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## Blind Horizontally Bored Remediation Well Concepts - Siltation Assessment and Cost Comparison



# Presentation Overview

- Background
- Remediation System Layout
- Well Installation
- Dewatering Well Concepts
- Dewatering Well Assessment
- Remediation System Enhancements
- Remediation Results



# Background



# Background

## Objectives

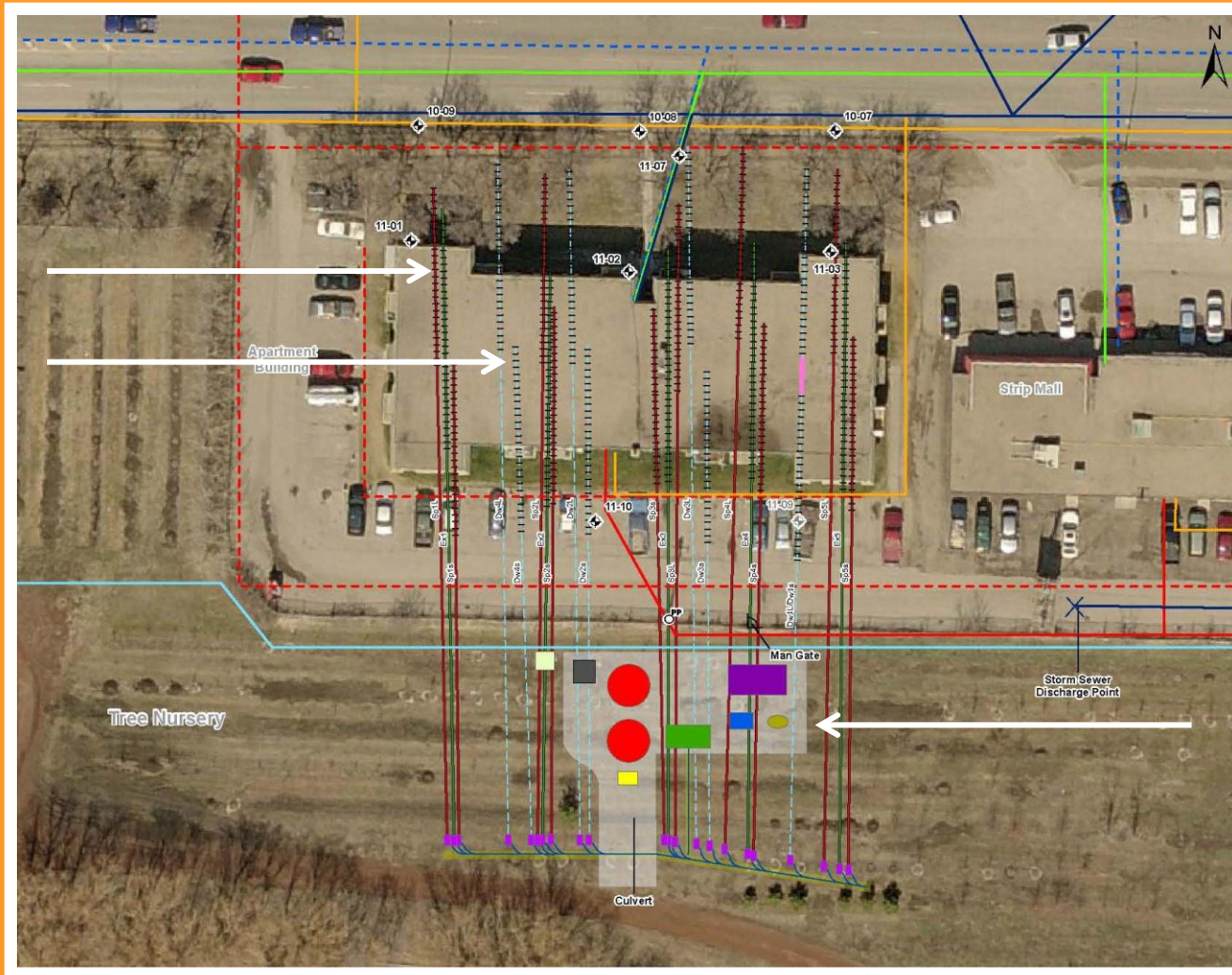
- Remediate impacts at the apartment property
- Provide vapour intrusion control
- Minimize disturbance to the tenants
- Reduce property devaluation
- Environmental stewardship

