Phase 1 and Phase 2 Environmental Site Assessments:

The Importance of Understanding and Investigating Geological and Hydrogeological Conditions

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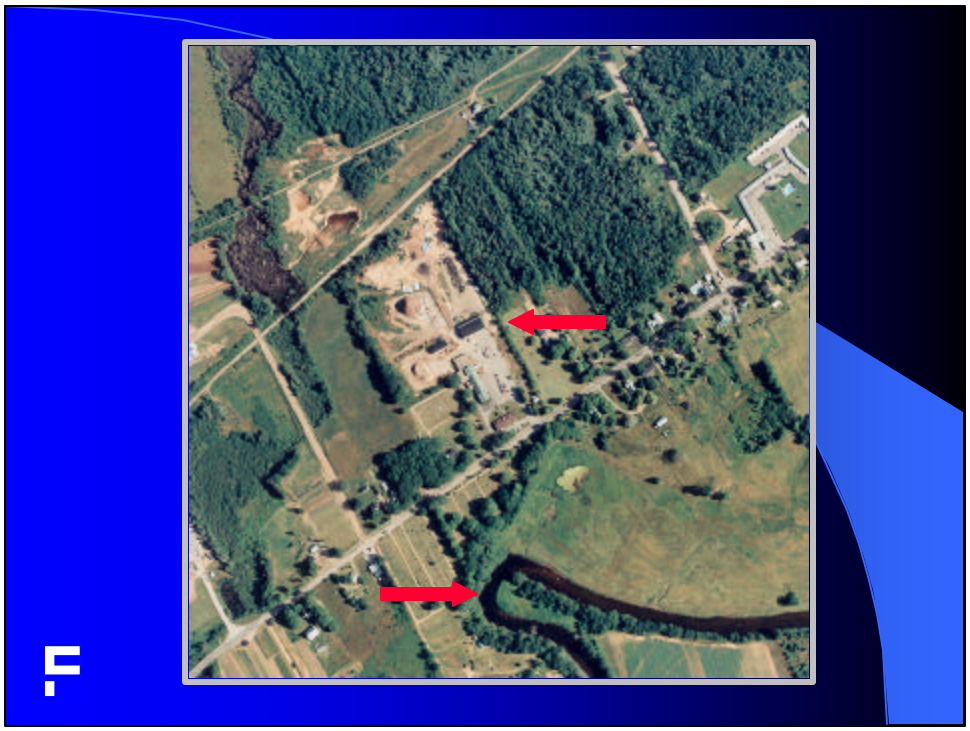
Current Situation / Basic Premise

- The importance of geology and hydrogeology in the assessment process (e.g., CSA Standard Z768-01) is often understated.
- Reviews of local and regional topographic maps, soil maps, and geological / hydrogeological maps continue to be listed as part of the Optional Records Review in the CSA Standard Z768 issued in 1994, reaffirmed in 1999, and revised in 2001.
- …. But this should be a mandatory requirement.



Purpose of a Phase 1 Environmental Site Assessment (ESA)

Identify actual and potential site contamination by:

- Records Review
- Site Visit
- Interviews
- Information Evaluation and Reporting

Site Assessor's Expertise

According to the CSA Standard, the Site Assessor is expected to have a "knowledge of"….

- Water/wastewater treatment and manufacturing processes
- Waste management
- Air emissions control
- Building sciences
- Geology and Hydrogeology

Site Assessor's Expertise (cont'd)

Thus, the level of formal education, skills, experience and training required by the Site Assessor in these areas should be clearly specified.

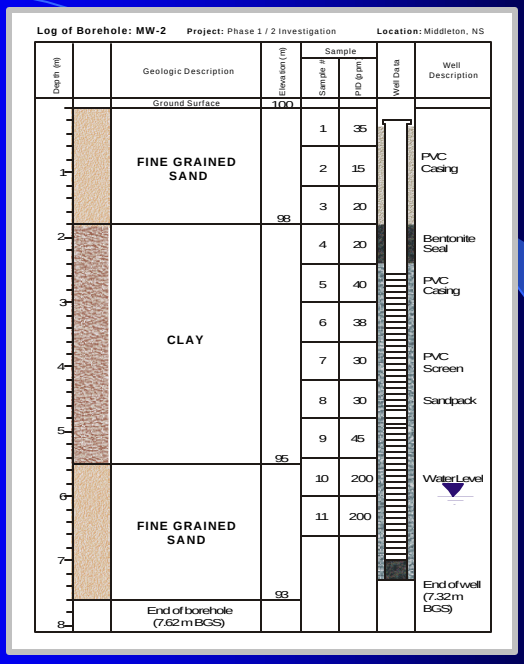
Results of Records Review

An earlier Phase 1 and 2 ESA report showed that:

