Workshop
Lower Clover Valley
Sewer Trunk Replacement
South Placer Municipal Utility District

Eric Nielsen, District Engineer

August 1, 2019
Lower Clover Valley (LCV) Sewer Trunk Replacement Project

- LCV Sewer Trunk CIP recommended in 2015 SECAP
- 2015 SECAP results: 18” trunk under capacity, surcharges in Near-Term PWWF design storm conditions. Needs 24” capacity upgrade to meet Long-Term (Lower Bound) conditions of 9.6 mgd.
- High Risk Facility assessment: high risk assets along Lower Clover Valley (exposed pipe crossings across Antelope Creek and exposure to undermining)
- Poor accessibility, operation and maintenance due to “backyard” easements and proximity to overlying structures
Exposed & elevated trunk creek crossing within 100-yr flood elevation

Existing Issues Along 18” LCV Trunk
34' deep SSMH. Close proximity to structures (within foundation 45-deg plane)

Exposed & elevated 15” SS (main) creek crossing

Difficult easement access, proximity to creek, proximity to structures and fill slopes

**Existing Issues Along 18” LCV Trunk**

Lower Clover Valley Trunk Sewer Replacement – Preliminary Design Report Workshop
Overview

Project Approach  Design Criteria  Constraints  Alternatives Development  Alternatives Assessment  Estimated Costs  Preferred Alternative

Existing Issues Along 18” LCV Trunk

Pipeline has been exposed due to creek migration/scour/undermining (historic)

Proximity to houses (within foundation 45-deg plane)

Inaccessible easement

Exposed & elevated 15” SS (main) creek crossing
Project Approach

- **Design Criteria**
  - Identify and develop engineering design criteria (hydraulics, materials, method of construction)

- **Constraints**
  - Identify major project constraints (environmental, geotechnical, existing utility conflicts, right of way/easement/encroachment access, and concerns of outside stakeholders)

- **Alternatives Development**
  - Identify and develop alignment alternatives based on physical constraints (elevations, buildings, etc.)

- **Alternatives Assessment**
  - Assess the alignment alternatives based on non-cost constraints

- **Estimated Costs**
  - Develop estimated construction costs

- **Preferred Alternative**
  - Recommend a preferred alternative to be selected for construction based on non-cost constraints and estimated construction costs
Geotechnical Constraints

- Majority of project area is Holocene Alluvium or Valley Springs Formation
- Preliminary site geology research does not suggest presence of hard rock formations but boulders could be present
  - Foothill Trunk and Loomis Diversion Line are located in the Penryn Pluton (granitic) and Rocklin Pluton (granitic)
  - Hard rock excavation risk increases with depth
- Construction in soft sands near creek embankments might require mitigation. Trench stabilization & trench cutoff walls may be necessary for long portions
- Increased scour potential with proximity to creek (fluvial morphology; “oxbow” effect). Alignments located directly in an embankment should use WSP and may require embankment armoring (rip-rap, etc.)
- High GW relative to creek; moderate dewatering likely required on 2/3rd of the alignments
- Care must be taken when installing manholes in fill-slopes due to slip-planes that could occur between native soils and fill from housing developments
- High shrink-swell potential and high surface water runoff potential near creek; mitigate with trench stabilization, CLSM backfill, and/or WSP pipe
Environmental Constraints

- Antelope Creek (perennial) runs through valley but is not listed as impaired water body
- Extensive valley foothill riparian habitat and annual grassland habitat present along with wetlands
- 100 YR floodplain is expansive
- Close proximity to residential homes mean construction noise will likely need to be mitigated
- Area is within USACE, RWQCB, and CDFW jurisdiction.
- Oak Tree removal governed by Rocklin (City)
- California Species of Special Concern (CDFW) present
- Raptors and bats may be present in trees
- Elderberry shrubs were not observed, but may be present
- Western pond turtle may be present
- Steelhead and Chinook Salmon may be present
- No known cultural sites identified within study limits nor observed during field survey along with UAIC tribal representative. Project area has low sensitivity for cultural resources.
- Moderate potential of discovering paleontological (fossils) resources

Potential Permits

- 404 – USACE
- 401 - CDFW
- 1602 - RWQCB
- Air - PCAQB
- Tree Removal: Rocklin
- General Permit - SWPPP
Channel (Antelope Creek) Hydraulics

- It is assumed that given all alternatives require some modification of an existing creek crossing, or “trading” for a new crossing and removal of others, then the District’s position is defensible and a new elevated/exposed creek crossing would be approved.
- An elevated or exposed pipeline may negatively impact channel hydraulics or exacerbate the 100yr floodplain. Rocklin and/or USACE may request a detailed surface flow hydraulic analysis (open-channel flow modeling).

