

RACER TRUST 4TH QUARTER 2017 PROGRESS REPORT LANSING PLANTS 2, 3 & 6

January 16, 2018

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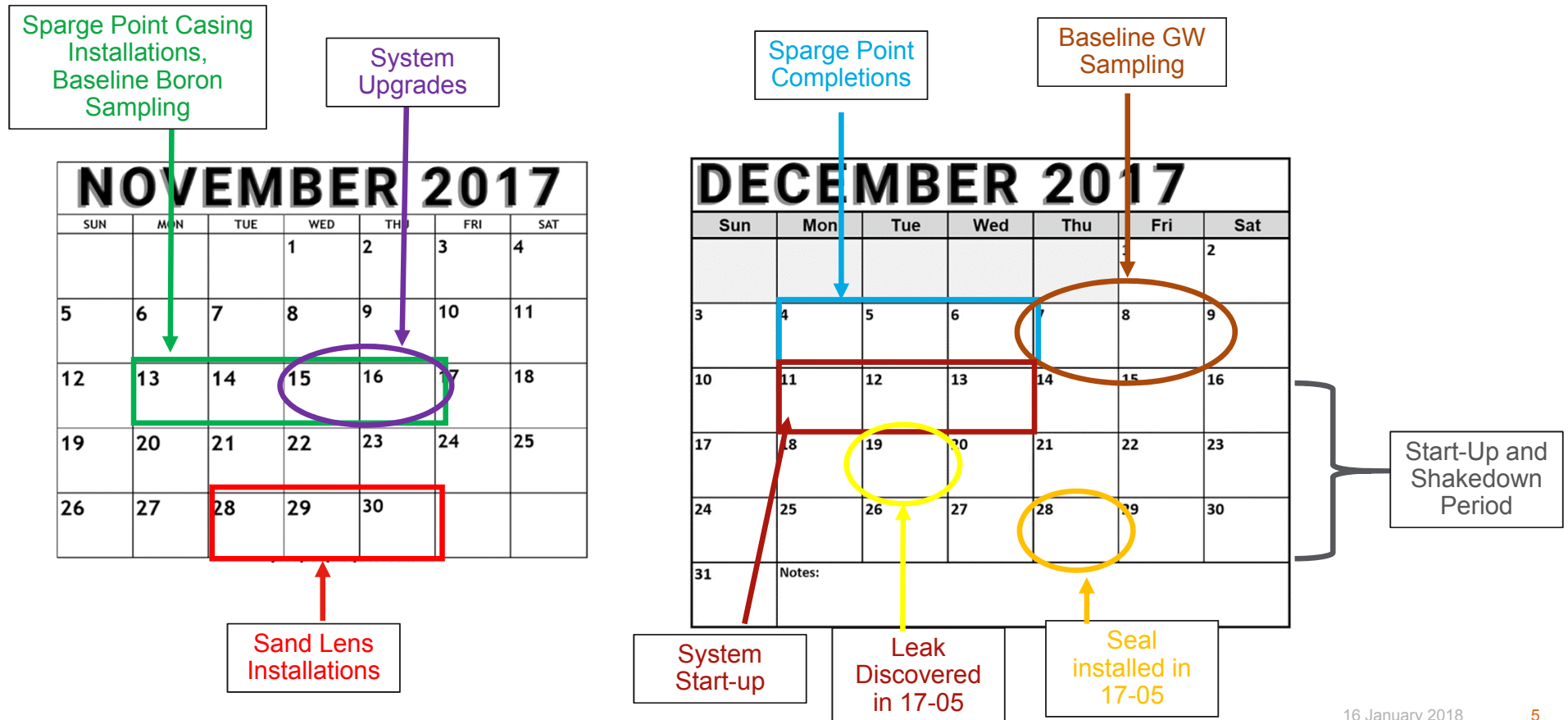
- Submittals / Discussion Topics
- LNAPL Composition

2018 First and Second Quarter Schedule

Biosparge Pilot Testing Update

Installation and Start-up Timeline

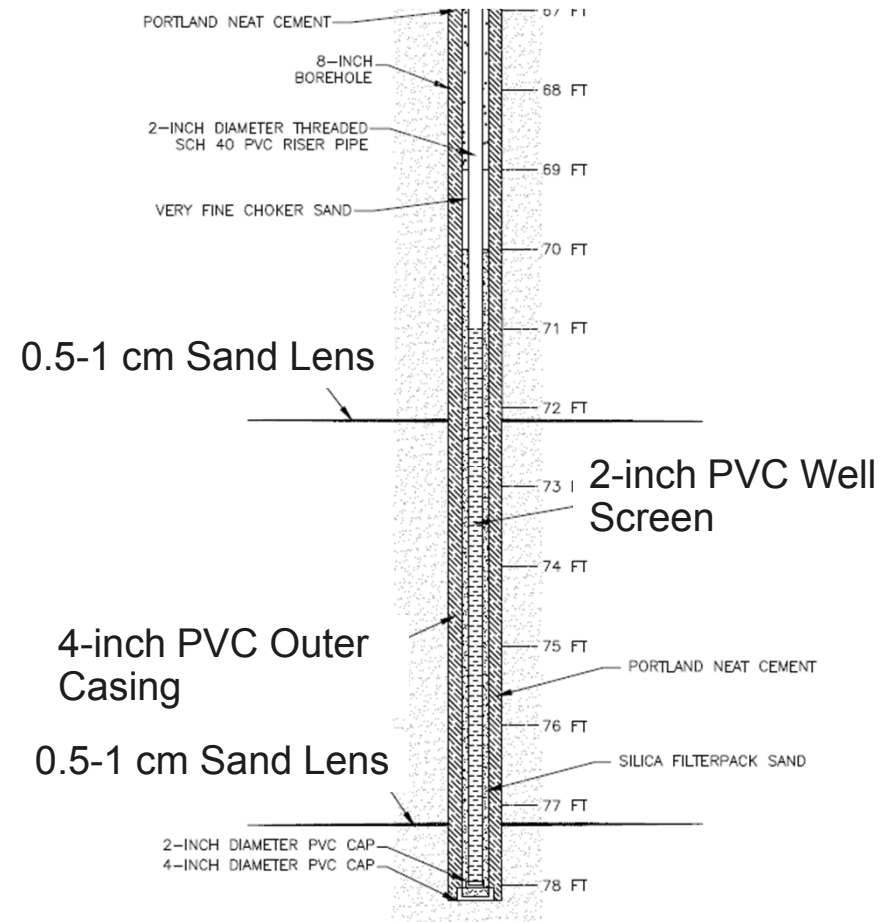
Work plan approved by MDEQ on November 9, 2017



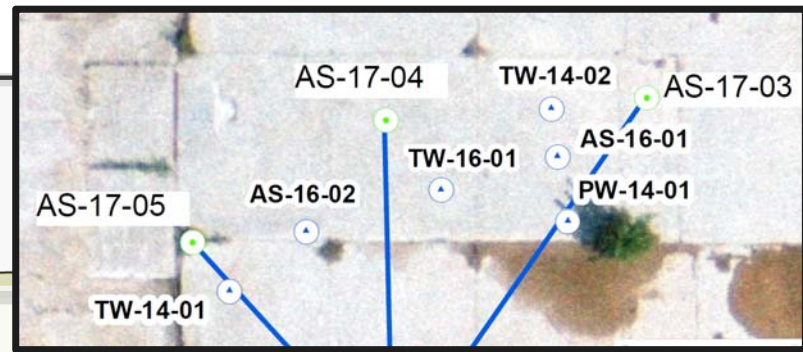
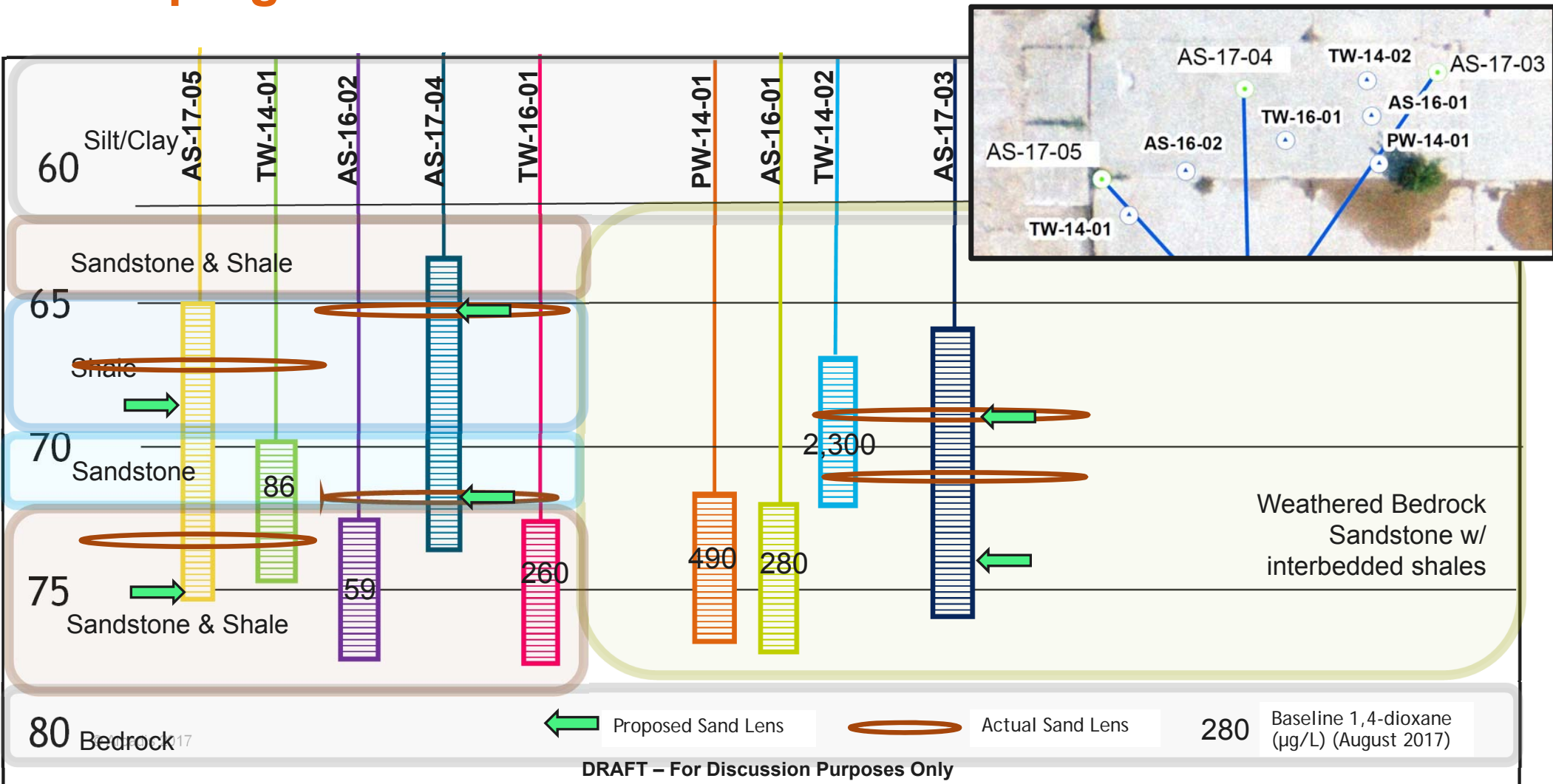
January 2018: Finish start-up/shakedown, bioaugmentation, and begin study operation

