/4" typ. to allow for water to drain after storm event.
Summation

- Modeling was performed to confirm the design, design modification, and interim measures needed to protect the channel from erosion.
- Modifications to the GLO channel have increased the factor of safety for the liner, reducing the potential for future erosion.
- Subsequent storm events have confirmed the design modification and interim measures are working as modeled.
Questions?