

# REMEDICATION OF A SUBSURFACE HYDROCARBON PLUME AT A MANUFACTURING FACILITY IN ALBERTA USING A VACUUM ENHANCED RECOVERY SYSTEM

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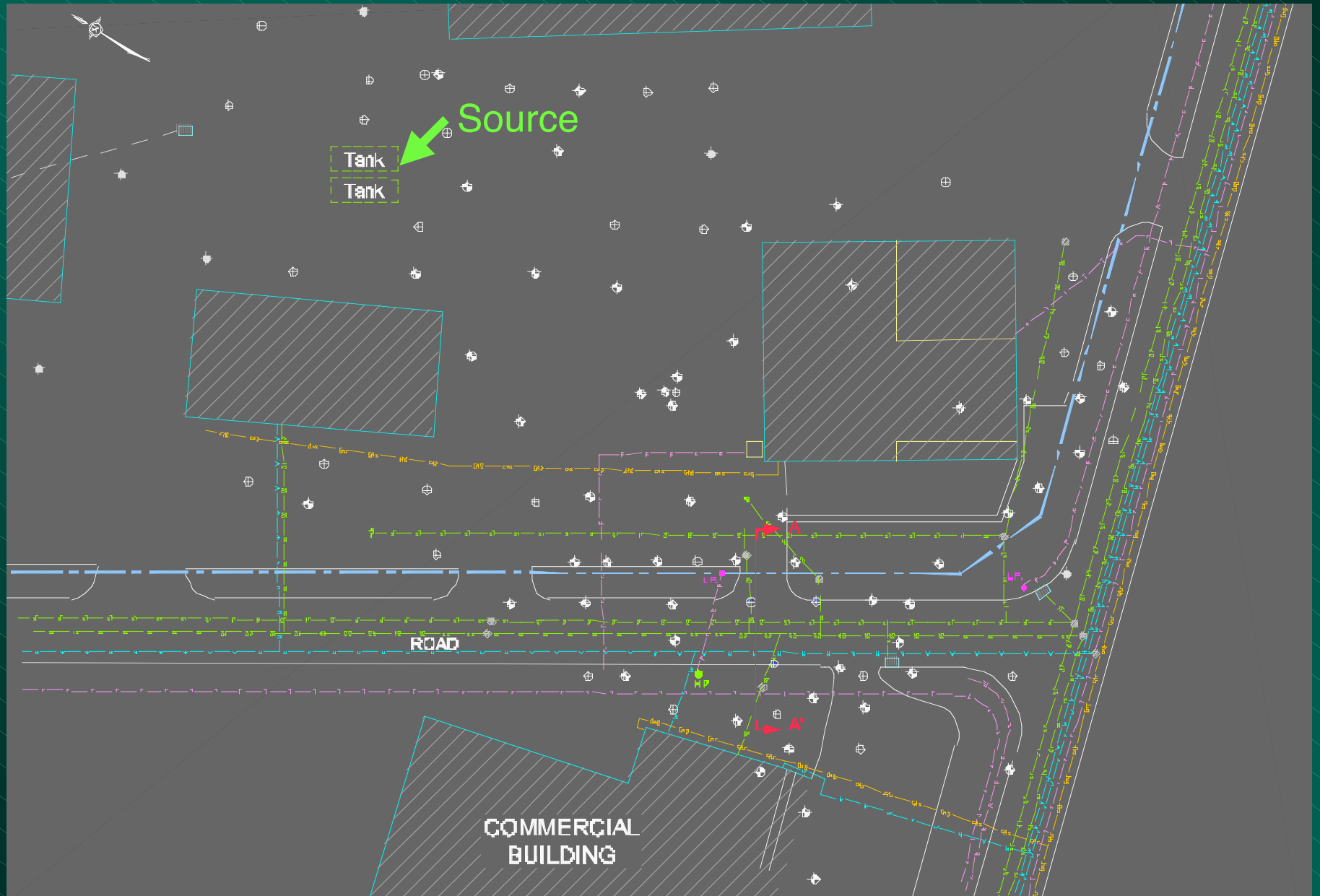
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# Outline

