## Appendix D
# OU2 Test Pit Technical Memorandum

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October 29, 2004

184199.RI.01

MRS. STEPHANIE LINEBAUGH
REMEDIAL PROJECT MANAGER
U.S. Environmental Protection Agency (SR-6J)
77 W. Jackson Boulevard
Chicago, IL 60604-3590

Subject: OU2 Test Pit Memorandum
Velsicol Chemical Site – Operable Unit #2, St. Louis, Michigan
Work Assignment No. 208-RARA-0532, Contract No. 68-W6-0025

Dear Mrs. Linebaugh:

Enclosed is a memorandum summarizing the findings during advancement of 14 test pits in Cell 6 and Cell 7 in September. Data collected during these activities will be incorporated into the final report at the conclusion of the source migration investigation early next year.

If you have any questions or comments, please contact me at 414-847-0430 or Gina Bayer at (920) 730-9503. Thank you.

Sincerely,

CH2M HILL

Rob Stryker
Assistant Site Manager

Enclosure

cc: Stephen Nathan, PO/U.S. EPA, Region 5 (w/o enclosure)
Dave Alberts, CO/U.S. EPA, Region 5 (w/o enclosure)
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# 2004 OU2 Test Pits
# Velsicol Chemical Site

**TO:** Stephanie Linebaugh/USEPA

**COPIES:** Gina Bayer/CH2M HILL
Theo von Wallmenich/CH2M HILL
Dan Lynch/Ecology & Environment

**FROM:** Jennifer Myers/CH2M HILL
Rob Stryker/CH2M HILL

**DATE:** October 29, 2004

## Introduction

Fourteen test pits were excavated in the OU2 Phase 2 Remedial Area on September 15, 16, and 17, 2004 to observe the distribution, depths, and thicknesses of sand layers within the glacial till, and to determine the presence or absence of NAPL. These test pits were numbered C6TP-1 through C6TP-8 (Cell 6) and C7TP-1 through C7TP-6 (Cell 7). Figure 1 shows the locations of these test pits, as well as areas where NAPL was encountered on the glacial till surface and within sand seams in the till in the Phase 2 area. The test pits advanced in Cell 5 in 2003 and the areas capped with clay in the Phase 1 area are also shown on Figure 1.

The test pits in the Phase 2 Remedial Area were excavated into the glacial till after sediment had been removed from the riverbed. They ranged in length from 20-35 feet, ranged in width from 8-10 feet, and were approximately 19 feet deep. After excavation was completed, the test pits were allowed to stand for 2 hours before backfilling. This was done to allow small quantities of NAPL which may have been present in very small sand seems to seep out into the test pit. After standing open for two hours, the test pits were backfilled with the excavated glacial till. Compaction was conducted using a vibrating plate excavator attachment.

## Observations

Findings during excavation of the test pits are noted in Table 1. Sand layers were present within the till in Cell 6 from 680-689 FMSL and ranged from >0.5 to 2 feet in thickness. Many very small sand layers were observed within the upper 8 feet of the excavation in C6TP-1, C6TP-3, C6TP-4, C6TP-7, and C6TP-8. In Cell 7, only C7TP-1 was observed to have a sand and gravel layer, which was approximately 8 inches thick. No other test pit in Cell 7 exhibited evidence of a sand or gravel seam.

NAPL was observed in C6TP-1 and C6TP-3. In C6TP-1, NAPL appeared only in the numerous small seams located in the upper 8 feet of the excavation. The larger

(approximately 1 foot) sand and gravel seam at approximately 684 FMSL showed no signs of NAPL. In C6TP-3, NAPL appeared in both the numerous small seams located in the top 8 feet of the excavation and in the larger (approximately 4-inch thick) seam of sand and gravel located at approximately 685 FMSL (the total quantity of NAPL in the test pit after standing open for two hours was very small—only a trace was present). A sample was collected for analysis from this seam. No NAPL was observed in any of the test pits in Cell 7.

Cross-sections depicting sand seam and NAPL occurrences and distribution that incorporate data from this and previous investigations and observations from the sediment remedial action will be incorporated into the report prepared at the end of the Source Migration Investigation.

# Chemical Analyses

A total of four soil samples were collected during excavation of the test pits; these were from test pits C6TP-2, C6TP-3, C7TP-1, and C7TP-4. (as noted in Table 1) and were analyzed for VOCs, SVOCs, total DDT, and metals. The sample collected from C6TP-2 was collected from a 1.5-foot-thick sand and gravel layer encountered approximately 15 feet below the till surface. The sample collected from C6TP-3 was obtained from the till directly below a coarse sand layer with NAPL in an attempt to assess the potential for downward NAPL migration from the sand seam (no such sample was collected in C6TP-1 because the quantity of NAPL present and the size of individual sand seams were so small). The two samples from C7TP-1 and C7TP-4 were both collected from the till at the bottom of the excavation.

Analytical results of these samples are shown in Tables 2 through 5.

## VOCs

No VOCs were detected in C6TP-2, C7TP-1, and C7TP-4. 1,2-dichloroethane, benzene, and methylene chloride were detected at concentrations of 3.2 µg/kg, 1.3 µg/kg, and 0.92 µg/kg (respectively) in C6TP-3.

## SVOCs

No SVOCs were detected in C6TP-2 and C6TP-3. The only SVOC detected in C7TP-1 and C7TP-4 was diethylphthalate, detected at a concentrations of 323 µg/kg and 261 µg/kg, respectively.

## Total DDT

No DDT, DDD, or DDE was detected in any of the four samples.

## Total Metals/Mercury

The inorganic compounds detected in the highest concentrations were calcium, magnesium, iron, and aluminum. Mercury was not detected in C6TP-2, and was detected at low estimated concentrations in C6TP-3, C7TP-1 and C7TP-4 ranging between 0.00191 mg/kg and 0.0113 mg/kg.

