

# HAMPDEN INFRASTRUCTURE COMMITTEE MEETING

## PINE TREE LANDFILL

DECEMBER 19, 2016

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### OVERVIEW OF PRESENTATION:

- Review of Landfill Construction and Closure Status
    - Review of Construction History
    - Leachate Recirculation
    - Geotechnical Monitoring – Slopes and Settlement
  - Corrective Actions
    - Pathways of Migration from Landfill
    - Corrective Actions
  - Water Quality Assessment
    - Sources of Impact to Groundwater
    - Resulting Effects on Water Quality
    - Trends in Water Quality
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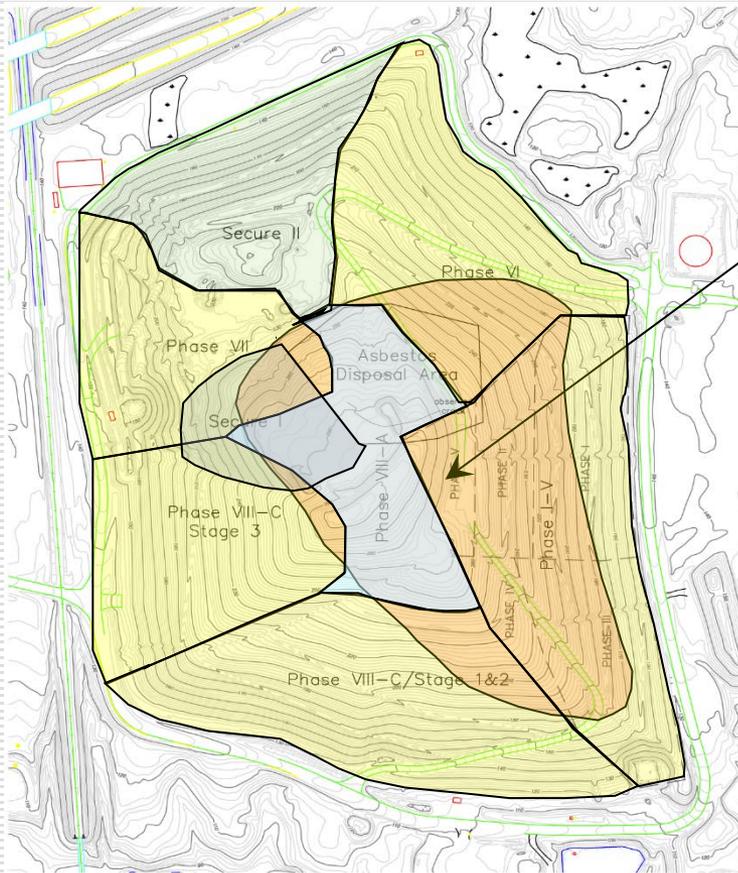
# Landfill Development History

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- Waste Disposal began in the early 1970's (site formerly know as the Sawyer Environmental Recovery Facility)
    - This initial facility was unlined
    - Later increased to include:
      - An Asbestos Disposal area
      - Secure I and Secure II Landfills.
  - 1992: Expanded to include Phases I through V of the Secure III Landfill, and later Phases VI through VIII.
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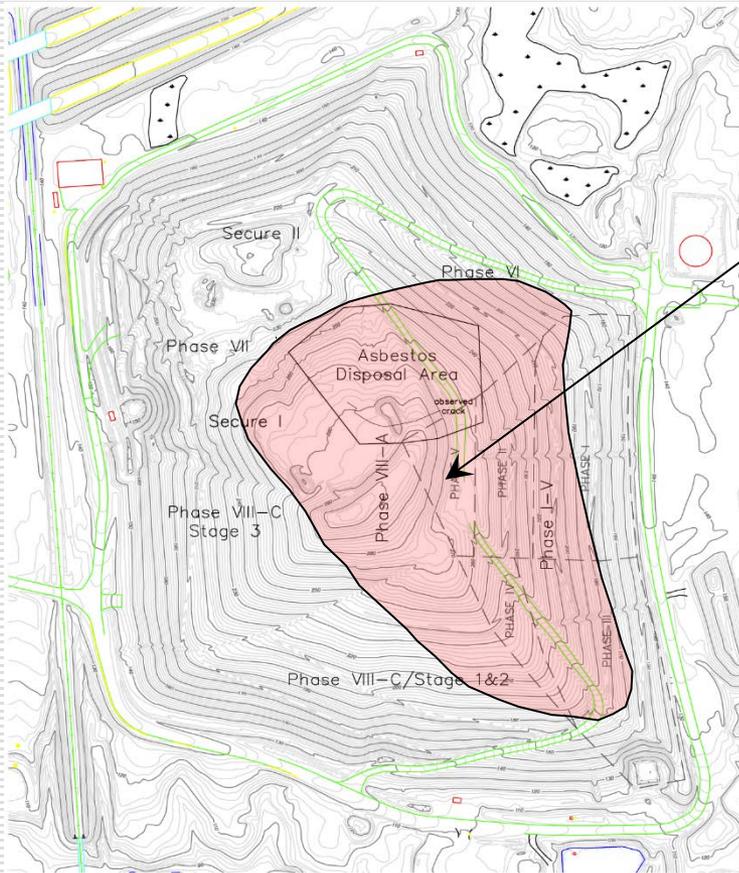
# Landfill Development History

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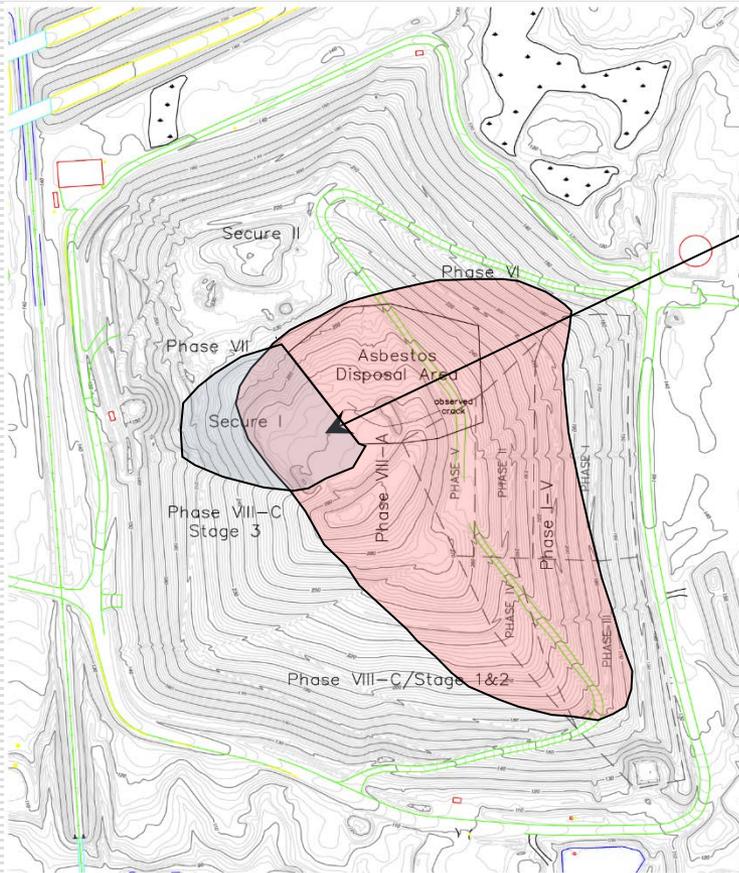
Conventional Landfill

# Landfill Development History



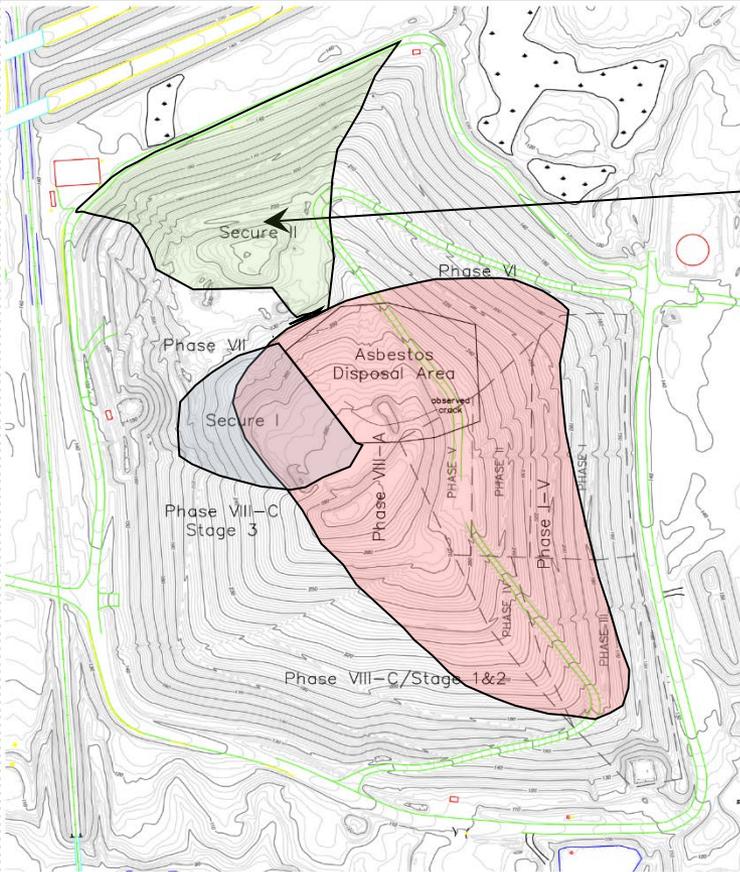
Conventional Landfill

# Landfill Development History



Secure I added

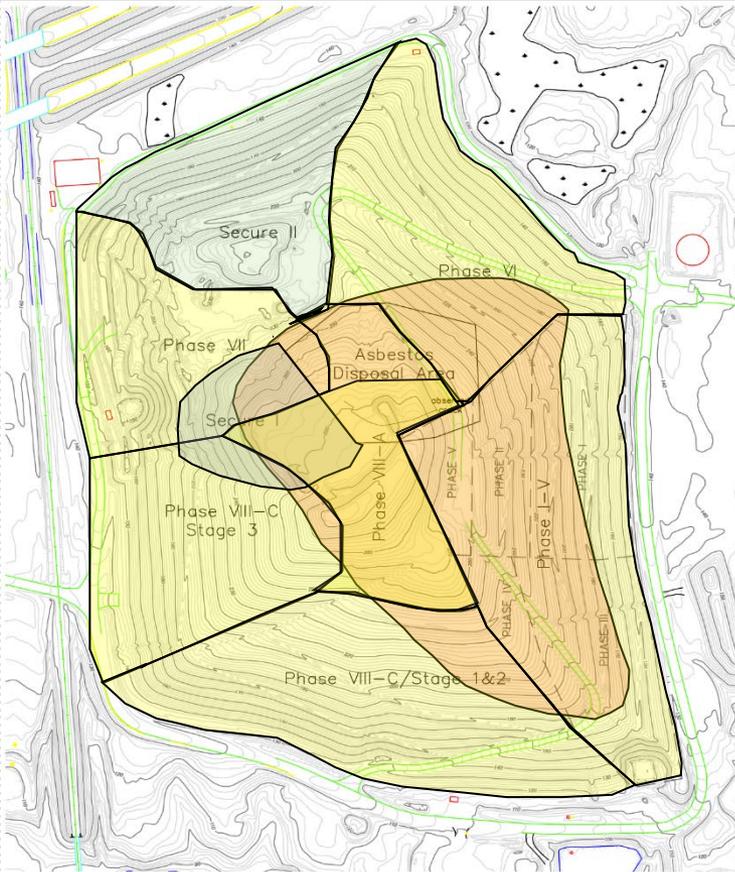
# Landfill Development History



Secure II Added (lined facility)

# Landfill Development History

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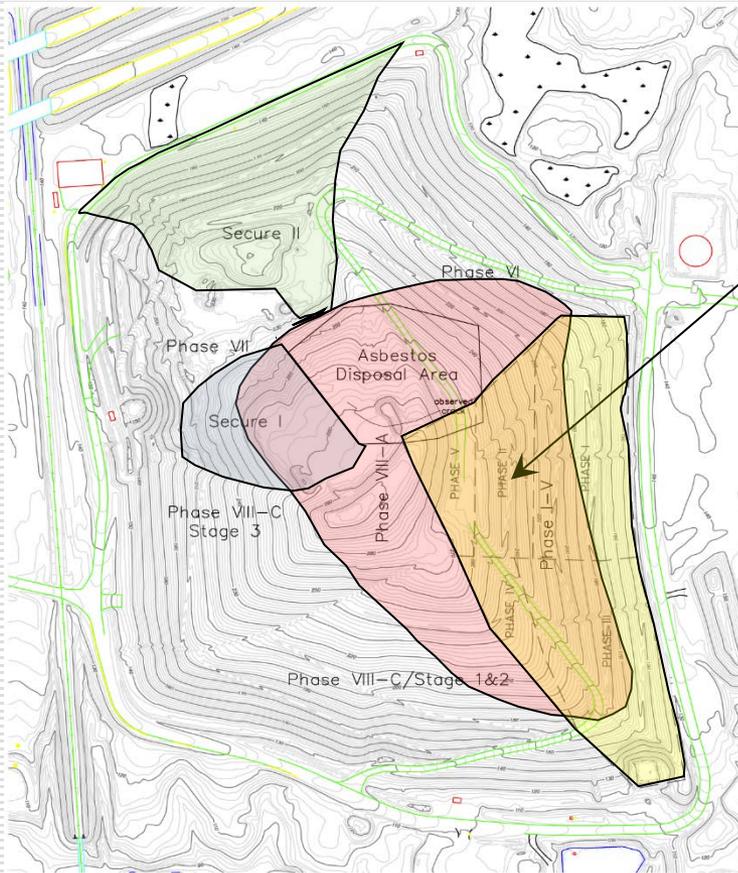


## Secure III permitted in 1992

- Included a series of lined landfill cells constructed around the perimeter of the conventional landfill.
- The cells were constructed up and over the Conventional Landfill , and included leachate collection systems.

