RACER Lansing Project Update

Plants 2, 3 & 6

Lansing, Michigan

October 10, 2014

Imagine the result

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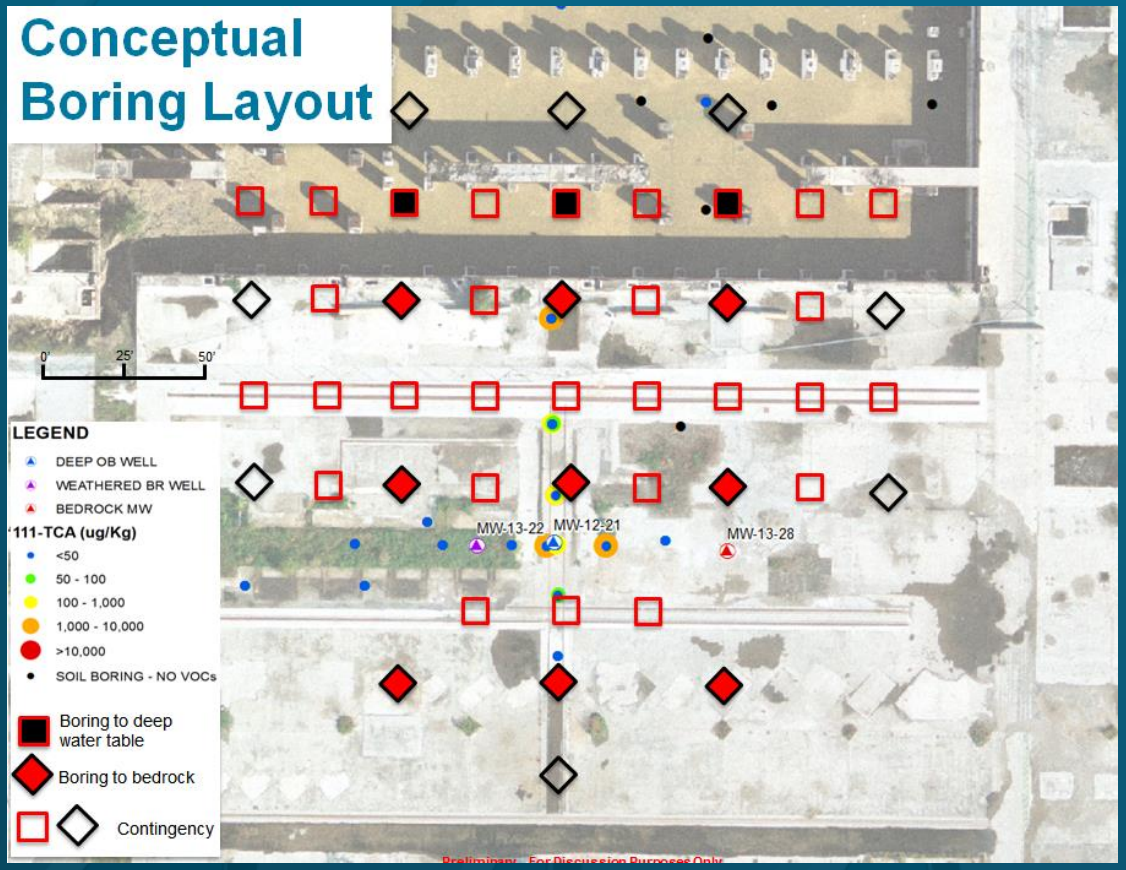
Agenda

- Lower 1,4-Dioxane Source Area Investigation
- Plant 2 LNAPL Additional Characterization
- Additional Monitoring Well Installation
- Lower 1,4-Dioxane Hydraulic Testing Update
- Submittal Status / Project Schedule

Lower 1,4-Dioxane Source Characterization



Objectives

- Determine if 1,4-dioxane source mass is present near coliseum within the perched zone and continues to contribute to the lower plume
  - Nature and extent
  - If 1,4-dioxane present, is it treatable?
- Determine the size and extent of the lower 1,4-dioxane source mass within the deep overburden
  - Evaluate hydraulic characteristics
    - Recirculation viable?
    - ISCO?

Summary of Results

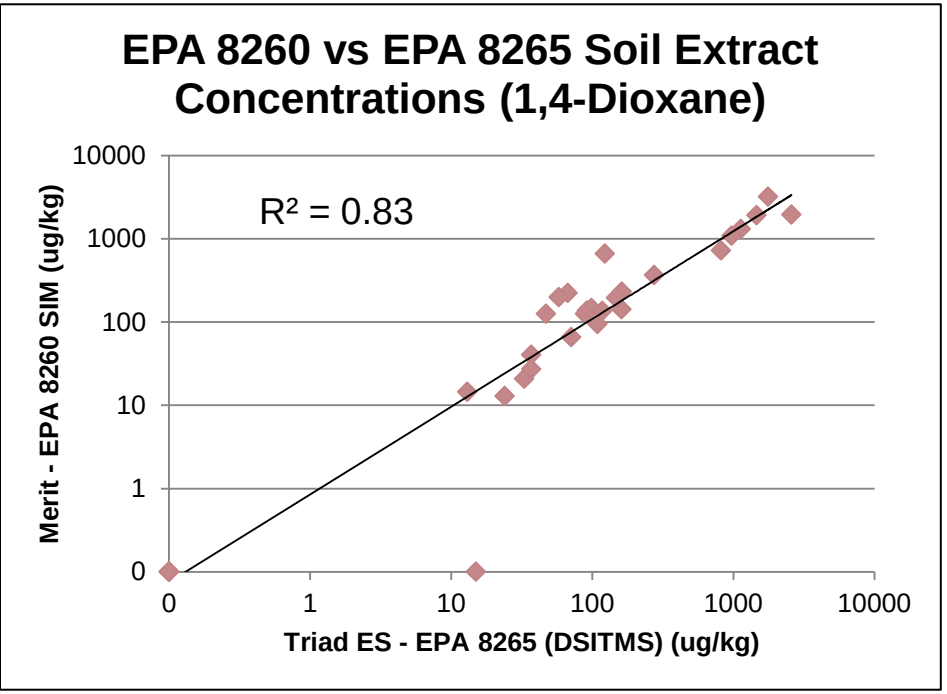
- 1,4-Dioxane impacts are generally diffuse with small zones of higher concentration
  - 99% of samples with 1,4-dioxane < 300 µg/Kg (8260 SIM Detection Limit)
  - Some CVOCs detected, no BTEX
- Perched Zone – highest concentrations confined to a small area
  - Only one boring location with 1,4-dioxane >1,000 µg/Kg (4 samples)
  - Isolated, limited perched water, low permeability
  - limited leachability / unlikely to act as continuing source
- Lower 1,4-Dioxane Plume - footprint of source area smaller than previous estimates
  - Results consistent with known concentrations
  - Downgradient sampling suggests source concentrations higher in the past (horse out of barn)
- Remedy Implications
  - Remaining source in perched zone could be removed, if necessary
  - Recirculation system potentially viable and size can be reduced near source area

