

Sustainable Remediation of Dissolved Phase Hydrocarbons at an Active Fuel Service Station Using an Integrated In-Situ Remedial System

Fourth International Symposium on Remediation and Sustainable Environmental Technologies

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Sustainable Remediation of Dissolved Phase Hydrocarbons at an **Active** Fuel Service Station Using an **Integrated In-Situ** Remedial System

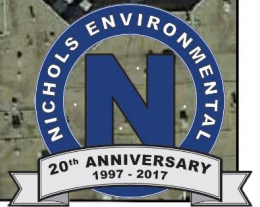
- **Sustainable** – minimize waste disposal
- **Active** – operational facility
- **Integrated** – multiple remedial options
- **In-Situ** – in the place



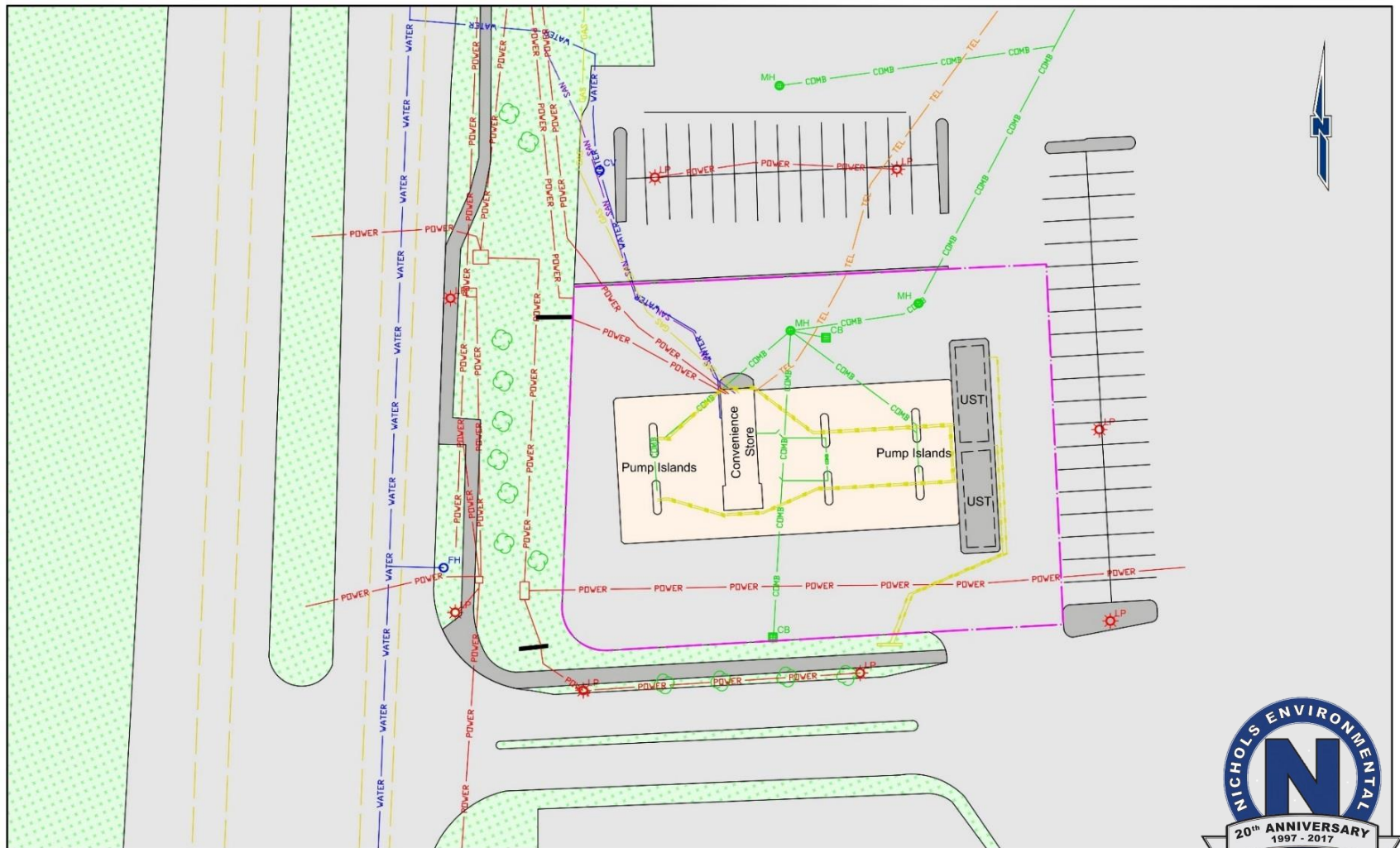
History



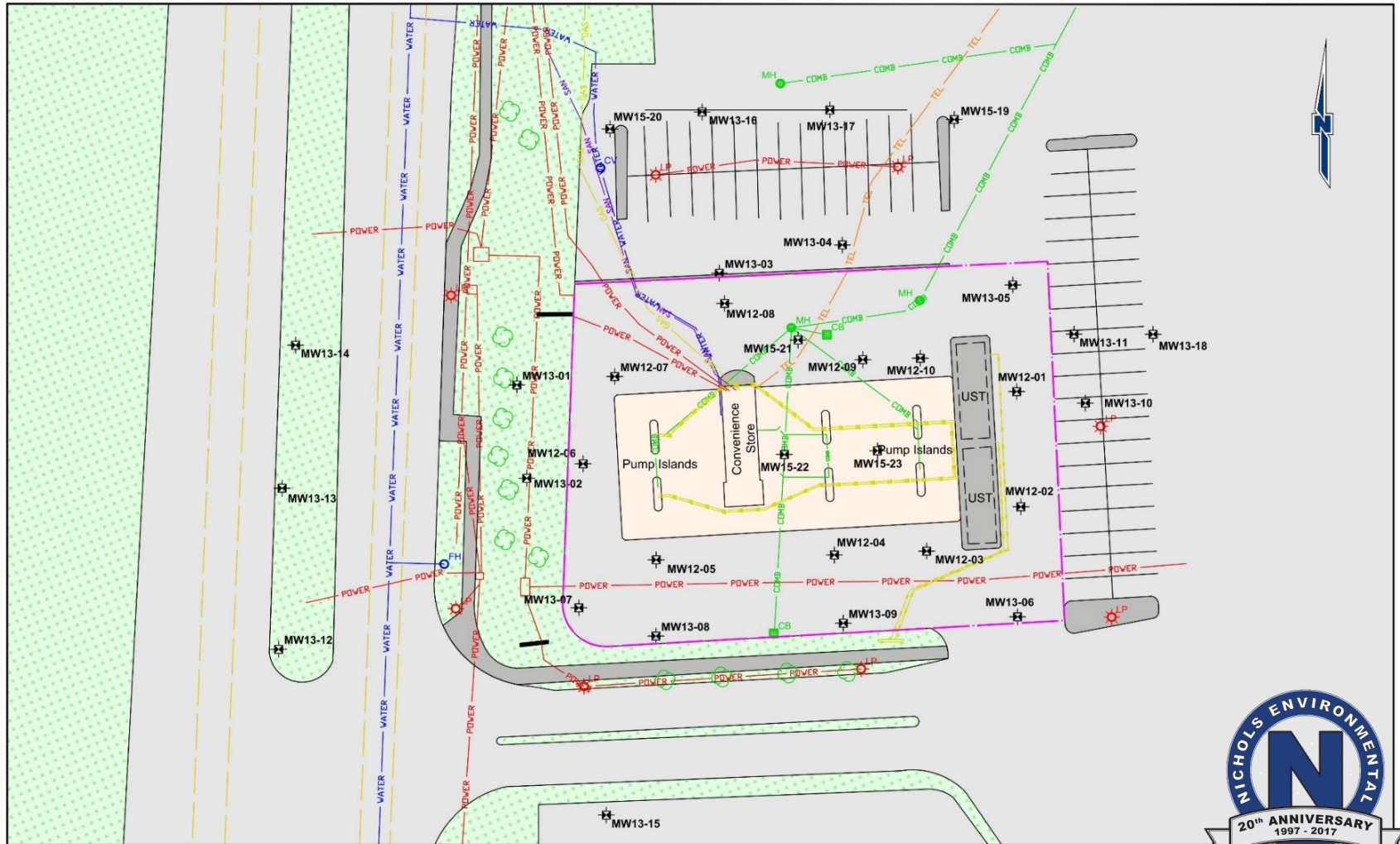
Site Location



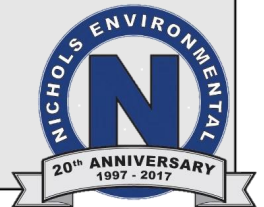
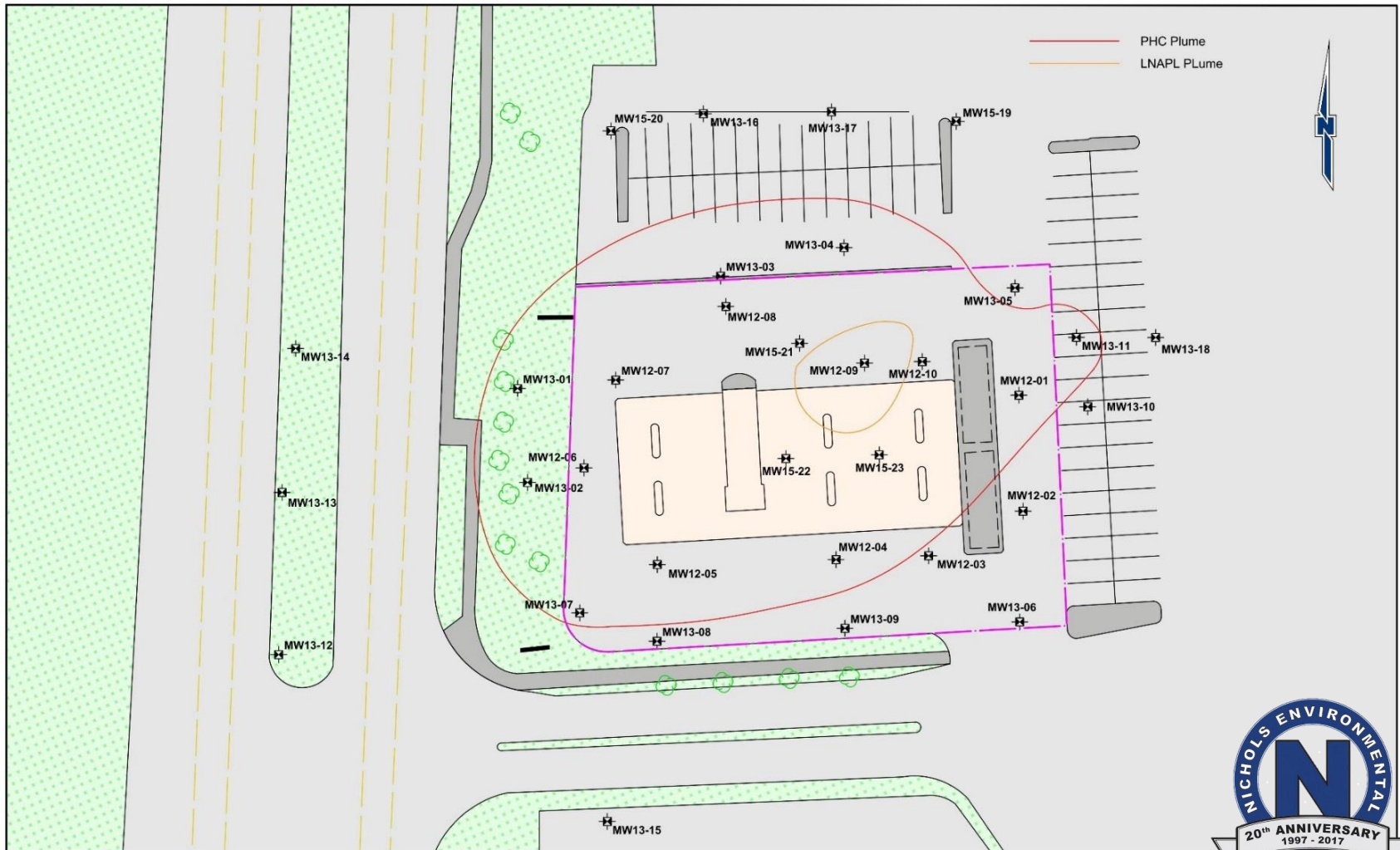
Site Detail - Utilities



