

CEEn-2018CPST-011

Riverton City - Hill Stabilization Project

BKAT Engineering



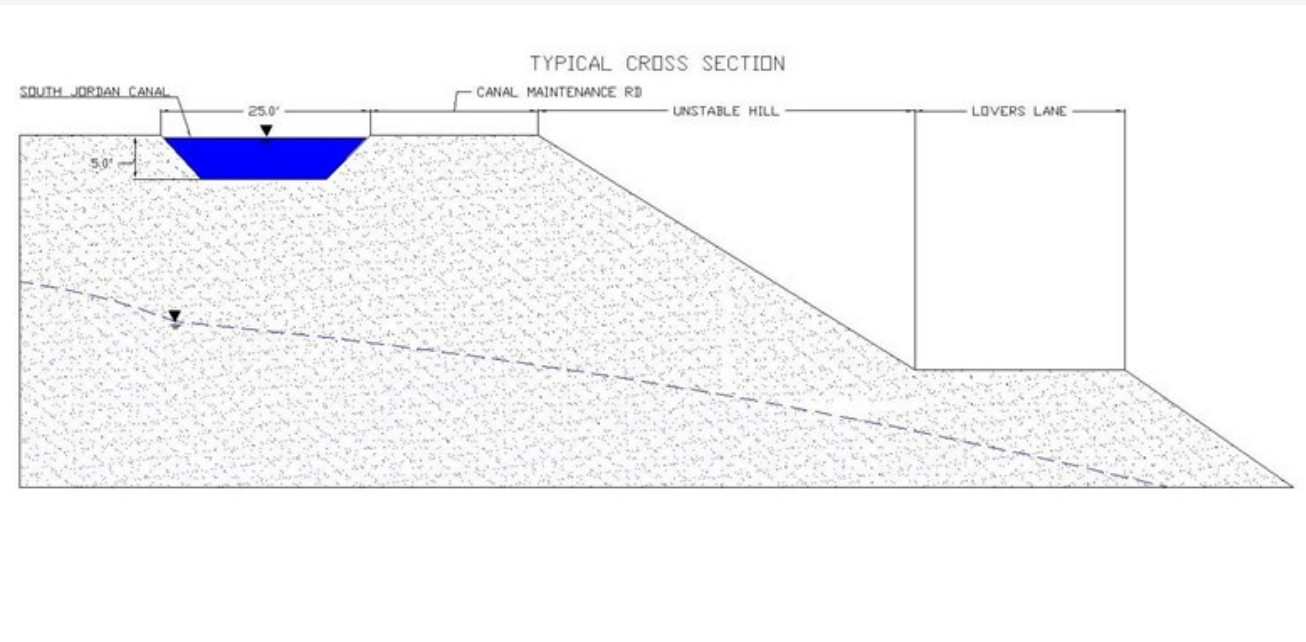
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Introduction

- Within the Riverton City limits there is a hillside that is adjacent to Lovers' Lane. At the top of the hillside is the South Jordan Canal. There are a few homes that sit downhill from the slope.
- This hill has been reported as unstable by previous geotechnical reports. It has an existing drainage system in the hill, but the drainage system is not in ideal condition.
- Three options were analyzed to rectify the stability issues, then a final recommendation was made.



Introduction



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Design and Analysis

- After field visits, study of the soil and geotechnical reports, and team discussions, it was determined that a combination of the slopes and two major sources of water were causing the instability of the hill. Those two sources include the high groundwater level from aquifer of the area, and seepage water from the adjacent irrigation canal. To address these issues, three solutions were analyzed and compared:
 - 1. Lining the Irrigation Canal**
 - 2. Optimizing the existing drainage system and reroute the water out of the area**
 - 3. Install a new drainage system that more efficiently drains the groundwater in the area**
- A cost-benefit analysis was completed for each option and then a final recommendation was formed

