## Appendix B

# Boring Logs and Well Completion Diagrams

# Boring Logs

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** MW16-D2a
**Sheet:** 1 of 2

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 727.66 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 95, 4.25 HSA and 5ft CME sampler
**START:** 08 January 2004 **FINISH:** 29 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| 5 | | | | | | Blind drill to 12' bgs with till confirmation. See MW 16-I for complete description of deposits. |
| 10 | | | | | | |
| 15 | 12.0<br>15.0 | CT-1 | 31.2 / 36 | | SILT (ML), orange (oxidized), moist, stiff-hard, Sand in partings, some Clay, trace subangular Gravel. (TILL) | Install 20-inch steel isolation casting to 12 feet bgs. |
| | 15.0<br>17.0 | CT-2 | 20.4 / 24 | | As above, gray. | BZ=0ppm HS=0 ppm |
| 20 | 17.0<br>20.0 | CT-3 | 33.6 / 36 | | 4.6-inch gray, wet, loose, medium sand with gravel seam at 16.3' bgs<br>SILT (ML), gray, moist, stiff-hard, Sand in partings, some Clay, trace Gravel. (TILL) | BZ=0ppm HS=0 ppm |
| | 20.0<br>25.0 | CT-4 | 52.8 / 60 | | As above. | BZ=0ppm HS=0 ppm |
| 25 | 25.0<br>30.0 | CT-5 | 60 / 60 | | SILT (ML), gray, moist to dry, hard to very hard. Some Sand and Clay, trace fine to coarse subangular Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| 30 | 30.0<br>35.0 | CT-6 | 43.2 / 60 | | As above. | BZ=0 ppm, HS=0 ppm |
| | | | | | SILTY SAND (SM), Very, very fine, moist, loose, slightly cohesive | HS=0 ppm |
| 35 | 35.0<br>38.0 | CT-7 | 36 / 36 | | SILT (ML), Gray, moist to dry, very hard, some sand, little clay, approximately 10-% gravel subangular, fine to coarse (till). | BZ=0 ppm, HS=0 ppm |
| 40 | 39.0<br>44.0 | CT-8 | 57.6 / 60 | | SILT (ML), grayish brown, moist, hard, Clayey with Sand in partings and trace subangular Gravel. (TILL) | Install 14-inch steel isolation casing to 38 feet bgs.<br>BZ=0 ppm, HS=4.0 ppm |
| 45 | 44.0<br>49.0 | CT-9 | 60 / 60 | | As above. | BZ=0 ppm, HS=0 ppm |
| 50 | | | | | 6-inch, wet, medium to fine, sand seam at 48.0'.<br>As above | |

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| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW16-D2a<br>Sheet: 2 of 2 |
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# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 727.66 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95, 4.25 HSA and 5ft CME sampler

**START:** 08 January 2004 **FINISH:** 29 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | 49.0<br>54.0 | CT-10 | 57.6 / 60 | | As above. | |
| | | | | | As above. | BZ=0 ppm, HS=0 ppm |
| 55 | 54.0<br>56.0 | CT-11 | 24 / 24 | | As above. | |
| | 56.0<br>60.0 | CT-12 | 0 / 60 | | | Large cobble in lodged in sampler cause of poor recovery. |
| 60 | 60.0<br>62.0 | CT-13 | 24 / 24 | | As above. | BZ=0 ppm, HS=0 ppm |
| | 62.0<br>64.0 | CT-14 | 24 / 24 | | As above. | BZ=0 ppm, HS=0 ppm |
| 65 | 64.0<br>69.0 | CT-15 | 22.8 / 60 | | | Cobble lodged in sampler cause of poor recovery |
| | | | | | SILT (ML), Brownish gray, moist, very stiff, with very fine Sand, some fine to coarse Gravel (TILL) | BZ=0 ppm, HS=0 ppm |
| 70 | 69.0<br>74.0 | CT-16 | 54 / 60 | | As above, more sand | BZ=0 ppm, HS=0 ppm |
| 75 | 74.0<br>76.0 | SPT-1 | 24 / 24 | 22-27-29-33 | As above | Switch to split spoon sampler because driller is concerned about sand lock |
| | 76.0<br>78.0 | SPT-2 | 24 / 24 | 20-21-29-29 | SILTY SAND (SM), Brown gray, moist, dense, fine to mediuam sand, some gravel. | BZ=0 ppm, HS=0 ppm |
| | 78.0<br>80.0 | SPT-3 | 24 / 24 | 20-20-29-40 | SAND (SP), Brownish yellow, saturated dense, fine to medium sand.. | BZ=0 ppm, HS=0 ppm |
| 80 | 80.0<br>82.0 | SPT-4 | 24 / 24 | 29-29-38-61 | 4-inch silty sand brownish gray, moist, dense, fine to medium sand at 77.6' bgs | BZ=0 ppm, HS=0 ppm |
| | 82.0<br>84.0 | SPT-5 | 18 / 24 | 41-49-57-68 | As above. | BZ=0 ppm, HS=0 ppm |
| | | | | | As above, some fine angular gravel. | |
| 85 | 84.0<br>86.0 | SPT-6 | 18 / 24 | 10-27-31-36 | SAND (SW), Brownish yellow, saturated, dense, medium to coarse Sand, angular to subangular, trace fine Gravel. | BZ=0 ppm, HS=0 ppm |
| | 86.0<br>88.0 | SPT-7 | 16 / 24 | 22-29-37-60 | | BZ=0 ppm, HS=0 ppm |
| | 88.0<br>90.0 | SPT-8 | 17 / 24 | 40-55-61-70 | | Collect soil sample for grain size analysis 86-91' bgs |
| 90 | 90.0<br>91.0 | SPT-9 | 12 / 12 | 32-47 | | |
| | | | | | End of Boring | End boring at 91' bgs |
| 95 | | | | | | |
| 100 | | | | | | |

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| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW16-I<br>Sheet: 1 of 1 |
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# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 727.99 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 03 Nov 04 **FINISH:** 19 Nov 04 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 2.0<br>4.0 | SPT-1 | 12 / 24 | 4-5-7-8 | SAND (SP),moist, brown to yellow brown, medium dense, fine Sand. | Begin sampling with split spoon sampler at 2' bgs |
| 5 | 4.0<br>6.0 | SPT-2 | 24 / 24 | 5-5-5-9 | CLAY (CL), silty, moist, brown to reddish brown, stiff, low plasticity | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-3 | 24 / 24 | 6-9-17-18 | (CAP) | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-4 | 24 / 24 | 9-15-18-18 | As above,gray, hard, more silt | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0<br>15.0 | CT-1 | 46.8 / 60 | | SILT (ML), gray with iron staining, moist-dry, hard, some Sand and Clay, trace Gravel. (TILL) | Install 10-inch isolation casing at 10 feet bgs. End split spoon sampling begin sampling with CME sampler |
| 15 | 15.0<br>17.0 | CT-2 | 22.8 / 24 | | As above.<br>1-inch coarse sand seam @ 15.3, yellowish brown, wet, coarse | BZ=0 ppm, HS=0 ppm |
| | 17.0<br>20.0 | CT-3 | 36 / 36 | | SILT (ML), gray, moist to dry, hard, Clayey, some Sand, trace Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| 20 | 20.0<br>22.5 | CT-4 | 24 / 30 | | | BZ=0 ppm, HS=0 ppm |
| | 22.5<br>25.0 | CT-5 | 33.6 / 36 | | SILT (ML), gray, moist, hard, Clayey and trace subangular Gravel. (TILL). | BZ=0 ppm, HS=0 ppm |
| 25 | 25.0<br>27.0 | CT-6 | 24 / 24 | | SILT (ML), Gray, moist, soft, approximately 40% very fine sand. | BZ=0 ppm, HS=0 ppm |
| | 27.0<br>30.0 | CT-7 | 36 / 36 | | SILT (ML), gray, moist to dry, hard to very hard. Some Sand and Clay, trace fine to coarse subangular Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| 30 | 30.0<br>33.5 | CT-8 | 36.5 / 36.5 | | 1-inch wet, subround to round, coarse gravel at 26.8' bgs. | BZ=0 ppm, HS=0 ppm |
| | 33.5<br>35.0 | CT-9 | 18 / 18 | | SILT (ML), gray, moist to dry, hard to very hard. Some Sand and Clay, trace fine to coarse subangular Gravel. (TILL) | Collect soil sample for grain size analysis 33.75-34.75' bgs |
| 35 | | | | | SILTY SAND (SM), Gray, moist to wet, 1.0', fine to very fine Sand at 33.75' bgs | End boring at 35' bgs |
| | | | | | SILT (ML), gray, moist to dry, hard to very hard. Some Sand and Clay, trace fine to coarse subangular Gravel. (TILL) | |
| 40 | | | | | End of Boring | |
| 45 | | | | | | |
| 50 | | | | | | |

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| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW16-I<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 727.99 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 03 November 2004 **FINISH:** 19 November 2004 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 2.0<br>4.0 | SPT-1 | 12 / 24 | 4-5-7-8 | SAND (SP),moist, brown to yellow brown, medium dense, fine Sand. | Begin sampling with split spoon sampler at 2' bgs |
| 5 | 4.0<br>6.0 | SPT-2 | 24 / 24 | 5-5-5-9 | CLAY (CL), silty, moist, brown to reddish brown, stiff, low plasticity | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-3 | 24 / 24 | 6-9-17-18 | (CAP) | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-4 | 24 / 24 | 9-15-18-18 | As above,gray, hard, more silt | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0<br>15.0 | CT-1 | 46.8 / 60 | N/A | SILT (ML), gray with iron staining, moist-dry, hard, some Sand and Clay, trace Gravel. (TILL) | Install 10-inch isolation casing at 10 feet bgs. End split spoon sampling begin sampling with CME sampler |
| 15 | 15.0<br>17.0 | CT-2 | 22.8 / 24 | N/A | As above.<br>1-inch coarse sand seam at 15.3, yellowish brown, wet, coarse | BZ=0 ppm, HS=0 ppm |
| | 17.0<br>20.0 | CT-3 | 36 / 36 | N/A | SILT (ML), gray, moist to dry, hard, Clayey, some Sand, trace Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| 20 | 20.0<br>22.5 | CT-4 | 24 / 30 | N/A | | BZ=0 ppm, HS=0 ppm |
| | 22.5<br>25.0 | CT-5 | 33.6 / 36 | N/A | SILT (ML), gray, moist, hard, Clayey and trace subangular Gravel. (TILL). | BZ=0 ppm, HS=0 ppm |
| 25 | 25.0<br>27.0 | CT-6 | 24 / 24 | N/A | SILT (ML), Gray, moist, soft, approximately 40% very fine sand. | BZ=0 ppm, HS=0 ppm |
| | 27.0<br>30.0 | CT-7 | 36 / 36 | N/A | SILT (ML), gray, moist to dry, hard to very hard. Some Sand and Clay, trace fine to coarse subangular Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| 30 | 30.0<br>35.0 | CT-8 | 60 / 60 | N/A | 1-inch wet, subround to round, coarse gravel at 26.8' bgs.<br>SILT (ML), gray, moist to dry, hard to very hard. Some Sand and Clay, trace fine to coarse subangular Gravel. (TILL) | BZ=0 ppm, HS=0 ppm<br>Collect soil sample for grain size analysis 33.75-34.75' bgs |
| 35 | | | | | SILTY SAND (SM), Gray, moist to wet, 1.0', fine to very fine Sand at 33.75' bgs<br>SILT (ML), gray, moist to dry, hard to very hard. Some Sand and Clay, trace fine to coarse subangular Gravel. (TILL) | End boring at 35' bgs |
| 40 | | | | | End of Boring | |
| 45 | | | | | | |
| 50 | | | | | | |

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| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW17-D2<br>Sheet: 1 of 2 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 732.87 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25HSA; 2ft split spoon and 5ft CME samplers

**START:** 02 November 2004 **FINISH:** 19 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 2.0<br>4.0 | SPT-1 | 18 / 24 | 8-28-30-30 | CLAY (CL), gray, very stiff, compacted, Silty and Sandy with Gravel. (CAP) | Begin sampling with split spoon sampler at 2' bgs |
| 5 | 4.0<br>6.0 | SPT-2 | 24 / 24 | 4-7-9-10 | GRAVEL (GP), black, some Sand. | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-3 | 8 / 24 | 11-8-9-9 | As above, more sand | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-4 | 18 / 24 | 9-5-4-4 | SAND (SP), brown, loose, medium Sand | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0<br>12.0 | SPT-5 | 24 / 24 | 2-2-2-2 | As above, wet, with shell fragments<br>SILTY SAND (SM), brown, fine Sand. | BZ=0 ppm, HS=0 ppm |
| | 12.0<br>14.0 | SPT-6 | 24 / 24 | 2-2-6-8 | SAND (SP), brown, wet, loose, coarse Sand, with shell fragments. | BZ=0 ppm, HS=0 ppm |
| 15 | 14.0<br>16.0 | SPT-7 | 18 / 24 | 5-7-8-8 | SILTY SAND (SM), Brown, wet, fine. | BZ=0 ppm, HS=0 ppm |
| | 16.0<br>20.0 | CT-1 | 48 / 48 | | SAND (SP), Brown, wet, medium, with shell fragments.<br>As above with gravel.<br>SILT (ML) gray, stiff, Clayey, with trace Gravel | Install 20-inch steel isolation casing at 18 feet bgs. Begin sampling with CME sampler. |
| 20 | 20.0<br>25.0 | CT-2 | 14.4 / 60 | | SILT (ML), brownish-gray, moist, stiff, Clayey, with Sand, and trace, grave.l (TILL)<br>As above | Cobble wedged in sampler cause of poor recovery |
| 25 | 25.0<br>30.0 | CT-3 | 26.4 / 60 | | SILT (ML), gray, moist, hard to very hard, clayey, some sand in partings, trace fine subangular gravel. (TILL)<br>GRAVEL (GP) wet, with Sand and fines. | Per driller's notes, 27-30 sand and gravel, residue in sampler of sand and gravel. Collect groundwater grab MW-17D2-30. |
| 30 | 30.0<br>35.0 | CT-4 | 60 / 60 | | SILT (ML), brownish gray, moist to dry, hard, massive non- plastic, Clayey, Sandy, trace subangular Gravel (TILL) | Install 14-inch steel isolation casing at 30 feet bgs.<br>BZ=0 ppm, HS=0 ppm |
| 35 | 35.0<br>39.0 | CT-5 | 48 / 48 | | As above<br>As above, possible laminations | BZ=0 ppm, HS=0 ppm |
| 40 | 39.0<br>44.0 | CT-6 | 51.6 / 60 | | 1-inch gravel layer at 29.8' bgs.<br>As above.<br>As above. | BZ=0 ppm, HS=0 ppm |
| 45 | 44.0<br>49.0 | CT-7 | 60 / 60 | | As above.<br>As above. | BZ=0 ppm, HS=0 ppm<br>Per driller's notes, large cobble at 47 feet bgs. |
| 50 | | | | | | |

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| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW17-D2<br>Sheet: 2 of 2 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 732.87 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25HSA; 2ft split spoon and 5ft CME samplers

**START:** 02 November 2004 **FINISH:** 19 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | 49.0<br>54.0 | CT-8 | 60 / 60 | | As above. | BZ=0 ppm, HS=0 ppm |
| 55 | 54.0<br>59.0 | CT-9 | 60 / 60 | | As above, more sand | BZ=0 ppm, HS=0 ppm |
| 60 | 59.0<br>64.0 | CT-10 | 60 / 60 | | As above.<br>SILTY SAND (SM), grayish-brown, moist, medium dense, very very fine Sand.<br>SILT (ML), grayish-brown, moist, firm, laminated. | BZ=0 ppm, HS=0 ppm |
| 65 | 64.0<br>69.0 | CT-11 | 21.6 / 60 | | SAND (SP), yellowish-gray, brown, wet, loose, fine. | BZ=0 ppm, HS=0 ppm |
| 70 | 69.0<br>71.0 | SPT-8 | 22.8 / 24 | 12-12-16-20 | SAND (SP), grayish-yellow, moist, medium dense, fine Sand. | Switch to split spoon because of sand and poor recovery |
| | 71.0<br>73.0 | SPT-9 | 21.6 / 24 | 10-12-12-18 | As above. | BZ=0 ppm, HS=0 ppm |
| 75 | 73.0<br>75.0 | SPT-10 | 20.4 / 24 | 12-15-15-21 | SILT (ML), grayish-brown, stiff, Clayey, low plasticity, laminated | BZ=0 ppm, HS=0 ppm |
| | 75.0<br>80.0 | CT-12 | 60 / 60 | | SAND (SP),gray yellow, moist, medium dense, medium to fine Sand. | BZ=0 ppm, HS=0 ppm |
| 80 | | | | | | End boring at 80 feet bgs. |
| | | | | | End of Boring | |
| 85 | | | | | | |
| 90 | | | | | | |
| 95 | | | | | | |
| 100 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW21-I<br>Sheet: 1 of 1 |
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# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 730.74 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25HSA; 2ft split spoon and 5ft CME samplers

**START:** 01 November 2004 **FINISH:** 16 November 2004 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | | | | | | |
| | 3.0<br>5.0 | SPT-1 | 18 / 24 | 10-12-15-15 | SILTY SAND (SM) light brow, moist, loose, with pebbles. | Begin split spoon sampling at 3 feet bgs. |
| 5 | 5.0<br>7.0 | SPT-2 | 8 / 24 | 5-7-9-12 | As above, less silt. | BZ=0 ppm, HS=0 ppm |
| | 7.0<br>9.0 | SPT-3 | 18 / 24 | 4-4-4-4 | SANDY GRAVEL (GP), black, high sheen, crude oil odor. | BZ=0 ppm, HS=2 ppm |
| 10 | 9.0<br>11.0 | SPT-4 | 18 / 24 | 3-4-5-5 | As above. | BZ=0ppm, HS=20ppm |
| | 11.0<br>13.0 | SPT-5 | 15 / 24 | 12-15-30-30 | As above, wet. | BZ=0 ppm, HS=0 ppm |
| | 13.0<br>15.0 | SPT-6 | 3 / 24 | 5-6-7-7 | As above, saturated, with shell fragments. | BZ=0 ppm, HS=0 ppm |
| 15 | 15.0<br>17.0 | SPT-7 | 2 / 24 | 5-8-9-9 | CLAY (CL), gray, stiff, with Sand and Silt, trace subangular Gravel. | BZ=0 ppm, HS=0 ppm |
| | 17.0<br>19.0 | SPT-8 | 18 / 24 | 4-5-7-10 | As above, hard | BZ=0 ppm, HS=0 ppm |
| 20 | 19.0<br>21.0 | SPT-9 | 24 / 24 | 7-10-10-20 | As above | BZ=0 ppm, HS=0 ppm |
| | 21.0<br>23.0 | SPT-10 | 24 / 24 | 7-10-15-15 | As above | BZ=0 ppm, HS=0 ppm |
| | 23.0<br>25.0 | CT-1 | 21.6 / 24 | | CLAY (ML), gray, hard, with silt, trace gravel. | Install 10-inch steel isolation casing at 23 feet bgs. |
| 25 | | | | | | BZ=0 ppm, HS=0 ppm |
| | 25.0<br>29.5 | CT-2 | 38.4 / 30 | | As above.<br>SAND (SW), gray, wet, loose, medium Sand<br>CLAY (CL), gray, moist, hard, with Silt.<br>GRAVEL (GP), Gray, wet, with fines, fine to coarse, no odor. | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| 30 | | | | | CLAY (CL), gray, moist, hard with Silt and trace Gravel. | End Boring at 29.5 feet bgs |
| | | | | | End of Boring | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** MW22-I **Sheet:** 1 of 1

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 728.11 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers
**START:** 02 November 2004 **FINISH:** 16 November 2004 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | | | | | | |
| | 2.0<br>4.0 | SPT-1 | 24 / 24 | 6-7-9-10 | SAND (SW), brown, moist, coarse, with Gravel.<br>CLAY (CL), gray, hard, dry compacted, Sandy. (CAP) | Begin split spoon sampling at 2 feet bgs. |
| 5 | 4.0<br>6.0 | SPT-2 | 18 / 24 | 2-2-2-2 | SAND (SW), Brown, moist, medium to coarse Sand with Gravel. | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-3 | 24 / 24 | 2-2-2-2 | GRAVEL (GW), Brown, fine. | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-4 | 24 / 24 | 4-4-4-4 | SAND (SW), brown, wet, medium to coarse Sand with Gravel. | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0<br>12.0 | SPT-5 | 18 / 24 | 4-4-8-10 | As above. | BZ=0 ppm, HS=0 ppm |
| | 12.0<br>14.0 | SPT-6 | 20 / 24 | 4-4-6-10 | As above. | BZ=0 ppm, HS=0 ppm |
| 15 | 14.0<br>16.0 | SPT-7 | 12 / 24 | 7-12-13-20 | SILT (ML), gray, stiff, with clay and sand, trace subangular gravel. | BZ=0 ppm, HS=0 ppm |
| | 16.0<br>20.0 | CT-1 | 48 / 48 | | SILT (ML), Gray, moist to dry, low plasticity, with clay and sand trace subangular gravel. (TILL) | BZ=0 ppm, HS=0 ppm<br>Install 10-inch steel isolation casing at 18 feet bgs. Begin sampling with CME sampler. |
| 20 | 20.0<br>23.0 | CT-2 | 32.4 / 36 | | As above. | BZ=0 ppm, HS=0 ppm |
| | 23.0<br>26.0 | CT-3 | 36 / 36 | | GRAVEL (GM), gray, moist, fine to coarse, cemented with fines and sand.<br>SAND (SP) gray, wet, loose, fine to coarse Sand. | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| 25 | 26.0<br>28.5 | CT-4 | 0 / 30 | | SILT (ML), gray, moist to dry, hard, low plasticity, Clayey, some Gravel.<br>SAND (SP), gray to brown wet, loose, medium Sand. | Per driller's notes sand 26-28.5' bgs. Sampler wet and contained small amount of sand. Switch to split spoon because of poor recovery |
| | 28.5<br>30.5 | SPT-8 | 24 / 24 | 54-71-71-80 | CLAY WITH SILT (CL), Gray, dry, low plasticity, some gravel. | End boring at 30.5 feet bgs |
| 30 | | | | | End of Boring | |
| 35 | | | | | | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** MW23-I **Sheet:** 1 of 1

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 733.04 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 45 and 95 with 4.25 HSA with 2ft split spoon & 5ft CME samplers

**START:** 04 November 2004 **FINISH:** 23 November 2004 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 2.0<br>4.0 | SPT-1 | 24 / 24 | 7-7-8-9 | CLAY (CL), gray, dry, compacted hard, some sand, trace gravel. (CAP) | Begin split spoon sampling at 2 feet bgs. |
| 5 | 4.0<br>6.0 | SPT-2 | 24 / 24 | 10-9-7-7 | SAND (SP), brown to black with orange mottles, moist, medium to fine. | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-3 | 24 / 24 | 5-5-9-10 | SAND (SP), Yellowish-brown, moist, medium. | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-4 | 24 / 24 | 5-8-10-11 | As above. | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0<br>12.0 | SPT-5 | 24 / 24 | 5-5-5-10 | As above, wet, coarse. | BZ=0 ppm, HS=0 ppm |
| | 12.0<br>14.0 | SPT-6 | 6 / 24 | 4-4-4-10 | SILT (ML), gray, moist, stiff, massive, non-plastic | BZ=0 ppm, HS=0 ppm |
| 15 | 14.0<br>16.0 | SPT-7 | 14 / 24 | 4-6-10-10 | | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| | 16.0<br>20.0 | CT-1 | 32/ 48 | | As above. | |
| 20 | | | | | As above. | Install 10-inch steel isolation casing at 18 feet bgs. |
| | 20.0<br>24.0 | CT-2 | 48 / 48 | | SILT (ML), gray, moist, hard, massive, non-plastic with medium sand, trace fine to coarse gravel. (TILL) | Collect soil sample for chemical analysis (VMP-MW23I-22-24) |
| 25 | 24.0<br>27.0 | CT-4 | 32.4 / 36 | | SAND (SW), gray with oxidation stains, moist, loose, medium Sand with some Gravel. | |
| | 27.0<br>30.0 | CT-5 | 36 / 36 | | SILT (ML), gray, moist to dry, hard massive, non-plastic, slight hydrocarbon odor,some clay, trace angular gravel. (TILL) | |
| 30 | | | | | As above, sand in partings, no odor | |
| | 30.0<br>35 | CT-6 | 58.8 / 60 | | As above, no odor | |
| | | | | | As above, sandy, no odor | |
| 35 | | | | | As above, no odor, less sand. | |
| | 35.0<br>40.0 | CT-8 | 60 / 60 | | SILT (ML), gray, moist to wet, stiff, wth clay, laminated. | |
| 40 | | | | | 1-inch seam of wet medium sand at 40 feet bgs. | |
| | 40.0<br>45.0 | CT-10 | 54 / 60 | | SILT(ML) grayish brown stiff, with clay, varves. | Collect soil sample for grain size analysis (42-45 feet bgs.). Per driller's notes sand approximately 1.5 feet thick. |
| 45 | | | | | SILT(ML)gray with oxidation stains, with Clay and Gravel. (TILL) | |
| | | | | | SAND (SP), grayish-light brown, wet, coarse Sand, with fine to coarse subangular Gravel. | End boring at 44.7' bgs |
| 50 | | | | | SILT (ML), gray, moist, hard, with Clay and Sand, trace subangulare Gravel. (TILL) | |
| | | | | | End of Boring | |