# Landfill Development History

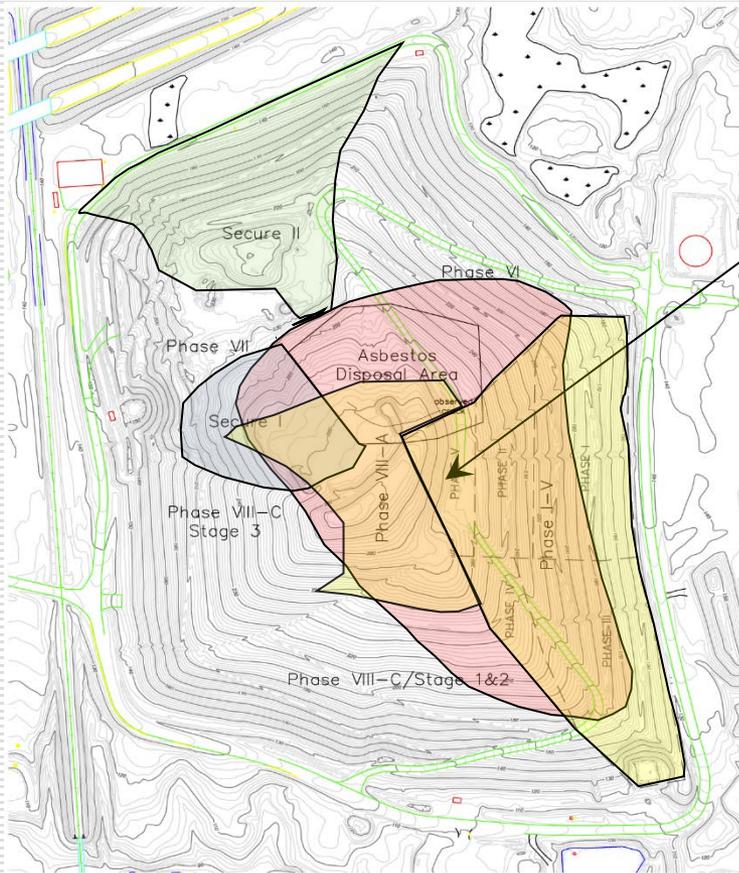
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Phases I-V

# Landfill Development History

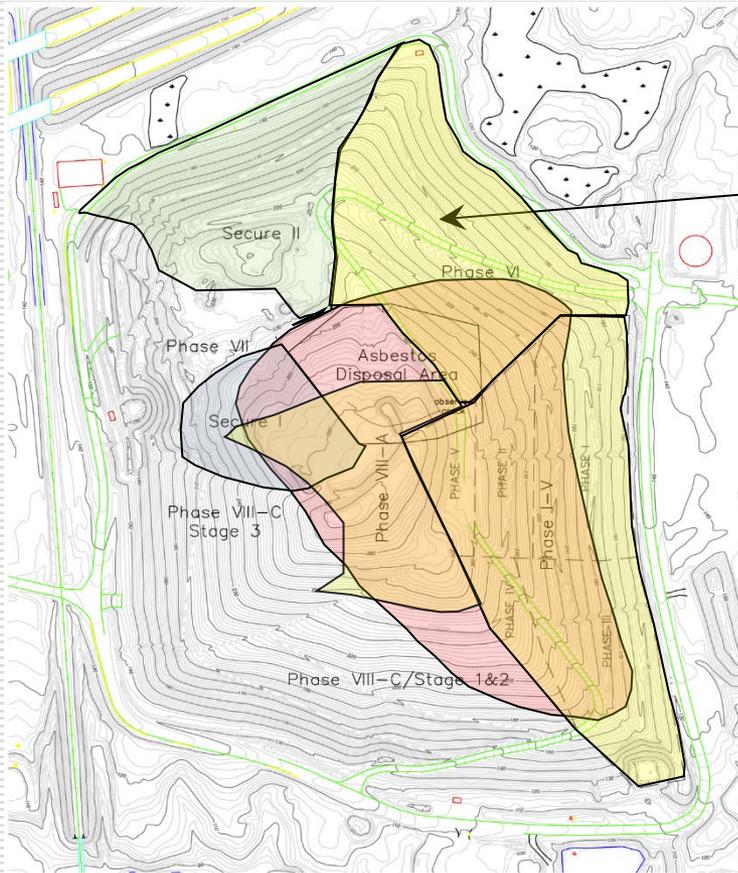
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Phase VIII-A

# Landfill Development History

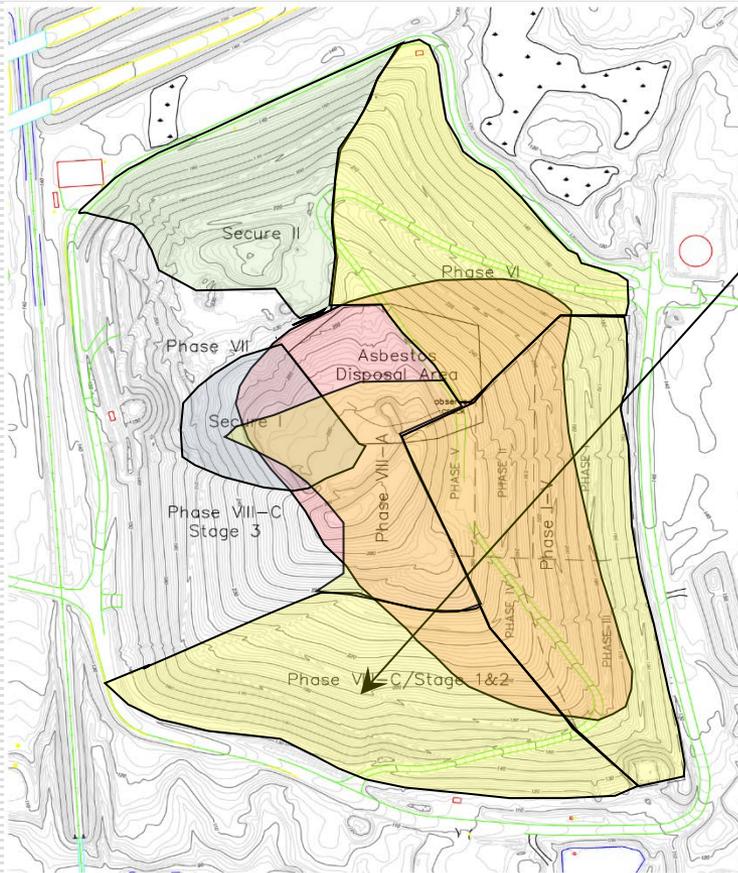
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Phase VI

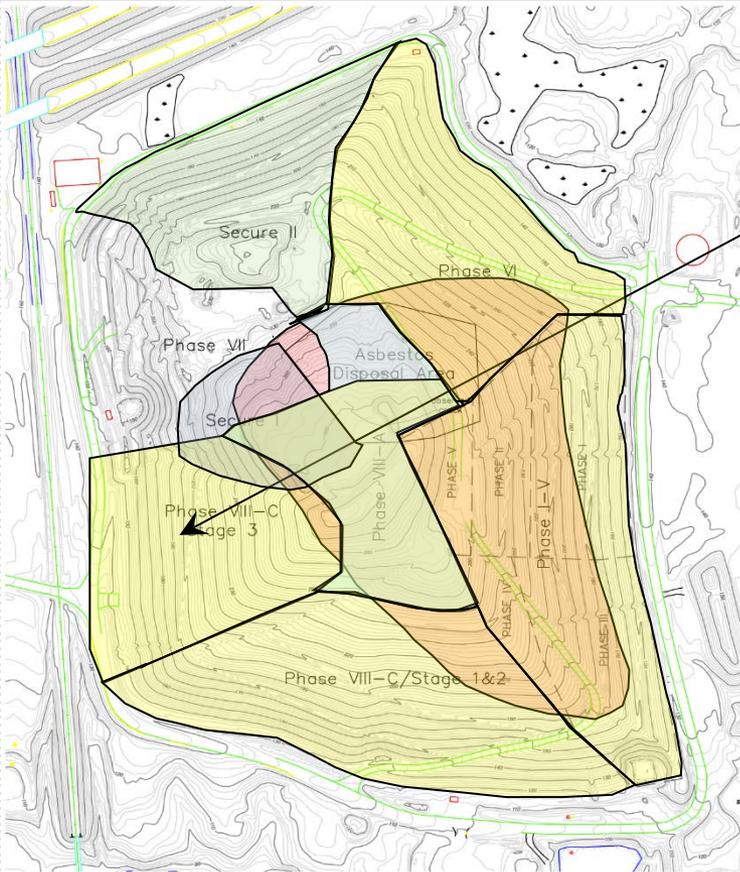
# Landfill Development History

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Phase VIII-C Stages 1 & 2

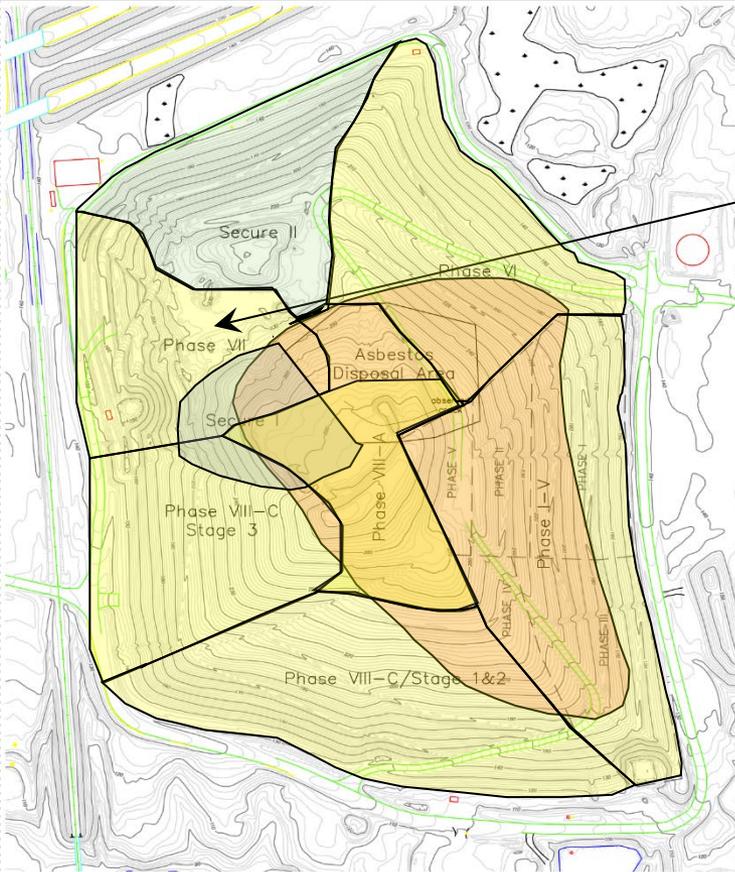
# Landfill Development History



Phase VIII-C – Stage 3

# Landfill Development History

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Stage VII

Secure 3 completed in 2006.

# Corrective Actions

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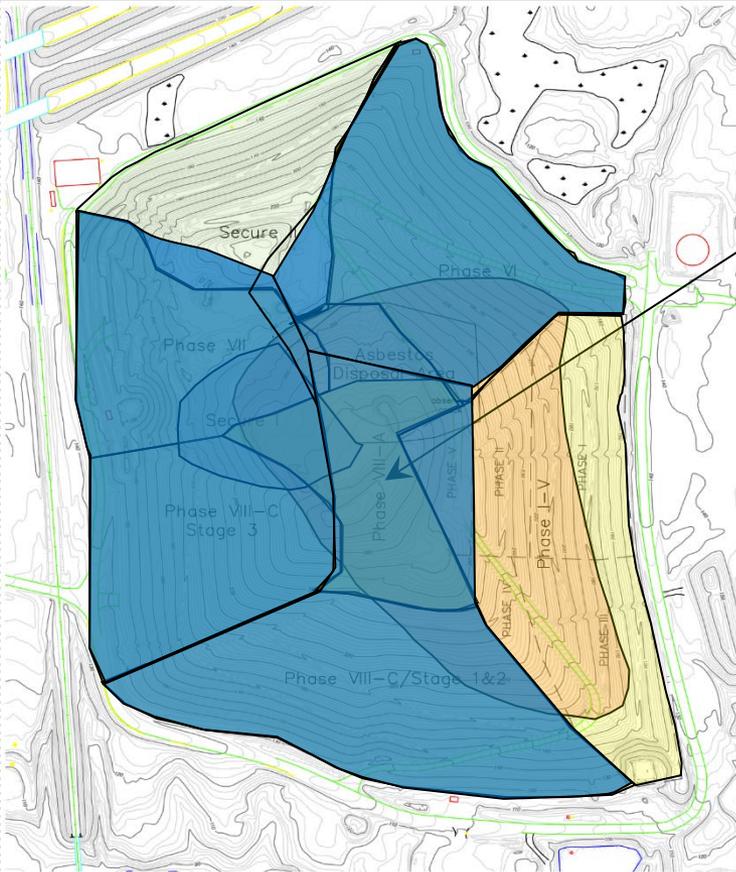


## Corrective Actions:

- Gas extraction wells through the waste to reduce off-site migration of methane
- Enhanced Leachate collection systems around the perimeter.