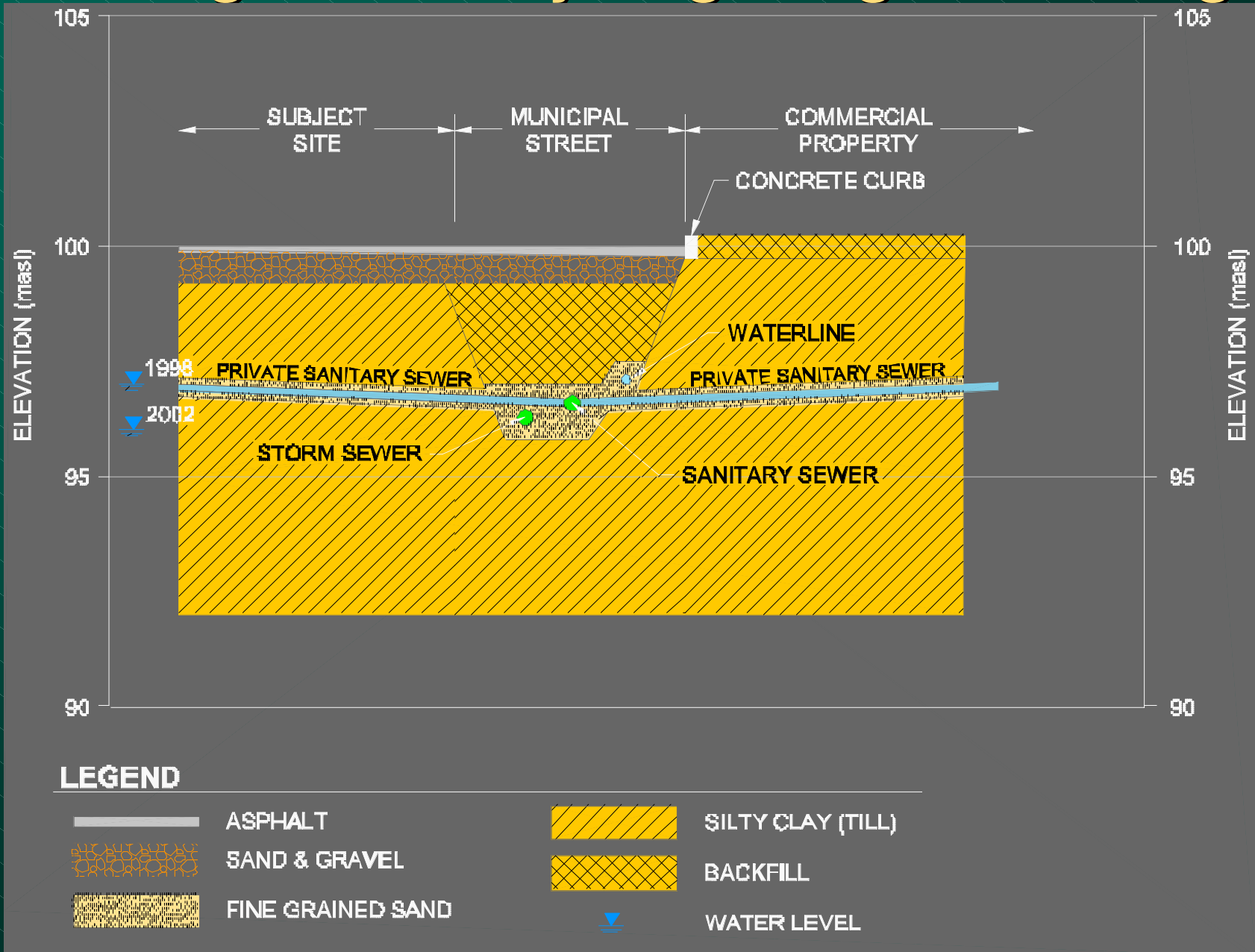
- ◆ Site Description and Background
- ◆ Nature and Extent of Hydrocarbon Contamination
- ◆ Remedial Objective
- ◆ Remedial Action Plan
- ◆ Remediation and Results
- ◆ Summary