Biosparge Point Installation

- Borehole installed using roto-sonic drilling method
 - 4" blank PVC casing installed to depth
 - Neat cement around casing, allowed to cure for ~1 week
- Sand lens installation
 - Two lenses per sparge point
 - Formation is pre-notched with water jet
 - Injection rig used to inject a guar gum, quartz silica sand, borax, and LEB-H – endo-1,4-R-mannase mixture. Approximately 1,000 lbs of sand and 200 gallons carrier fluid injected per lens
 - Multiple attempts were required to adequately penetrate the formation and initiate a fracture at several locations, resulting in modified lens depths
- Each point fitted with an air sparge well screen



Biosparge Point Installation



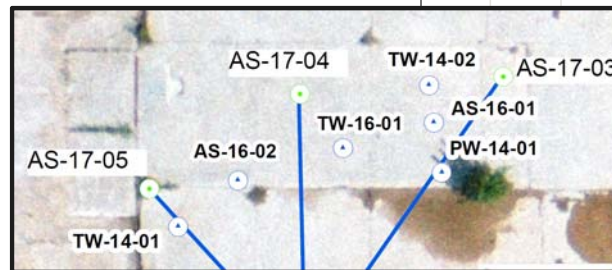
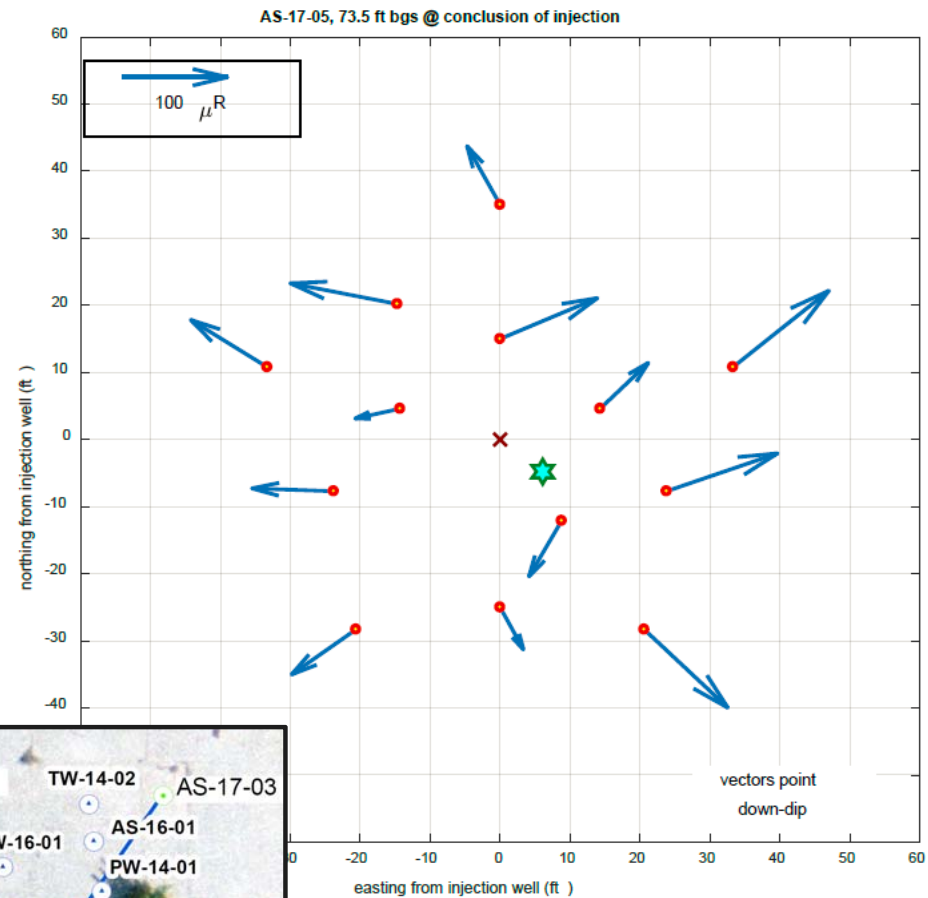
Radius of Influence

ROI of at least 15 feet based on:

- Tilt meters detected surface deformation 20-35 ft
- Injected sand mixture volume injected indicated minimum of 15ft ROI
- Hydraulic response in MWs 10 to 25 ft away
- Backpressure in idle sparge points 30 to 60 ft away
- DO response in MWs greater than 15 ft
- Increase in TOC up to 15 ft

AS-16-02		
Date	Sparge Well Installed (Sand Lens)	Result (mg/L)
8/31/2017 (Baseline)	None	7.7
11/29/2017	AS-17-03 (1)	8.8
11/29/2017	AS-17-03 (2)	9.1
11/30/2017	AS-17-05 (2)	272
12/6/2017	All	330

Tilt Meter



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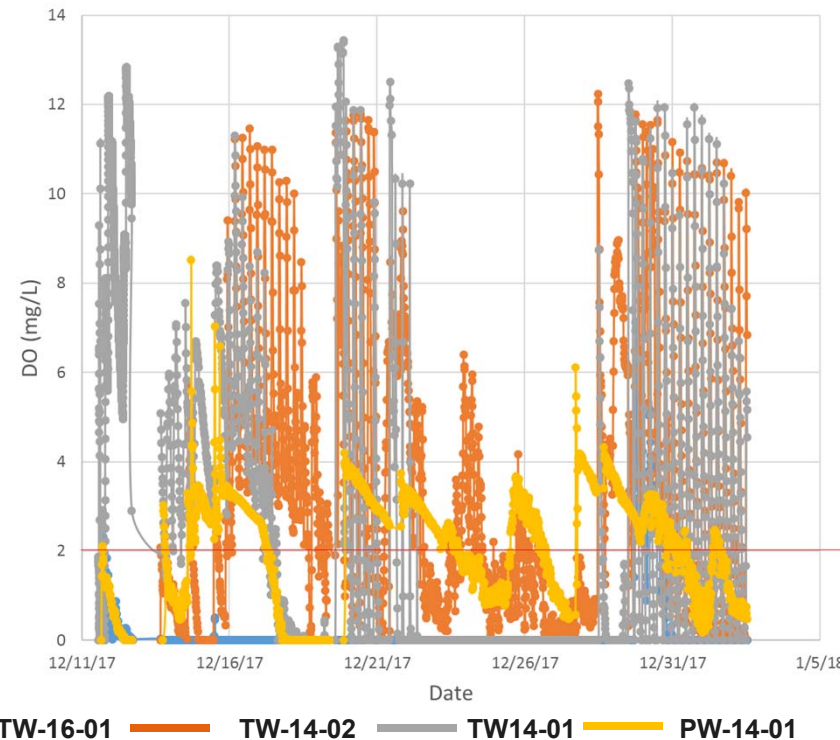
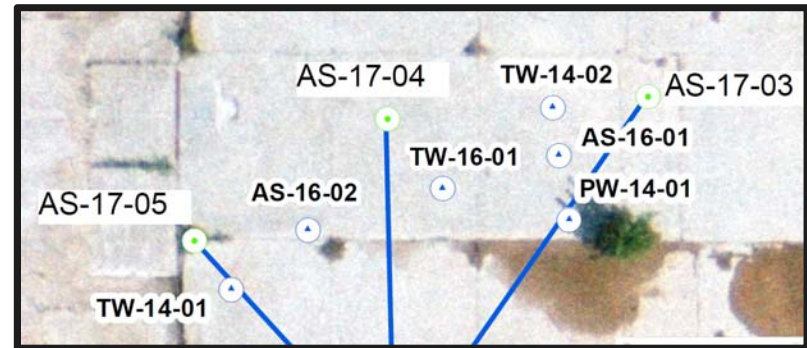
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System Operation