**TABLE 1**
Cell 6 and 7 Test Pit Observations
*Velsicol Chemical Site*

| Test Pit | Top Elevation of Sand Seam (FMSL)[1] | Thickness of Sand Seam (ft) | Soil Description | Observations & Samples Collected |
|---|---|---|---|---|
| C6TP-1 | 684 | 1 | SW | Traces of NAPL present in very small sand seams in top 8' of till. No NAPL or odor in lower 1'-thick seam. No sample collected. |
| C6TP-2 | 685 | 1.5 | SW | No NAPL, no odor, coarse sand and gravel. Sample collected from the sand & gravel layer. |
| C6TP-3 | 685 | 0.33 | SW | NAPL within SW (coarse), Strong odor, many other small (<.3') within top 8' of excavation. Sample collected from soft glacial till immediately below the coarse sand layer. |
| C6TP-4 | 699 | <.5 | SP | No NAPL, no odor, coarse sand seam, many other small (<.3') throughout. No sample collected. |
| C6TP-5 | 689 | 1 | SW | No NAPL, no odor, coarse sand and gravel. No sample collected. |
| C6TP-6 | 680 | 2 | SP | No NAPL, no odor, medium to coarse sand in both seams fining downward, 6" seam intersecting top of till sloping eastward to level at 699. No sample collected. |
| | 690 | 1.5 | SP | |
| C6TP-7 | 698 | 1.5 | SP | No NAPL, no odor, medium to coarse sand seam intersecting top of till sloping to east level at 689. No sample collected. |
| C6TP-8 | Various | Various | SP | No NAPL, no odor, medium to coarse sand lenses throughout. No sample collected. |
| C7TP-1 | 687 | 0.67 | GW/SW | No NAPL, no odor, Gravel fining downward into coarse sand. Sample collected from bottom of test pit excavation. |
| C7TP-2 | N/A | N/A | N/A | No NAPL, no odor, no sand seams. No sample collected. |
| C7TP-3 | N/A | N/A | N/A | No NAPL, no odor, no sand seams. No sample collected. |
| C7TP-4 | N/A | N/A | N/A | No NAPL, no odor, no sand seams. Sample collected from bottom of test pit excavation. |
| C7TP-5 | N/A | N/A | N/A | No NAPL, no odor, no sand seams. No sample collected. |
| C7TP-6 | N/A | N/A | N/A | No NAPL, no odor, no sand seams. No sample collected. |

[1] Elevations are currently estimated. More precise elevations will be determined after the results of the post-excavation surveys from the remedial activities become available.

**TABLE 2**
C6TP-2 Soil Sample - Analytical Results
*Velsicol Chemical Site–2004 Test Pits Memorandum*

Date/Time Sampled: 9/15/2004 16:20
Sample ID: 04CB12-38

***VOCs - Analytical Method SW8260B***

| Compound | Result | Units |
|---|---|---|
| 1,1,1-Trichloroethane | <23.3 | µg/kg |
| 1,1,2,2-Tetrachloroethane | <23.3 | µg/kg |
| 1,1,2-Trichloroethane | <23.3 | µg/kg |
| 1,1-Dichloroethane | <23.3 | µg/kg |
| 1,1-Dichloroethene | <23.3 | µg/kg |
| 1,2-Dibromo-3-chloropropane | <11.6 | µg/kg |
| 1,2-Dichloroethane | <23.3 | µg/kg |
| 1,2-Dichloroethene, Total | <23.3 | µg/kg |
| 1,2-Dichloropropane | <23.3 | µg/kg |
| 1-Chlorohexane | <4.6 | µg/kg |
| 2-Butanone | <23.3 | µg/kg |
| 2-Hexanone | <23.3 | µg/kg |
| 4-Methyl-2-Pentanone | <23.3 | µg/kg |
| Acetone | <23.3 | µg/kg |
| Benzene | <23.3 | µg/kg |
| Bromodichloromethane | <23.3 | µg/kg |
| Bromoform | <23.3 | µg/kg |
| Bromomethane | <23.3 | µg/kg |
| Carbon Disulfide | <23.3 | µg/kg |
| Carbon Tetrachloride | <23.3 | µg/kg |
| Chlorobenzene | <23.3 | µg/kg |
| Chloroethane | <23.3 | µg/kg |
| Chloroform | <23.3 | µg/kg |
| Chloromethane | <23.3 | µg/kg |
| cis-1,3-Dichloropropene | <23.3 | µg/kg |
| Dibromochloromethane | <23.3 | µg/kg |
| Ethylbenzene | <23.3 | µg/kg |
| Methylene Chloride | <23.3 | µg/kg |
| Styrene | <23.3 | µg/kg |
| Tetrachloroethene | <23.3 | µg/kg |
| Toluene | <23.3 | µg/kg |
| trans-1,3-Dichloropropene | <23.3 | µg/kg |
| Trichloroethene | <23.3 | µg/kg |
| Vinyl Chloride | <23.3 | µg/kg |
| Xylenes, Total | <23.3 | µg/kg |

***SVOCs - Analytical Method SW8270C***

| Compound | Result | Units |
|---|---|---|
| 2,2-Oxybis(1-chloropropane) | <344 | µg/kg |
| 2,4,5-Trichlorophenol | <865 | µg/kg |
| 2,4,6-Trichlorophenol | <344 | µg/kg |
| 2,4-Dichlorophenol | <344 | µg/kg |
| 2,4-Dimethylphenol | <344 | µg/kg |