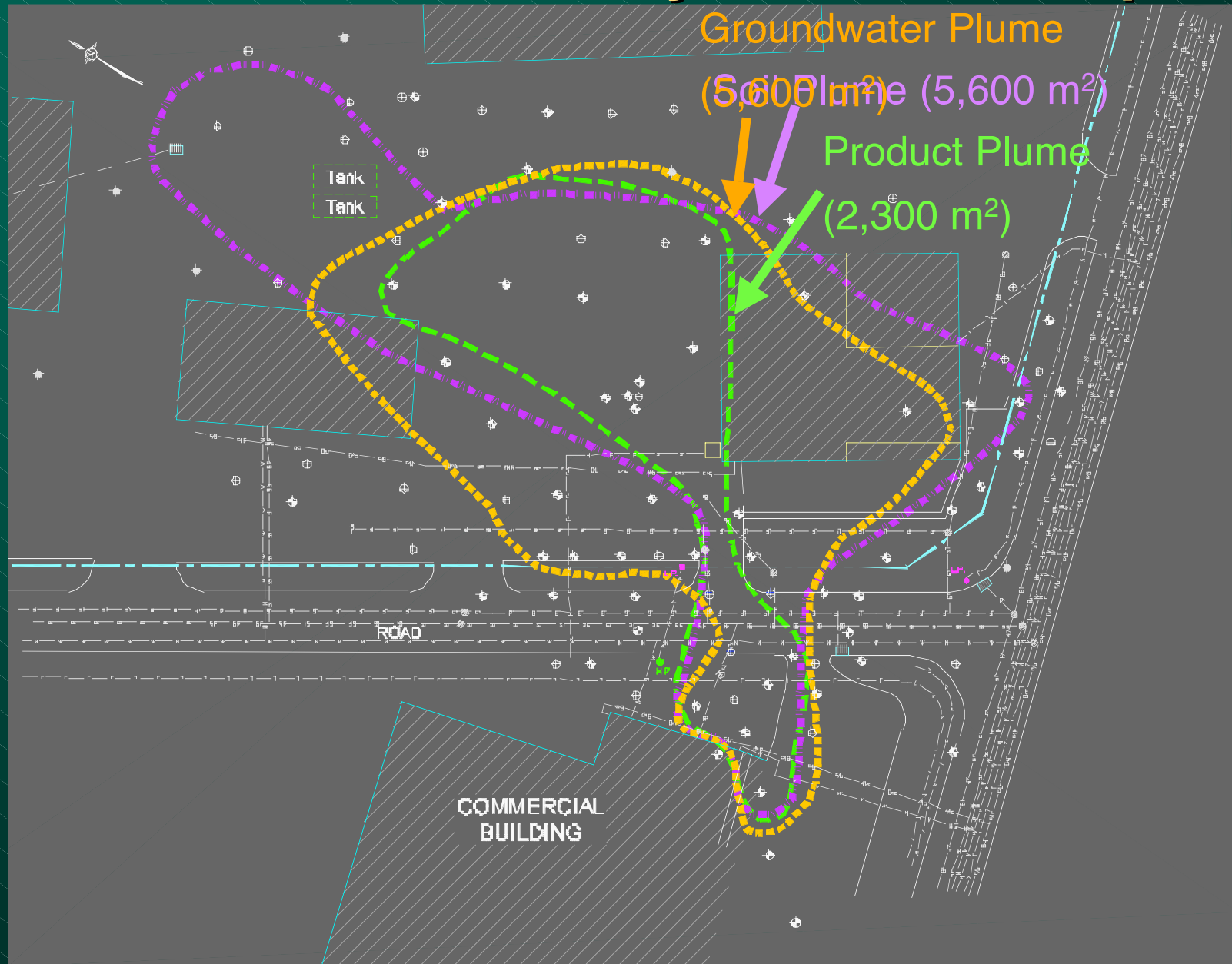
# Site Description and Background



# Geological and Hydrogeological Setting



# Nature and Extent of Hydrocarbon Impacts



# Remedial Objective

- ◆ Remedial Goal - AENV 2001 Risk Management Guidelines for Petroleum Storage Tank Sites, commercial land-use and fine-grained soil.
- ◆ Off-Site impacts - reduce all off-site environmental liability by January 2003.
- ◆ On-Site impacts - contain the impacts on site and remediate the Site within a 3 to 5 year time frame.



# Remedial Action Plan



◆ The selected remedial action plan consisted of:

1. Excavation and disposal of impacts on the municipal road and adjacent commercial property
2. Installation and operation of a vacuum enhanced recovery and treatment system on the site.

# Off Site Remediation

- ◆ Off site remedial activities began in October 2002 and excavation work was completed in December 2002.
- ◆ A total of approximately 2,600 tonnes of impacted soil was excavated and transported off site.





# Off Site Remediation

Excavation next to commercial building was conducted in a series of slots that were then backfilled with fillcrete.