## Challenges

- Impacts were located beneath the apartment building
- Limited access to the property
- Blind horizontal remediation well installations were uncommon in area

# Remediation System Layout

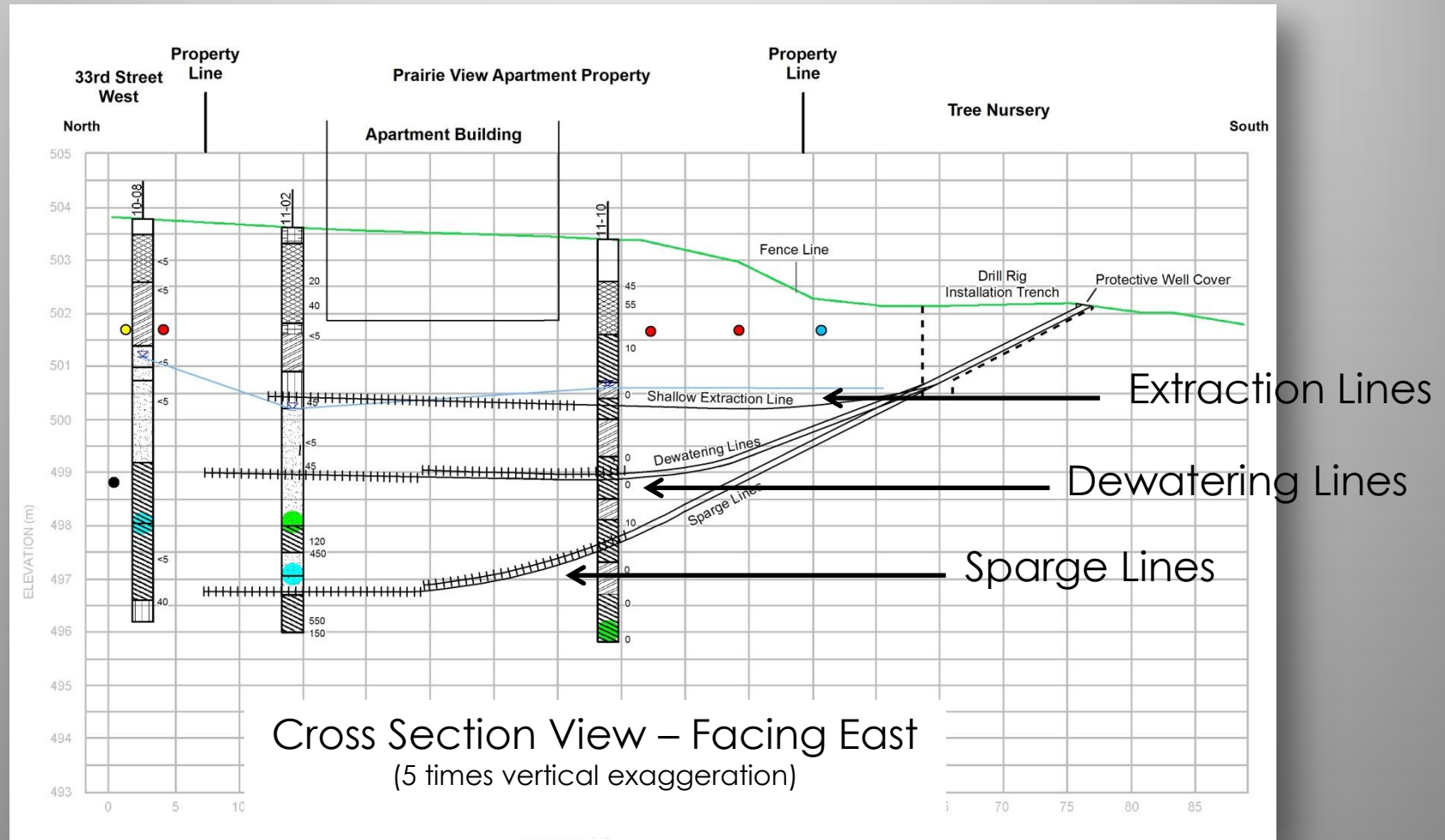
Horizontal  
Wells



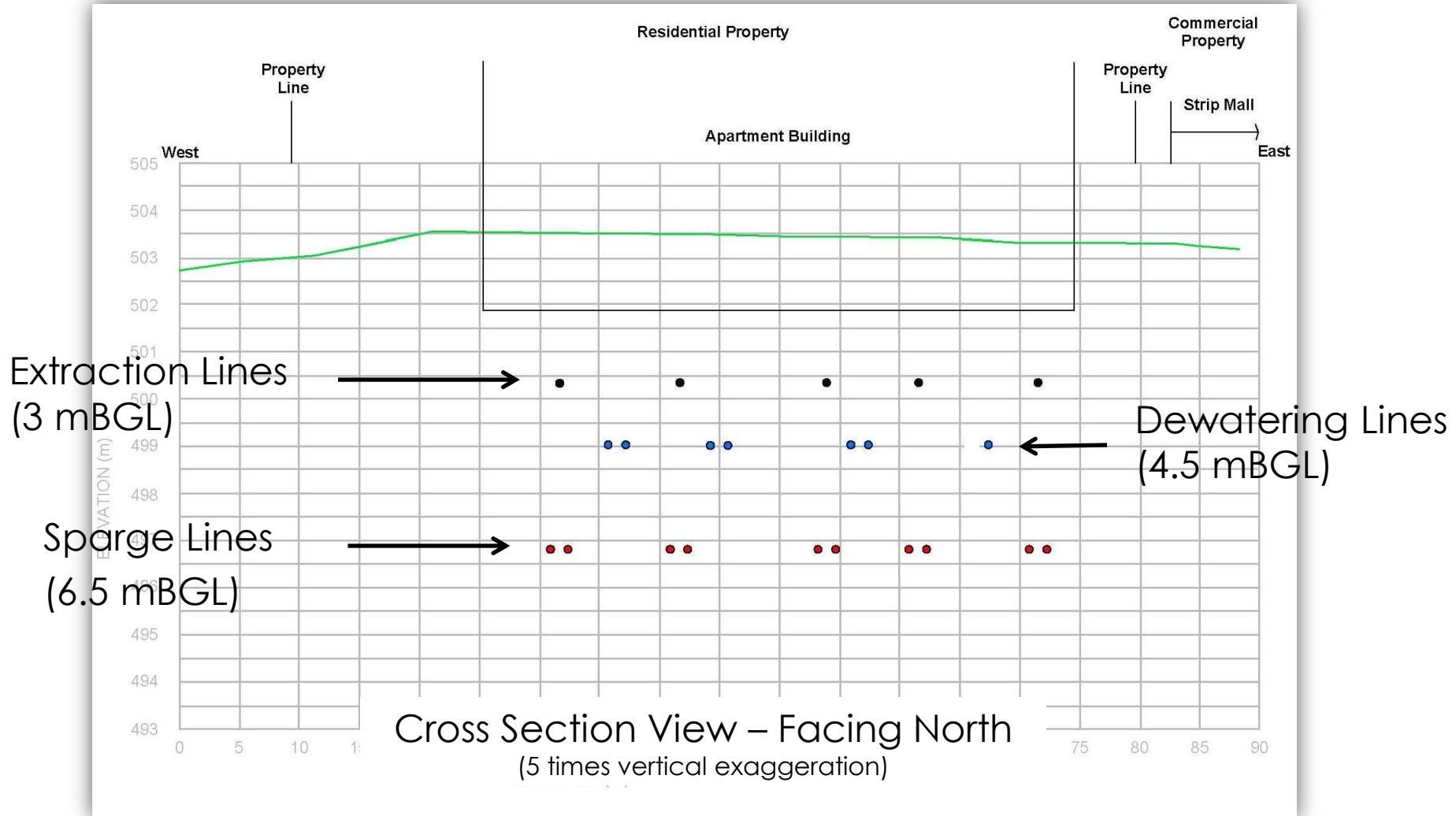
Remediation  
System  
Components



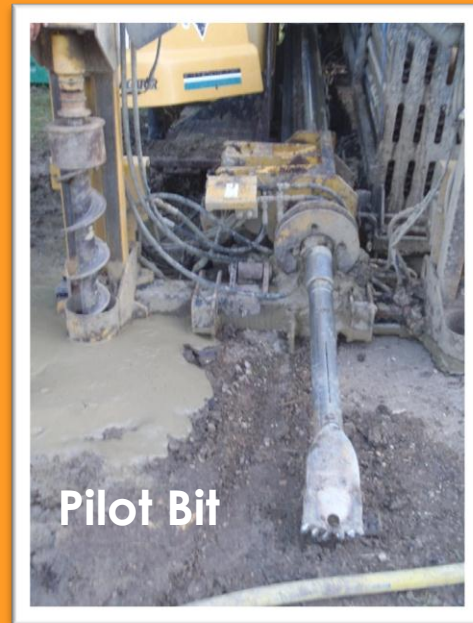
