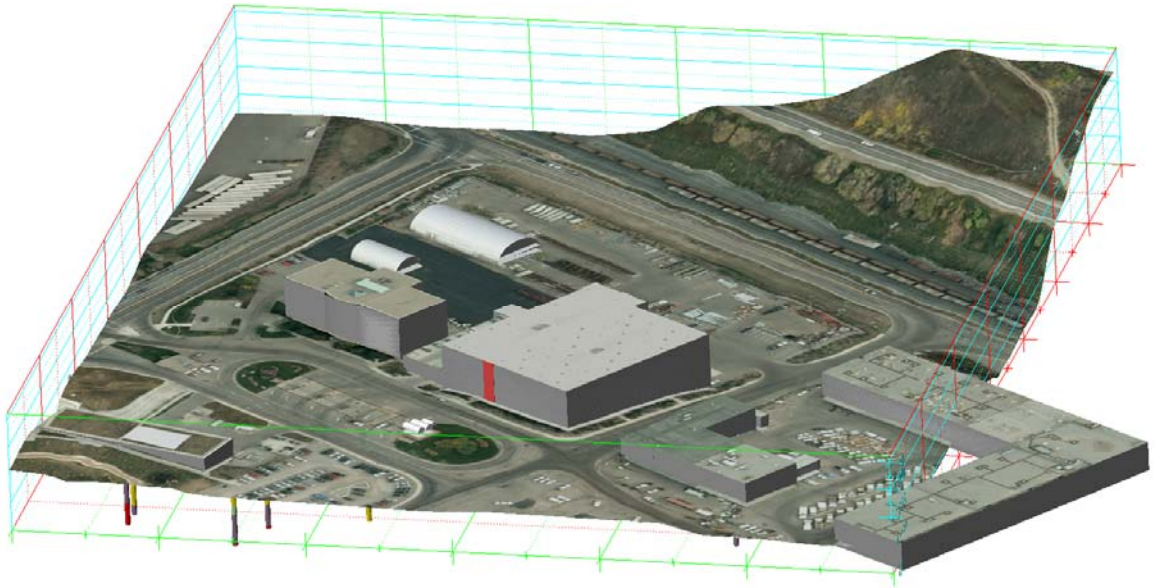
TETRA TECH EBA

Use of a Conceptual Site Model to Evaluate, Communicate and Support Discussion of Petroleum Hydrocarbon Impacts on Subsurface Receptors



Jordan Wakefield, Project Engineer

Presentation by
Tetra Tech EBA Inc.

October 2015

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Purpose and Agenda

Purpose

To facilitate a focal point for discussion and decision making for diversely educated stakeholders.

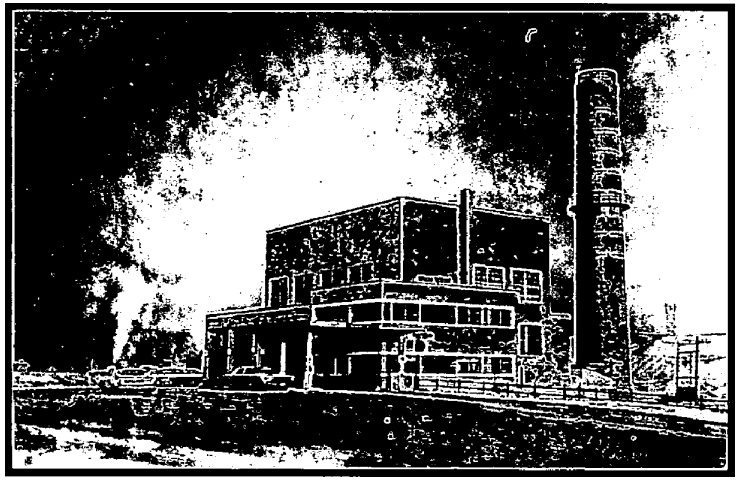
Agenda

1. Background
2. Site Activities and Findings
3. Conceptual Site Model

Site Overview

Site History

Incinerator



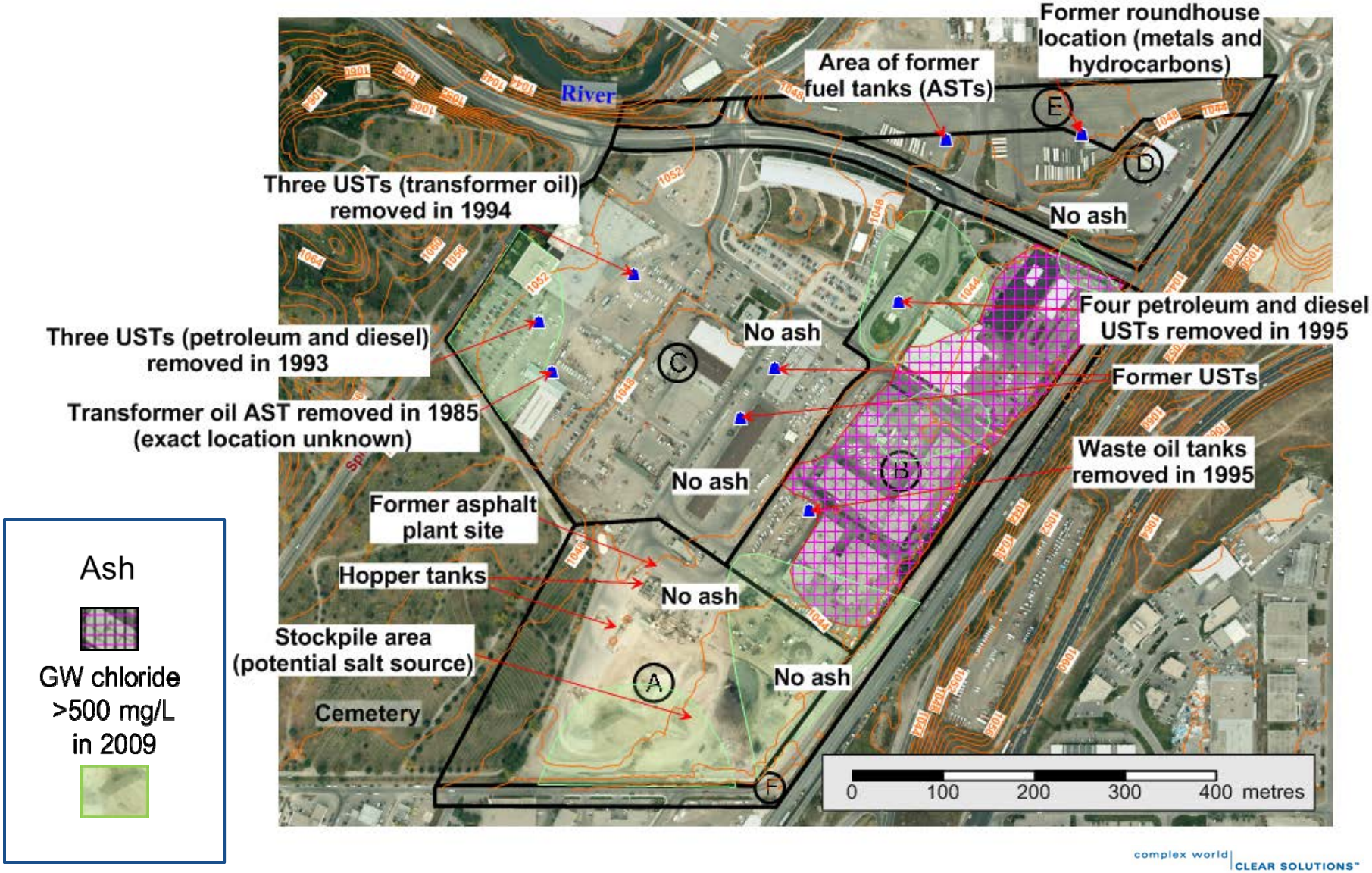
1951 1954 1953 1955 1964 1968 1988 2004 2012 2015

- 1st geotech investigation (1951)
- Test burns (1953)
- 1st issues (smell, metals) (1954)
- Unburned sanitary waste buried (1955)
- 5% of ash was "metal cans" (1964)
- Incinerator closed, leaving 310,000 m^3 of ash (1968)
- Site redeveloped (1988)
- EMP Developed (2004)
- CSM Developed (2012)