# Landfill Closure Agreement - 2006

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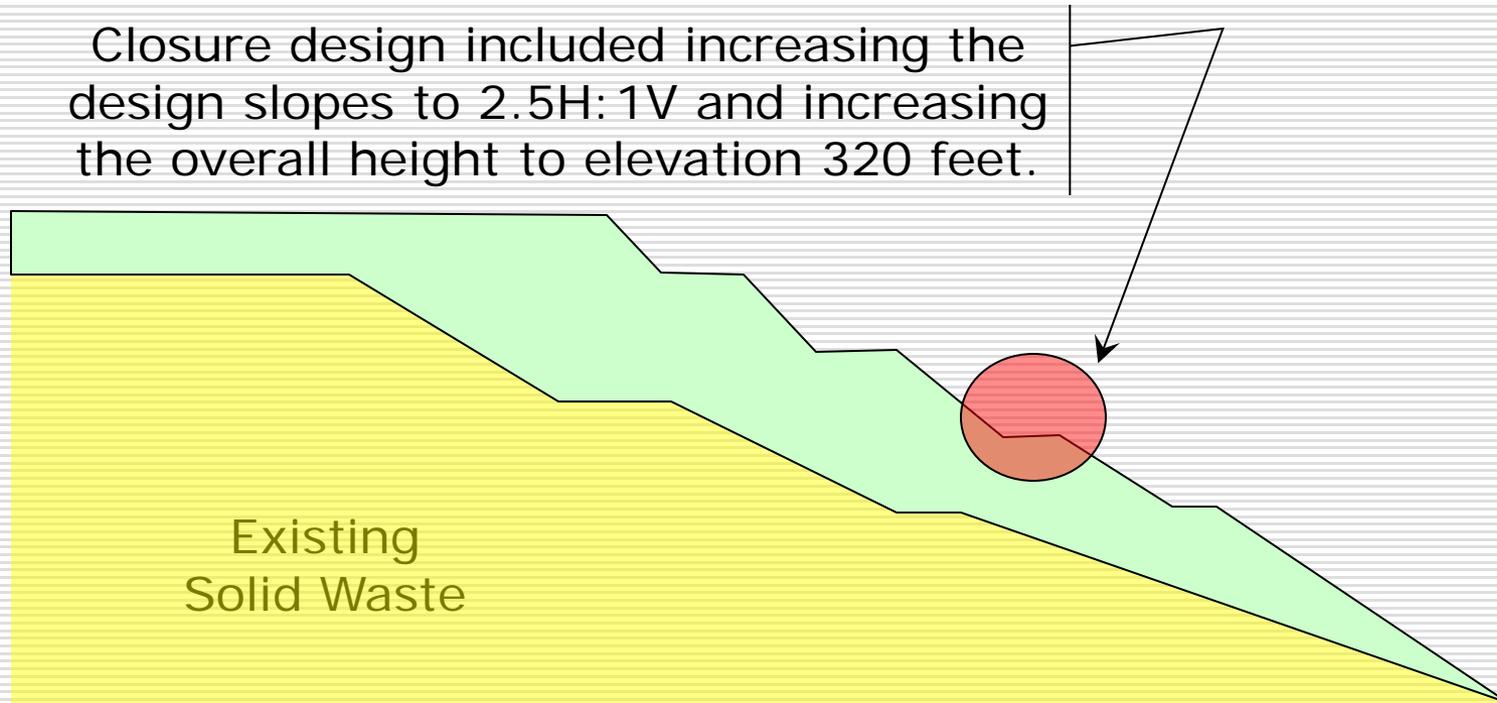
Closed in three Phases  
from 2008 through 2010  
Top Elevation 320 feet)

(Secure II and Secure I-V  
closed already)

# Closure Design Issues

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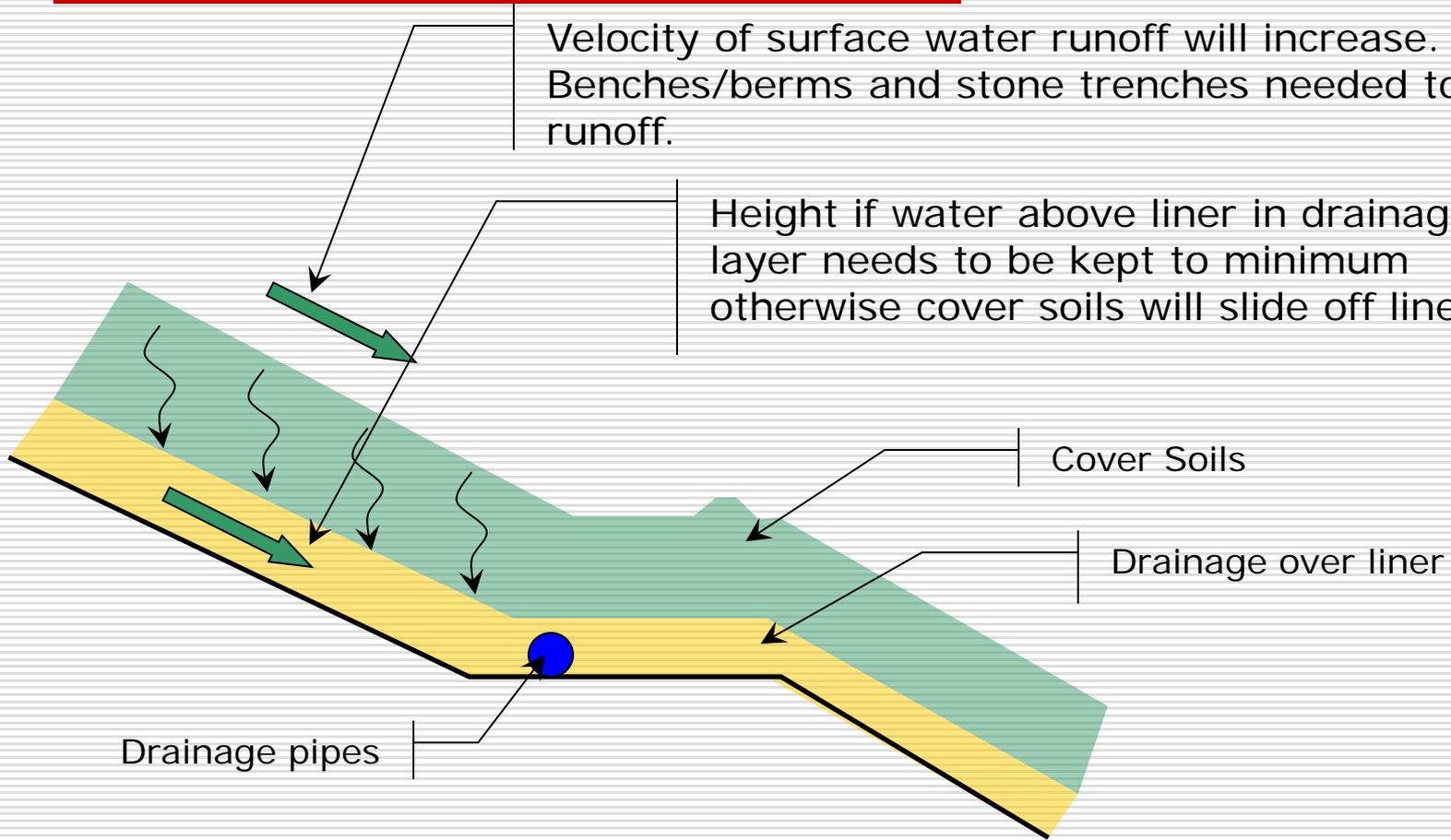
Closure design included increasing the design slopes to 2.5H:1V and increasing the overall height to elevation 320 feet.



# Closure Design Issues

Velocity of surface water runoff will increase.  
Benches/berms and stone trenches needed to control runoff.

Height of water above liner in drainage layer needs to be kept to minimum  
otherwise cover soils will slide off liner.



# Leachate Recirculation

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- Leachate recirculation was proposed as a means to increase gas production for the Gas to Energy Facility. Gas production had been observed to decrease, possibly due to a decrease in moisture content of the waste attributed to:
    - Disposal of more CDD since 2007
    - Elimination of organic rich waste after 2007,
    - installation of cover system.
  - Pilot study conducted in 2009 to study the effects of adding moisture to waste
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# Leachate Recirculation

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- Pilot study conducted in 2009
    - 1,200,000 gallons introduced over a 5 month period.
    - Introduced into a 200 foot long trench and gas extraction wells.
    - Monitoring performed included:
      - Settlement, Hydrogen sulfide monitoring, moisture profiling from Ground penetrating radar, Gas generation testing from nearby wells, Leachate collection system monitoring.
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# Leachate Re-Circulation



Figure 4-1 2015 Leachate Recirculation Pumping Structure Locations

# Leachate Recirculation

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- Leachate collection was approved in 2011 and the system involves a series of leachate trenches on top of the landfill that are periodically filled with leachate to enhance the production of methane.
  - Some gas extraction wells are also pumped with leachate.
  - 2015 volume 2,900,000 gallons.
  - Total remaining capacity of the waste mass is ~ 14,000,000 gallons of the initially approved 36,000,000 gallons in the area of influence of the trenches and wells
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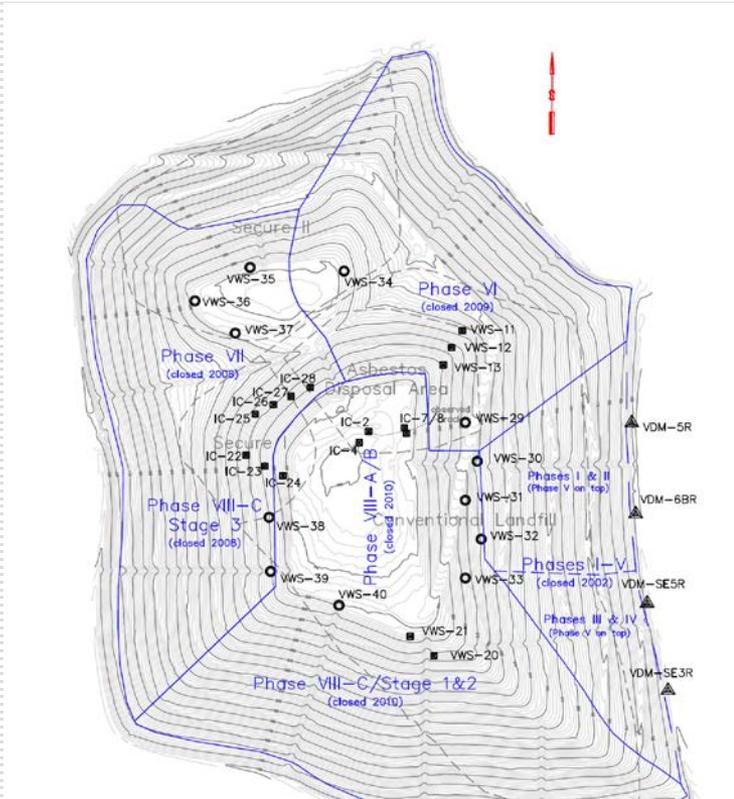
# Post Closure Settlement and Stability Monitoring

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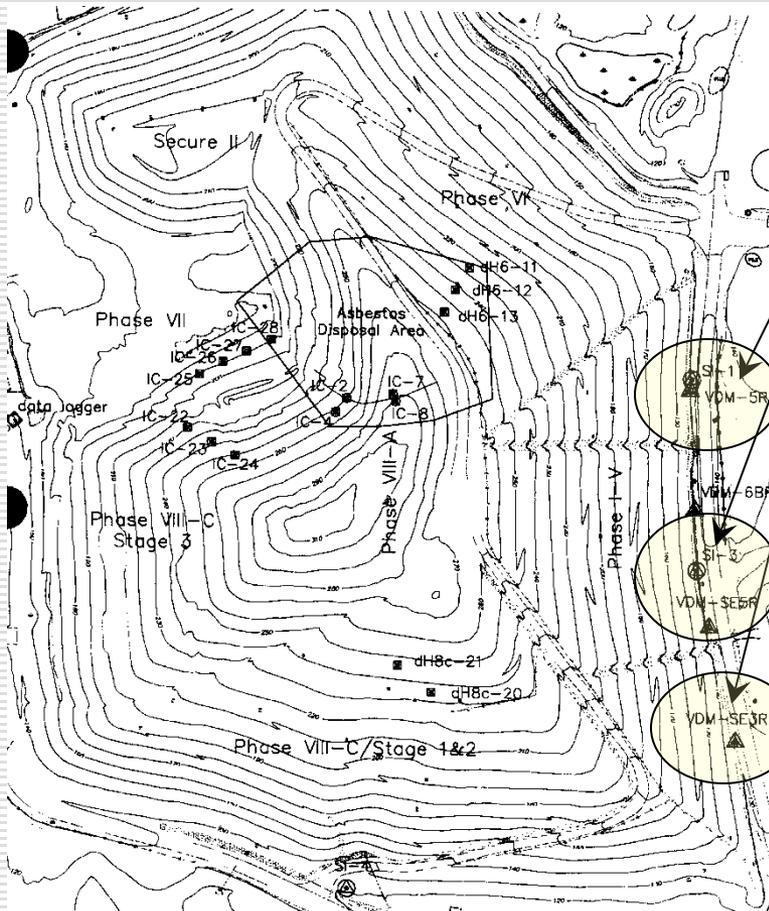
The primary purposes of the geotechnical monitoring are to assess if the internal waste mass and foundation soils are stable, and to assess if the cover system is performing as-designed

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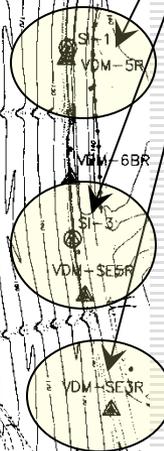
# Post Closure Settlement and Stability Monitoring