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| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW27-I<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 735.64 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 03 November 2004 **FINISH:** 18 November 2004 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY) | COMMENTS (DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID) |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 2.0<br>4.0 | SPT-1 | 24 / 24 | | SILTY SAND (SM), brown, medium dense, fine Sand. | Begin split spoon sampling at 2 ft bgs. |
| 5 | 4.0<br>6.0 | SPT-2 | 24 / 24 | | CLAY (CL), brown, moist, stiff, Silty with some Sand. | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-3 | 24 / 24 | | As above. | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-4 | 24 / 24 | | SILT (ML), brown, stiff, Clayey with some Sand.<br>As above | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0<br>12.0 | SPT-5 | 24 / 24 | | SAND (SP), brown, medium dense, fine Sand. | BZ=0 ppm, HS=0 ppm |
| | 12.0<br>16.0 | CT-1 | 21.6 / 48 | | SILT (ML), brown, stiff, Clayey with Some sand<br>SILT (ML), grayish brown, moist, very stiff, trace Gravel, Sand partings. (TILL) | BZ=0 ppm, HS=0 ppm<br>Install 10-inch steel isolation casing at 14 feet bgs. |
| 15 | 16.0<br>20.0 | CT-2 | 45.6 / 48 | | As above<br>As above, less sand, more dry. | BZ=0 ppm, HS=0 ppm |
| 20 | 20.0<br>22.0 | CT-3 | 24 / 24 | | As above. | BZ=0 ppm, HS=0 ppm |
| | 22.0<br>25.0 | CT-4 | 34.8 / 36 | | As above.<br>As above, oxidation staining. | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| 25 | 25.0<br>27.5 | CT-5 | 26.4 / 30 | | SILTY SAND (SM) grayish-brown, moist, medium dense, very fine Sand. | BZ=0 ppm, HS=0 ppm |
| | 27.5.<br>30.0 | CT-6 | 30 / 30 | | SILT (ML), moist to dry, very stiff, Clayey, trace Gravel, fine to medium Sand in partings. | BZ=0 ppm, HS=0 ppm |
| 30 | 30.0<br>31.7 | CT-7 | 12 / 20.4 | | 3-inch layer wet coarse sand and gravel at 24.8<br>SILT (ML), moist, hard, Clayey, trace Gravel. (TILL) | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm<br>End boring 31.7 feet bgs |
| 35 | | | | | SILT (ML), gray, moist to dry, very stiff, Trace Gravel. (TILL)<br>SAND (SP), gray, wet, loose, fine to medium Sand. | |
| | | | | | SILT (ML), gray, moist, hard, Clayey. | |
| 40 | | | | | SAND (SP), gray, wet, loose fine to fine to medium Sand. | |
| | | | | | SILT (ML), gray, moist, hard, clayey. (TILL) | |
| 45 | | | | | End of Boring | |
| 50 | | | | | | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** MW30-I **Sheet:** 1 of 1

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 722.78 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 03 November 2004 **FINISH:** 20 November 2004 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 2.0 4.0 | SPT-1 | 24 / 24 | | SILT (ML), brown, medium soft, some clay. | Begin split spoon sampling at 2 feet bgs. |
| 5 | 4.0 6.0 | SPT-2 | 12 / 24 | 3-3-4-6 | SAND (SM), brown,moist, fine sand with fines. | BZ=0 ppm, HS=0 ppm |
| | 6.0 8.0 | SPT-3 | 12 / 24 | 2-2-2-2 | As above. | BZ=0 ppm, HS=0 ppm |
| | 8.0 10.0 | SPT-4 | 12 / 24 | 2-1-1-1 | As above, black with sheen, wet, strong grease trap type odor, odor and sheen 6.5-7.5 feet bgs.. | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0 12.0 | SPT-5 | 8 / 24 | 1-4-6-10 | SILT (ML), brown, moist, stiff. | BZ=0 ppm, HS=0 ppm |
| | 12.0 14.0 | SPT-6 | 12 / 24 | 12-15-18-20 | As above. | BZ=0 ppm, HS=0 ppm |
| 15 | 14.0 16.0 | SPT-7 | 18 / 24 | 10-12-18-18 | SILT (ML), gray, moist, stiff, Clayey with Sand and trace Gravel. | BZ=0 ppm, HS=0 ppm |
| | 18.0 21.0 | CT-1 | 60 / 60 | 8-14-19-20 | As above | Install 10-inch Isolation casing at 18 feet bgs |
| 20 | | | | | SILT (ML), gray, moist, very stiff, massive, non-plastic, Clayey with Sand and trace subangular to subround Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| | 21.0 25.0 | CT-2 | 45.6 / 48 | | As above, sand in partings, sand is fine to medium, approximately 5%, higher clay content. | |
| 25 | 25.0 28.0 | CT-3 | 34.8 / 36 | | As above | BZ=0 ppm, HS=0 ppm |
| | 28.0 30.0 | CT-4 | 24 /24 | | SAND (SP), brown, angular medium sand | |
| 30 | 30.0 32.0 | CT-5 | 12 / 24 | | As above, wet at 30' bgs | BZ=0 ppm, HS=0 ppm |
| | | | | | SILT (ML), gray, moist, hard, Clayey with sand and trace subangular Gravel. (TILL) | End boring at 32.2 feet bgs |
| 35 | | | | | End of Boring | |
| 40 | | | | | | |
| 45 | | | | | | |
| 50 | | | | | | |

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| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW31-Da<br>Sheet: 1 of 2 |
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# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.87 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 06 December 2004 **FINISH:** 30 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | | | | | | |
| 5 | | | | | | |
| 10 | | | | | | Blind drill to 12 feet bgs. Till confirmed. See MW31-I for complete description of deposits. |
| 15 | 12.0<br>16.0 | CT-1 | 46.8 / 48 | | SILT (ML), gray, moist, stiff, Clayey with Sand. (TILL) | Install 20-inch steel isolation casing at 12 feet bgs.<br>BZ=0 ppm, HS=0 ppm |
| | 16.0<br>18.0 | CT-2 | 15.6 / 24 | | SAND (SM), gray, moist to wet, loose, very fine sand with fines. | BZ=0 ppm, HS=0 ppm |
| 20 | 18.0<br>22.0 | CT-3 | 0 / 48 | | SILT (ML), gray, moist, very hard, Clayey, some Sand and trace subangular Gravel. (TILL) | Per driller's notes, very hard drilling, possible rock in shoe. |
| | 22.0<br>25.0 | CT-4 | 0 / 36 | | | |
| 25 | 25.0<br>27.0 | SPT-1 | 24 / 24 | 16-29-33-40 | SILT (ML) gray, moist, very hard, Clayey with Sand and trace subangular Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| | 27.0<br>30.0 | CT-5 | 0 / 36 | | | Driller believes that rock is being pushed down in advance of the auger causing continous poor recovery. |
| 30 | 30.0<br>35.0 | CT-6 | 12 / 60 | | | |
| 35 | 35.0<br>37.0 | CT-7 | 30 / 60 | | SILT(ML), gray, moist, very hard, Clayey, with Sand and trace subangular Gravel. (TILL). | BZ=0 ppm, HS=0 ppm<br>Pieces of boulder in tip of sampler 30-35, driller thinks he's finally broken up the obstruction. |
| | 37.0<br>39.0 | SPT- | 24 / 24 | | SILT (ML), gray, wet to moist, dense, with very fine Sand laminated. | BZ=0 ppm, HS=0 ppm |
| 40 | 39.0<br>41.0 | SPT- | 24 / 24 | | As above, sandy | BZ=0 ppm, HS=0 ppm |
| | 41.0<br>44.0 | CT-8 | 0 / 36 | | SILT (ML), gray moist to wet, firm, laminated, cohesive Clayey.<br>As above, drier. | Install 14-inch steel isolation casing at 41 feet bgs. |
| 45 | 44.0<br>49.0 | CT-9 | 14.4 / 60 | | CLAY (CL), grayish brown, moist, stiff, medium to high plasticity, Silty.<br>SAND (SP), brownish yellow, wet, loose. | BZ=0 ppm, HS=0 ppm |
| 50 | 49.0<br>51.0 | SPT-1 | 24 / 24 | | As above. | BZ=0 ppm, HS=0 ppm |

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| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW31-Da<br>Sheet: 2 of 2 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.87 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 06 December 2004 **FINISH:** 30 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 55 | 51.0<br>53.0 | SPT-2 | 21.6 / 24 | | GRAVEL (GM), Wet, loose, fine subangular Silty Gravel, with Sand. | BZ=0 ppm, HS=0 ppm |
| | 53.0<br>55.0 | SPT-3 | 15.6 / 24 | | As above, silty. | BZ=0 ppm, HS=0 ppm |
| | 55.0<br>57.0 | SPT-4 | 21.6 / 24 | | SILT (ML), gray, wet, soft,Clayey, approximately 40% fine subangular Gravel , medium plasticity, no odor. | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| | | | | | SAND (SP), yellow ish brown, moist, very dense, fine to medium sand. | End boring at 57 feet bgs |
| 60 | | | | | End of Boring | |
| 65 | | | | | | |
| 70 | | | | | | |
| 75 | | | | | | |
| 80 | | | | | | |
| 85 | | | | | | |
| 90 | | | | | | |
| 95 | | | | | | |
| 100 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW31-Da<br>Sheet: 1 of 2 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.87 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 06 December 2004 **FINISH:** 30 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| 5 | | | | | | |
| 10 | | | | | | Blind drill to 12 feet bgs. Till confirmed. See MW31-I for complete description of deposits. |
| 15 | 12.0<br>16.0 | CT-1 | 46.8 / 48 | N/A | SILT (ML), gray, moist, stiff, Clayey with Sand. (TILL) | Install 20-inch steel isolation casing at 12 feet bgs.<br>BZ=0 ppm, HS=0 ppm |
| | 16.0<br>18.0 | CT-2 | 15.6 / 24 | N/A | SAND (SM), gray, moist to wet, loose, very fine sand with fines. | BZ=0 ppm, HS=0 ppm |
| 20 | 18.0<br>22.0 | CT-3 | 0 / 48 | N/A | SILT (ML), gray, moist, very hard, Clayey, some Sand and trace subangular Gravel. (TILL) | Per driller's notes, very hard drilling, possible rock in shoe. |
| | 22.0<br>25.0 | CT-4 | 0 / 36 | N/A | | |
| 25 | 25.0<br>27.0 | SPT-1 | 24 / 24 | 16-29-33-40 | SILT (ML) gray, moist, very hard, Clayey with Sand and trace subangular Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| | 27.0<br>30.0 | CT-5 | 0 / 36 | N/A | | Driller believes that rock is being pushed down in advance of the auger causing continous poor recovery. |
| 30 | 30.0<br>35.0 | CT-6 | 12 / 60 | N/A | | |
| 35 | 35.0<br>37.0 | CT-7 | 30 / 60 | N/A | SILT(ML), gray, moist, very hard, Clayey, with Sand and trace subangular Gravel. (TILL). | BZ=0 ppm, HS=0 ppm<br>Pieces of boulder in tip of sampler 30-35, driller thinks he's finally broken up the obstruction. |
| | 37.0<br>39.0 | SPT-2 | 24 / 24 | 6-9-11-18 | SILT (ML), gray, wet to moist, dense, with very fine Sand laminated. | BZ=0 ppm, HS=0 ppm |
| 40 | 39.0<br>41.0 | SPT-3 | 24 / 24 | 9-12-19-19 | As above, sandy<br>SILT (ML), gray moist to wet, firm, laminated, cohesive Clayey. | BZ=0 ppm, HS=0 ppm |
| | 41.0<br>44.0 | CT-8 | 0 / 36 | N/A | As above, drier. | Install 14-inch steel isolation casing at 41 feet bgs. |
| 45 | 44.0<br>49.0 | CT-9 | 14.4 / 60 | N/A | CLAY (CL), grayish brown, moist, stiff, medium to high plasticity, Silty.<br>SAND (SP), brownish yellow, wet, loose. | BZ=0 ppm, HS=0 ppm |
| 50 | 49.0<br>51.0 | SPT-4 | 24 / 24 | 10-18-29-32 | As above. | BZ=0 ppm, HS=0 ppm |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW31-Da<br>Sheet: 2 of 2 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.87 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 06 December 2004 **FINISH:** 30 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | 51.0<br>53.0 | SPT-5 | 21.6 / 24 | 48-51-67-70 | GRAVEL (GM), Wet, loose, fine subangular Silty Gravel, with Sand. | BZ=0 ppm, HS=0 ppm |
| | 53.0<br>55.0 | SPT-6 | 15.6 / 24 | 10-14-20-21 | As above, silty. | BZ=0 ppm, HS=0 ppm |
| 55 | 55.0<br>57.0 | SPT-7 | 21.6 / 24 | 4-20-48-60 | SILT (ML), gray, wet, soft,Clayey, approximately 40% fine subangular Gravel , medium plasticity, no odor. | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| | | | | | SAND (SP), yellow ish brown, moist, very dense, fine to medium sand. | End boring at 57 feet bgs |
| 60 | | | | | End of Boring | |
| 65 | | | | | | |
| 70 | | | | | | |
| 75 | | | | | | |
| 80 | | | | | | |
| 85 | | | | | | |
| 90 | | | | | | |
| 95 | | | | | | |
| 100 | | | | | | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** MW31-I **Sheet:** 1 of 1

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 729.64 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers
**START:** 03 November 2004 **FINISH:** 17 November 2004 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 2.0<br>4.0 | SPT-1 | 24 / 24 | 4-5-6-7 | SAND (SW), brownish-gray, moist, loose, fine to medium sand. | Begin split spoon sampling at 2 feet bgs. |
| 5 | 4.0<br>6.0 | SPT-2 | 24 / 24 | 5-7-7-9 | As above. | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-3 | 12 /24 | 4-6-8-12 | SILT (ML), gray, moist, dense, cohesive, sand, trace gravel. | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-4 | 20 / 24 | 4-5-5-6 | As above. | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0<br>12.0 | SPT-5 | 24 / 24 | 5-7-7-9 | As above, stiff | BZ=0 ppm, HS=0 ppm |
| | 12.0<br>15.0 | CT-1 | 36 / 36 | | Silty (ML) gray, moist, massive, stiff, Clayey, some sand. | Install 10-inch steel isolation casing at 14 feet bgs. |
| 15 | | | | | As above. | BZ=0 ppm, HS=0 ppm |
| | 15.0<br>20.0 | CT-2 | 42 / 60 | | As above, wet 16.5-16.75 feet bgs. | BZ=0 ppm, HS=0 ppm |
| | | | | | SAND (SP), gray, wet, coarse with fines and fine Gravel. | BZ=0 ppm, HS=0 ppm |
| 20 | 20.0<br>22.0 | CT-3 | 24 / 24 | | SANDY SILT (SM), gray, moist, massive. | BZ=0 ppm, HS=0 ppm |
| | 22.0<br>25.0 | CT-4 | 36 / 36 | | SILT (ML), gray, moist, hard, Clayey, trace subangular gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| 25 | | | | | As above. | |
| | 25.0<br>27.0 | CT-5 | 24 / 24 | | As above. | BZ=0 ppm, HS=0 ppm |
| | 27.0<br>29.0 | CT-6 | 24 / 24 | | As above. | BZ=0 ppm, HS=0 ppm |
| | | | | | As above. | |
| 30 | 29.0<br>32.0 | CT-7 | 33.6 / 36 | | As above. | BZ=0 ppm, HS=0 ppm |
| | 32.0<br>34.0 | CT-8 | 24 / 24 | | As above. | BZ=0 ppm, HS=0 ppm |
| 35 | 34.0<br>37.0 | CT-9 | 36 / 36 | | SILT (ML), grayish-brown, moist, soft, sandy (fine), laminated. | BZ=0 ppm, HS=0 ppm |
| | 37.0<br>40.0 | CT-10 | 36 / 36 | | SILTY SAND (SM), gray, saturated very very fine sand with silt, gradational laminations | BZ=0 ppm, HS=0 ppm |
| 40 | | | | | SILT (ML), gray, moist, massive | |
| | 40.0<br>43.0 | CT-11 | 33.6 / 36 | | | BZ=0 ppm, HS=0 ppm |
| | 43.0<br>45.0 | CT-12 | 24 / 24 | | SILT (ML), grayish-brown, moist, hard, Clayey with trace subangular Gravel. (TILL) | End boring at 45.0 feet bgs |
| 45 | | | | | End of Boring | |
| 50 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW34-D<br>Sheet: 1 of 2 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.87 **DRILLING CONTRACTOR:** Matecto

**DRILLING METHOD AND EQUIPMENT:** CME 95 HSA with 5' CME continous sampler

**START:** 08 March 2005 **FINISH:** 15 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION<br>SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS<br>DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING<br>BZ=Breathing zone PID<br>HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| 5 | | | | | | Blind drill to 24 feet bgs. Till confirmation at 17 feet. See MW34-I for description of these deposits. |
| 10 | | | | | | |
| 15 | | | | | | |
| 20 | | | | | | Install 20-inch steel isolation casing at 19 feet bgs. |
| 25 | 24.0<br>29.0 | CT-1 | 51.6 / 60 | | SILT (ML) gray, moist, stiff, some Clay, trace subangular Gravel. (TILL)<br>As above, drier | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| 30 | 29.0<br>34.0 | CT-2 | 60 / 60 | | SAND (SP), brown, saturated, loose, medium Sand.<br>SILT (ML), brwon, moist, hard, some Sand, trace subangular Gravel. (TILL) | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| 35 | 34.0<br>37.0 | CT-3 | 36 / 36 | | SAND (SP), brown, wet, dense, fine Sand.<br>SILT (ML), brownish-gray, moist, hard, Clayey, some Sand, trace subangular Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| 40 | 39.0<br>44.0 | CT-4 | 43.2 / 48 | | SILT (ML), brownish-gray, moist, stiff, Clayey, some Sand in partings, trace subangular Gravel. (TILL)<br>As above. | Install 14-inch steel isolation casing at 37 feet bgs.<br>BZ=0 ppm, HS=0 ppm<br>Cobble in tip of sampler caused poor recovery. |
| 45 | 44.0<br>49.0 | CT-5 | 60 / 60 | | As above<br>As above. | BZ=0 ppm, HS=0 ppm |
| 50 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW34-D<br>Sheet: 2 of 2 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.87 **DRILLING CONTRACTOR:** Matecto

**DRILLING METHOD AND EQUIPMENT:** CME 95 HSA with 5' CME continous sampler

**START:** 08 March 2005 **FINISH:** 15 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | 49.0<br>54.0 | CT-6 | 60 / 60 | | As above.<br>As above, less sand. | BZ=0 ppm, HS=0 ppm |
| 55 | 54.0<br>59.0 | CT-7 | 57.6 / 60 | | As above.<br>As above.<br>As above. | BZ=0 ppm, HS=0 ppm |
| 60 | 59.0<br>64.0 | CT-8 | 60 / 60 | | As above.<br>As above<br>As above | BZ=0 ppm, HS=0 ppm |
| 65 | 64.0<br>69.0 | CT-9 | 33.6 / 60 | | Sand (SW) brown, saturated loose, medium angular Sand, some Gravel | BZ=0 ppm, HS=0 ppm |
| 70 | 69.0<br>71.0 | SPT-1 | 24 / 24 | | SILT (ML), brown, moist, firm, laminated, some Clay.<br>End of Boring | End boring at 71 feet bgs. |
| 75 | | | | | | |
| 80 | | | | | | |
| 85 | | | | | | |
| 90 | | | | | | |
| 95 | | | | | | |
| 100 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW34-I<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.86 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 45/95 HSA with 2' split spoon and 5' CME continous samplers

**START:** 5 November 2004 **FINISH:** 9 February 2005 **LOGGER:** J. Myers & J. Mallison

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 2.0<br>4.0 | SPT-1 | 24 / 24 | 11-4-4-7 | CLAY (CL) gray, dessicated, hard, Sandy. (CAP) | Begin split spoon sampling at 2 feet bgs. |
| 5 | 4.0<br>6.0 | SPT-2 | 12 / 24 | 5-5-5-5 | | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-4 | 24 / 24 | 5-7-7-10 | GRAVEL (GW) moist, gravel with glass, concrete,and wood fragemnts, hydrocarbon ordor | BZ=0 ppm, HS=40 ppm |
| | 8.0<br>10.0 | SPT-5 | 0 / 24 | 5-5-5-7-9 | Sand (SP), black, moist, medium dens, hydrocarbon odor, medium sand with fines. | Driller thinks aguger is pushing a rock which is causing poor recovery |
| 10 | 10.0<br>12.0 | SPT-6 | 8 / 24 | 7-7-7-7 | SILT (ML) gray, wet, medium soft, Clayey. | BZ=0 ppm, HS=0 ppm |
| | 12.0<br>14.0 | SPT-7 | 3 / 24 | 7-9-10-10 | As above, stiff | BZ=0 ppm, HS=0 ppm |
| 15 | 14.0<br>17.0 | CT-1 | 18 / 36 | | SILT (ML), gray, moist, stiff, some clay, trace subangular gravel. | Install 20-inch steel isolation casing at 16 feet bgs. |
| | 17.0<br>19.0 | CT-2 | 22.8 / 24 | | | |
| 20 | 19.0<br>21.0 | CT-3 | 24 / 24 | | | BZ=0 ppm, HS=0 ppm |
| | 21.0<br>24.0 | CT-4 | 36 / 36 | | | BZ=0 ppm, HS=0 ppm |
| 25 | 24.0<br>27.0 | CT-5 | 36 / 36 | | SILT (ML), brown, saturated, stiff, trace Sand and fine Gravel. | |
| | 27.0<br>29.0 | CT-6 | 24 / 24 | | SAND (SP), brown, saturated, loose, medium sand, trace Gravel, Silt, and Clay. | BZ=0 ppm, HS=0 ppm |
| 30 | 29.0<br>33.0 | CT-7 | 48 / 48 | | SILT (ML), brown, saturated, stiff, some fine Sand, some Clay, trace fine Gravel | Install 14-inch steel isolation casing at 28 feet. |
| | | | | | SAND(SP), brown, saturated, loose, medium Sand, trace Gravel, Clay, and Silt. | BZ=0 ppm, HS=0 ppm |
| 35 | 33.0<br>35.8 | CT-8 | 33.6/ 33.6 | | SILT(ML), gray, moist-wet, cohesive, some subangular Gravel. | BZ=0 ppm, HS=0 ppm<br>End boring 35.8 feet bgs |
| 40 | | | | | End of Boring | |
| 45 | | | | | | |
| 50 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: MW35-I<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 721.69 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 55 HSA with 2 ft split spoon and 5' CME continous samplers

**START:** 30 March 2005 **FINISH:** 04 April 2005 **LOGGER:** R. Schuth

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0.0<br>2.0 | SPT-1 | 21.6/24 | 1-1-2-2 | SILT (ML) reddish-brown, mottled | BZ=0 ppm, HS=0 ppm |
| | 2.0<br>4.0 | SPT-2 | 24 / 24 | 3-7-9-12 | SILT (ML) reddish-brown, mottled, medium soft, Clayey, some coarse Sand. | BZ=0 ppm, HS=0 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 24 / 24 | 3-6-7-7 | | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-4 | 21.6/24 | 3-12-18-21 | SILT (ML) Reddish-brown, moist, very stiff, trace subangular Gravel. | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-5 | 24 / 24 | 16-40-40-48 | As above, hard | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 24 / 24 | 16-29-33-46 | SILT (ML) gray, moist-dry, hard, some Sand, trace fine Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| | 12.0<br>14.0 | CT-1 | 19.2 / 36 | N / A | | Install 10-inch steel isolation casing at 12 feet bgs |
| 15 | 15.0<br>20.0 | CT-2 | 24 / 60 | N / A | SILT (ML), gray, moist-dry, hard, Clayey, some Sand, trace Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| 20 | | | | | As above. | BZ=0 ppm, HS=0 ppm |
| | 20.0<br>25.0 | CT-3 | 60 / 60 | N / A | As above | |
| 25 | | | | | SILT (ML), gray, medium soft, Sandy, some Clay, trace Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| | 25.0<br>28.0 | CT-4 | 31.2 / 36 | N / A | SAND (SP), gray, wet, loose, fine Sand. | BZ=0 ppm, HS=0 ppm |
| | | | | | SILT (ML), gray, medium soft, Sandy, some Clay, trace Gravel. (TILL) | End boring 28 feet bgs. |
| 30 | | | | | End of Boring | |
| 35 | | | | | | |
| 40 | | | | | | |
| 45 | | | | | | |
| 50 | | | | | | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBI-01 **Sheet:** 1 of 2