- Three USTs had been removed, including a 33,000 L steel, riveted, waste oil UST
- Significant hydrocarbon contamination was discovered when removing the waste oil tank
- Free product oil was observed at the base of the excavation and about 200 L were removed

Results of Records Review (cont'd)

- 192 tonnes of contaminated soil were hauled off site, while the clean soil was stockpiled on site
- One sample of stockpiled soil contained 960 mg/Kg TPH, but was considered anomalous (i.e., no staining and only a faint odour)
- The excavation was backfilled with the approval of DOE and no further work was recommended by the consultant



Concerns with the earlier Phase 1 & 2 ESA report include:

- The directions of groundwater flow were assumed and not determined
  - Shallow groundwater flow was assumed to follow the site topography, northwest toward the rear of the property
  - Deeper groundwater flow was assumed to follow the regional surface topography, southwest toward the Annapolis River

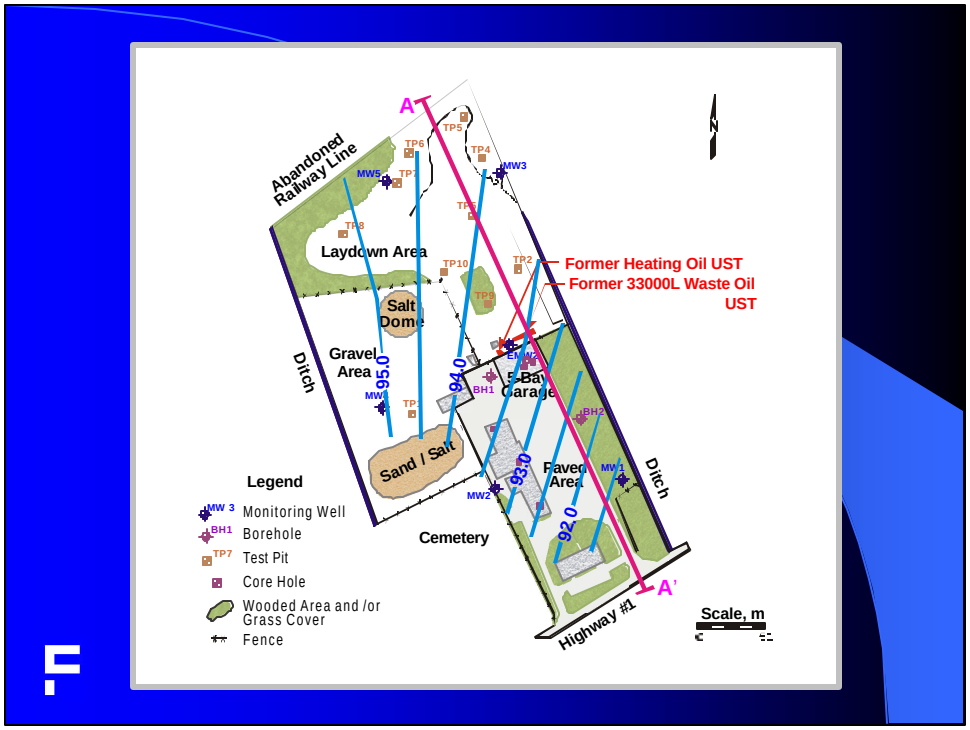
Concerns with the earlier Phase 1 & 2 ESA report include: (cont'd)