# Remediation System Layout



# Remediation System Layout



# Well Installation



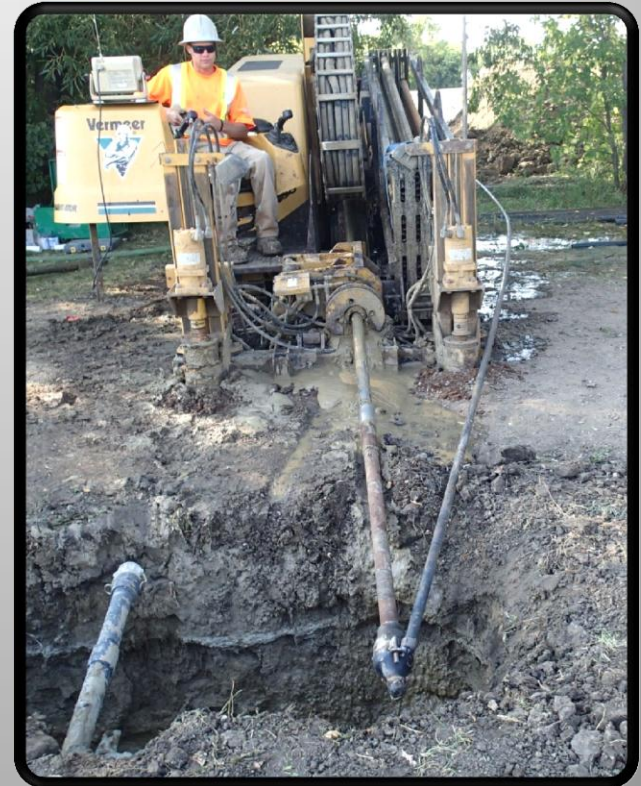
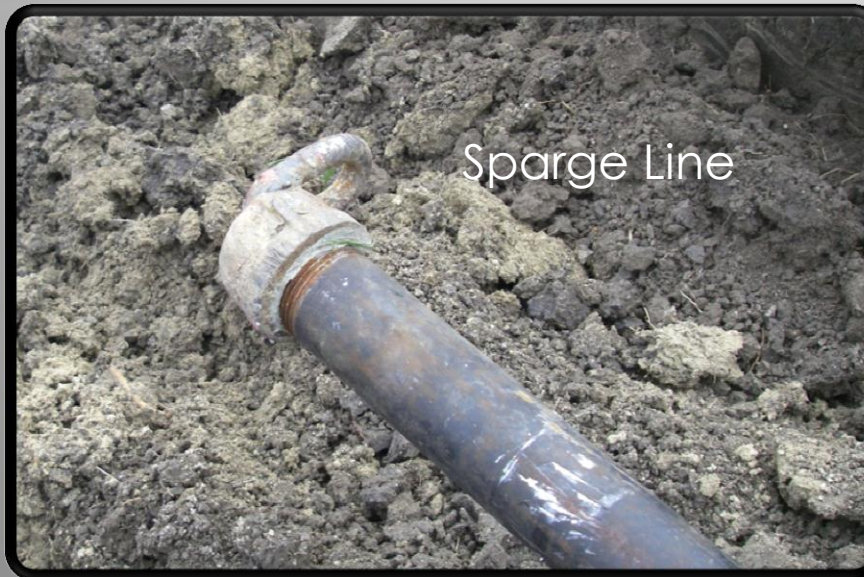