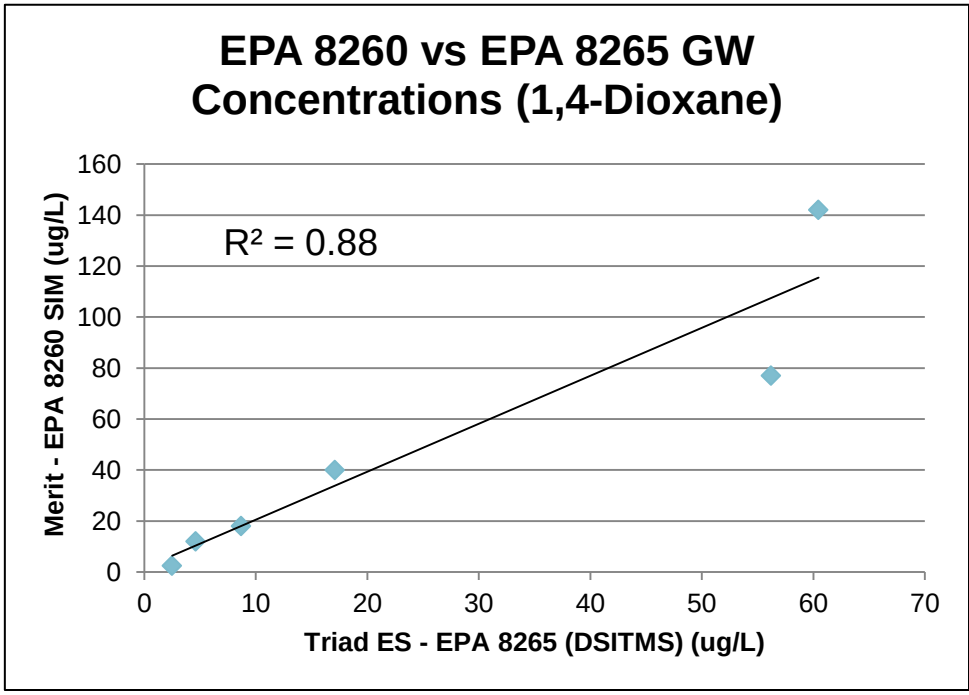
Components of Pre-Design Study

- 25 Borings
  - Soil sampling from the surface to bedrock - saturated & vadose samples
  - Groundwater samples from 9 intervals – 8 weathered bedrock, one perched
- Laboratory Analysis
  - On-site DSITMS analyses
    - 1,4-dioxane (>800 samples)
    - VOCs (>500 samples)
  - Subset of samples analyzed with off-site fixed lab
    - 1,4-Dioxane & VOCs
    - SPLP, FOC
    - Permeability, bulk density, & porosity

Comparison of Analytical Methods (1,4-Dioxane)

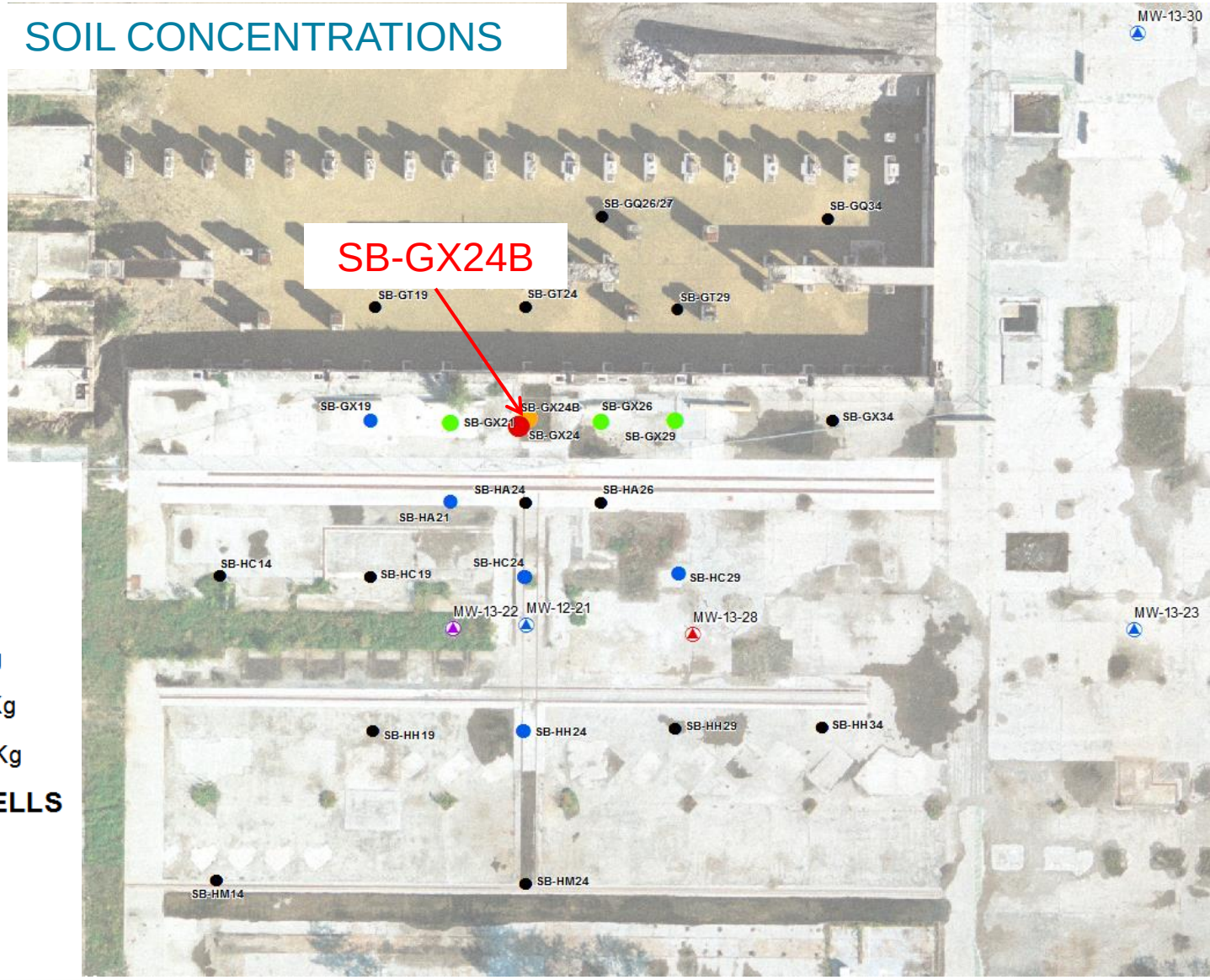
- Generally good agreement between the methods
- DSITMS reliable indicator of 1,4-dioxane in soil and groundwater
  - Bias slightly low for groundwater





1,4-Dioxane-Perched Zone (0-25 ft bgs)