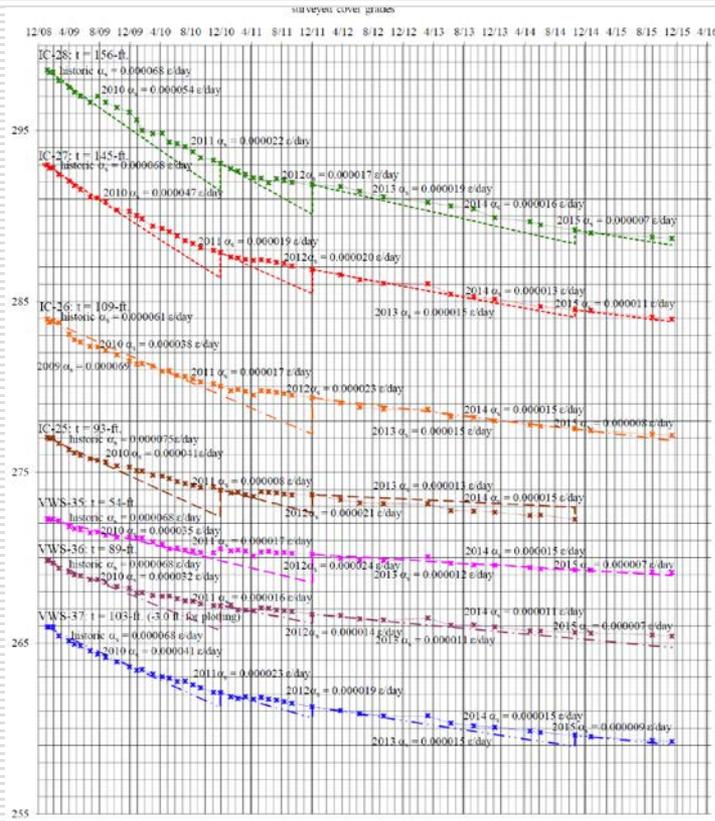
# Stability Monitoring Locations



Stability Monitoring Points:  
• 4 Vertical & Horizontal Displacement Monuments

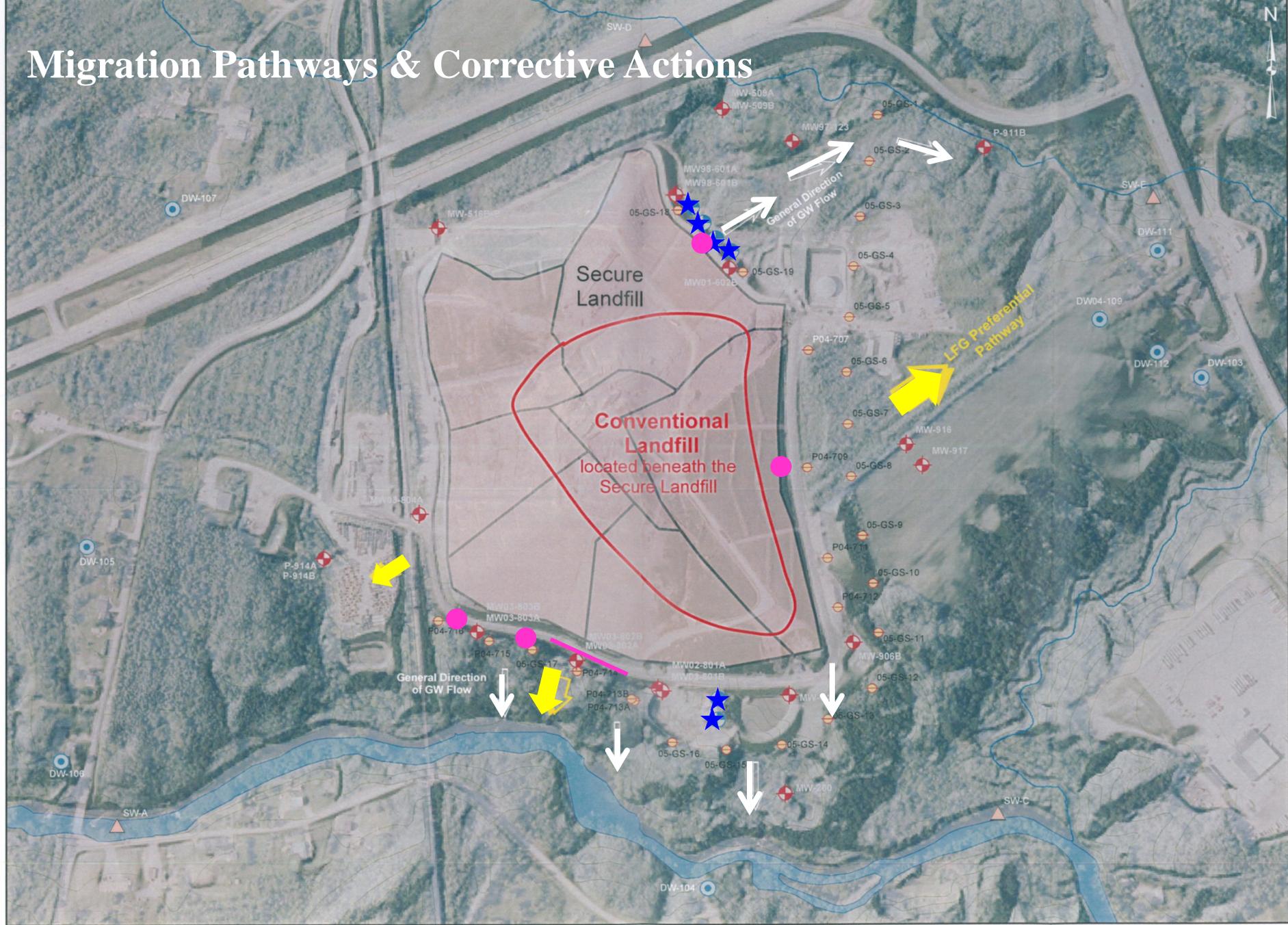


# 2005 Settlement Monitoring



- The horizontal deformation plots for all phases do not indicate any trends that would be indicative of large scale movements that would be detrimental to the cover system integrity.
  - The vertical displacement plots all indicate that the rate settlement is diminishing with time.
  - The current rate of strain is also extrapolated over the 30-year closure period and those extrapolations are also well within the allowable strain for the liner.
  - Topographic surveying of the landfill is also performed on a regular basis. The results of these surveys do not show any unusual features on the topographic surface that would indicate large scale movements
- The monitoring indicates that the landfill is performing as design.

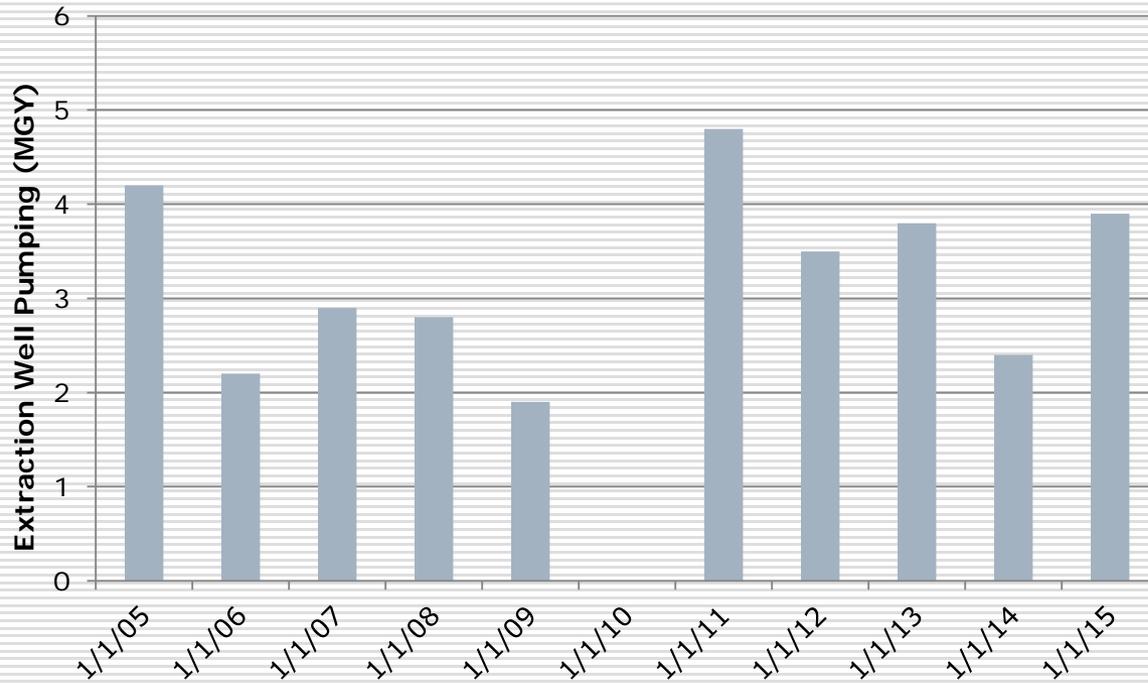
# Migration Pathways & Corrective Actions



# Corrective Actions

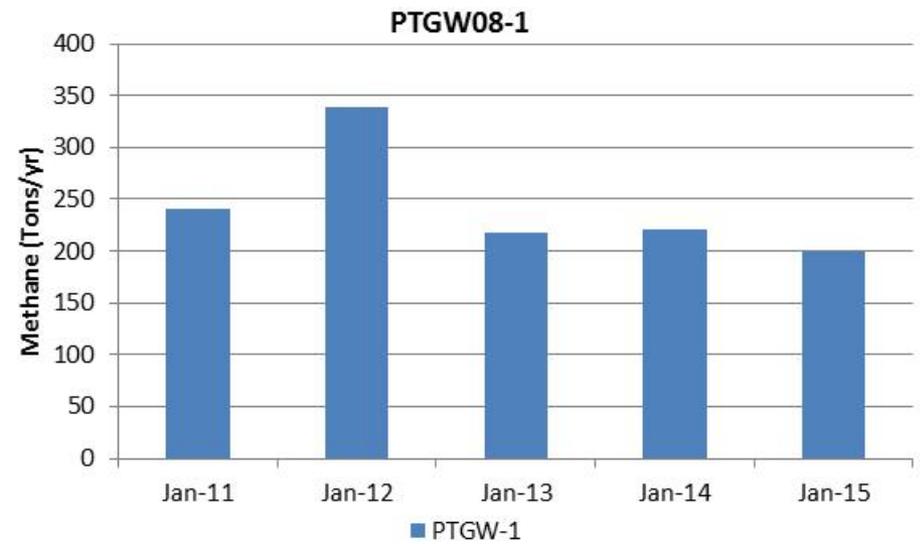
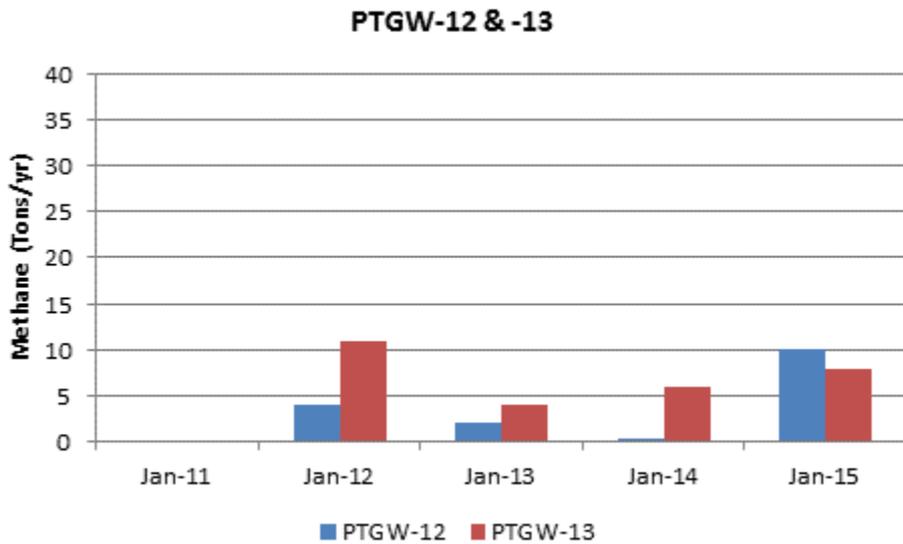
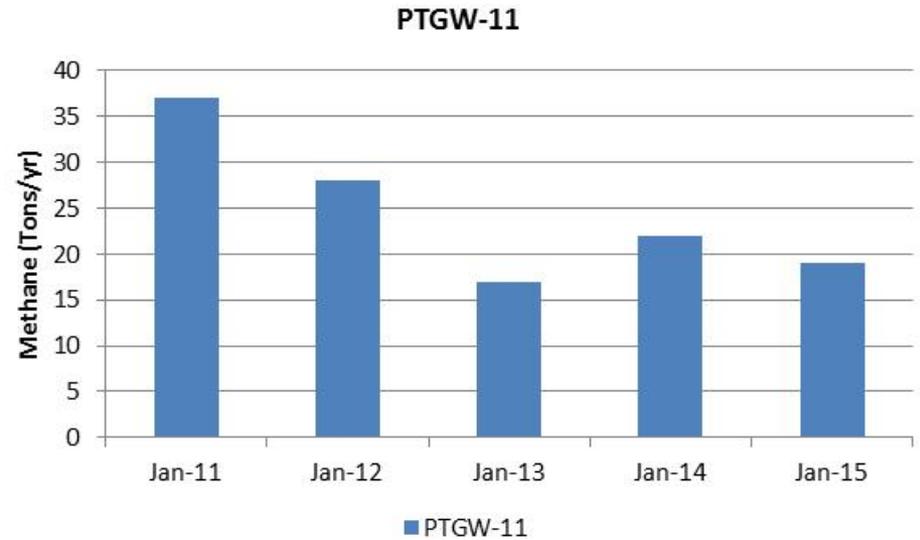
## CORRECTION ACTIONS – Groundwater Extraction

- Pumping From Extraction Wells – 2005 to 2015



# Corrective Actions

## GAS EXTRACTION



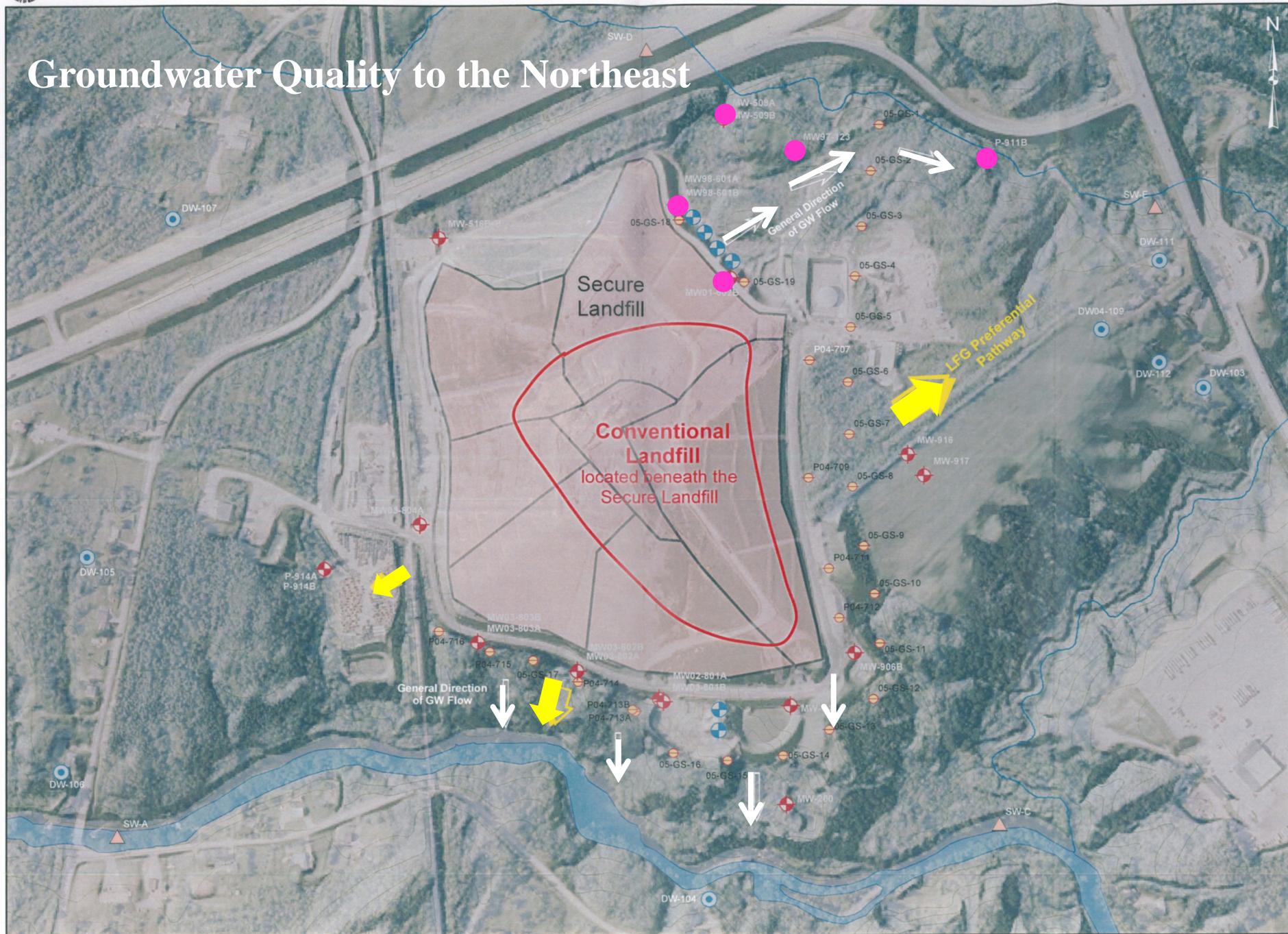
# Water Quality Corrective Action Criteria