***SVOCs - Analytical Method SW8270C (cont'd)***

| Compound | Result | Units |
|---|---|---|
| 2,4-Dinitrophenol | <865 | µg/kg |
| 2,4-Dinitrotoluene | <344 | µg/kg |
| 2,6-Dinitrotoluene | <344 | µg/kg |
| 2-Chloronaphthalene | <344 | µg/kg |
| 2-Chlorophenol | <344 | µg/kg |
| 2-Methylnaphthalene | <344 | µg/kg |
| 2-Methylphenol (O-Cresol) | <344 | µg/kg |
| 2-Nitroaniline | <865 | µg/kg |
| 2-Nitrophenol | <344 | µg/kg |
| 3,3'-Dichlorobenzidine | <344 | µg/kg |
| 3-Nitroaniline | <865 | µg/kg |
| 2-Methyl-4,6-dinitrophenol | <865 | µg/kg |
| 4-Bromophenyl Phenyl Ether | <344 | µg/kg |
| 4-Chloro-3-Methylphenol | <344 | µg/kg |
| 4-Chloroaniline | <344 | µg/kg |
| 4-Chlorophenyl Phenyl Ether | <344 | µg/kg |
| 4-Methylphenol | <344 | µg/kg |
| 4-Nitroaniline | <865 | µg/kg |
| 4-Nitrophenol | <865 | µg/kg |
| Acenaphthene | <344 | µg/kg |
| Acenaphthylene | <344 | µg/kg |
| Anthracene | <344 | µg/kg |
| Benzo(A)Anthracene | <344 | µg/kg |
| Benzo(A)Pyrene | <344 | µg/kg |
| Benzo(B)Fluoranthene | <344 | µg/kg |
| Benzo(G,H,I)Perylene | <344 | µg/kg |
| Benzo(K)Fluoranthene | <344 | µg/kg |
| Butylbenzylphthalate | <344 | µg/kg |
| Bis(2-Chloroethoxy) Methane | <344 | µg/kg |
| Bis(2-Chloroethyl) Ether | <344 | µg/kg |
| Bis(2-Ethylhexyl) Phthalate | <344 | µg/kg |
| Caprolactam | <344 | µg/kg |
| Carbazole | <344 | µg/kg |
| Chrysene | <344 | µg/kg |
| Dibenz(A,H)Anthracene | <344 | µg/kg |
| Dibenzofuran | <344 | µg/kg |
| Diethyl Phthalate | <344 | µg/kg |
| Dimethyl Phthalate | <344 | µg/kg |
| Di-N-Butyl Phthalate | <344 | µg/kg |
| Di-N-Octylphthalate | <344 | µg/kg |
| Fluoranthene | <344 | µg/kg |
| Fluorene | <344 | µg/kg |
| Hexachlorobenzene | <344 | µg/kg |

J flagged results are estimated values.

**TABLE 2**
C6TP-2 Soil Sample - Analytical Results
*Velsicol Chemical Site–2004 Test Pits Memorandum*

Date/Time Sampled: 9/15/2004 16:20
Sample ID: 04CB12-38

***SVOCs - Analytical Method SW8270C (cont'd)***

| Compound | Result | Units |
|---|---|---|
| Hexachlorobutadiene | <344 | µg/kg |
| Hexachlorocyclopentadiene | <344 | µg/kg |
| Hexachloroethane | <344 | µg/kg |
| Indeno(1,2,3-C,D)Pyrene | <344 | µg/kg |
| Isophorone | <344 | µg/kg |
| Naphthalene | <344 | µg/kg |
| Nitrobenzene | <344 | µg/kg |
| N-Nitroso-di-N-Propylamine | <344 | µg/kg |
| N-Nitrosodiphenylamine | <344 | µg/kg |
| Pentachlorophenol | <865 | µg/kg |
| Phenanthrene | <344 | µg/kg |
| Phenol | <344 | µg/kg |
| Pyrene | <344 | µg/kg |

***Pesticides - Analytical Method SW8081***

| Compound | Result | Units |
|---|---|---|
| 4,4-DDD | <21 | µg/kg |
| 4,4-DDE | <21 | µg/kg |
| 4,4-DDT | <21 | µg/kg |
| 2,4-DDD | <21 | µg/kg |
| 2,4-DDE | <21 | µg/kg |
| 2,4-DDT | <21 | µg/kg |

***Total Metals - Analytical Method SW6010B***

| Compound | Result | | Units |
|---|---|---|---|
| Aluminum | 1,740 | | mg/kg |
| Antimony | <3.68 | | mg/kg |
| Arsenic | 19.8 | | mg/kg |
| Barium | 5.51 | J | mg/kg |
| Beryllium | 0.288 | J | mg/kg |
| Cadmium | <0.413 | | mg/kg |
| Calcium | 134,000 | | mg/kg |
| Chromium | 30.4 | | mg/kg |
| Cobalt | 3.37 | J | mg/kg |
| Copper | 6.64 | | mg/kg |
| Iron | 5,640 | | mg/kg |
| Lead | <2.47 | | mg/kg |
| Magnesium | 51,900 | | mg/kg |
| Manganese | 270 | | mg/kg |
| Nickel | 31.5 | | mg/kg |
| Potassium | 120 | | mg/kg |
| Selenium | <3.35 | | mg/kg |
| Silver | <0.314 | | mg/kg |
| Sodium | 267 | J | mg/kg |
| Thallium | <3.35 | | mg/kg |
| Vanadium | 8.58 | J | mg/kg |
| Zinc | 2.77 | J | mg/kg |

***Specialty Compounds***

| Compound | Result | Units | Analytical Method |
|---|---|---|---|
| Mercury | <0.00153 | mg/kg | SW7471A |

J flagged results are estimated values.