Site Detail – Monitoring Wells



PHC & LNAPL Plumes

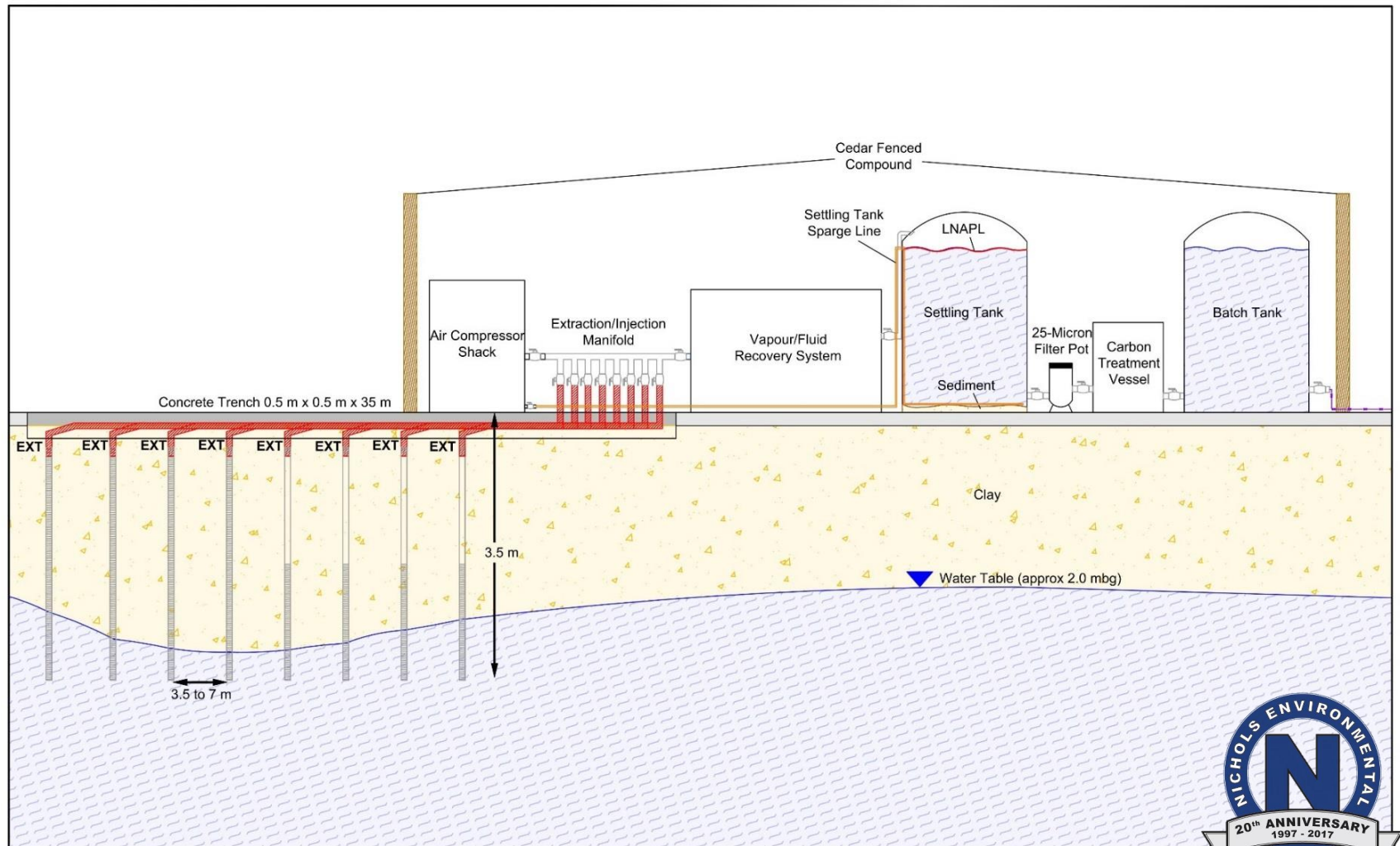


Approach

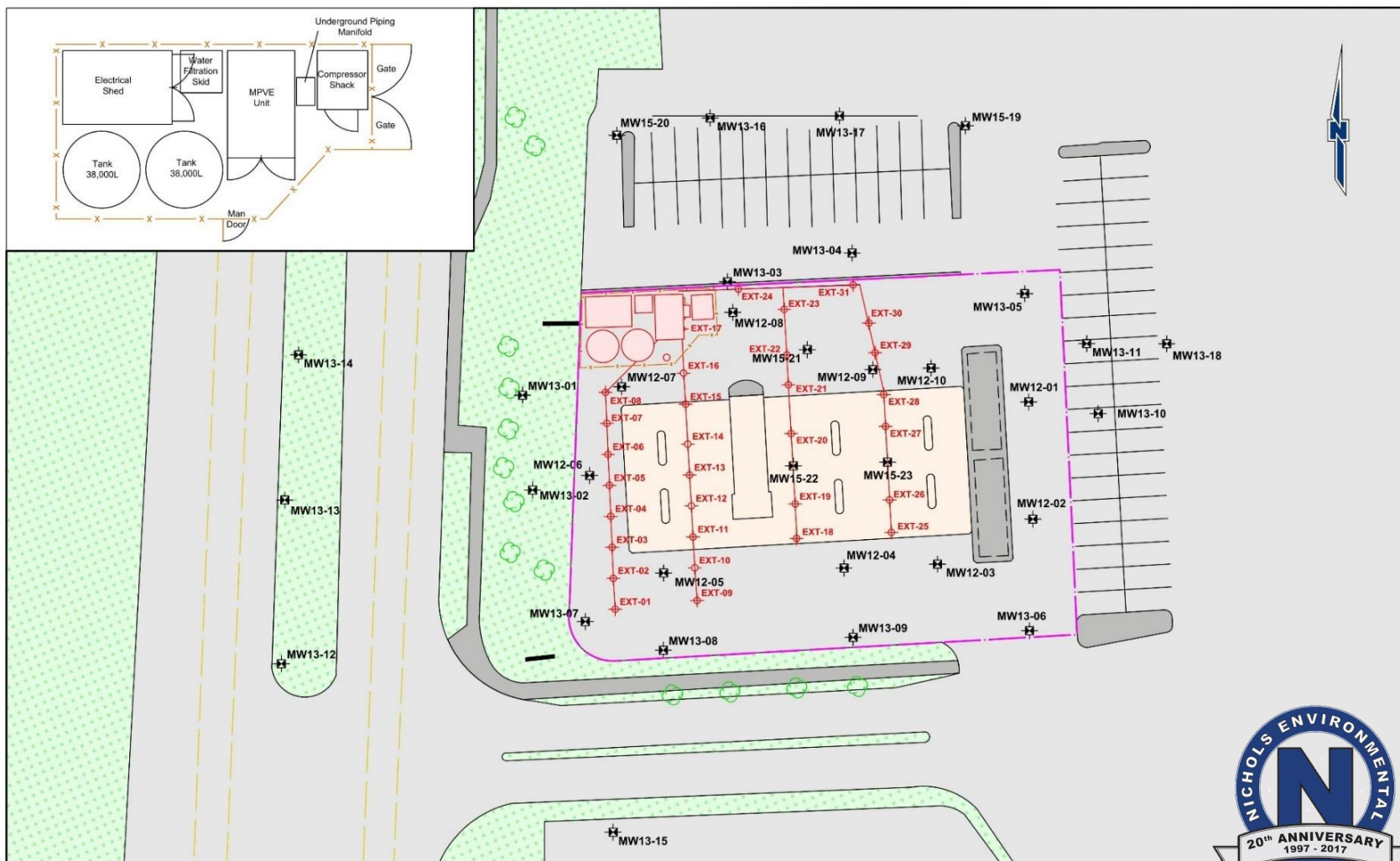
- Integrated/multi-faceted
- Mechanical extraction of vapours and GW
- On-site treatment capability
- Air sparge delivery
- Nutrient/oxidant amendment delivery
- Eliminate disposal of impacted media
- **ZERO DOWN TIME**