SOIL CONCENTRATIONS



LEGEND

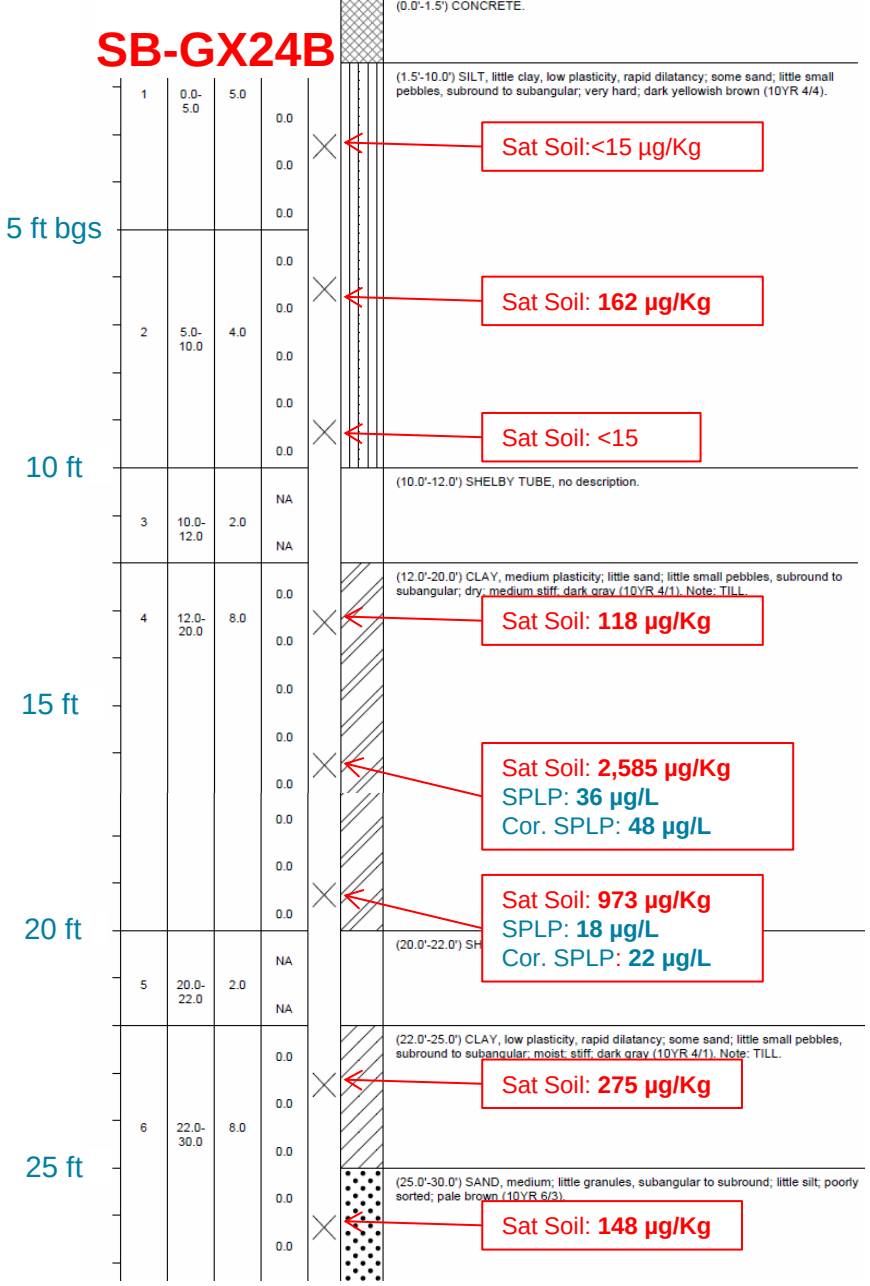
- NON-DETECT
- LESS THAN 15 ug/Kg
- BETWEEN 15 - 100 ug/Kg
- BETWEEN 100 - 500 ug/Kg
- GREATER THAN 500 ug/Kg

EXISTING MONITORING WELLS

- DEEP OVERBURDEN
- WEATHERED BEDROCK
- BEDROCK

SPLP Results

- For weakly sorbed compounds like 1,4-dioxane, SPLP will under predict field leachate concentration
- Corrected leachate concentrations calculated using NJDEP spreadsheet:
  - 12 SPLP Samples submitted (4 perched, 8 vadose and deep OB)
  - All <DL except two from SB-GX24B perched zone
  - DAF of 20 suggests leachate >170 µg/L required to be considered an ongoing source to lower plume
  - SB-GX24B SPLP concentrations <170 µg/L



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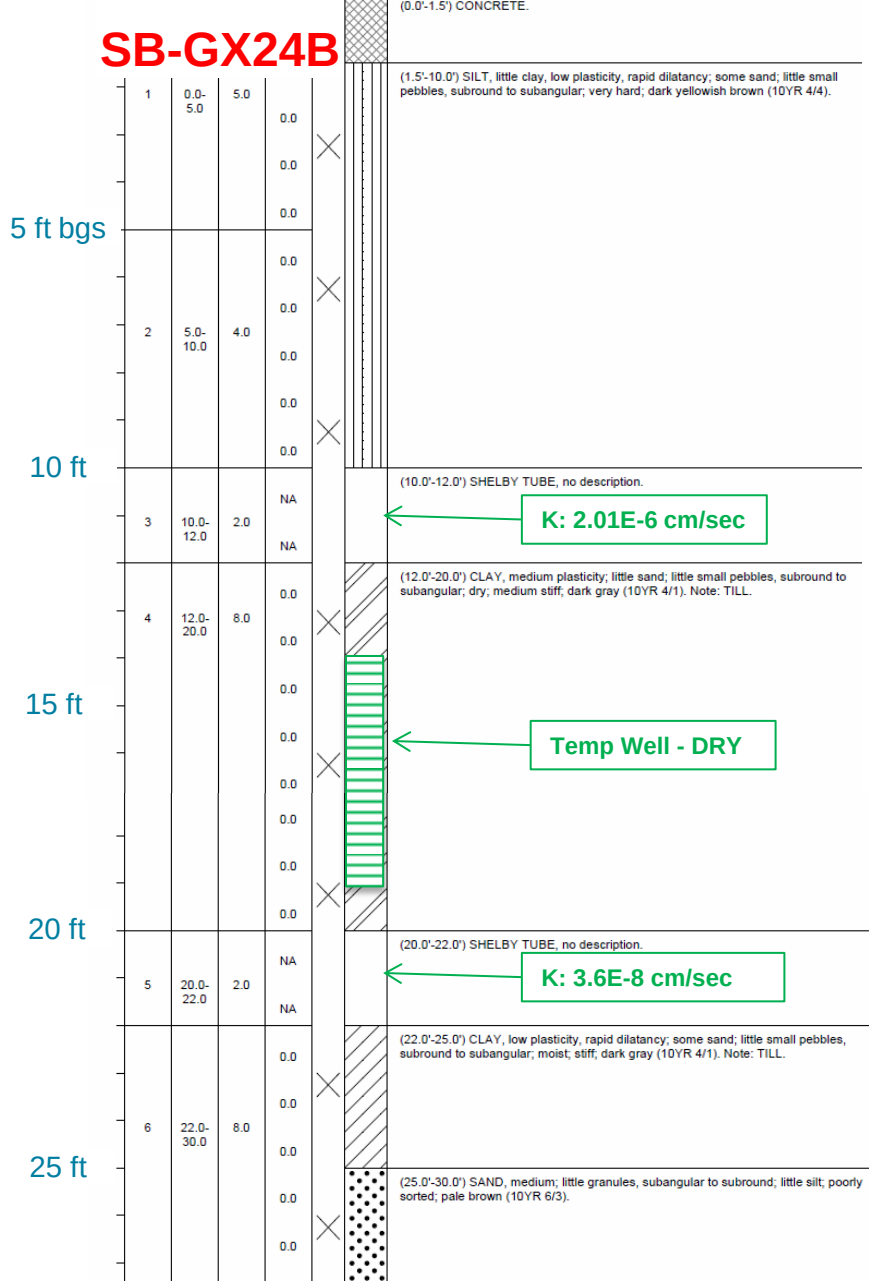
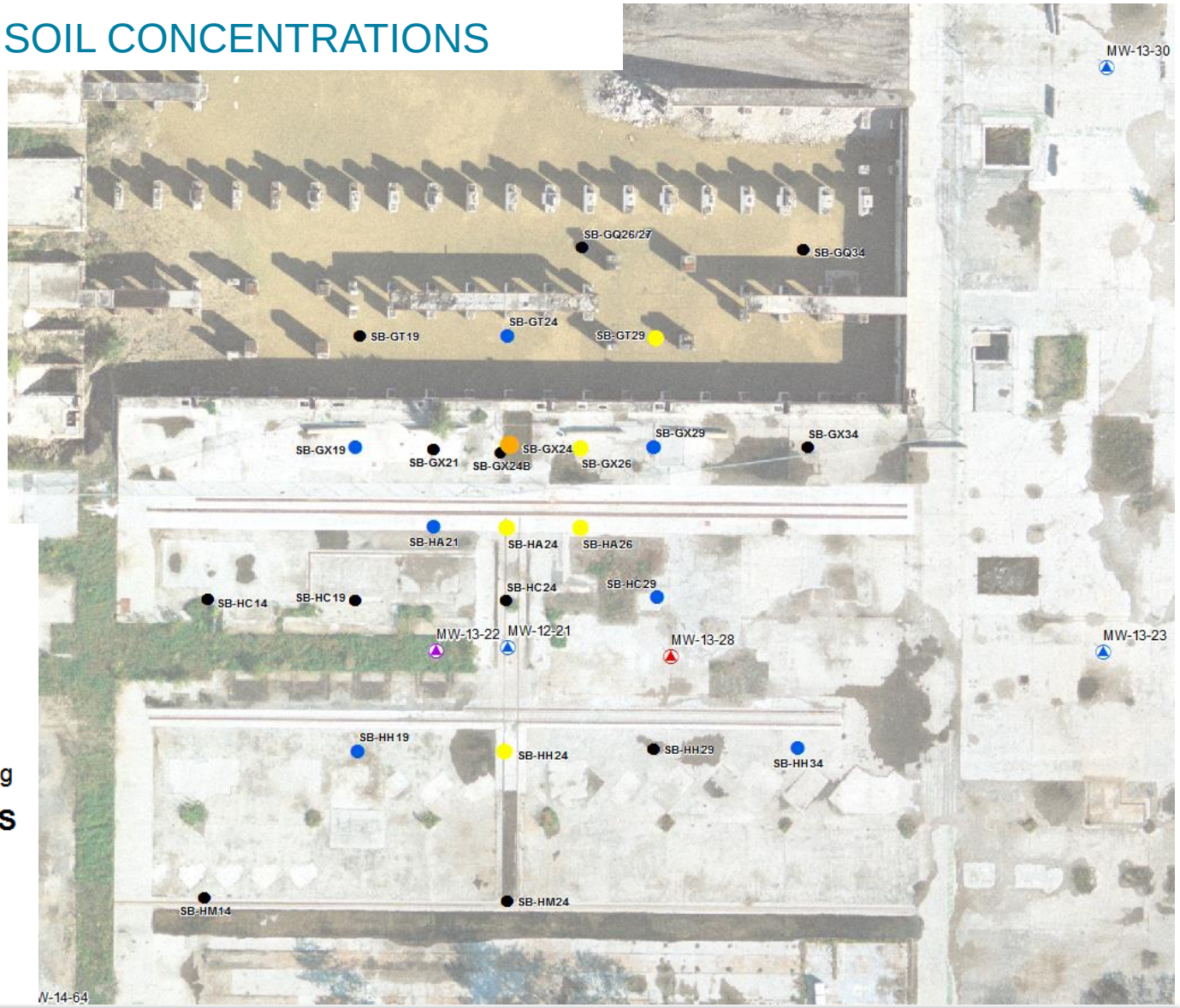
Soil Characteristics