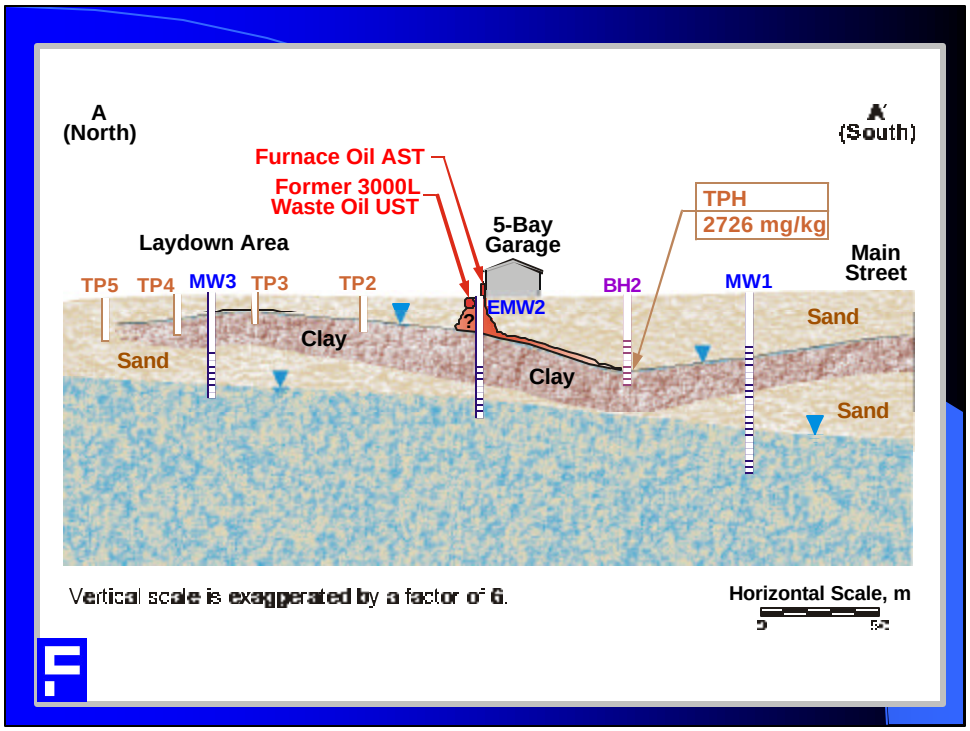
- The clay was described as a confining layer on the basis of a very limited drilling program and there was no evidence in the report to suggest that the area geology and hydrogeology maps had been thoroughly reviewed.
- The earlier report did not reflect the level of understanding of the geological and hydrogeological conditions that is needed to clearly define the potential contaminant risks in such a complex site.

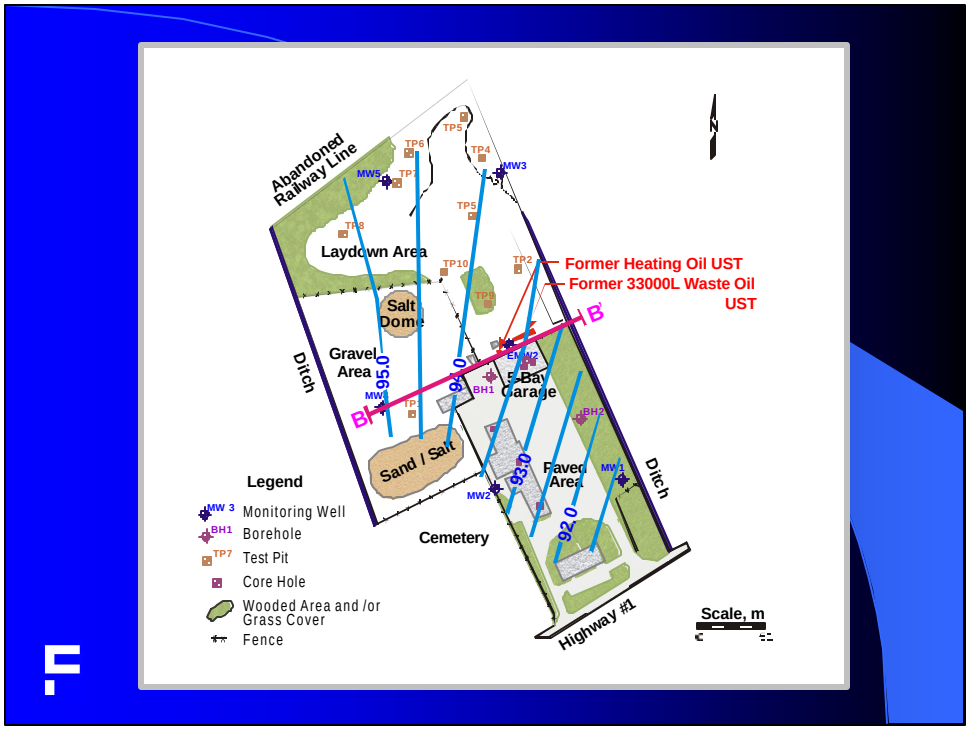
Fracflow's Phase 1 findings included a recommendation to proceed with a Phase 2 ESA.