Conceptual Site Model



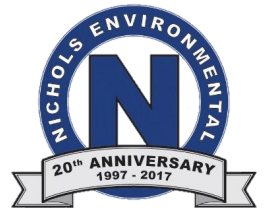
Remediation Infrastructure



Remediation Infrastructure



Water Line Replacement



Extraction Wells

Lines 1 and 2



Extraction Wells

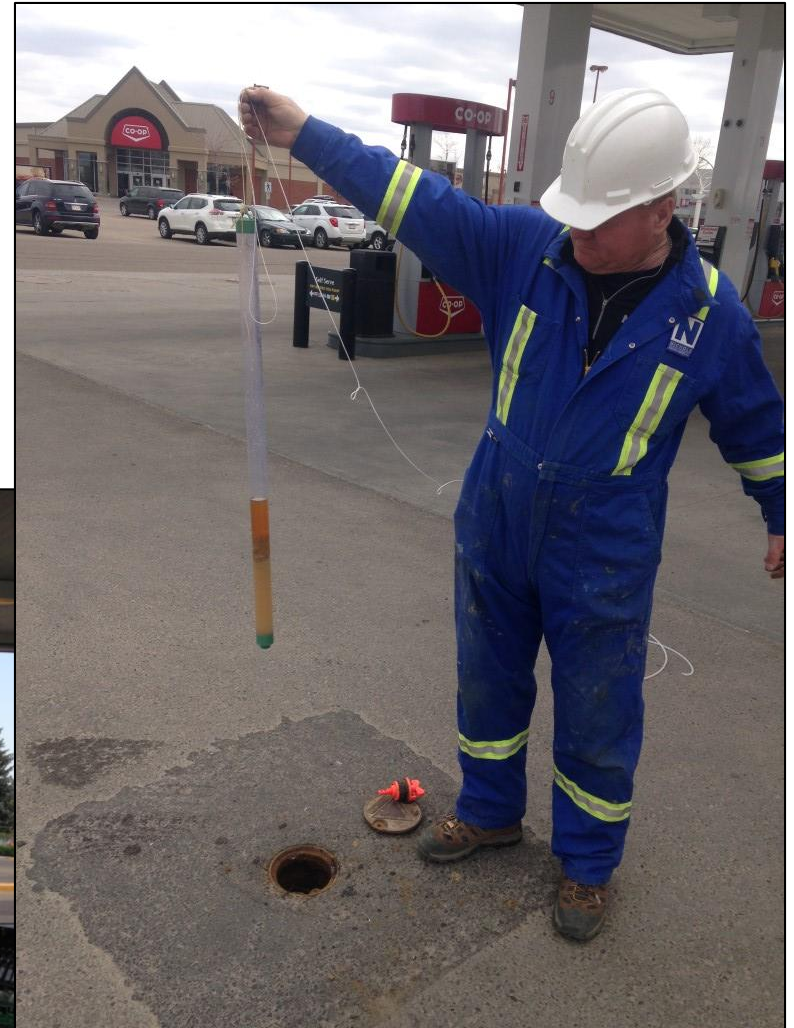
Lines 1 and 2



Secured Compound



Monitoring Well Installation



Extraction Wells

Lines 3 and 4

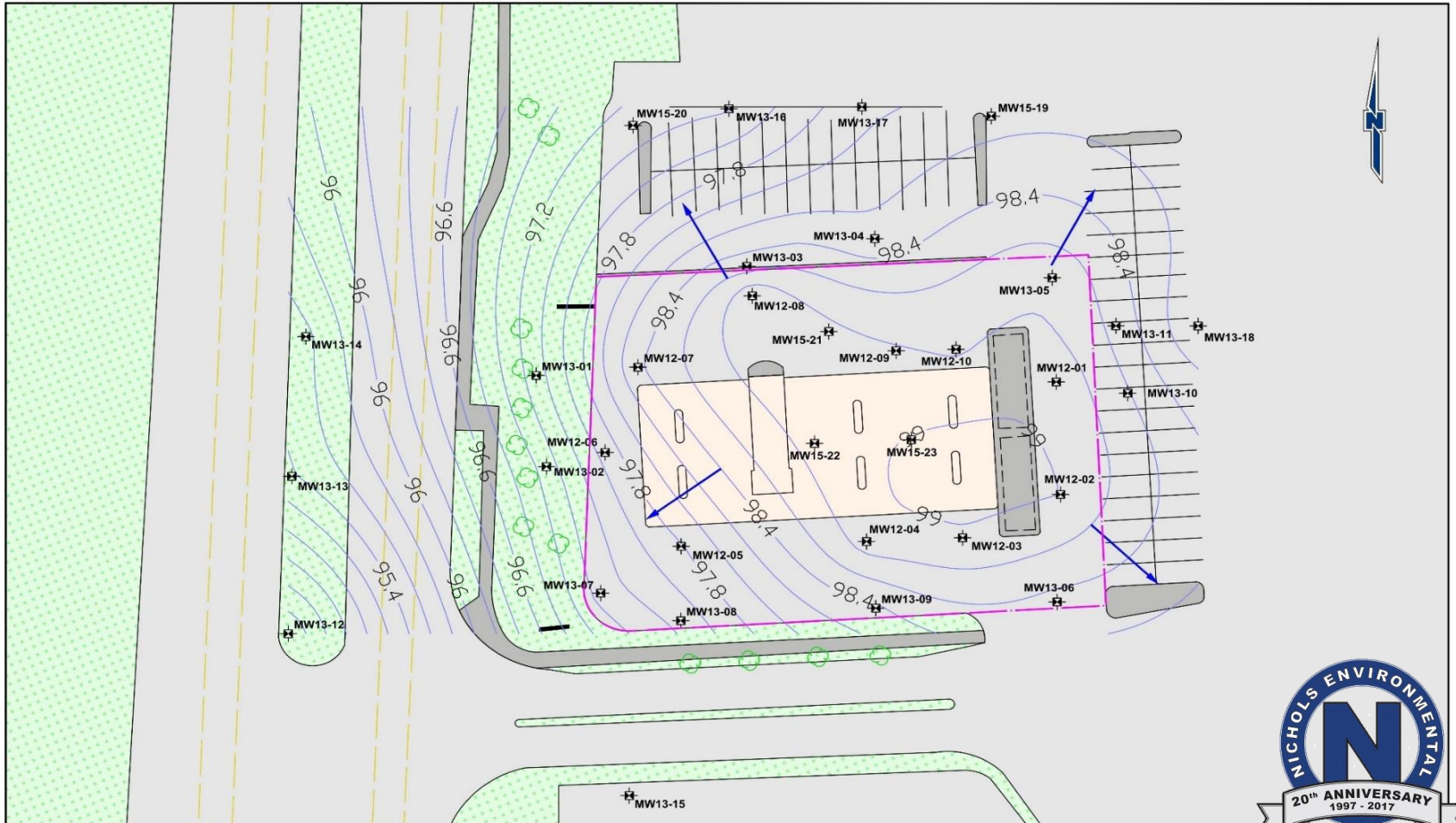


Results

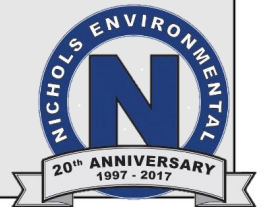
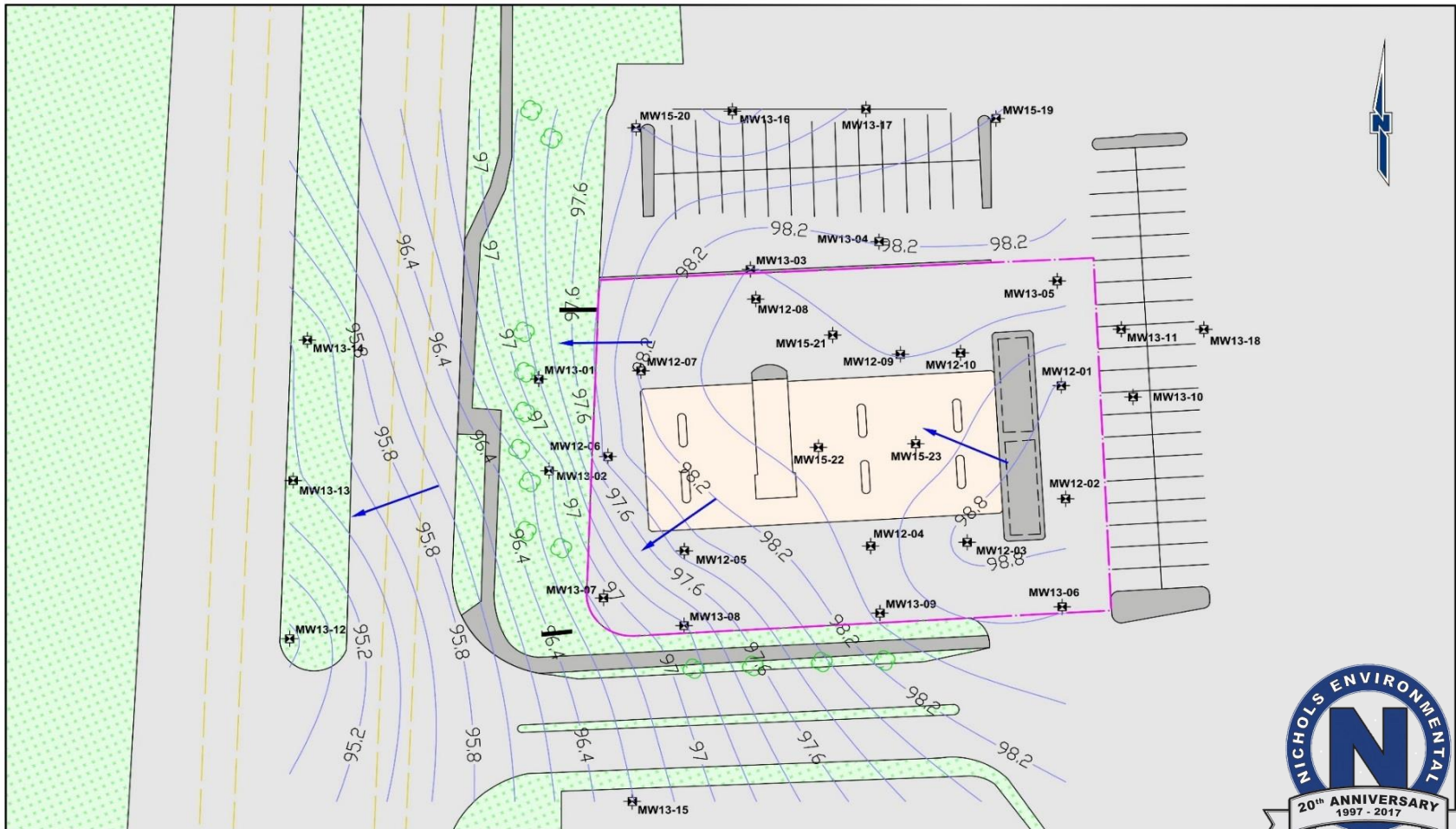
- System operational for ~300 days during 2015 and 2016
- On-site recovery and treatment of **~138,000 L** impacted groundwater
- Mechanical removal of **~3,000 KG** of PHCs
- Dissolved phase PHCs concentrations **reduced by 84%**