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 731.60 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 45' with 2' SS Sampler/CME 95 4 1/4 HSA - 5' Continuous Sampler

**START:** 04 November 2004 **FINISH:** 28 February 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 2.0 4.0 | SPT-1 | 24 / 24 | 10-12-13-15 | CLAY (CL),Gray, dessicated hard, some Silt and Sand. (CAP) | Begin split spoon sampling at 2 feet bgs. BZ=0 ppm, HS=0 ppm |
| 5 | 4.0 6.0 | SPT-2 | 24 / 24 | 8-10-11-12 | As above. | |
| | 6.0 8.0 | SPT-3 | 6 / 24 | 10-10-6-6 | SAND (SP), Black, dry to moist, peppery hydrocarbon odor, sheen. | BZ=0 ppm, HS=223 ppm Encounter pipe at 7 feet bgs, hole abandoned, and rig repostioned. |
| | 8.0 10.0 | SPT-4 | 24 / 24 | 4-4-5-6 | As above, no sheen, no odor. | |
| 10 | 12.0 14.0 | CT-1 | 22.8 / 48 | N/A | SILT (ML), Brown, soft, becoming dense, very stiff and grey with depth. (TILL) | BZ=0 ppm, HS=0 ppm |
| | | | | | SILT (ML), Gray, moist, hard, massive, non-plastic, Clayey, some Sand, trace angular Gravel. (TILL) | Install 20-inch steel isolation casing at 12 feet bgs. |
| 15 | 14.0 18.5 | CT-2 | 42 / 42 | N/A | As above | BZ=0 ppm, HS=0 ppm |
| | 17.5 20.0 | CT-3 | 30 / 30 | N/A | 2-inch layer loose, wet, medium sand at 16.5 feet bgs. | |
| 20 | 20.0 24 | CT-4 | 48 / 48 | N/A | 4-inch layer of moist, loose, silty sand at 17.5 feet bgs. As above | BZ=0 ppm, HS=0 ppm |
| | | | | | 2-inch layer wet, coarse sand and gravel at 22.7 feet bgs. | |
| 25 | 24.0 27.0 | CT-5 | 36 / 36 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| | 27.0 30.0 | CT-6 | 34 / 36 | N/A | As above. | |
| 30 | 30.0 34.0 | CT-7 | 48 / 48 | N/A | 2-inch wet, loose, fine sand at 29.5 feet bgs. As above, low plasticity. | BZ=0 ppm, HS=0 ppm |
| 35 | 34.0 39.0 | CT-8 | 60 / 60 | N/A | As above, stiff. | BZ=0 ppm, HS=0 ppm |
| 40 | 39.0 43.0 | CT-9 | 15.6 / 48 | N/A | Sand (SP), Brown, wet, loose, coarse subangular Sand and fine subangular Gravel. | Collect groundwater grab sample SBI-01-39 (39-43). Collect soil sample for grain size analysis (39-42). |
| | | | | | SILT (ML), Gray, moist, hard, massive, non-plastic, Clayey, some Sand, trace subangular fine Gravel. (TILL) | Install 14-inch steel isolation casing at 43 feet bgs. |
| 45 | 43.0 47.0 | CT-10 | 48 / 48 | N/A | SILT (ML), Brownish-gray, moist to dry, stiff, massive, non-plastic, some gravel, angular. (TILL) | BZ=0 ppm, HS=0 ppm |
| | 47.0 49.5 | CT-11 | 27.6 / 30 | N/A | As above, sand in partings. | |
| 50 | | | | | As above, fine wet sand in partings. | BZ=0 ppm, HS=0 ppm |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBI-01 **Sheet:** 2 of 2

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 731.60 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 45' with 2' SS Sampler/CME 95 4 1/4 HSA - 5' Continuous Sampler
**START:** 04 November 2004 **FINISH:** 28 February 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | 49.5<br>52.0 | CT-12 | 33.6 / 30 | N/A | As above, hard | |
| | 52.0<br>54.5 | CT-13 | 27.6 / 30 | N/A | SILTY SAND (SM), Gray, wet, medium density, very fine Sand with Silt, trace subangular Gravel. | |
| 55 | 54.5<br>59.5 | CT-14 | 55.2 / 60 | N/A | 4-inch layer gray, wet, loose, medium sand at 55 feet bgs. | BZ=0 ppm, HS=0 ppm |
| 60 | 59.5<br>63.5 | CT-15 | 56.3 / 60 | N/A | SILT (ML), Gray, moist, hard, massive, non-plastic, Clayey, some Sand, trace subangular fine Gravel. (TILL)<br>As above. | BZ=0 ppm, HS=0 ppm |
| 65 | 63.5<br>69.5 | CT-16 | 50 /54 | N/A | As above.<br>As above. | BZ=0 ppm, HS=0 ppm |
| 70 | 69.0<br>74.0 | CT-17 | 60 / 60 | N/A | As above.<br>CLAYEY SILT (ML), Gray-brown, moist, stiff, Clayey, with laminations. | BZ=0 ppm, HS=0 ppm |
| 75 | 74.0<br>79.0 | CT-18 | 60 / 60 | N/A | As above.<br>As above. | BZ=0 ppm, HS=0 ppm |
| 80 | 79.0<br>84.0 | CT-19 | 60 / 60 | N/A | As above. | BZ=0 ppm, HS=0 ppm<br>End boring at 84 feet bgs. |
| 85 | | | | | End of Boring | |
| 90 | | | | | | |
| 95 | | | | | | |
| 100 | | | | | | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBI-02 **Sheet:** 1 of 2

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 732.14 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 45' with 2' SPT Sampler/CME 95 4 1/4 HSA - 5' Continuous Sampler
**START:** 04 November 2004 **FINISH:** 03 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 2.0<br>4.0 | SPT-1 | 24 / 24 | 8-9-11-12 | CLAY (CL) Gray, dessicated, hard, Sandy. (CAP) | Begin split spoon sampling at 2 feet bgs.<br>BZ=0 ppm, HS=0 ppm |
| 5 | 4.0<br>6.0 | SPT-2 | 24 / 24 | 4-5-7-9 | SAND (SP), Brownish red to yellow, medium. | BZ=0 ppm, HS=5 ppm |
| | 6.0<br>8.0 | SPT-3 | 24 / 24 | 2-2-4-5 | SILTY SAND (SM), Black, moist, odor trace, gravel. | BZ=0 ppm, HS=4 ppm |
| | 8.0<br>10.0 | SPT-4 | 24 / 24 | 3-3-3-3 | As above, peppery NAPL smell and sheen. | BZ=0 ppm, HS=587 ppm |
| 10 | 10.0<br>12.0 | SPT-5 | 24 / 24 | 4-6-8-16 | SAND (SP), Light brown, meidum coarsing down to gravelly coarse Sand. | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| | 14.0<br>17.0 | CT-1 | 36 / 60 | N/A | SILT (ML), Brown, wet, soft, low plasticity.<br>As above, gray, stiff, with some sand.<br>SILT (ML), Gray, moist, stiff, Clayey, Sand in partings, trace subangular Gravel. (TILL). | BZ=0 ppm, HS=0 ppm<br>Install 20-inch steel isolation casing at 14 feet bgs. |
| 15 | 17.0<br>19.0 | CT-2 | 24 / 24 | N/A | As above. | BZ=0 ppm, HS=0ppm |
| 20 | 19.0<br>22.0 | CT-3 | 36 / 36 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| | 22.0<br>25.0 | CT-4 | 34.8 / 36 | N/A | As above, drier, more sand. | |
| 25 | 25.0<br>29.0 | CT-5 | 60 / 60 | N/A | As above, more plastic. | BZ=0 ppm, HS=0 ppm |
| 30 | 30.0<br>34.0 | CT-6 | 48 / 48 | N/A | As above.<br>SILT (ML), Gray, moist, stiff, slight plasticity, Clayey, some Sand, trace angular Gravel. (TILL). | BZ=0 ppm, HS=0 ppm |
| 35 | 34.0<br>39.0 | CT-7 | 60 / 60 | N/A | As above.<br>As above, wet, 35- 36.5 feet bgs.<br>As above. | BZ=0 ppm, HS=0 ppm |
| 40 | 39.0<br>44.0 | CT-8 | 60 / 60 | N/A | As above.<br>As above, non-plastic.<br>As above, no gravel, possible lamination. | BZ=0 ppm, HS=0 ppm |
| 45 | 44.5<br>49.0 | CT-9 | 45.6 / 60 | N/A | 1-inch coarse sand, wet at 43.80 feet bgs<br>SAND (SP), Gray, wet, coarse, loose.<br>SILT (ML), Gray, moist, medium plastic, Clayey, some subangular Gravel and Sand. (TILL) | Collect soil sample for grain size analysis and groundwater grab sample 45-50 feet bgs. |
| 50 | 49.0<br>51.0 | CT-10 | 6 / 24 | N/A | GRAVEL (GP), Brown, wet, fine gravel. | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBI-02 **Sheet:** 2 of 2

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 732.14 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 45' with 2' SPT Sampler/CME 95 4 1/4 HSA - 5' Continuous Sampler

**START:** 04 November 2004 **FINISH:** 03 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | SAND (SP), Brown, wet, loose, medium sand. | |
| | 51.0<br>55.0 | CT-11 | 25.2 / 48 | N/A | SILT (ML), Gray, moist, hard, low plasticity, massive. (TILL)<br>As above, trace subangular gravel. | Install 14-inch steel isolation casing at 51 feet bgs. |
| 55 | 55.0<br>58.0 | CT-12 | 36 / 36 | N/A | SAND (SM), Brown/gray, wet, medium dense, silt matrix, fine sand.<br>SILT (ML), Gray, moist, hard, low plasticity, massive, some sand and gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| 60 | 58.0<br>62.0 | CT-13 | 46.8 / 48 | N/A | As above.<br>As above, sand in partings. | BZ=0 ppm, HS=0 ppm |
| 65 | 62.0<br>64.0 | CT-14 | 31.2 / 3 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| 70 | 67.0<br>72.0 | CT-15 | 32.4 / 60 | N/A | As above.<br>As above, more sand. | BZ=0 ppm, HS=0 ppm |
| 75 | 72.0<br>76.0 | CT-16 | 0 | N/A | BOULDER (GW) from 72-75 feet bgs. | Rotary drill 72-75 feet bgs. |
| | 76.0<br>78.0 | SPT-7 | 15.6 / 24 | 18-18-20-27 | SILT (ML), Gray brown, moist, stiff, Clayey, laminated. | BZ=0 ppm, HS=0 ppm |
| 80 | 78.0<br>80.0 | SPT-8 | 20.4 / 24 | 18-19-21-29 | As above.<br>End of Boring | End boring at 80 feet bgs. |
| 85 | | | | | | |
| 90 | | | | | | |
| 95 | | | | | | |
| 100 | | | | | | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBI-03 **Sheet:** 1 of 2

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 730.09 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 45' with 2' SS Sampler/CME 95 4 1/4 HSA - 5' Continuous Sampler

**START:** 04 November 2004 **FINISH:** 17 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY) | COMMENTS (DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID) |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | | | | | | |
| | 2.0<br>4.0 | SPT-1 | 24 / 24 | 4-7-10-11 | SILTY SAND (SM), Dark brown, wet, loose. | |
| 5 | 4.0<br>6.0 | SPT-2 | 24 / 24 | 4-9-10-10 | CLAY (CL), Gray, dessicated, hard, some gravel. (CAP) | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-3 | 24 / 24 | 5-8-7-9 | SILT (ML), Moist, soft, non-cohesive, Clayey with coarse gravel. | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-4 | 24 / 24 | 4-4-9-11 | SAND (SP), Black, moist, organic odor, no sheen, medium density, medium sand. | BZ=0 ppm, HS=2 ppm |
| 10 | 10.0<br>12.0 | SPT-5 | 24 / 24 | 4-4-17-20 | SILT (ML), Brown, moist, stiff, cohesive. | BZ=0 ppm, HS=0 ppm |
| | 14.0<br>17.0 | CT-1 | 32.4 /36 | N/A | SILT (ML), Gray with orange oxidation stains, very stiff, cohesive, massive, non-plastic,some Sand, trace subangular Gravel. (TILL). | |
| 15 | 17.0<br>19.0 | CT-2 | 24 / 24 | N/A | As above, gray, staining ends at 17.5 feet bgs. | BZ=0 ppm, HS=0 ppm |
| | 19.0<br>21.5 | CT-3 | 30 / 30 | N/A | As above. | |
| 20 | 21.5<br>24.0 | CT-4 | 30 / 30 | N/A | 4-inches wet, very fine silty sand at 21.2 feet bgs.<br>As above. | BZ=0 ppm, HS=0 ppm |
| | 24.0<br>27.0 | CT-5 | 36 / 36 | N/A | As above, drier, more sand.<br>As above. | |
| 25 | 27.0<br>29.5 | CT-6 | 30 / 30 | N/A | SILT (ML), Gray, moist to dry, hard, massive, non-plastice, Clayey some Sand, trace subangular Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| 30 | 29.5<br>33.0 | CT-7 | 42 /42 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| | 33.0<br>36.0 | CT-8 | 36 / 36 | N/A | SAND (SP), Gray, wet, loose, fine to medium. | BZ=0 ppm, HS=0 ppm<br>Collect groundwater grab sample SBI-03-33 (33-36 feet bgs). |
| 35 | 36.0<br>39.0 | CT-9 | 36 / 36 | N/A | SILT (ML), Gray, moist to dry, hard, massive, non-plastice, Clayey some Sand, trace subangular Gravel. (TILL) | Install 14-inch steel isolation casing at 36 feet bgs. |
| | 39.0<br>42.0 | CT-10 | 34.8 / 36 | N/A | As above.<br>As above. | BZ=0 ppm, HS=0 ppm |
| 40 | 42.0<br>45.0 | CT-11 | 34.8 /36 | N/A | As above. | |
| 45 | 45.0<br>48.0 | CT-12 | 36 / 36 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| | 48.0<br>50.0 | CT-13 | 24 /24 | N/A | As above.<br>As above. | BZ=0 ppm, HS=0 ppm |
| 50 | | | | | | |

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBI-03<br>Sheet: 2 of 2 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 730.09 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 45' with 2' SS Sampler/CME 95 4 1/4 HSA - 5' Continuous Sampler

**START:** 04 November 2004 **FINISH:** 17 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 55 | 50.0<br>55.0 | CT-14 | 58.0 / 60 | N/A | As above.<br>GRAVEL (GW), Wet, subangular to subrounded. | Collect groundwater grab sample (51.3-56.3 feet bgs). |
| | 55.0<br>60.0 | CT-15 | 60 / 60 | N/A | SILT (ML), Gray brown, moist, hard, approximately 25% angular gravel, Clayey, some Sand. (TILL)<br>4-inches loose, wet, medium sand at 55.5<br>As above, very stiff. | Install 8-inch steel isolation casing at 58 feet bgs. |
| 60 | 60.0<br>65.0 | CT-16 | 54 / 60 | N/A | | BZ=0 ppm, HS=0 ppm |
| 65 | 65.0<br>70.0 | CT-17 | 60 / 60 | N/A | As above.<br>As above. | BZ=0 ppm, HS=0 ppm |
| 70 | 70.0<br>75.0 | CT-18 | 51.6 / 60 | N/A | As above.<br>As above, stiff. | BZ=0 ppm, HS=0 ppm |
| 75 | 75.0<br>80.0 | CT-19 | 55.2 / 60 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| 80 | 80.0<br>85.0 | CT-20 | 60 / 60 | N/A | As above, stiff. | BZ=0 ppm, HS=0 ppm<br>End boring at 85 feet bgs. |
| 85 | | | | | End of Boring | |
| 90 | | | | | | |
| 95 | | | | | | |
| 100 | | | | | | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBI-04 **Sheet:** 1 of 2

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 730.71 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 45' with 2' SS Sampler/CME 95 4 1/4 HSA - 5' Continuous Sampler
**START:** 04 November 2004 **FINISH:** 16 February 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 2.0 4.0 | SPT-1 | 24 / 24 | 4-7-9-9 | CLAY (CL) Gray, dessicated, hard, some Sand. (CAP) | Begin split spoon sampling at 2 feet bgs. |
| 5 | 4.0 6.0 | SPT-2 | 18 / 24 | 4-5-9-10 | As above. | BZ=0 ppm, HS=0 ppm |
| | 6.0 8.0 | SPT-3 | 24 / 24 | 4-5-7-9 | SAND (SP), Brown, moist, loose, fine to medium Sand, some fines. | BZ=0 ppm, HS=0 ppm |
| | 8.0 10.0 | SPT-4 | 18 / 24 | 2-2-4-6 | SAND (SP), Black, some fines, "sticky", organic odor. | BZ=0 ppm, HS=4.5 ppm |
| 10 | 10.0 12.0 | SPT-5 | 24 / 24 | 1-1-12-17 | As above, gray, no odor | BZ=0 ppm, HS=0 ppm |
| | 12.0 14.0 | SPT-6 | 24 / 24 | 9-9-17-19 | SILT (ML), Brownish yellow, moist, stiff, Clayey. | BZ=0 ppm, HS=0 ppm |
| 15 | 14.0 16.0 | CT-1 | 24 / 24 | N/A | SILT (ML), Yellowish brown and gray, moist, some oxidation staining, hard,Clayey, some Sand, trace subangular Gravel. (TILL). | Install 20-inch steel isolation casing at 14 fee bgs. |
| | 16.0 18.0 | CT-2 | 60 / 60 | N/A | As above, less staining | BZ=0 ppm, HS=2 ppm |
| 20 | | | | | 4-inch layer of gray, wet, loose angular medium sand with styrene 17.3-17.6 feet bgs. | |
| | 21.0 26.0 | CT-4 | 60 / 60 | N/A | As above, no oxidation staining, hard | BZ=0 ppm, HS=0 ppm |
| 25 | | | | | SAND (SP), Yellowish gray, wet, loose, angled grains, medium Sand becoming fine with depth. | BZ=0 ppm, HS=0 ppm |
| | 26.0 29.0 | CT-6 | 36 / 36 | N/A | SILT (ML), Gray, some orange oxidation stains, moist, hard, low plasticity, massive, Clayey, some sand, trace subangular gravel. (TILL). | Collect groundwater grab sample SBI-04-24 (24-29 ft bgs) |
| 30 | 29.0 32.0 | CT-7 | 6 / 36 | N/A | As above, end oxidation stains | Install 14-inch steel isolation casing at 29 feet bgs. Large cobble lodged in sampler, cause of poor recovery. |
| | 32.0 35.0 | CT-8 | 30 / 36 | N/A | As above. | |
| 35 | 35.0 38.0 | CT-10 | 36 / 36 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| | 38.0 41.0 | CT-11 | 34.8 / 36 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| 40 | 41.0 44.0 | CT-12 | 22.8 / 36 | N/A | As above, more gravel | |
| 45 | 44.0 49.0 | CT-13 | 60 / 60 | N/A | As above. | BZ=0 ppm, HS=1 ppm |
| | | | | | As above. | |
| 50 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBI-04<br>Sheet: 2 of 2 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 730.71 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 45' with 2' SS Sampler/CME 95 4 1/4 HSA - 5' Continuous Sampler

**START:** 04 November 2004 **FINISH:** 16 February 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | 49.0<br>54.0 | CT-15 | 60 / 60 | N/A | As above.<br>SAND (SP), Dark brown, wet, loose, coarse, angular sand. | BZ=0 ppm, HS=0 ppm |
| 55 | 54.0<br>56.0 | CT-17 | 60 / 60 | N/A | SILT (ML), Gray, moist, hard, low plasticity, massive, Clayey, some sand, trace subangular gravel. (TILL).<br>3-inch layer gray, saturated, loose, clayey, fine sand at 52.8 | BZ=0 ppm, HS=0 ppm |
| 60 | 59.0<br>64.0 | CT-19 | 60 / 60 | N/A | As above. | |
| 65 | 64.0<br>68.0 | CT-21 | 48 / 48 | N/A | As above, very stiff. | BZ=0 ppm, HS=0 ppm |
| 70 | 68.0<br>71.5 | CT-22 | 42/ 42 | N/A | CLAYEY SAND (SC), Gray, wet, plastic, trace subangular Gravel.<br>SILT (ML), Gray, moist, trace Gravel, laminated. | End boring at 71.5 feet bgs. |
| 75 | | | | | End of Boring | |
| 80 | | | | | | |
| 85 | | | | | | |
| 90 | | | | | | |
| 95 | | | | | | |
| 100 | | | | | | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBI-06 **Sheet:** 1 of 2

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 734.85 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 45' with 2' SS Sampler/CME 95 4 1/4 HSA - 5' Continuous Sampler

**START:** 05 November 2004 **FINISH:** 05 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | | | | | | |
| | 2.0<br>4.0 | SPT-1 | 24 | 8-8-9-9 | | Begin split spoon sampling at 2 feet bgs. |
| | 4.0<br>6.0 | SPT-2 | 24 | 5-5-9-9 | CLAY (CL), Gray, dessicated, hard, some Sand. (CAP) | BZ=0 ppm, HS=0 ppm |
| 5 | 6.0<br>8.0 | SPT-3 | 0 / 24 | 4-3-3-4 | SAND (SP), Brown, moist, loose, medium sand. | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-4 | 24 / 24 | 1-1-3-6 | GRAVEL (GP), Wet, fine gravel, organic odor. | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0<br>12.0 | SPT-5 | 24 / 24 | 2-2-2-2 | SILT (ML), Dark brown, soft, low plasticity, Clayey. | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| | 12.0<br>14.0 | SPT-6 | 24 / 24 | 2-2-2-2 | GRAVEL (GP), Black, wet, coarse.<br>SAND (SP), Brown, wet, medium loose. | BZ=0 ppm, HS=0 ppm |
| 15 | 14.0<br>16.0 | SPT-7 | 24 / 24 | 4-4-9-10 | | BZ=0 ppm, HS=0 ppm |
| | 16.0<br>18.0 | SPT-8 | 24 / 24 | 8-12-29-27 | | BZ=0 ppm, HS=0 ppm |
| 20 | 20.0<br>25.0 | CT-1 | 60 / 60 | N/A | SILT (ML), Gray, moist, very stiff, some Gravel, some fine Sand. (TILL)<br>SILT (ML), Dark gray, moist to dry, hard, some Sand, trace subangular Gravel. (TILL).<br>As above. | Install 20-inch steel isolation casing at 20 feet bgs. |
| 25 | 25.0<br>30.0 | CT-2 | 42 / 60 | N/A | As above.<br>As above, possible laminations.<br>As above, wet | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| 30 | 30.0<br>35.0 | CT-3 | 46.8 / 60 | N/A | GRAVEL (GP), Wet, subangular, Sand/Silt matrix.<br>SILT (ML), Moist, hard, non-plastic, massive, Clayey, some Sand, trace Gravel. (TILL) | Attempt groundwater grab at 31.5 feet bgs, but recharge insufficient. |
| 35 | 35.0<br>37.0 | SPT-9 | 24 / 24 | 17-19-19-32 | As above. | Switch to split spoon because driller reports rock. |
| | 37.0<br>39.0 | SPT-10 | 21.6 / 24 | 51-54-74-74 | As above. | |
| 40 | 39.0<br>41.0 | SPT-11 | 24 / 24 | 67-82-89-107 | | BZ=0 ppm, HS=0 ppm |
| | 41.0<br>43.0 | SPT-12 | 24 /24 | 74-96-111-121 | As above, gray to brown. | |
| | 43.0<br>45.0 | SPT-13 | 24 / 24 | 88-94-108-136 | As above, reddish brown, more sand. | |
| 45 | 45.0<br>49.0 | CT-4 | 48 / 48 | N/A | As above. | Install 14-inch steel isolation casing at 44 feet bgs. |
| 50 | | | | | As above. | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBI-06 **Sheet:** 2 of 2

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 734.85 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 45' with 2' SS Sampler/CME 95 4 1/4 HSA - 5' Continuous Sampler

**START:** 05 November 2004 **FINISH:** 05 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | 49.0<br>54.0 | CT-5 | 60 / 60 | N/A | | |
| 55 | 54.0<br>59.0 | CT-6 | 60 / 60 | N/A | As above, drier more sand. | BZ=0 ppm, HS=0 ppm |
| 60 | 59.0<br>64.0 | CT-7 | 60 / 60 | N/A | SAND (SP), Brown, saturated, loose, fine to medium sand.<br>SILT (ML), Moist, hard, some Gravel. (TILL)<br>SAND (SP), Brown, wet, loose, fine to medium Sand, some Gravel. | BZ=0 ppm, HS=0 ppm<br>Collect soil sample for grain size analysis and groundwater grab (SBI06-60.5) 60.5-65.5 feet bgs. |
| 65 | 64.0<br>66.0 | CT-8 | 24 / 24 | N/A | | End boring at 66 feet bgs. |
| 70 | | | | | End of Boring | |
| 75 | | | | | | |
| 80 | | | | | | |
| 85 | | | | | | |
| 90 | | | | | | |
| 95 | | | | | | |
| 100 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBI-07<br>Sheet: 1 of 3 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.93 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** 4.25 HSA with 2 foot split spoon and 5 foot CME continuous samplers