**TABLE 3**
C6TP-3 Soil Sample - Analytical Results
*Velsicol Chemical Site–2004 Test Pits Memorandum*

Date/Time Sampled: 9/15/2004 12:00
Sample ID: 04CB12-39

***VOCs - Analytical Method SW8260B***

| Compound | Result | | Units |
|---|---|---|---|
| 1,1,1-Trichloroethane | <11.1 | | µg/kg |
| 1,1,2,2-Tetrachloroethane | <11.1 | | µg/kg |
| 1,1,2-Trichloroethane | <11.1 | | µg/kg |
| 1,1-Dichloroethane | <11.1 | | µg/kg |
| 1,1-Dichloroethene | <11.1 | | µg/kg |
| 1,2-Dibromo-3-chloropropane | <11.6 | | µg/kg |
| 1,2-Dichloroethane | 3.2 | J | µg/kg |
| 1,2-Dichloroethene, Total | <11.1 | | µg/kg |
| 1,2-Dichloropropane | <11.1 | | µg/kg |
| 1-Chlorohexane | <2.2 | | µg/kg |
| 2-Butanone | <11.1 | | µg/kg |
| 2-Hexanone | <11.1 | | µg/kg |
| 4-Methyl-2-Pentanone | <11.1 | | µg/kg |
| Acetone | <11.1 | | µg/kg |
| Benzene | 1.3 | J | µg/kg |
| Bromodichloromethane | <11.1 | | µg/kg |
| Bromoform | <11.1 | | µg/kg |
| Bromomethane | <11.1 | | µg/kg |
| Carbon Disulfide | <11.1 | | µg/kg |
| Carbon Tetrachloride | <11.1 | | µg/kg |
| Chlorobenzene | <11.1 | | µg/kg |
| Chloroethane | <11.1 | | µg/kg |
| Chloroform | <11.1 | | µg/kg |
| Chloromethane | <11.1 | | µg/kg |
| cis-1,3-Dichloropropene | <11.1 | | µg/kg |
| Dibromochloromethane | <11.1 | | µg/kg |
| Ethylbenzene | <11.1 | | µg/kg |
| Methylene Chloride | 0.92 | J | µg/kg |
| Styrene | <11.1 | | µg/kg |
| Tetrachloroethene | <11.1 | | µg/kg |
| Toluene | <11.1 | | µg/kg |
| trans-1,3-Dichloropropene | <11.1 | | µg/kg |
| Trichloroethene | <11.1 | | µg/kg |
| Vinyl Chloride | <11.1 | | µg/kg |
| Xylenes, Total | <11.1 | | µg/kg |

***SVOCs - Analytical Method SW8270C***

| Compound | Result | | Units |
|---|---|---|---|
| 2,2-Oxybis(1-chloropropane) | <376 | | µg/kg |
| 2,4,5-Trichlorophenol | <945 | | µg/kg |
| 2,4,6-Trichlorophenol | <376 | | µg/kg |
| 2,4-Dichlorophenol | <376 | | µg/kg |
| 2,4-Dimethylphenol | <376 | | µg/kg |

***SVOCs - Analytical Method SW8270C (cont'd)***

| Compound | Result | Units |
|---|---|---|
| 2,4-Dinitrophenol | <945 | µg/kg |
| 2,4-Dinitrotoluene | <376 | µg/kg |
| 2,6-Dinitrotoluene | <376 | µg/kg |
| 2-Chloronaphthalene | <376 | µg/kg |
| 2-Chlorophenol | <376 | µg/kg |
| 2-Methylnaphthalene | <376 | µg/kg |
| 2-Methylphenol (O-Cresol) | <376 | µg/kg |
| 2-Nitroaniline | <945 | µg/kg |
| 2-Nitrophenol | <376 | µg/kg |
| 3,3'-Dichlorobenzidine | <376 | µg/kg |
| 3-Nitroaniline | <945 | µg/kg |
| 2-Methyl-4,6-dinitrophenol | <945 | µg/kg |
| 4-Bromophenyl Phenyl Ether | <376 | µg/kg |
| 4-Chloro-3-Methylphenol | <376 | µg/kg |
| 4-Chloroaniline | <376 | µg/kg |
| 4-Chlorophenyl Phenyl Ether | <376 | µg/kg |
| 4-Methylphenol | <376 | µg/kg |
| 4-Nitroaniline | <945 | µg/kg |
| 4-Nitrophenol | <945 | µg/kg |
| Acenaphthene | <376 | µg/kg |
| Acenaphthylene | <376 | µg/kg |
| Anthracene | <376 | µg/kg |
| Benzo(A)Anthracene | <376 | µg/kg |
| Benzo(A)Pyrene | <376 | µg/kg |
| Benzo(B)Fluoranthene | <376 | µg/kg |
| Benzo(G,H,I)Perylene | <376 | µg/kg |
| Benzo(K)Fluoranthene | <376 | µg/kg |
| Butylbenzylphthalate | <376 | µg/kg |
| Bis(2-Chloroethoxy) Methane | <376 | µg/kg |
| Bis(2-Chloroethyl) Ether | <376 | µg/kg |
| Bis(2-Ethylhexyl) Phthalate | <376 | µg/kg |
| Caprolactam | <376 | µg/kg |
| Carbazole | <376 | µg/kg |
| Chrysene | <376 | µg/kg |
| Dibenz(A,H)Anthracene | <376 | µg/kg |
| Dibenzofuran | <376 | µg/kg |
| Diethyl Phthalate | <376 | µg/kg |
| Dimethyl Phthalate | <376 | µg/kg |
| Di-N-Butyl Phthalate | <376 | µg/kg |
| Di-N-Octylphthalate | <376 | µg/kg |
| Fluoranthene | <376 | µg/kg |
| Fluorene | <376 | µg/kg |
| Hexachlorobenzene | <376 | µg/kg |

**TABLE 3**

J flagged results are estimated values.