# Well Installation



Specialty Tooling

# Well Installation





# Well Installation

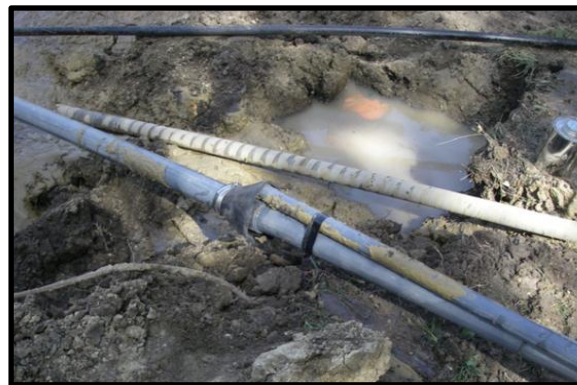
- Well Development
  - 1,000 L of water
  - 500 L of 3% - 5% Hydrogen Peroxide Solution
- Sand Tremme – 10/20 Filter Sand
- Bentonite/Cement Grout Seal



Well Development



Filter Sand and Grout Equipment



Grout Tremme

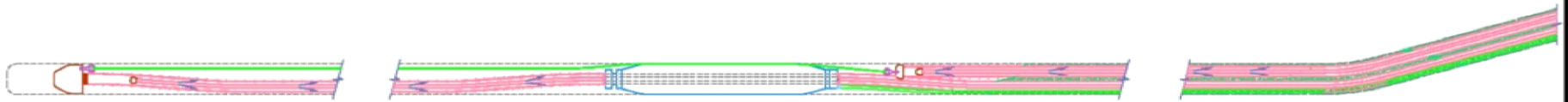
# Dewatering Well Concepts

- Four different dewatering well concepts were assembled and installed
  - Nested well with inflatable packer
  - Geosynthetic well
  - Carrier casing well
  - Standard PVC well
- Evaluate the ability of the well to minimize siltation
- Evaluate the labour requirements for installation
- Evaluate the cost of the well materials