**START:** 05 November 2004 **FINISH:** 22 March 2005 **LOGGER:** J. Myers & T. Vonwallmenich

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY) | COMMENTS (DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID) |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | | | | | | begin split spoon sampling at 2 feet bgs. |
| | 2.0<br>4.0 | SPT-1 | 24 / 24 | 4-7-10-10 | SANDY CLAY (CL), Gray, dessicated, hard. (CAP) | BZ=0 ppm, HS=0 ppm |
| 5 | 4.0<br>6.0 | SPT-2 | 24 / 24 | 8-12-16-16 | | |
| | 6.0<br>8.0 | SPT-3 | 24 / 24 | 8-10-10-18 | SILT (ML) Brown, moist, Sandy with glass and gravel. (FILL) | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-4 | 6 / 24 | 3-4-5-5 | SAND, Black, moist, soft, medium sand with magnesium oxide. (FILL)<br>As above, less sand, wet. | BZ=0 ppm, HS=1 ppm |
| 10 | 10.0<br>12.0 | SPT-5 | 24 / 24 | 2-2-2-2 | As above, gray, little sand. | BZ=0 ppm, HS=0 ppm |
| | 12.0<br>14.0 | SPT-6 | 8 / 24 | 2-2-4-9 | As above, firmer. | BZ=0 ppm, HS=0 ppm |
| 15 | 14.0<br>16.0 | SPT-7 | 24 /24 | 5-5-5-5 | SAND (SP), Black, wet, coarse, no odor. | |
| | | | | | CLAY (CL), Dark brown-gray, moist, stiff. | BZ=0 ppm, HS=0 ppm |
| | 16.0<br>18.0 | SPT-8 | 24 / 24 | 8-10-10-12 | SAND (SP), Black, coarse, no odor.<br>As above. | BZ=0 ppm, HS=1 ppm |
| | 18.0<br>20.0 | SPT-9 | 24 / 24 | 4-9-10-16 | SILT(ML), Dark brown to gray, moist, stiff, Clayey.<br>As above, very stiff. | BZ=0 ppm, HS=0 ppm |
| 20 | 21.0<br>25.0 | CT-1 | 49.2 / 48 | N/A | CLAYEY SILT (ML), Gray, moist, hard, occasional fine Sand and fine Gravel. (TILL).<br>As above.<br>As above.<br>As above. | Install 20-inch steel isolation casing at 21 feet bgs.<br>BZ=0 ppm, HS=0 ppm |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBI-07<br>Sheet: 2 of 3 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.93 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** 4.25 HSA with 2 foot split spoon and 5 foot CME continuous samplers

**START:** 05 November 2004 **FINISH:** 22 March 2005 **LOGGER:** J. Myers & T. Vonwallmenich

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION<br>SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS<br>DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING<br>BZ=Breathing zone PID<br>HS=Headspace PID |
|---|---|---|---|---|---|---|
| | 25.0<br>30 | CT-2 | 60 / 60 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| | | | | | GRAVEL (GW), Wet, medium Sand and Gravel, angular to sub angular material. | BZ=0 ppm, HS=0 ppm |
| 30 | 30.0<br>33.0 | CT-4 | 33.6 / 36 | N/A | SILT (ML), Gray, moist, hard, Clayey, some Sand, trace Gravel. (TILL).<br>SILT (ML), Brown-grayish brown, moist to dry, hard, massive, sandy and clayey, trace fine to coarse rounded gravel. (TILL) | Install 14-inch steel isolation casing at 30 feet bgs.<br>BZ=0 ppm, HS=0 ppm |
| 35 | 33.0<br>38.0 | CC #2 | 60 / 60 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| 40 | 38.0<br>43.0 | CT-5 | 21.6 / 60 | N/A | SAND (SP), Yellow brown, wet, loose, medium sand, trace fine gravel. | BZ=0 ppm, HS=0 ppm |
| | 43.0<br>45.0 | CT-6 | 24 / 24 | N/A | | Collect groundwater grab and grain size samples |
| 45 | 45.0<br>50.0 | CT-7 | 36 / 60 | N/A | CLAYEY SILT (ML), Gray moist hard, trace fine sand and fine gravel, grades in and out with very fine Silty Sand/Sandy Silt. (TILL)<br>As above | Install 8-inch stell isolation casing at 45 feet bgs. |
| 50 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBI-07<br>Sheet: 3 of 3 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.93 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** 4.25 HSA with 2 foot split spoon and 5 foot CME continuous samplers

**START:** 05 November 2004 **FINISH:** 22 March 2005 **LOGGER:** J. Myers & T. Vonwallmenich

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION<br>SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS<br>DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING<br>BZ=Breathing zone PID<br>HS=Headspace PID |
|---|---|---|---|---|---|---|
| | 50.0<br>55.0 | CT-8 | 36 / 60 | N/A | SILTY SAND (SM), Grayish brown, moist, very dense, fine to medium with occasional fine gravel. | BZ=0 ppm, HS=0 ppm |
| 55 | | | | | As above,with coarse gravel and cobbles, gravel fragments are dolomite. | |
| | 55.0<br>56.5 | CT-9 | 18 / 18 | N/A | CLAY WITH SAND AND GRAVEL (CL), Grayish brown with coarse gravel (1"), moist, very hard, sand is very fine in the laminae and medium angular in matrix. | Difficult drilling at 56' |
| | 57.5<br>58.5 | STP-10 | 9 / 12 | 64-100/3" | SILTY CLAY WITH SAND (CL), Grayish brown, sand is very fine medium coarse in matrix, hard becoming wet (TILL). | BZ=0 ppm, HS=0 ppm |
| | 58.5<br>60.0 | CT-10 | 36 / 36 | N/A | | Chatter |
| 60 | | | | | SILTY SAND (SM), Gray, wet, sand is coarse, angular, occasional coarse gravel, cobble, dense, silt approximaterly 50%. | Install temporary well 56-61 feet bgs. Grab sample SBI07-56-61-GW obtained 23 March 2005 |
| | | | | | FINE SAND WITH SILT (SP-SM), Gray with fine to coarse gravel (up to 2"), wet, dense. | |
| | | | | | End of Boring | |
| 65 | | | | | | |
| 70 | | | | | | |
| 75 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBI-08<br>Sheet: 1 of 2 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 730.40 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** HSA with 2-foot split spoon and 5 foot CME samplers

**START:** 03 November 2004 **FINISH:** 16 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 2.0<br>4.0 | SPT-1 | 6 /24 | 8-12-16-20 | CLAY (CL), Gray, dessicated, hard, occasional fine Gravel. (CAP) | Begin split spoon sampling at 2 feet bgs. |
| 5 | 4.0<br>6.0 | SPT-2 | 24 / 24 | 7-12-15-17 | | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-3 | 18 / 24 | 15-31-30-20 | CLAYEY SILT(ML), Dark brown, moist, some medium Sand and occasional Gravel | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-4 | 18 / 24 | 5-7-10-10 | SAND (SP), Yellow -brown, coarse. | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0<br>12.0 | SPT-5 | 24 / 24 | 7-10-10-8 | SAND (SP), Black, moist, medium Sand with yellow sulpher-like globblular material. | BZ=0 ppm, HS=0 ppm |
| | 12.0<br>14.0 | SPT-6 | 18 / 24 | 3-4-5-5 | SAND (SP), Brown, moist, medium to fine.<br>As above, wet, coarsinging to fine Gravel | BZ=0 ppm, HS=0 ppm |
| 15 | 14.0<br>16.0 | SPT-7 | 18 /24 | 4-4-4-4 | CLAY (CL), Black, wet, very soft, cohesive, no odor, some Sand. | BZ=0 ppm, HS=0 ppm |
| | 16.0<br>18.0 | SPT-8 | 24 / 24 | 5-7-9-10 | SAND (SP), Gray brown, moist, fine to medium. | BZ=0 ppm, HS=0 ppm |
| | 18.0<br>20.0 | SPT-9 | 24 /24 | 9-9-15-17 | CLAY (CL), Dark brown, wet, low plasticity, stiff | BZ=0 ppm, HS=0 ppm |
| 20 | | | | | CLAYEY SILT(ML), Gray, moist, very stiff, non-plastic, massive. | |
| | 22.0<br>25.0 | CT-1 | 60 / 60 | N/A | CLAYEY SILT (ML), Gray, moist to dry, very stiff, massive, non-plastic, trace fine Gravel. (TILL) | Install 20-inch steel isolation casing at 22 feet bgs. |
| 25 | | | | | 1-inch wet, fine to medium subangular gravel seam at 23.4. | |
| | 25.0<br>30.0 | CT-2 | 58.8 / 60 | N/A | | BZ=0 ppm, HS=0 ppm |
| 30 | | | | | 1-inch wet, fine to medium subangular gravel seam at 28.7 | |
| | 30.0<br>35.0 | CT-3 | 60 / 60 | N/A | 1-inch very fine wet sand at 30.45 feet bgs<br>5-inch gray, fine sand at 31.5 feet bgs. | BZ=0 ppm, HS=0 ppm |
| 35 | | | | | CLAYEY SILT (ML), Gray, moist to dry, very stiff trace fine Gravel. (TILL). | |
| | 35.0<br>40.0 | CT-4 | 60 / 60 | N/A | As above, more gravel | BZ=0 ppm, HS=0 ppm |
| 40 | | | | | 3-inches coarse, wet sand at 39.7 feet bgs. | BZ=0 ppm, HS=1.9 ppm |
| | 40.0<br>44.0 | CT-4 | 48 / 48 | N/A | CLAYEY SILT (ML), Gray brown, moist, stiff, approximately 20% gravel, clayey, some sand (TILL). | Install 14-inch steel isolation casing at 41 feet bgs. |
| 45 | | | | | As above. | |
| | 44.0<br>49.0 | CT-5 | 60 / 60 | N/A | | |
| 50 | | | | | As above, more sand. | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBI-08<br>Sheet: 2 of 2 |
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# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 730.40 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** HSA with 2-foot split spoon and 5 foot CME samplers

**START:** 03 November 2004 **FINISH:** 16 March 2005 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | 49.0<br>54.0 | CT-6 | 60 / 60 | N/A | As above. | |
| 55 | 54.0<br>59.0 | CT-7 | 60 /60 | N/A | CLAYEY SILT (ML), Brown with oxidation stains, stiff, some Sand, trace fine Gravel. bottom 3 inches of sample are green in color. (TILL)<br>CLAYEY SILT (ML), Gray brown, moist to dry, stiff, some fine Sand, trace fine Gravel. (TILL) | BZ=0 ppm, HS=0 ppm |
| 60 | 59.0<br>64.0 | CT-8 | 60 / 60 | N/A | | BZ=0 ppm, HS=0 ppm |
| | | | | | SAND (SP), Brownish yellow, saturated, medium sand. | BZ=0 ppm, HS=0 ppm |
| 65 | 64.0<br>67.0 | CT-9 | 36 / 36 | N/A | SILTY CLAY (ML), Gray brown, moist, stiff, laminated. | BZ=0 ppm, HS=0 ppm |
| | | | | | SAND (SP), Brownish yellow, saturated, medium sand. | End boring at 67 feet bgs. |
| 70 | | | | | SILTY CLAY (ML), Gray brown, moist, stiff, laminated. | |
| | | | | | End of Boring | |
| 75 | | | | | | |
| 80 | | | | | | |
| 85 | | | | | | |
| 90 | | | | | | |
| 95 | | | | | | |
| 100 | | | | | | |

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBI-09<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 731.83 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 55 Track Rig with 2' SS HSA

**START:** 29 March 2005 **FINISH:** 29 March 2005 **LOGGER:** R. Schuth

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION<br>SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS<br>DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 16.8 / 24 | 7-8-8-7 | 2.4 inches asphalt | |
| | 2.0<br>4.0 | SPT-2 | 19.2 / 24 | 1-2-2-3 | 0.2 - 0.8' - SAND WITH GRAVEL, Brown, moist, medium, loose. | BZ=0 ppm, HS=0 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 16.8 / 24 | 3-3-3-4 | SILT (ML), Brown, moist, firm, with fine Sand. | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-4 | 18 / 24 | 3-4-7-10 | As above. | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-5 | 24 / 24 | 3-4-6-9 | SILT (ML), Brown with yellow brown and gray mottling, moist, stiff, some Clay and coarse Sand. | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 20.4 / 24 | 5-5-8-11 | CLAYEY SILT (ML), Gray, moist, stiff. | BZ=0 ppm, HS=0 ppm |
| | 12.0<br>14.0 | SPT-7 | 20.4 / 24 | 7-12-12-25 | CLAYEY SILT(ML) Brown with dark brown mottling, moist, stiff, some fine Sand, trace fine Gravel. | BZ=0 ppm, HS=0 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 6 /24 | 7-9-14-16 | SILT (ML), Gray, moist to dry, stiff, some fine gravel. | BZ=0 ppm, HS=0 ppm |
| | 16.0<br>18.0 | SPT-9 | 15.6 / 24 | 9-29-50-51 | | |
| 20 | 18.0<br>23.0 | CT-1 | 52.8 / 60 | N/A | 3-inches wet loose silty sand at 12 feet bgs.<br>SILTY CLAY (CL), Gray, moist to dry, hard, angular fine Gravel. | Install 10-inch steel isolation casing at 18 feet bgs. |
| | | | | | CLAYEY SILT (ML), Reddish brown, moist to wet, stiff, some fine Sand. | BZ=0 ppm, HS=0 ppm |
| 25 | 23.0<br>27.0 | CT-2 | 30 / 60 | N/A | SILTY CLAY (CL), Gray, moist to dry, hard, angular fine Gravel. | BZ=0 ppm, HS=0 ppm |
| 30 | 28.0<br>33.0 | CT-3 | 60 / 60 | N/A | CLAYEY SILT (ML), Gray, moist to dry, hard, some fine Sand, trace fine to coarse Gravel. (TILL). | BZ=0 ppm, HS=0 ppm |
| 35 | 33.0<br>38.0 | CT-4 | 60 / 60 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| 40 | 38.0<br>43.0 | CT-5 | 54 / 60 | N/A | As above. | |
| 45 | 43.0<br>48.0 | CT-6 | 60 / 60 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| 50 | 48.0<br>52.5 | CT-7 | 54 / 60 | N/A | As above. | End boring at 52.5 feet bgs. |
| 55 | | | | | End of Boring | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01

**BORING NUMBER:** SBI-10
**Sheet:** 1 of 1

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 733.11 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 55 Track Rig, 4.25 HSA, 2 ft split spoon and 5 ft CME samplers
**START:** 30 March 2005 **FINISH:** 30 March 2005 **LOGGER:** R. Schuth

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0.0<br>2.0 | SPT-1 | 21.6 / 24 | 4-4-4-4 | Asphalt | BZ=0 ppm, HS=0 ppm |
| | 2.0<br>4.0 | SPT-2 | 0 / 24 | 2-2-2-2 | SAND (SP), Brown, moist, loose, trace Gravel, coarse Sand, asphalt. (ROAD FILL) | BZ=0 ppm, HS=0 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 16.8 / 24 | 1-2-2-5 | SAND (SP), Brown, moist, loose, coarse Sand, trace Gravel. | BZ=0 ppm, HS=0 ppm |
| | 6.0<br>8.0 | SPT-4 | 16.8 / 24 | 8-9-9-12 | SILT (ML), Brown with red brown mottling, moist to wet, stiff, Sandy, trace Gravel. | BZ=0 ppm, HS=0 ppm |
| | 8.0<br>10.0 | SPT-5 | 21.6 / 24 | 7-10-10-10 | | BZ=0 ppm, HS=0 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 8.4 / 24 | 5-5-5-7 | SILT (ML), Gray, moist, stiff, some Sand, trace Gravel. | BZ=0 ppm, HS=0 ppm |
| | 12.0<br>14.0 | SPT-7 | 14.4 / 24 | 6-6-11-13 | As above, very stiff. | BZ=0 ppm, HS=0 ppm |
| | 14.0<br>16.0 | SPT-8 | 24 / 24 | 6-6-13-21 | SILTY SAND (SM), Gray, wet, loose, coarse Sand with Silt. | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| 15 | 16.0<br>18.0 | SPT-9 | 21.6 / 24 | 8-13-16-23 | SILT (ML), Gray-brown, moist, very stiff, trace Gravel. | BZ=0 ppm, HS=0 ppm |
| | 19.0<br>24.0 | CT-1 | 27.6 / 60 | N/A | SILT (ML), Gray, moist to dry very stiff to hard, some fine Sand and Gravel. (TILL).<br>SILT (ML), Gray, moist to dry, hard, Clayey, some fine Sand, trace Gravel. (TILL). | BZ=0 ppm, HS=0 ppm<br>BZ=0 ppm, HS=0 ppm |
| 20 | | | | | | |
| 25 | 24.0<br>29.0 | CT-2 | 60 / 60 | N/A | | BZ=0 ppm, HS=0 ppm |
| 30 | 29.0<br>34.0 | CT-3 | 57.6 / 60 | N/A | As above, sand in partings. | BZ=0 ppm, HS=0 ppm |
| 35 | 34.0<br>39.0 | CT-4 | 57.6 / 60 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| 40 | 39.0<br>44.0 | CT-5 | 60 / 60 | N/A | As above. | BZ=0 ppm, HS=0 ppm |
| 45 | 44.0<br>49.0 | CT-6 | 54 | N/A | As above. | BZ=0 ppm, HS=0 ppm<br>End boring at 49 feet bgs. |
| 50 | | | | | End of Boring | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01

**BORING NUMBER:** SBS-01
**Sheet:** 1 of 1

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 731.16 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT
**START:** 12/14/05 **FINISH:** 12/14/05 **LOGGER:** T. Vonwallmenich

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 24 / 24 | 32-45-23-27 | WELL GRADED SAND WITH SILT (SW-SM), Brown, moist with fines and gravel, very dense. | |
| | 2.0<br>4.0 | SPT-2 | 24 / 24 | 27-22-23-26 | CLAY (CL), Brown, moist, sandy with occasional fines and gravel, hard. | |
| 5 | 4.0<br>6.0 | SPT-3 | 8.4 / 24 | 20-37-23-28 | Clay for approximately 3" then drove rock. | |
| | 6.0<br>8.0 | SPT-4 | 19.2 / 24 | 4-4-3-2 | CLAY (CL), Brown, moist, sand, occasional fine to coarse gravel, stiff. | HS=1.3 ppm |
| | 8.0<br>10.0 | SPT-5 | 18 / 24 | 2-2-7-10 | Becomes gray.<br>WELL GRADED SAND WITH SILT (SW-SM), Moist, black, medium dense. | |
| 10 | 10.0<br>12.0 | SPT-6 | 16.8 / 24 | 4-7-8-7 | Becomes wet. | HS=1.5 ppm<br>Collect groundwater grab sample 10-15 feet bgs. |
| | 12.0<br>14.0 | SPT-7 | 24 / 24 | 2-2-3-4 | PEAT (PT), Brown and black.<br>FINE SAND (SP), Greenish gray, wet, very fine, loose. | HS= 1.5 ppm<br>HS=0.7 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 24 / 24 | 3-4-6-7 | SILT/CLAY (ML/CL), Brown to gray, grades from very fine silt at top to clay at bottom with orange-brown mottles, medium stiff to stiff. | |
| | 16.0<br>18.0 | SPT-9 | 24 / 24 | 3-4-5-6 | SANDY CLAY/CLAYEY SAND (CL/SM), Brown-gray, moist, sand is in pockets of fine and coarse, medium stiff to stiff, loose. | |
| | 18.0<br>20.0 | SPT-10 | 24 / 24 | 4-7-13-20 | SANDY CLAY (CL), Gray, moist, sand is fine to meium, occasional coarse gravel, very stiff (till). | 0.7 ppm |
| 20 | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-02<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 730.94 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 12/14/05 **FINISH:** 12/15/05 **LOGGER:** T. Vonwallmenich

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | 0<br>2.0 | SPT-1 | 21.6 / 24 | 18-40-60-38 | SANDY CLAY (CL), Brown, dry, fine to coarse with occasional fines and gravels, hard. | |
| | 2.0<br>4.0 | SPT-2 | 22.8 / 24 | 21-28-28-34 | WELL GRADED SAND (SW), Light brown, moist, loose, occasional fine gravel.<br>SAND CLAY (CL), Brown, dry, fine to coarse with occasional fines and gravels, hard. | HS=1.3 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 0 / 24 | 40-40-38-36 | Drove rock. | |
| | 6.0<br>8.0 | SPT-4 | 22.8 / 24 | 8-12-17-20 | SAND WITH SILT (SW-SM), Black to brown, moist, with wood, medium dense. | HS=0.5 ppm |
| | 8.0<br>10.0 | SPT-5 | 24 /24 | 7-6-5-4 | As above, magnesium oxide, loose. | |
| 10 | | | | | | HS=0.2 ppm |
| | 10.0<br>12.0 | SPT-6 | 14.4 / 24 | 3-6-6-5 | As above, Black becoming wet, medium dense. | HS=0.2 ppm |
| | 12.0<br>14.0 | SPT-7 | 24 / 24 | 3-3-4-4 | | Collect groundwater grab sample 9-14 feet bgs. |
| | | | | | PEAT (PT), Black, wet, woody. | HS=0.2 ppm, odor |
| 15 | 14.0<br>16.0 | SPT-8 | 24 / 24 | 2-3-4-6 | FINE SAND (SP), Light brown mottled with orange, wet, loose, occasional black peat and coarse sand. | |
| | | | | | CLAYEY SAND (SC), Brown (mottled with orange),moist, top is mottled with black to approximately 15.0', sand is very fine to fine, occasional coarse, medium dense (clayey sections stiff). | End boring at 16 feet bgs. |
| | | | | | End of Boring | |
| 20 | | | | | | |
| 25 | | | | | | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBS-03 **Sheet:** 1 of 1

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** ST. Louis, MI

**ELEVATION:** 730.04 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 2/15/05 **FINISH:** 2/15/05 **LOGGER:** T. Vonwallmenich

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY) | COMMENTS (DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID) |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 20.4 / 24 | 9-12-19-28 | SANDY CLAY (CL), Brown, moist,very stiff to hard, with fine gravel, occasional coarse gravel. | |
| | 2.0<br>4.0 | SPT-2 | 24 / 24 | 27-25-20-18 | Same as above. | HS=0 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 14.4 / 24 | 14-21-29-20 | Shoe broke off downhole, brick fragments in cuttings, wood pieces (possible roots). | |
| | 6.0<br>8.0 | SPT-4 | 14.4 / 24 | 5-5-2-9 | SILTY SAND (SM), Brown, moist, loose, fine to coarse with coarse gravel. | HS=0.6 ppm, driller reports odor |
| | 8.0<br>10.0 | SPT-5 | 8.4 / 24 | 5-4-1-2 | As above, wet.<br>As above, becomes blackwith medium sheen, petroleum odor | HS=3 ppm<br>Collect ground water grab sample 9-14 feet bgs |
| 10 | 10.0<br>12.0 | SPT-6 | 21.6 / 24 | 1-2-3-3 | FINE SAND (SP), Brown/black, wet, loose.<br>As above, gray (11. -11.5 feet bgs) | DNAPL Spray Test positive.<br>HS=0 ppm |
| | 12.0<br>14.0 | SPT-7 | 24 / 24 | 2-2-2-4 | As above, black (11.5-12 feet bgs)<br>Grades to very fine sand/silt greenish gray with black streaks, medium to high sheen. | DNAPL Spray Test positive.<br>HS=0 ppm |
| 15 | | | | | Grades to fine-medium silty sand, brown with orange.<br>CLAY (CL), Brown with orange, moist, very stiff.<br>End of Boring | Driller reports just touched into harder clay at 14.0' |
| 20 | | | | | | |
| 25 | | | | | | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBS-04 **Sheet:** 1 of 1

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 730.23 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT
**START:** 12/17/05 **FINISH:** 2/17/05 **LOGGER:** S. Saxena