Discussion of Results

- Option 1 – Lining the South Jordan Canal

Pros

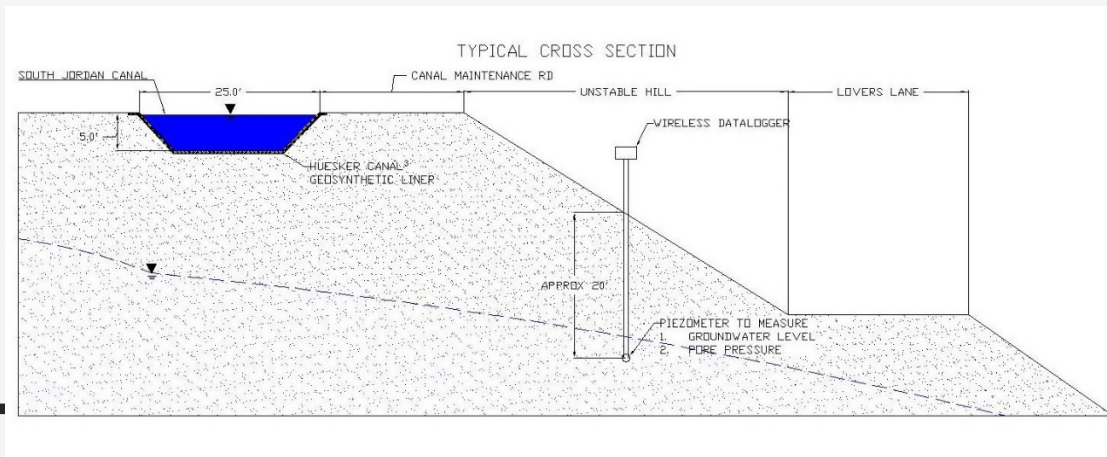
- Most effective way to decrease the water content in the hill
- Only way to eliminate seepage water from entering the hill
- Simple Upkeep

Cons

- Upfront substantial costs
- Would require coordination with South Jordan Canal Company

Basic Cost Analysis

Item	Cost
Site Preparation/Excavation	\$ 25,220.00
Synthetic Canal Lining	\$ 90,200.00
Miscellaneous	\$ 23,000.00
Total:	\$ 138,420.00



Discussion of Results Cont'd

- Option 2 – Optimize Existing Drainage System and Use Abandoned Sewer Pipe to Reroute Water Out

Pros

- Relatively cheap
- Simple procedure
- Optimizes existing system

Cons

- Doesn't address a major source of water in the hill (seepage)
- Existing drains are in poor condition (deteriorated) and pipe may need to be replaced, making the project much more expensive
- Water would need to be pumped up to abandoned sewer line
- Connection to old RCP pipe may present more issues

Basic Cost Analysis

Item	Cost
Site Preparation/Pipe Connections/Pump	\$ 40,000.00
Cleaning out existing pipes	\$ 20,000.00
Miscellaneous	\$ 5,000.00
Total Cost:	\$65,000.00

Discussion of Results Cont'd

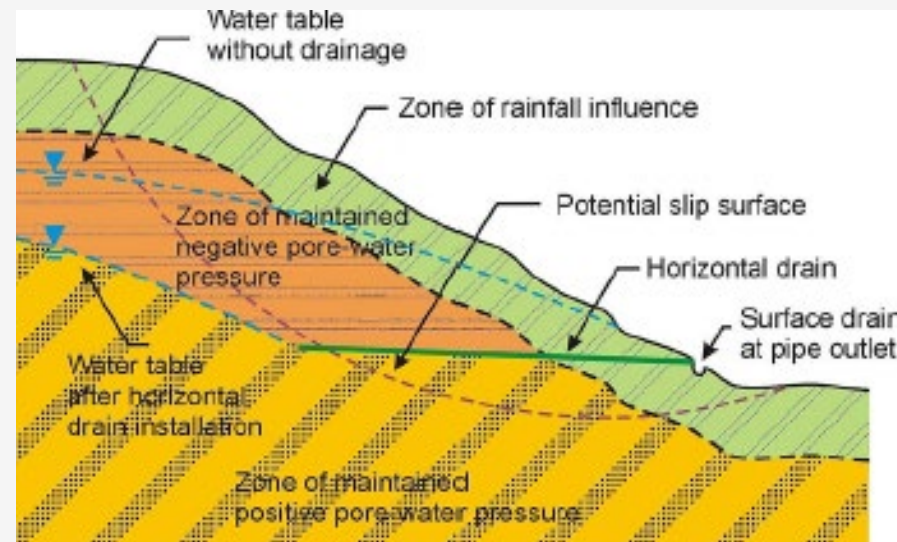
- Option 3 – Install new horizontal drainage system, and French Drain System at the bottom of the hillside

