Outfall 33 Rehabilitation
Urgent Sewer Repair using Pilot Tube Construction Method

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Bureau of Environmental Services
City of Portland, OR
January 12th, 2017
Agenda

• Project area background & overview
  – Outfall basin & pipe condition
  – Utility conflicts
  – PGE/DEQ site cleanup
  – Proposed Eastbank beach/habitat

• Alternatives analysis
  – Repair/replace in existing alignment
  – Re-alignment/phased approach
  – Basin transfer to OF34 system
  – Alt’s comparison & selection

• Design
  – PAURSS
  – Project team
  – Field Investigations

• Construction

• Conclusion/discussion
Agenda

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Pipe/Outfall Condition

- Existing pipe

<table>
<thead>
<tr>
<th>Install Date</th>
<th>Size</th>
<th>Material</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1895</td>
<td>12&quot;</td>
<td>VSP, CSP, CMP</td>
<td>360-ft to ABU868 (orig. outfall point); 80-ft to discharge in bank</td>
</tr>
</tbody>
</table>

- Recent inspection dates: August, 2015; April, 2014.
  - Pipe segment ABU929-ABU868 has a grade 5 structural score.
  - Pipe segment ABU873-ABU929 has a grade 3.

- OF33 is buried by undocumented fill.
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Utility Conflicts

- **30” water transmission line**
  - Installed 1910.
  - Major transmission conduit serving Downtown PDX.
  - Recent repair conducted beneath Willamette River (2015).
  - Based on recent survey, approximate horizontal separation varies from approximately 5-12’ center-to-center (3.25-10.25’ skin-to-skin).
  - Approx. IE = 11.25’ (approx. IE of existing storm main @ ABU868 = 14.3’).
  - 6” blow-off line runs approx. 6’ south of transmission conduit.
Utility Conflicts

- **PGE Vaults & Conduit**
  - Two major vaults along existing storm main alignment
  - High voltage conduit is above significant portions of storm main
  - Possible PGE abandonment - ~2yrs
Utility Conflicts

- CenturyLink / Time Warner
  - Vault & telecom conduit above storm main and near ABU929
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PGE/DEQ Site Remediation

- PCB contamination (OF33 pathway) – PGE facility connection to storm system.
- Originally scheduled for Summer 2016. Now 2017
- Remedial activities in immediate vicinity of OF33 and proposed Eastbank beach and habitat restoration project.
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Eastbank Beach/Habitat

- Bureau of Planning & Sustainability, BES, Mayor, etc.
- $300K in FY16 budget.
- Beach restoration and access project also in FY16 budget.
- Politically driven -> up in the air.
- Presented several interface challenges with OF33
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Alternatives: Repair/Replace Existing

- Potential design approaches:
  - Spot repair
  - Spot repair & CIPP lining
  - Pipe bursting
- Phased approach required
- Contamination
- Utilities
- Cost/risk
  - Cost is lower in theory
  - Risk is higher due to above items
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Alternatives: Re-alignment / Phased

- Jack & bore + open cut
- Phased approach
- Very expensive (~$1600/ft for J&B)
- Cost = approx. 3 X budgeted $
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Alternatives: Basin Transfer to OF34

- Intercept flow @ SE Clay & Water
- Route into OF34 system @ Hawthorne (OF34 has capacity)
- Initial cost estimate = can be done within budget +/- 10%
- Long-term solution (OF33 could be abandoned)
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# Alternatives Comparison

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Details</th>
<th>Project Cost (-)</th>
<th>Long-Term Risk(s) (-)</th>
<th>Long-Term Benefit(s) (+)</th>
<th>Short-Term Risk(s) (-)</th>
<th>Short-Term Benefit(s) (+)</th>
<th>Traffic Impacts (-)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do Nothing</td>
<td>Run to failure</td>
<td>Low (-1)</td>
<td>High</td>
<td>Low (+1)</td>
<td>Moderate</td>
<td>Low</td>
<td>None</td>
<td>-1-3+1-2+1-0 = -4</td>
</tr>
<tr>
<td>Spot repair</td>
<td>Replace segment(s) in very poor condition</td>
<td>Low* (-1)</td>
<td>High</td>
<td>Low (+1)</td>
<td>High</td>
<td>Moderate</td>
<td>Moderate</td>
<td>-1-3+1-3+2-2 = -6</td>
</tr>
<tr>
<td>Pipe burst</td>
<td>Pipe burst from ABU929-ABU868; existing OF replaced in Phase 2 project</td>
<td>Moderate* (-2)</td>
<td>High</td>
<td>Moderate (+2)</td>
<td>High</td>
<td>Moderate</td>
<td>Moderate</td>
<td>-2-3+2-3+2-2 = -6</td>
</tr>
<tr>
<td>CIPP Lining</td>
<td>Line from ABU929-ABU868; existing OF replaced in Phase 2 project</td>
<td>Low* (-1)</td>
<td>High</td>
<td>Moderate (+2)</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>-1-3+2-2+2-2 = -4</td>
</tr>
<tr>
<td>Re-alignment (trenchless)</td>
<td>Jack &amp; Bore; existing OF replaced in Phase 2 project</td>
<td>High (-3)</td>
<td>Moderate</td>
<td>Moderate (+2)</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>-3-2+2-2+2-2 = -5</td>
</tr>
<tr>
<td>Basin transfer to OF34</td>
<td>Intercept stormwater in SE Water and route to OF34 system</td>
<td>Moderate (-2)</td>
<td>Low</td>
<td>High (+3)</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>-2-1+3-1+3-3 = +1</td>
</tr>
</tbody>
</table>