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 16.8 / 24 | 6-4-2-2 | CLAY WITH SAND (CL), Brown, moist. | |
| | 2.0<br>4.0 | SPT-2 | 19.2 / 24 | 6-22-10-11 | CLAY WITH SAND (CL), Brown, dry, some gravel, hard. | |
| 5 | 4.0<br>6.0 | SPT-3 | 18 / 24 | 6-8-12-19 | CLAY WITH POORLY GRADED SAND (CL), Some peat, dry, gravel present. | DNAPL Spray Test positive. |
| | 6.0<br>8.0 | SPT-4 | 12 / 24 | 12-22-25-26 | SAND (SP), Black to brown, moist, medium sand, odor | |
| | 8.0<br>10.0 | SPT-5 | 6 / 24 | 4-4-6-5 | SAND (SP), Black wet, sheen, medium sand, odor. | |
| 10 | 10.0<br>12.0 | SPT-6 | 18 / 24 | 4-3-6-6 | As above. | HS=5 ppm |
| | 12.0<br>14.0 | SPT-7 | 18 / 24 | 15-26-10-11 | As above, saturated. | HS=20 ppm<br>Collect soil sample 10-12 feet bgs.<br>Collect possible product sample 12-14 feet bgs. |
| | | | | | SILTY CLAY (CL), Brown, moist, stiff, some sand. | |
| 15 | | | | | End of Boring | |
| 20 | | | | | | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-05<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 732.71 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 2/16/05 **FINISH:** 2/16/05 **LOGGER:** S. Saxena

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | 0<br>2.0 | SPT-1 | 20.4 / 24 | 8-6-5-5 | SANDY CLAY (CL), Brown, moist. | |
| | 2.0<br>4.0 | SPT-2 | 24 / 24 | 5-13-15-13 | SANDY CLAY (CL), Brown, dry. | |
| 5 | 4.0<br>6.0 | SPT-3 | 18 / 24 | 7-9-9-9 | CLAY (CL), Brown, dry, some medium to fine sand. | |
| | 6.0<br>8.0 | SPT-4 | 21.6 / 24 | 5-13-11-12 | CLAY WITH SAND (CL), Brown, dry, lower 6 inches crushed brick. | |
| | 8.0<br>10.0 | SPT-5 | 21.6 / 24 | 6-8-9-9 | CLAY WITH SAND (CL), Brown, moist, gray medium sand in bottom 2 inches | |
| 10 | 10.0<br>12.0 | SPT-6 | 15.6 / 24 | 5-5-5-10 | POORLY GRADED SAND WITH CLAY (SC), Grayish moist, medium sand, with pieces of brick. | DNAPL spray test positive |
| | 12.0<br>14.0 | SPT-7 | 18 / 24 | 6-8-5-11 | SAND (SP), Black, wet, medium sand, pieces of brick and wood, odor. | DNAPL Spray test positive |
| 15 | 14.0<br>16.0 | SPT-8 | 18 / 24 | 19-13-14-17 | Clay (CL), Black to gray, moist, stiff. (TILL) | DNAPLE Spray test positive<br>Sample collected 1400 |
| | | | | | End of Boring at 16.0' | |
| 20 | | | | | | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-06<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 734.85 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT
**START:** 2/17/05 **FINISH:** 2/17/05 **LOGGER:** S. Saxena

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 18 / 24 | 7-9-13-12 | SANDY CLAY (CL), Brown, dry, some gravel. | |
| | 2.0<br>4.0 | SPT-2 | 21.6 / 24 | 18-16-24-27 | SANDY CLAY (CL), Brown, dry, poorly sorted sand, some gravel. | |
| 5 | 4.0<br>6.0 | SPT-3 | 24 / 24 | 7-11-12-10 | As above. | |
| | 6.0<br>8.0 | SPT-4 | 13.2 /24 | 2-3-3-3 | As above. | |
| | 8.0<br>10.0 | SPT-5 | 13.2 /24 | 4-6-21-27 | SAND (SP), Brown, dry, sand with rock and concrete fragments. | HS=0 ppm<br>Suspect PID is not working properly do to extreme cold. |
| 10 | 10.0<br>12.0 | SPT-6 | 18 / 24 | 17-15-10-8 | SAND (SP), Gray to black, moist, loose, concrete fragments. | HS=0 ppm |
| | 12.0<br>14.0 | SPT-7 | 8.4 / 24 | 3-8-6-4 | SAND (SP), Gray, wet, some fine gravel. | HS=0 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 18 / 24 | 4-6-8-18 | SAND (SW), Gray, wet. | Ground water grab sample 12-17 feet bgs. Soil sample collected 14-15 feet bgs. |
| | 16.0<br>18.0 | SPT-9 | 16.8 / 24 | 9-10-13-14 | SAND (SW), Gray, wet, loose, medium sand.<br>CLAY (CL) Gray, moist, stiff. | |
| 20 | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-07<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 735.73 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT
**START:** 2/16/05 **FINISH:** 2/17/05 **LOGGER:** S. Sexana

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 2 / 24 | 7-16-12-8 | SANDY CLAY (CL), Brown, moist, becoming dry with depth. | |
| | 2.0<br>4.0 | SPT-2 | 21.6 / 24 | 16-22-14-12 | SANDY CLAY (CL), Brown, dry, consolidated. | |
| 5 | 4.0<br>6.0 | SPT-3 | 19.2 / 24 | 13-11-11-13 | SANDY CLAY (CL), consolidated, dry. | |
| | 6.0<br>8.0 | SPT-4 | 6 / 24 | 4-9-12-7 | CLAY WITH SAND (CL), Brown, moist. | DNAPL Spray Test negative |
| | 8.0<br>10.0 | SPT-5 | 0 / 24 | 9-10-12-50 for 3" | brick fragments. | |
| 10 | 10.0<br>12.0 | SPT-6 | 0 / 24 | 50 for 5" | brick fragments | |
| | 12.0<br>14.0 | SPT-7 | 24 / 24 | 14-22-22-27 | SAND (SP), Black, moist, loose, medium, odor. | HS=1.8 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 24 / 24 | 6-3-3-6 | As above. | |
| | 16.0<br>18.0 | SPT-9 | 24 / 24 | 5-6-10 -10 | As above. | Groundwater grab sample collected 14-19 feet bgs. Soil sample collected 16-18 feet bgs. |
| | 18.0<br>20.0 | SPT-10 | 24 / 24 | 5-9-11-16 | As above. | |
| 20 | | | | | CLAY (CL) Gray, mosit, stiff. | |
| | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-08<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 735.57 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT
**START:** 2/16/05 **FINISH:** 2/16/05 **LOGGER:** S. Saxena

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-2 | 24 / 24 | 15-20-18 (38) | SANDY CLAY (CL), Brown, dry, fine to coarse sand, fine gravel. | |
| | 2.0<br>4.0 | SPT-5 | 16 / 24 | 8-6-6 (12) | As above. | |
| 5 | 4.0<br>6.0 | SPT-3 | 24 / 24 | 11-13-13 (26) | SAND WITH CLAY (SC), Gray, black, moist, loose, medium sand. | HS=14 ppm |
| | 6.0<br>8.0 | SPT-4 | 12 / 24 | 8-50/3" | As above. | HS=3 ppm |
| | 8.0<br>10.0 | SPT-9 | 1.5 | 8-4-3 (7) | SAND WITH CLAY (SC), Light to dark brown, moist loose, medium sand. | HS=0 ppm |
| 10 | | | | | Concrete | |
| | 10.0<br>12.0 | SPT-6 | 6 /24 | 8-54-14 (68) | SAND (SW) Brown, moist, loose, medium sand.<br>As above. | HS=2 ppm |
| | 12.0<br>14.0 | SPT-1 | 0 / 24 | 100/4" | Concrete | |
| 15 | 14.0<br>16.0 | SPT-7 | 12 / 24 | 9-11-4 (15) | As above. | DNAPL Spray test negative<br>Groundwater grab sample collected 13-18 feet bgs. Soil sample collected 16-18 feet bgs. |
| | 16.0<br>18.0 | SPT-8 | 1 / 24 | 7-10-7 (17) | SAND (SW), Black, moist, loose,medium, odor,<br>CLAY (CL) Gray, moist, stiff. | HS=39 ppm |
| 20 | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-09<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 733.55 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 750 ATV rig - 2" and 2 1/2" SS with Autohammer - 4 1/4 ID HSA

**START:** 2/23/05 **FINISH:** 2/23/05 **LOGGER:** R. Stryker

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 20.4 / 24 | 6-4-7-7 | Topsoil, frozen<br>SILTY SAND (SM), Brown, moist. | HS FID=3 ppm |
| | 2.0<br>4.0 | SPT-2 | 12 / 24 | 5-45-50 for 1" | Concrete slab. | HS FID=3 ppm |
| 5 | | | | | | |
| | 6.0<br>8.0 | SPT-3 | 24 / 24 | 6-11-12-14 | SILTY SAND (SM) Brown, moist, loose, medium sand with fine gravel and wood fragments. | HS FID=25 ppm |
| | 8.0<br>10.0 | SPT-4 | 6 / 24 | 14-19-20-18 | As above, red staining 7-8 feet bgs.<br>Concrete | HS FID=5 ppm |
| 10 | | | | | | |
| | 10.0<br>12.0 | SPT-5 | 12 / 24 | 7-11-6-11 | SAND (SP),Black, moist, loose, medium, some fine gravel, strong crude oil odor. | HS FID=129 ppm |
| | 12.0<br>14.0 | SPT-6 | 14.4 / 24 | 8-5-8-20 | As above. | HS FID=160 ppm<br>Collect groundwater grab sample 12-17 feet bgs. Collect soil sample 12-14 feet bgs. |
| 15 | 14.0<br>16.0 | SPT-7 | 14.4 / 24 | 12-16-18-8 | As above, gray, wet. | HS FID=373 ppm |
| | 16.0<br>18.0 | SPT-8 | 18 / 24 | 8-10-9-14 | CLAYEY SILT (CL-ML), Gray, moist trace fine gravel. | HS FID=18 ppm |
| 20 | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-10<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.96 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 2/17/05 **FINISH:** 2/18/05 **LOGGER:** S. Saxena

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | 0<br>2.0 | SPT-1 | 20.4 / 24 | 6-6-12-14 | CLAY (CL), Brown, dry,with some medium sand and fine gravel. | |
| | 2.0<br>4.0 | SPT-2 | 22.8 / 24 | 6-12-8-10 | As above, pieces of brick. | |
| 5 | 4.0<br>6.0 | SPT-3 | 18 / 24 | 6-7-8-8 | SAND (SW), Brown, moist, loose, some brick framents. | |
| | 6.0<br>8.0 | SPT-4 | 3.6 / 12 | 5-3-3-7 | As above, with fine gravel, wet. | |
| | 8.0<br>10.0 | SPT-5 | 22.8 / 24 | 5-6-8-9 | SAND (SP) Gray, wet, loose, medium sand with fine gravel. | Collect groundwater grab sample 8.5-13.5 feet bgs. Collect soil sample 8 feet bgs. |
| 10 | 10.0<br>12.0 | SPT-6 | 24 / 24 | 10-10-15-17 | SAND (SP), Gray, wet, loose, medium sand. | |
| | 12.0<br>14.0 | SPT-7 | 24 / 24 | 13-13-8-11 | As above. | |
| | | | | | SANDY CLAY (CL), Gray, mosit, firm, very fine sand. | |
| 15 | | | | | End of Boring | |
| 20 | | | | | | |
| 25 | | | | | | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBS-11 **Sheet:** 1 of 1

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 732.00 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 22 Feb 05 **FINISH:** 22 Feb 05 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 24 / 24 | 4-3-3-6 | SANDY SILT(ML), Brown, moist, medium density, medium sand. (TOPSOIL) | |
| | 2.0<br>4.0 | SPT-2 | 20.4 / 24 | 9-27-12-13 | SANDY CLAY (CL), Gray, dessicated, hard. (CAP) | HS FID=1.9 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 0 / 24 | 12-9-50 for 1" | As above. | Crushed tip of spoon can not open concrete in shoe |
| | 6.0<br>8.0 | SPT-4 | 21.6 / 24 | 10-13-9-13 | SAND (SP), Black, dry to moist, medium, loose, no odor. | |
| | 8.0<br>10.0 | SPT-5 | 20.4 / 24 | 4-4-3-4 | SAND (SP), Brown/yellow, moist to wet, medium, some oxidation in bands. | HS FID=133 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 24 / 24 | 6-8-7-10 | SAND (SP), Black, wet, loose, medium, saturated, light sheen, low odor. | HS FID=207 ppm<br>Collect groundwater grab sample 8.6 -13.6 feet bgs. Collect soil sample 10-12 feet bgs. |
| | 12.0<br>14.0 | SPT-7 | 15.6 / 24 | 5-8-12-26 | As above, wet. | HS FID=69 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 24 / 24 | 6-12-9-11 | As above, wet | HS FID=86 ppm |
| | | | | | SANDY SILT (ML), Gray, moist, stiff, occassional fine gravel. | |
| 20 | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-12<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.81 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 2/18/05 **FINISH:** 2/18/05 **LOGGER:** S. Saxena

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | 0<br>2.0 | SPT-1 | 24 / 24 | 13-8-7-11 | SILT (ML), Brown, moist, medium dense. (TOPSOIL)<br>CLAY (CL), Gray, dessicted, hard, occasional gravel. | |
| | 2.0<br>4.0 | SPT-2 | 24 / 24 | 14-21-20-27 | As above. | |
| 5 | 4.0<br>6.0 | SPT-3 | 13.2 / 24 | 15-21-25-20 | As above.<br>SILT (SM), Brown, moist, stiff, wood fragments. | |
| | 6.0<br>8.0 | SPT-4 | 12 / 24 | 5-12-12-9 | SAND (SP), Brown, wet, loose, mediumsand with trace gravel and white granular material. | HS=54 ppm |
| | 8.0<br>10.0 | SPT-5 | 18 / 24 | 4-9-1-15 | SAND (SW), Dark gray, wet, loose, medium sand, odor. | HS=60 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 9.6 / 24 | 7-5-5-7 | As above. | HS=55 ppm |
| | 12.0<br>14.0 | SPT-7 | 24 / 24 | 7-11-11-13 | SAND (SP), Gray, wet, loose, medium sand. | HS=102 ppm<br>Collect groundwater grab sample 11-16 feet bgs. Collect soil sample 12-14 feet bgs. |
| 15 | 14.0<br>16.0 | SPT-8 | 24 / 24 | 9-10-10-16 | As above.<br>CLAY (CL) Gray, moist, stiff. | HS=40 ppm |
| 20 | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-13<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 731.82 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 2" Split Spoon
**START:** 19 Feb 05 **FINISH:** 19 Feb 05 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | | | | | Topsoil | |
| | 0<br>2.0 | SPT-1 | 22.8 / 24 | 12-5-3-3 | SANDY CLAY (CL), Gray, dessicated, hard. | |
| | 2.0<br>4.0 | SPT-2 | 24 / 24 | 12-13-17-13 | As above. | |
| | | | | | As above. | |
| 5 | 4.0<br>6.0 | SPT-3 | 21.6 / 24 | 14-19-12-10 | SAND (SW), Brown, moist, loose, medium sand, some wood fragments. | HS FID=29 ppm |
| | 6.0<br>8.0 | SPT-4 | 18 / 24 | 11-13-14-50 | SILTY SAND (SM), Dark brown, moist, loose, some wood fragments. | HS FID=30.4 ppm<br>Bits of glass and washers in cuttings |
| | | | | | Concrete slab | Per Driller concrete slab 7.5-8.5, with cobbles 6.5-9.5. Cuttings contain rebar and concrete. Collect groundwater grab sample 8.6-13.6 feet bgs. |
| 10 | 10.0<br>12.0 | SPT-7 | 0 / 24 | 12-16-18-31 | | Concrete in shoe cause of poor recovery 10-12 feet bgs. |
| | 12.0<br>14.0 | SPT-8 | 24 / 24 | 14-21-30-34 | SILTY SAND (SM), Brown, wet, medium density, medium to fine sand. | HS FID=107 ppm<br>Collect soil sample 12-14 feet bgs. |
| | | | | | SILTY CLAY (CL), Gray, moist, firm, trace gravel, angular, medium plasticity. (TILL). | |
| 15 | | | | | End of Boring | |
| 20 | | | | | | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-14<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.61 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 2' Split Spoon

**START:** 19 Feb 05 **FINISH:** 19 Feb 05 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY) | COMMENTS (DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID) |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 24 /24 | 21-24-25-31 | SANDY SILT (ML), Brown, moist, loose, fine sand. (TOPSOIL)<br>SANDY CLAY (CL), Gray, dessicated, hard. (CAP | |
| | 2.0<br>4.0 | SPT-2 | 24 / 24 | 13-12-21-27 | | |
| 5 | 4.0<br>6.0 | SPT-3 | 21.6 / 24 | 11-6-6-8 | SAND (GW), Yellow brown, dry, medium, loose.<br>SILT (ML), Gray brown, moist, medium firm, white chalky substance (magnesium oxide?)<br>As above, more white chalky substance, wet. | |
| | 6.0<br>8.0 | SPT-4 | 0 / 24 | 2-2-2-2 | | Rock in shoe cause of poor recovery |
| | 8.0<br>10.0 | SPT-5 | 24 / 24 | 4-5-6-9 | SANDY SILT (ML), Brown, wet, loose, fine sand.<br>SAND (SW), Brown, saturated, very coarse, angular, odor. | Collect soil sample 9-10 feet bgs.<br>DNAPL Spray Test - Positive<br>HS FID=512 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 24 /24 | 10-10-13-18 | SAND (SW), Gray, saturated, medium sand, odor, sheen. | HS FID=225 ppm<br>DNAPL Spray Test - Negative |
| | 12.0<br>14.0 | SPT-7 | 18 / 24 | 100+ for 1 inch | SAND (SW), Brown, saturated, very coarse, angular, odor. | HS FID=337 ppm<br>DNAPL Spray Test - Negative |
| 15 | 14.0<br>16.0 | SPT-8 | 24 / 24 | 26-24-27-32 | SAND (SW), Black, saturated, loose, medium, odor and sheen.<br>SAND (SW), Brown, saturated, coarse, loose, odor, sheen. | DNAPL Spray Test - Positive<br>HS FID=169 ppm<br>HS FID=150 ppm<br>DNAPL Spray Test - negative |
| | 16.0<br>18.0 | SPT-9 | 24 / 24 | 18-13-11-21 | SAND (SW), Black, saturated, loose, odor and sheen. | Collect groundwater grab sample 15-18 feet bgs.<br>HS FID=386 ppm |
| | 18.0<br>19.0 | SPT-10 | 12 / 12 | 9-50 | SAND (SW), Brown, moist, loose, odor, no sheen, coarse.<br>SANDY CLAY (CL), Gray, moist, hard, some fine sand, trace angular gravel. (TILL) | HS FID=380 ppm |
| 20 | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-15<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 731.19 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 750 Tire Mount 4 1/4" HSA - 2' Split Spoon

**START:** 18 Feb 05 **FINISH:** 18 Feb 05 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 18 / 24 | 9-5-2-3 | SANDY SILT (ML), Brown, moist, loose, fine sand. (TOPSOIL)<br>SANDY CLAY (CL), Gray, dessicted, hard. (CAP) | |
| | 2.0<br>4.0 | SPT-2 | 20.4 / 24 | 9-18-21-15 | As above. | |
| 5 | 4.0<br>6.0 | SPT-3 | 24 / 24 | 15-16-21-21 | As above. | |
| | 6.0<br>8.0 | SPT-4 | 22.8 / 24 | 11-13-7-5 | SAND (SP), Yellow brown, moist, dense, medium sand.<br>SILT (ML), Gray, moist, firm. | |
| | 8.0<br>10.0 | SPT-5 | 0 / 24 | 3-1 for 12 inches-7 | Brick fill. | HS FID=.03 ppm<br>Possible void space 8.5-9.5 bgs. |
| 10 | 10.0<br>12.0 | SPT-6 | 6 / 24 | 7-2-2-3 | SILT (ML), Gray, wet. | HS FID= 0.7 ppm<br>Large cobble in shoe cause of poor recovery |
| | 12.0<br>14.0 | SPT-7 | 24 / 24 | 3-5-7-8 | As above, chemical odor | HS FID=23 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 24 / 24 | 6-8-11-17 | SAND (SP), Yellow brown, wet, angular, loose, chemical odor, medium sand. | HS FID=42 ppm |
| | 16.0<br>18.0 | SPT-9 | 22.8 / 24 | 6-23-24-24 | SAND (SP), Yellow Brown, wet, angular, loose chemical odor, medium sand. | HS FID=33 ppm |
| | 18.0<br>20.0 | SPT-10 | 24 / 24 | 15-26-28-30 | As above. | HS FID=202 ppm<br>Collect groundwater grab sample 21.4-26.4 feet bgs. Collect soil sample 18-20 feet bgs. |
| 20 | 20.0<br>22.0 | SPT-11 | 24 / 24 | 7-13-20 (33) | | HS FID=187 ppm |
| | | | | | SILTY CLAY (CL), Reddish brown, moist, hard to stiff, trace angular gravel. (TILL). | |
| | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-16<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 734.36 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 750 4 1/4" HSA - 2' Split Spoon
**START:** 19 Feb 05 **FINISH:** 19 Feb 05 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | 0<br>2.0 | SPT-1 | 24 / 24 | 9-5-4-7 | SANDY SILT (ML), Brown, moist, loose, fine sand, roots. (TOPSOIL)<br>CLAY (CL), Gray, dessicated, hard. (CAP) | |
| | 2.0<br>4.0 | SPT-2 | 14.4 / 24 | 6-10-30-15 | As above. | |
| 5 | 4.0<br>6.0 | SPT-3 | 24 / 24 | 12-14-12-26 | SANDY SILT (ML), Brown, moist, firm, hydrocarbon odor. | HS FID=59.8 ppm<br>DNAPL Spray Test - Negative |
| | 6.0<br>8.0 | SPT-4 | 16.8 / 24 | 9-28-29-21 | SAND (SW), Brown, moist, loose, medium sand, some fine gravel. | HS FID=9.2 ppm<br>Concrete in tip of sampler cause of poor recovery |
| | 8.0<br>10.0 | SPT-5 | 18 / 24 | 9-10-15-20 | As above. | HS FID=5.4 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 19.2 / 24 | 12-11-13-8 | SAND (SP), Yellow-brown, wet, loose, mediumsand. | HS FID=2.48 ppm |
| | 12.0<br>14.0 | SPT-7 | 21.6 / 24 | 2-3-34 | As above. | HS FID=23.75 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 24 / 24 | 8-12-6-10 | As above.<br>SILTY CLAY (CL), Gray, moist, firm, some angular gravel (TILL). | HS FID=4.2 ppm |
| | | | | | End of Boring | |
| 20 | | | | | | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-17<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 732.76 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 750 4 1/4" HSA - 2" Split Spoon
**START:** 19 Feb 05 **FINISH:** 19 Feb 05 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 24 / 24 | 10-5-7-10 | Topsoil<br>SAND (SP), Yellow brown, dry, medium, loose. | |
| | 2.0<br>4.0 | SPT-2 | 24 / 24 | 8-10-27-25 | SANDY CLAY (CL), Gray, dessicted, hard. (CAP)<br>As above. | HS FID=0 ppm HS PID=0 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 24 / 24 | 13-15-17-18 | As above. | HS FID=1 ppm HS PID=1 ppm |
| | 6.0<br>8.0 | SPT-4 | 18 / 24 | 5-5-6-3 | As above. | |
| | 8.0<br>10.0 | SPT-5 | 12 / 24 | 2-3-9-5 | SILT (ML) Gray, moist, firm, white chalky material present (magnesium oxide?). | HS FID=1 ppm HS PID=1 ppm<br>Wood in shoe |
| 10 | 10.0<br>12.0 | SPT-6 | 16.8 / 24 | 4-2-3-4 | SAND (SW), Black with yellow layers, moist, loos, fine sand. | HS FID=105 ppm HS PID=2.11 ppm |
| | 12.0<br>14.0 | SPT-7 | 24 /24 | 3-6-9-13 | SANDY SILT (ML), Brown, saturaturated, soft.<br>SAND (SW), Black, wet, loose, fine. | HS FID=38 ppm HS PID=2 ppm<br>HS FID=306 ppm HS PID=5 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 24 /24 | 6-6-16-17 | SAND (SW), Black, moist, medium density, odor.<br>SILTY CLAY (CL), Orangeish, hard, trace angular fine gravel. (TILL). | HS FID=284 ppm HS PID=8 ppm<br>Collect groundwater grab sample 11-16 feet bgs. Collect soil sample 13-15 feet bgs. |
| | | | | | End of Boring | |
| 20 | | | | | | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-18<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 734.31 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 2/20/05 **FINISH:** 2/20/05 **LOGGER:** S. Saxena

