The Cannon Drive Levee:
Coupling Roadway Improvements and Flood Protection at The Ohio State University

2018 OTEC Conference
October 2, 2018
The Ohio State University Cannon Drive Corridor
University Framework Plan

- Enhanced access to the University’s Medical Campus and other core areas
- Flood protection for the campus
- Connection to the Olentangy River Bikepath
Project Stakeholders

The Ohio State University

THE CITY OF COLUMBUS
ANDREW J. GINTHE, MAYOR

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION

U.S. Department of Homeland Security
FEMA

AEP American Electric Power

U.S. Army Corps of Engineers®
Project Goals

- Create a north-south gateway and connection between Lane and King Ave
- No impact to the SR 315 exit ramp capacity
- Provide a 500-year level of flood protection
- Levee recognized by NFIP
- Create 12 acres of developable land
- Green infrastructure
- Olentangy River to be part of an open space amenity
- Relocate Franklin Main
- Minimize impacts to AEP distribution systems
Other Project Considerations

- Transportation Needs
- OSU WMC Expansion
- Maintenance of Traffic
- Park Development
- Landscaping
- Utility Coordination
- Medical Center and Battelle Access
- Engineered Levee
- NFIP Acceptance (CLOMR/LOMR)
- ODNR Approval
- Columbus Approval

- Environmental Covenant Modification
- Section 404 Permit (USACE)
- NPDES Stormwater NOI (OEPA)
- Columbus Stormwater Drainage Manual Compliance
- Scheduling and permitting timelines
Medical Campus and Research Center in the 500-Year Floodplain
Fifth Avenue Dam Removal

- Precursor project
- Restored free flowing bankfull channel with connected floodplain bench
- Grading and landscaping connectivity to Cannon Drive project
- Provided updated hydraulic model for Olentangy River
Historical Flood Protection
Historical Flood Protection
Phase I

Phase II

Relocated Cannon Drive/Line of Flood Protection
Construction Phasing & MOT
Roadway Section
Examples of Roadways Constructed on Dams
Phase I

Phase II

Relocated Cannon Drive/
Line of Flood Protection
CURVE DATA

<table>
<thead>
<tr>
<th>DELTA</th>
<th>INDEX</th>
<th>SUMMIT</th>
<th>LENGTH</th>
<th>EQUINOX</th>
<th>MEDIAN</th>
<th>PILOT ARC</th>
<th>RADIUS POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>2544.42'</td>
<td>366.00'</td>
<td>92.33'</td>
<td>181.06'</td>
<td>12.81'</td>
<td>12.53'</td>
<td>352.02'</td>
</tr>
<tr>
<td>B</td>
<td>1'34'45&quot;</td>
<td>1890.00'</td>
<td>236.00'</td>
<td>473.85'</td>
<td>14.26'</td>
<td>14.16'</td>
<td>2252</td>
</tr>
<tr>
<td>C</td>
<td>0929.84&quot;</td>
<td>560.04'</td>
<td>13.01'</td>
<td>28.01'</td>
<td>0.17'</td>
<td>0.17'</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>0021.90&quot;</td>
<td>1013.50'</td>
<td>36.69'</td>
<td>113.20'</td>
<td>1.36'</td>
<td>1.26'</td>
<td>40</td>
</tr>
<tr>
<td>E</td>
<td>0004.22&quot;</td>
<td>755.00'</td>
<td>251.38'</td>
<td>402.67'</td>
<td>0.77'</td>
<td>0.77'</td>
<td>272</td>
</tr>
<tr>
<td>F</td>
<td>1928.53&quot;</td>
<td>1423.29'</td>
<td>240.74'</td>
<td>477.03'</td>
<td>0.09'</td>
<td>0.09'</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>1328.98&quot;</td>
<td>1423.29'</td>
<td>240.74'</td>
<td>477.03'</td>
<td>0.09'</td>
<td>0.09'</td>
<td>380</td>
</tr>
<tr>
<td>H</td>
<td>0101.26&quot;</td>
<td>50.00'</td>
<td>60.66'</td>
<td>88.16'</td>
<td>26.67'</td>
<td>18.22'</td>
<td>830</td>
</tr>
<tr>
<td>I</td>
<td>6554.94&quot;</td>
<td>295.76'</td>
<td>172.28'</td>
<td>310.70'</td>
<td>40.95'</td>
<td>49.76'</td>
<td>5183</td>
</tr>
</tbody>
</table>

BENCH MARKS CONTINUED

<table>
<thead>
<tr>
<th>Time5</th>
<th>Checked square at the corner of sidewalk at the northeast corner of parking garage, east of Common, south of 12th Street. Elev. 719.695</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time12</td>
<td>Checked square on the northeast wall of bridge over Chehalis River on south side of John H. Herrick Drive. Elev. 721.58</td>
</tr>
</tbody>
</table>

BASIS OF BEARINGS

The bearings shown on these plans were transferred from a field traverse originating from and tying to Franklin County Survey Control monuments, including NWS94 and PCC07, and is based on the Ohio State Plane Coordinate System, South Zone as per NAV 83.

