Racer Trust CVO DNAPL and Soil Excavation to Protect Adjacent Water Body

Kevin Lund, PE, CPG

Michigan Department of Environmental Quality

Beth Landale, PE

GHD (Formerly CRA)

October 7, 2015

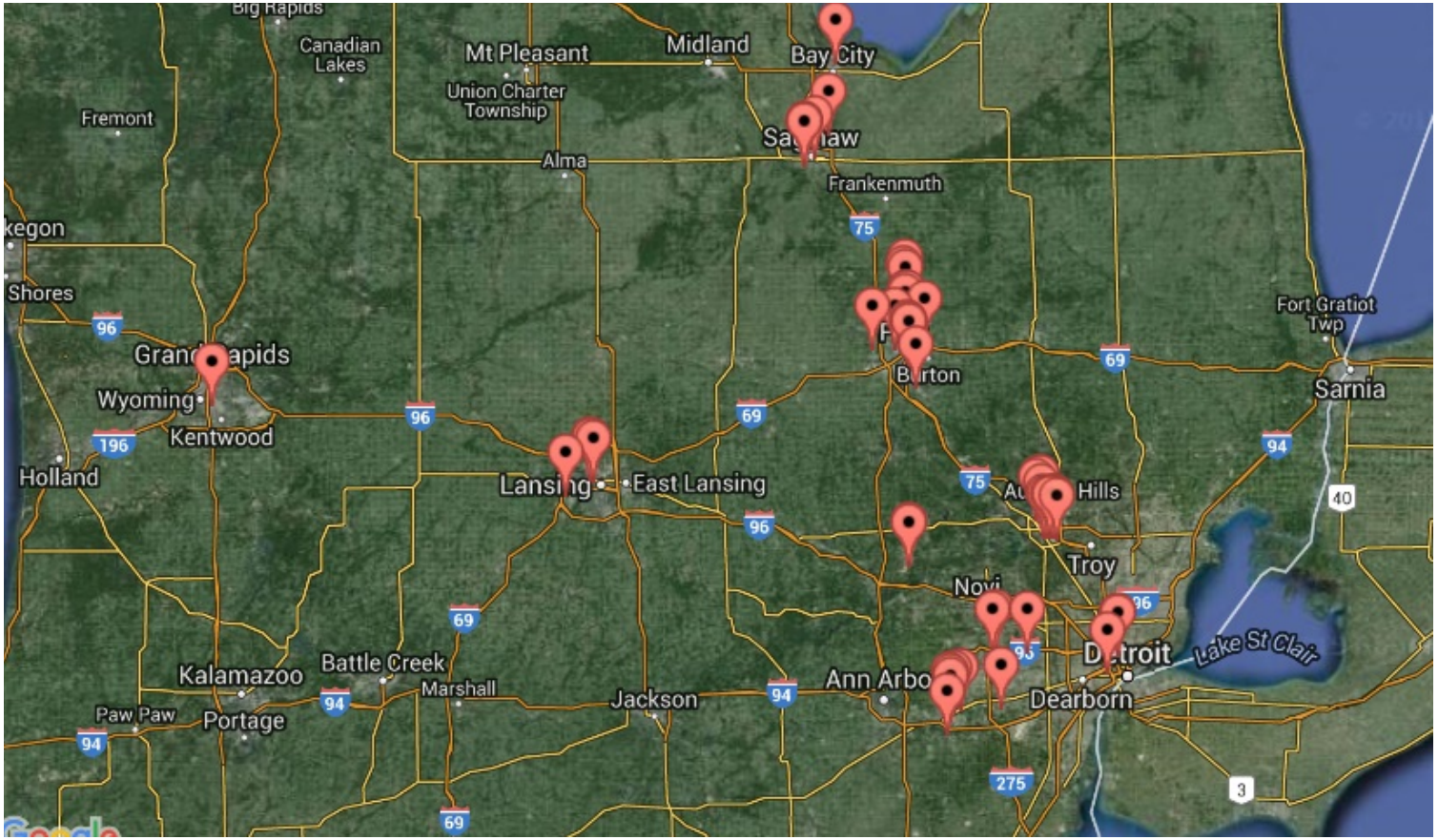
Traverse City, Michigan

Outline

- Bankruptcy Settlement Agreement
- What is RACER?
- Part 201 vs RCRA Corrective Action
- Site History
- CSM
- Interim Measure
  - PAOC 18
- Collaboration

GM Bankruptcy Settlement Agreement
June 2009 to October 2010

RACER TRUST CREATED MARCH 31, 2011 MICHIGAN SITES



Working Together

RACER Key Elements

- RACER conducts and pays for cleanups.
- Cleanups approved by state and/or federal regulatory agencies.
- RACER can sell or lease properties even before cleanups begin or are completed, as long as RACER access is guaranteed.
- RACER's goal is to obtain "No Further Action" letters from environmental regulators for all locations where cleanups are required.


We Can Do It!
WAR PRODUCTION CO-ORDINATING COMMITTEE

RCRA CA and Part 201

- Liability scheme
- Changes to Part 201
  - 2010, 2012, 2014 Amendments
- Waste Classification

RCRA CA and Part 201

2010 – 2012 - 2014 Amendments

- LNAPL
- Background soils
- Vapor intrusion MIOSHA provisions

RCRA CA and Part 201

Waste Characterization

- ü Listed
- ü Characteristic
- ü TSCA Coordinated Approval

Area


0 1000 2000ft
WILLOW RUN POWERTRAIN
FORMER WILLOW RUN ASSEMBLY PLANT
YCUA WWTP
WILLOW RUN AIRPORT
TYLER POND
DAM
WILLOW RUN COMPANY VEHICLE OPERATIONS (CVO)
FONS LANDFILL (CLOSED)
WILLOW RUN SLUDGE LAGOON (CLOSED)
EQ LANDFILLS
OLD WAYNE LANDFILL (CLOSED)
EDISON POND
BELLEVILLE LAKE