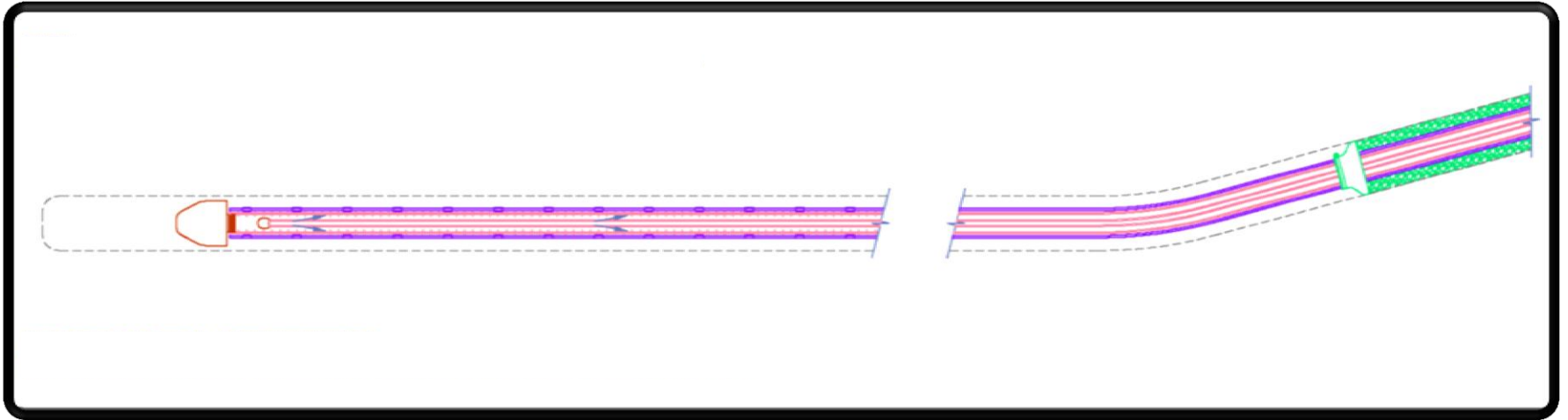
# Dewatering Well Concepts

## Nested Well with Inflatable Packer



# Dewatering Well Concepts

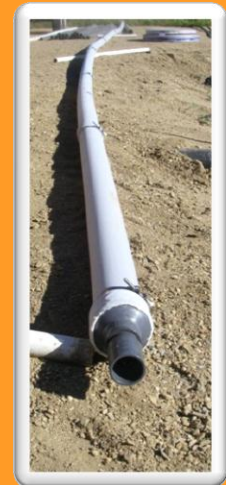
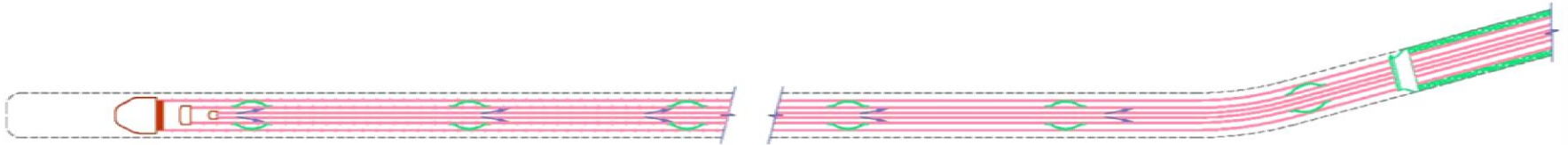
## Geosynthetic Well





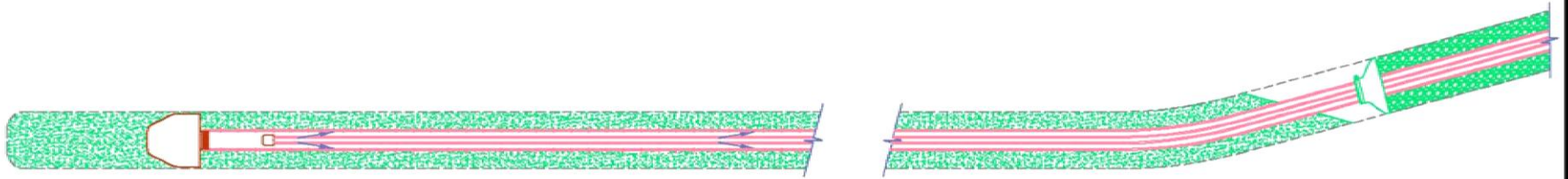
# Dewatering Well Concepts

## Carrier Casing Well



# Dewatering Well Concepts

## Standard PVC Well





# Dewatering Well Assessment

- Similar silt load observed during the initial operation
- Silt diminished shortly after operation