Pros

- Effective way to remove groundwater from hill and transport out of the area

Cons

- Most Expensive (> \$250,000)
- Construction activity may trigger movement in the hill
- Seepage water will continue to percolate into the hill



Recommendations

- A major cause of the instability in the hillside is due the seepage that comes from the canal. Another major source of water is the aquifer in the area. To help eliminate the first major source of water in the hill, it is recommended that the City work with the canal company to line the canal in the area adjacent to Lovers Lane.
- It is a recommend the City consider lining the canal with a geosynthetic composite, such as the Huesker Canal³ liner. This will greatly reduce the amount of water in the hill, increasing the stability of the hillside significantly. The North Jordan Canal Company has recently completed a project using this product.



BEFORE RESHAPING



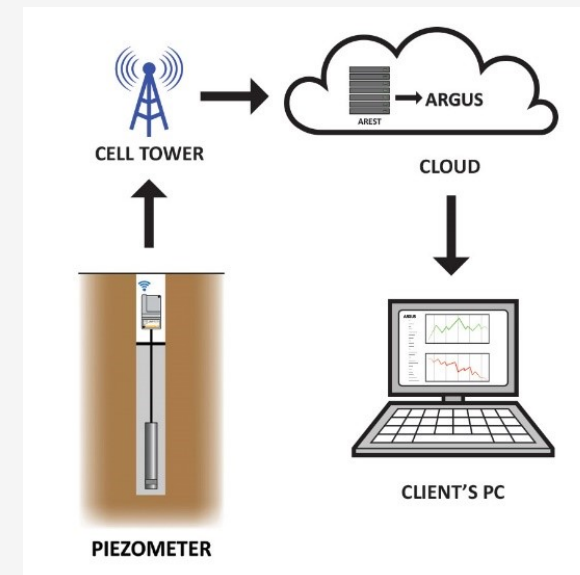
PREPARED CANAL



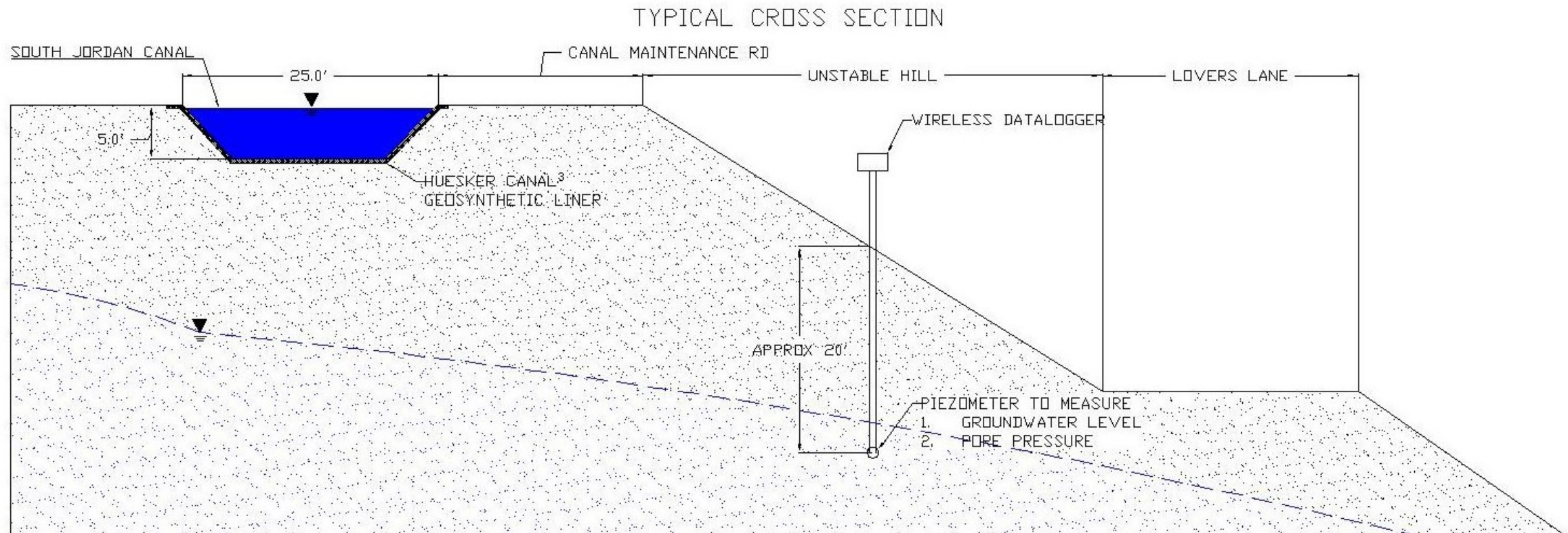
CANAL³ INSTALLATION

Recommendations Cont'd

- It is also recommend to install three wireless piezometer measuring stations in the hillside to evaluate the effects of installing the liner to the hillside.
- After at least a year of installing the liner, the hillside should be re-inspected and additional mitigation may be considered, as necessary. Further mitigation may be installing French –style drain system at based of hill.

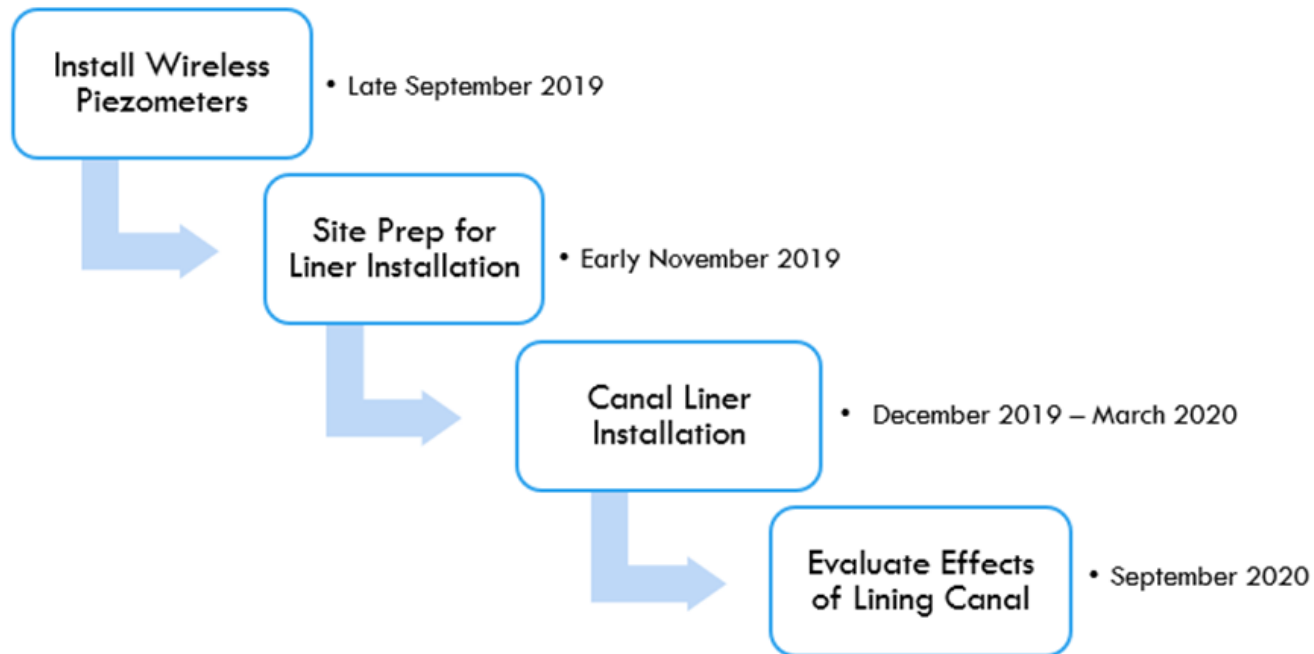


Recommendations Cont'd



Project Tasks and Deliverables

Schedule



Tasks

- Install Wireless Piezometers
- Site Preparation
- Canal Liner Installation
- Reevaluate Stability of Hill