Area & Site History

- Area developed as part of the war efforts
- Historic filling practices (1940's & 1950's) have impacted soil and groundwater
- CVO Property was used as storage and was not developed (current building) until 1959
- Owned/Operated by several parties since the 1940's

Impacts

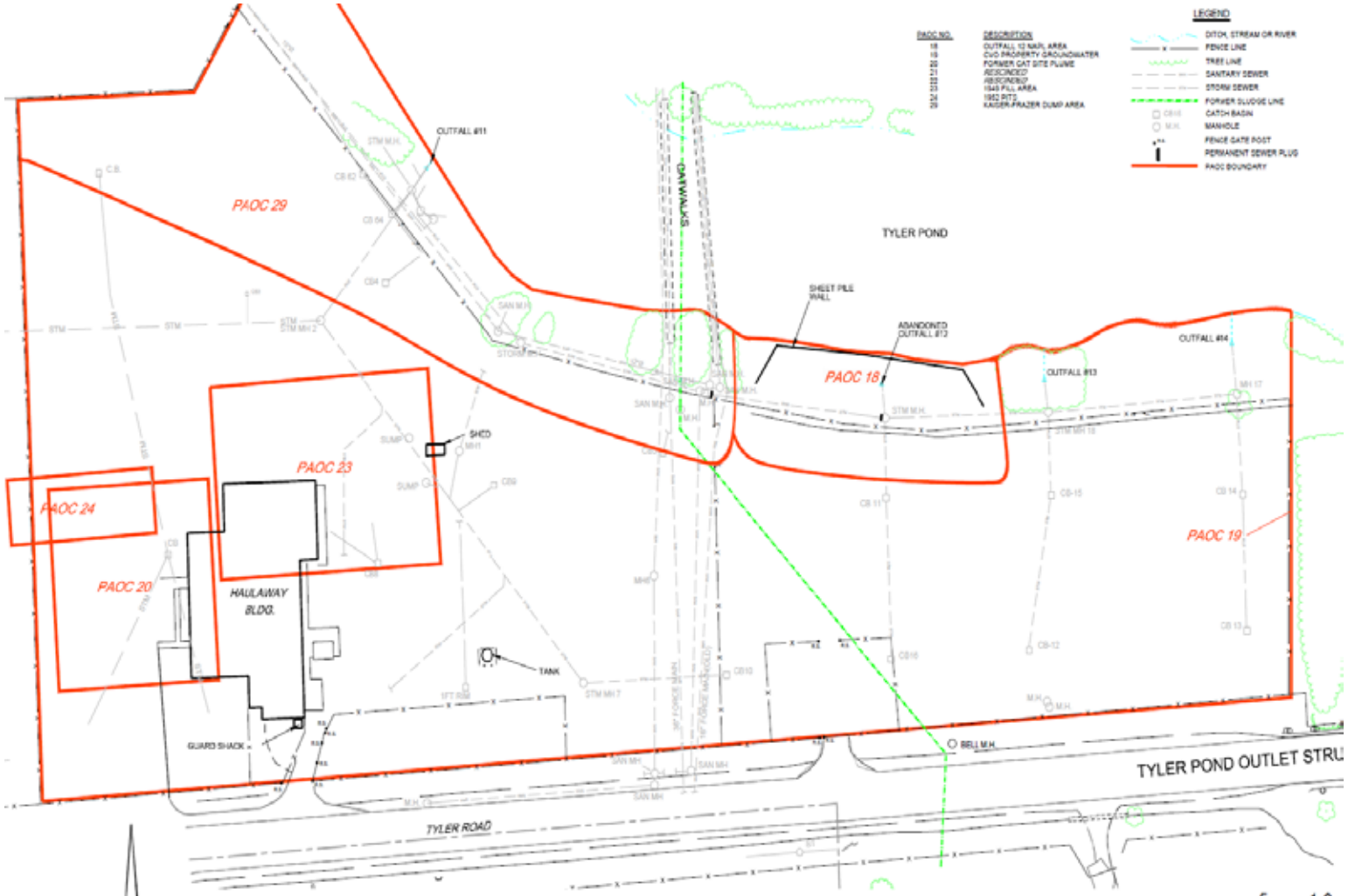


figure 1.3

PAOC LOCATIONS - REVISED
SITE SUMMARY REPORT
FORMER GENERAL MOTORS COMPANY VEHICLE OPERATIONS PROPERTY
Ypsilanti, Michigan