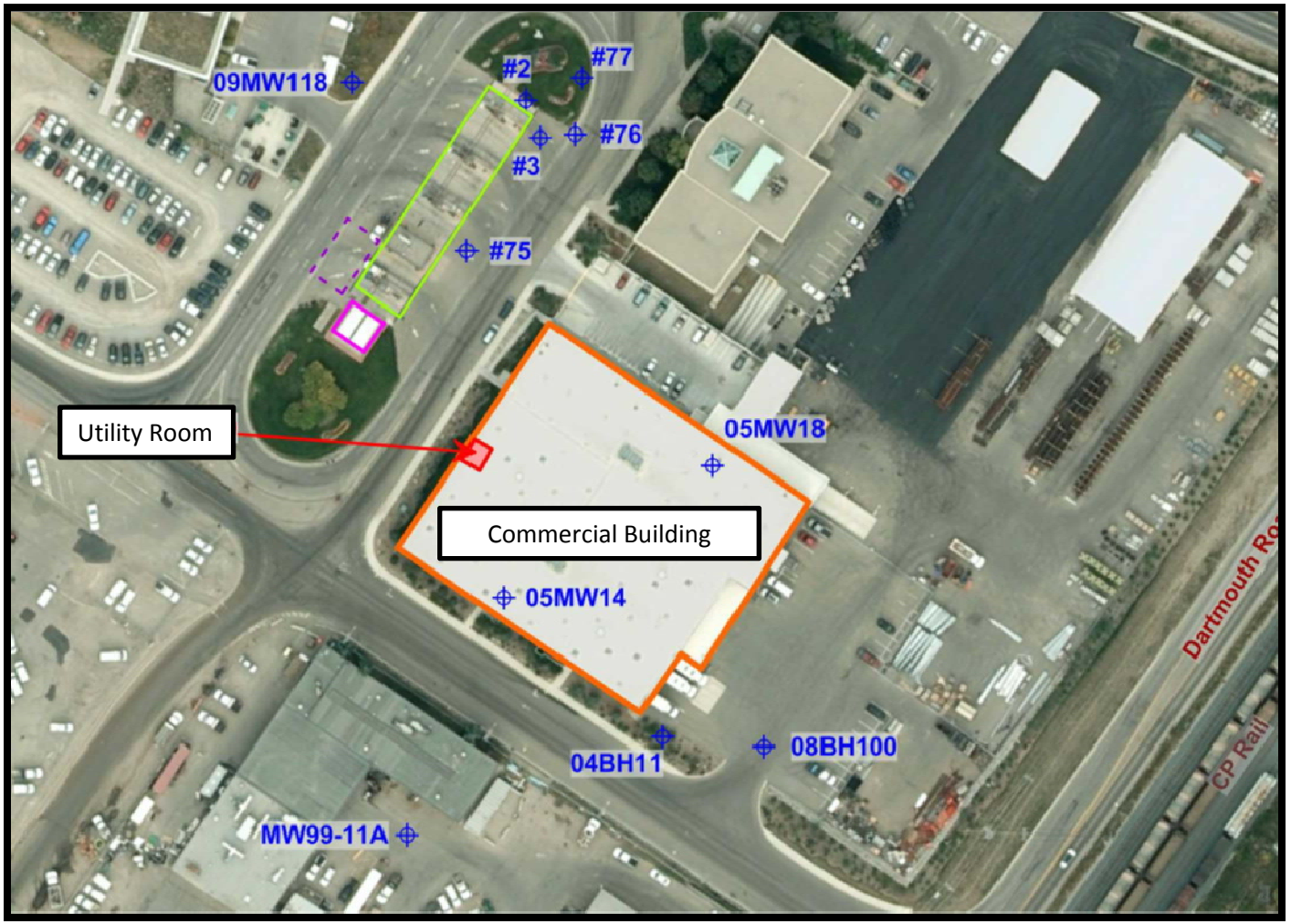
Other Activities Included

- Gravel pit
- Railway yards and roundhouse
- Numerous ASTs and USTs – fuel, and oil
- Asphalt plant
- Salt storage
- Salt and oil spray tests

Site Plan Showing Historical Potential Concerns



Focus of Assessment

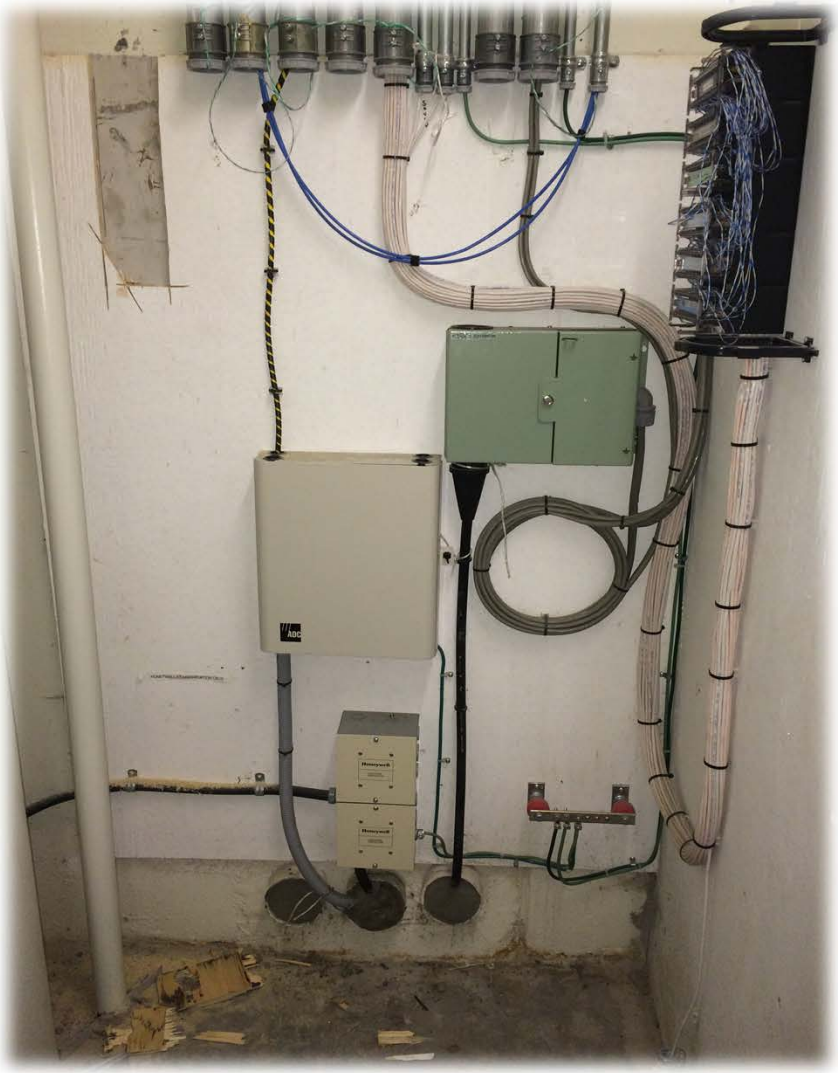


Why We Got Started – Utility Room

Initial Investigation

- Ambient odours were identified by the client.
- We collected an ambient air sample and petroleum hydrocarbon parameters were detected.

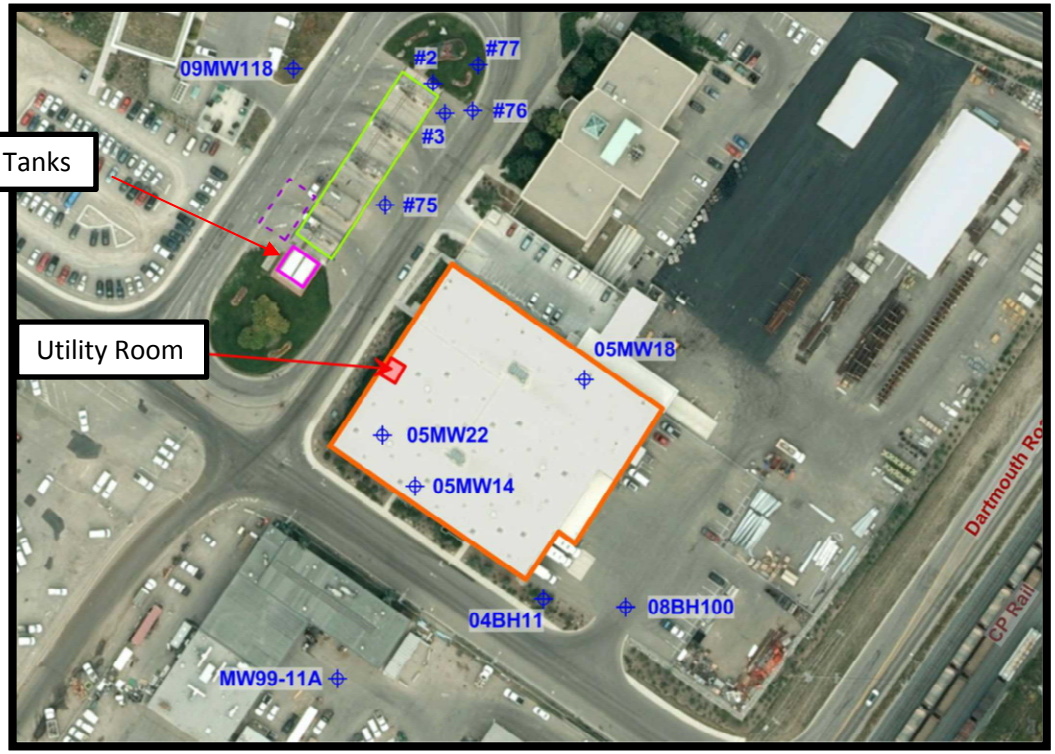
Stakeholders' question – What is the source of the odour?