C6TP-3 Soil Sample - Analytical Results
*Velsicol Chemical Site–2004 Test Pits Memorandum*

Date/Time Sampled: 9/15/2004 12:00
Sample ID: 04CB12-39

***SVOCs - Analytical Method SW8270C (cont'd)***

| Compound | Result | Units |
|---|---|---|
| Hexachlorobutadiene | <376 | µg/kg |
| Hexachlorocyclopentadiene | <376 | µg/kg |
| Hexachloroethane | <376 | µg/kg |
| Indeno(1,2,3-C,D)Pyrene | <376 | µg/kg |
| Isophorone | <376 | µg/kg |
| Naphthalene | <376 | µg/kg |
| Nitrobenzene | <376 | µg/kg |
| N-Nitroso-di-N-Propylamine | <376 | µg/kg |
| N-Nitrosodiphenylamine | <376 | µg/kg |
| Pentachlorophenol | <945 | µg/kg |
| Phenanthrene | <376 | µg/kg |
| Phenol | <376 | µg/kg |
| Pyrene | <376 | µg/kg |

***Pesticides - Analytical Method SW8081***

| Compound | Result | Units |
|---|---|---|
| 4,4-DDD | <23 | µg/kg |
| 4,4-DDE | <23 | µg/kg |
| 4,4-DDT | <23 | µg/kg |
| 2,4-DDD | <23 | µg/kg |
| 2,4-DDE | <23 | µg/kg |
| 2,4-DDT | <23 | µg/kg |

***Total Metals - Analytical Method SW6010B***

| Compound | Result | | Units |
|---|---|---|---|
| Aluminum | 7,280 | | mg/kg |
| Antimony | <2.59 | | mg/kg |
| Arsenic | 16.2 | | mg/kg |
| Barium | 60 | | mg/kg |
| Beryllium | 0.685 | J | mg/kg |
| Cadmium | <0.29 | | mg/kg |
| Calcium | 94,100 | | mg/kg |
| Chromium | 15.2 | | mg/kg |
| Cobalt | 7.21 | | mg/kg |
| Copper | 11.4 | | mg/kg |
| Iron | 16,700 | | mg/kg |
| Lead | 4.83 | J | mg/kg |
| Magnesium | 35,400 | | mg/kg |
| Manganese | 326 | | mg/kg |
| Nickel | 17 | | mg/kg |
| Potassium | 1,580 | | mg/kg |
| Selenium | <2.35 | | mg/kg |
| Silver | <0.22 | | mg/kg |
| Sodium | 1,130 | | mg/kg |
| Thallium | <2.35 | | mg/kg |
| Vanadium | 21.6 | | mg/kg |
| Zinc | 31 | J | mg/kg |

***Specialty Compounds***

| Compound | Result | | Units | Analytical Method |
|---|---|---|---|---|
| Mercury | 0.0113 | J | mg/kg | SW7471A |

J flagged results are estimated values.

**TABLE 4**
C7TP-1 Soil Sample - Analytical Results
*Velsicol Chemical Site–2004 Test Pits Memorandum*

Date/Time Sampled: 9/17/2004 11:30
Sample ID: 04CB12-40

***VOCs - Analytical Method SW8260B***

| Compound | Result | Units |
|---|---|---|
| 1,1,1-Trichloroethane | <24.1 | µg/kg |
| 1,1,2,2-Tetrachloroethane | <24.1 | µg/kg |
| 1,1,2-Trichloroethane | <24.1 | µg/kg |
| 1,1-Dichloroethane | <24.1 | µg/kg |
| 1,1-Dichloroethene | <24.1 | µg/kg |
| 1,2-Dibromo-3-chloropropane | <12 | µg/kg |
| 1,2-Dichloroethane | <24.1 | µg/kg |
| 1,2-Dichloroethene, Total | <24.1 | µg/kg |
| 1,2-Dichloropropane | <24.1 | µg/kg |
| 1-Chlorohexane | <4.8 | µg/kg |
| 2-Butanone | <24.1 | µg/kg |
| 2-Hexanone | <24.1 | µg/kg |
| 4-Methyl-2-Pentanone | <24.1 | µg/kg |
| Acetone | <24.1 | µg/kg |
| Benzene | <24.1 | µg/kg |
| Bromodichloromethane | <24.1 | µg/kg |
| Bromoform | <24.1 | µg/kg |
| Bromomethane | <24.1 | µg/kg |
| Carbon Disulfide | <24.1 | µg/kg |
| Carbon Tetrachloride | <24.1 | µg/kg |
| Chlorobenzene | <24.1 | µg/kg |
| Chloroethane | <24.1 | µg/kg |
| Chloroform | <24.1 | µg/kg |
| Chloromethane | <24.1 | µg/kg |
| cis-1,3-Dichloropropene | <24.1 | µg/kg |
| Dibromochloromethane | <24.1 | µg/kg |
| Ethylbenzene | <24.1 | µg/kg |
| Methylene Chloride | <24.1 | µg/kg |
| Styrene | <24.1 | µg/kg |
| Tetrachloroethene | <24.1 | µg/kg |
| Toluene | <24.1 | µg/kg |
| trans-1,3-Dichloropropene | <24.1 | µg/kg |
| Trichloroethene | <24.1 | µg/kg |
| Vinyl Chloride | <24.1 | µg/kg |
| Xylenes, Total | <24.1 | µg/kg |

***SVOCs - Analytical Method SW8270C***

| Compound | Result | Units |
|---|---|---|
| 2,2-Oxybis(1-chloropropane) | <351 | µg/kg |
| 2,4,5-Trichlorophenol | <884 | µg/kg |
| 2,4,6-Trichlorophenol | <351 | µg/kg |
| 2,4-Dichlorophenol | <351 | µg/kg |
| 2,4-Dimethylphenol | <351 | µg/kg |