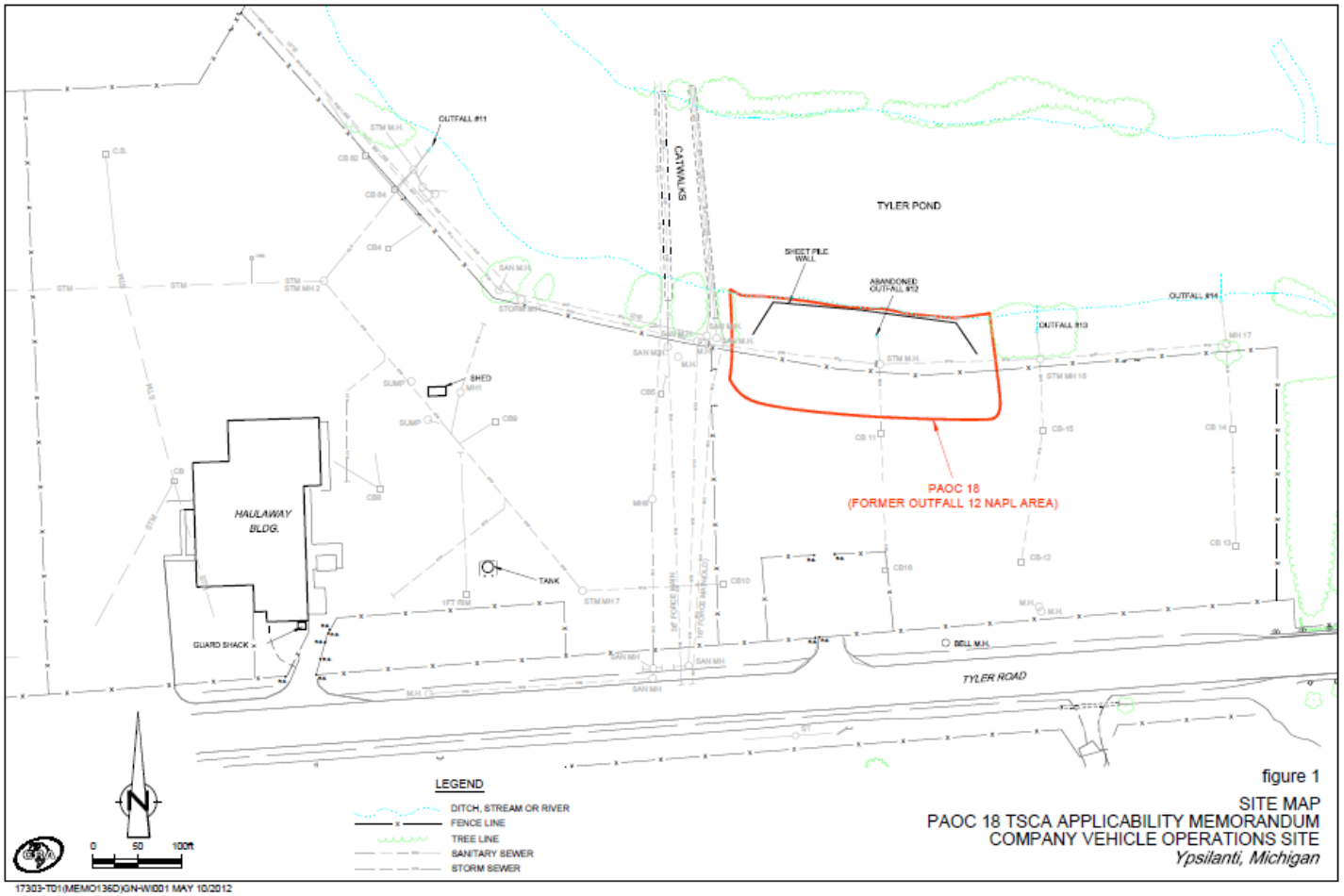
Impacts

- Historic dumping has caused contamination
- Two source areas of CVOCs
  - PAOC 23
    - Partially beneath building onsite
  - PAOC 18
    - DNAPL identified as ongoing source for GW venting to surface water > acute GSI

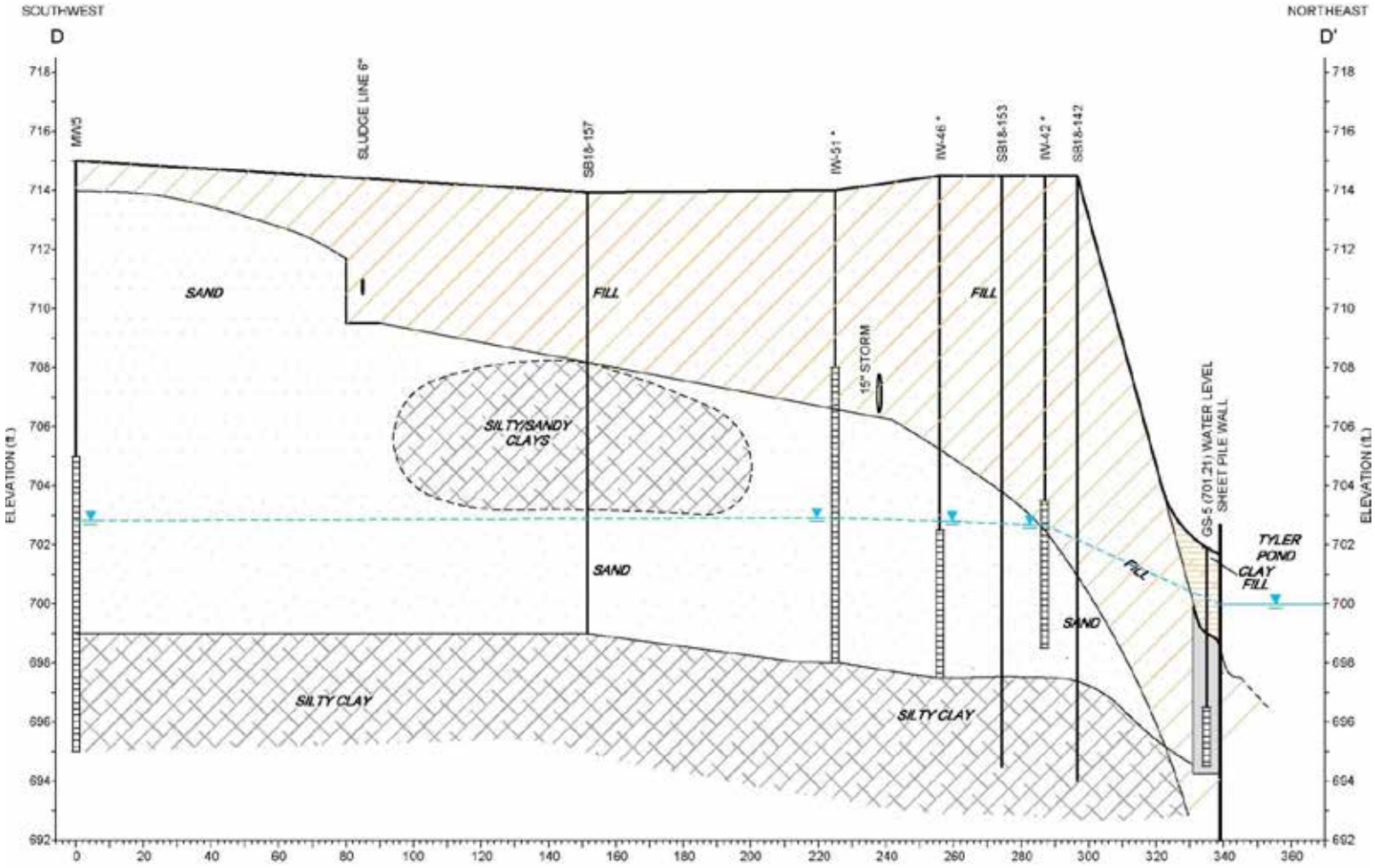
Impacts

- Chlorinated VOCs primary COCs
- DNAPL identified – TCE (~ 40%), PCBs (~1.5%)
- CVOCs venting to surface water
- PCBs non-mobile