Most Likely Suspect - Fueling Facility

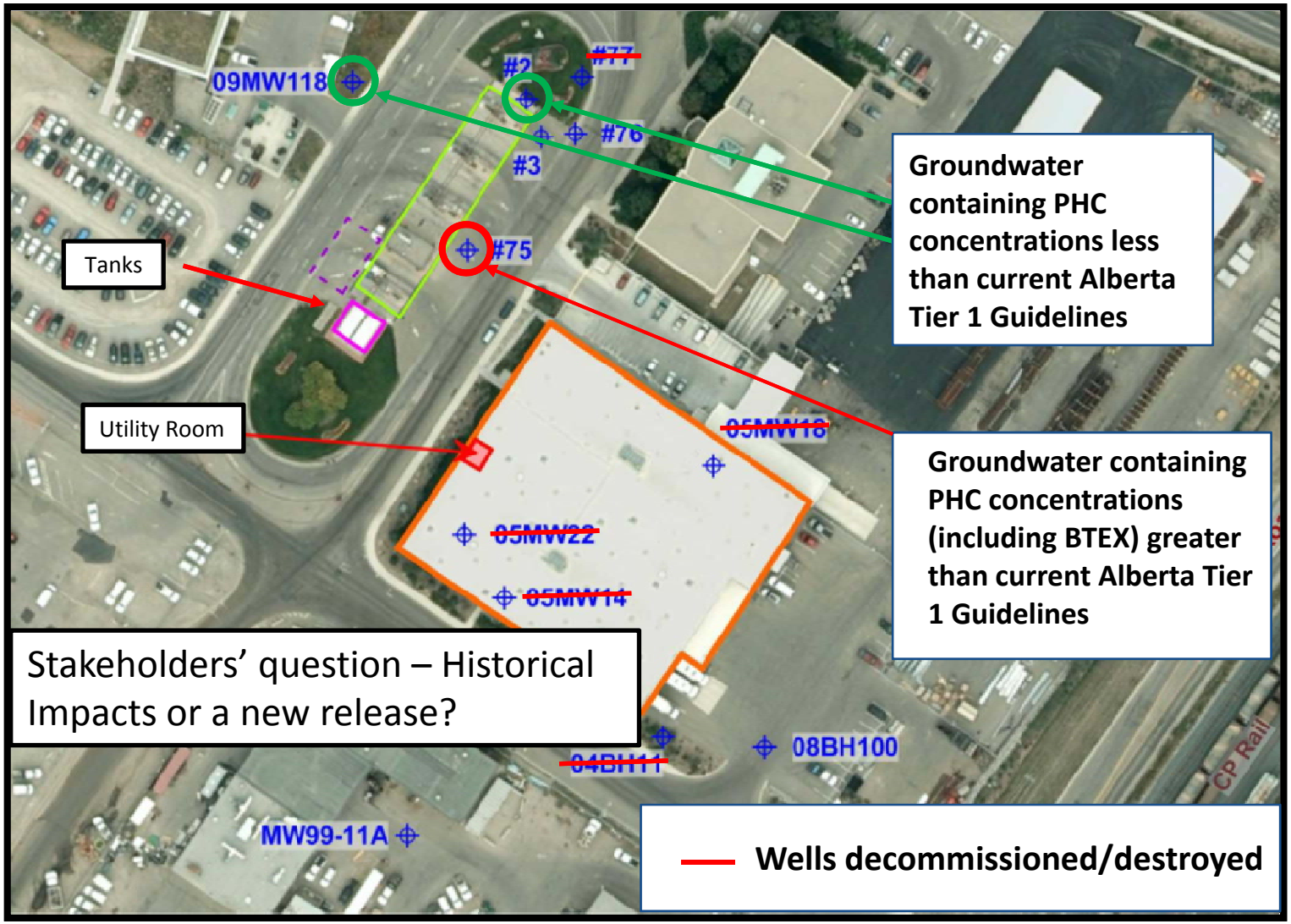
- The Fueling Facility is located west of the Commercial Building.
- Historically contained four underground storage tanks (gasoline and diesel) which were removed in the mid 90s.
- Three above-ground storage tanks (gasoline, diesel, and marked diesel) were installed after the USTs were removed, and currently operate.

Historical Groundwater Data

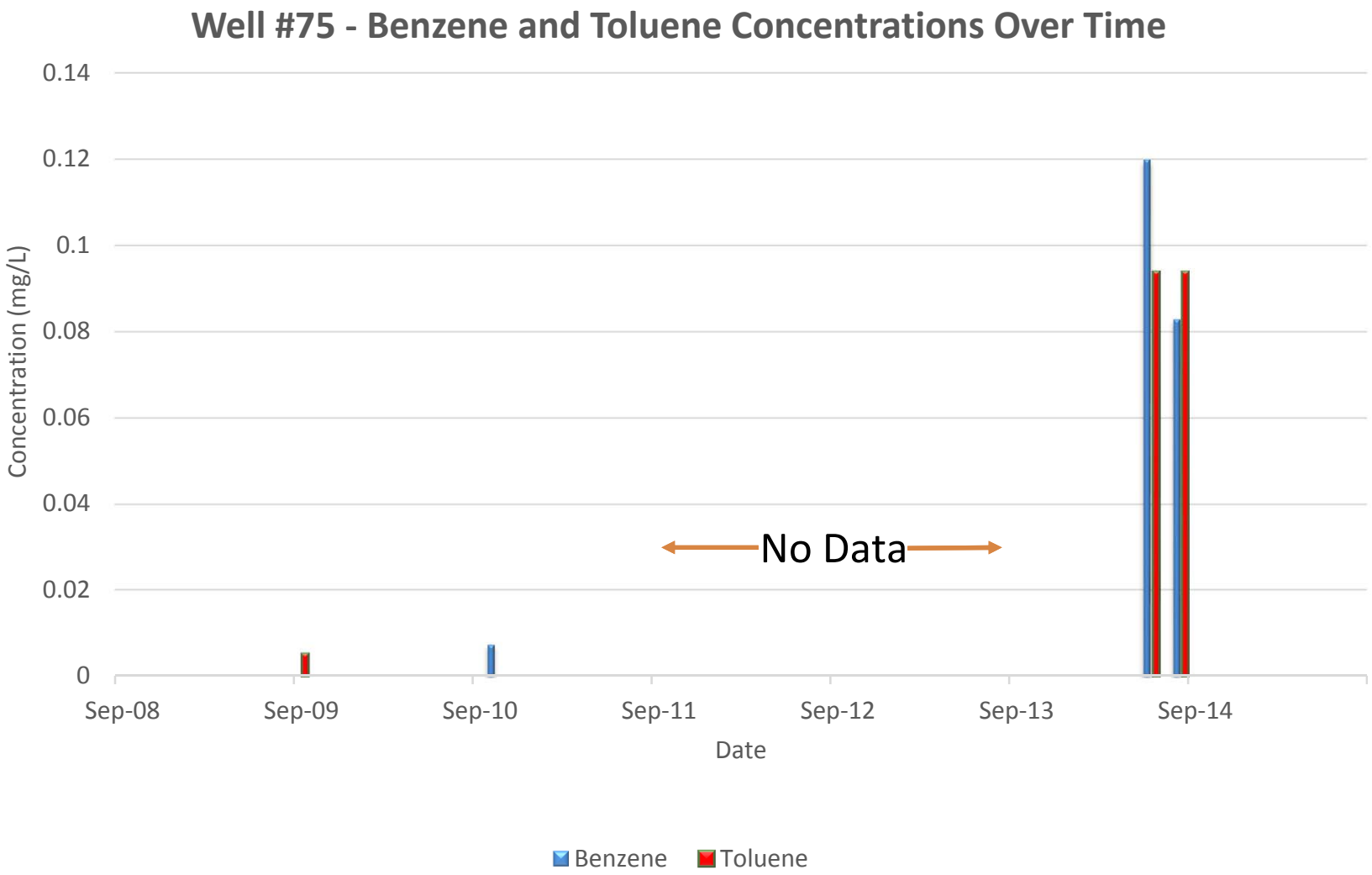


- Groundwater from Monitoring well #75 was historically analyzed for petroleum hydrocarbons (PHCs) from 2005 to 2010.
- The groundwater in well #75 historically contained concentrations of PHC Fractions F1 and F2 greater than current Alberta Tier 1 Guidelines.
- The groundwater in well #75 contained detectable concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) however concentrations were less than current Alberta Tier 1 Guidelines.
- No PHC product was encountered in well #75 from 2005 to 2010.