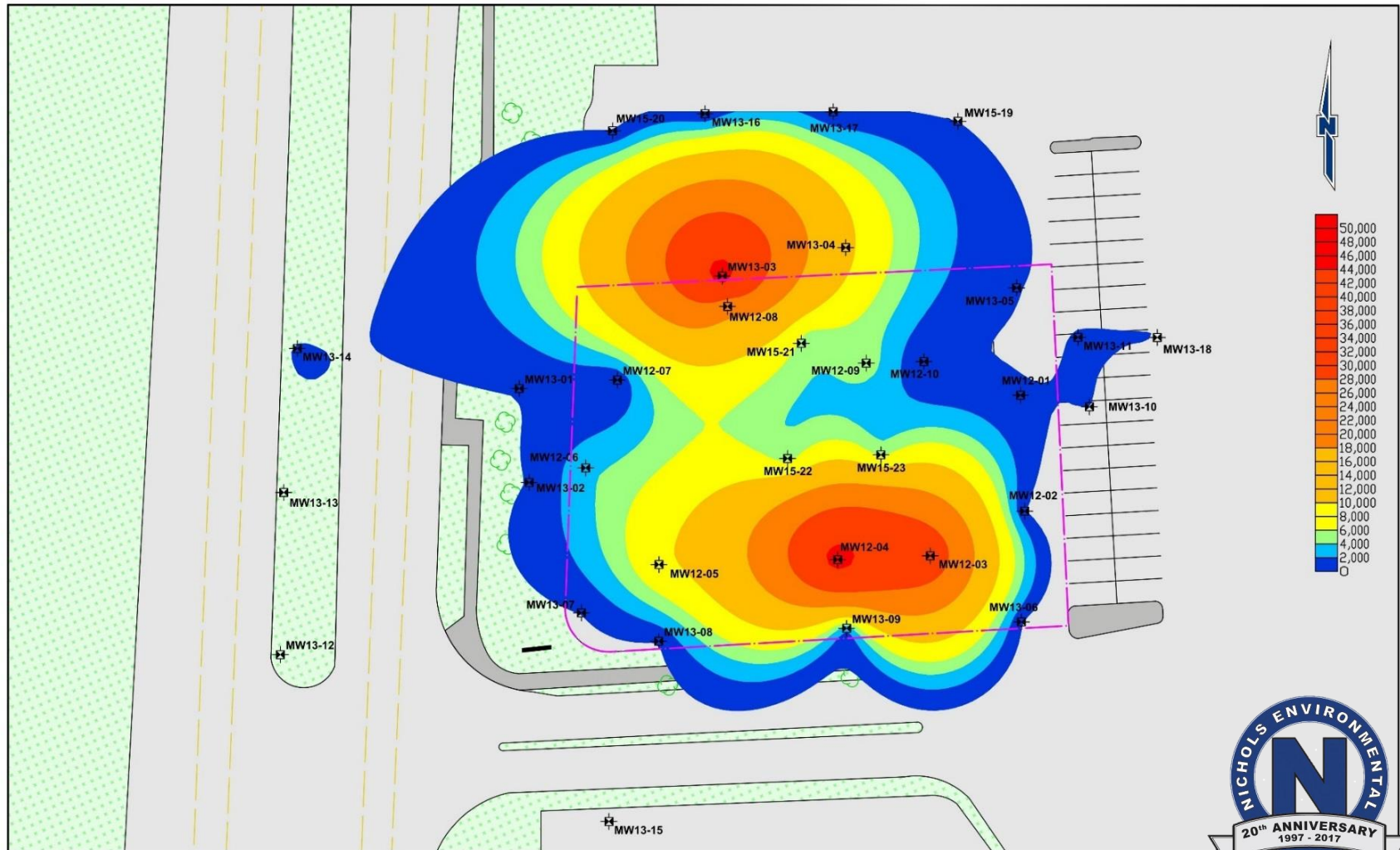
Groundwater Contours - Pre Treatment



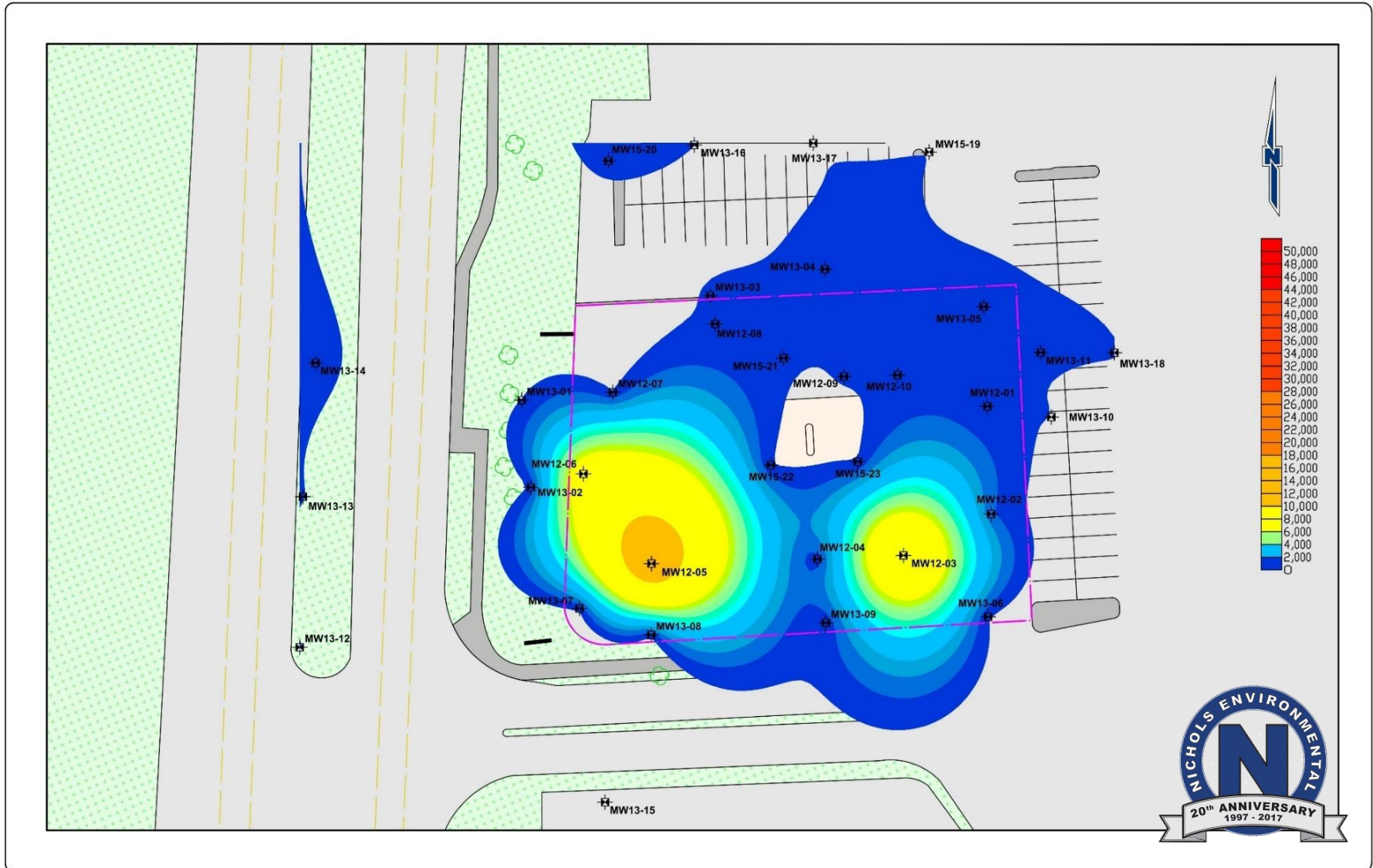
