ASTSWMO LUST Workshop
September 2019
Deepak Singh
Location: Washington DC, NW quadrant
Facility: Gas Station since 1943 but zoned for mixed use

Background
USTs: 4 tanks currently in use (gasoline and diesel)
Release: Phase II indicated gasoline leak from UST pipe lines in 2008 (Benzene at 1730 ug/L)
Impacted media: Soil and groundwater

Sensitive receptors:
School located 500 feet up-gradient and east of site, across a the road.
Single family homes located west and southwest of site, (across road).
Washington Aqueduct Reservoir located 500 ft. southeast of Site.
Potomac River located 1,500 ft. southwest of site.
Utility line: storm sewer located along south property line.
### SITE STRATIGRAPHY

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>USC</th>
<th>Type of Soil and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-8</td>
<td>SC</td>
<td>Clayey fine to medium grained SAND</td>
</tr>
<tr>
<td>8-19</td>
<td>ML</td>
<td>Fine SANDY SILT</td>
</tr>
<tr>
<td>19-25</td>
<td>SM</td>
<td>Silty fine SAND</td>
</tr>
<tr>
<td>(25-*</td>
<td></td>
<td>Groundwater)</td>
</tr>
</tbody>
</table>
Figure 5-2
Graphical Display of a Site Conceptual Exposure Scenario
(For Illustration Only)
IMPACT AND REMEDIATION

IMPACT:
- **Light NAPL:** None noted at the site.
- **Adsorbed Phase:** Impact on-site near MW-C at depths from 10-25 ft. Impacted soil concentration were low: Benzene concentrations in soil ranged from 0.009 to 7.5 mg/kg, and TPH-GRO ranged from 4.2 to 2680 mg/kg.
- **Dissolved Phase:** On site, maximum benzene concentration ranged from 1730 ug/L to 5500 ug/L in MW-3. Impact has migrated off-site to the south where highest groundwater concentrations for benzene ranged from 3600 ug/L to 1600 ug/L at off-site well MW-6.

REMEDIATION:
- **Soil Vapor Extraction /Air-Sparge System** – SVE chosen based on soil type found at the site. System ran from October 2014 till December 2015.
- **Per sulfate injection** was suggested initially in CAP. However, per sulfate injection was not approved.
- **BOS-200 injection** was suggested as the other option to address dissolved phase impact in October, 2016.
BOS-200 Activated carbon trap and treat completed in October, 2018

**Activated Carbon Application:**
Carbon: 15,000 pounds
Bacteria concentration: 35 gallon
Calcium Sulfate (Gypsum): small amounts (terminal electron acceptors)
Depth ranging from 10 to 25 feet below ground surface.
Locations (off site) 95 boring points spaced five feet apart.

**Monitoring schedule:** Measure VOCs, Sulfates, and other natural attenuation parameters in soil - after 7, 30, 60 days of post injection.
REMEDIATION LOCATION

Gas Station Site (Up gradient)

BOS-200 injection points (downgradient – off site grass area)
INJECTION POINTS (OFF-SITE)

Gas Station Site (Up gradient)

BOS-200 injection points (downgradient – off site)
RESULTS

PRE-INJECTION:
BOS200 carbon injection was conducted in October, 2018. Impact migrated offsite past the south property line.

POST INJECTION BENZENE:

<table>
<thead>
<tr>
<th>GROUNDWATER DATA</th>
<th>Off site</th>
<th>On-site</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MW-1</td>
<td>MW-2</td>
</tr>
<tr>
<td>2011</td>
<td>0.6</td>
<td>ND</td>
</tr>
<tr>
<td>MID</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>2019</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>RANGE:</td>
<td></td>
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ADDITIONAL WORK

- Permits from DCRA for per sulfate injection
- Storm Sewer approval from DC Waters – access for CCTV survey.
- CCTV – contract and report
- Repeat Permits from DCRA – Borings for 95 points
- Permits from DDOT - construction and occupancy
- Stakeholder’s approval for reservoir located 500 ft. of Site.
- Public Participation letters, communication, and comments

All approvals needed for injection was received in June, 2018. BOS200 carbon injection was conducted in October, 2018.
Public participation Pre-Injection:
As required by DC regulation 20 DCMR 6212, nine single family home owners were contacted by mail notifying them before injection was started in October 2018 as impact had migrated off-site.

Requests during injection:
Complain about carbon injection overflow of carbon product from wells on the ground surface looking unsightly, but was explained to be harmless.

Public Contacts made Post Injection:
Received a few inquiries that were addressed to via emails or site visits. Encouraged parties to contact consultants and DOEE and ask questions. Made the CAP work as transparent as possible.
Creative Funding
HRSC, Treatment Trains
Risk-Based Corrective Action (RBCA)
Low-Threat Closures
Legacy Sites
Orphan LUST Sites
MNA & NSZD
Working with Consultants
Offsite Contamination Challenges
Question & Answer Session