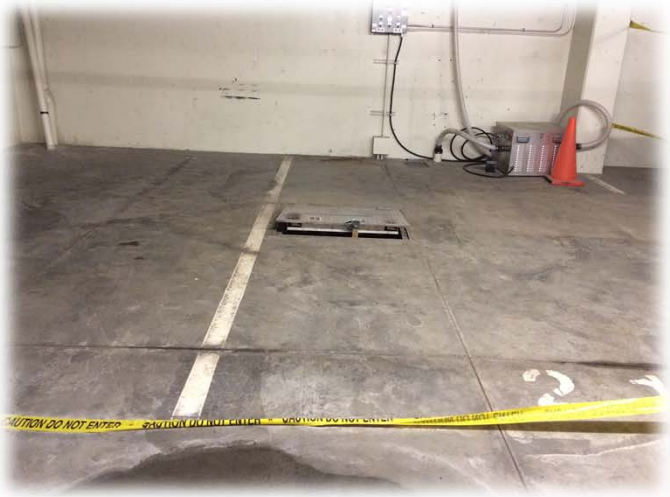
Let's Investigate - Initial Groundwater Assessment



What's the Story - Well #75



Other Potential Concerns - Building Weeping Tile and Underground Parkade Sump



- Groundwater is managed through the weeping tile system surrounding the building.
- The groundwater is collected in a sump located in the underground parkade.
- The water sampled from the sump contained concentrations of PHCs greater than regulatory guidelines.

Stakeholders' question – What is the source of the petroleum hydrocarbon impacts?

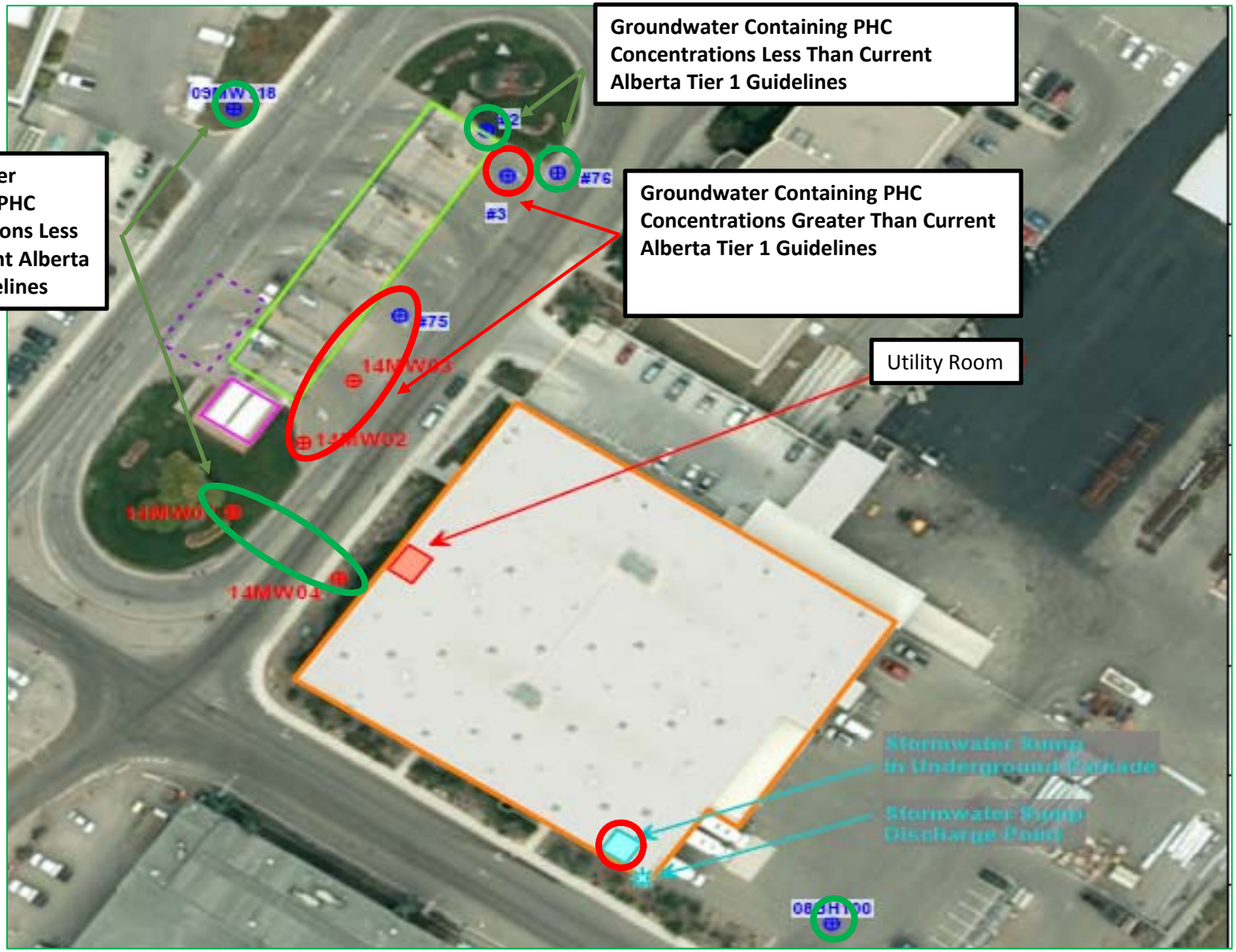
Sump Water Management

- Several methods were employed to contain and treat the impacted water.

Let's Investigate More - Phase II Environmental Site Assessment

A Phase II environmental site assessment (ESA) was conducted near the fueling area and commercial building:

- Four boreholes were advanced and groundwater monitoring wells were installed.
- Groundwater samples were collected from the newly installed and existing monitoring wells.


Groundwater Containing PHC Concentrations Less Than Current Alberta Tier 1 Guidelines
Groundwater Containing PHC Concentrations Less Than Current Alberta Tier 1 Guidelines
Groundwater Containing PHC Concentrations Greater Than Current Alberta Tier 1 Guidelines
Utility Room
#76
#3
#75
14MW02
14MW04
Stormwater Sump in Underground Carpark
Stormwater Sump Discharge Point

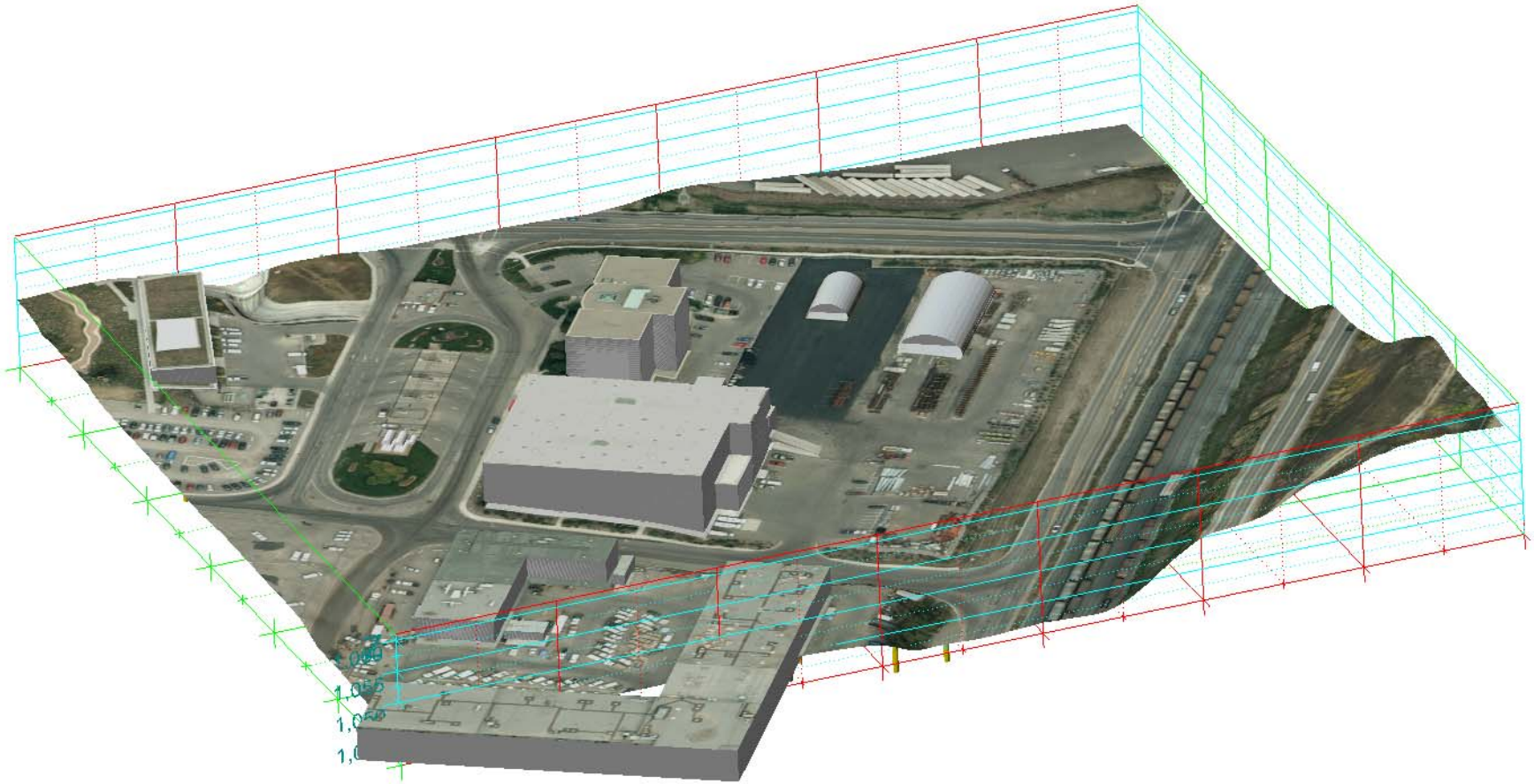
Conceptual Site Model

Tetra Tech EBA previously developed an all-encompassing CSM for the entire site.