Groundwater Contours – Post Treatment



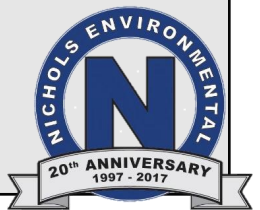
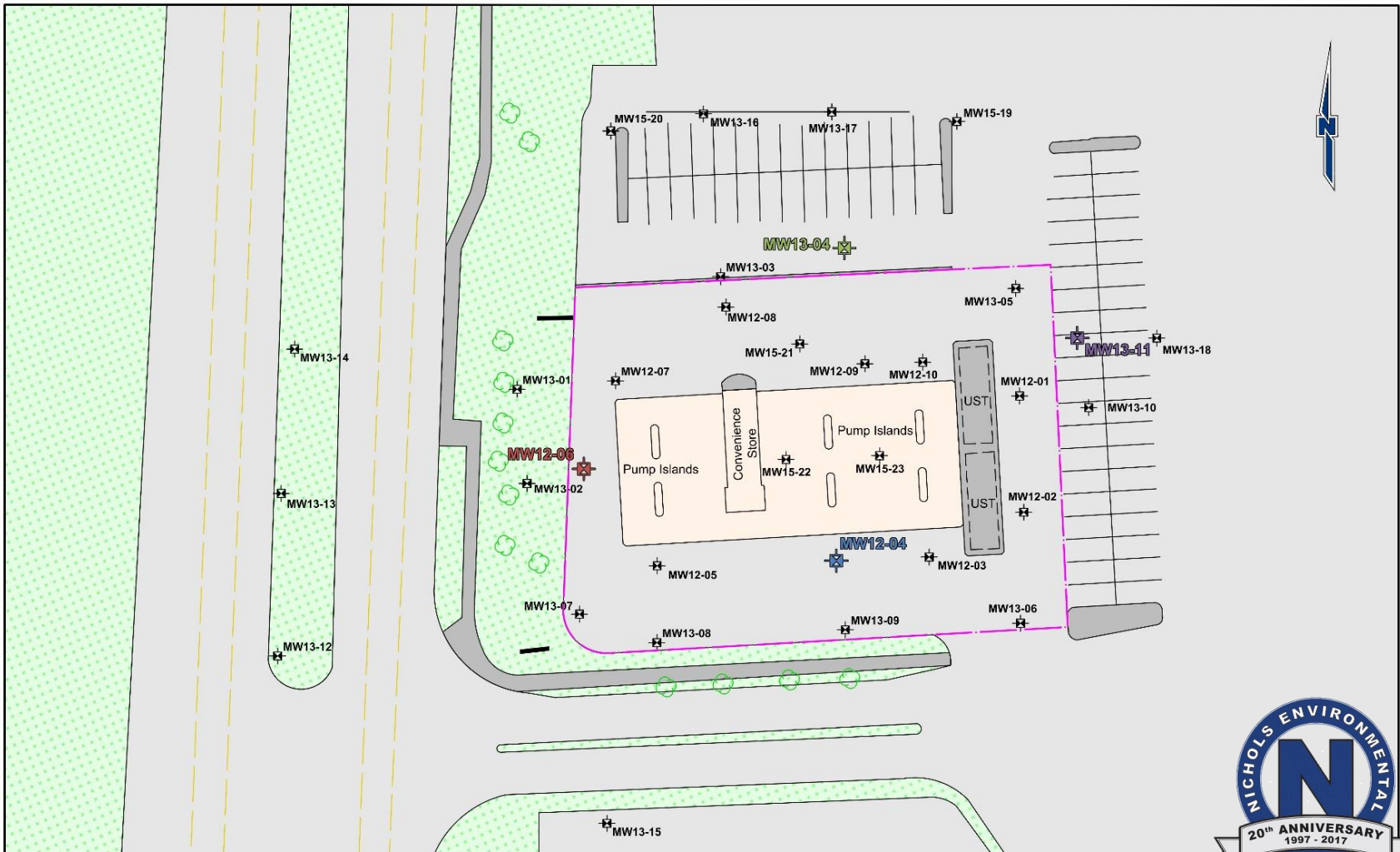
HVCs – Pre Treatment