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## Post-Closure Water Quality Criteria for “**Successful Corrective Action**”

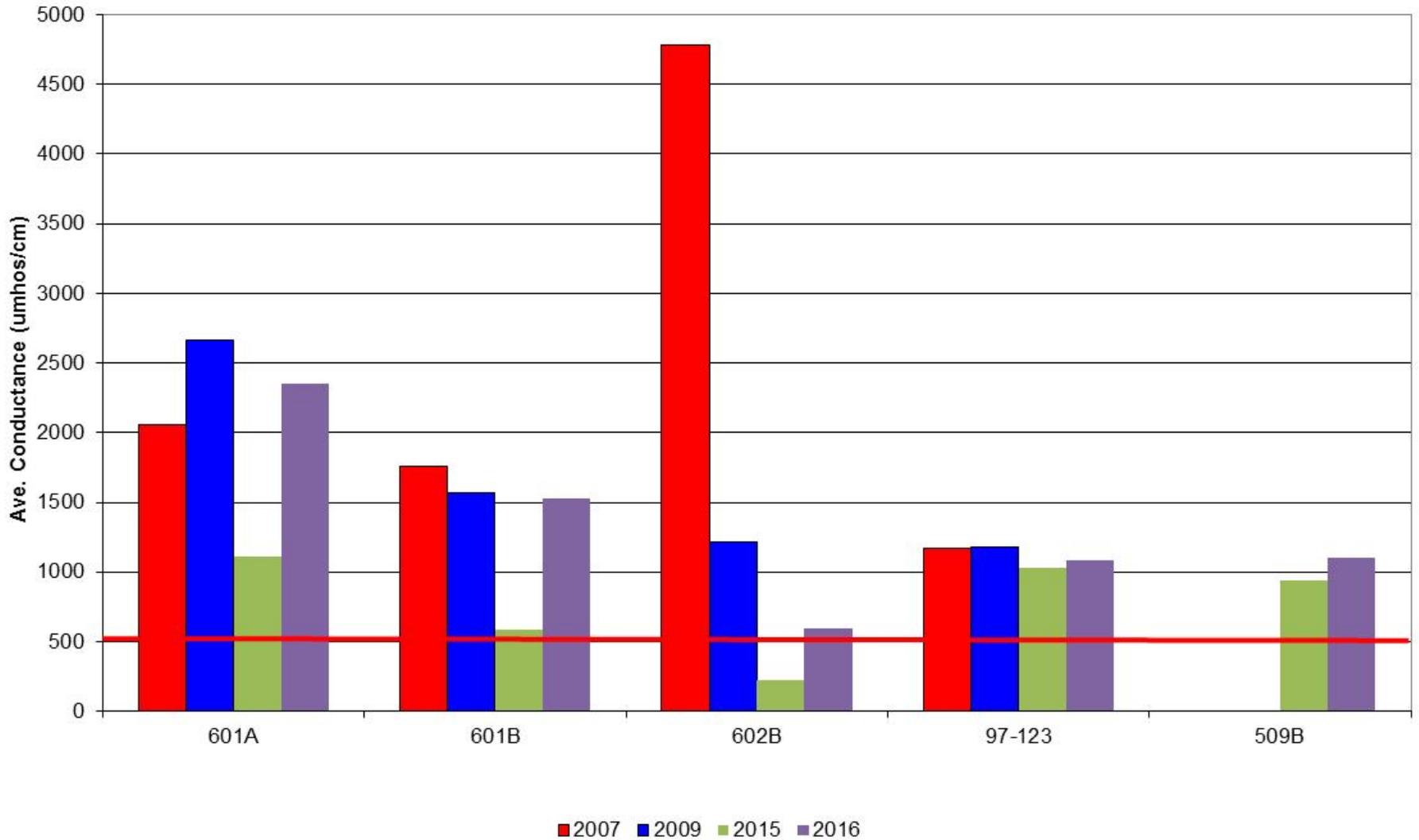
- Groundwater On-Site:
    - Specific Conductance < 500 umhos/cm
  
  - Groundwater Off of PTL Property:
    - Groundwater Meets MCL & MEG Values
    - Specific Conductance < 400 umhos/cm
    - Methane < 700 ug/L
  
  - Surface Water Quality
    - Must Meet Existing Water Quality Classification Criteria
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# Groundwater Quality to the Northeast

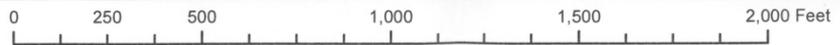
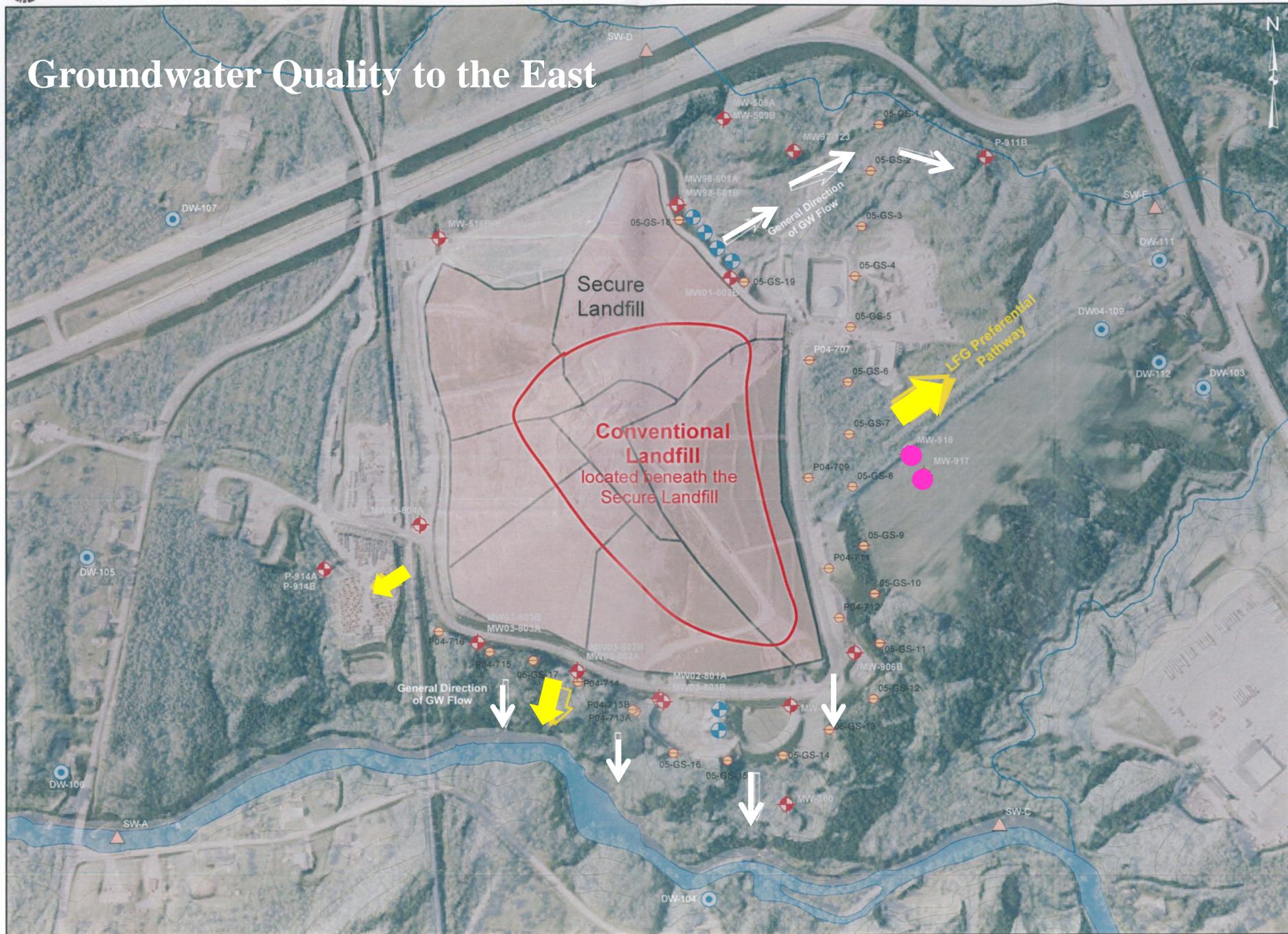


0 250 500 1,000 1,500 2,000 Feet

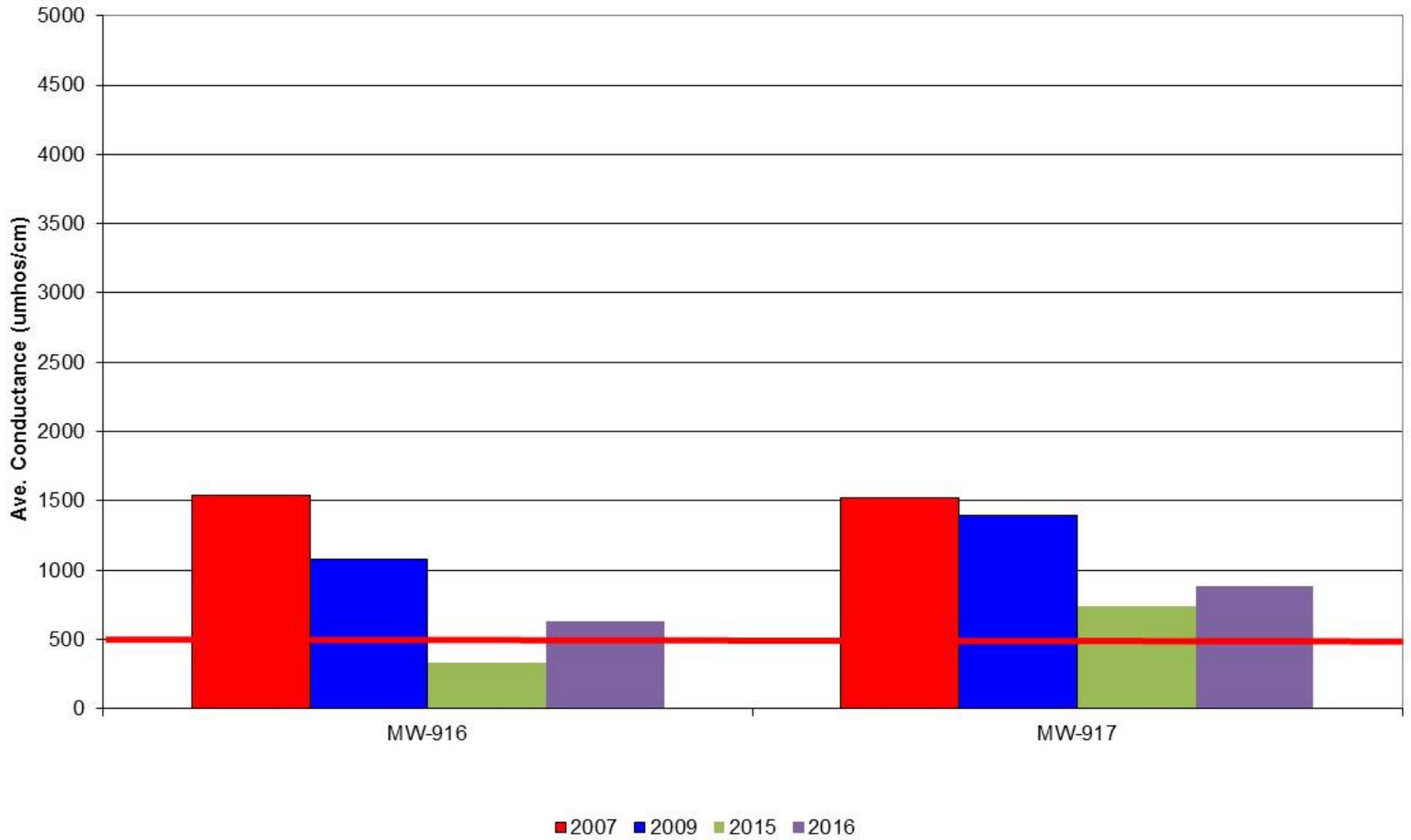
Specific Conductance Data- 2007 - 2009 - 2015 - 2016  
Northeast Groundwater Flow Pathway