***SVOCs - Analytical Method SW8270C (cont'd)***

| Compound | Result | | Units |
|---|---|---|---|
| 2,4-Dinitrophenol | <884 | | µg/kg |
| 2,4-Dinitrotoluene | <351 | | µg/kg |
| 2,6-Dinitrotoluene | <351 | | µg/kg |
| 2-Chloronaphthalene | <351 | | µg/kg |
| 2-Chlorophenol | <351 | | µg/kg |
| 2-Methylnaphthalene | <351 | | µg/kg |
| 2-Methylphenol (O-Cresol) | <351 | | µg/kg |
| 2-Nitroaniline | <884 | | µg/kg |
| 2-Nitrophenol | <351 | | µg/kg |
| 3,3'-Dichlorobenzidine | <351 | | µg/kg |
| 3-Nitroaniline | <884 | | µg/kg |
| 2-Methyl-4,6-dinitrophenol | <884 | | µg/kg |
| 4-Bromophenyl Phenyl Ether | <351 | | µg/kg |
| 4-Chloro-3-Methylphenol | <351 | | µg/kg |
| 4-Chloroaniline | <351 | | µg/kg |
| 4-Chlorophenyl Phenyl Ether | <351 | | µg/kg |
| 4-Methylphenol | <351 | | µg/kg |
| 4-Nitroaniline | <884 | | µg/kg |
| 4-Nitrophenol | <884 | | µg/kg |
| Acenaphthene | <351 | | µg/kg |
| Acenaphthylene | <351 | | µg/kg |
| Anthracene | <351 | | µg/kg |
| Benzo(A)Anthracene | <351 | | µg/kg |
| Benzo(A)Pyrene | <351 | | µg/kg |
| Benzo(B)Fluoranthene | <351 | | µg/kg |
| Benzo(G,H,I)Perylene | <351 | | µg/kg |
| Benzo(K)Fluoranthene | <351 | | µg/kg |
| Butylbenzylphthalate | <351 | | µg/kg |
| Bis(2-Chloroethoxy) Methane | <351 | | µg/kg |
| Bis(2-Chloroethyl) Ether | <351 | | µg/kg |
| Bis(2-Ethylhexyl) Phthalate | <351 | | µg/kg |
| Caprolactam | <351 | | µg/kg |
| Carbazole | <351 | | µg/kg |
| Chrysene | <351 | | µg/kg |
| Dibenz(A,H)Anthracene | <351 | | µg/kg |
| Dibenzofuran | <351 | | µg/kg |
| Diethyl Phthalate | 323 | J | µg/kg |
| Dimethyl Phthalate | <351 | | µg/kg |
| Di-N-Butyl Phthalate | <351 | | µg/kg |
| Di-N-Octylphthalate | <351 | | µg/kg |
| Fluoranthene | <351 | | µg/kg |
| Fluorene | <351 | | µg/kg |
| Hexachlorobenzene | <351 | | µg/kg |

**TABLE 4**

J flagged results are estimated values.

C7TP-1 Soil Sample - Analytical Results
*Velsicol Chemical Site–2004 Test Pits Memorandum*

Date/Time Sampled: 9/17/2004 11:30
Sample ID: 04CB12-40

***SVOCs - Analytical Method SW8270C (cont'd)***

| Compound | Result | Units |
|---|---|---|
| Hexachlorobutadiene | <351 | µg/kg |
| Hexachlorocyclopentadiene | <351 | µg/kg |
| Hexachloroethane | <351 | µg/kg |
| Indeno(1,2,3-C,D)Pyrene | <351 | µg/kg |
| Isophorone | <351 | µg/kg |
| Naphthalene | <351 | µg/kg |
| Nitrobenzene | <351 | µg/kg |
| N-Nitroso-di-N-Propylamine | <351 | µg/kg |
| N-Nitrosodiphenylamine | <351 | µg/kg |
| Pentachlorophenol | <884 | µg/kg |
| Phenanthrene | <351 | µg/kg |
| Phenol | <351 | µg/kg |
| Pyrene | <351 | µg/kg |

***Pesticides - Analytical Method SW8081***

| Compound | Result | Units |
|---|---|---|
| 4,4-DDD | <21 | µg/kg |
| 4,4-DDE | <21 | µg/kg |
| 4,4-DDT | <21 | µg/kg |
| 2,4-DDD | <21 | µg/kg |
| 2,4-DDE | <21 | µg/kg |
| 2,4-DDT | <21 | µg/kg |

***Total Metals - Analytical Method SW6010B***

| Compound | Result | | Units |
|---|---|---|---|
| Aluminum | 2,730 | | mg/kg |
| Antimony | <2.21 | | mg/kg |
| Arsenic | 10.7 | | mg/kg |
| Barium | 16.9 | | mg/kg |
| Beryllium | 0.339 | J | mg/kg |
| Cadmium | <0.248 | | mg/kg |
| Calcium | 87,900 | | mg/kg |
| Chromium | 7.48 | | mg/kg |
| Cobalt | 3.46 | | mg/kg |
| Copper | 6.78 | | mg/kg |
| Iron | 7,470 | | mg/kg |
| Lead | <1.48 | | mg/kg |
| Magnesium | 23,900 | | mg/kg |
| Manganese | 167 | | mg/kg |
| Nickel | 8.77 | | mg/kg |
| Potassium | 567 | | mg/kg |
| Selenium | <2.01 | | mg/kg |
| Silver | <0.189 | | mg/kg |
| Sodium | 658 | | mg/kg |
| Thallium | <2.01 | | mg/kg |
| Vanadium | 11.5 | | mg/kg |
| Zinc | 11.5 | J | mg/kg |

***Specialty Compounds***

| Compound | Result | | Units | Analytical Method |
|---|---|---|---|---|
| Mercury | 0.00191 | J | mg/kg | SW7471A |

J flagged results are estimated values.

