

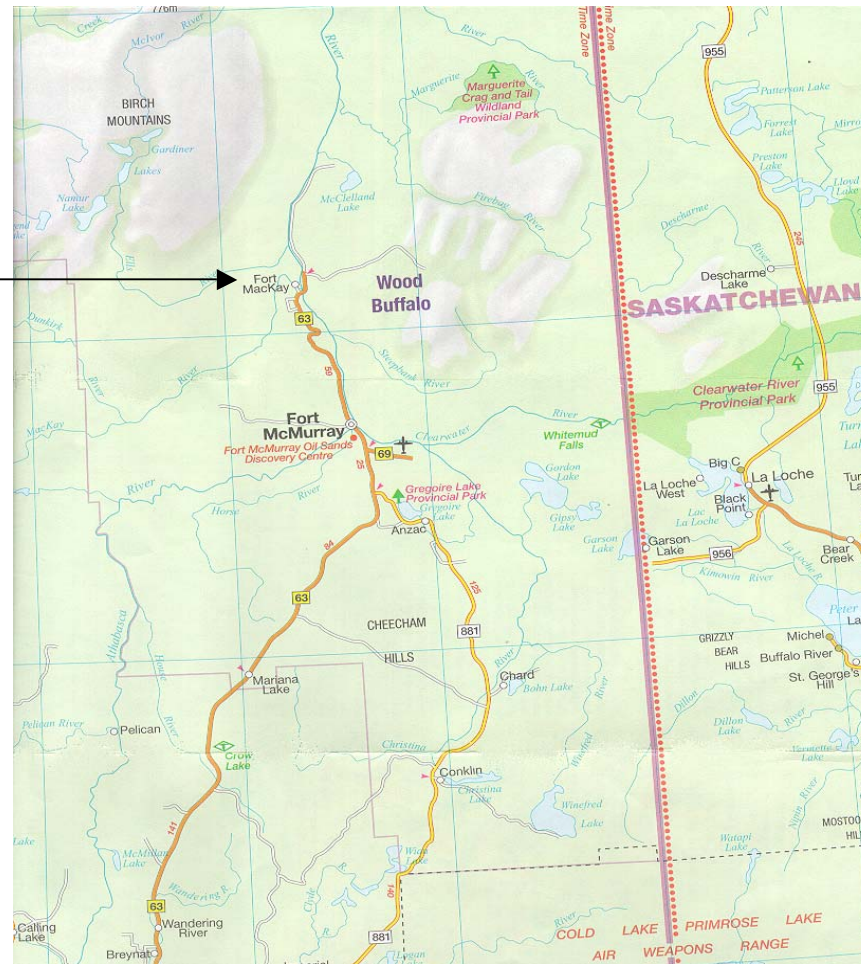
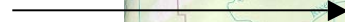
# LOW DISTURBANCE AND LIMITED ACCESS IN-SITU SOIL AND GROUNDWATER BIOREMEDIATION

Presented by:

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# Site Location Map

Fort McKay



# Background

- A fiberglass UST installed in 1991
- Land transaction resulted in Phase I ESA
- Spring 2000 Phase II ESA (around UST)
- Fall 2002 UST removed
- Groundwater Delineation Completed (~35 m<sup>3</sup> of gasoline)

# Background cont...

- Building Air Sparging (AS) and Soil Vapour Extraction (SVE) systems installation
- Spring 2001 Hydrocarbon Free Phase Extraction (MPE 50 HP)
- Fall 2001 In-Situ Site Bioremediation
- AS and SVE