- Perched groundwater noted at only one location (SB-HH24) (19.8 µg/L)
- Temp well installed within impacted zone at GX24B (14-19') - DRY
- Shelby Tube samples collected from GX24B
  - Perched zone vertical hydraulic conductivity (K) ranging from 10-6 to 10^{-8} cm/sec
  - 10^{-5} cm/sec for deep overburden



1,4-Dioxane-Vadose Zone Soil (25-55 ft bgs)

SOIL CONCENTRATIONS



LEGEND

- NON-DETECT
- LESS THAN 15 ug/Kg
- BETWEEN 15 TO 100 ug/Kg
- BETWEEN 100 AND 200 ug/Kg

EXISTING MONITORING WELLS

- DEEP OVERBURDEN
- WEATHERED BEDROCK
- BEDROCK

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Saturated Soil to Groundwater Correlation

Saturated soil data can be converted to an equivalent groundwater concentration:

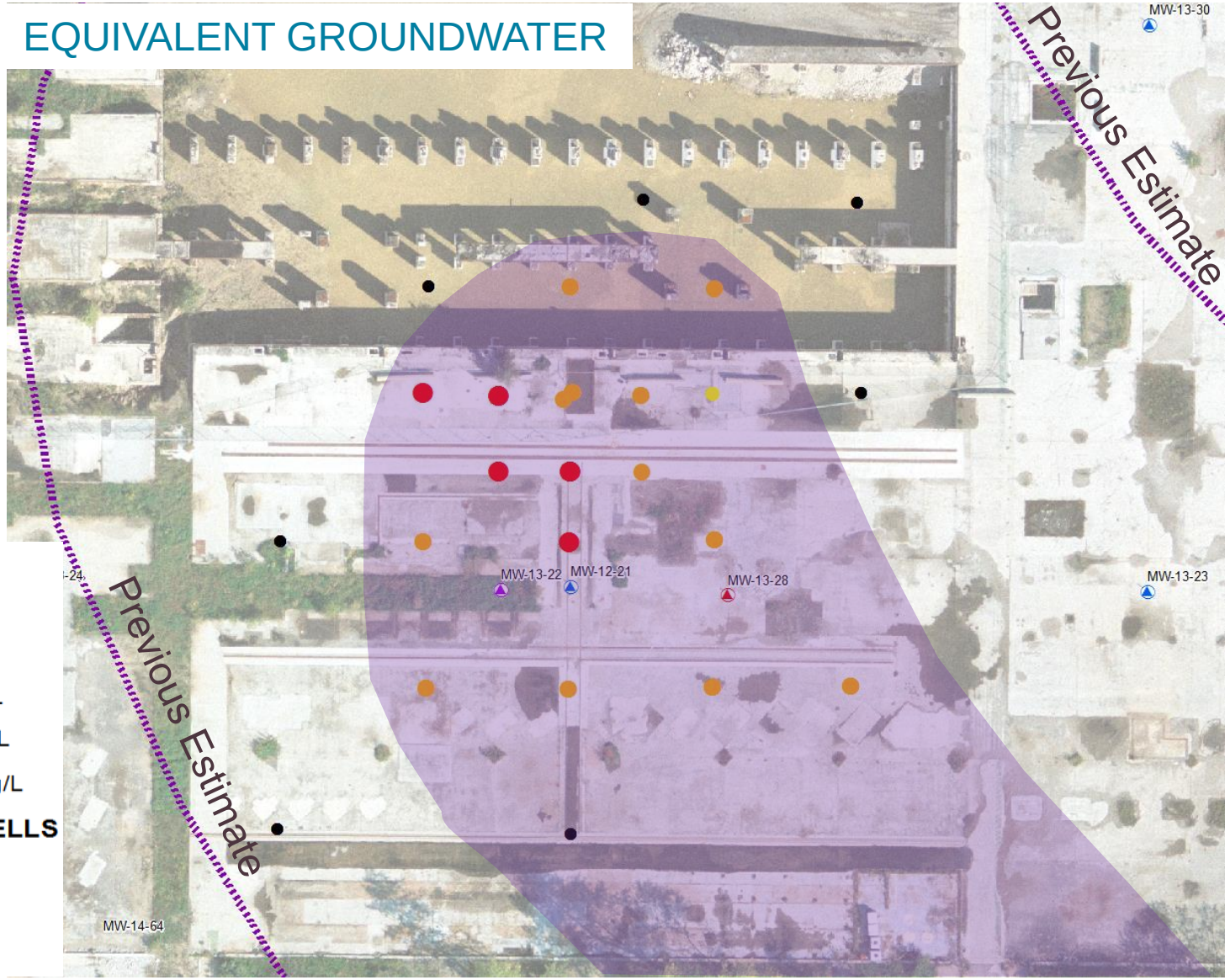
- Based on the chemical specific properties for 1,4-dioxane and site specific values for FOC, bulk density, and porosity: ~6X conversion factor

For example, near MW-12-21:

Nearby Max sat soil	=	110 µg/Kg (SB-HA24 70 ft)
Equivalent GW Conc.	=	660 µg/L
MW-12-21 (70-75 ft)	=	510 µg/L

Lower 1,4-Dioxane Plume (>55 ft bgs)