Impacts


OUTFALL #11
TYLER POND
CATWALKS
SHEET PILE WALL
ABANDONED OUTFALL #12
OUTFALL #14
OUTFALL #13
SHED
HAULAWAY BLDG.
PAOC 18
(FORMER OUTFALL 12 NAPL AREA)
TANK
GUARD SHACK
TYLER ROAD
LEGEND
DITCH, STREAM OR RIVER
FENCE LINE
TREE LINE
SANITARY SEWER
STORM SEWER
0
50
100ft
figure 1
SITE MAP
PAOC 18 TSCA APPLICABILITY MEMORANDUM
COMPANY VEHICLE OPERATIONS SITE
Ypsilanti, Michigan
17303-T01(MEMO136D)GN-W001 MAY 10/2012

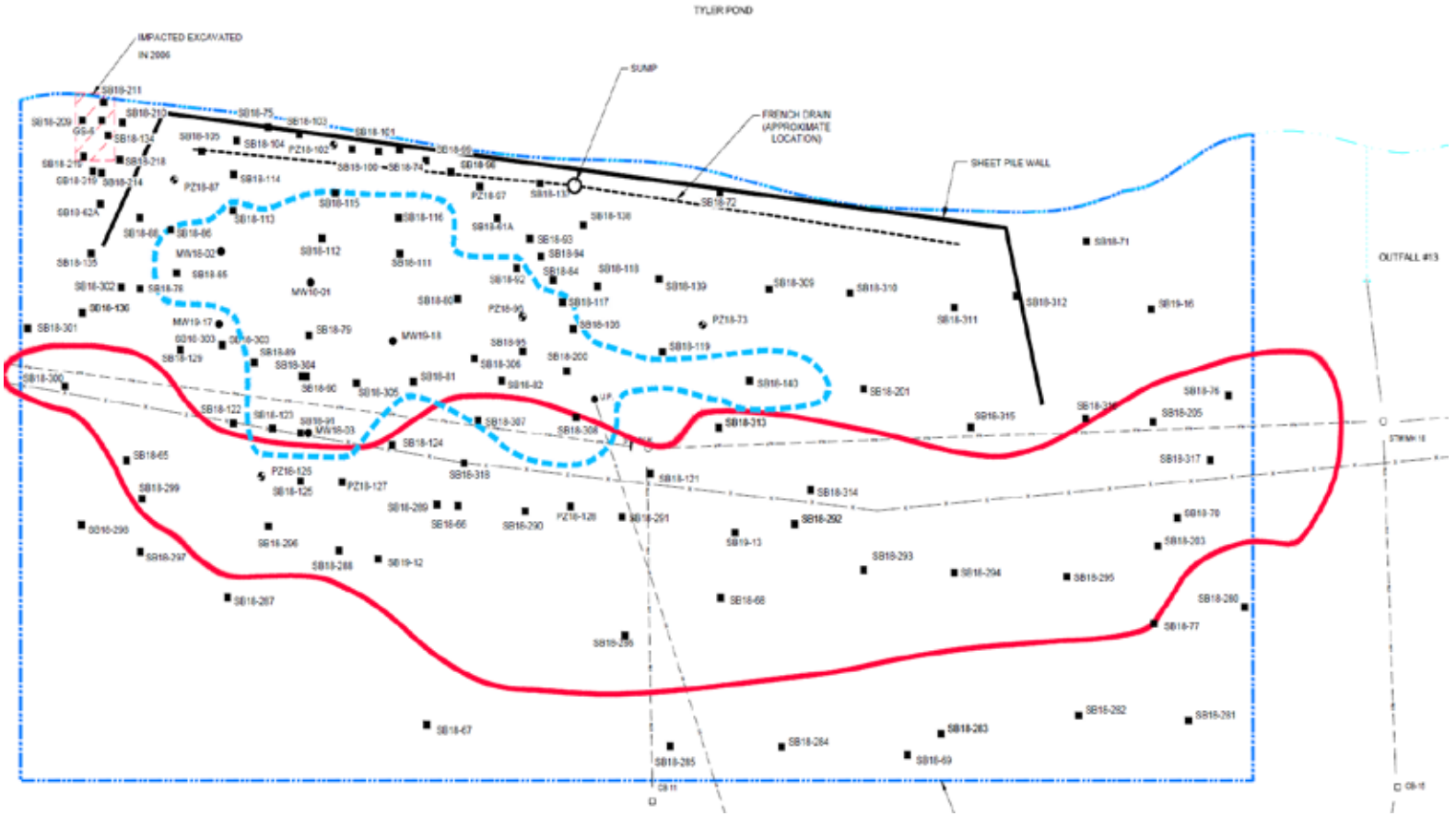
Conceptual Site Model



Conceptual Site Model

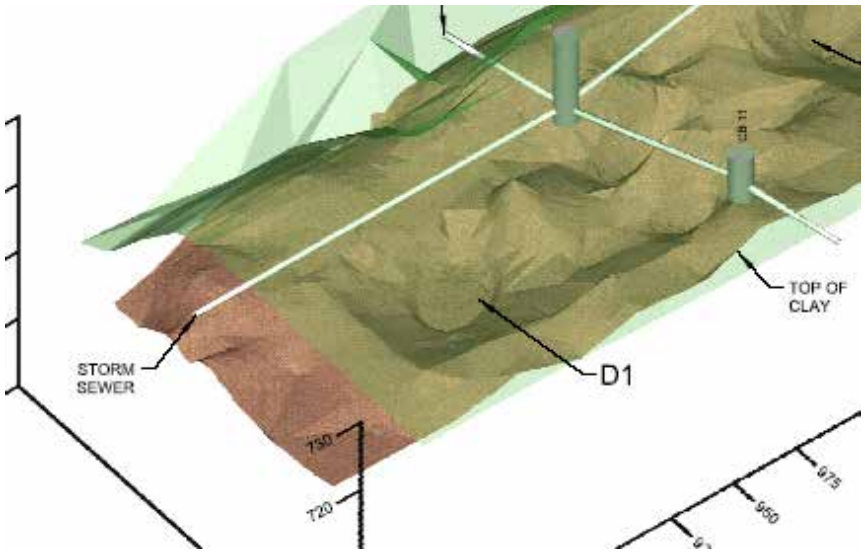
- Historic dumping has caused contamination
- CVOCS in GW venting to Pond > acute GSI (FAV)