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | 0<br>2.0 | SPT-1 | 24/ 24 | 13-17-18-21 | SANDY SILT (ML), Brown, moist, loose, fine sand. (TOPSOIL)<br>SAND (SP), Brown, moist, loose, medium sand. | |
| | 2.0<br>4.0 | SPT-2 | 18 / 24 | 17-18-13-14 | SANDY CLAY (CL),Gray, dessicated, hard. (CAP<br>As above. | |
| 5 | 4.0<br>6.0 | SPT-3 | 13.2 / 24 | 10-14-50 for 4 inches | | |
| | 6.0<br>8.0 | SPT-4 | 24 /24 | 8-19-25-27 | As above<br>SAND (SP), Brown, moist, loose, medium sand. | |
| | 8.0<br>10.0 | SPT-5 | 24 /24 | 21-15-21-21 | SILTY SAND (SM), Black, moist, medium sand. | |
| 10 | 10.0<br>12.0 | SPT-6 | 13.2 / 14 | 8-12-7-10 | SAND (SP), Brown, moist,loose, medium sand with pieces of rock. | |
| | 12.0<br>14.0 | SPT-7 | 21.6 / 14 | 8-6-4-5 | SAND (SW) Brown, wet, loose, medium sand. | Collect groundwater grab sample 12-15 feet bgs. Collect soil sample 8-10 feet bgs. |
| 15 | 14.0<br>16.0 | SPT-8 | 18 / 24 | 6-5-11-9 | As above. | |
| | 16.0<br>18.0 | SPT-9 | 21.6 / 24 | 4-6-13-19 | As above.<br>CLAY (CL), Gray, moist, stiff. | |
| 20 | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-19<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 736.79 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT
**START:** 20 Feb 05 **FINISH:** 20 Feb 05 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 22.8 / 24 | 15-22-5-7 | SANDY SILT (ML), Brown, moist, soft, fine sand. (TOPSOIL) | |
| | | | | | SANDY (CL), Gray, dessicated, hard, trace fine gravel. (CAP) | |
| | 2.0<br>4.0 | SPT-2 | 6 / 24 | 8-6-10-12 | As above. | |
| 5 | 4.0<br>6.0 | SPT-3 | 24 / 24 | 6-7-5-4 | SILTY SAND (SM), Brown, moist, medium dense, medium sand. | HS FID=1.98 ppm |
| | 6.0<br>8.0 | SPT-4 | 24 / 24 | 8-8-15 (23) | SILT/CLAY (CL/ML), Brown/Gray, moist, firm, bits of concrete, brick, grass, no odor, no sheen. | HS FID=8.3 ppm<br>DNAPL Spray Test - Negative |
| | 8.0<br>10.0 | SPT-5 | 6 / 24 | 5-50 for 1 inch | As above. | Cobble in sampler tip cause of poor recovery. |
| 10 | 10.0<br>12.0 | SPT-6 | 6 / 24 | 11-24-34-36 | SILT (ML), Brown, moist, firm. | DNAPL Spray Test - Negative<br>Cobble in sampler tip cause of poor recovery. |
| | 12.0<br>14.0 | SPT-7 | 6 / 24 | 11-12-16-16 | SANDY SILT (ML), Brown, moist, medium sand. | HS FID=34 ppm<br>Cobble in sampler tip cause of poor recovery. |
| 15 | 14.0<br>16.0 | SPT-8 | 12 / 24 | 7-7-15-12 | SILT (ML), Brown, moist, firm, odor, sheen. | HS FID=7.3 ppm<br>DNAPL Spray Test - negative |
| | 16.0<br>18.0 | SPT-9 | 6 / 24 | 7-11-14-15 | SANDY SILT (ML), Brown, wet, firm, odor, sheen. | HS FID=161 ppm<br>DNAPL Spray Test - negative |
| | | | | | CLAY (CL), Gray, moist, firm, some gravel (TILL). | Collect groundwater grab sample 13-18 feet bgs and soil sample 16-18 feet bgs. |
| 20 | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-20<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 734.97 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 55 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 02/21/05 **FINISH:** 02/21/05 **LOGGER:** R. Stryker

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 24 / 24 | 11-15-9-9 | SANDY SILT (ML), Brown, moist, soft, fine sand. (TOPSOIL) | |
| | | | | | SAND (SP), Yellow, moist, loose, medium sand. | HS FID=3 ppm |
| | 2.0<br>4.0 | SPT-2 | 19.2 / 24 | 16-17-15-11 | SILTY SAND (SM), Light brown, loose, moist, fine sand.. | |
| | | | | | SILTY SAND (SM), Brown, moist, medium dense, fine sand, trace fine gravel. | HS FID=4 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 24 / 24 | 10-12-13-13 | | HS FID=32 ppm |
| | 6.0<br>8.0 | SPT-4 | 0 / 24 | 6-11-13-15 | | |
| | 8.0<br>10.0 | SPT-5 | 18 / 24 | 6-7-11-11 | As above. | HS FID=8 ppm |
| | | | | | SAND (SP), Gray, moist, medium, some fine gravel. | Collect soil sample 4-6 feet bgs. Groundwater insufficient to obtain sample. |
| 10 | 10.0<br>12.0 | SPT-6 | 18 / 24 | 11-15-19-21 | SAND (SP), Golden brown, moist, loose, medium sand, trace fine gravel. | HS FID=5 ppm |
| | 12.0<br>14.0 | SPT-7 | 20.4 / 24 | 4-6-13-19 | CLAYEY SILT (CL-ML), Gray, moist, stiff, some fine sand. | HS FID=8 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 13.2 / 24 | 9-10-12-14 | | HS FID=5 ppm |
| | | | | | SANDY SILT (ML), Gray, moist, stiff, trace fine angular gravel. (TILL) | |
| | | | | | End of Boring | |
| 20 | | | | | | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-21<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 736.58 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 55 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 02/21/2005 **FINISH:** 02/21/2005 **LOGGER:** R. Stryker

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY) | COMMENTS (DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID) |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | 0<br>2.0 | SPT-1 | 24 / 24 | 12-14-14-14 | SILTY SAND (SM), Brown, moist, loose, fine sand. (TOPSOIL) | HS FID= 3 ppm |
| | 2.0<br>4.0 | SPT-2 | 24 / 24 | 8-11-12-9 | SANDY CLAY (CL), Gray, dessicated, hard. (CAP)<br>SILTY SAND (SM), Brown, moist, odor. | HS FID= 209 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 9.6 / 24 | 7-9-6-8 | SILTY SAND (SM), Brown, moist, medium density, fine sand, some fine gravel. | HS FID= 989 ppm |
| | 6.0<br>8.0 | SPT-4 | 0 / 24 | 13-8-7-6 | | |
| | 8.0<br>10.0 | SPT-5 | 19.2 / 24 | 3-4-6-12 | SAND WITH SILT (SM), Brown, moist, medium density, fine sand. | HS FID= 843 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 4.8 / 24 | 4-5-4-3 | SILTY SAND (SM), Gray, moist, medium density, fine sand. | HS FID= 413 ppm |
| | 12.0<br>14.0 | SPT-7 | 21.6 / 24 | 5-4-3-6 | SILTY SAND (SM), Gray, moist, medium density, fine sand. | HS FID= 182 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 24 / 24 | 9-10-9-9 | SAND (SP), Gray, wet, loose, medium grain. | HS FID= 28 ppm<br>Collect groundwater grab sample (16-21 feet bgs) and soil sample (4-10 feet bgs.) |
| | 16.0<br>18.0 | SPT-9 | 14.4 / 24 | 3-3-3-4 | SILT (ML), Gray, wet, soft. | HS FID= 7 ppm |
| | 18.0<br>20.0 | SPT-10 | 24 / 24 | 5-8-7-10 | As above. | |
| 20 | 20.0<br>22.0 | STP-11 | 18 / 24 | 5-13-21-29 | SANDY SILT (ML), Gray, moist, hard, trace fine gravel. (TILL) | HS FID= 4 ppm<br>HS FID= 4 ppm |
| | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-22<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 731.59 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT
**START:** 21 Feb 05 **FINISH:** 21 Feb 05 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | 0<br>2.0 | SPT-1 | 16.8 / 24 | 8-6-5-5 | SILT (ML), Brown, moist, firm, some fine gravel. | |
| | 2.0<br>4.0 | SPT-2 | 24 / 24 | 12-18-30-50 | SANDY CLAY (CL), Gray, dessicated, hard. | Cobble in sampler causing poor recovery |
| | | | | | As above. | |
| 5 | 4.0<br>6.0 | SPT-3 | 9.6 / 24 | 8-12-18-11 | SAND (SW), Yellow -brown, angular, loose, medium sand, some fine gravel. | HS FID=12 ppm HS PID=1.9 ppm |
| | 6.0<br>8.0 | SPT-4 | 15.6 / 24 | 8-15-24-34 | As above.<br>As above. | HS FID=21.6 ppm |
| | 8.0<br>10.0 | SPT-5 | 19.2 / 24 | 4-6-19-24 | As above, wet.<br>CLAY (CL), Gray with black staining, stiff, hydrocarbon odor. | HS FID=41 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 24 / 24 | 7-11-18-18 | SILT (ML), Brown, wet, stiff, approximately 30% very fine sand, hydrocarbon odor.<br>As above. | HS FID=41 ppm |
| | 12.0<br>14.0 | SPT-7 | 24 / 24 | 4-6-14-016 | SILT (ML), Gray, moist, very stiff, some fine gravel and clay (TILL). | Collect groundwater grab sample 8.3-13.3 feet bgs and soil sample 10-12 feet bgs. |
| 15 | | | | | End of Boring | |
| 20 | | | | | | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-23<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** 6' N. of Weston F12

**ELEVATION:** 734.39 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 2/15/05 **FINISH:** 2/15/05 **LOGGER:** T. Von Wallmerich, S. Saxena, R. Stryker

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 21.6 / 24 | 4-7-8-12 | SANDY CLAY (CL), Brown to dark brown, pocket (4") of SW at 0.7 - 1.1',moist, stiff. | |
| | 2.0<br>4.0 | SPT-2 | 24 / 24 | 10-11-11-12 | As, above, pocket (4") of fine to very fine sand at 3.5', very stiff. | |
| 5 | 4.0<br>6.0 | SPT-3 | 24 / 24 | 5-11-13-15 | SAND WITH CLAY (SW-SC), Brown/yellowish, moist, fine to coarse, occasional fine gravel, medium dense. | HS PID=0 ppm<br>DNAPL Spray Test - Negative |
| | 6.0<br>8.0 | SPT-4 | 15.6 / 24 | 6-3-3-4 | SANDY CLAY (CL), Brown/yellowish, moist.<br>SANDY CLAY (CL), Brown/grayish, occasional gravel, green and yellow mottling | 1 inch pipe fragments in cuttings from 6.5 feet bgs. |
| | 8.0<br>10.0 | SPT-5 | 0 / 24 | 100/3" | Concrete | Driller reports slight odor, BZ PID=0 ppm<br>Concrete slab 8.5 feet bgs, abandon hole and reposition 2 feet north. |
| 10 | | | | | | |
| | 12.0<br>14.0 | SPT-7 | 2.4 / 24 | 12-9-6-7 | SILTY SAND (SM), Brown, moist, medium density, fine sand, some fine gravel | Drill through concrete 8.5-12.5 feet bgs. |
| 15 | 14.0<br>16.0 | SPT-10 | 0 / 24 | 19-20-19-22 | | HS FID=9 ppm<br>Sampler became unthreaded and lost down hole, abandon hole and repositon 4 feet south. |
| | 16.0<br>18.0 | SPT-12 | 12 / 24 | 9-15-8-8 | SAND (SP), Gray to brown, wet, loose, medium sand, some fine gravel, pungent odor.<br>SILTY CLAY (CL-ML), Gray, wet, some fine gravel, odor. (TILL) | HS FID=108 ppm<br>Collect groundwater grab sample (14-19 feet bgs) and soil sample (16-18 feet bgs.) |
| | 18.0<br>20.0 | SPT-13 | 12 / 24 | 8-9-13-18 | | HS FID=31 ppm |
| 20 | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-24<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.70 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 2 Feb 05 **FINISH:** 2 Feb 05 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | 0<br>2.0 | SPT-1 | 24 / 24 | 8-5-6-9 | SANDY SILT (ML), Brown, moist, fine sand, roots. (TOPSOIL) | |
| | | | | | SANDY CLAY (CL), Gray, dessicated, hard, trace gravel. (CAP) | |
| | 2.0<br>4.0 | SPT-2 | 24 / 24 | 14-13-9-27 | As above. | HS FID=6.2 ppm HS PID=0 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 24 / 24 | 18-30-22-34 | BRICK WITH WOOD, crushed loose brick and wood fragments. | |
| | 6.0<br>8.0 | SPT-4 | 0 / 24 | 6-12-8-8 | | Concrete in tip of sampler. |
| | 8.0<br>10.0 | SPT-5 | 20.4 / 24 | 4-5-7-8 | SAND (SP), Brown, wet, loose, angular, coarse sand, some black staining in bands.. | HS FID=78 ppm HS PID=.8 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 24 / 24 | 5-8-10-13 | As above. | HS FID=107 ppm HS PID=5.8 ppm |
| | 12.0<br>14.0 | SPT-7 | 21.6 / 24 | 10-8-8-13 | | Collect groundwater grab sample 8.4-13.4 feet bgs and soil sample 10-13 feet bgs. |
| | | | | | CLAY (ML), Gray, moist, firm to hard, low plasticity, trace gravel. (TILL) | HS FID=108 ppm |
| 15 | | | | | End of Boring | |
| 20 | | | | | | |
| 25 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-25<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 743.87 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 55, 3/4 HSA - Split Spoon Sampler (2 1/2" diameter)

**START:** 3/18/05 **FINISH:** 3/18/05 **LOGGER:** R. Stryker

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 24 / 24 | 15-15-12-14 | SILT (ML), Brown, moist, soft, roots. (TOPSOIL) | |
| | | | | | SILTY SAND (SM), Brown, moist, loose, fine sand. | |
| | 2.0<br>4.0 | SPT-2 | 9.6 / 24 | 2-2-5-2 | CLAYEY SILT (ML), Brownish gray, moist, soft, some fine sand. | HS PID=0.5 ppm<br>HS PID=1.1 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 12 / 24 | 5-5-5-5 | As above. | HS PID=1.1 ppm |
| | 6.0<br>8.0 | SPT-4 | 24 / 24 | 4-5-5-5 | CLAYEY SILT (ML), Brown, moist, some fine sand and gravel. | HS PID=0.6 ppm |
| | 8.0<br>10.0 | SPT-5 | 10.8 / 24 | 2-3-3-3 | SANDY SILT (ML), Brownish gray, moist, some fine gravel. | HS PID=0.5 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 14.4 / 24 | 2-2-3-3 | As above | HS PID=1.1 ppm |
| | 12.0<br>14.0 | SPT-7 | 21.6 / 24 | 2-2-5-9 | SANDY SILT (ML), Brownish gray, moist, some fine sand and gravel, strong brine odor. | HS PID=48 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 21.6 / 24 | 3-5-9-10 | As above. | HS PID=28 ppm |
| | 16.0<br>18.0 | SPT-9 | 18 / 24 | 16-16-14-15 | SAND(SP), Brown, dry, loose, medium sand with fine gravel. | HS PID=6 ppm |
| | 18.0<br>20.0 | SPT-10 | 10.8 / 24 | 7-8-10-10 | As above. | HS PID=4 ppm |
| 20 | 20.0<br>22.0 | SPT-11 | 4.8 / 24 | 2-4-5-8 | As above. | HS PID=2 ppm |
| | 22.0<br>24.0 | SPT-12 | 18 / 24 | 4-7-10-14 | SILT (ML), Light brown, moist, soft, trace fine sand. | HS PID=2 ppm |
| 25 | 24.0<br>26.0 | SPT-13 | 9.6 / 24 | 4-10-10-14 | As above. | HS PID=0.9 ppm |
| | 26.0<br>28.0 | SPT-14 | 24 / 24 | 10-16-16-21 | As above. | HS PID=0.5 ppm |
| | 28.0<br>30.0 | SPT-15 | 13.2 / 24 | 8-12-26-21 | SAND(SP), Grayish brown, moist, loose, coarse sand with fine gravel. | HS PID=0.2 ppm |
| 30 | | | | | SANDY SILT (ML), Grayish brown, moist, stiff, fine sand, trace fine gravel. (TILL) | |
| | | | | | End of Boring | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-26<br>Sheet: 1 of 2 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 747.08 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 55 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 3/18/05 **FINISH:** 3/18/05 **LOGGER:** R. Stryker

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 18 / 24 | 5-5-5-7 | SANDY SILT (ML), Brown, moist, soft, fine sand. (TOPSOIL)<br>SILTY SAND (SM) Brown, moist, fine sand, some fine gravel and organic matter. | |
| | 2.0<br>4.0 | SPT-2 | 18 / 24 | 1-13-13-13 | SILTY SAND (SM), Gray, dry, trace fine gravel. | HS PID=0.5 ppm<br>HS PID=0.8 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 13.2 / 24 | 3-4-9-11 | SILTY SAND (SM), Brown, dry some fine gravel. | HS PID=0.3 ppm<br>HS PID=0.5 ppm |
| | 6.0<br>8.0 | SPT-4 | 15.6 / 24 | 6-12-15-15 | As above. | HS PID=1.1 ppm |
| | 8.0<br>10.0 | SPT-5 | 20.4 / 24 | 6-8-12-15 | As above, dark brown | HS PID=0.6 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 21.6 / 24 | 6-6-12-13 | As above with brine odor. | HS PID=1.2 ppm |
| | 12.0<br>14.0 | SPT-7 | 21.6 / 24 | 3-3-3-5 | SANDY SILT (ML), Black staining, petro (cyanide) odor. | HS PID=33 ppm<br>Collect soil sample 12-14 feet bgs. |
| 15 | 14.0<br>16.0 | SPT-8 | 24 / 24 | 2-2-2-2 | SILT (ML), Light gray, very soft. | HS PID=4 ppm |
| | 16.0<br>18.0 | SPT-9 | 18 / 24 | 2-2-1-1 | SILT (ML), Dark gray and brown mottle, very soft. | HS PID=6 ppm |
| | 18.0<br>20.0 | SPT-10 | 24 / 24 | 1-1-1-3 | As above. | HS FID=3 ppm<br>HS FID=1.2 ppm |
| 20 | 20.0<br>22.0 | SPT-11 | 9.6 / 24 | 2-2-2-3 | SILTY SAND (SM), Grayish brown, dry, medium density, fine sand, some fiine gravel. | HS FID=1.8 ppm |
| | 22.0<br>24.0 | SPT-12 | 10.8 / 24 | 11-16-31-27 | SAND (SW), Gray, moist, loose, medium sand, some fine gravel. | |
| 25 | 24.0<br>26.0 | SPT-13 | 15.6 / 24 | 6-7-10-15 | As above | HS FID=2.0 ppm |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBS-26 **Sheet:** 2 of 2

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 747.08 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 55 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 3/18/05 **FINISH:** 3/18/05 **LOGGER:** R. Stryker

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY) | COMMENTS (DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID) |
|---|---|---|---|---|---|---|
| | | | | | SILT (ML), Brown, moist, firm, some fine gravel. | |
| | 26.0<br>28.0 | SPT-14 | 18 /24 | 3-6-10-16 | SILT (ML), Brown gray, moist, firm, some fine sand. | HS FID=1.7 ppm |
| | 28.0<br>30.0 | SPT-15 | 18 / 24 | 7-15-19-30 | SAND (SP), Gray, wet, loose, medium sand. | HS FID=1.1 ppm<br>Collect groundwater grab sample 28-33 feet bgs. |
| 30 | 30.0<br>32.0 | SPT-16 | 14.4 / 24 | 3-5-5-12 | As above. | HS FID=1.5 ppm |
| | 32.0<br>34.0 | SPT-17 | 21.6 / 24 | 7-15-38-50 for 5 inches | CLAYEY SILT (ML), Gray, moist, stiff, trace fine gravel. | HS FID=0.6 ppm |
| 35 | | | | | End of Boring | |
| 40 | | | | | | |
| 45 | | | | | | |
| 50 | | | | | | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-27<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 731.16 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 55 HSA 4 1/4" ID - 140 lb Autohammer SPT

**START:** 3/23/05 **FINISH:** 3/23/05 **LOGGER:** R. Stryker

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY) | COMMENTS (DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID) |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | 0<br>2.0 | SPT-1 | 21.6 / 24 | 7-15-10-8 | SANDY SILT (ML), Brown, moist, soft, fine sand. (TOPSOIL) | |
| | | | | | SANDY SILT (ML), Brown, dry, some fine gravel. (CAP) | |
| | 2.0<br>4.0 | SPT-2 | 6 / 24 | 9-16-21-21 | As above. | HS PID=0.2 ppm<br>HS PID=0.4 ppm<br>Collect soil sample 4-6 feet bgs. |
| 5 | 4.0<br>6.0 | SPT-3 | 21.6 / 24 | 4-10-12-15 | SILTY SAND (SM), Brown, moist, fine sand, some fine gravel, brine odor. | HS PID=9 ppm |
| | 6.0<br>8.0 | SPT-4 | 19.2 / 24 | 4-5-8-14 | CLAYEY SILT (ML), Brown and gray mottle, most, soft, some fine sand.<br>As above, magnesium oxide present. | HS FID=0.6 ppm<br>HS PID=3 ppm |
| | 8.0<br>10.0 | SPT-5 | 2.4 / 24 | 2-2-2-1 | As above, wet, magnesium oxide present. | HS FID=0.8 ppm<br>Encounter obstuction at 8.6 feet bgs. Reposition, blind drill to 8 feet bgs. |
| 10 | 10.0<br>1.0 | SPT-6 | 21.6 /24 | 1-1-1-1 | As above, wet, magnesium oxide present. | HS PID=0 ppm |
| | 12.0<br>14.0 | SPT-7 | 0 / 24 | WHO-1-1 | | |
| 15 | 14.0<br>16.0 | SPT-8 | 21.6 /24 | 1-3-3-12 | As above, wet, magnesium oxide present. | HS PID=0 ppm |
| | | | | | SAND (SP), Black, moist, medium sand, some fine gravel, stained. | HS PID=0 ppm |
| | 16.0<br>18.0 | SPT-9 | 14.4 /24 | 4-4-9-10 | SANDY SILT (ML), Dark brown, moist, soft.<br>SAND (SP), Brown, wet, loose, medium. | Collect groundwater grab sample 15-20 feet bgs. |
| 20 | 18.0<br>20.0 | SPT-10 | 13.2 /24 | 6-6-10-14 | CLAYEY SILT (ML), Brownish gray, moist, stiff, some fine sand, trace fine gravel. (TILL). | HS PID=0 ppm |
| | 20.0<br>22.0 | SPT-11 | 12 / 24 | 4-8-14-14 | As above. | |
| 25 | | | | | | |

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| PROJECT NUMBER: 321099.EN.01 | BORING NUMBER: SBS-28<br>Sheet: 1 of 1 |
|---|---|

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 732.64 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT
**START:** 4/6/05 **FINISH:** 4/6/05 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| 0 | | | | | Ground Surface | |
| | 0<br>2.0 | SPT-1 | 19.2 / 24 | 4-6-6-12 | SANDY SILT (ML), Brown, moist, soft, fine sand. (TOPSOIL)<br>SAND (SW), Brown, moist, loose, coarse sand. | |
| | 2.0<br>4.0 | SPT-2 | 12 / 24 | 12-17-17-14 | SILT (ML), Brown-gray, dessicated, hard. (CAP)<br>As above. | BZ=0 ppm, HS=0 ppm |
| 5 | 4.0<br>6.0 | SPT-3 | 14.4 / 24 | 17-16-15-14 | As above. | Refusal at 6 feet bgs, repositon 10 feet north, blind drill to 6 feet bgs. |
| | 6.0<br>8.0 | SPT-4 | 20.4 / 24 | 3-4-4-6 | As above<br>SILTY SAND (SP), Moist, loose, medium sand, some fine gravel. | HS PID=20.4 ppm<br>Rock in shoe |
| | 8.0<br>10.0 | SPT-5 | 16.8 / 24 | 3-4-5-7 | SAND (SW), Brown with black mottles, moist to wet, loose, medium sand. | HS PID=23.4 ppm<br>HS PID=87 ppm |
| 10 | 10.0<br>12.0 | SPT-6 | 20.4 / 24 | 2-2-2-2 | As above, strong solvent odor<br>As above ,wet, strong solvent odor | BZ=0 ppm<br>HS PID=167 ppm<br>Collect groundwater grab sample 11-16 feet bgs. |
| | 12.0<br>14.0 | SPT-7 | 24 / 24 | 1-4-7-10 | As above, wet, strong solvent odor | BZ=0 ppm<br>Collect soil sample 12-16 feet bgs.<br>HS PID=185 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 24 / 24 | 1-5-8-8 | As above, wet, strong solvent odor.<br>SILT (ML), Gray, moist, hard, firm, some gravel. | HS PID=193 ppm |
| 20 | | | | | End of Boring | |
| 25 | | | | | | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **BORING NUMBER:** SBS-29 **Sheet:** 1 of 1