- Sparge points operating at ~2 scfm @ ~10 psi
- Ongoing adjustments to cycle times. Current operation:
 - Three wells sparging 1.5 hrs on and 1.5 hrs off
 - Propane 30 minutes every 6 hrs at 15% LEL
- Weekly DO logger data downloads to optimize DO distribution
 - High DO immediately after sparging begins then decreasing DO through out sparge cycle
 - Increase cycling rate to troubleshoot
 - Operate with wells capped to evaluate short circuiting through MWs
- Wellhead LEL readings 0% of LEL within pilot test area
- Air leak in AS-17-05 along outer edge of 2” riser on 12/22
 - Possible leak was caused by cement grout shrinkage during curing
 - Evaluating alternate grouting methods
 - Leak repaired on 12/28 with Fernco seal and metal fasteners

© Arcadis | Continuing to monitor seal for leakage

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Biosparge Path Forward

- Continue optimizing DO by adjusting cycling times and/or flow rates.
- Conduct test in which all monitoring wells are capped and observe DO response (week of January 8th)
- Sample 1,4-dioxane to measure treatment progress (week of January 8th), and at least monthly thereafter
- Propane sampling (week of January 8th) to evaluate propane dosing
- Bioaugmentation tentatively scheduled in mid-January, pending DO optimization
- TKN and phosphorous sampling immediately following bioaugmentation

Start-up and shake-down period is ongoing as we prepare for initiation of study

Plant 3 PFAS Investigation

PFAS Investigation to Date

December 2016 - Initial Monitoring Well Sampling

- Two perched and two deep overburden wells sampled
- Initial detection of PFAS

April 2017 - Initial VAP Investigation

- 12 VAP borings completed
- Sampled an additional 3 deep overburden monitoring wells, two perched wells and storm sewer outfall (P3-MH-NE)

June 2017 - Monitoring Well Sampling and Storm Sewer Sampling

- Sampled an additional five perched monitoring wells
- Resampled storm sewer P3-MH-NE

August 2017 - Adaptive VAP Borings

- Adaptive approach utilizing mobile lab (Cascade) (35 VAP borings)

September 2017 - Storm Sewer Investigation

- Camera survey of storm mains
- Sampled 10 storm sewer manholes

October 2017 - Storm Sewer Sampling

- Sample additional storm sewer manholes upgradient

October 2017 - Additional VAP Borings

- Delineate impacts to the west and south (25 VAP borings)

November 2017 - Deep Monitoring Well Sampling

- 8 deep overburden and 4 bedrock wells sampled

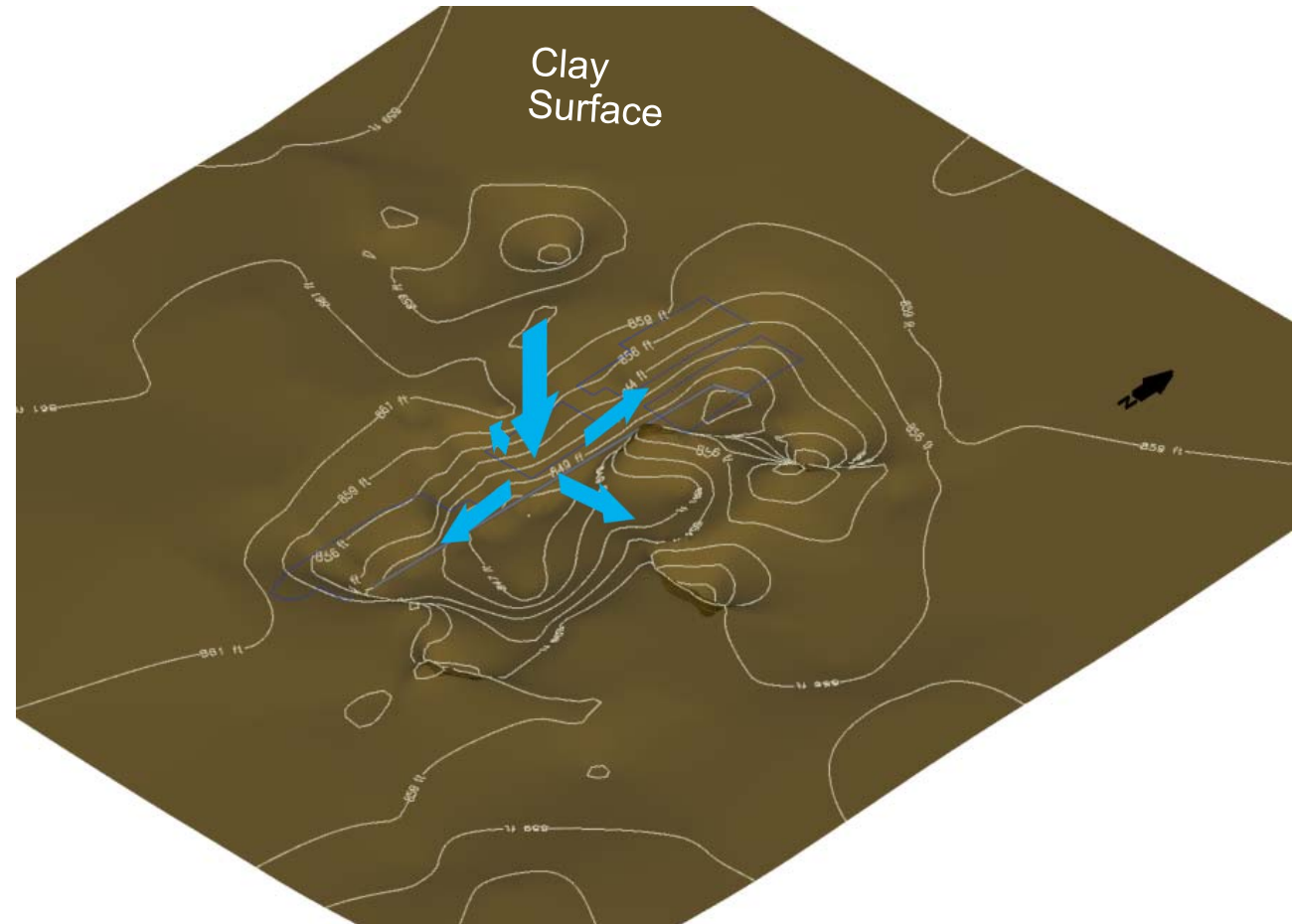
December 2017 – Resample Deep Monitoring Wells

- Resample two deep overburden wells with PFAS detections

Geology

The clay surface underlying the shallow fill is shown on the right

- Fill serves as a preferential pathway
- Away from fill, perched water is connected via confined sand seams
- Advection likely follows the depressions in the clay surface
- Driven by recharge through the former press pits (right)
- Radial flow creating a multi-lobed plume
- Highly variable with fill thickness, material, seasonal recharge













Perched PFAS Delineation

PFOS is the primary compound of concern

- PFOA and other PFAS coincident with elevated PFOS but at lower concentrations

PFOS requires additional delineation off-site to east

LEGEND

-  APPROXIMATE PLUME PFOS > 70 ng/L [dashed where inferred]
-  APPROXIMATE PLUME PFOS > 12 ng/L [dashed where inferred]
-  PFOS < 12 ng/L
-  PFOS > 12 ng/L
-  PFOS > 70 ng/L
-  DRY LOCATION
-  SANITARY LINE
-  VAP BORING LOCATION
-  PERCHED ZONE MONITORING WELL
-  APPROXIMATE PLANT 3 BOUNDARY