*Project cost expected to fluctuate depending on contingency cost due to project risks associated with alternative design approach*
Alternative Selection

• Basin Transfer to OF34
  – Fits in budget (+/-) (at the time...)
  – Better suited to design & constructability
  – Long-term solution
    • Doesn’t require multiple phases
    • OF33 can be abandoned -> consolidated with OF34
    • Lowers long-term maintenance & reliability burden
  – Lower risk
    • Fewer conflicts with existing utilities
    • Contamination
  – Challenges (known knowns and known unknowns)
    • Storm connections W of ABU929
    • Work in SE Water
      – Traffic control
      – Possible geotechnical issues
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  – Field investigations
  – Geotechnical
  – Environmental
• Construction
• Conclusion/discussion
Design - PAURSS

• **Price Agreement for Urgent Repair of Sanitary Sewers**
  - Project re-prioritized due to PGE / DEQ site remediation
  - Project given “Urgent” status (but we called it an emergency)
  - J.W. Fowler Co. awarded “on-call” construction contract
    • Based on pre-approved bid items & unit prices (NOTE: pilot tube was not one of these 😐)
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Design – Project Team

• HDR: Design Consultant
  – Geotechnical sub-Consultant: RhinoOne
  – Environmental sub-Consultant: Northwest Geotech, Inc.
  – Trenchless sub-Consultant: Staheli Trenchless Consultant

• JWF: Construction Contractor
  – Also provided Design phase services!
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Field Investigations - Utilities
Field Investigations - Utilities
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Field Investigations – Inspections

- May 26, 2016
- CCTV - Outfall 33

**5/26/16:** Connections to storm main. Roof drain confirmed abandoned. Dye testing resulted in drainage from side of building.

**5/19/16:** Only incoming flow is from the N and NE inlets.

**5/26/16:** Connection to sanitary line. Dye test to confirm if pipe flows into ABU971 (flowing water in pipe, push cam not extended past turn, direction not known: assumed sanitary connection).

**5/25/16:** CCTV completed for ABU929 to connection with swale at 3.15 ft.

**5/25/16:** Confirmed abandoned.

**5/19/16:** Debris blocking complete CCTV

**5/19/16:** Confirmed abandoned.

**5/25/16:** Confirmed abandoned. CCTV pushed from ABU976 (significant debris found, but pipe not completely plugged).
Field Investigations – Inspections
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# Field Investigations - Geotechnical

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Site Exploration Plan</th>
<th>Outfall 33 Rehabilitation (BGS E10731)</th>
<th>Portland, Oregon</th>
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<tr>
<td>HDR-2016-004</td>
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<tr>
<td>Date</td>
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<tr>
<td>June 27, 2016</td>
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</tbody>
</table>

## Figure 2

### Boring Number: B-1

- **Soil Type:** Sand, silt, clay
- **Depth:** 0-3 ft
- **Material:** Gravel, cobbles, pebbles

### Boring Number: B-2

- **Soil Type:** Clay, silt
- **Depth:** 3-5 ft
- **Material:** Organic matter, plant roots

### Boring Number: B-4

- **Soil Type:** Sand, gravel
- **Depth:** 5-8 ft
- **Material:** Seashells, coral fragments

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[Image of field investigations and geotechnical boring logs]

Legend:
- Boring Location and Number

Prepared for:
HDR Engineering, Inc.
1001 NW 5th Avenue, Suite 1800
Portland, OR 97204
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Field Investigations - Environmental
Field Investigations - Environmental
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- Project area background & overview
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- Proposed design scope
- Design
- **Construction**
- Conclusion/discussion
Construction - Setup
Construction - Equipment

22.5” Powered Cutter Head

16” Powered Reaming Head

339A Latching Frame
(jacking force: 100 ton)

12” & 18” (I.D.) Logan NO-DIG VCP
Construction – Clay to Hawthorne
Construction – OF 34 Basin Transfer Tie-in
Figure 11. Wharfs, warehouses on piling, and elevated plank streets reaching from Water to Fourth Street, East Portland, 1870s (West Shore Magazine, 1886) (OHS Neg. 733).
Figure 21. View west toward Willamette River, 1890s, Hawthorne Street on left and a succession of elevated plank roads extending north prior to filling of Hawthorne Slough (OHS 5523). Note: horizontal photograph cut and entered in two parts.
Construction – OF33 Basin Tie-in
Construction – Flow Reverse Run
Construction – Upstream Storm
Construction – Wrap-up/Restoration
Construction - Restoration
Agenda

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Conclusion

• Urgent repair triggered by structural condition.
• Many alternatives evaluated -> ‘Basin Transfer’ selected.
• Difficult project site led us to Pilot Tube as construction method.
• Coordination with local/State stakeholders accelerated project schedule -> PAURSS.
• Partnering with Consultants/Contractor proved to be good decision.
Discussion