BASIS OF STATIONING

The stationing of Cannon Drive is established with a set station of 147488.72 at the centerline of King Avenue. The stationing of Gold Drive is established with a set station of 13404.00 at the centerline of King Avenue. The stationing of King Avenue is established with a set station of 1734.24 at the centerline of King Avenue. The stationing of Common Drive is established with a set station of 1004.00 at the centerline of Cannon Drive. The stationing of 17th Avenue is established with a set station of 20410.00 at the centerline of Common Drive. The stationing of John Herrick Drive is established with a set station of 100413.38 at the centerline of Cannon Drive.

Horizon Control

The coordinates shown on this map are based on the Ohio State Plane Coordinate System, South Zone, NAV 83 (1986). Sold coordinates originated from a field traverse which was tied (referred to) to coordinate system by State GPS observations of Franklin County Engineering Department monument CS04-05, and PCC07. The grid to ground scale factor (1.000038765) was applied at the location of point number 201.
Jet Grout Seepage Barrier

River Side of Levee

Land Side of Levee

JET GROUT SEEPAGE BARRIER LEVEE TYPICAL SECTION
Sta 0+28 to Sta 0+55
Riverine H&H

- 543 sq. mi. watershed
- FEMA model revised after 5th Ave Dam Removal
- Hydrology influenced by Delaware Dam
- Peak discharge rates based on USGS Gaging Station in Worthington
- SWMM model prepared to validate FEMA flows
- Revised HEC-RAS 1-D analysis
- Levee final design based on FEMA 500 year streamflow plus two foot freeboard to address uncertainty concerns
• Likelihood of local rain event and Olentangy River flood occurring simultaneously
• Review of historical rainfall data and stream gage records
• Analysis determined weak correlation

<table>
<thead>
<tr>
<th>River Flooding Return Frequency</th>
<th>Annual Probability</th>
<th>Design Storm Event</th>
<th>24-hour Rainfall Depth</th>
<th>HGL Elevation at 12th Ave.</th>
<th>Joint Probability of Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-yr (100%)</td>
<td>100%</td>
<td>500-yr</td>
<td>7.17</td>
<td>723.35</td>
<td>500-yr</td>
</tr>
<tr>
<td>5-yr (20%)</td>
<td>20%</td>
<td>100-yr</td>
<td>5.63</td>
<td>722.44</td>
<td>500-yr</td>
</tr>
<tr>
<td>10-yr (10%)</td>
<td>10%</td>
<td>50-yr</td>
<td>5.02</td>
<td>722.07</td>
<td>500-yr</td>
</tr>
<tr>
<td>50-yr (2%)</td>
<td>2%</td>
<td>10-yr</td>
<td>3.74</td>
<td>722.28</td>
<td>500-yr</td>
</tr>
<tr>
<td>100-yr (1%)</td>
<td>1%</td>
<td>5-yr</td>
<td>3.24</td>
<td>721.81</td>
<td>500-yr</td>
</tr>
<tr>
<td>500-yr (0.2%)</td>
<td>0.2%</td>
<td>1-yr</td>
<td>2.20</td>
<td>720.26</td>
<td>500-yr</td>
</tr>
</tbody>
</table>
Interior Drainage System – Phase 1 Routing

- SWMM analysis
- Routing to detention basin under river low flow condition
- Under river high flow condition, weir opens at pump station to divert flow
- Box culvert (8’x5’) in Cannon Drive provides conveyance and storage
LOW RIVER TAILWATER CONDITION
Interior Drainage System – Phase 1 Pump Station

- Maximum capacity = 120 cfs (or 77 MGD)
  - 3 duty pumps; 2 submersible pumps
- Primary electrical feed with natural gas backup generator
ODNR Levee Construction Permit

• Preliminary Design Report: Phase 1 & 2
• Final Design Report: Phase 1 only in 2017
• Permit issued for Phase 1 construction: September 2017
Levee Review – Federal

Conditional Letter of Map Revision

• Phase 1: Issued Feb. 2017
• Phase 2: Revised CLOMR
• LOMR to be filed upon completion of Phase 2
• NFIP 65.10 compliance
  • Freeboard (7 to 8 feet provided for 100 year flood)
  • Closures (Checkmate backflow valves)
  • Scour protection
  • Embankment Stability, Seepage, & Settlement
  • Interior drainage analysis
  • Operation and Maintenance Plan
PHASE 1

Under Construction
Completion December 2019

PHASE 2

In Design Phase
Construction TBD