**TABLE 5**
C7TP-4 Soil Sample - Analytical Results
*Velsicol Chemical Site–2004 Test Pits Memorandum*

Date/Time Sampled: 9/16/2004 15:45
Sample ID: 04CB12-41

***VOCs - Analytical Method SW8260B***

| Compound | Result | Units |
|---|---|---|
| 1,1,1-Trichloroethane | <14.8 | µg/kg |
| 1,1,2,2-Tetrachloroethane | <14.8 | µg/kg |
| 1,1,2-Trichloroethane | <14.8 | µg/kg |
| 1,1-Dichloroethane | <14.8 | µg/kg |
| 1,1-Dichloroethene | <14.8 | µg/kg |
| 1,2-Dibromo-3-chloropropane | <7.4 | µg/kg |
| 1,2-Dichloroethane | <14.8 | µg/kg |
| 1,2-Dichloroethene, Total | <14.8 | µg/kg |
| 1,2-Dichloropropane | <14.8 | µg/kg |
| 1-Chlorohexane | <3 | µg/kg |
| 2-Butanone | <14.8 | µg/kg |
| 2-Hexanone | <14.8 | µg/kg |
| 4-Methyl-2-Pentanone | <14.8 | µg/kg |
| Acetone | <14.8 | µg/kg |
| Benzene | <14.8 | µg/kg |
| Bromodichloromethane | <14.8 | µg/kg |
| Bromoform | <14.8 | µg/kg |
| Bromomethane | <14.8 | µg/kg |
| Carbon Disulfide | <14.8 | µg/kg |
| Carbon Tetrachloride | <14.8 | µg/kg |
| Chlorobenzene | <14.8 | µg/kg |
| Chloroethane | <14.8 | µg/kg |
| Chloroform | <14.8 | µg/kg |
| Chloromethane | <14.8 | µg/kg |
| cis-1,3-Dichloropropene | <14.8 | µg/kg |
| Dibromochloromethane | <14.8 | µg/kg |
| Ethylbenzene | <14.8 | µg/kg |
| Methylene Chloride | <14.8 | µg/kg |
| Styrene | <14.8 | µg/kg |
| Tetrachloroethene | <14.8 | µg/kg |
| Toluene | <14.8 | µg/kg |
| trans-1,3-Dichloropropene | <14.8 | µg/kg |
| Trichloroethene | <14.8 | µg/kg |
| Vinyl Chloride | <14.8 | µg/kg |
| Xylenes, Total | <14.8 | µg/kg |

***SVOCs - Analytical Method SW8270C***

| Compound | Result | Units |
|---|---|---|
| 2,2-Oxybis(1-chloropropane) | <363 | µg/kg |
| 2,4,5-Trichlorophenol | <914 | µg/kg |
| 2,4,6-Trichlorophenol | <363 | µg/kg |
| 2,4-Dichlorophenol | <363 | µg/kg |
| 2,4-Dimethylphenol | <363 | µg/kg |

***SVOCs - Analytical Method SW8270C (cont'd)***

| Compound | Result | | Units |
|---|---|---|---|
| 2,4-Dinitrophenol | <914 | | µg/kg |
| 2,4-Dinitrotoluene | <363 | | µg/kg |
| 2,6-Dinitrotoluene | <363 | | µg/kg |
| 2-Chloronaphthalene | <363 | | µg/kg |
| 2-Chlorophenol | <363 | | µg/kg |
| 2-Methylnaphthalene | <363 | | µg/kg |
| 2-Methylphenol (O-Cresol) | <363 | | µg/kg |
| 2-Nitroaniline | <914 | | µg/kg |
| 2-Nitrophenol | <363 | | µg/kg |
| 3,3'-Dichlorobenzidine | <363 | | µg/kg |
| 3-Nitroaniline | <914 | | µg/kg |
| 2-Methyl-4,6-dinitrophenol | <914 | | µg/kg |
| 4-Bromophenyl Phenyl Ether | <363 | | µg/kg |
| 4-Chloro-3-Methylphenol | <363 | | µg/kg |
| 4-Chloroaniline | <363 | | µg/kg |
| 4-Chlorophenyl Phenyl Ether | <363 | | µg/kg |
| 4-Methylphenol | <363 | | µg/kg |
| 4-Nitroaniline | <914 | | µg/kg |
| 4-Nitrophenol | <914 | | µg/kg |
| Acenaphthene | <363 | | µg/kg |
| Acenaphthylene | <363 | | µg/kg |
| Anthracene | <363 | | µg/kg |
| Benzo(A)Anthracene | <363 | | µg/kg |
| Benzo(A)Pyrene | <363 | | µg/kg |
| Benzo(B)Fluoranthene | <363 | | µg/kg |
| Benzo(G,H,I)Perylene | <363 | | µg/kg |
| Benzo(K)Fluoranthene | <363 | | µg/kg |
| Butylbenzylphthalate | <363 | | µg/kg |
| Bis(2-Chloroethoxy) Methane | <363 | | µg/kg |
| Bis(2-Chloroethyl) Ether | <363 | | µg/kg |
| Bis(2-Ethylhexyl) Phthalate | <363 | | µg/kg |
| Caprolactam | <363 | | µg/kg |
| Carbazole | <363 | | µg/kg |
| Chrysene | <363 | | µg/kg |
| Dibenz(A,H)Anthracene | <363 | | µg/kg |
| Dibenzofuran | <363 | | µg/kg |
| Diethyl Phthalate | 261 | J | µg/kg |
| Dimethyl Phthalate | <363 | | µg/kg |
| Di-N-Butyl Phthalate | <363 | | µg/kg |
| Di-N-Octylphthalate | <363 | | µg/kg |
| Fluoranthene | <363 | | µg/kg |
| Fluorene | <363 | | µg/kg |
| Hexachlorobenzene | <363 | | µg/kg |

**TABLE 5**

J flagged results are estimated.

C7TP-4 Soil Sample - Analytical Results
*Velsicol Chemical Site–2004 Test Pits Memorandum*

Date/Time Sampled: 9/16/2004 15:45
Sample ID: 04CB12-41

***SVOCs - Analytical Method SW8270C (cont'd)***

| Compound | Result | Units |
|---|---|---|
| Hexachlorobutadiene | <363 | µg/kg |
| Hexachlorocyclopentadiene | <363 | µg/kg |
| Hexachloroethane | <363 | µg/kg |
| Indeno(1,2,3-C,D)Pyrene | <363 | µg/kg |
| Isophorone | <363 | µg/kg |
| Naphthalene | <363 | µg/kg |
| Nitrobenzene | <363 | µg/kg |
| N-Nitroso-di-N-Propylamine | <363 | µg/kg |
| N-Nitrosodiphenylamine | <363 | µg/kg |
| Pentachlorophenol | <914 | µg/kg |
| Phenanthrene | <363 | µg/kg |
| Phenol | <363 | µg/kg |
| Pyrene | <363 | µg/kg |