# Off-Site Remediation



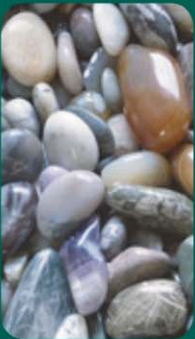
Excavation in the road involved reconstruction of sanitary and storm sewers and a water line.





# Off-Site Results

- ◆ Remedial approach was effective in removing off site liability by 2003.
- ◆ Post excavation sampling was conducted in May 2003 and all groundwater concentrations were below the applicable guidelines.



# On Site Remediation

- ◆ A VER pilot study was conducted in August 2002.
- ◆ Results:
  - 6 m radius of influence;
  - opt. vacuum of 10" Hg;
  - airflow rate ~36 scfm; and
  - water pumping rate ~2.0 L/min.



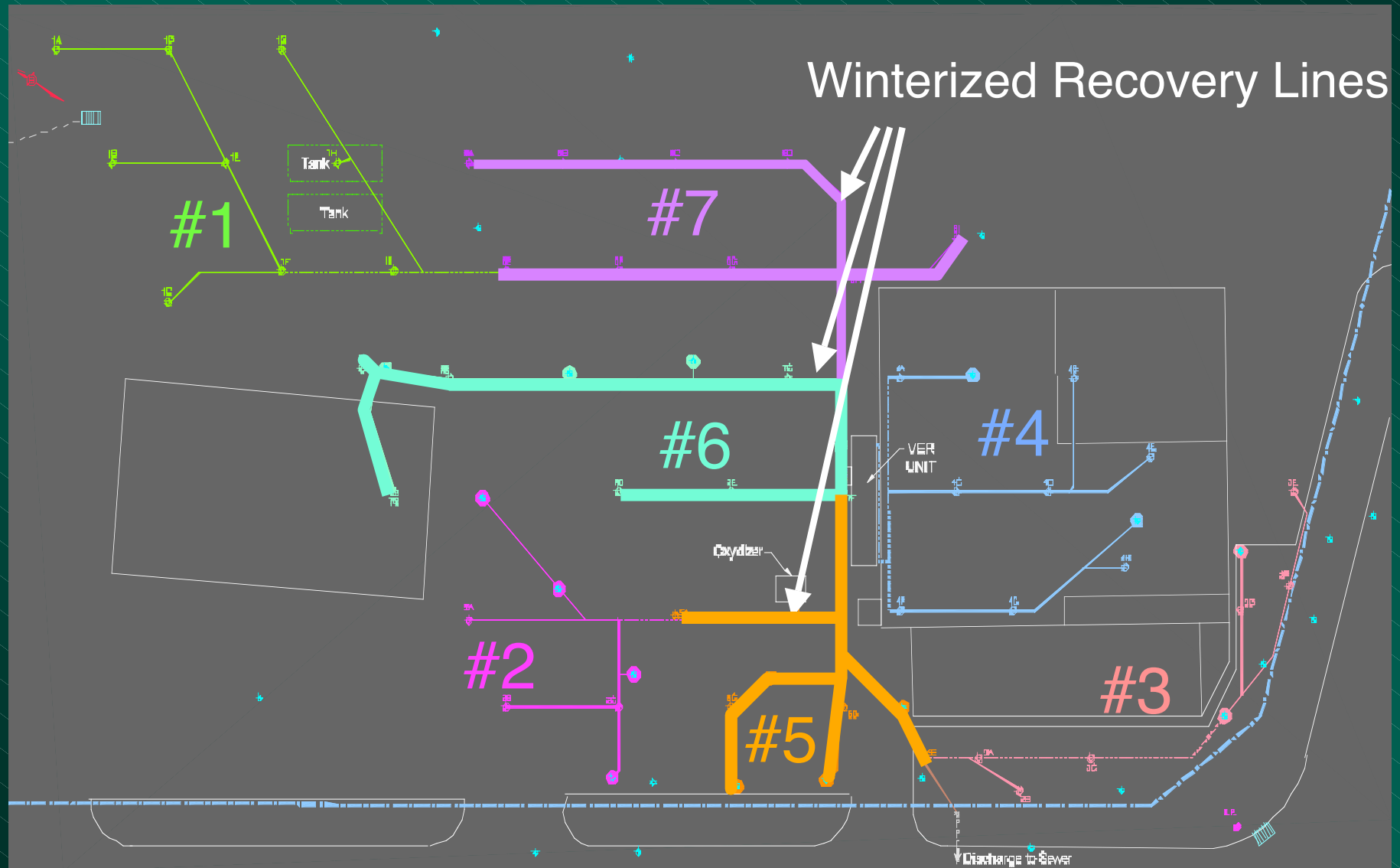
# On Site Remediation

- ◆ Site preparation included installing 47 new wells;
- ◆ Recovery wells were standard 2" diameter monitoring wells completed to depths ranging from 5.8 to 6.8 m.
- ◆ Recovery well heads were installed on new wells and 16 existing wells.