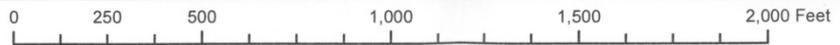
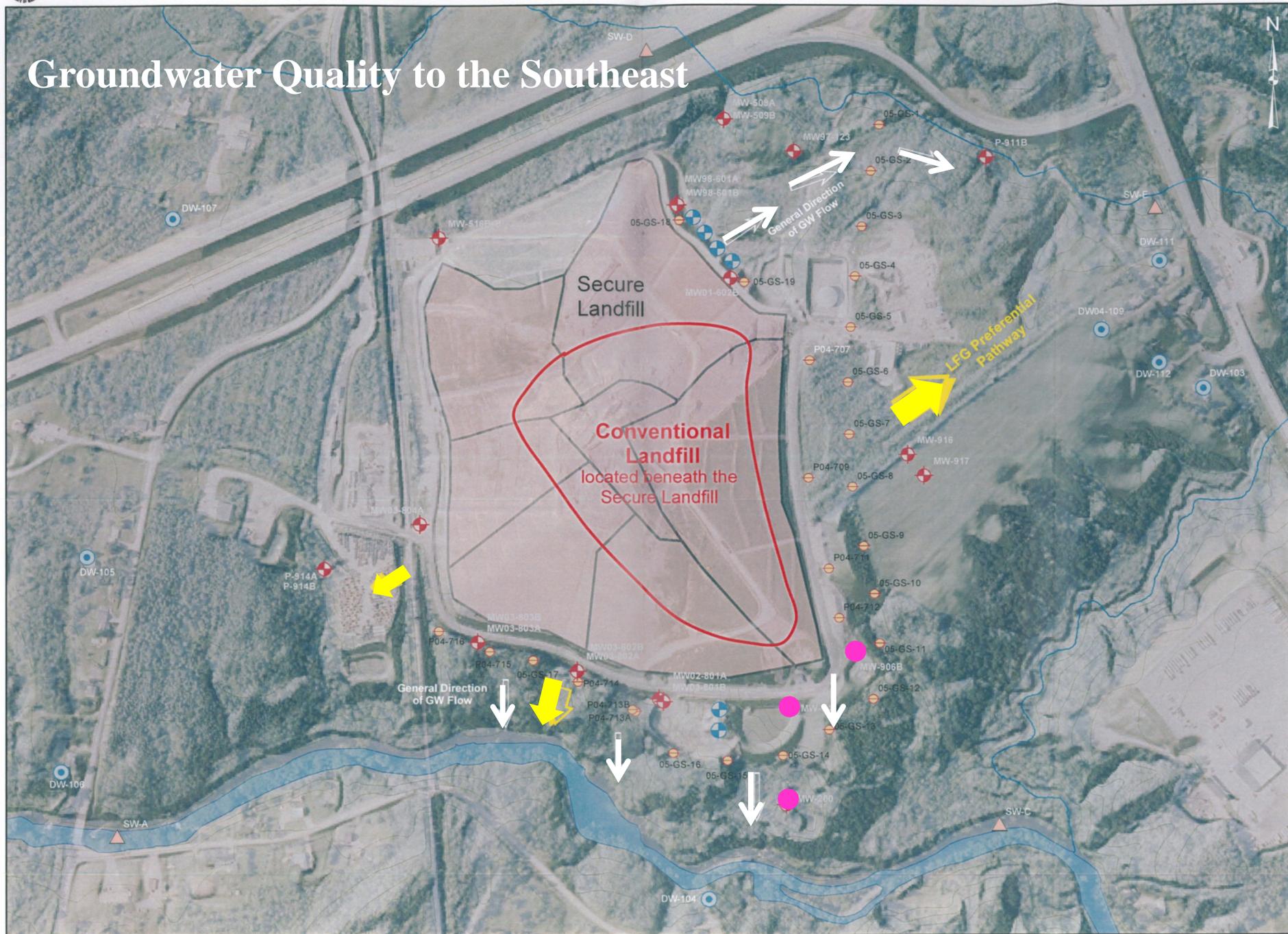
# Groundwater Quality to the East



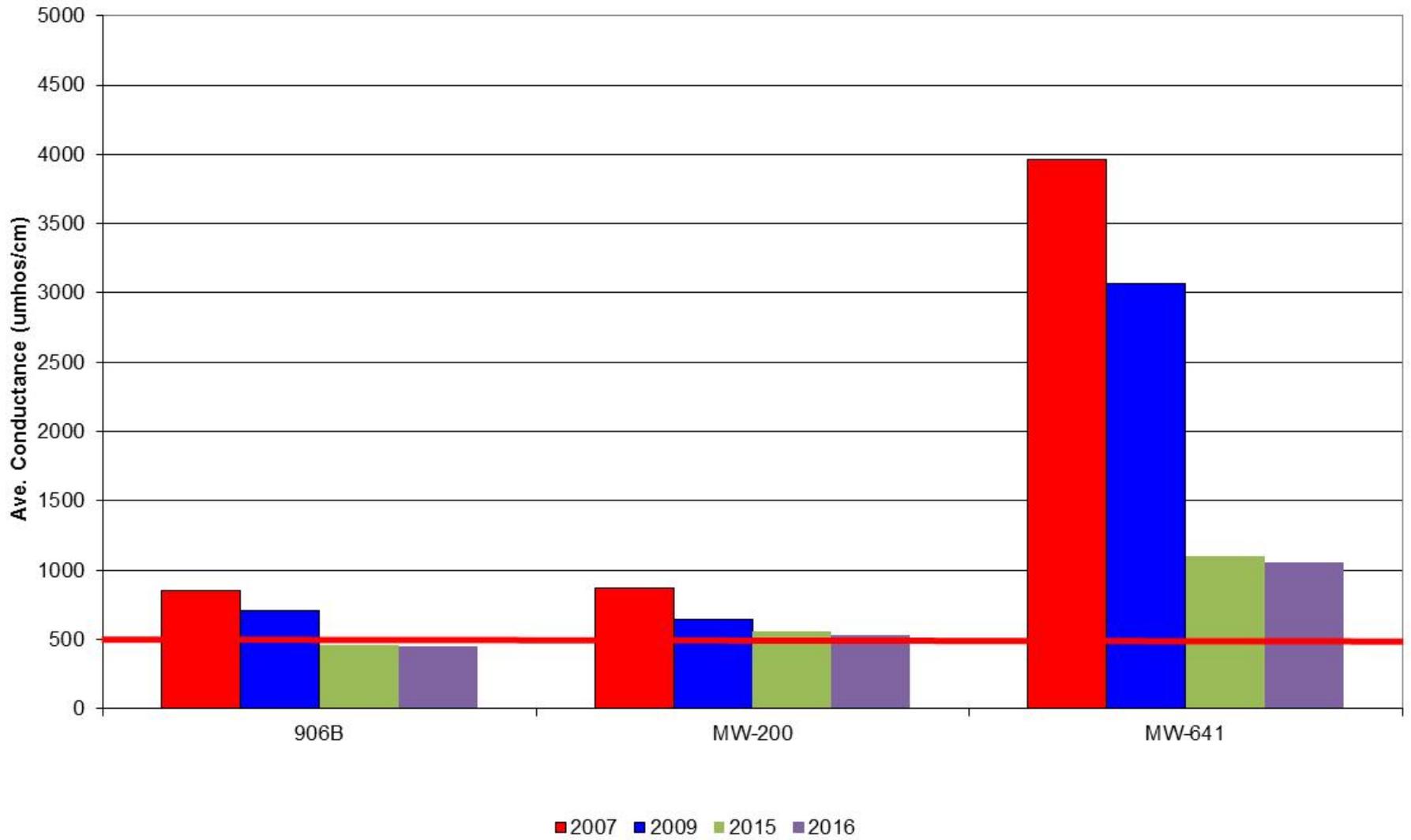
Specific Conductance Data- 2007 - 2009 - 2015 - 2016  
Eastern Gas Migration Flow Pathway



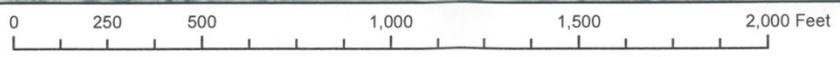
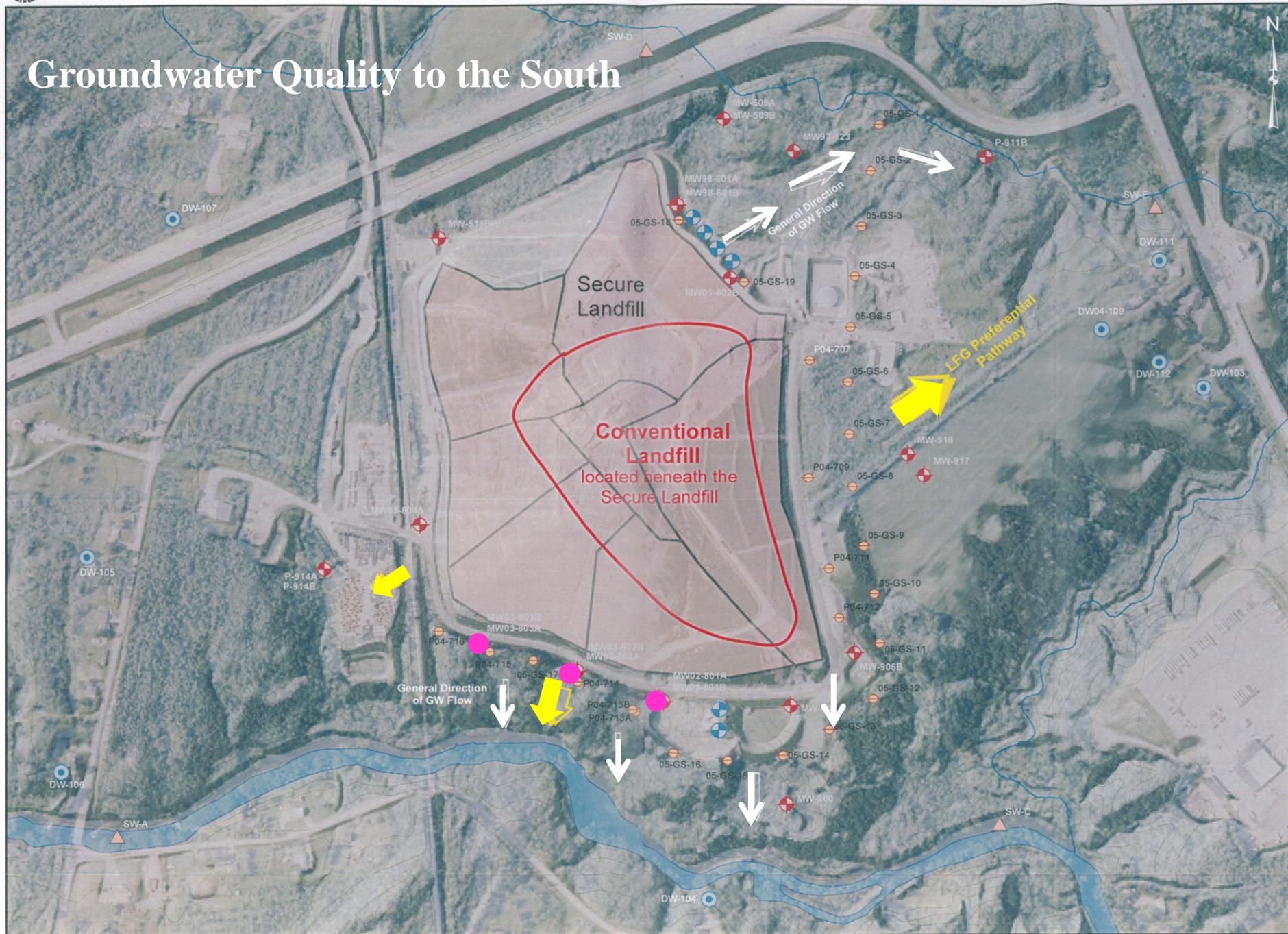
# Groundwater Quality to the Southeast



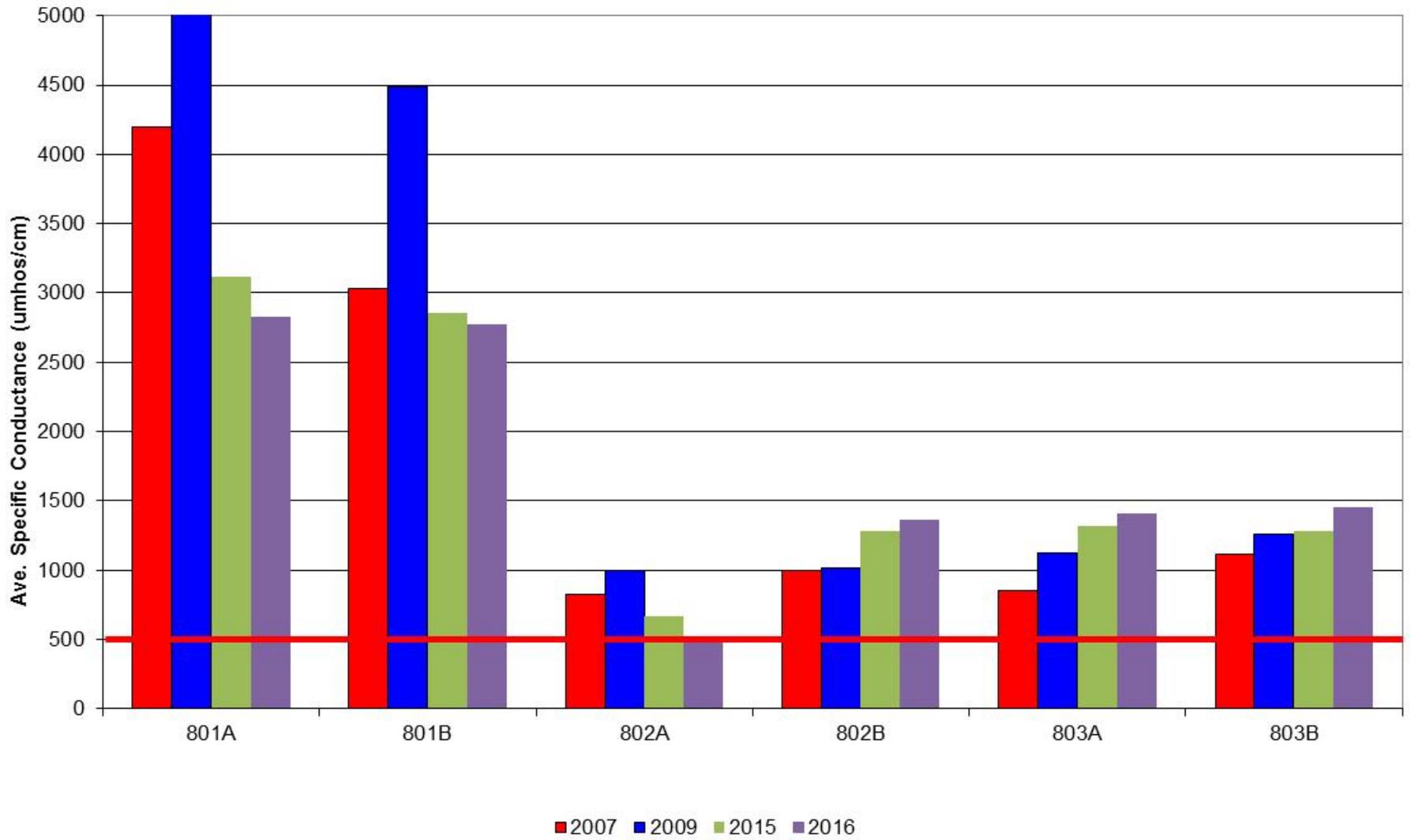
Specific Conductance Data- 2007 - 2009 - 2015 - 2016  
Southeast Groundwater Flow Pathway