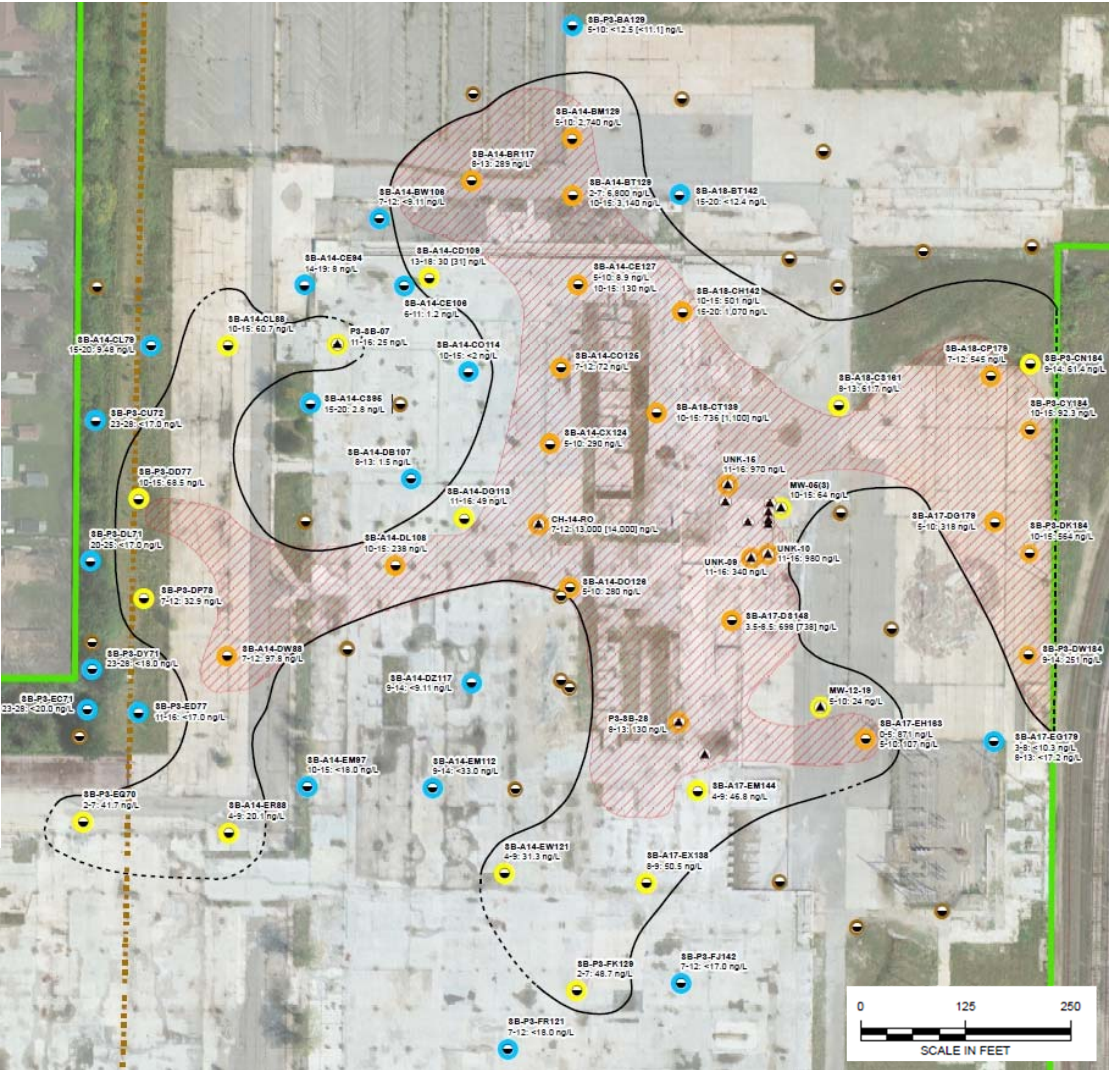
NOTES:

THE 2018 MDEQ RULE 57 HUMAN NON-CANCER VALUE FOR SURFACE WATER FROM A NON-DRINKING WATER SOURCE FOR PFOS IS 12 ng/L.

THE 2017 PROPOSED MDEQ PART 201 DRINKING WATER CRITERIA FOR PFOS IS 70 ng/L.

ANALYTICAL DATA IN BRACKETS REPRESENT DUPLICATE SAMPLE ANALYTICAL RESULTS.

ng/L - NANOGRAMS PER LITER



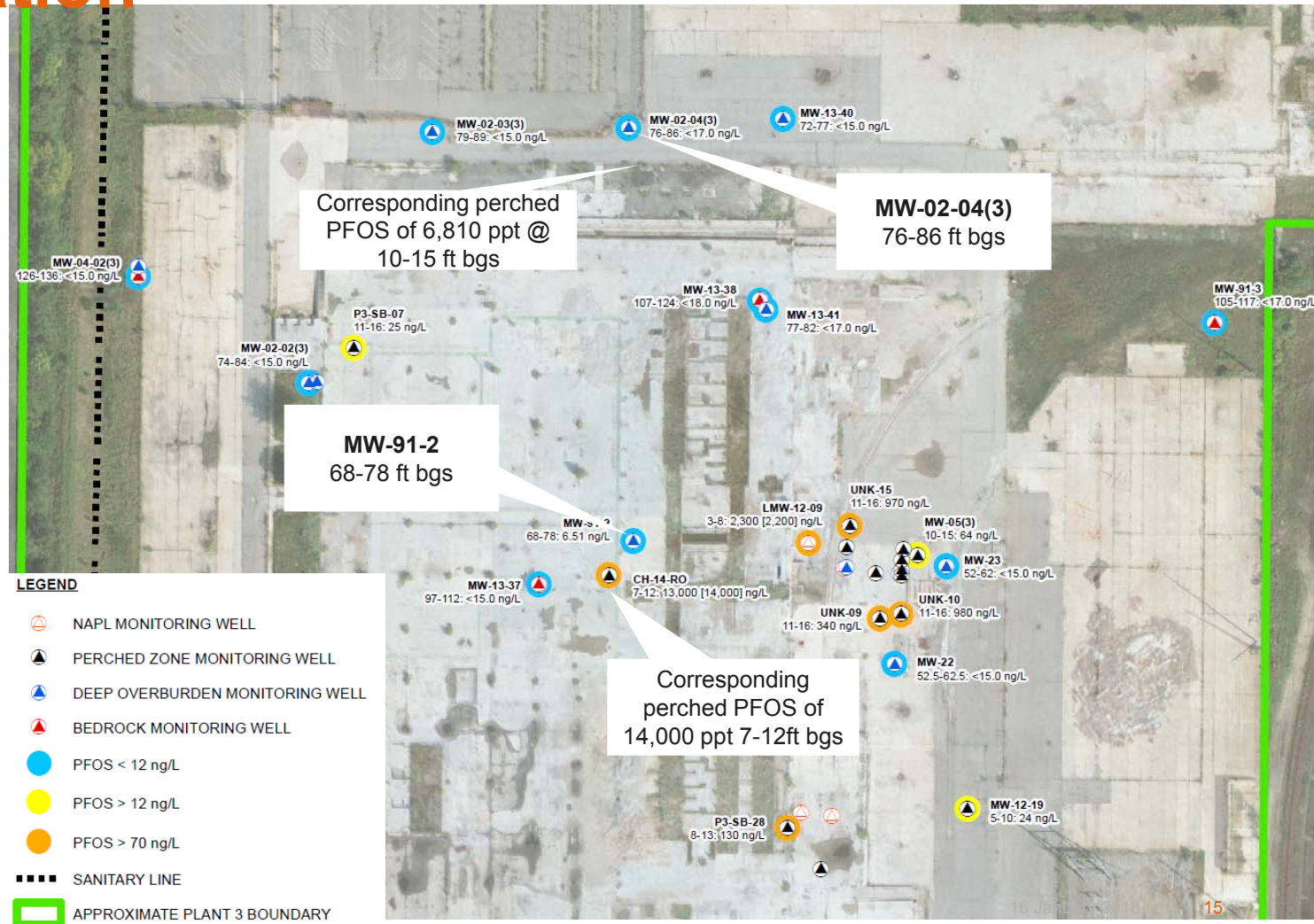
Vertical Delineation

Deep Overburden and Bedrock Groundwater Sampling:

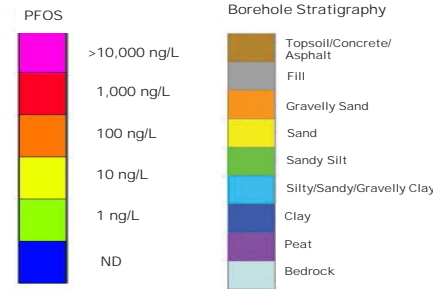
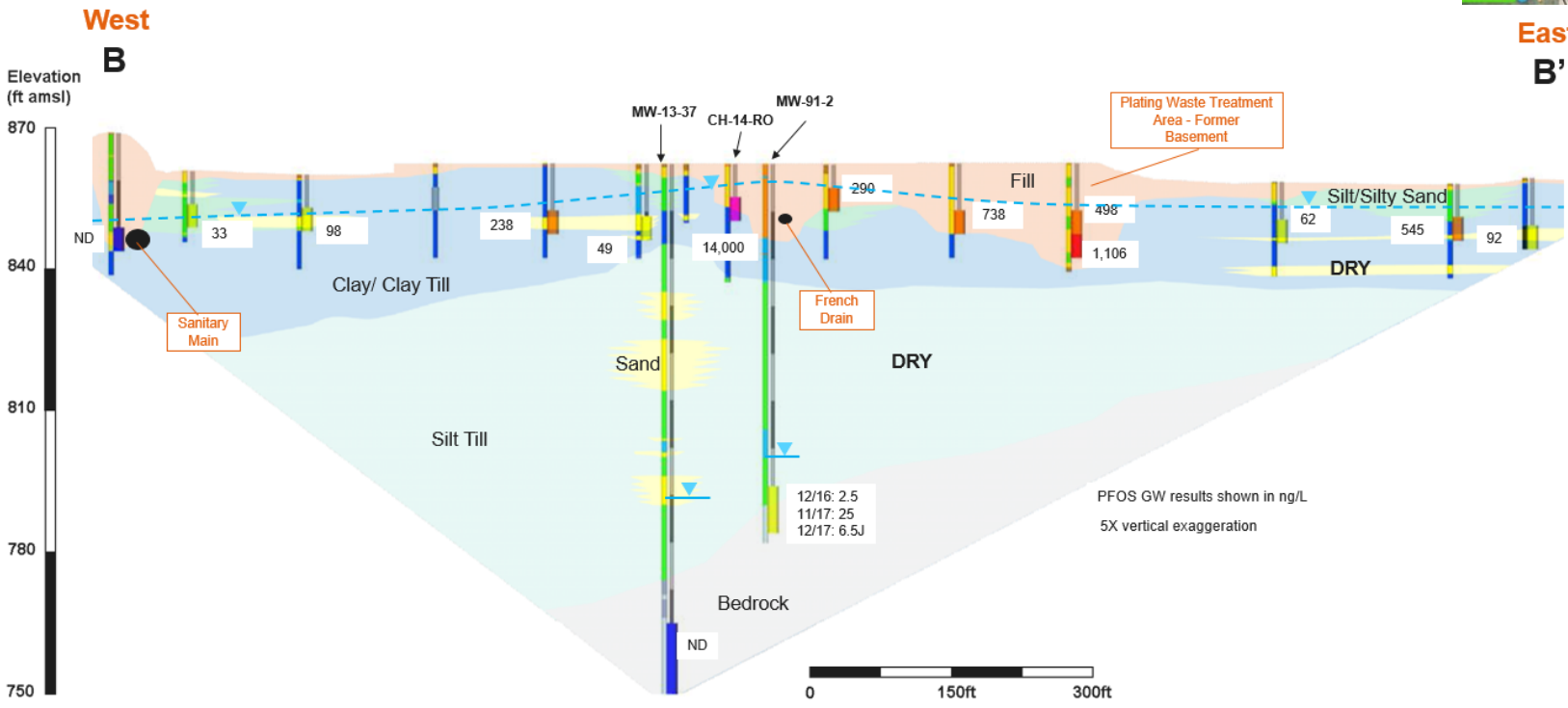
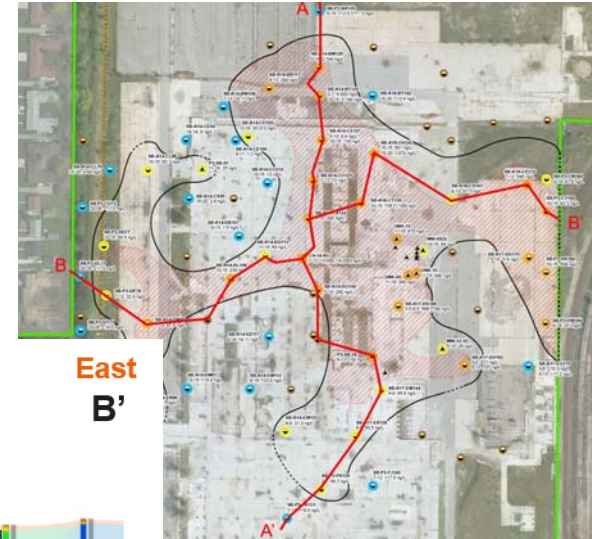
- No PFAS were detected in the bedrock wells
- No exceedances of DW criteria detected in deep wells:
- April 2017:
 - MW-02-04: PFOS at **<1.9 ng/L**
 - MW-91-2: PFOS at **2.5 ng/L**
- November 2017:
 - MW-02-04: PFOS at **42.6 ng/L**
 - MW-91-2: PFOS at **25 ng/L**
 - Results appear anomalous

The two deep overburden wells were re-sampled in December 2017:

- MW-02-04: PFOS at **<1.7 ng/L**
- MW-91-2: PFOS at **6.5J ng/L**



East-West Cross-Section



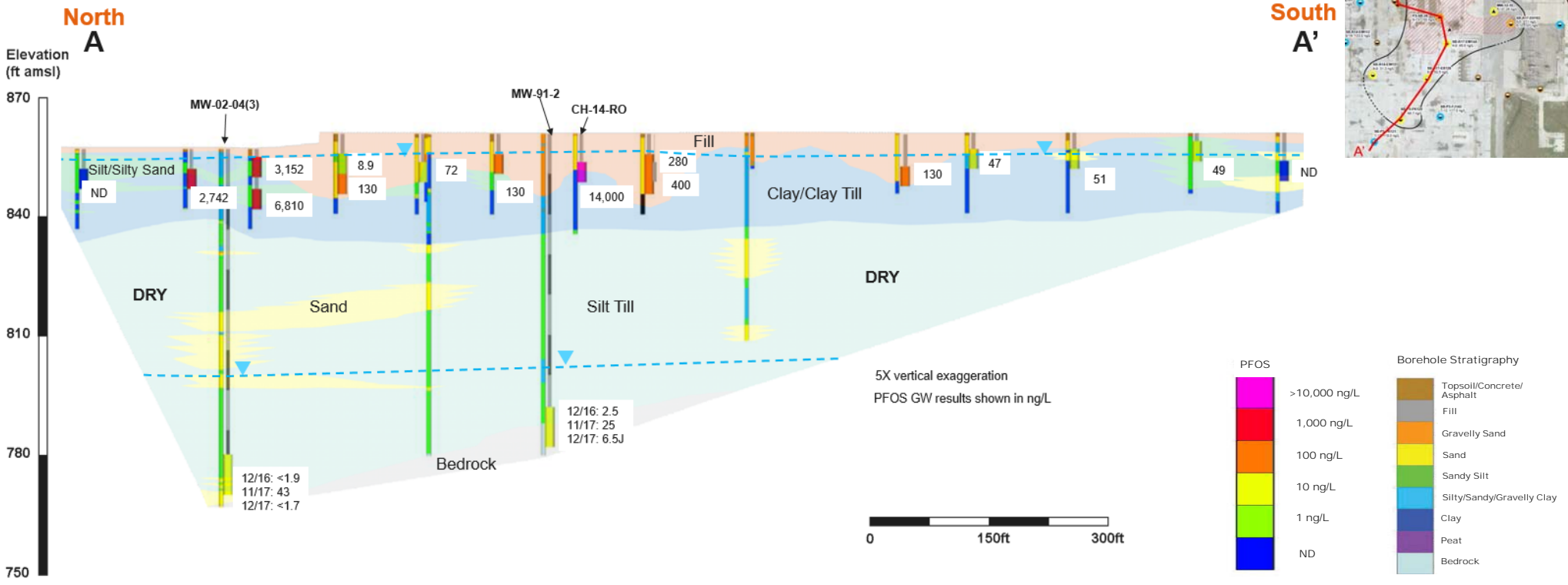
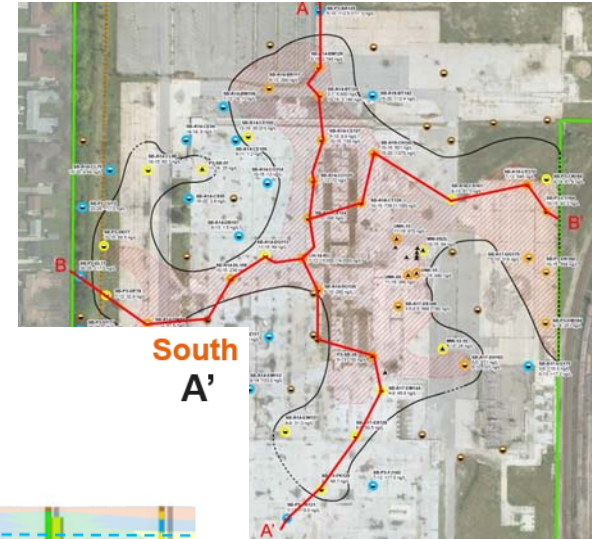
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North-South Cross-Section