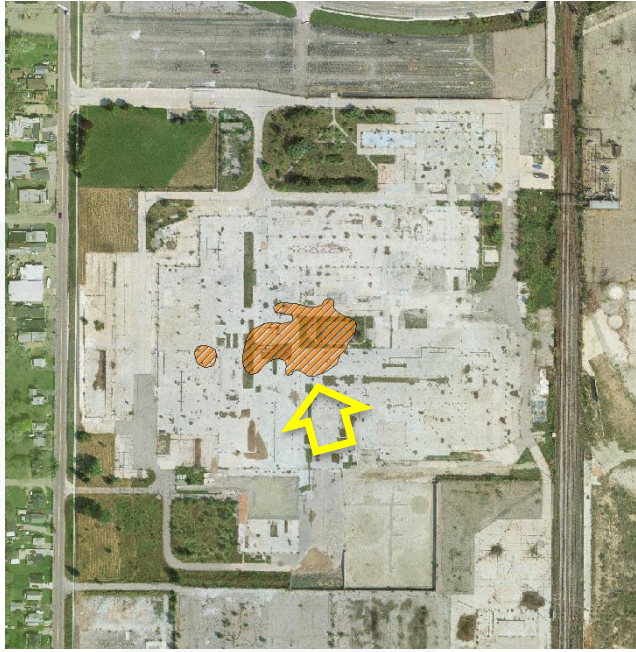
- Footprint of source area plume smaller than original estimate

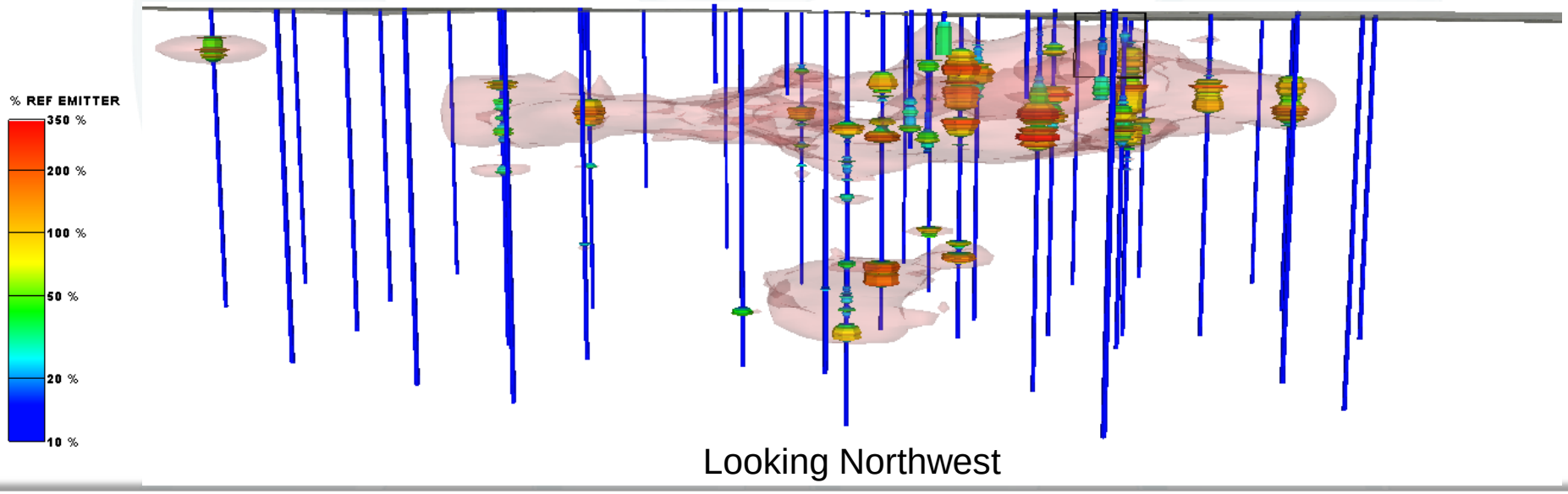


Lower 1,4-D Source Area Conclusions

- Perched Zone - impacts are limited with highest concentrations located in low permeability, dry till
  - Currently do not appear to leach at significant concentrations (>170 µg/L)
- Lower 1,4-Dioxane Plume - footprint of source area smaller than previous estimates
  - Max concentrations consistent with known impacts
  - Concentrations higher in the past
- Remedy
  - Perched - impacts could be removed, but wait and see approach may be warranted
  - Lower - smaller system footprint required in source area than original estimate

Plant 2 LNAPL Additional Characterization





Looking Northwest

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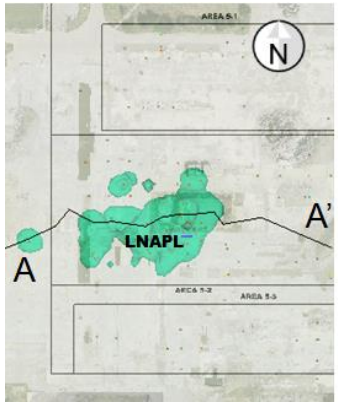
Confined LNAPL Conditions

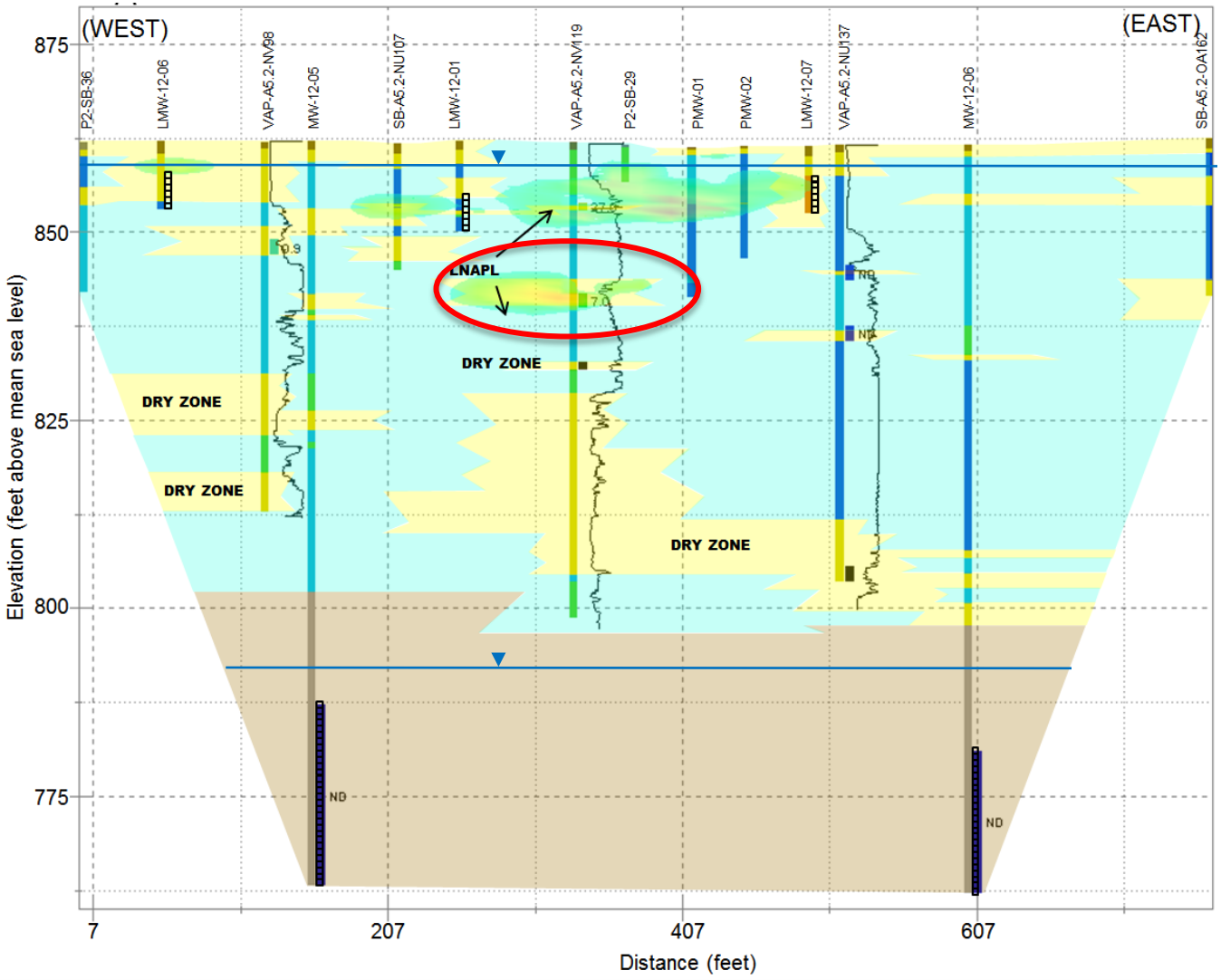


General Hydrostratigraphy

- Higher Permeability (Sand/Gravel)
- Lower Permeability (Silt/Clay)
- Bedrock

Boring Log Lithology

- CONCRETE/ASPHALT/TOPSOIL
- FILL
- GRAVELLY_SAND
- SAND
- SANDY_SILT/SILT
- SILTY/SANDY/GRAVELLY_CLAY
- CLAY
- PEAT
- BEDROCK
- NO_RECOVERY