The subsurface program was designed to investigate the vertical and lateral extent of the clay layer and:

- Its possible effect on spill migration underneath the garage
- The risk of groundwater contamination on other areas of the property


A
A'
Abandoned Railway Line
Laydown Area
Salt Dome
Gravel Area
Ditch
Former Heating Oil UST
Former 33000L Waste Oil UST
5-Bay Garage
Sand / Salt
Paved Area
Ditch
Cemetery
Highway #1
95.0
94.0
93.0
92.0
Legend
Monitoring Well
Borehole
Test Pit
Core Hole
Wooded Area and /or Grass Cover
Fence
Scale, m


A
(North)
A'
(South)
Furnace Oil AST
Former 3000L Waste Oil UST
TPH
2726 mg/kg
Laydown Area
5-Bay Garage
Main Street
TP5
TP4
MW3
TP3
TP2
BH2
MW1
EMW2
Sand
Clay
Sand
Clay
Sand
Vertical scale is exaggerated by a factor of 6.
Horizontal Scale, m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Ditch
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Highway #1
Former Heating Oil UST
Former 33000L Waste Oil UST
B
B'
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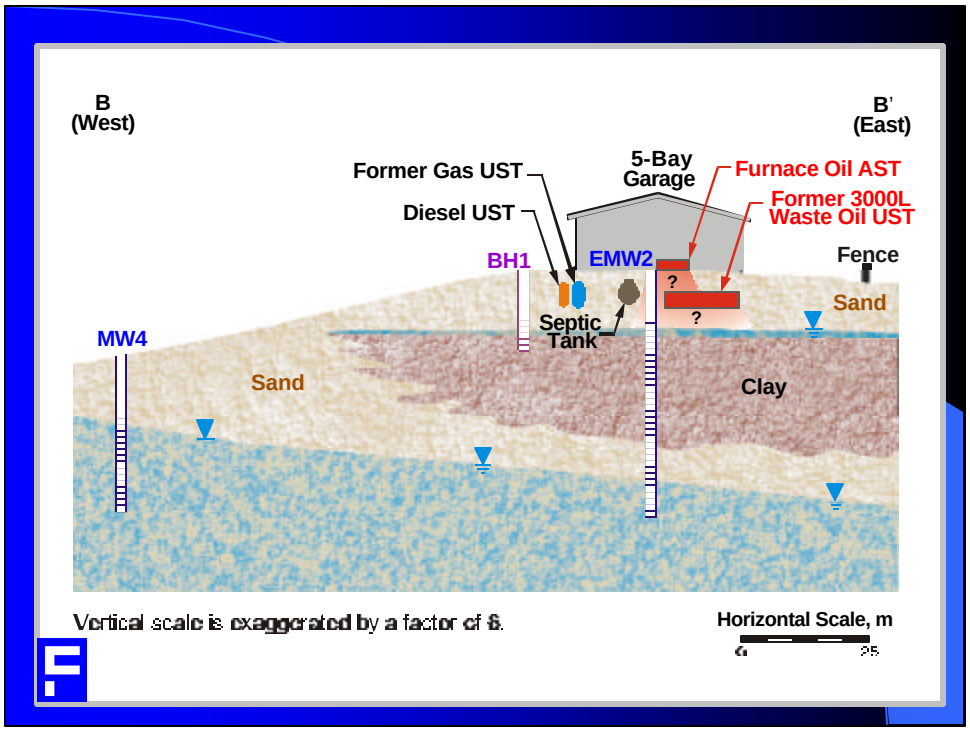
Borehole
Test Pit
Core Hole
Wooded Area and /or Grass Cover
Fence
Scale, m