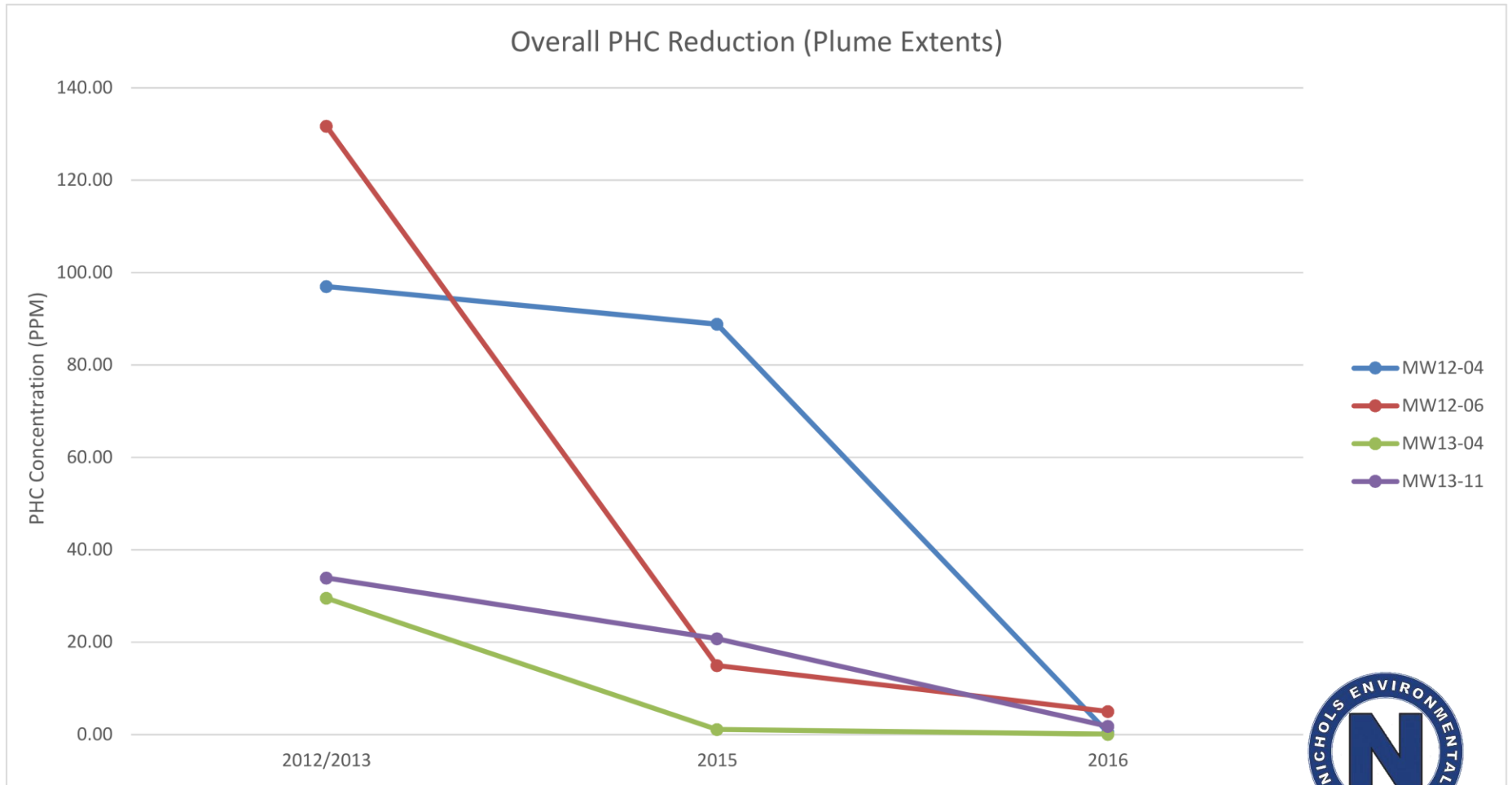
HVCs – Post Treatment



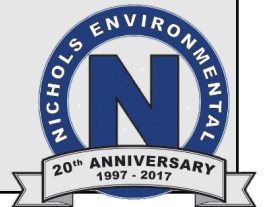
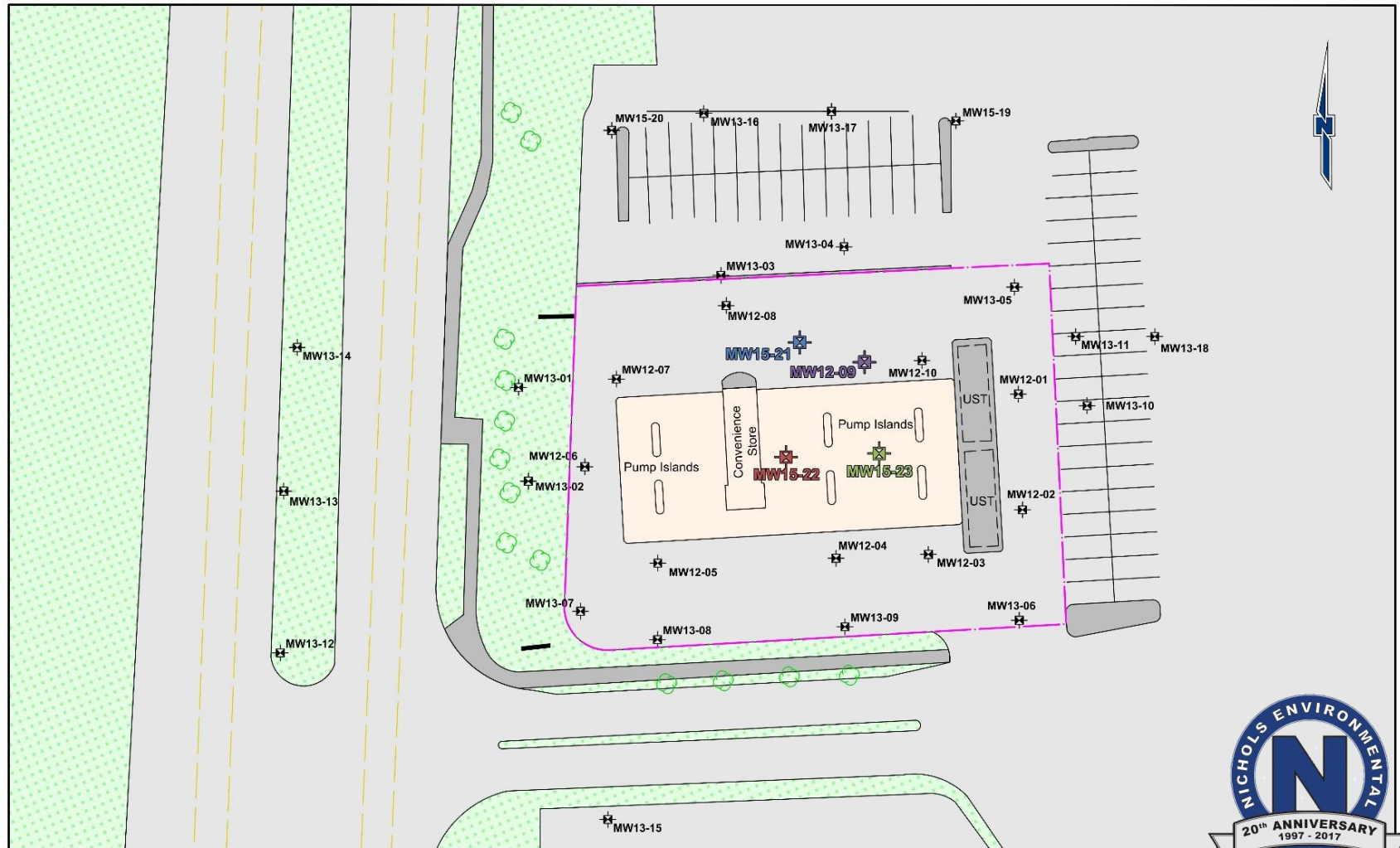
Overall PHC Reduction



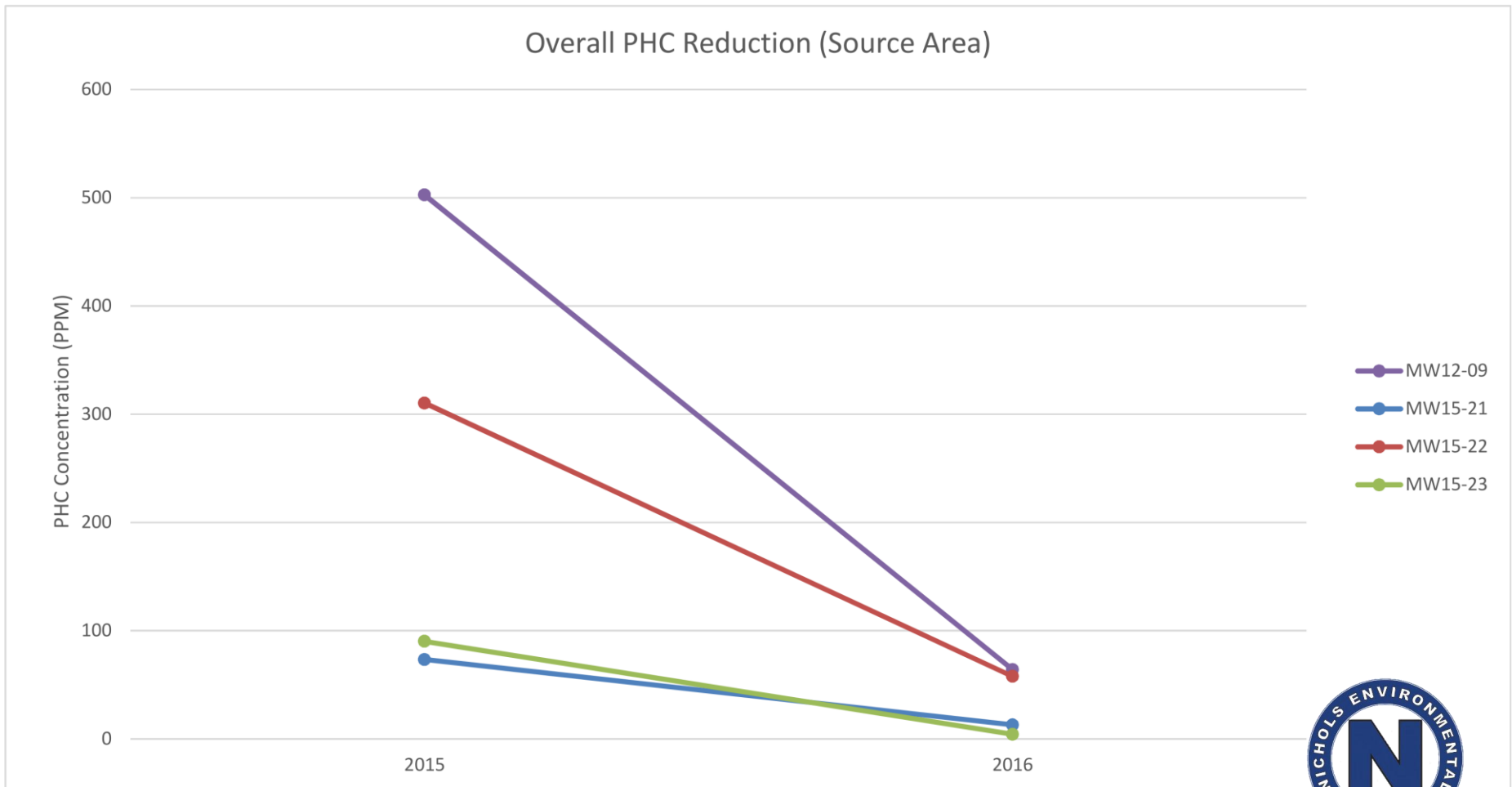
Overall PHC Reduction



Overall PHC Reduction



Overall PHC Reduction



Conclusions

- Mass mechanical removal of fluids/vapour has been achieved
- Evidence of bio-degradation occurring supported by CO₂, manganese, iron and sulphate generation
- Reaching the tipping point between effective mechanical removal and transition to bio-degradation



Conclusions

- Continue fluid/vapour recovery into 2017
- Utilize recovered and treated groundwater for amendment preparation
 - Advantage: maintain consistency with native groundwater chemistry and indigenous bacteria
 - Advantage: eliminate discharge requirements
- System hardware can be utilized for amendment delivery