# SOIL BORING LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 732.85 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 750 HSA 4 1/4" ID - 140 lb Autohammer SPT
**START:** 4/7/05 **FINISH:** 4/7/05 **LOGGER:** J. Myers

| DEPTH BELOW | SAMPLE INTERVAL | SAMPLE TYPE AND NUMBER | SAMPLE RECOVERY (IN) | STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" | SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY | COMMENTS: DEPTH OF CASING, TESTS, INSTRUMENTATION AND AIR MONITORING BZ=Breathing zone PID HS=Headspace PID |
|---|---|---|---|---|---|---|
| | | | | | Ground Surface | |
| 0 | 0<br>2.0 | SPT-1 | 22.8 / 24 | 6-7-10-10 | SANDY SILT (ML), brown, moist, fine sand. (TOPOSIL)<br>SAND (SP ), Brown, loose, medium sand. | HS PID=0 ppm |
| | 2.0<br>4.0 | SPT-2 | 20.4 / 24 | 5-6-7-10 | SANDY CLAY (CL), Gray,dessicated, hard ,fine sand, trace fine gravel. (CAP).<br>As above. | |
| 5 | 4.0<br>6.0 | SPT-3 | 19.2 / 24 | 4-8-12-20 | As above.<br>SILTY SAND (SM), Brown, dry, loose, medium sand. | HS PID=3 ppm |
| | 6.0<br>8.0 | SPT-4 | 16.8 / 24 | 2-2-3-3 | As above.<br>SAND (SW), Brown, wet to moist, fine to coarse, no odor, trace fine gravel. | HS PID=5.2 ppm<br>HS PID=4.5 ppm |
| | 8.0<br>10.0 | SPT-5 | 19.2 / 24 | 2-2-3-4 | | |
| 10 | 10.0<br>12.0 | SPT-6 | 20.4 / 24 | 2-2-5-5 | As above, wet. | |
| | 12.0<br>14.0 | SPT-7 | 19.2 / 24 | 3-5-9-9 | As above, saturated. | HS PID=6 ppm<br>HS PID=15.2 ppm |
| 15 | 14.0<br>16.0 | SPT-8 | 21.6 / 24 | 4-9-7-10 | As above, saturated. | Collect groundwater grab sample (12.87-17.87 feet bgs.) and soil sample (15-17 feet bgs.). |
| | 16.0<br>18.0 | SPT-9 | 21.6 / 24 | 5-7-12-18 | SILT (ML), Gray, moist, stiff, trace, angular gravel. | |
| 20 | | | | | End of Boring | |
| 25 | | | | | | |

# Well Completion Diagrams

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **WELL NUMBER:** MW16-D2a | **Sheet:** 1 of 3

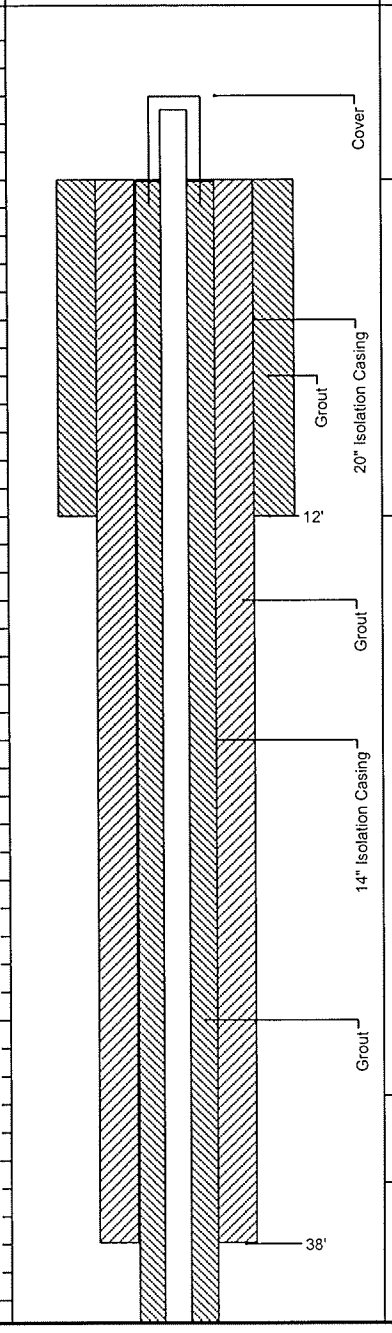
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 727.66 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA and 5ft CME sampler

**START:** 08 Jan 04 **FINISH:** 29 Mar 05 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| -5 |  | | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 20 inches<br>Type of Joints: None |
| 0 | | Ground Surface | |
| 5 | | | ISOLATION CASING #2<br>Material: Type 316 Steel<br>Diameter: 14 inches<br>Type of Joints: Welded |
| 10 | | | WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: Threaded |
| 15 | | SILT (ML),Orange (oxidized), moist, stiff-hard, fine sand in partings, some clay, trace subangular gravel. (TILL)<br>As above, gray.<br>4.6-inches gray, wet, loose, medium sand with gravel at 16.3 feet bgs. | WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches |
| 20 | | SILT (ML), Gray, moist, stiff-hard, sand in partings, some clay, trace fine gravel. (TILL)<br>As above. | DEVELOPMENT<br>Development Method: Pump<br>Time: 1.5 hrs 03-31-05 plus 1/2 hour w/surge block prior to grout |
| 25 | | SILT (ML), Gray, moist to dry, hard, some fine sand and clay, trace fine to coarse subangular gravel. (TILL) | |
| 30 | | As above. | COMMENTS<br>Filter Pack: Well Gravel (K&I Well gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids)<br>Well Grout: AquaGuard (Baroid Drilling Fluids)<br>Grout Method: Tremie pipe<br>Steel locking cover with 3 protective bollards, 2' round pad |
| 35 | | SILTY SAND (SM), Gray, moist, loose, slightly cohesive, very fine sand. | |
| 40 | | SILT (ML), Gray, moist to dry, very hard, some sand, little clay, trace gravel subangular, fine to coarse. (TILL) | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW16-D2a<br>Sheet: 2 of 3 |
|---|---|

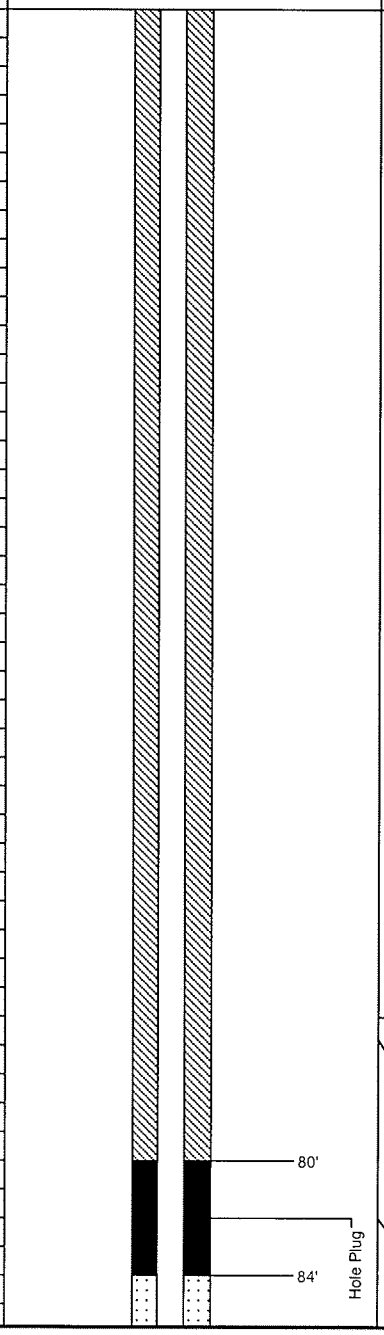
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 727.66 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA and 5ft CME sampler

**START:** 08 Jan 04 **FINISH:** 29 Mar 05 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| 45 |  | CLAYEY SILT (ML), Grayish brown, moist, hard, fine sand in partings and trace subangular gravel. (TILL) | |
| 50 | | As above.<br>6-inch, wet, medium to fine, sand seam at 48.0 feet bgs.<br>As above<br>As above. | |
| 55 | | As above.<br>As above. | |
| 60 | | As above.<br>As above. | |
| 65 | | SILT (ML), Brownish gray, moist, very stiff, with very fine sand, some fine to coarse gravel. (TILL) | |
| 70 | | As above, more sand | |
| 75 | | As above<br>SILTY SAND (SM), Brown gray, moist, dense, fine to mediuam sand, some gravel. | |
| 80 | | SAND (SP), Brownish yellow, saturated, dense, fine to medium sand.<br>4-inch silty sand brownish gray, moist, dense, fine to medium sand at 77.6 feet bgs.<br>As above. | |
| 85 | | As above, some fine angular gravel.<br>SAND (SW), Brownish yellow, saturated, dense, medium to coarse sand, trace fine gravel. | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW16-D2a<br>Sheet: 3 of 3 |
|---|---|

# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 727.66 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA and 5ft CME sampler

**START:** 08 Jan 04 **FINISH:** 29 Mar 05 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| 90<br>95<br>100<br>105<br>110<br>115<br>120<br>125<br>130 | 86'<br>Sand<br>Screen<br>91' | End boring | |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **WELL NUMBER:** MW17-D2 | **Sheet:** 1 of 2

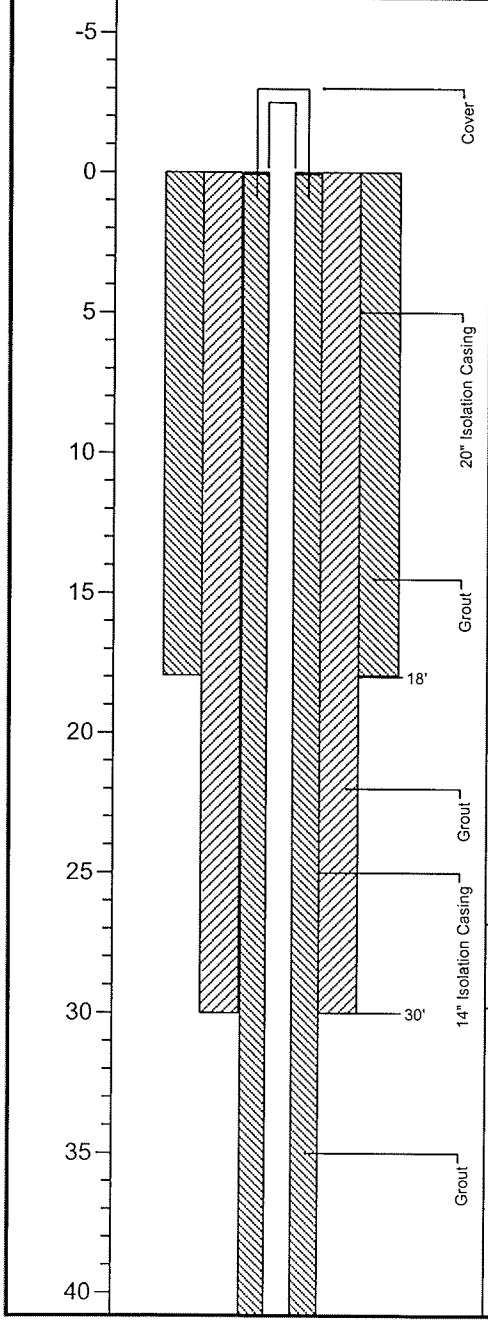
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 731.87 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25HSA; 2ft split spoon and 5ft CME samplers

**START:** 02 Nov 04 **FINISH:** 19 Mar 05 **LOGGER:** J. Myers




| SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|
| Ground Surface | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 20 inches<br>Type of Joints: None |
| SILTY SANDY CLAY (CL), Gray, very stiff, compacted, some with gravel. (CAP) | ISOLATION CASING #2<br>Material: Type 316 Steel<br>Diameter: 14 inches<br>Type of Joints: Welded |
| GRAVEL (GP), Black, some sand. | |
| SAND (SP), Brown, loose, medium sand, shell fragments. | WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: Threaded |
| 6-inches brown silty fine sand at 9 feet bgs. | |
| SAND (SP), Brown, wet, loose, coarse sand, with shell fragments. | |
| SILTY SAND (SM), Brown, wet, fine. | |
| SAND (SP), Brown, wet, medium, with shell fragments. | WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches |
| As above with gravel. | |
| CLAYEY SILT (ML) Gray, stiff, trace fine gravel. | |
| CLAYEY SILT (ML), Brownish-gray, moist, stiff, some fine sand, trace gravel. (TILL) | DEVELOPMENT<br>Development Method: Pump<br>Time: 1 hr 11-19-04 plus 1/2 hour w/surge block prior to grout |
| As above. | |
| CLAYEY SILT (ML), Gray, moist, hard, fine sand in partings, trace fine gravel. (TILL) | |
| GRAVEL (GP) Browm,wet, some medium sand and fines. | |
| CLAYEY SANDY SILT (ML), Brownish gray, moist to dry, hard, massive non-plastic, trace subangular gravel. (TILL) | COMMENTS<br>Filter Pack: Well Gravel (K&I Well Gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids)<br>Well Grout: AquaGuard (Baroid Drilling Fluids)<br>Well Grout Method: Tremie pipe<br>Steel locking cover with 3 protective bollards, 2' round pad |
| As above. | |
| As above, possible laminations. | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW17-D2<br>Sheet: 2 of 2 |
|---|---|

# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 731.87 **DRILLING CONTRACTOR:** Mateco
**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25HSA; 2ft split spoon and 5ft CME samplers
**START:** 02 Nov 04 **FINISH:** 19 Mar 05 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| 45 | | 1-inch wet, brown, fine, gravel at 29.8 feet bgs.<br>As above.<br>As above.<br>As above.<br>As above. | |
| 50 | | As above. | |
| 55 | | As above, more sand. | |
| 60 | | As above. | |
| 65 | | SILTY SAND (SM), Grayish-brown, moist, medium dense, very fine sand.<br>SILT (ML), Grayish-brown, moist, firm, laminated.<br>SAND (SP), Yellowish-gray brown, wet, loose, fine. | |
| 70 | 68'<br>Hole Plug<br>72' | SAND (SP), grayish-yellow, moist, medium dense, fine sand.<br>As above. | |
| 75 | Sand<br>75' | CLAYEY SILT (ML), Grayish-brown, moist, stiff, low plasticity, laminated. | |
| 80 | Screen<br>80' | SAND (SP), Gray yellow, moist, medium dense, medium to fine sand.<br>End boring | |
| 85 | | | |

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| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW-22I<br>Sheet: 1 of 1 |
|---|---|

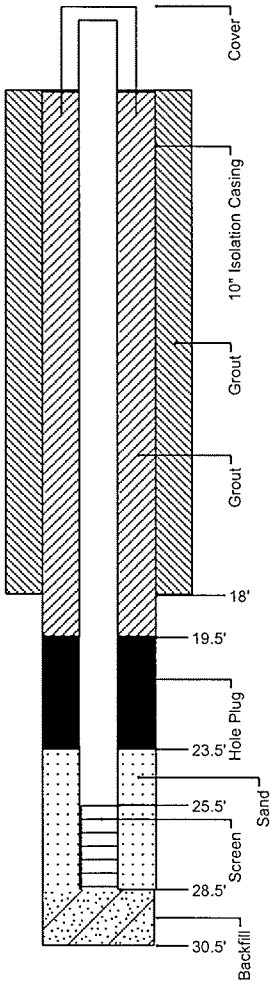
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 728.11 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 02 Nov 04 **FINISH:** 16 Nov 04 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| -5<br>0<br>5<br>10<br>15<br>20<br>25<br>30<br>35<br>40 |  | Ground Surface<br>SAND (SW), Brown, moist, coarse, with gravel.<br>SANDY CLAY (CL), Gray, desiccated hard. (CAP)<br>SAND (SW), Brown, moist, medium to coarse sand with gravel.<br>GRAVEL (GW), Brown, fine.<br>SAND (SW), Brown, wet, medium to coarse sand with gravel.<br>As above.<br>As above.<br>SILT (ML), gray, stiff, some clay and fine sand, trace subangular gravel.<br>SILT (ML), Gray, moist to dry, low plasticity, some clay and fine sand, trace subangular gravel. (TILL)<br>As above.<br>GRAVEL (GM), gray, moist, fine to coarse, cemented with fines and sand.<br>SAND (SP) Gray, wet, loose, fine to coarse sand.<br>CLAYEY SILT (ML), Gray, moist to dry, hard, low plasticity, some fine gravel. (TILL)<br>SAND (SP), Gray to brown wet, loose, medium sand.<br>CLAY WITH SILT (CL), Gray, dry, low plasticity, some fine gravel. (TILL)<br>End boring | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 10 inches<br>Type of Joints: None<br><br>WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: Threaded<br><br>WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches<br><br>DEVELOPMENT<br>Development Method: Pump<br>Time: 3 hrs 11-16-04 plus 1/2 hour w/surge block prior to grout<br><br>COMMENTS<br>Filter Pack: Well Gravel (K&I Well Gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids)<br>Well Grout: AquaGuard (Baroid Drilling Fluids)<br>Grout Method: Tremie pipe<br>Backfill: Hole plug bentonite chips (Baroid Drilling Fluids) and Well gravel (K&I Well Gravel)<br>Backfill Method: Gravity filled<br>Steel locking cover with 3 protective bollards, 2' round pad |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW23-I<br>Sheet: 1 of 2 |
|---|---|

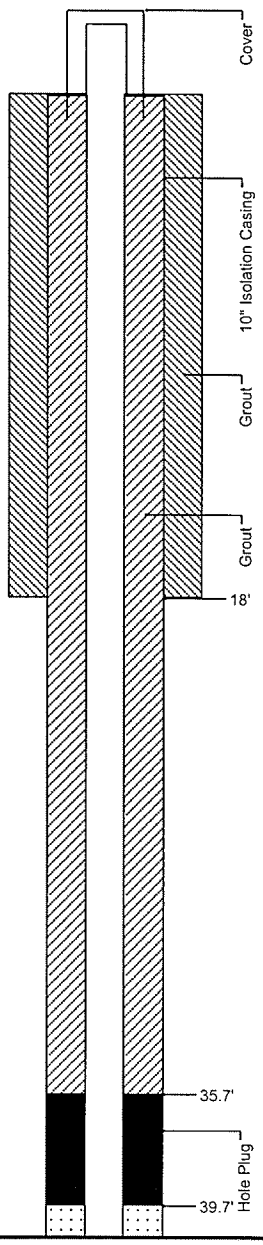
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 733.04 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 45 and 95 with 4.25 HSA with 2ft split spoon & 5ft CME samplers

**START:** 04 Nov 04 **FINISH:** 23 Nov 04 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| -5<br>0<br>5<br>10<br>15<br>20<br>25<br>30<br>35<br>40 |  | Ground Surface<br>CLAY (CL), Gray, desiccated, hard, some fine sand, trace gravel. (CAP)<br>SAND (SP), Brown to black with orange mottles, moist, medium to fine.<br>SAND (SP), Yellowish-brown, moist, medium.<br>As above.<br>As above, wet, coarse.<br>SILT (ML), gray, moist, stiff, massive, non-plastic<br>As above.<br>As above.<br>SILT (ML), Gray, moist, hard, massive, non-plastic, some medium sand, trace fine to coarse gravel. (TILL)<br>SAND (SW), Gray with oxidation stains, moist, loose, medium sand with some gravel.<br>SILT (ML), Gray, moist to dry, hard massive, non-plastic, slight hydrocarbon odor, some clay, trace angular gravel. (TILL)<br>As above, sand in partings, no odor.<br>As above, no odor.<br>As above, sandy, no odor.<br>As above, no odor, less sand.<br>SILT (ML), Gray, moist to wet, stiff, wth clay, laminated. | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 10 inches<br>Type of Joints: None<br><br>WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: Threaded<br><br>WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches<br><br>DEVELOPMENT<br>Development Method: Pump<br>Time: 1.5 hrs 11-23-04 plus 1/2 hour w/surge block prior to grout<br><br>COMMENTS<br>Filter Pack: Well Gravel (K&I Well Gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids)<br>Well Grout: AquaGuard (Baroid Drilling Fluids)<br>Well Grout Method: Tremie pipe<br>Steel locking cover with 3 protective bollards, 2' round pad |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW23-I<br>Sheet: 2 of 2 |
|---|---|

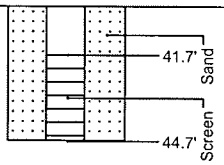
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 733.04 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 45 and 95 with 4.25 HSA with 2ft split spoon & 5ft CME samplers

**START:** 04 Nov 04 **FINISH:** 23 Nov 04 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| 45<br>50<br>55<br>60<br>65<br>70<br>75<br>80<br>85 |  | 1-inch wet, medium sand at 40 feet bgs.<br>SILT (ML) Grayish brown stiff, some clay, varves.<br>SILT (ML), Gray with oxidation stains, with clay and gravel. (TILL)<br>SAND (SP), Grayish-light brown, wet, coarse sand, with fine to coarse subangular gravel.<br>SILT (ML), Gray, moist, hard, with clay and sand, trace subangular gravel. (TILL)<br>End boring | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW-31I<br>Sheet: 1 of 2 |
|---|---|

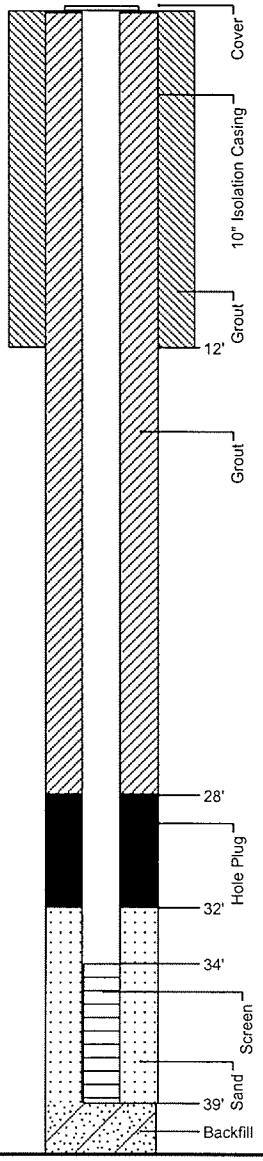
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.10 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 3 Nov 04 **FINISH:** 17 Nov 04 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| -5<br>0<br>5<br>10<br>15<br>20<br>25<br>30<br>35<br>40 |  | Ground Surface<br><br>SAND (SW), Brownish-gray, moist, loose, fine to medium sand.<br>As above.<br>SILT (ML), Gray, moist, dense, cohesive, some fine sand, trace gravel.<br>As above.<br>As above, stiff<br>CLAYEY SILT (ML) Gray, moist, massive, stiff, some fine sand.<br>As above, wet<br>SAND (SP), Gray, wet, coarse with fines and fine gravel.<br>SANDY SILT (SM), Gray, moist, massive.<br>CLAYEY SILT (ML), Gray, moist, hard, trace subangular gravel. (TILL)<br>As above.<br>As above.<br>As above.<br>As above.<br>As above.<br>As above.<br>SANDY SILT (ML), Grayish-brown, moist, soft, fine sand, laminated.<br>SILTY SAND (SM), Gray, saturated very fine sand, gradational, laminations.<br>SILT (ML), Gray, moist, massive. | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 10 inches<br>Type of Joints: None<br><br>WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: Threaded<br><br>WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches<br><br>DEVELOPMENT<br>Development Method: Pump<br>Time: 3 hrs 11-20-04 plus 1/2 hour w/surge block prior to grout<br><br>COMMENTS<br>Filter Pack: Well Gravel (K&I Well Gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids)<br>Well Grout: AquaGuard (Baroid Drilling Fluids)<br>Grout Method: Tremie pipe<br>Backfill: Hole plug bentonite chips (Baroid Drilling Fluids) and Well gravel (K&I Well Gravel)<br>Backfill Method: Gravity fill<br>Flushmount, 2' round pad |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW-31I<br>Sheet: 2 of 2 |
|---|---|

# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.10 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 3 Nov 04 **FINISH:** 17 Nov 04 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| 45 | Backfill<br>45' | CLAYEY SILT (ML), Grayish-brown, moist, hard, trace subangular gravel. (TILL)<br>End boring | |
| 50 | | | |
| 55 | | | |
| 60 | | | |
| 65 | | | |
| 70 | | | |
| 75 | | | |
| 80 | | | |
| 85 | | | |