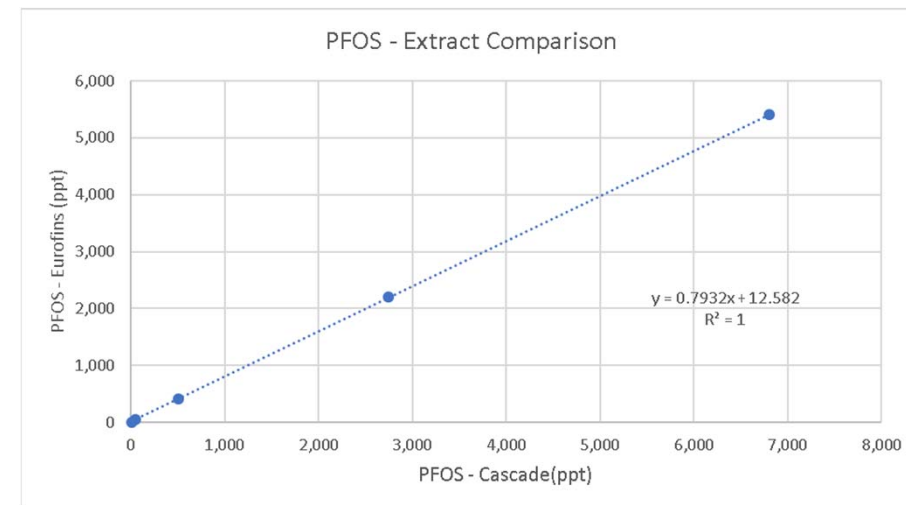
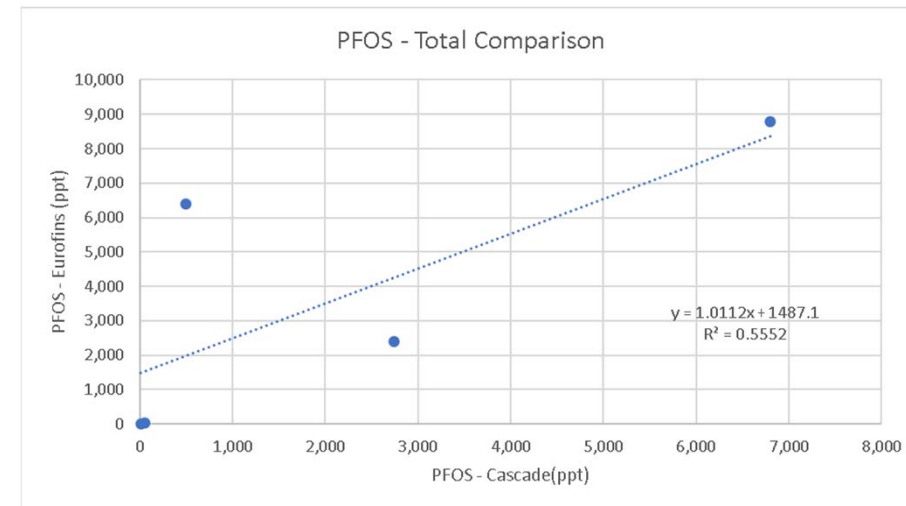
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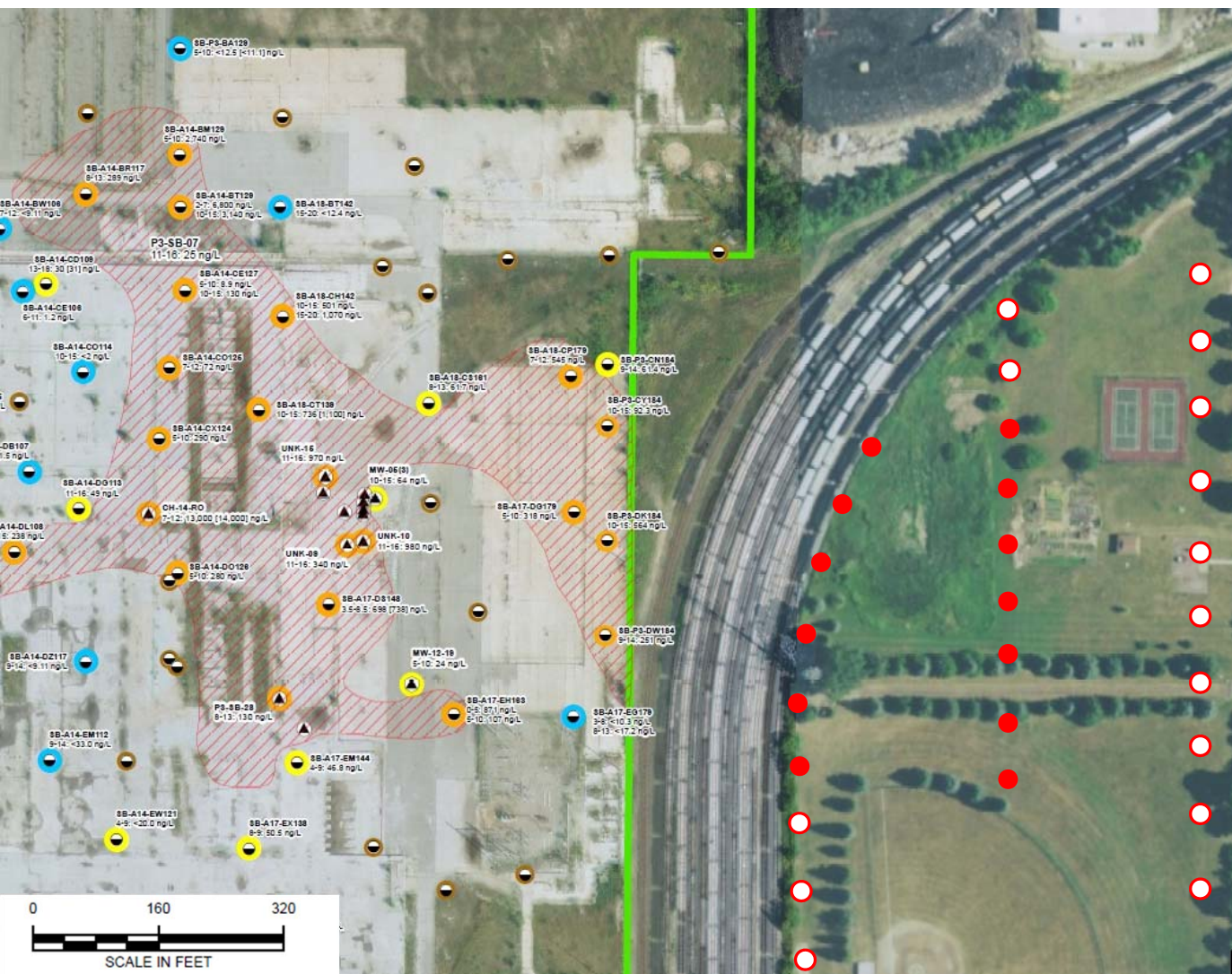
Mobile Lab / Fixed Lab Data Comparison

PFOS	SB-A14-BM129 (5-10)	SB-A14-BT129 (2-7)	SB-A14-CL79 (15-20)	SB-A17-EX138 (4-9)	SB-A18-CH142 (10-15)
Cascade	2,740	6,800	9.48	50.5	501
Eurofins - Total	2,400	8,800	7	42	6,400
Eurofins - Extract	2,200	5,400	9	46	420

- Cascade Technical Services PFAS Mobile Lab used for August 2017 delineation event.
- Five samples were split to evaluate mobile lab results. Each split consisted of:
 - The remaining extract prepared by the mobile lab,
 - Whole groundwater sample collected at the borehole
- Extracts show a good match with a very slight high bias for the mobile lab
- Whole sample results show a good match with one outlier and no discernable bias



Proposed Off-Site Delineation



LEGEND

- APPROXIMATE PLUME PFOS>70ng/L
- PFOS < 12 ng/L
- PFOS > 12 ng/L
- PFOS > 70 ng/L
- DRY LOCATION
- SANITARY LINE
- VAP BORING LOCATION
- PERCHED ZONE MONITORING WELL
- APPROXIMATE PLANT 3 BOUNDARY

NOTES:

THE 2016 MDEQ RULE 57 HUMAN NON-CANCER VALUE FOR SURFACE WATER FROM A NON-DRINKING WATER SOURCE FOR PFOS IS 12 ng/L.

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ANALYTICAL DATA IN BRACKETS REPRESENT DUPLICATE SAMPLE ANALYTICAL RESULTS.