4d Model

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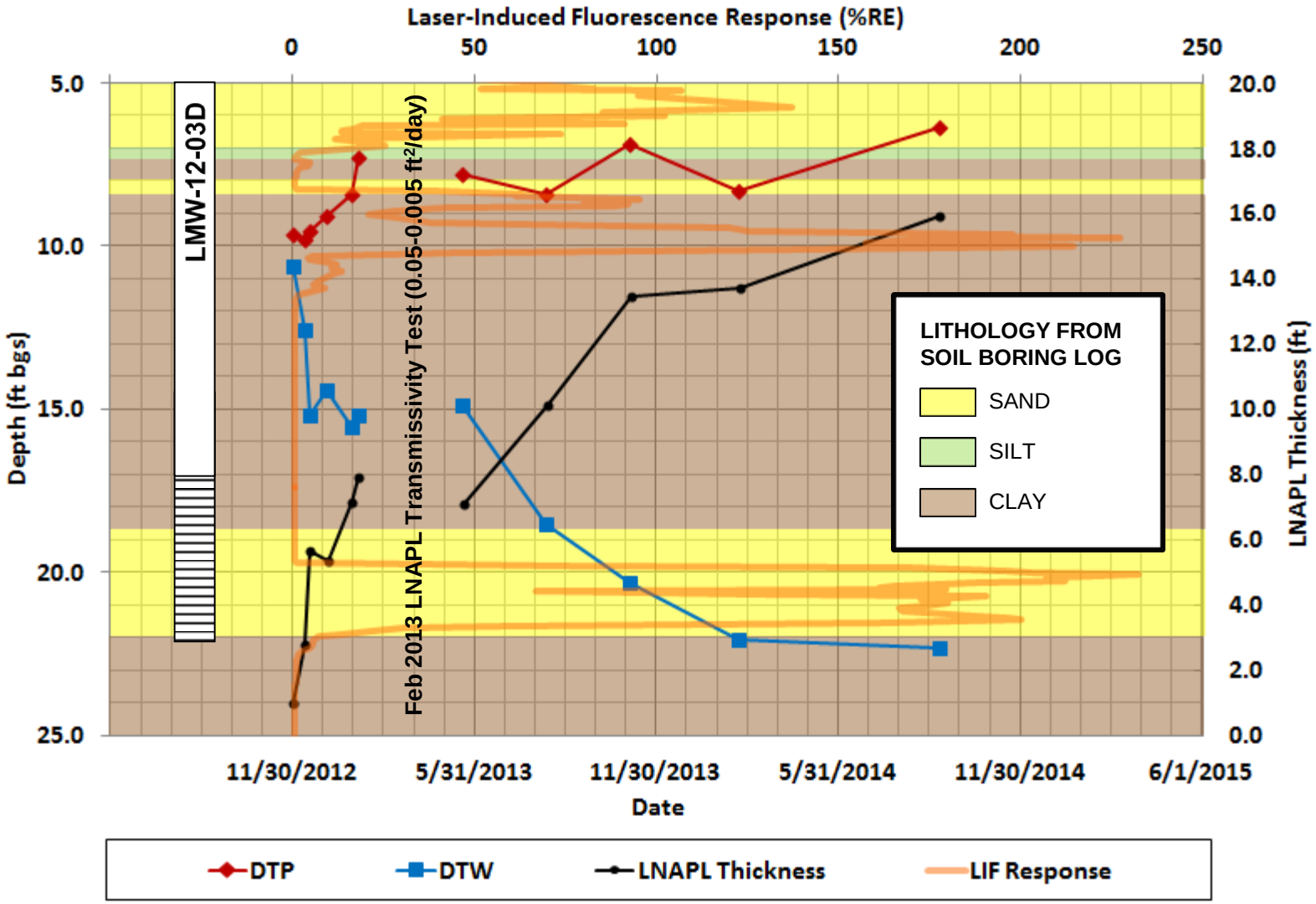
Confined LNAPL Conditions



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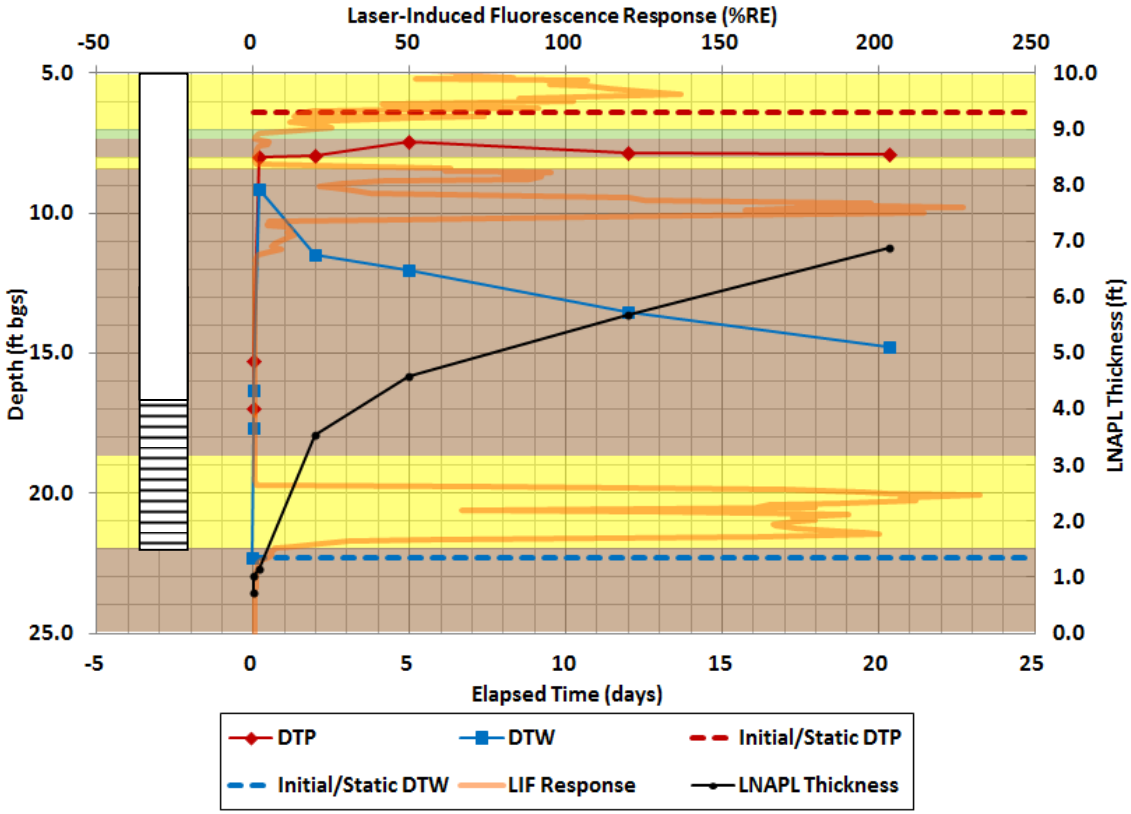
LMW-12-03D LNAPL Characteristics