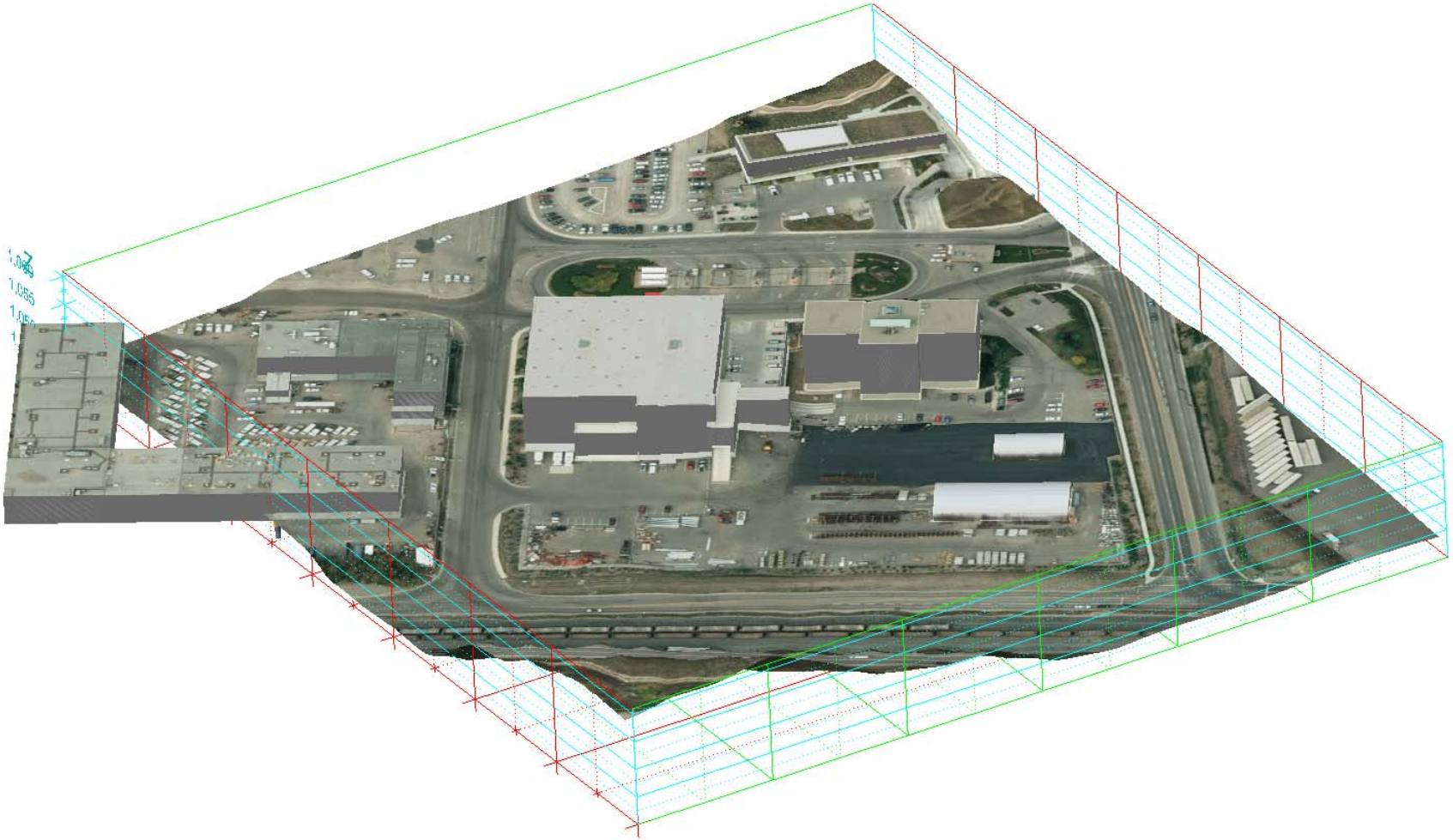
Our client requested that we refine our model to focus on the study area.

Using the site information gathered, we honed in on the study area to illustrated how surface features, infrastructure, subsurface geology, and hydrogeology interact, and presented it to stakholder.