# Site Physical Settings



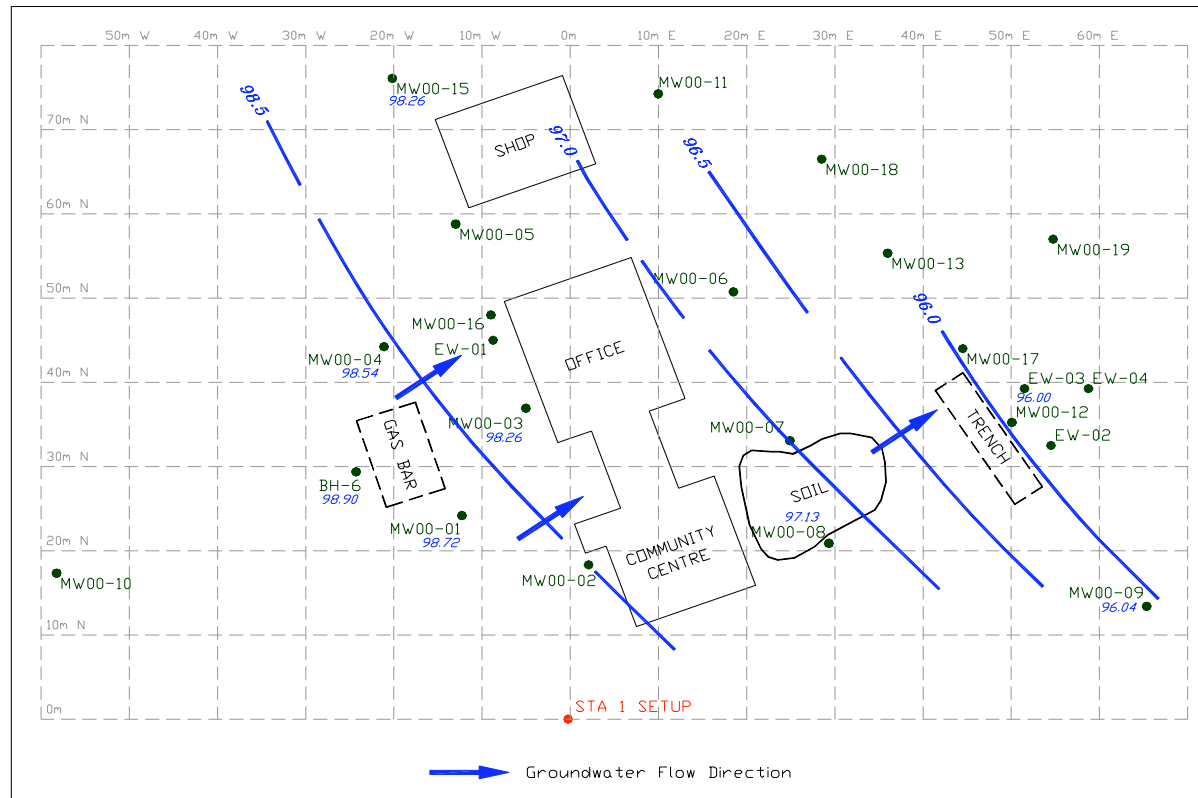
# Site Physical Settings

- First Nation Community
- Grade sloped towards the river
- Shallow Groundwater
- Silty clay and sand till
- Near Athabasca Oil Sand deposits

# Project Challenges

- Severe weather conditions (Northern Climate)
- Semi-remote area with limited resources
- Limited access to the LNAPL free phase and contaminated groundwater
- Implementation of H&S program to protect the building occupants from the VOCs

# Site Plan





# What Happened

- Materials used for the UST installation were not as required by the AENV guidelines