- Physical Properties (55^{o}F):
  - Density: 0.899 g/cm^{3}
  - Viscosity: 323 cP (similar to motor oil)
- Composition:
  - PCBs: 500 mg/kg (Aroclor 1242)
    - Calculated equivalent soil concentration: 47 mg/Kg
  - Chloroethane: 8 mg/kg
  - Xylenes: 2.5 mg/kg
  - Toluene: 2.2 mg/kg
  - 1,1-DCA: 0.8 mg/kg
  - 1,4-Dioxane: <3 mg/kg

September 2014 LNAPL Baildown Test

- Baildown test initiation on September 10th
  - Initial LNAPL column = 15.9 ft

- LNAPL recovered to 6.9 ft 20 days (1.1 gal)
- Steady LNAPL discharge to well observed from 5 to 20 days (0.4 gal total)
- LNAPL transmissivity between 0.04 and 0.004 ft^2/day
  - Consistent with previous results
  - Recoverability
    - ITRC: 0.1-0.8 ft^2/day
    - MDEQ: 0.5 ft^2/day



Deeper Plant 2 LNAPL

Options:

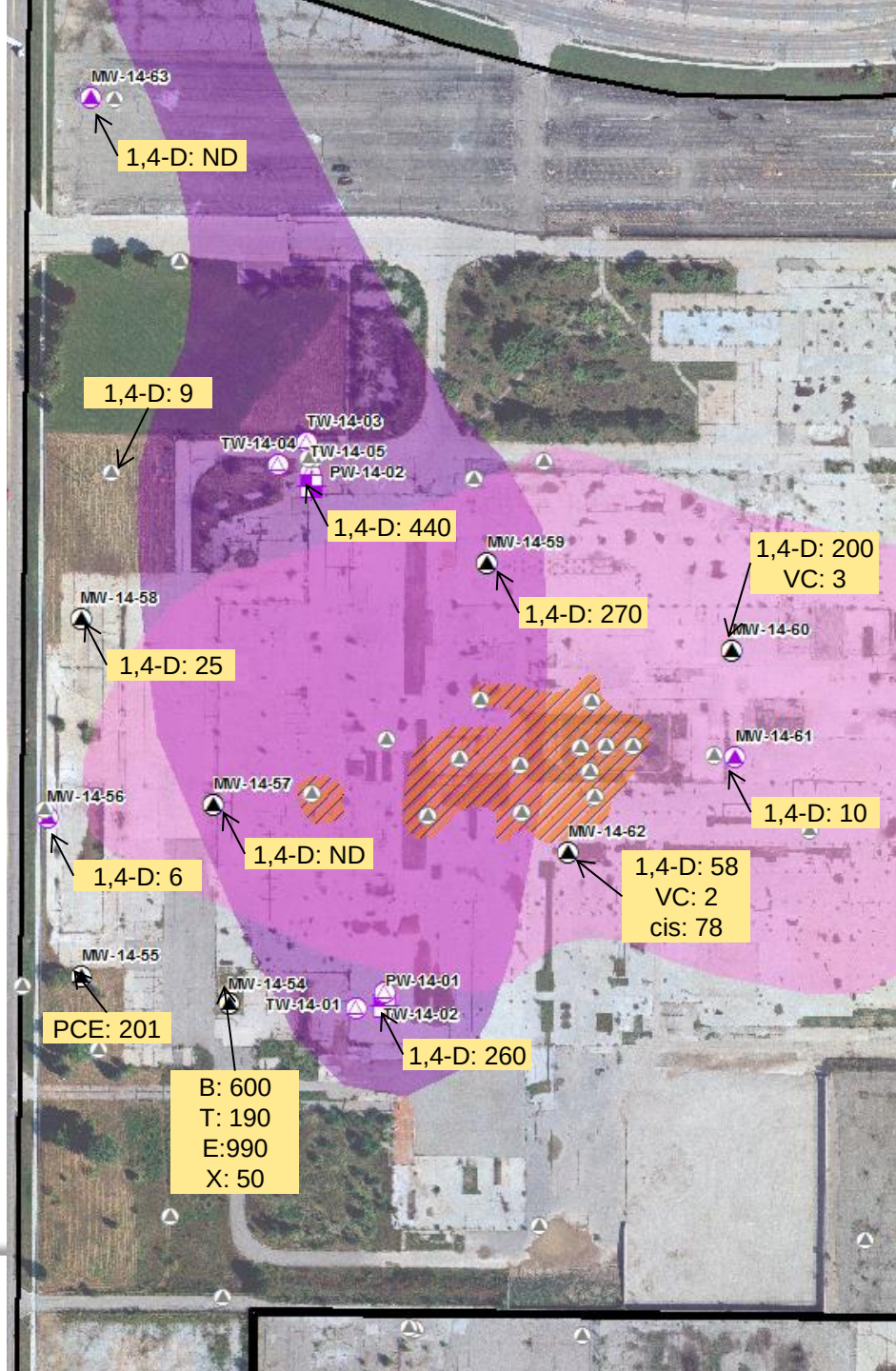
- Removal (bailing) of LNAPL at LMW-12-03D
- Active skimming system
- Additional delineation of deeper plume
  - LIF
  - LNAPL MW installation
  - Soil and LNAPL sampling
- Additional excavation
  - Deep – requires engineering controls, fluid management
- Status quo (immobile, not recoverable, no risk)
  - Cap, restrict and monitor

Additional Monitoring Well Installation

- Third quarter 2015 sampling

New Wells Plant 2

- Sampling Results for New Monitoring Wells
- Generally consistent with CSM
  - Continue monitoring