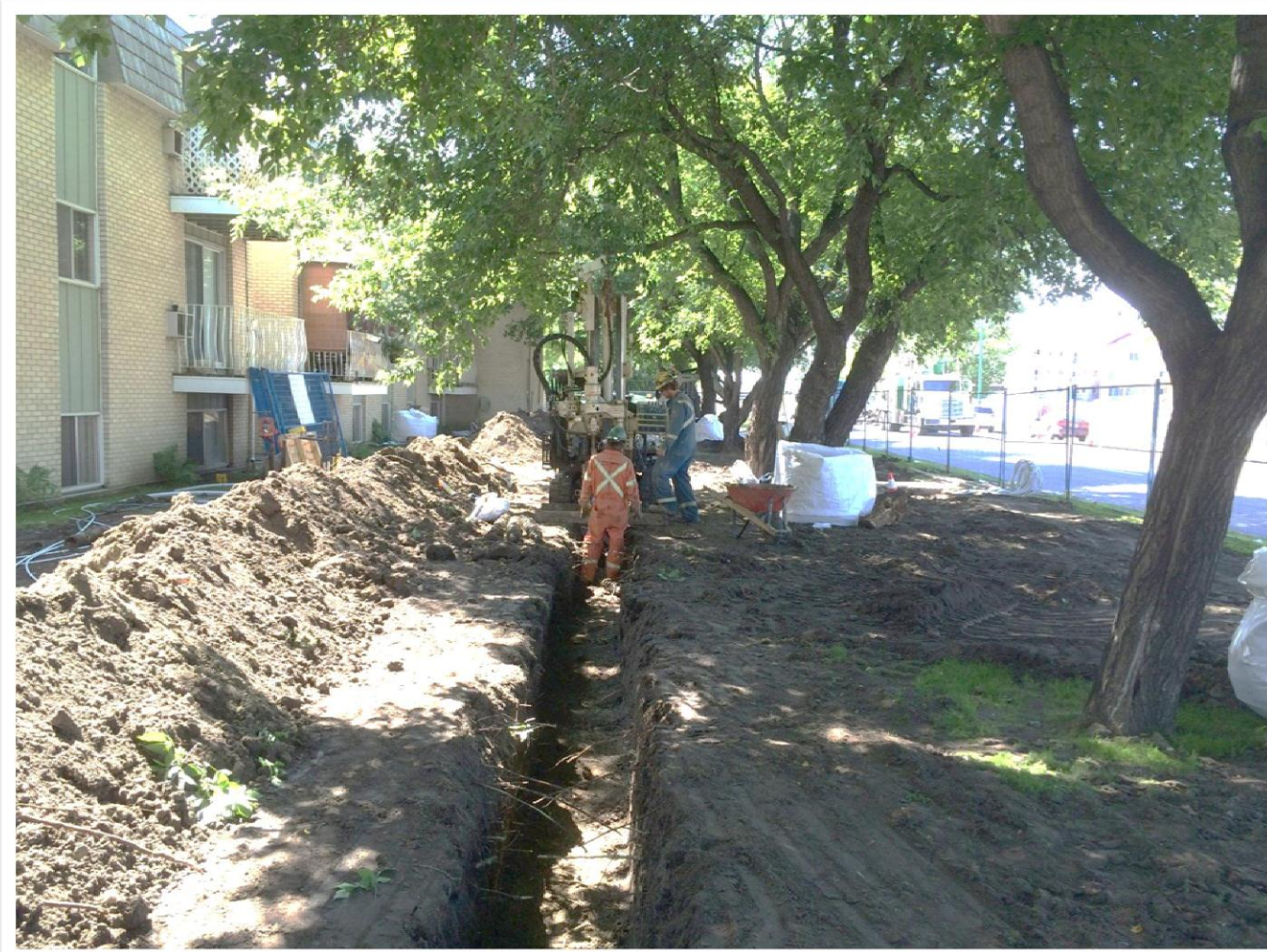


# Dewatering Well Assessment

- Cost of well screen material: \$37/m to \$124/m (additional costs for inflatable packer)
- Additional drilling time required for larger diameter wells
- Increase drill cutting disposal costs for larger boreholes

Well Type	Material Costs (per m of well screen)	Labour and Installation Requirements
Nested Well with Inflatable Packer	\$37 + \$3,900	-Drilling time reduced by half -well assembly time required
Geosynthetic Well	\$124	-easy to assemble -simple installation
Carrier Casing Well	\$114	-well assembly time required -additional drill time to advance larger diameter borehole
Standard PVC Well	\$37	-easy to assemble