- Presence of DNAPL causing continued GW impacts > FAV
- PCBs non-mobile

Conceptual Site Model



Conceptual Site Model

- DNAPL first identified in 2004
- Investigation identified DNAPL in low spots in the clay

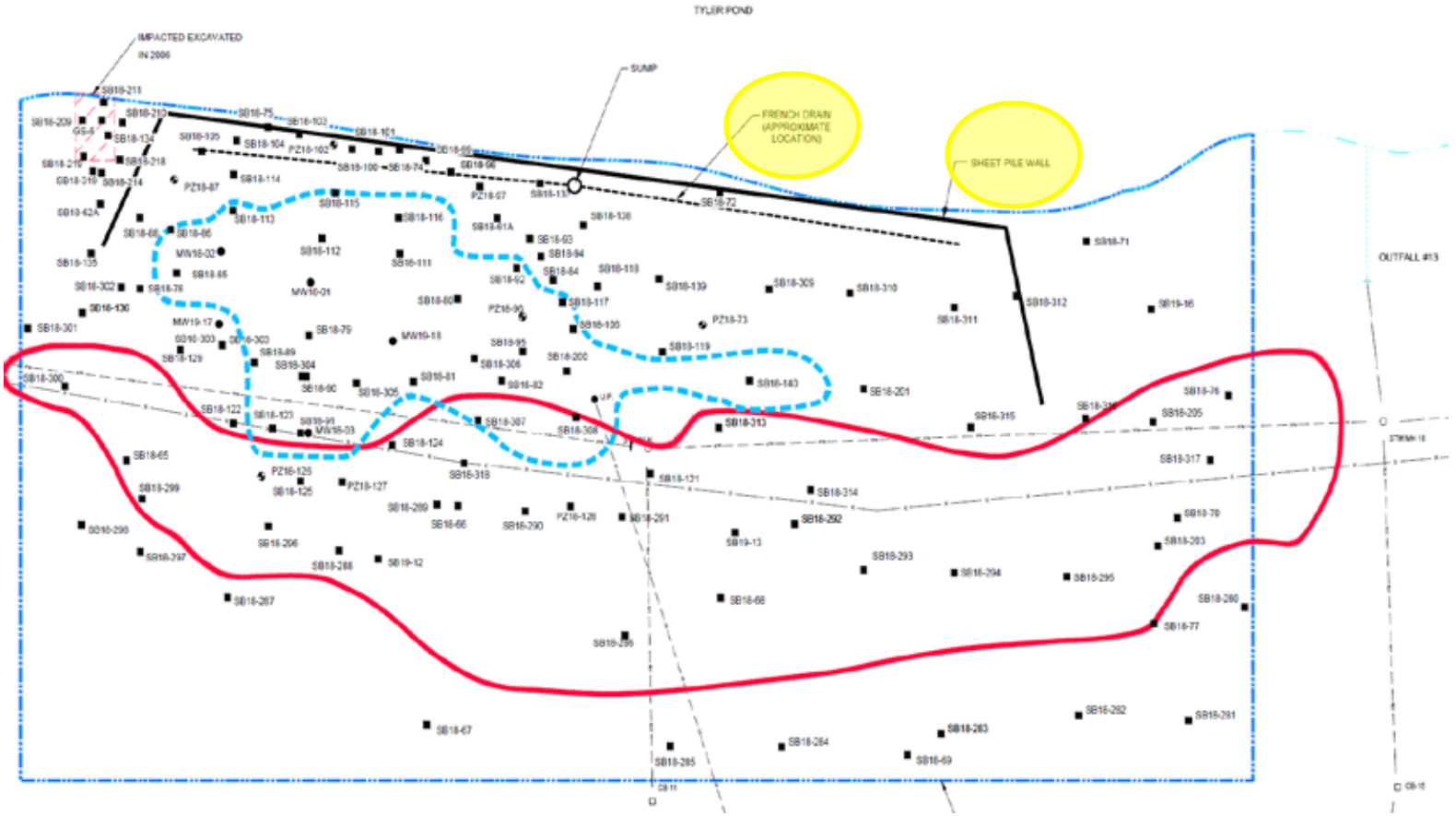


- Additional DNAPL recovery points installed
- ~1,750 gallons of DNAPL recovered over 8 years

Past Interim Measures

- Late 2004 - Sheet pile wall installed as barrier to DNAPL (not water) venting to pond
- 2010 - Collection, treatment and discharge of groundwater from behind the wall to local POTW
- Hydraulic containment costing +$100,000/year