Refining the Model - Site Area



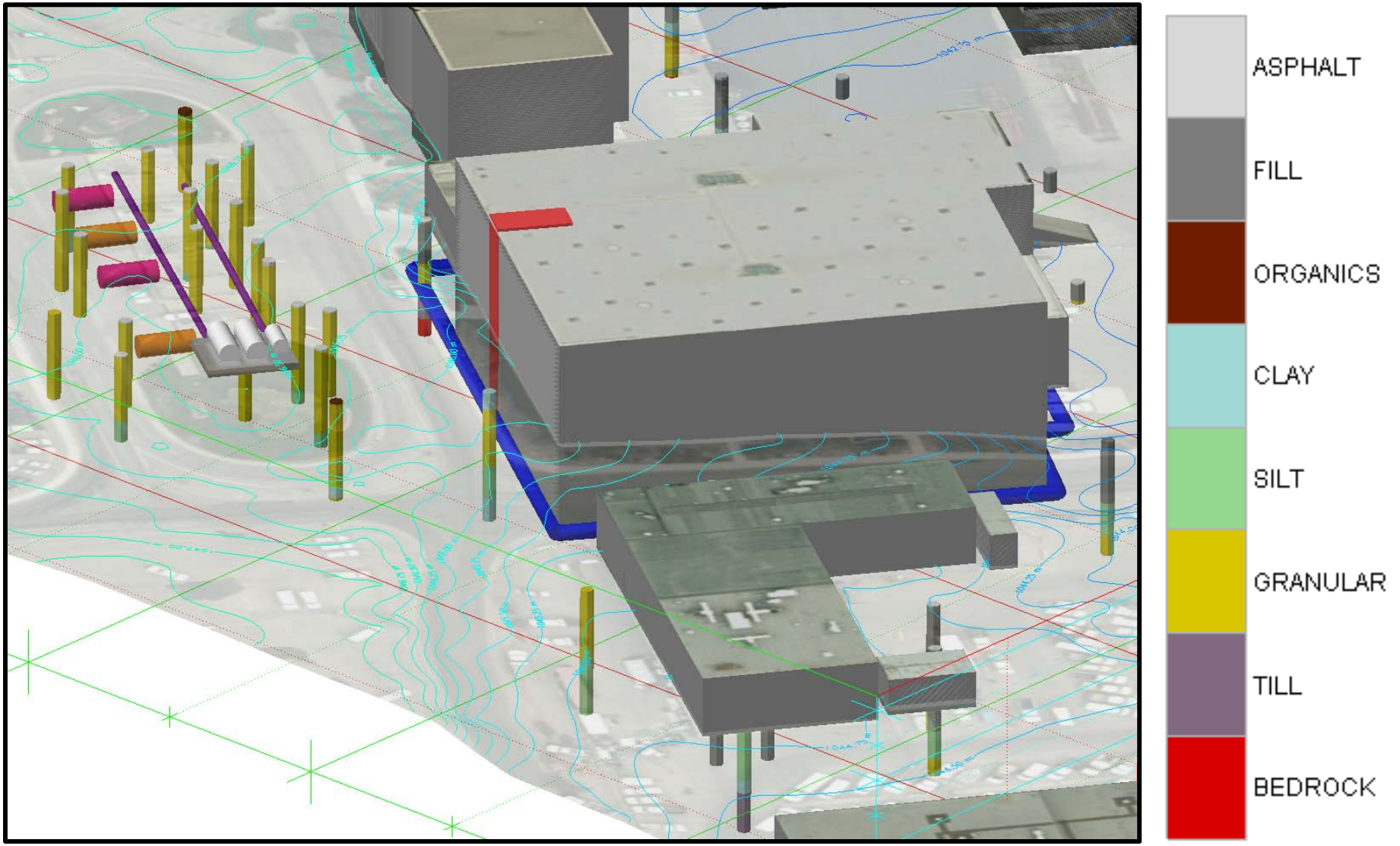
Site Area



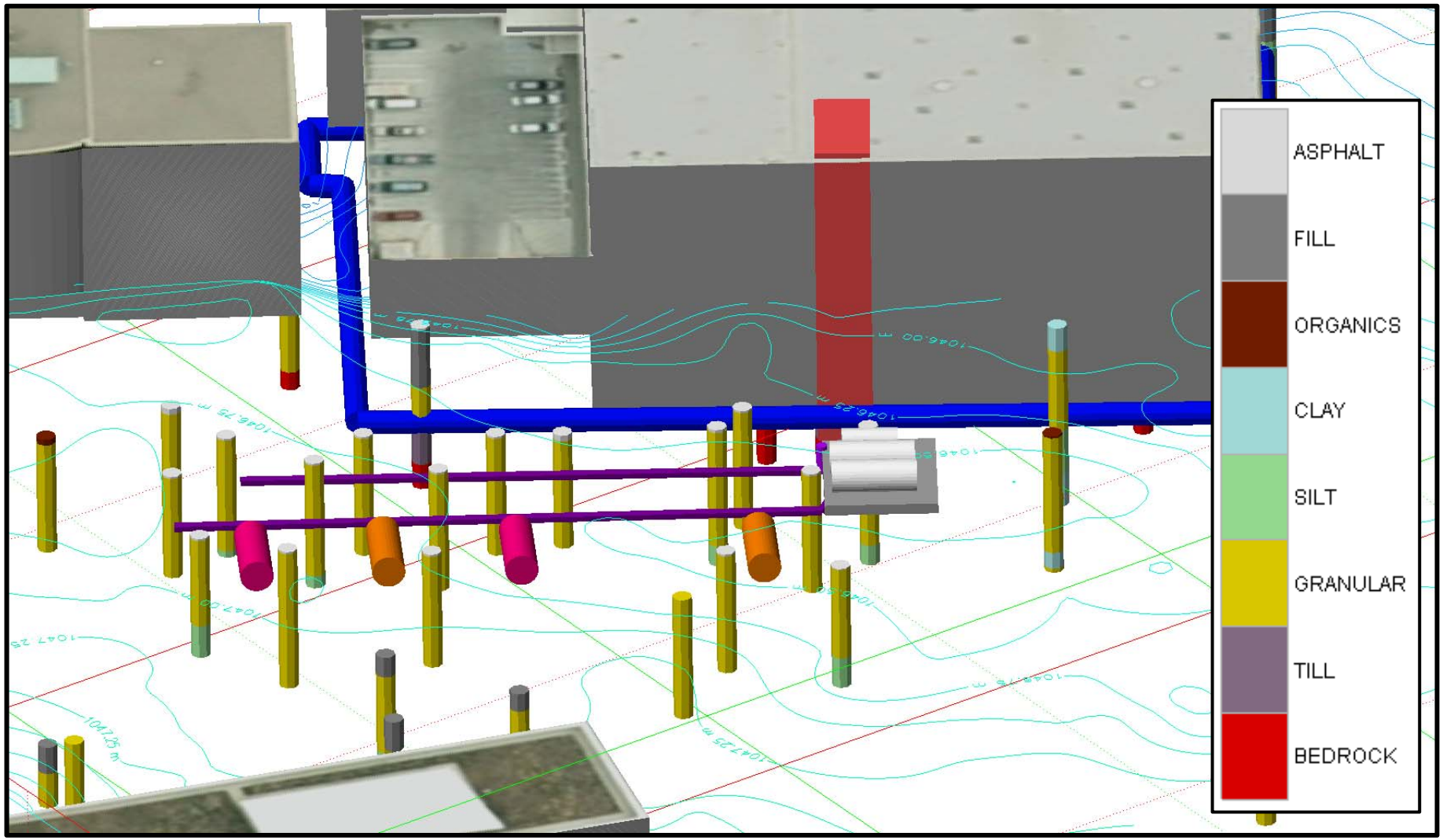
Commercial Building and Fueling Facility

Landscaped areas with irrigation

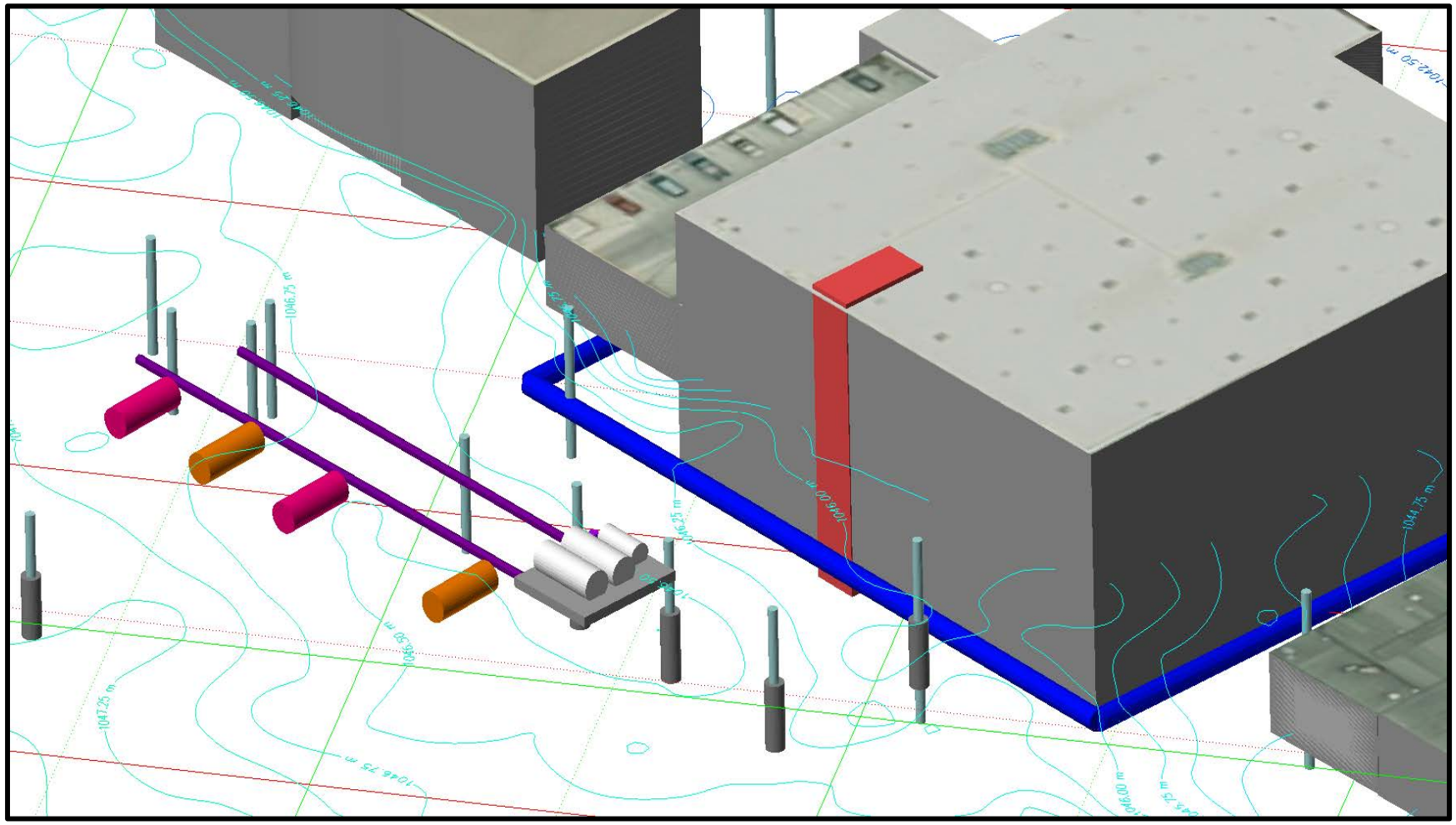
Geology (Pre-existing Borehole Information)