Assumed Permitting Difficulty

Best Case:
- No New Creek Crossing
- Trenchless Creek Crossing
- Buried pipe lower than channel flow line (little to no cover)
- Elevated pipe outside of OHWM & 100yr floodplain
- Elevated pipe outside OHWM but within 100yr floodplain
- Elevated pipe outside OHWM & 100yr floodplain

Worst Case:
- Exposed pipe at channel flow line (higher risk of scouring pipe or sedimentation behind it)
- Exposed pipe at channel flow line (higher risk of scouring pipe or sedimentation behind it)

Alternatives

- Alt 1: Parallel Creek Option & Alt 1-2: Hybrid Parallel/Willowynd
- Alt 2: Shannon Bay-Willowynd
- Alt 3: Whitney-Rainier

Constraints

May require an inverted siphon
Alignment Alternatives Development and Assessment Process

- Five preliminary working alignment alternatives were developed:
  - Replace in Place Existing LCV Trunk
  - Replace in Place & Parallel Replacement – Creek Alignment
  - Parallel Replacement – Shannon Bay / Willowynd
  - Parallel Replacement – Whitney / Rainier
  - Parallel Replacement – Springview
  - Parallel Replacement – Creek / Willowynd Hybrid

<table>
<thead>
<tr>
<th>Working Alignment Alternative</th>
<th>Length</th>
<th>General Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace-in-Place Existing Trunk</td>
<td>3878</td>
<td>Capacity upgrade only</td>
</tr>
<tr>
<td>Replace-in-Place/Parallel Replacement along Creek</td>
<td>3490</td>
<td>Capacity + O&amp;M upgrades</td>
</tr>
<tr>
<td>Parallel Replacement – Shannon Bay/Willowynd</td>
<td>4531</td>
<td>Capacity + O&amp;M + Creek Risk Reduction Upgrades</td>
</tr>
<tr>
<td>Parallel Replacement – Whitney/Rainier</td>
<td>5231</td>
<td>Capacity + O&amp;M + Creek Risk Reduction Upgrades</td>
</tr>
<tr>
<td>Parallel Replacement - Springview</td>
<td>4471</td>
<td>Capacity + O&amp;M + Creek Risk Reduction Upgrades</td>
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</tbody>
</table>

See Figure 5 for Alternative 1-2: Parallel Replacement Creek-Willowynd Hybrid (4000 LF)
Alignment Alternatives Development and Assessment Process

- Five preliminary alignment alternatives were developed:
  - Replace in Place Existing LCV Trunk ✗
  - Replace in Place & Parallel Replacement – Creek Alignment ✓
  - Parallel Replacement – Shannon Bay / Willowynd ✓ ✓
  - Parallel Replacement – Whitney / Rainier ✓
  - Parallel Replacement – Springview ✗
  - Parallel Replacement – Creek / Willowynd Hybrid ✓
Final Alignment Alternatives

- Three alternatives were further assessed:
  - Alt 1: Replace in Place & Parallel Replacement – Creek Alignment
  - Alt 2: Parallel Replacement – Shannon Bay / Willowynd
  - Alt 1-2: Parallel Replacement – Creek / Willowynd Hybrid
  - Alt 3: Parallel Replacement – Whitney / Rainier

Alignment Alternative Goals and Risks

- The various working alignment alternatives are not functionally equivalent as they meet different goals and offer different risks. These are summarized in the following table.

<table>
<thead>
<tr>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 1-2</th>
<th>Alt 3</th>
<th>Goal/Risk Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>Provide new capacity &amp; trunk asset life</td>
</tr>
<tr>
<td>-</td>
<td>+</td>
<td>-</td>
<td>0</td>
<td>Eliminate trunk exposed crossings (high risk &amp; consequence)</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>Eliminate main-line exposed crossings</td>
</tr>
<tr>
<td>-</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>Improve O&amp;M accessibility</td>
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<tr>
<td>-</td>
<td>+</td>
<td>-</td>
<td>0</td>
<td>Reduce exposure to 100-yr floodplain and USACE permitting</td>
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<tr>
<td>-</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>Eliminate creek scour potential to trunk</td>
</tr>
<tr>
<td>+</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>Public impact</td>
</tr>
<tr>
<td>+</td>
<td>-</td>
<td>0</td>
<td>-</td>
<td>Reduce hard rock excavation risk</td>
</tr>
<tr>
<td>0</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>Right-of-Way procurement</td>
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<tr>
<td>-</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>Reduce environmental permitting &amp; schedule risk</td>
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</table>
### Alignment Alternative Cost Comparison

<table>
<thead>
<tr>
<th>Segment</th>
<th>Segment Length (ft)</th>
<th>Construction Subtotal</th>
<th>Total Construction Cost</th>
<th>Total Indirect Construction Cost</th>
<th>Total Segment Cost</th>
<th>Cost [$ / LF]</th>
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<tbody>
<tr>
<td>Alt 1: Parallel Creek Option</td>
<td>3500</td>
<td>$1,745,200</td>
<td>$2,304,000</td>
<td>$179,000</td>
<td>$2,483,000</td>
<td>$709</td>
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<td>Alt 2: Shannon Bay / Willowynd</td>
<td>4550</td>
<td>$3,170,600</td>
<td>$4,186,000</td>
<td>$172,000</td>
<td>$4,358,000</td>
<td>$958</td>
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<td>Alt 1-2: Creek / Willowynd Hybrid</td>
<td>4000</td>
<td>$2,356,000</td>
<td>$3,110,000</td>
<td>$182,000</td>
<td>$3,292,000</td>
<td>$823</td>
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<tr>
<td>Alt 3: Whitney / Rainier</td>
<td>5174</td>
<td>$4,055,500</td>
<td>$5,353,000</td>
<td>$125,000</td>
<td>$5,478,000</td>
<td>$1,059</td>
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</table>

*Includes 10% design contingency and 20% construction contingency
*Cost per linear foot is the total segment cost divided by the length of replacement trunk length; note that there are additional linear improvements (CIPP lining, abandonment, etc.) that is not reflected in the length total.