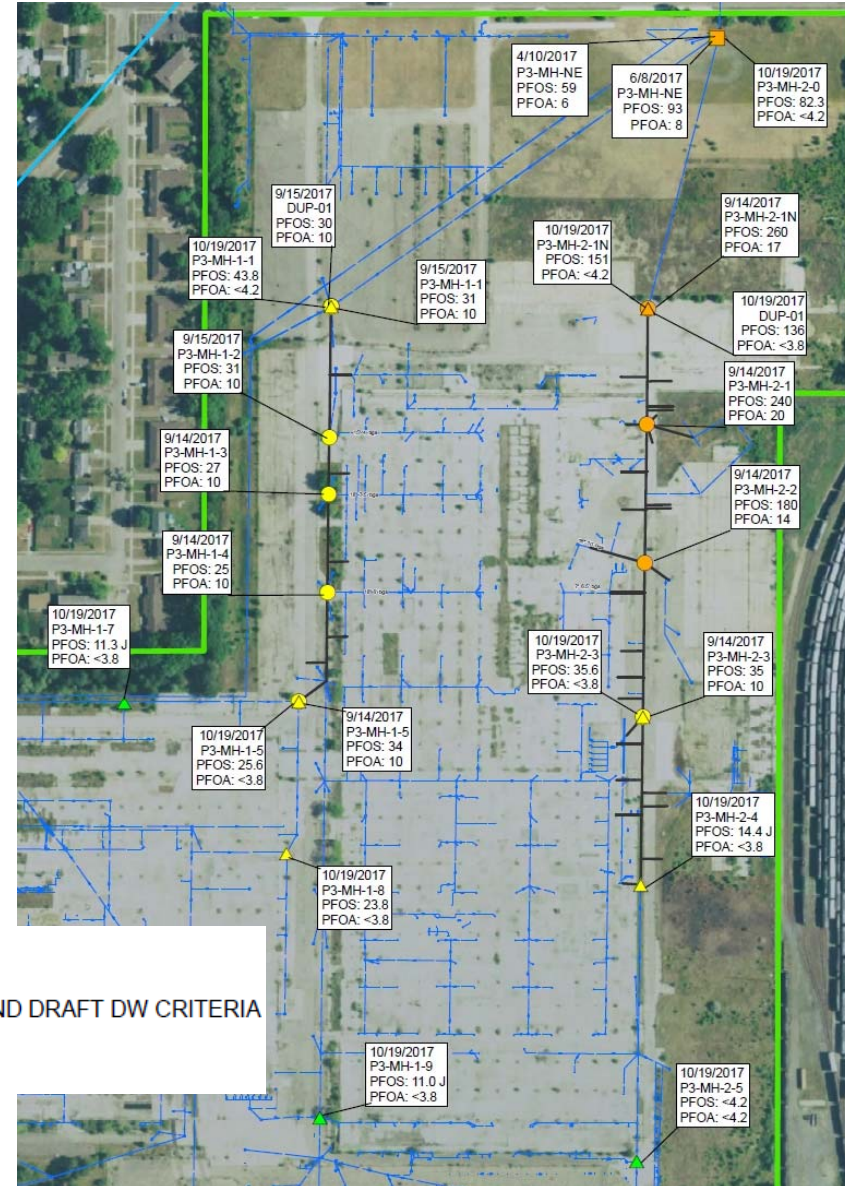
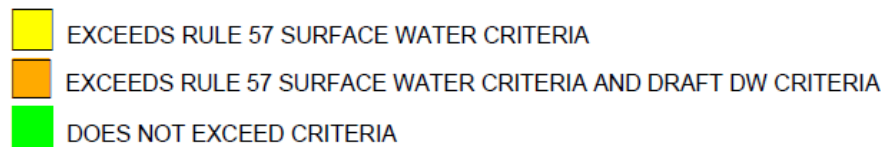
ng/L - NANOGRAMS PER LITER

- Potential Perched VAP Location
- Potential Step Out VAP Location

Storm Sewer Sampling Results

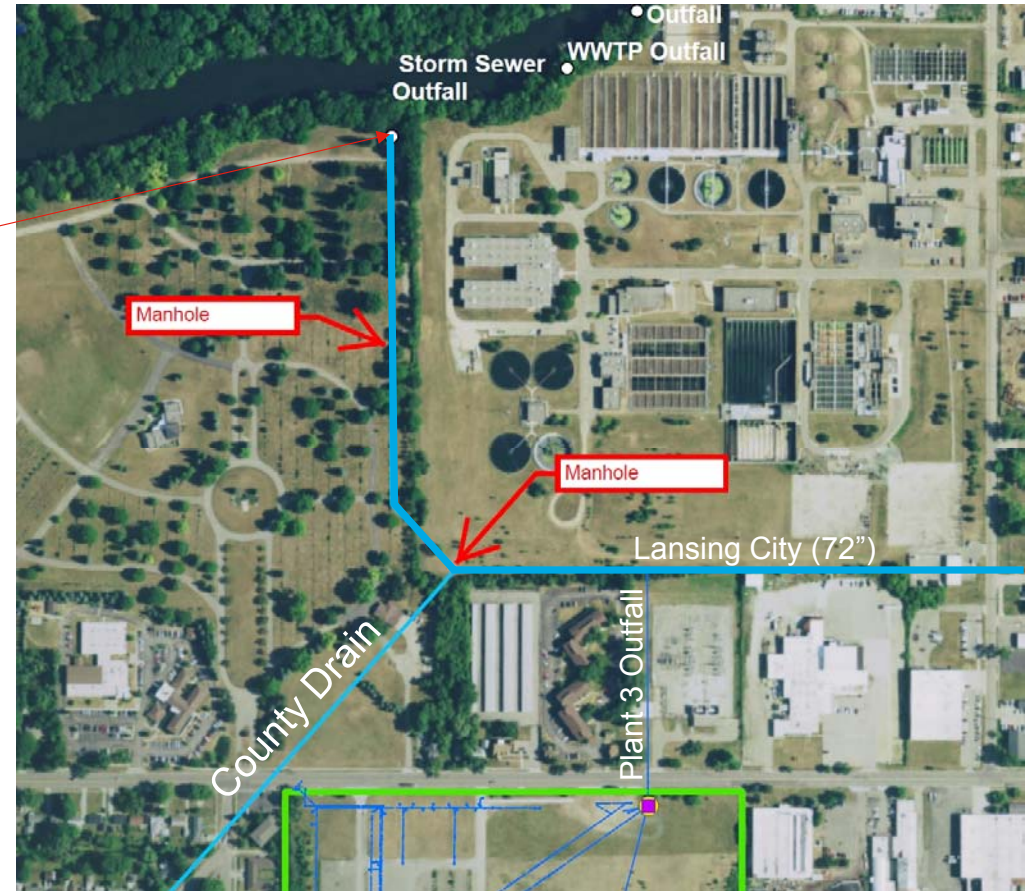
Rule 57 Surface Water Criteria (PFOS: 12 ng/L) exceedances in storm sewer along both sides of PFAS impacted area

- Storm sewer impacts defined south of impacted area
- Eastern storm drain has highest concentrations
- 260 ng/L in September 2017
- Western storm drain consistent at ~30 and 40 ng/L
- Plant 3 outfall consistent between 60 and 90 ng/L



Off-Site Storm Sewer

Currently considering access and potential collection of storm sewer samples at downgradient manholes



PFAS Path Forward

- Complete off-site delineation of PFOS to draft 2017 DW Criteria (70 ng/L)
- Update IGMP to incorporate PFAS monitoring wells and/or add as a parameter for wells currently covered under the IGMP
- Potential collection of downgradient storm sewer samples
- Evaluate need for and remedy options for PFAS, including:
 - Surface cover to reduce infiltration through plating area fill
 - Storm sewer bulkheading to eliminate potential discharge to Grand River
 - Source treatment to reduce future potential vertical migration

LNAPL Summary

LNAPL Discussion Items

- Meeting with MDEQ on September 15 discussed Area 5-2 LNAPL
- The following has been provided to MDEQ related to the LNAPL:
 - 2017 Plant 2 LNAPL 1,4-D Investigation Summary (sent via email 7/3/17)
 - LNAPL mobility and recoverability report from the RFI (sent via email 10/10/17)
 - TPH Risk White Paper (sent via email 10/10/17)
 - Updated LNAPL Decision Tree for Area 5-2 (sent via email 11/14/17)
 - Area 5-2 LNAPL Corrective Measure Study Excerpt Slides (sent via email 11/14/17)
- Set up a meeting to discuss MDEQ questions/comments related to LNAPL
- NSZD Work Plan to be submitted in first quarter 2018

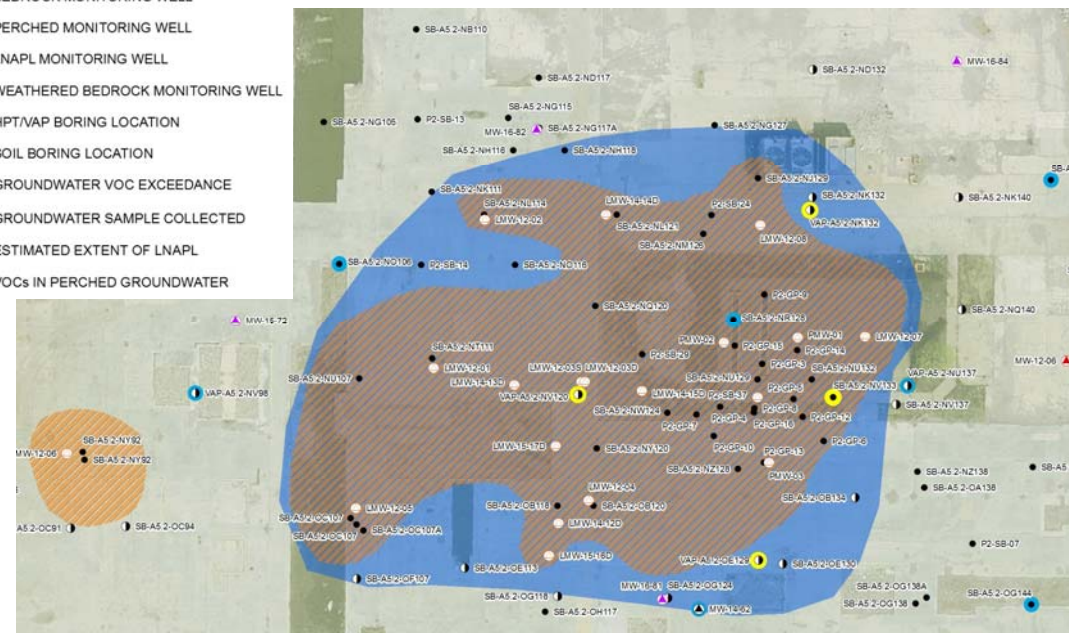
Area 5-2 LNAPL

Background

- Previous work shows LNAPL is depleted of 1,4-dioxane, contains some PCBs and VOCs
- LNAPL fingerprinting – consistent with cutting oil, low-risk heavier (higher-carbon compounds)
- VOCs and PCBs make up only a small part of the LNAPL mixture – what’s in the other 98%?