B
(West)
B'
(East)
Former Gas UST
Diesel UST
5-Bay Garage
Furnace Oil AST
Former 3000L Waste Oil UST
BH1
EMW2
Fence
Septic Tank
Sand
MW4
Sand
Clay
Vertical scale is exaggerated by a factor of 6.
Horizontal Scale, m

Summary and Conclusions

- An incomplete assessment of the subsurface geology and hydrogeology of a complex site such as this will lead to an understatement of the associated risks of contamination from a variety of on site sources
- Site-specific geological and hydrogeological information cannot be interpreted without understanding the more "local to intermediate" geological and hydrogeological framework

Summary and Conclusions (cont'd)

- Section 7.1.7.1 of CSA Standard Z768-01, "Geological and Soil Maps", should be part of the Mandatory Records Review and not part of the Optional Records Review.

Proposal for Change

- We firmly feel that Geology and Hydrogeology map reviews should be part of the CSA's Mandatory Records Review.
- If you agree, please complete the Proposal for Change Form and submit to the CSA.

Proposition de modification

N'hésitez pas à nous faire part de vos suggestions et de vos commentaires. Au monent de soumettre des propositions de modification aux normes CSA et autres publications CSA prière de fournir les renseignements demandés ci-dessous et de formuler les propositions sur une feuille volante. Il est recommandé d'inclure

- le numéro de la norme/publication
- le nuuméro de l'article, du tableau ou de la figure visé
- la formulation proposée
- las rasion de cette modification.

Proposal for change

CSA welcomes your suggestions and comments. To submit your proposals for changes to CSA Standards and other CSA publications, please supply the information requested below and attach your proposal for change on a separate page(s). Be sure to include the

- Standard/publication number
- relevant Clause, Table, and/or Figure number(s)
- wording of the proposed change
- rationale for the change.

Nom/Name: _____

Affillation: _____

Adresse /Address: _____

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Ville/City: _____

État/Province/State: _____

Pays/Country: _____ **Code postal/Postal/Zip code:** _____

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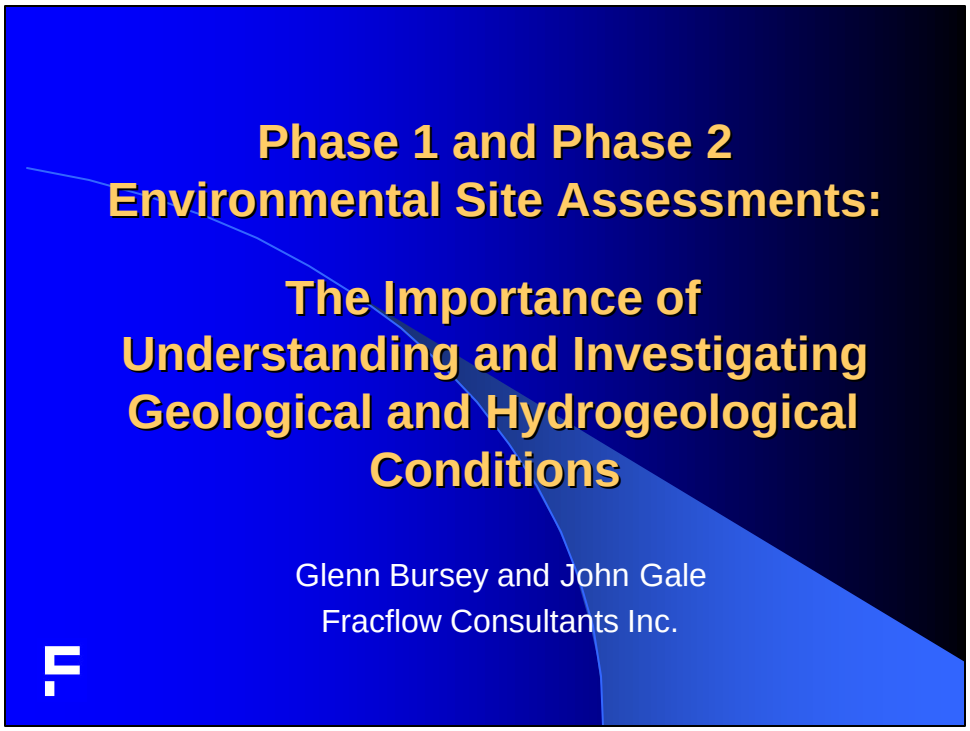
Date: _____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