# UST Removal

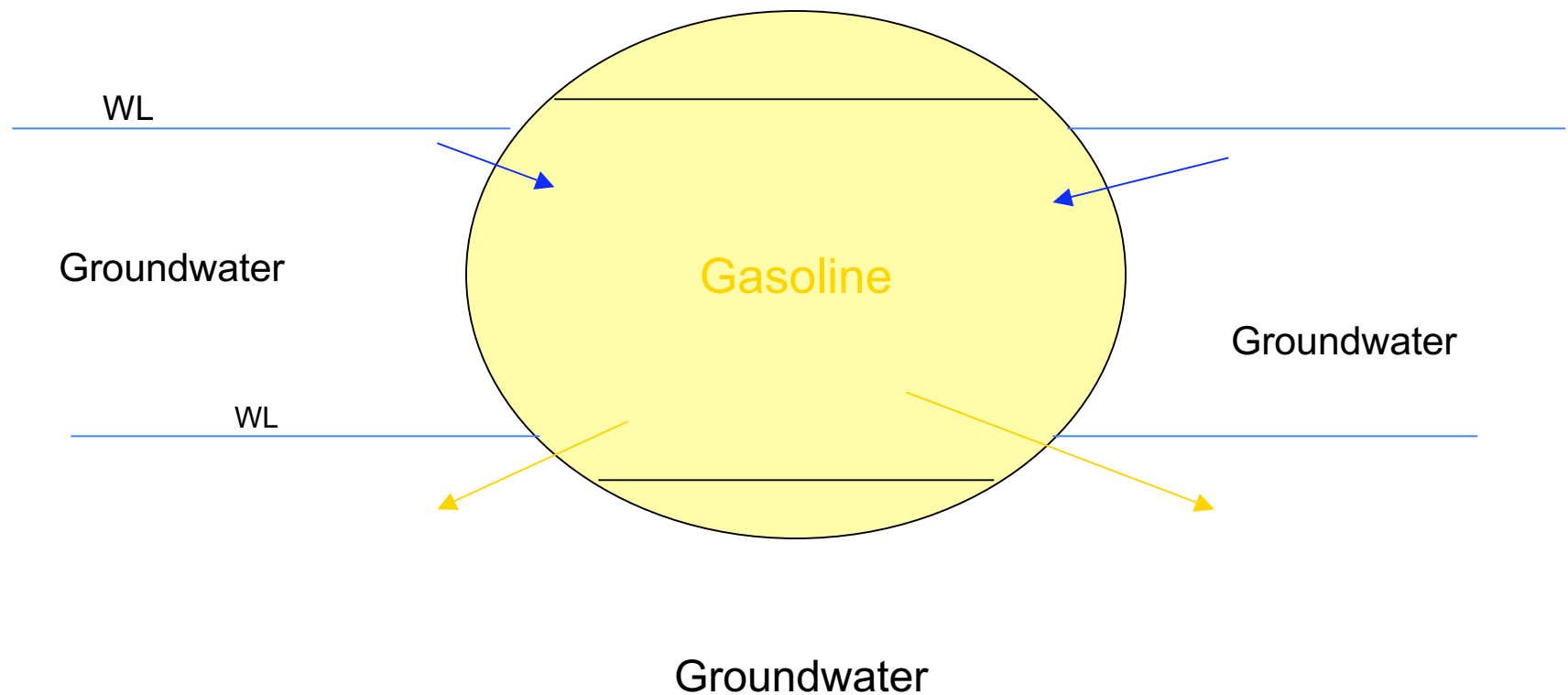




# UST Removal



# UST Leakage



# Gasoline in Soil (~10 m E)

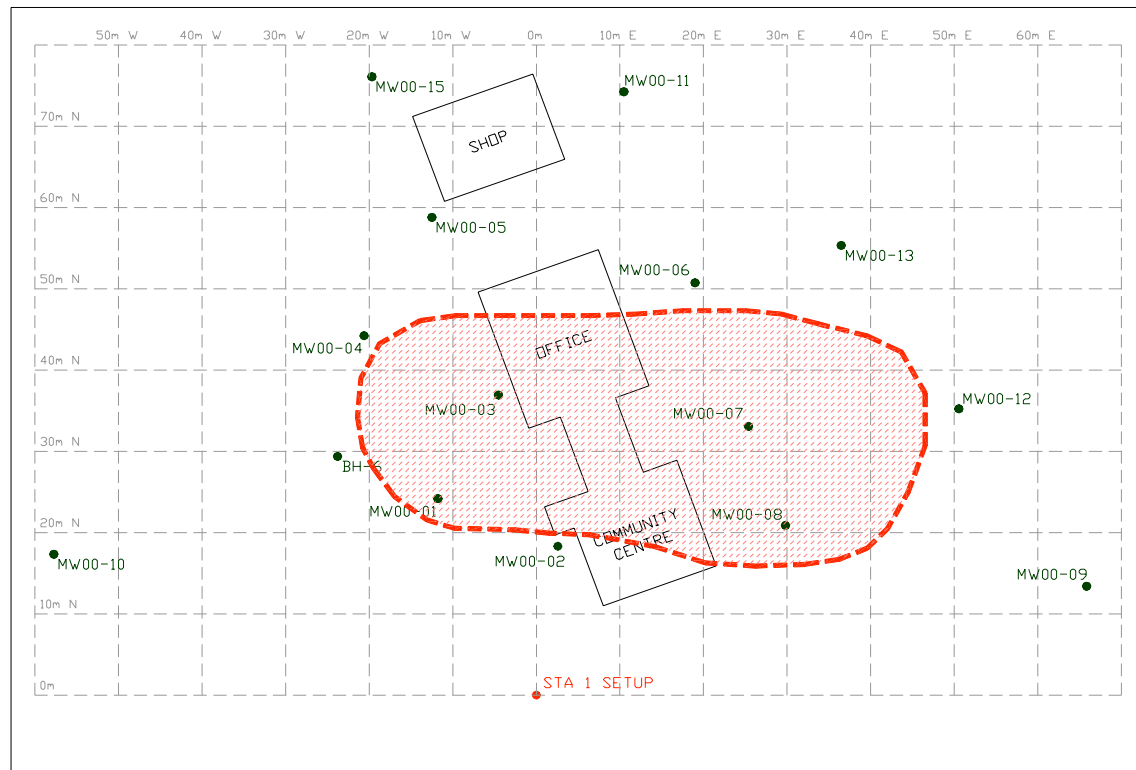




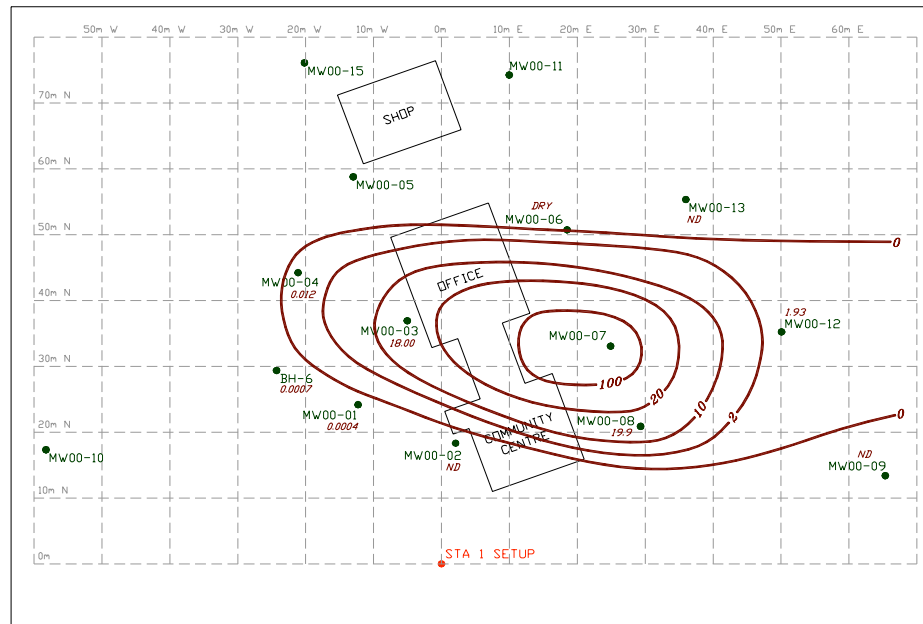