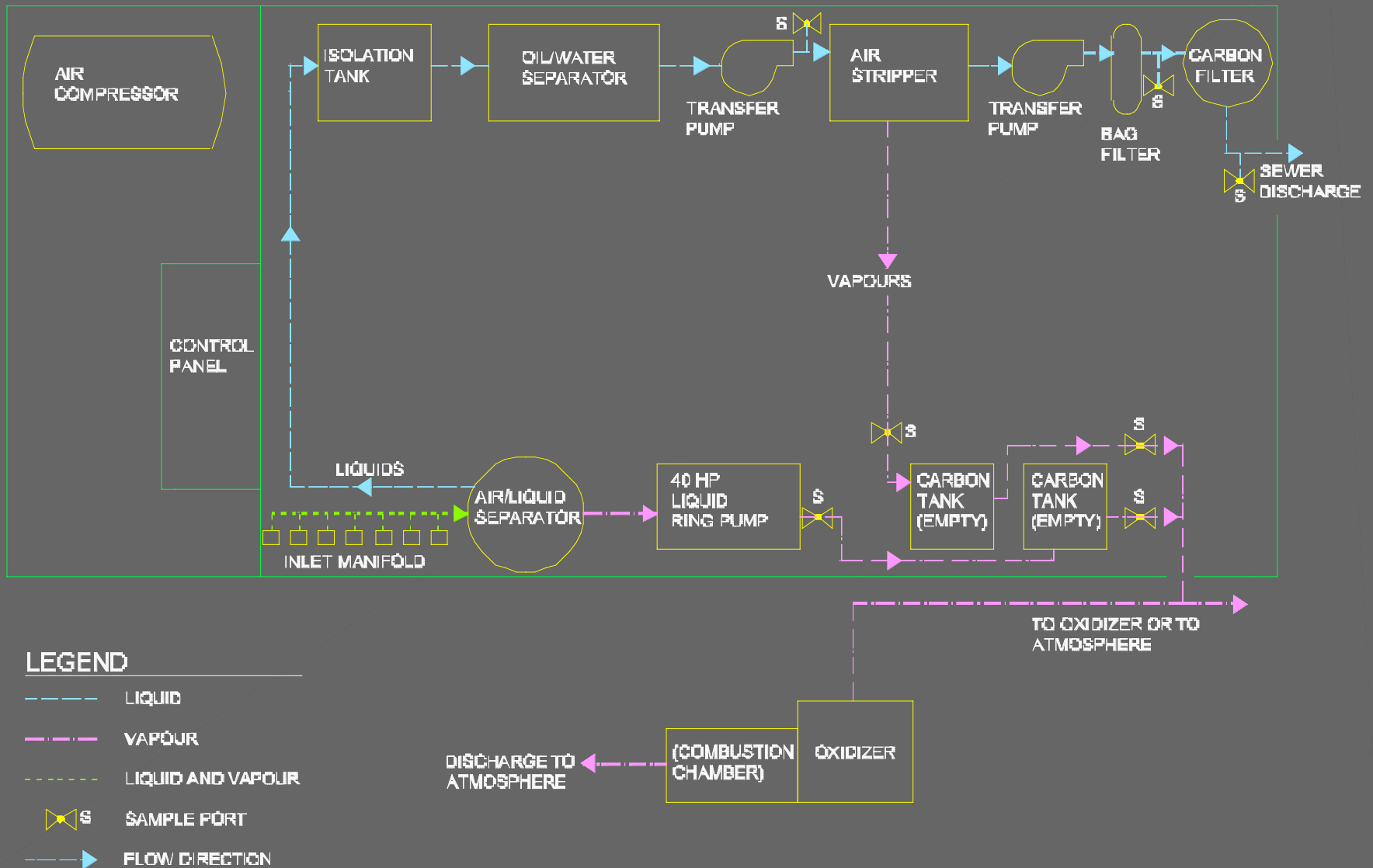




# On Site Remediation



# On Site Remediation



# On-Site Remediation

1



2



3



4



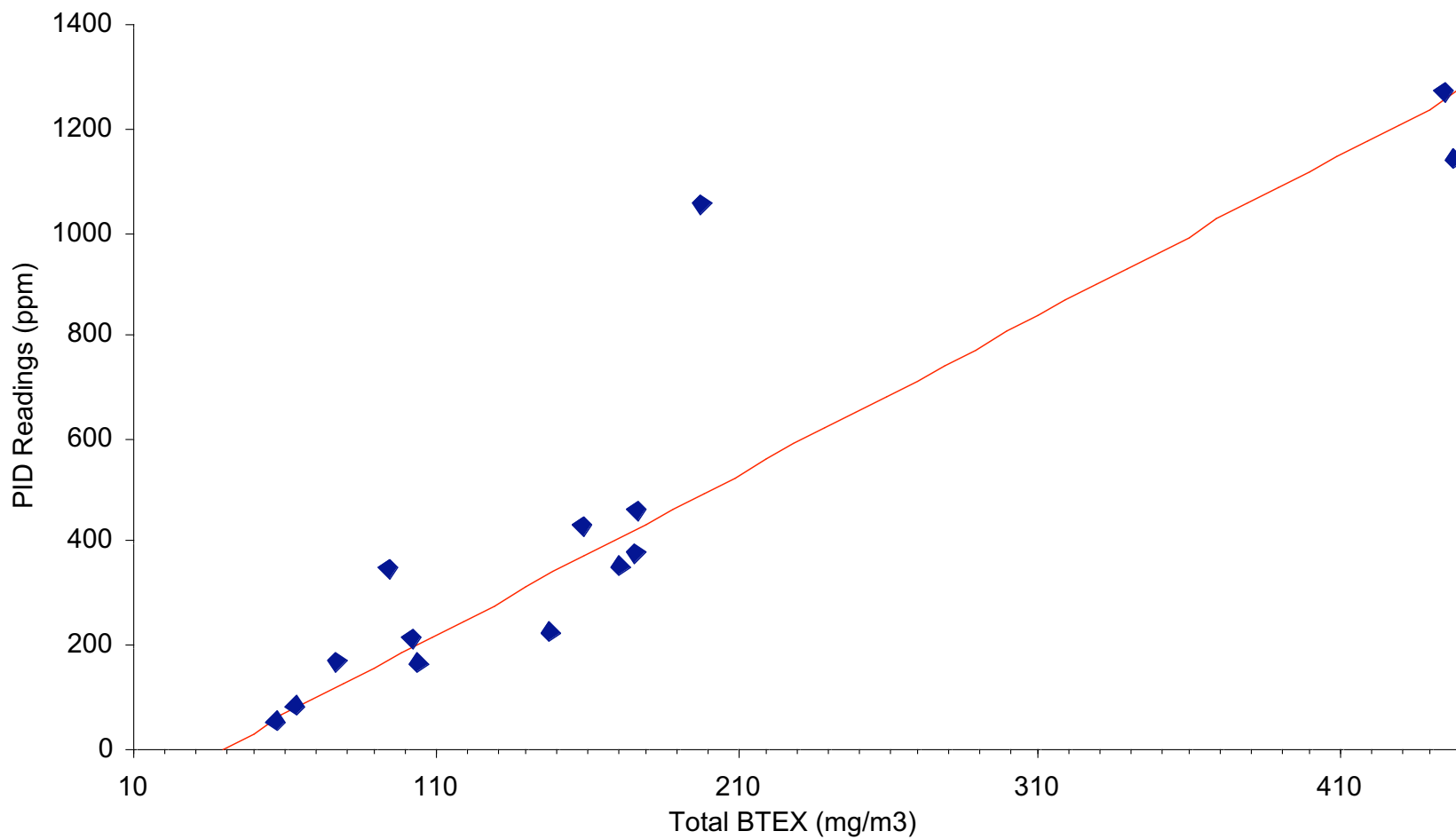
# On-Site Results

- ◆ Operation of the VER system began in January 2003.
- ◆ Results indicate that groundwater recovery flow rates have ranged from 0.1 to 5.0 L/min and a total of approximately 11,400 L of groundwater has been recovered over an operational period of about six months.
- ◆ The average air flow recovery rate for each network is 500 scfm.