Past Interim Measures



IM - Objective

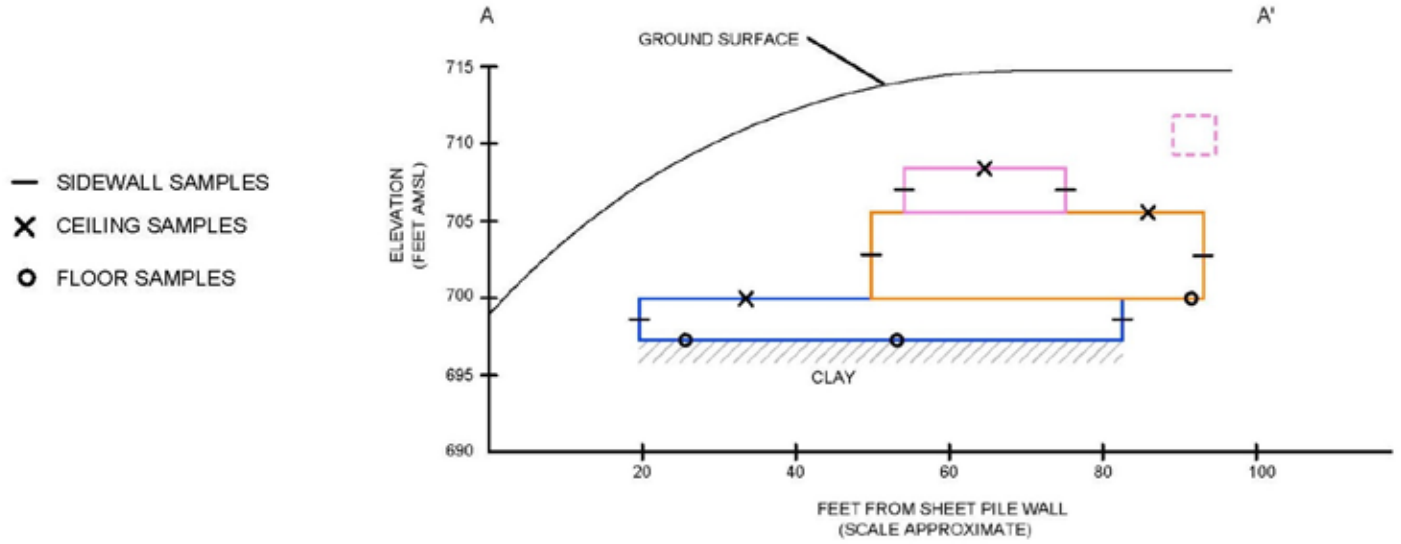
- Remove DNAPL and impacted soil with potential to leach CVOCs such that GW concentrations venting to surface water are reduced
- Regulator and owner wanted a cost effective long-term solution

IM - Approach

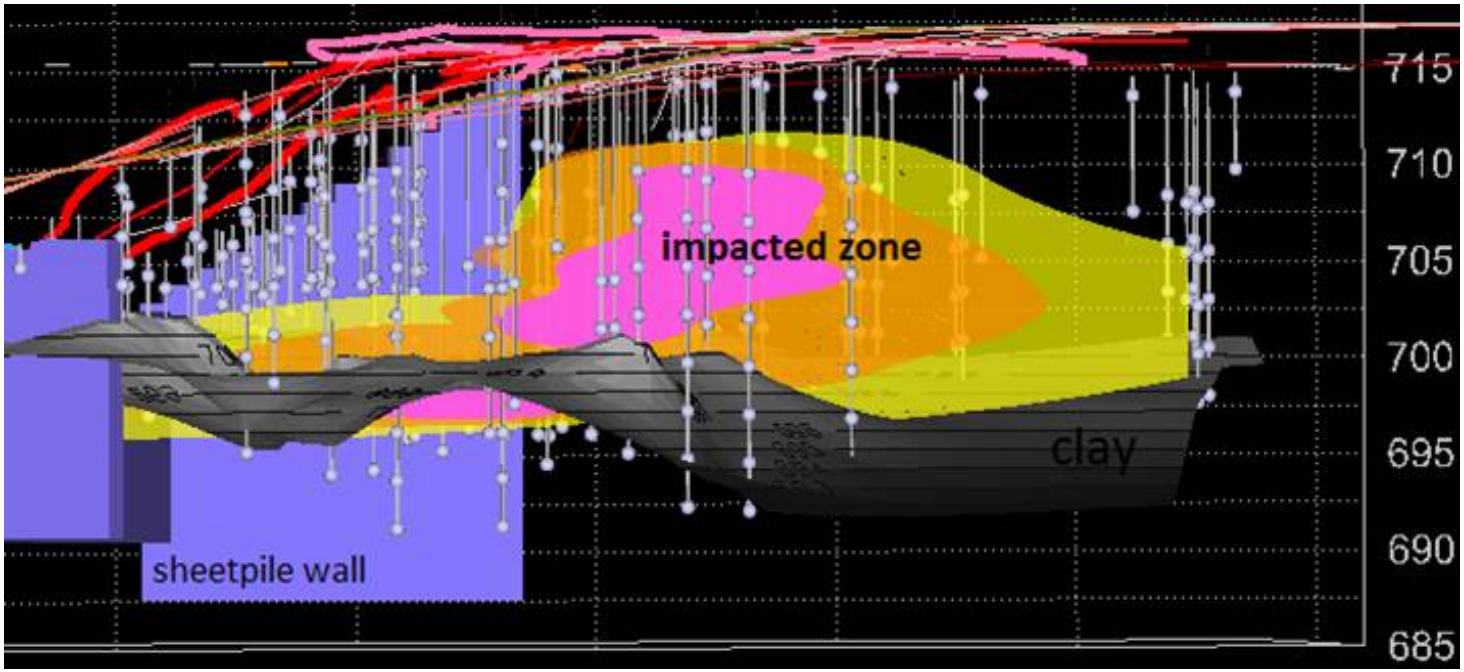
- Iterative sampling coupled with 3D modeling helped define the problem and explain a solution
  - Increasing Owner/Regulator acceptance of “mining like” removal
- Soil conditioning within excavation limits to reduce CVOC concentrations
  - Using sodium persulfate and potassium permanganate
  - Reduced to non-haz prior to the point of waste generation

IM – Remediation Requirements

- Additional investigation to define remediation scope
- ↑ Environmental Understanding = ↓ Remediation Cost



IM – Remediation Requirements



IM – Remediation Requirements

- Problem were trying to solve:

GW venting above Acute GSI Values

- So how do we solve that:
  - Remove source. What is the source?
    - DNAPL
    - Soil
      - How do we define “source” for soil????
        - » Visual impacts, concentration based???
- Calculated a mixing zone based site specific GSI soil protection criteria

IM – Remediation Requirements

1. Calculated Mixing Zone Based GSI Values
   - Water values based on our site specific conditions

$$WLA = \frac{Zt(Qe+Qr)-(Qr)(Cr)}{Qe}$$

Where:
WLA = Wasteload Allocation (Mixing Zone Based Criteria) - equation defined under R 323.1207
Zt = water quality value developed for the toxic substance expressed as total or total recoverable (Part 201 GSI value)
Q e= effluent design flow, which is the annual average flow for groundwater venting to the river
Qr = flow of the receiving water allocated for mixing under R 323.1082.
Cr = receiving water background concentration of the toxic substance developed under R 323.1207
River flow rates: harmonic mean = 0.1 ft3/s.
The venting groundwater flow rate for the site = 0.003 ft3/s.

IM – Remediation Requirements

2. Calculated GSI Protection Criteria
   - Corresponding Soil criteria using:

$$SWPV = Cw\left[Kd + \left(\frac{\theta w + \left(H' \times TAF \times \theta a\right)}{\rho b}\right)\right]$$

SWPV = Soil Water Partitioning Value (ug/kg)[1] (GSI Protection Criteria)
Cw = Target Soil Leachate Concentration (ug/L) (Target Water Criteria x 16)
Kd = Soil-Water Distribution Coefficient (L/kg)
Koc = Soil Organic Carbon-Water Partition Coefficient (L/kg)
Foc = 0.002 (Fraction of Organic Carbon in Soil) generic value
H' = Dimensionless Henry's Constant

HLC = Henry's Law Constant at 25°C
θw = 0.16 Lwater/Lair (Soil Water-Filled Porosity)
θa = 0.09 Lair/Lsoil (Soil Water-Filled Porosity)
TAF = 0.50 (Temperature Adjustment Factor)
ρb = 1.5 kg/L (Dry Soil Bulk Density)

IM – Remediation Requirements

- TCE

MIXING ZONE BASED SUMMARY

Basis for MZ based Calculation	10-1 Dilution for Pond	Stream Flow (ft^3/s) 0.1 (per MDEQ website)	0.05 (50% of MDEQ website value)	0.01 (10% of MDEQ website value)	0.003 (same as gw flow)
Calculated Water Values (ug/L)					
MZ based GSI	2,000	1,867	1,033	367	250
Calculated Soil Values (ug/kg)					
Generic Foc	14,571	13,599	7,528	2,671	1,821
Site Specific Foc - min	20,484	19,119	10,584	3,755	2,561
Site Specific Foc - max	300,574	280,536	155,297	55,105	37,572
Site Specific Foc - avg	109,242	101,959	56,442	20,028	13,655
20 x MZ Based GSI [1]	40,000	37,333	20,667	7,333	5,000

Notes

[1] Per March 2005 Michigan Department of Environmental Quality RRD Operational Memorandum No. 1 - Technical Support Document Attachment 9 - Following calculation of the SWPV, that value is compared to 20X the mixing zone-based GSI criterion and the greater of the two becomes the GSIP criterion.

PROPOSED SOIL TARGET CONCENTRATION BASED ON DATA PRESENTED ABOVE

10,000 ppb

Value Included in RFP (rounded value)
Value calculated using most conservative stream flow
Value included in IMWP - reduced from values above to match the 20 x Toxicity Characteristic Regularoty Limit for waste disposal

IM – Remediation Requirements

- Cis-1,2-DCE

MIXING ZONE BASED SUMMARY

Basis for MZ based Calculation	10-1 Dilution for Pond	Stream Flow (ft^3/s) 0.1 (per MDEQ website)	0.05 (50% of MDEQ website value)	0.01 (10% of MDEQ website value)	0.003 (same as gw flow)
Calculated Water Values (ug/L)					
MZ based GSI	6,200	5,787	3,203	1,137	775
Calculated Soil Values (ug/kg)					
Generic Foc	169,327	16,933	9,373	3,326	2,268
Site Specific Foc - min	205,584	20,558	11,381	4,038	2,753
Site Specific Foc - max	1,922,845	192,284	106,443	37,770	25,752
Site Specific Foc - avg	749,768	74,977	41,505	14,728	10,042
20 x MZ Based GSI [1]	1,157,333	115,733	64,067	22,733	15,500

Notes

[1] Per March 2005 Michigan Department of Environmental Quality RRD Operational Memorandum No. 1 - Technical Support Document Attachment 9 - Following calculation of the SWPV, that value is compared to 20X the mixing zone-based GSI criterion and the greater of the two becomes the GSIP criterion.

PROPOSED SOIL TARGET CONCENTRATION BASED ON DATA PRESENTED ABOVE

16,900 ppb

Value Included in RFP (rounded value)
Value calculated using most conservative stream flow
Value included in IMWP - based on value included in RFP (rounded value)

IM – Remediation Requirements

- Vinyl Chloride

MIXING ZONE BASED SUMMARY

Basis for MZ based Calculation	10-1 Dilution for Pond	Stream Flow (ft^3/s) 0.1 (per MDEQ website)	0.05 (50% of MDEQ website value)	0.01 (10% of MDEQ website value)	0.003 (same as gw flow)
Calculated Water Values (ug/L)					
MZ based GSI	130	121	67	24	16
Calculated Soil Values (ug/kg)					
Generic Foc	368	343	190	67	46
Site Specific Foc - min	410	383	212	75	51
Site Specific Foc - max	2,415	2,254	1,248	443	302
Site Specific Foc - avg	1,046	976	540	192	135
20 x MZ Based GSI [1]	2,600	2,420	1,343	477	325

Notes

[1] Per March 2005 Michigan Department of Environmental Quality RRD Operational Memorandum No. 1 - Technical Support Document Attachment 9 - Following calculation of the SWPV, that value is compared to 20X the mixing zone-based GSI criterion and the greater of the two becomes the GSIP criterion.