# Gasoline in Soil (~10 m N)



# HC Free Phase Distribution Map



# Benzene Concentration Distribution Map (Oct. 2000)





# Building SVE



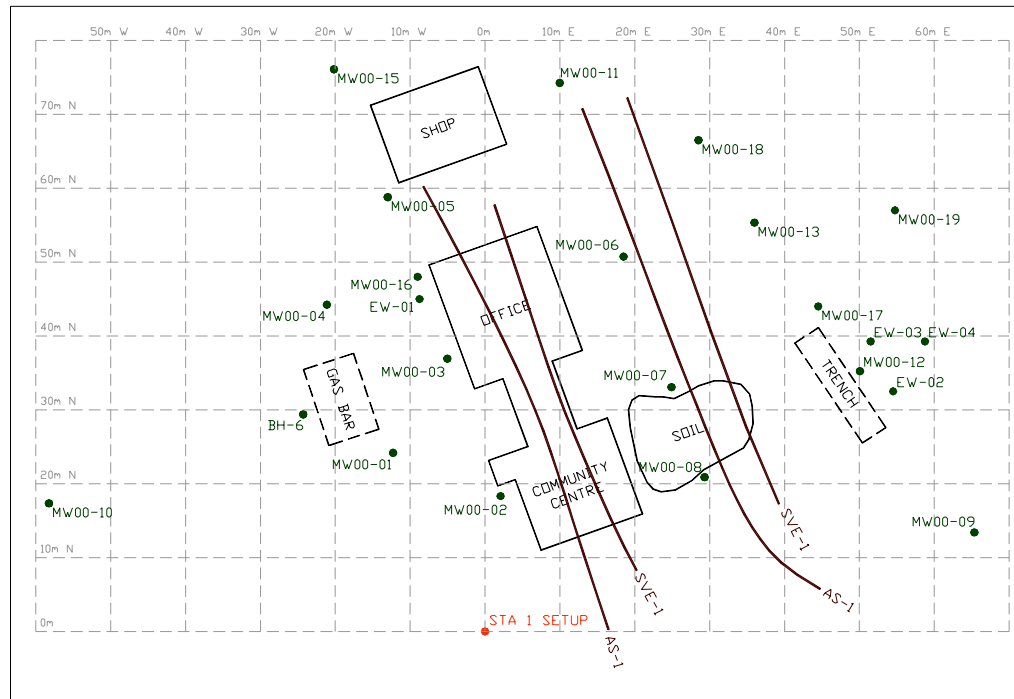
# Building SVE cont...