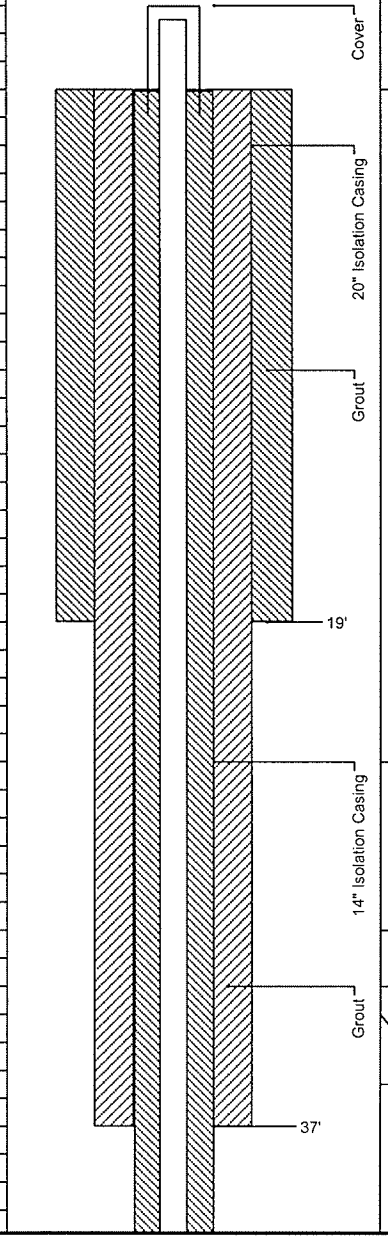
CH2MHILL

**PROJECT NUMBER:** 321099.EN.01

**WELL NUMBER:** MW34-D
**Sheet:** 1 of 2

# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI
**ELEVATION:** 729.87 **DRILLING CONTRACTOR:** Matecto
**DRILLING METHOD AND EQUIPMENT:** CME 95 HSA with 5' CME continous sampler
**START:** 8 Mar 05 **FINISH:** 15 Mar 05 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| -5 to 40 |  | Ground Surface<br>SILT (ML) gray, moist, stiff, some Clay, trace subangular Gravel. (TILL)<br>As above, drier<br>SAND (SP), brown, saturated, loose, medium Sand.<br>SILT (ML), brwon, moist, hard, some Sand, trace subangular Gravel. (TILL)<br>SAND (SP), brown, wet, dense, fine Sand.<br>SILT (ML), brownish-gray, moist, hard, Clayey, some Sand, trace subangular Gravel. (TILL) | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 20 inches<br>Type of Joints: None<br><br>ISOLATION CASING #2<br>Material: Type 316 Steel<br>Diameter: 14 inches<br>Type of Joints: Welded<br><br>WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: Threaded<br><br>WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches<br><br>DEVELOPMENT<br>Development Method: Pump<br>Time: 1 hr 3-15-05 plus 1/2 hour w/surge block prior to grout<br><br>COMMENTS<br>Filter Pack: Well Gravel (K&I Well Gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids)<br>Well Grout: AquaGuard (Baroid Drilling Fluids)<br>Well Grout Method: Tremie pipe<br>Steel locking cover with 3 protective bollards, 2' round pad |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW34-D<br>Sheet: 2 of 2 |
|---|---|

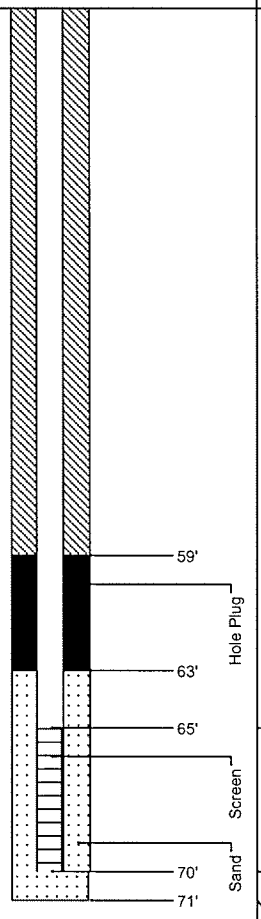
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.87 **DRILLING CONTRACTOR:** Matecto

**DRILLING METHOD AND EQUIPMENT:** CME 95 HSA with 5' CME continous sampler

**START:** 8 Mar 05 **FINISH:** 15 Mar 05 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| 45<br>50<br>55<br>60<br>65<br>70<br>75<br>80<br>85 |  | SILT (ML), brownish-gray, moist, stiff, Clayey, some Sand in partings, trace subangular Gravel. (TILL)<br>As above.<br>As above<br>As above.<br>As above.<br>As above, less sand.<br>As above.<br>As above.<br>As above.<br>As above.<br>As above<br>As above<br>Sand (SW) brown, saturated loose, medium angular Sand, some Gravel<br>SILT (ML), brown, moist, firm, laminated, some Clay.<br>End boring | |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW-34I<br>Sheet: 1 of 1 |
|---|---|

# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.86 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 45/95 HSA with 2' split spoon and 5' CME continous samplers

**START:** 5 Nov 2005 **FINISH:** 9 Feb 2005 **LOGGER:** J. Myers & J. Mallison

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| -5<br>0<br>5<br>10<br>15<br>20<br>25<br>30<br>35<br>40 | Cover<br>20" Isolation Casing<br>Grout<br>14" Isolation Casing<br>16'<br>Grout<br>Grout<br>22'<br>Hole Plug<br>26'<br>28'<br>Sand<br>Screen<br>31'<br>Backfill<br>35.8' | Ground Surface<br>SANDY CLAY (CL) Gray, desiccated, hard. (CAP)<br>GRAVEL (GW) Brown, moist, gravel with glass, concrete, and wood fragments, hydrocarbon odor.<br>SAND (SP), Black, moist, medium dense, hydrocarbon odor, medium sand, some fines..<br>CLAYEY SILT (ML) Gray, wet, medium soft.<br>As above, stiff.<br>SILT (ML), Gray, moist, stiff, some clay, trace subangular gravel. (TILL)<br>SILT (ML), Brown, saturated, stiff, trace sand and fine gravel. (TILL)<br>SAND (SP), Brown, saturated, loose, medium sand, trace gravel and fines.<br>SILT (ML), Brown, saturated, stiff, some fine sand, some clay, trace fine gravel. (TILL)<br>SAND (SP), Brown, saturated, loose, medium sand, some fines, trace fine gravel.<br>SILT(ML), Gray, moist-wet, cohesive, some subangular gravel. (TILL)<br>End boring | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 20 inches<br>Type of Joints: None<br>ISOLATION CASING #2<br>Material: Type 316 Steel<br>Diameter: 14 inches<br>Type of Joints: Welded<br>WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: Threaded<br>WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches<br>DEVELOPMENT<br>Development Method: Pump<br>Time: 2 hrs 2-09-05 plus 1/2 hour w/surge block prior to grout<br>COMMENTS<br>Filter Pack: Well Gravel (K&I Well Gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids) |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **WELL NUMBER:** MW-35I | **Sheet:** 1 of 1

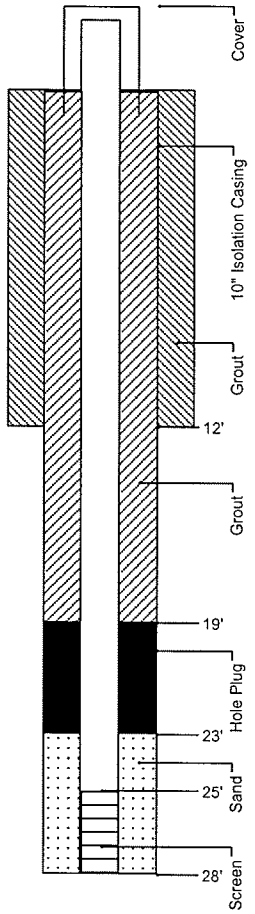
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 721.69 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 55 HSA with 2 ft split spoon and 5' CME continous samplers

**START:** 30 Mar 05 **FINISH:** 1 Apr 05 **LOGGER:** R. Schuth

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| -5<br>0<br>5<br>10<br>15<br>20<br>25<br>30<br>35<br>40 |  | Ground Surface<br>SILT (ML) Reddish-brown, mottled.<br>CLAYEY SILT (ML) Reddish-brown, mottled, medium soft, some coarse sand.<br>SILT (ML) Reddish-brown, moist, very stiff, trace subangular gravel.<br>As above, hard.<br>SILT (ML) Gray, moist-dry, hard, some fine sand, trace fine gravel. (TILL)<br>CLAYEY SILT (ML), Gray, moist-dry, hard, some fine sand, trace fine gravel. (TILL)<br>As above.<br>As above.<br>SANDY SILT (ML), Gray, medium soft, some clay, trace fine gravel. (TILL)<br>SAND (SP), Gray, wet, loose, fine sand.<br>SANDY SILT (ML), Gray, medium soft, some clay, trace fine gravel. (TILL)<br>End boring | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 10 inches<br>Type of Joints: None<br><br>WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: Threaded<br><br>WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches<br><br>DEVELOPMENT<br>Development Method: Whale Pump<br>Time: 1 hr 4-06-05 plus 1/2 hour w/surge block prior to grout<br><br>COMMENTS<br>Filter Pack: Well Gravel (K&I Well Gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids)<br>Well Grout: AquaGuard (Baroid Drilling Fluids)<br>Well Grout Method: Tremie pipe<br>Steel locking cover with 3 protective bollards, 2' round pad |

CH2MHILL

**PROJECT NUMBER:** 321099.EN.01 | **WELL NUMBER:** MW-16I | **Sheet:** 1 of 1

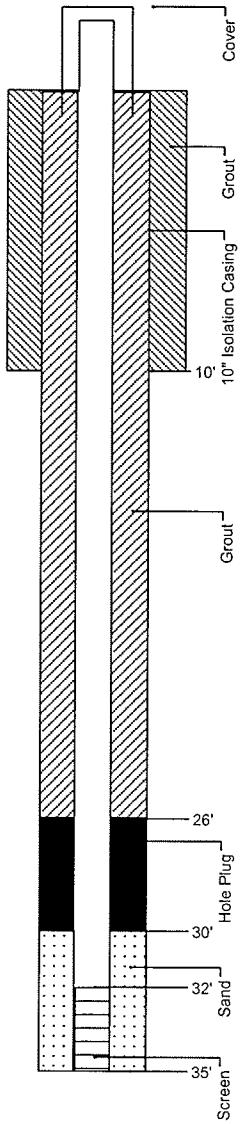
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.99 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 03 Nov 04 **FINISH:** 19 Nov 04 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| -5<br>0<br>5<br>10<br>15<br>20<br>25<br>30<br>35<br>40 |  | Ground Surface<br>SAND (SP), Brown to yellow-brown, moist, medium dense, fine sand.<br>SILTY CLAY (CL), Brown to reddish brown, moist, stiff, low plasticity.<br>As above ,gray, hard, more silt.<br>SILT (ML), Gray with iron staining, moist-dry, hard, some fine sand and clay, trace gravel. (TILL)<br>As above.<br>1-inch yellowish brown, wet, coarse sand at 15.3 feet bgs.<br>CLAYEY SILT (ML), Gray, moist to dry, hard, some fine sand , trace gravel. (TILL)<br>CLAYEY SILT (ML), Gray, moist, hard, trace subangular gravel. (TILL)<br>SANDY SILT (ML), Gray, moist, soft, very fine sand.<br>SILT (ML), Gray, moist to dry, hard to very hard, some fine sand and clay, trace fine to coarse subangular gravel. (TILL)<br>1-inch wet, subround to round, coarse gravel at 26.8 feet bgs.<br>SILT (ML), Gray, moist to dry, hard to very hard, some fine sand and clay, trace fine to coarse subangular gravel. (TILL)<br>SILTY SAND (SM), Gray, moist to wet, fine to very fine sand.<br>SILT (ML), Gray, moist to dry, hard to very hard, some fine sand and clay, trace fine to coarse subangular gravel. (TILL) | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 10 inches<br>Type of Joints: None<br>WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: Threaded<br>WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches<br>DEVELOPMENT<br>Development Method: Pump<br>Time: 3.5 hrs 11-21-04 plus 1/2 hour w/surge block prior to grout<br>COMMENTS<br>Filter Pack: Well Gravel (K&I Well Gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids)<br>Well Grout: AquaGuard (Baroid Drilling Fluids)<br>Well Grout Method: Tremie pipe<br>Steel locking cover with 3 protective bollards, 2' round pad |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW-21I<br>Sheet: 1 of 1 |
|---|---|

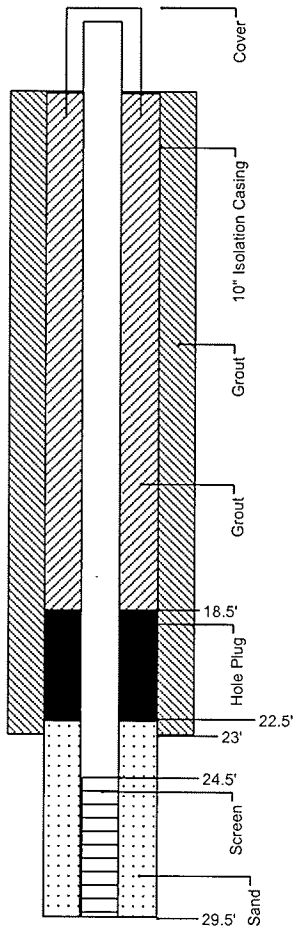
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 730.74 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25HSA; 2ft split spoon and 5ft CME samplers

**START:** 01 Nov 04 **FINISH:** 16 Nov 04 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| -5<br>0<br>5<br>10<br>15<br>20<br>25<br>30<br>35<br>40 |  | Ground Surface<br>SILTY SAND (SM), Light brown, moist, loose, with pebbles.<br>As above, less silt.<br>SANDY GRAVEL (GP), black, high sheen, crude oil odor.<br>As above.<br>As above, wet.<br>As above, saturated, with shell fragments.<br>CLAY (CL), Gray, stiff, some fine sand and silt, trace subangular gravel.<br>As above, hard.<br>As above.<br>As above.<br>CLAY (ML), Gray, hard, some silt, trace gravel.<br>As above.<br>SAND (SW), Gray, wet, loose, medium sand.<br>CLAY (CL), Gray, moist, hard, with silt.<br>GRAVEL (GP), Gray, wet, fine to coarse, some fines.<br>CLAY (CL), Gray, moist, hard with silt and trace fine gravel.<br>End boring | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 10 inches<br>Type of Joints: None<br>WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: Threaded<br>WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches<br>DEVELOPMENT<br>Development Method: Pump<br>Time: 1.5 hrs 11-22-04 plus 1/2 hour w/surge block prior to grout<br>COMMENTS<br>Filter Pack: Well Gravel (K&I Well Gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids)<br>Well Grout: AquaGuard (Baroid Drilling Fluids)<br>Well Grout Method: Tremie pipe<br>Steel locking cover with 3 protective bollards, 2' round pad |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW-27I<br>Sheet: 1 of 1 |
|---|---|

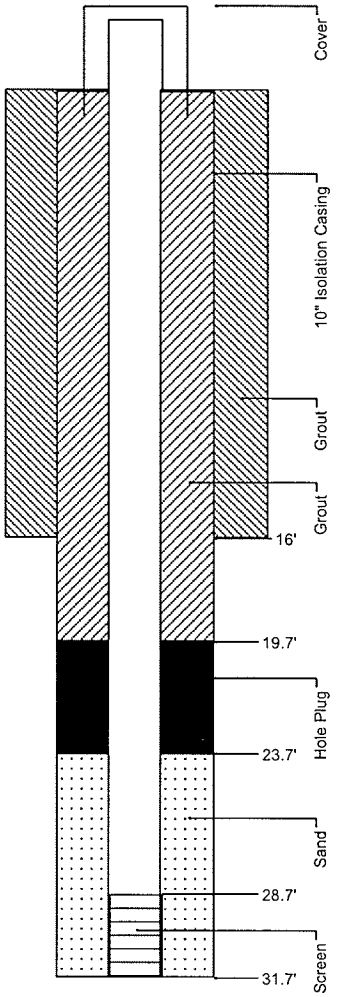
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 735.64 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 03 Nov 04 **FINISH:** 18 Nov 04 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| -5<br>0<br>5<br>10<br>15<br>20<br>25<br>30<br>35<br>40 |  | Ground Surface<br>SILTY SAND (SM), Brown, medium dense, fine sand.<br>SILTY CLAY (CL), Brown, moist, stiff, some fine sand.<br>As above.<br>CLAYEY SILT (ML), Brown, stiff, some fine sand.<br>As above<br>SAND (SP), Brown, medium dense, fine sand.<br>CLAYEY SILT (ML), Brown, stiff, some fine sand.<br>SILT (ML), Grayish brown, moist, very stiff, trace gravel, sand partings. (TILL)<br>As above<br>As above, less sand, more dry.<br>As above.<br>As above, oxidation staining.<br>SILTY SAND (SM) Grayish-brown, moist, medium dense, very fine sand.<br>CLAYEY SILT (ML), moist to dry, very stiff, trace gravel, fine to medium sand in partings.<br>3 inches wet, coarse sand and fine gravel at 24.8 feet bgs.<br>CLAYEY SILT (ML), moist, hard, trace gravel. (TILL)<br>SILT (ML), Gray, moist to dry, very stiff, trace gravel. (TILL)<br>SAND (SP), Gray, wet, loose, fine to medium sand.<br>CLAYEY SILT (ML), Gray, moist, hard. (TILL)<br>SAND (SP), Gray, wet, loose fine to fine to medium sand.<br>CLAYEY SILT (ML), Gray, moist, hard. (TILL)<br>End boring | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 10 inches<br>Type of Joints: None<br><br>WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: Threaded<br><br>WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches<br><br>DEVELOPMENT<br>Development Method: Pump<br>Time: 2 hrs 11-21-04 plus 1/2 hour w/surge block prior to grout<br><br>COMMENTS<br>Filter Pack: Well Gravel (K&I Well Gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids)<br>Well Grout: AquaGuard (Baroid Drilling Fluids)<br>Well Grout Method: Tremie pipe<br>Steel locking cover with 3 protective bollards, 2' round pad |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW-30I<br>Sheet: 1 of 1 |
|---|---|

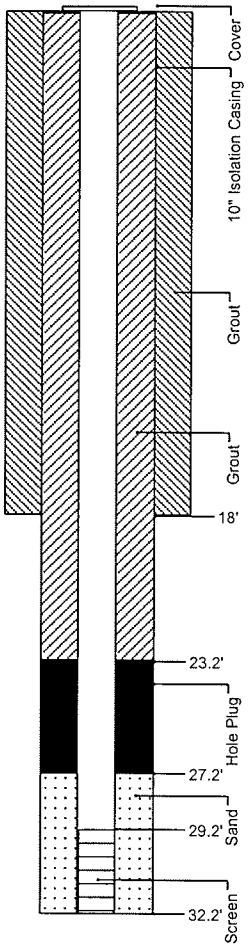
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 722.78 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 03 Nov 04 **FINISH:** 20 Nov 04 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| -5<br>0<br>5<br>10<br>15<br>20<br>25<br>30<br>35<br>40 |  | Ground Surface<br><br>SILT (ML), Brown, medium soft, some clay.<br>SAND (SM), Brown,moist, fine sand with fines.<br>As above.<br>As above, black with sheen, wet, strong grease trap type odor.<br>SILT (ML), Brown, moist, stiff.<br>As above.<br>CLAYEY SILT (ML), Gray, moist, stiff, some fine sand, trace gravel.<br>As above.<br>CLAYEY SILT (ML), Gray, moist, very stiff, massive, non-plastic, some fine sand, trace subangular to subround gravel. (TILL)<br>As above, fine to medium sand in partings, more clay<br>As above.<br>SAND (SP), Brown, angular medium sand.<br>As above, wet at 30 feet bgs<br>CLAYEY SILT (ML), Gray, moist, hard, some fine sand, trace subangular gravel. (TILL)<br>End boring | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 10 inches<br>Type of Joints: None<br><br>WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: threaded<br><br>WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches<br><br>DEVELOPMENT<br>Development Method: Pump<br>Time: 0.5 hrs 11-20-04 plus 1/2 hour w/surge block prior to grout<br><br>COMMENTS<br>Filter Pack: Well Gravel (K&I Well Gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids)<br>Well Grout: AquaGuard (Baroid Drilling Fluids)<br>Well Grout Method: Tremie pipe<br>Steel locking cover with 3 protective bollards, 2' round pad |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW-31Da<br>Sheet: 1 of 2 |
|---|---|

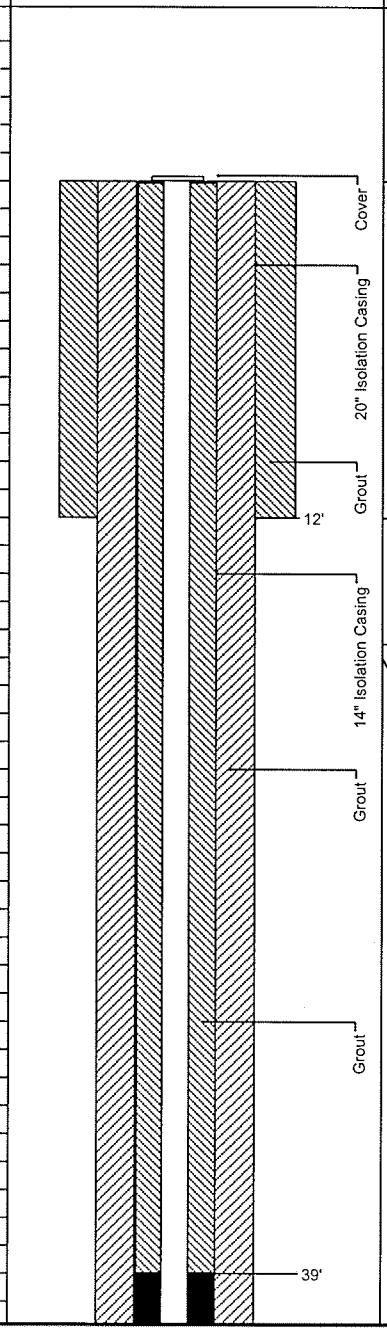
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.57 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 06 Dec 04 **FINISH:** 30 Mar 05 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| -5<br>0<br>5<br>10<br>15<br>20<br>25<br>30<br>35<br>40 |  | Ground Surface<br>CLAYEY SILT (ML), Gray, moist, stiff, some fine sand. (TILL)<br>SAND (SM), Gray, moist to wet, loose, very fine sand with fines.<br>CLAYEY SILT (ML), Gray, moist, hard, some fine sand, trace subangular gravel. (TILL)<br>CLAYEY SILT (ML), Gray, moist, hard, some fine sand, trace subangular gravel. (TILL)<br>CLAYEY SILT (ML), Gray, moist, hard, some fine sand, trace subangular gravel. (TILL)<br>SILT (ML), Gray, wet to moist, stiff, very fine sand laminated.<br>As above, sandy. | ISOLATION CASING #1<br>Material: Type 316 Steel<br>Diameter: 20 inches<br>Type of Joints: None<br><br>ISOLATION CASING #2<br>Material: Type 316 Steel<br>Diameter: 14 inches<br>Type of Joints: Welded<br><br>WELL CASING<br>Material: Type 316 Stainless Steel<br>Diameter: 2 inches<br>Type of Joints: Threaded<br><br>WELL SCREEN<br>Type of Screen: Type 316 Stainless Steel<br>Size: 0.010-inch wire wrap<br>Diameter: 2 inches<br><br>DEVELOPMENT<br>Development Method: Pump<br>Time: 1 hr 03-31-05 plus 1/2 hour w/surge block prior to grout<br><br>COMMENTS<br>Filter Pack: Well Gravel (K&I Well Gravel)<br>Seal: Holeplug bentonite chips (Baroid Drilling Fluids)<br>Isolation Casing Grout: LeFarge Type 1 Portland and QuickGel bentonite powder (Baroid Drilling Fluids)<br>Well Grout: AquaGuard (Baroid Drilling Fluids)<br>Grout Method: Tremie pipe<br>Backfill: Hole plug bentonite chips (Baroid Drilling Fluids) and Well gravel (K&I Well Gravel) |

CH2MHILL

| PROJECT NUMBER: 321099.EN.01 | WELL NUMBER: MW-31Da<br>Sheet: 2 of 2 |
|---|---|

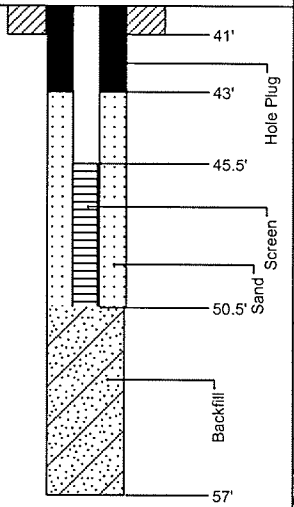
# WELL CONSTRUCTION LOG

**PROJECT:** Velsicol Main Plant Site **LOCATION:** St. Louis, MI

**ELEVATION:** 729.57 **DRILLING CONTRACTOR:** Mateco

**DRILLING METHOD AND EQUIPMENT:** CME 95 with 4.25 HSA; 2ft split spoon and 5ft CME samplers

**START:** 06 Dec 04 **FINISH:** 30 Mar 05 **LOGGER:** J. Myers

| DEPTH BELOW GROUND SURFACE (FT) | WELL | SOIL DESCRIPTION | WELL CONSTRUCTION INFORMATION |
|---|---|---|---|
| 45<br>50<br>55<br>60<br>65<br>70<br>75<br>80<br>85 |  | CLAYEY SILT (ML), Gray moist to wet, firm, laminated, cohesive.<br>As above, drier.<br>SAND (SP), Brownish yellow, wet, loose.<br>As above.<br>SILTY GRAVEL (GM), Wet, loose, fine subangular gravel, some fine sand.<br>As above, silty.<br>CLAYEY SILT (ML), Gray, wet, soft, some subangular gravel, medium plasticity, no odor.<br>SAND (SP), Yellowish brown, moist, very dense, fine to medium sand.<br>End boring | |