PROPOSED SOIL TARGET CONCENTRATION BASED ON DATA PRESENTED ABOVE

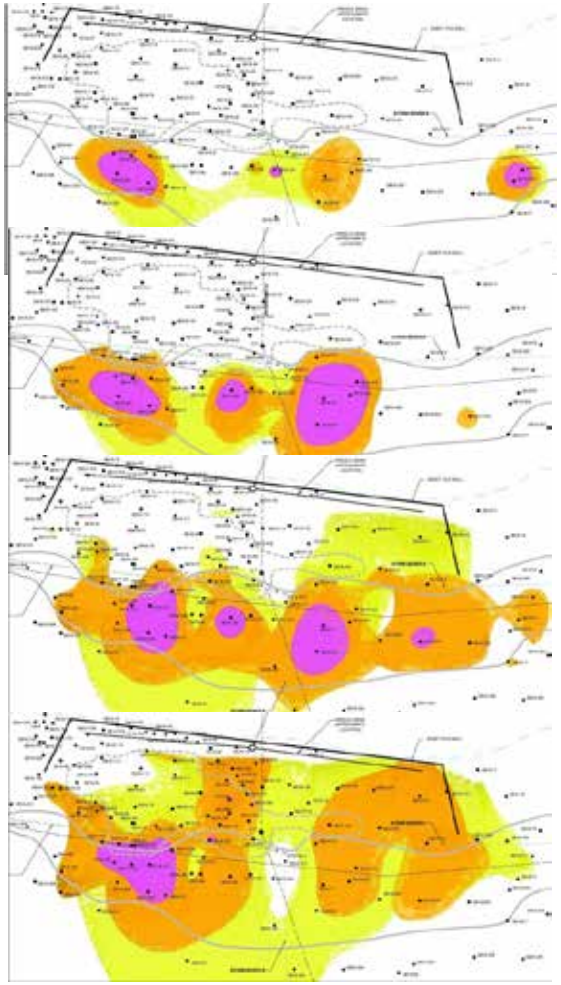
343 ppb

Value Included in RFP
Value calculated using most conservative stream flow
Value included in IMWP - based on value included in RFP

IM – Remediation Requirements

- Colors indicate concentrations exceeding
  - Remediation Requirements
  - 20 x RCRA
  - Alt. Soil Treatment Std.

- 1 foot vertical interval slices through model



IM – Implementation

- Extent of excavation based on in-situ soil concentrations and 3D model
- Maximum lateral extent of excavation approved before excavation began
- Overburden that met clean up criteria re-used as backfill (excavated, staged, sampled)

IM- Implementation

- Soil Conditioning Mixing
  - completed in 20 ft x 20 ft x 10 ft cells within excavation
  - “Proving samples” collected from each cell to evaluate conditioning for landfill disposal
    - 2 per cell (1 top 5ft, 1 bottom 5 ft)
    - designed to verify consistency in soil concentrations within a cell

IM- Implementation

- Soil Conditioning Mixing
  - On-site VOC laboratory – key for quick turn around time on progress and proving samples
  - Conditioned soils were disposed off-site to avoid concerns of chem ox reagents remaining onsite adjecent to pond
  - Groundwater collected within the excavation, treated and discharged to POTW

IM- Implementation

- Other
  - Imported Clay – 2 ft of clay was imported and placed on native clay at bottom of excavation to inhibit back diffusion if impacts remained
  - Infiltration Gallery – a network of horizontal wells was installed throughout the excavation to provide future access for water removal, nutrient or amendment addition

IM- Implementation

IM- Implementation

IM- Implementation

IM- Implementation

IM- Implementation

IM- Implementation

IM- Implementation

IM- Implementation

- ~20,000 CYD of soils managed
  - ~10,000 CYD of CVOC impacted soils conditioned and disposed of as non-hazardous soils
  - ~1,400 CYD of TSCA/CVOC impacted soils conditioned and disposed of as TSCA/RCRA haz soils
  - ~8,600 CYD of reusable overburden removed, tested and re-used as fill

IM- Implementation

- ~230,000 gallons of water treated and discharged to local utility under permit
- Completed for ~$2.4M (Contractor and Oversight)
- Substantially completed between September 2013 and January 2014, restoration June 2014

Post IM Sampling

- Post implementation sampling has involved sampling sump in re-installed french drain/sump and select infiltration gallery locations
- 2015 groundwater concentrations are well below acute GSI values
  - Infiltration galleries
    - Only exceed DW with the exception of 1 up gradient location
  - French Drain/Sump
    - No exceedances of generic VOC criteria

Collaboration

Extraordinary cooperation between RACER and DEQ/EPA.

- Annual budget approval process.
- Work scope approval process.
- Resulting co-managed budgets.
- Streamlined Part 201/Part 111/RCRA documentation.
- E-mail work plan and budget amendment approval process.
- Comfort letter issued timely (Jose Cisneros - Region V).
- Developing model PPA (RCRA, CERCLA, TSCA).
- Agency(s) willingness and availability to engage with users.
- TAPs Team and RAT Team (program consistency) and
- Cooperation between DEQ and EPA

Collaboration

- Feedback/Discussions during Mixing Zone determination calculations
- Participation in weekly onsite meetings during implementation
  - Timely information sharing
  - Timely approvals for decisions needed during implementation
- Coordinated Approval with EPA for TSCA portion of work

Collaboration

- Joint participation in public meetings prior to work being initiated
  - Identify to the community what to expect
- Communications with the new owner
- PPA for the property

Redevelopment

- RACER continues to complete corrective action after property sale
- ITI received a Prospective Purchase Agreement from EPA

Questions or Comments?

Kevin Lund, PE, CPG
lundk@michigan.gov
517.780.7846

Beth Landale, PE
Beth.Landale@ghd.com
734.357.5528

Follow DEQ on Twitter @MichiganDEQ