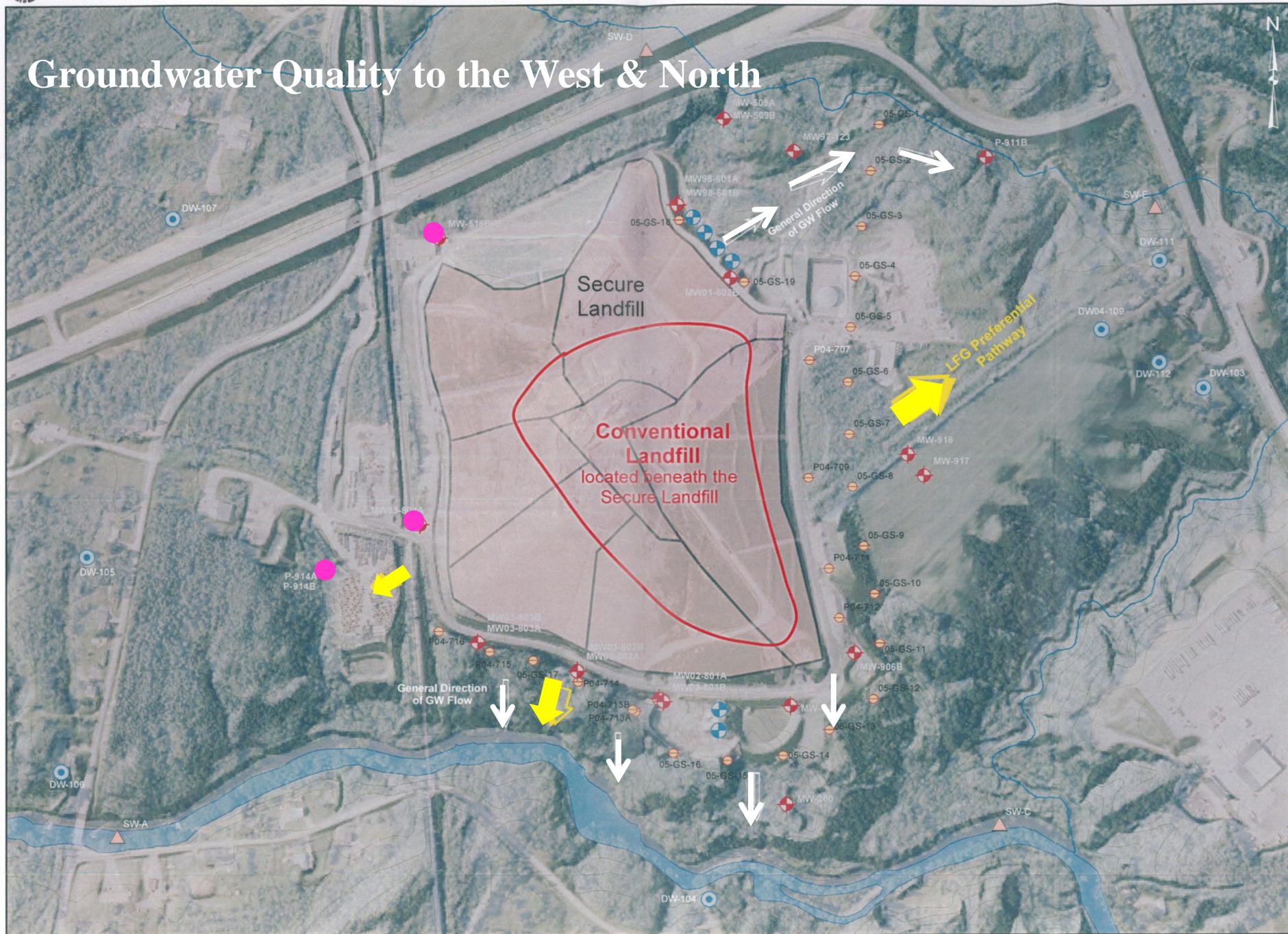
# Groundwater Quality to the South



Specific Conductance Data- 2007 - 2009 - 2015 - 2016  
South Groundwater & Gas Migration Pathway

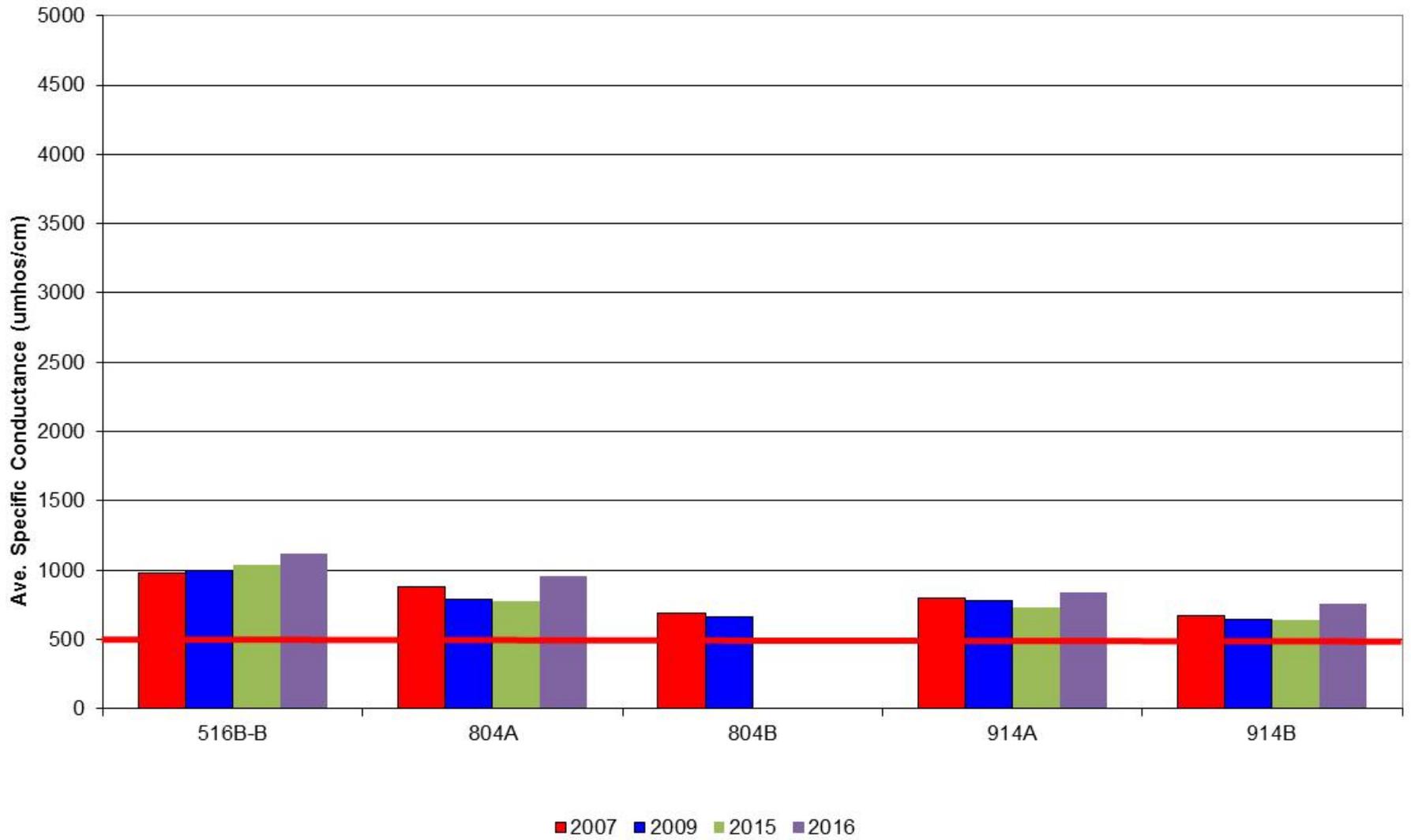


# Groundwater Quality to the West & North



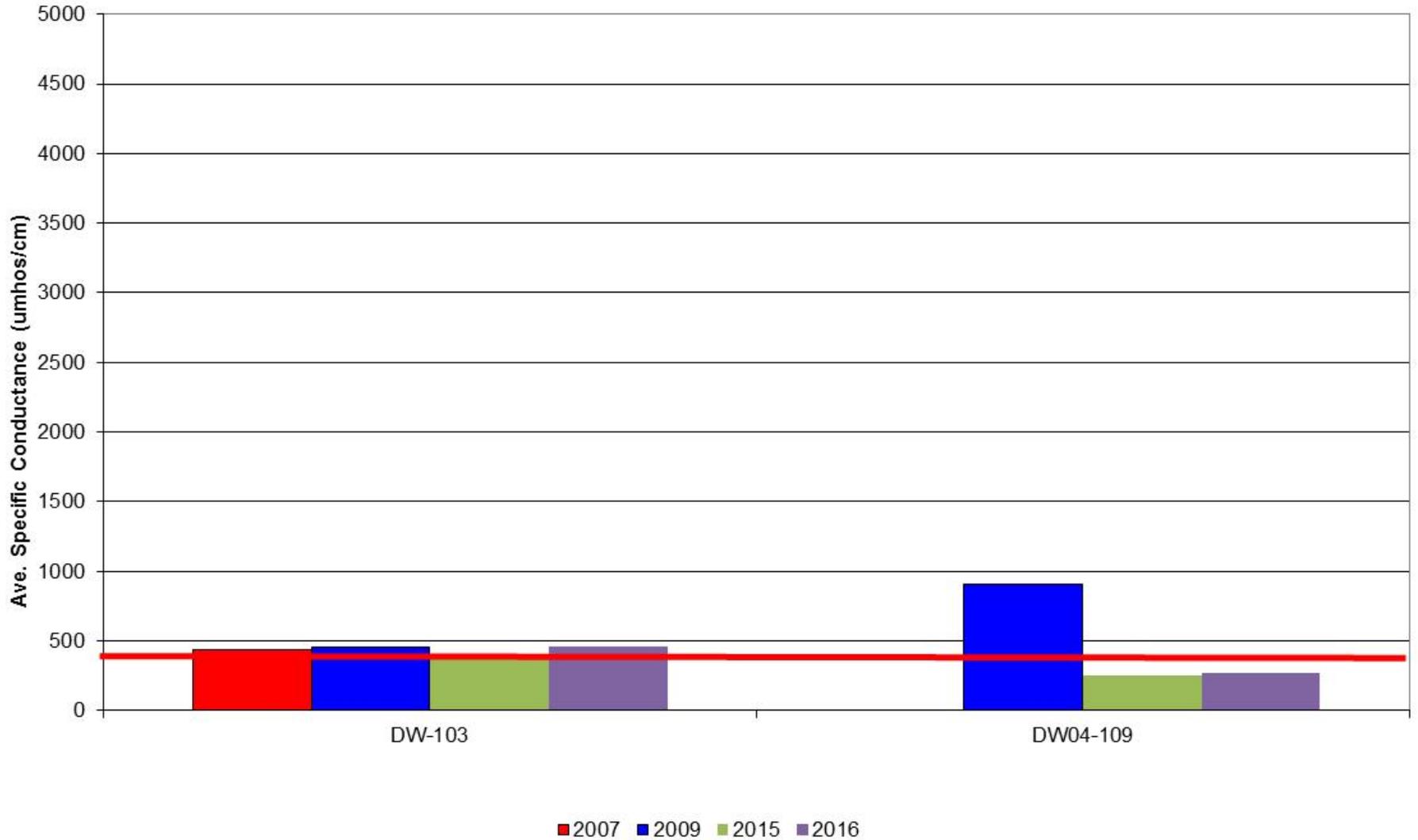
0 250 500 1,000 1,500 2,000 Feet

Specific Conductance Data- 2007 - 2009 - 2015 - 2016  
West Gas Migration Pathway

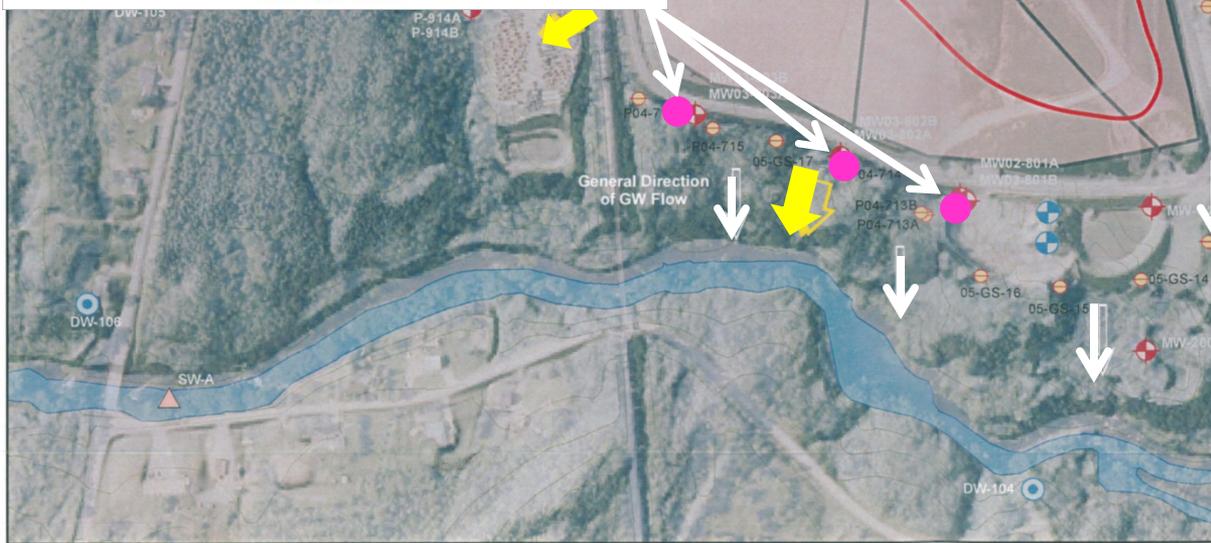
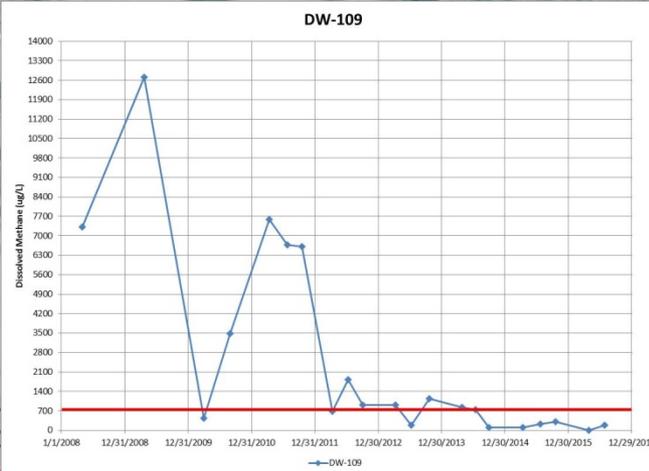
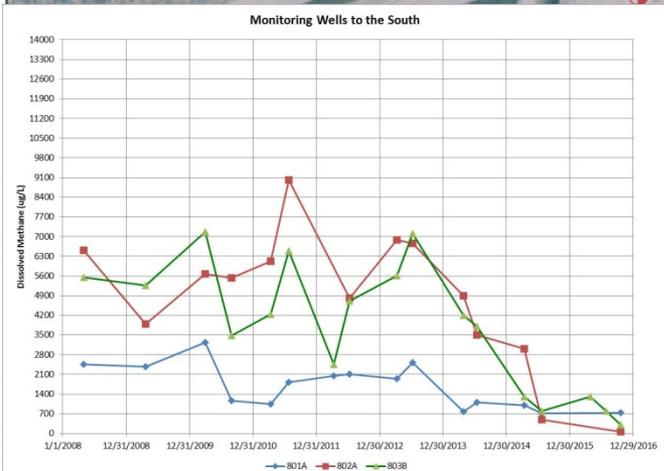