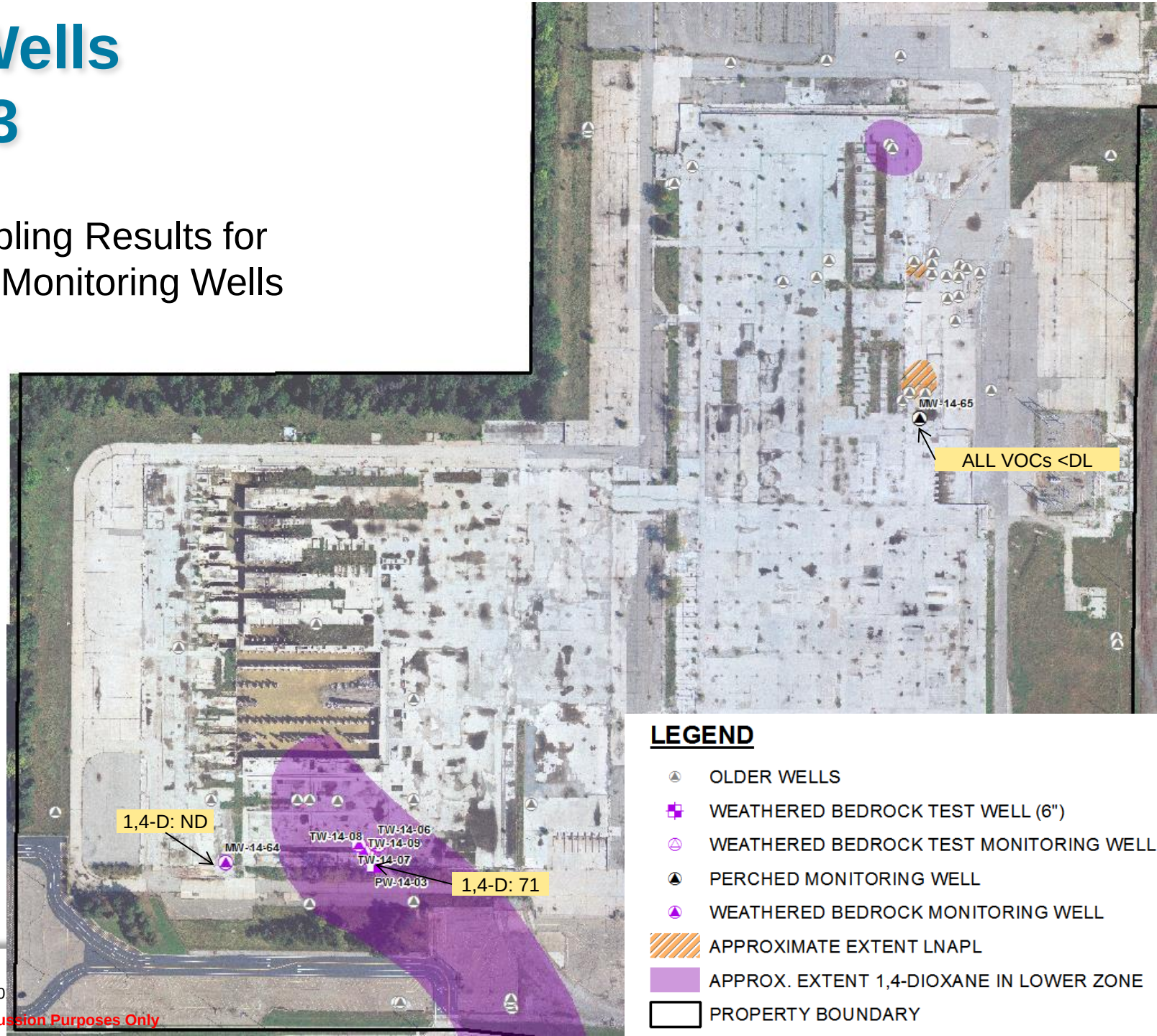


LEGEND

- OLDER WELLS
- WEATHERED BEDROCK TEST WELL (6")
- WEATHERED BEDROCK TEST MONITORING WELL
- PERCHED MONITORING WELL
- WEATHERED BEDROCK MONITORING WELL
- APPROXIMATE EXTENT LNAPL
- APPROX. EXTENT 1,4-DIOXANE IN PERCHED ZONE
- APPROX. EXTENT 1,4-DIOXANE IN LOWER ZONE
- PROPERTY BOUNDARY

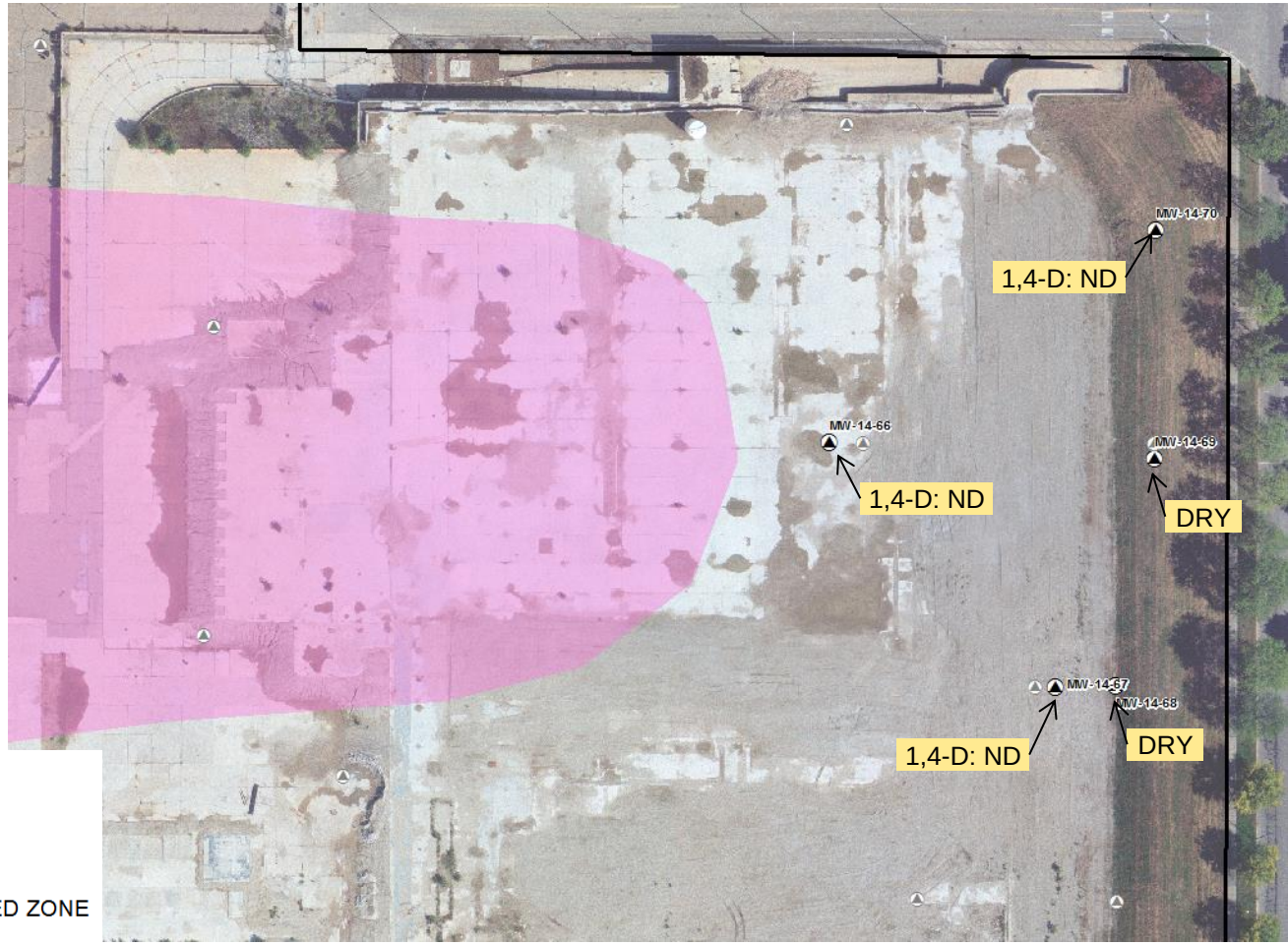
New Wells
Plant 3

- Sampling Results for New Monitoring Wells



New Wells Plant 6

- Sampling Results for New Monitoring Wells



LEGEND

- OLDER WELLS
- PERCHED MONITORING WELL
- APPROX. EXTENT 1,4-DIOXANE IN PERCHED ZONE
- PROPERTY BOUNDARY

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Lower 1,4-Dioxane Plume Hydraulic Testing Update

- Completed test sequence at PW-14-02
  - Low extraction rates / high injection rates
  - Recirculation appears viable
- Currently testing PW-14-01
  - Very low extraction rates

Plant 3

Plant 2 North

Plant 2 South

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Current Submittals

- RFI Summary
- Revised Geochem & Plume Stability Assessment
- Draft CMS
- Interim Groundwater Monitoring Plan
  - currently in revision
- PM Env - Plant 2 Vault and PCB Soil Excavation Plan
- PM Env – Plant 6 Excavation Work Plan

Path Forward

- October 22, 2014 – Pre-design lower 1,4-d hydraulic testing complete
  - December 2014 – Summary Memo to MDEQ
- October 31, 2014 – Revised Interim Groundwater Monitoring Plan to MDEQ
- October 31, 2014 – Pre-design 1,4-dioxane source area characterization memo
- December 2014 – Fourth quarter groundwater sampling event
- TBD – Technical meeting with BWL/Westside/City/MDEQ
- TBD – Excavations Plants 2 & 6
- CMI Work Plan - 90 days after MDEQ approval of CMS (March 2015?)