LEGEND

- ▲ BEDROCK MONITORING WELL
- ▲ PERCHED MONITORING WELL
- LNAPL MONITORING WELL
- ▲ WEATHERED BEDROCK MONITORING WELL
- HPT/VAP BORING LOCATION
- SOIL BORING LOCATION
- GROUNDWATER VOC EXCEEDANCE
- GROUNDWATER SAMPLE COLLECTED
- ▨ ESTIMATED EXTENT OF LNAPL
- VOCs IN PERCHED GROUNDWATER



Area 5-2 LNAPL Composition

- Used the Massachusetts TPH Fractionation Method (VPH/EPH)
- Measures aliphatic/aromatic fractions in different carbon ranges
- Higher-carbon number compounds and aliphatic compounds = low toxicity
- Medium- and high-carbon number compounds = very low in solubility

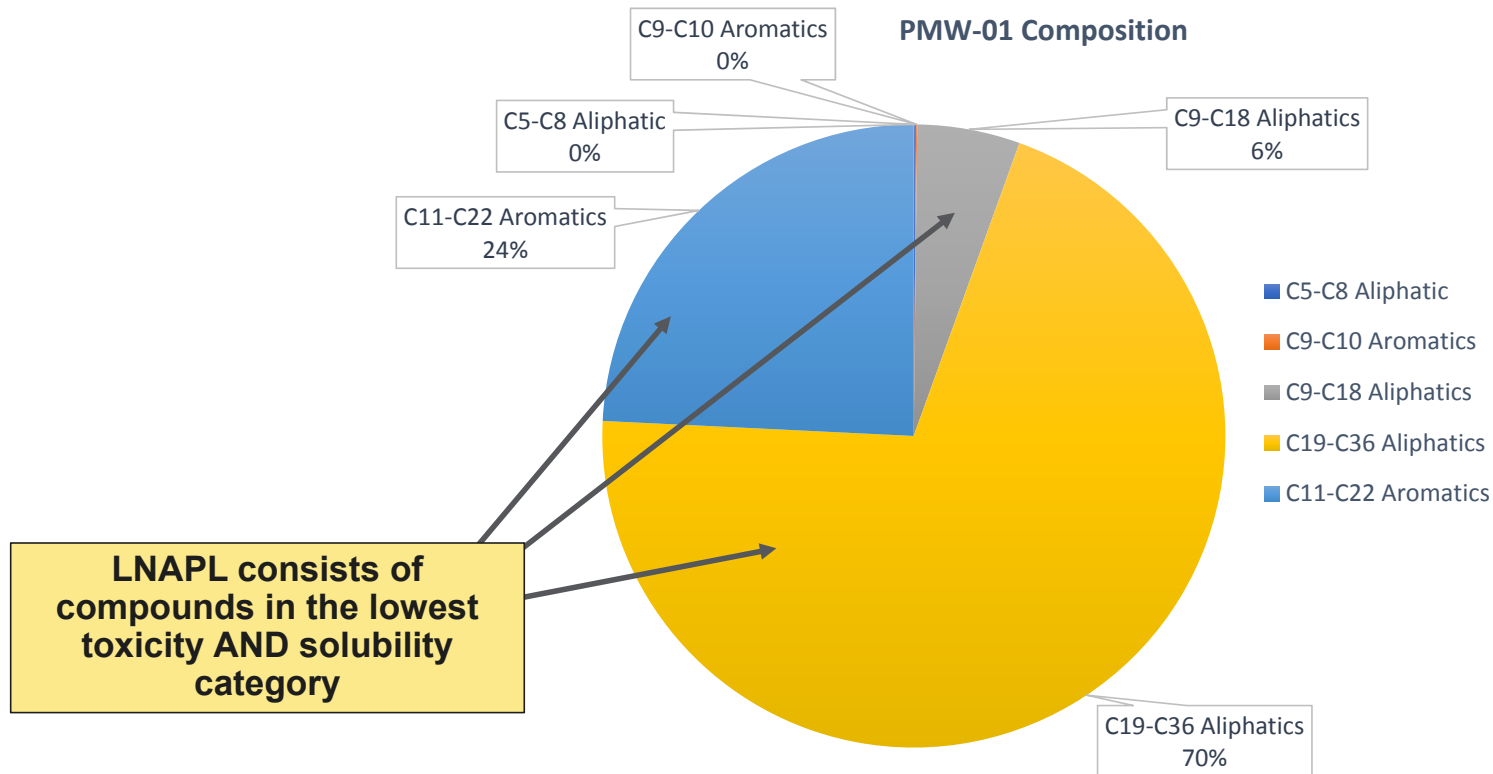
	LMW-12-08	PMW-01	MW-14-12D
C5-C8 Aliphatic	28	480	120
C9-C12 Aliphatic	660	200	240
C9-C18 Aliphatic	20,000	22,000	14,000
C19-C36 Aliphatic	210,000	290,000	410,000
C9-C10 Aromatic	690	260	500
C11-C22 Aromatic	120,000	100,000	11,000

Note: milligrams per kilogram (mg/Kg)

Other Compounds

- 1,4-Dioxane
 - Present in groundwater but no longer present at meaningful levels in LNAPL.
- VOCs
 - Consistent with previous LNAPL results. BTEX, TMBs, CVOCs present in LNAPL (e.g., 1,1,1-TCA) but not present at meaningful levels in groundwater
 - Degradation (facilitated by organic content of LNAPL) addresses dissolved VOCs at near the same rate as they're leached from LNAPL
- SVOCs
 - LMW-12-12D: ND, LMW-12-08: ND, PMW-01: Fluorene (165 ppm), Phenanthrene (174 ppm).
 - Analysis shows no significant concentrations of high-toxicity or high-solubility SVOCs in LNAPL or groundwater
- PCBs
 - Consistent with previous analysis - LMW-14-12D: 223 ppm, LMW-12-08: 15 ppm, PMW-01: 30 ppm
 - Low-solubility PCBs will stay within LNAPL and sorb to residual organic material; no mobility expected

Area 5-2 LNAPL Composition

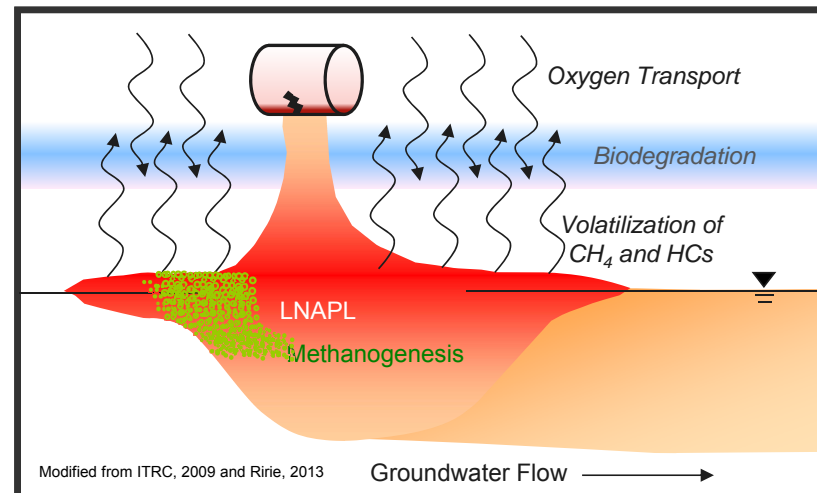


TPH fractions indicate low overall risk related to toxicity and solubility. LNAPL can be addressed with NSZD and institutional controls.

LNAPL Path Forward

Prepare Natural Source Zone Depletion (NSZD) workplan

- NSZD Processes include:**
- Volatilization
 - Dissolution
 - Biodegradation



2018 Target Activities

1st Quarter 2018

- Continue Biosparge Pre-Design Study
- Revised RFI Summary Report
- Draft Biosparge Interim Measures Workplan
- First Quarter GW sampling event
- Plant 3 PFAS Investigation Summary Report
- PFAS Notice of Migration for Jackson & Lansing Railroad
- PFAS Off-site delineation & storm sewer sampling (access approval needed)
- NSZD Workplan
- Plant 6 DRC Finalized and Recorded

2nd Quarter 2018

- Continue Biosparge Pre-Design Study / Pre-Design Study Report
- 2017 Annual Groundwater Monitoring Report
- Plant 6 Construction Completion Report
- Community Information Session
- Re-evaluate Plant 2 Vault and PCB Soil Removal Plan

Monthly 2018 - LNAPL monitoring and removal