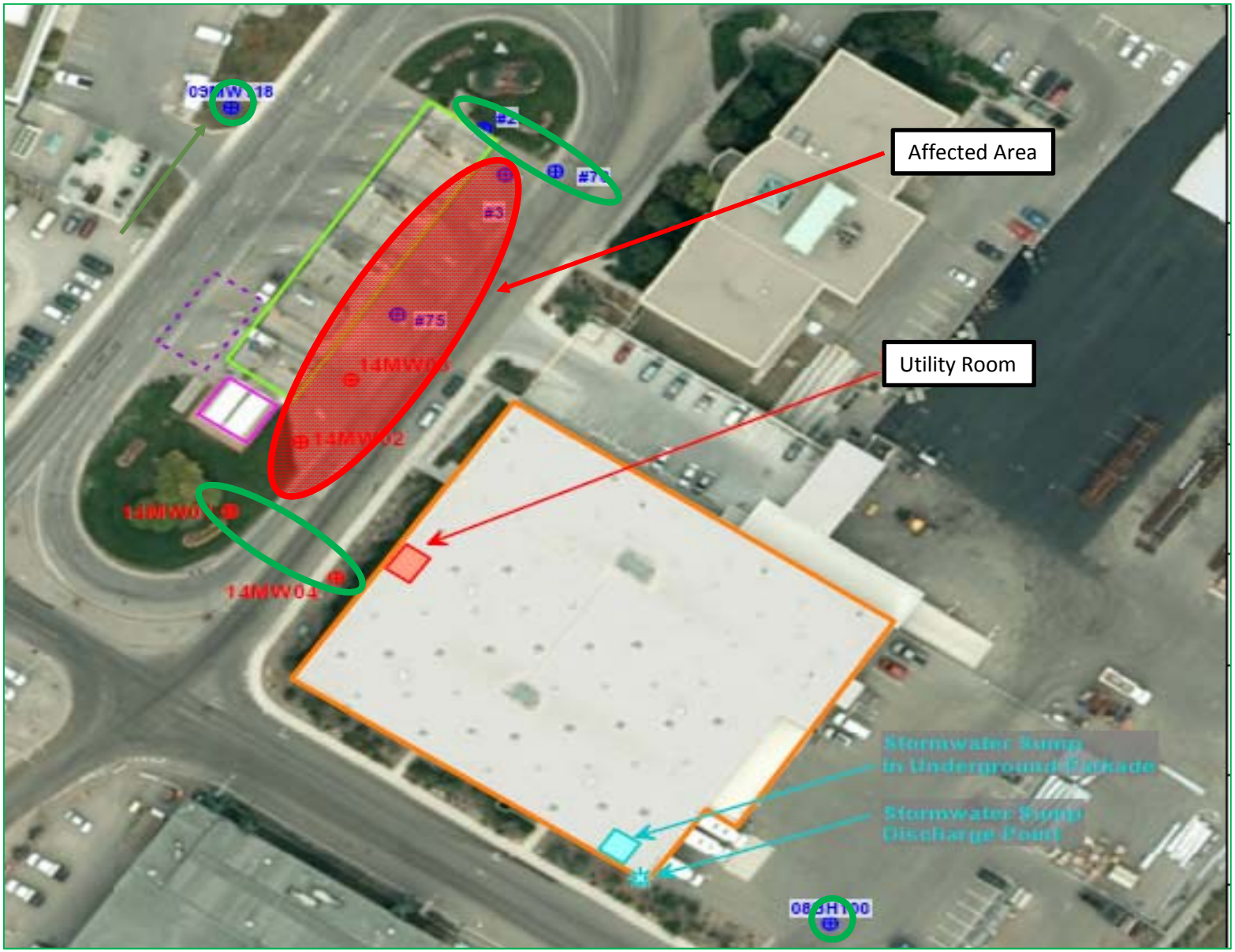


Geology (Pre-existing Borehole Information)

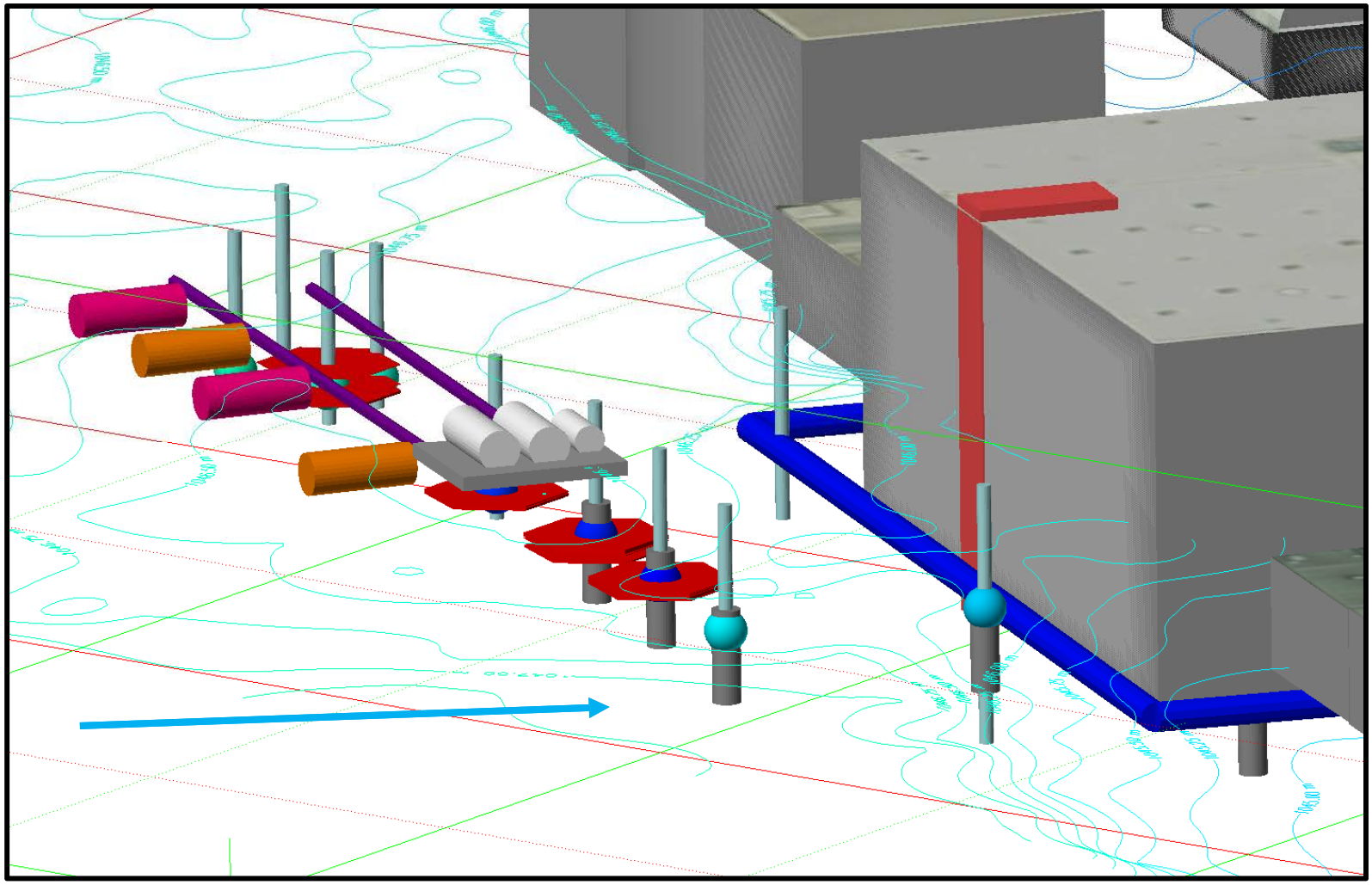


Location of Underground Infrastructure: Former USTs, Groundwater Monitoring Wells, and Weeping Tile

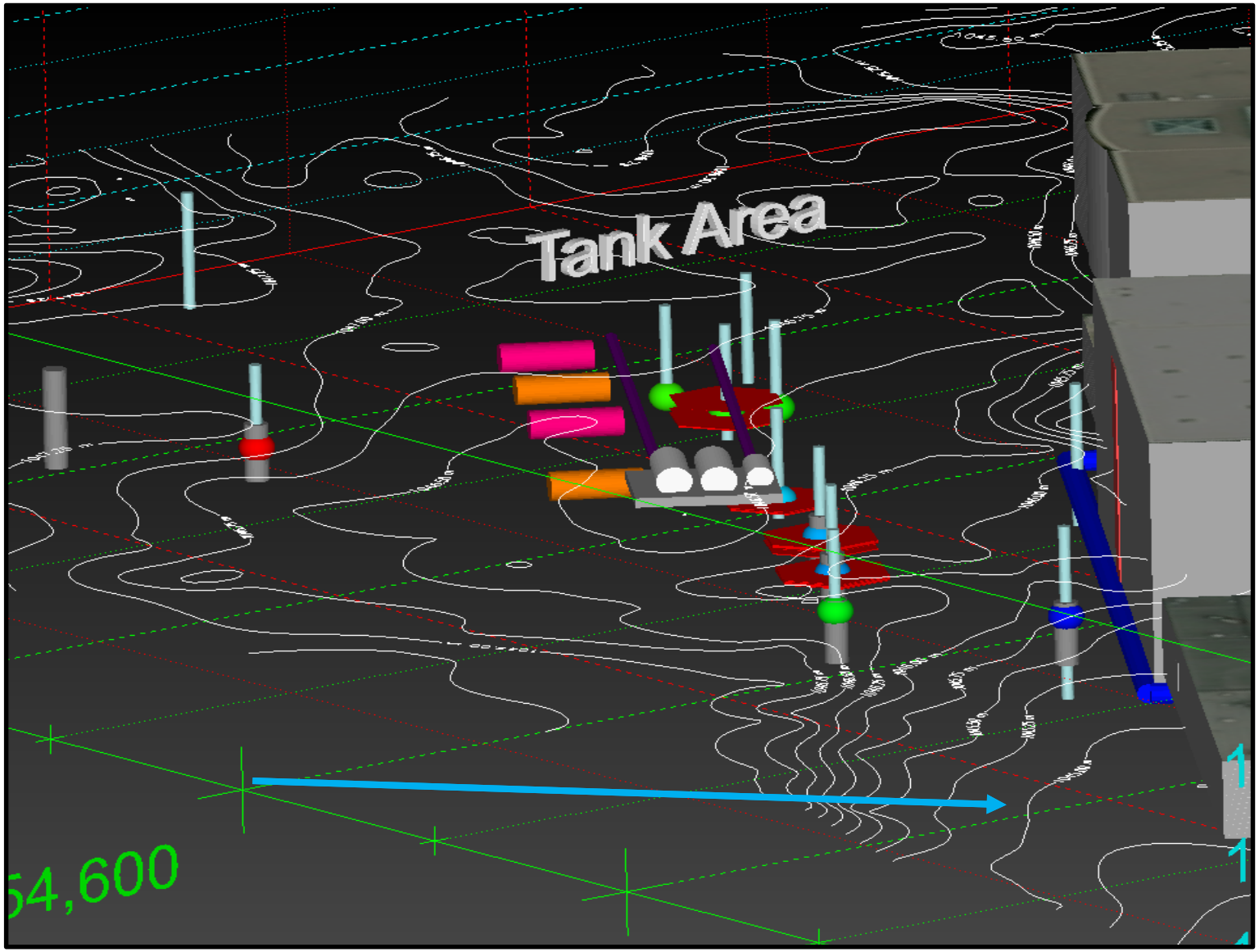



Affected Area
Utility Room
#3
#75
14MW03
14MW02
14MW04
Stormwater Sump
in Underground Cascade
Stormwater Sump
Discharge Point