***Pesticides - Analytical Method SW8081***

| Compound | Result | Units |
|---|---|---|
| 4,4-DDD | <22 | µg/kg |
| 4,4-DDE | <22 | µg/kg |
| 4,4-DDT | <22 | µg/kg |
| 2,4-DDD | <22 | µg/kg |
| 2,4-DDE | <22 | µg/kg |
| 2,4-DDT | <22 | µg/kg |

***Total Metals - Analytical Method SW6010B***

| Compound | Result | | Units |
|---|---|---|---|
| Aluminum | 3,620 | | mg/kg |
| Antimony | <2.4 | | mg/kg |
| Arsenic | 15.3 | | mg/kg |
| Barium | 33.9 | | mg/kg |
| Beryllium | 0.449 | J | mg/kg |
| Cadmium | <0.269 | | mg/kg |
| Calcium | 94,800 | | mg/kg |
| Chromium | 8.32 | | mg/kg |
| Cobalt | 4.17 | | mg/kg |
| Copper | 6.81 | | mg/kg |
| Iron | 11,000 | | mg/kg |
| Lead | 3.54 | J | mg/kg |
| Magnesium | 25,200 | | mg/kg |
| Manganese | 205 | | mg/kg |
| Nickel | 11.2 | | mg/kg |
| Potassium | 789 | | mg/kg |
| Selenium | <2.18 | | mg/kg |
| Silver | <0.204 | | mg/kg |
| Sodium | 430 | | mg/kg |
| Thallium | <2.18 | | mg/kg |
| Vanadium | 12.5 | | mg/kg |
| Zinc | 17 | J | mg/kg |

***Specialty Compounds***

| Compound | Result | | Units | Analytical Method |
|---|---|---|---|---|
| Mercury | 0.00565 | J | mg/kg | SW7471A |

J flagged results are estimated.

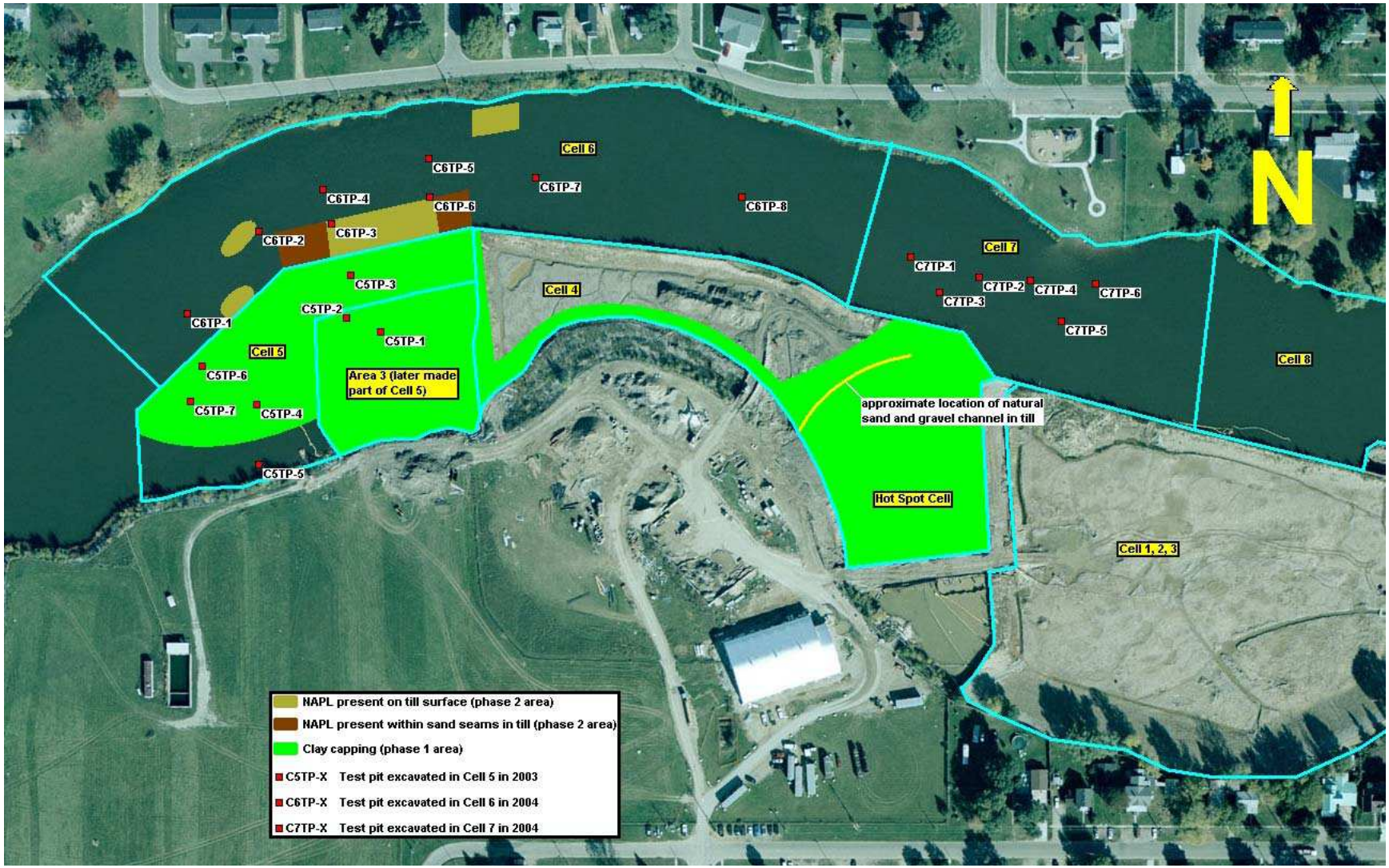



**Figure 1. Location of Test Pits in OU2 Remedial Area** **Scale: 1″=240′**
**Velsicol Chemical/Pine River Site in St. Louis, Michigan**
**2004 Test Pits Memorandum** **Aerial photo dated October 14, 2002**