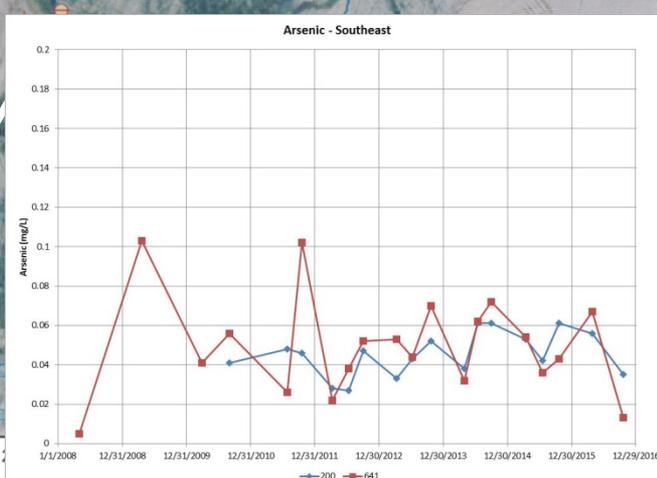
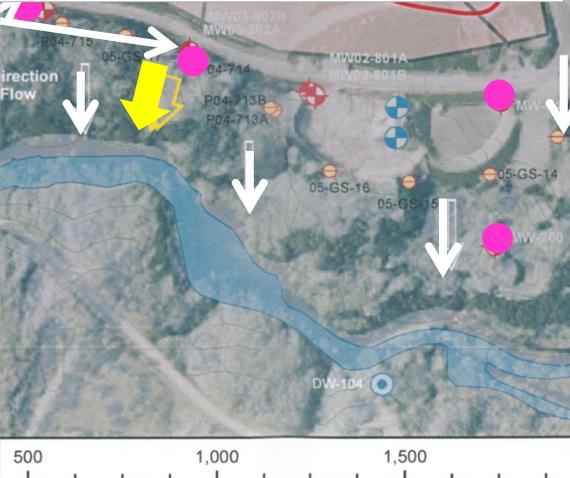
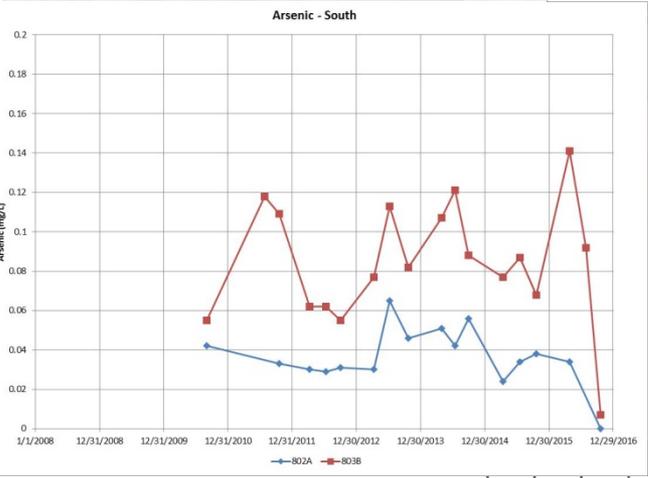
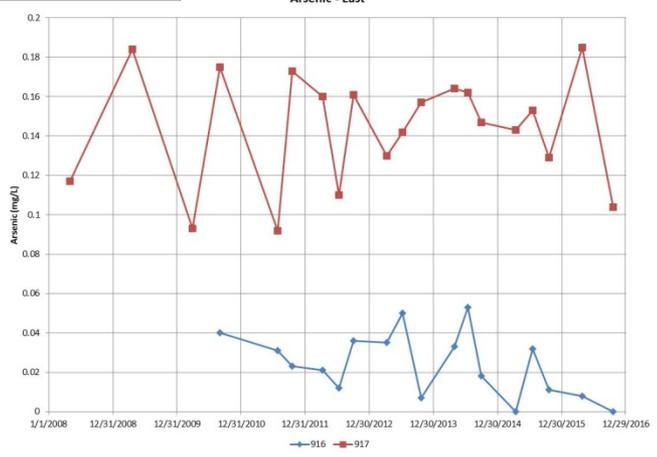
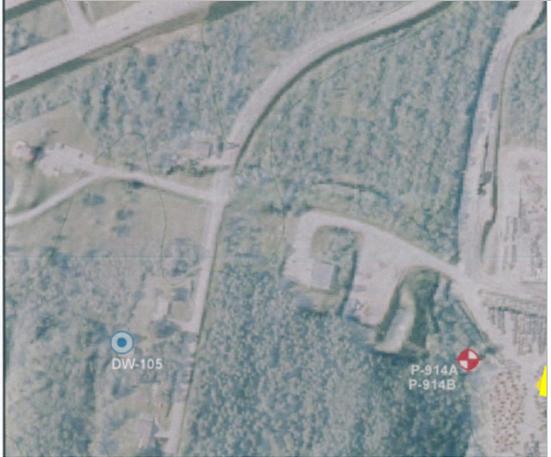
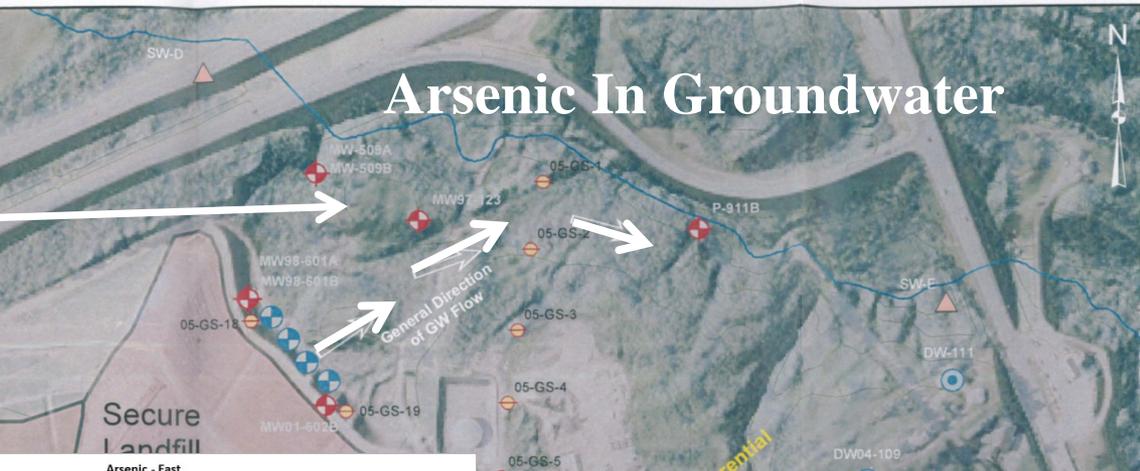
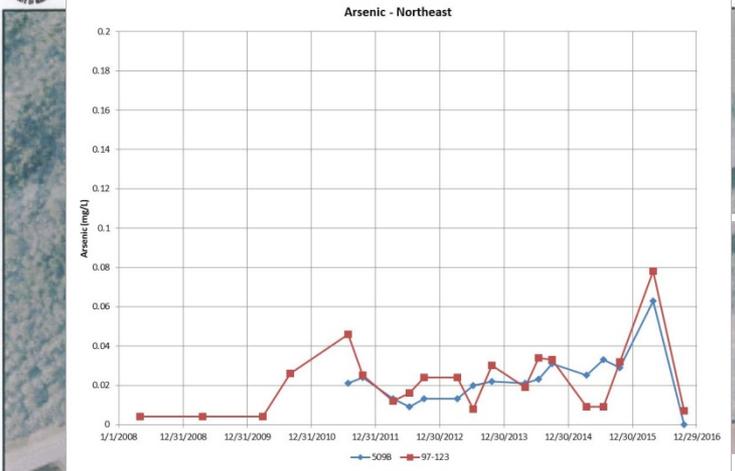
### Specific Conductance Data- 2007 - 2009 - 2015 - 2016 Off-Site Residential to the East



# Methane In Groundwater

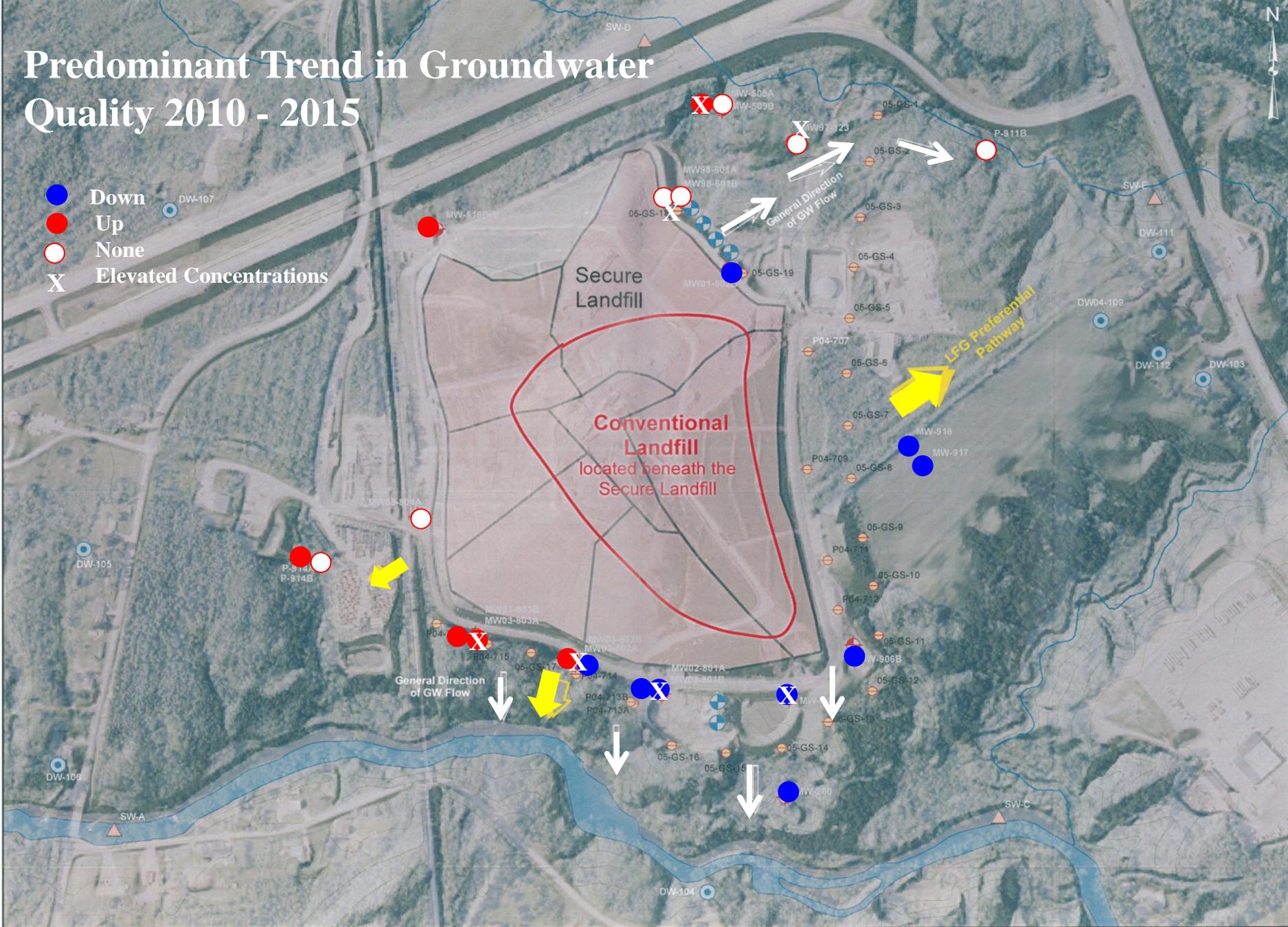


# Arsenic In Groundwater



# Predominant Trend in Groundwater Quality 2010 - 2015

- Down
- Up
- None
- X Elevated Concentrations



# Summary of Water Quality

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- **WATER QUALITY DATA INDICATE THAT:**
    - **GROUNDWATER MEETS CONDUCTANCE CRITERIA AT MW-906B & IS CLOSE AT MW-200, -916 & -602B**
    - **MANY WELLS HAVE SLOW DOWNWARD TREND BUT STILL SIGNIFICANTLY ELEVATED**
    - **SOUTHWEST WELLS HAVE ELEVATED CONDUCTANCE BUT LOWER METHANE**
    - **AGGRESSIVE OPERATION OF CORRECTIVE ACTIONS GENERALLY IMPROVES WATER QUALITY**
    - **GAS COLLECTION HAS SIGNIFICANTLY LOWERED METHANE CONCENTRATIONS**
    - **ARSENIC IS ELEVATED IN MOST ON-SITE WELLS. BUT ABOVE STANDARDS IN DW-103 & 917 OFF-SITE**
    - **SURFACE WATER MEETS APPLICABLE AWQC CRITERIA**
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# MOVING FORWARD: 2016 to 2020 Monitoring

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- 2 Sampling Events/ Year (Spring & Fall)
- Sampling for Methane 1 time/year
- Continue with all wells except DW-111 (inaccessible)
- Reducing Regular Leachate Sampling to 2 Locations