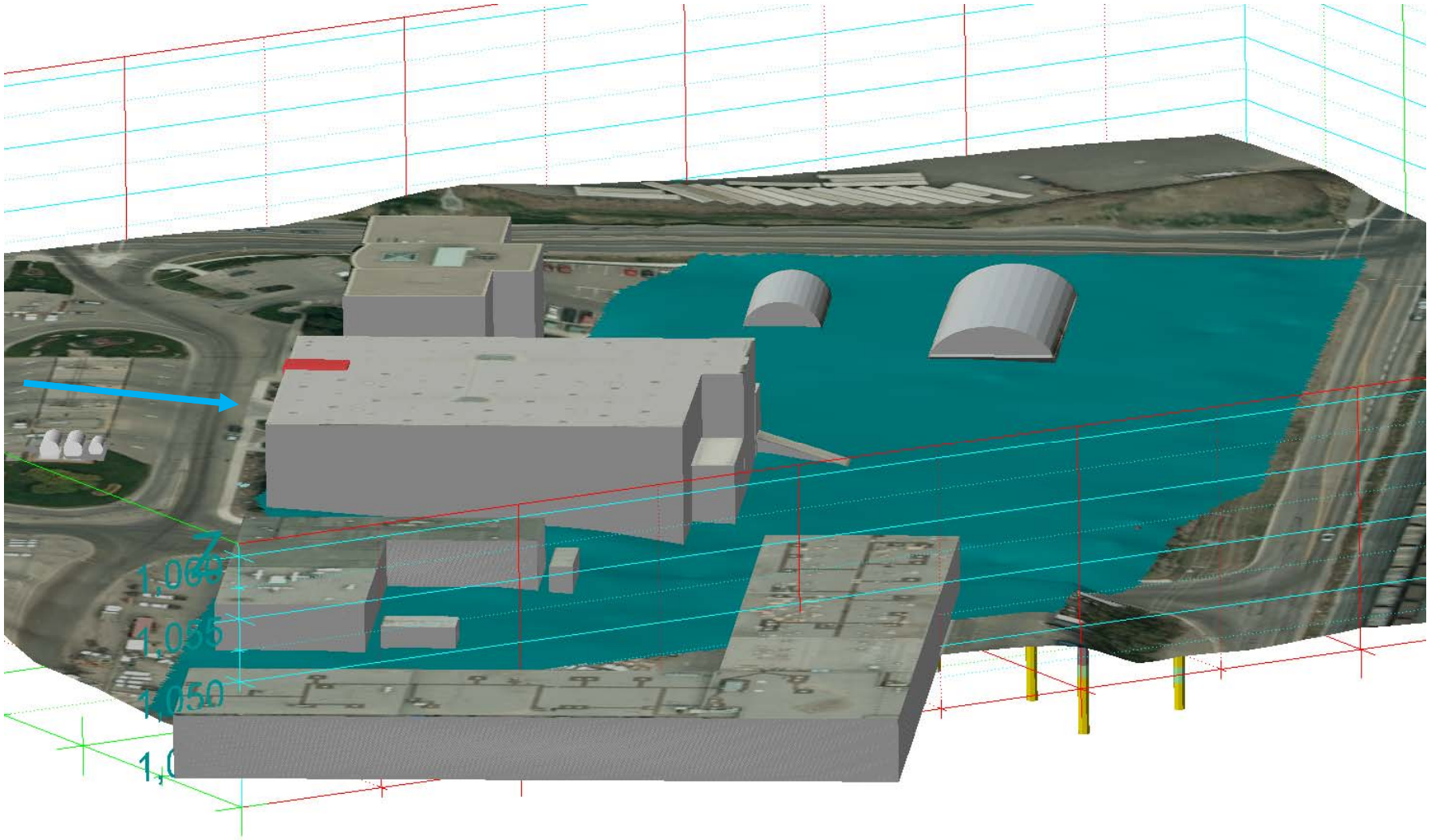
Site Data - Groundwater Elevations (spheres) and Liquid Product Results (red hexagons)



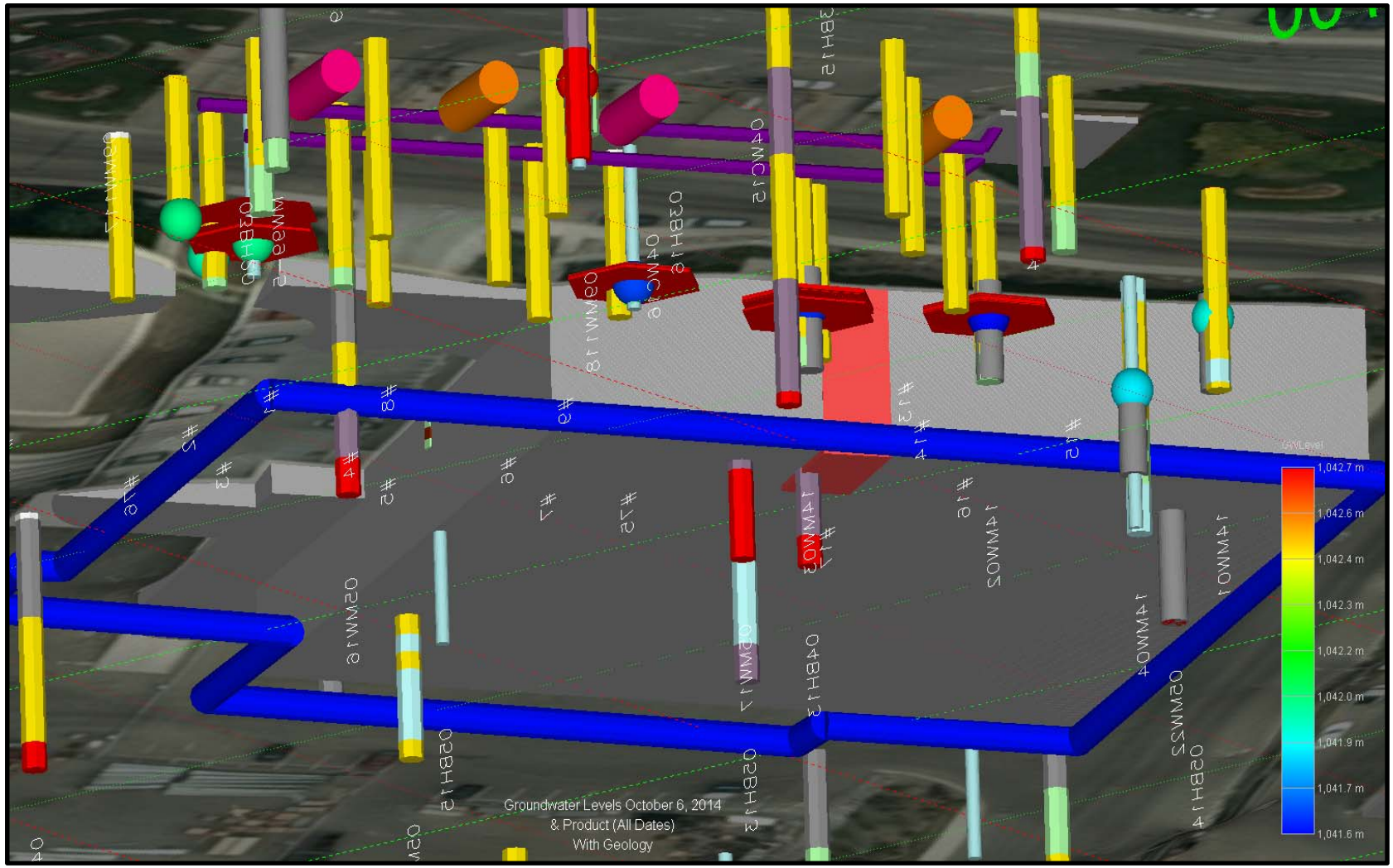
Groundwater – Overhead View



Known Ash Area



Geology and Groundwater Overview (Underground View)



What we helped stakeholders determine...

- The PHC impacts were from a new release and not from the buried ash.
- The odour in utility room was likely associated with the subsurface PHC impacts.
- The PHC impacts in the sump were likely associated with the impacted groundwater.

This work gave us a starting point and more importantly stakeholder agreement for managing the impacts and ultimately solving the issues.

1962 (*Alberta Environment and Sustainable Resource Development Aerial Photo Record System*)

Questions?

Thank You!

2014 (*Google Earth 2015*)