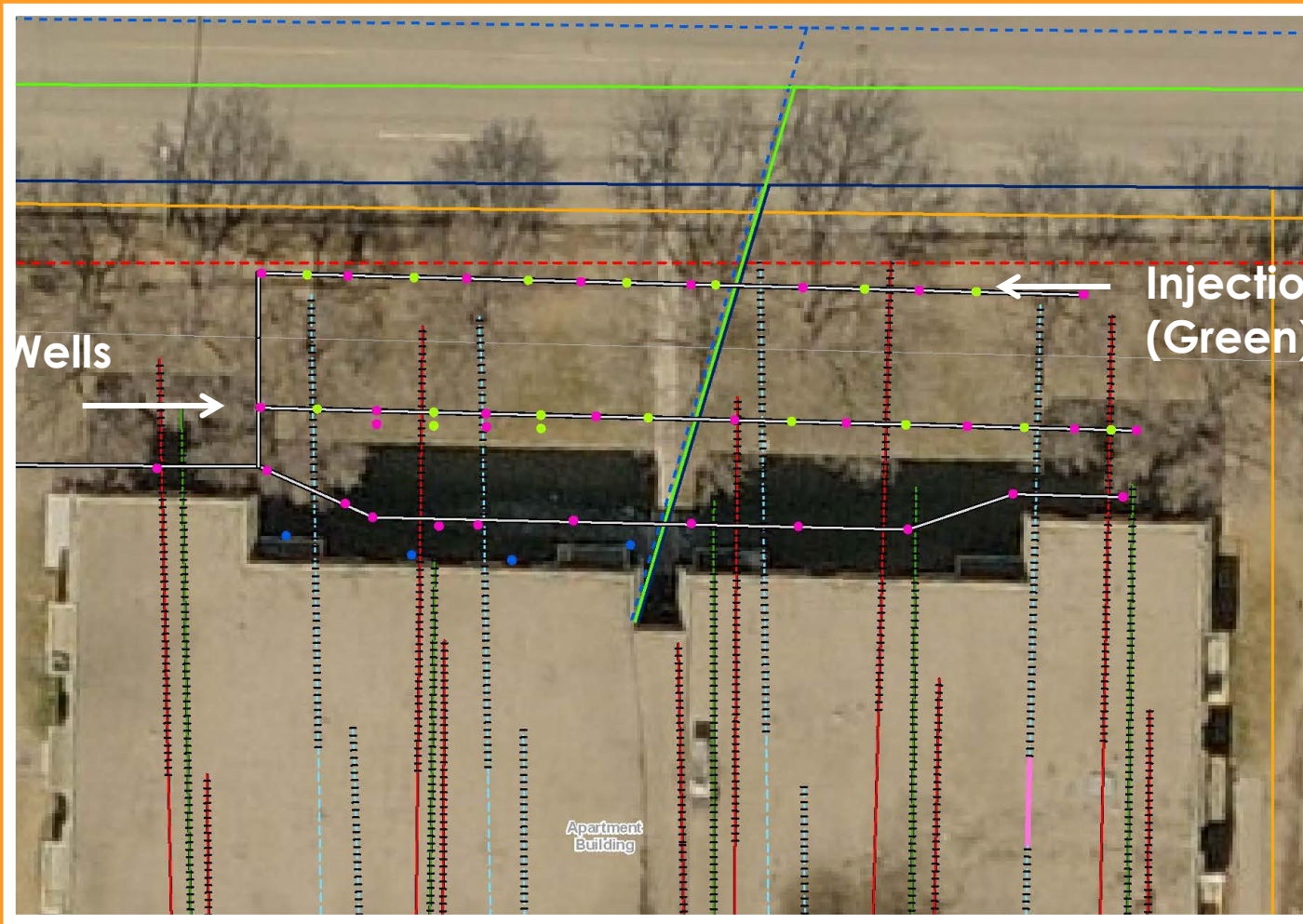
# Remediation System Enhancements





# Remediation System Enhancements

Recovery Wells  
(Pink)



Injection Wells  
(Green)

Apartment  
Building



# Remediation System Enhancements

- 31 Recovery Wells
- 18 Air Injection Wells
- Greater than 2,500 m of Header Line



# Remediation Results

- Operational period: October 2013 to October 2014
- Total Groundwater Recovered – Over 1.5 M L
- Total PHC Mass Recovered – 12,200 Kg



# Acknowledgements

This project was a collaborative effort between:

- Stantec Consulting Ltd.
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