# Remediation Program

- In-Situ Soil and Groundwater Bioremediation
- HC Free Phase Extraction
- Air Sparging (AS)
- Soil Vapour Extraction (SVE)

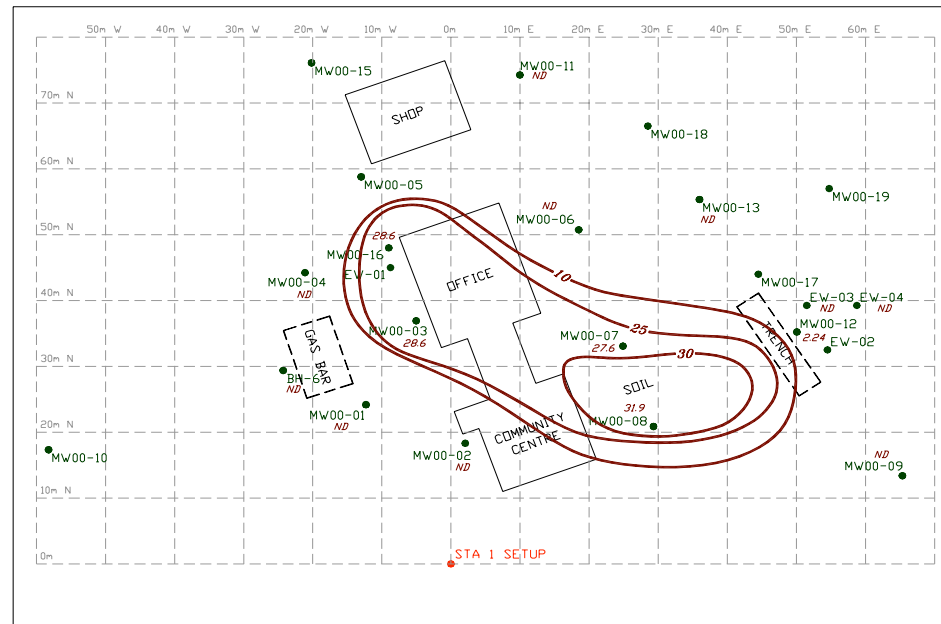
# AS and SVE Wells



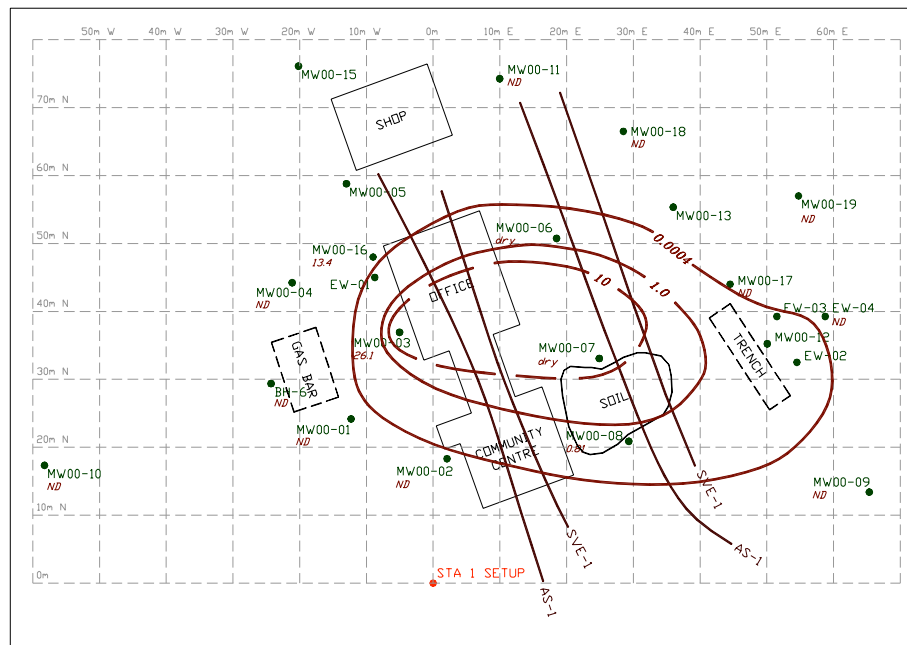
# AS and SVE Wells

- AS wells installed at ~4 m
- SVE wells installed at ~1.8 m

# Benzene Concentration Distribution Map (Oct. 2001)



# Benzene Concentration Distribution Map (Oct. 2002)





# Soil Treatment Area Preparation





# Gasoline Extraction



# Tank Storage



18. 10. 2000