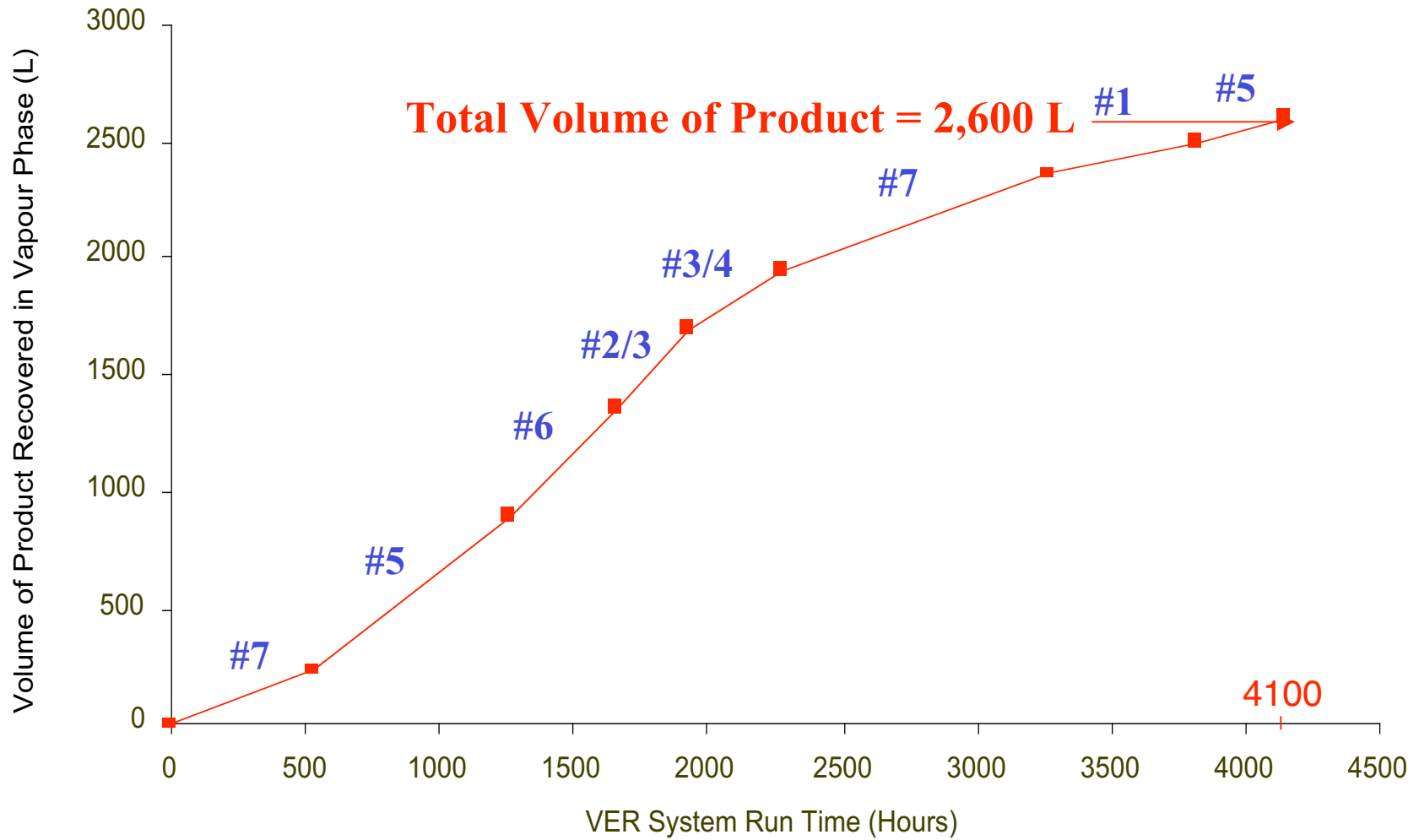
# On-Site Results

Correlation Total BTEX (mg/m<sup>3</sup>) to PID Reading





# On-Site Results



# On-Site Results

- ◆ Effluent water and ambient air concentrations indicated that the system is effectively treating recovered groundwater and vapours.
- ◆ VER system has removed approximately 2,600 L of product over 6 months.
- ◆ The system is effectively containing impacts on the Site.



# Project Summary

- ◆ Off-site remedial approach was effective in removing off-site liability by 2003
- ◆ VER system is effectively containing impacts on the site and recovering hydrocarbons.
- ◆ It is anticipated that the Site will be remediated within a 5 year time frame.



**QUESTIONS ?**