# Monitoring Well Purging Form

Well ID: LL5MW-006-GW

Date: 01/03/05

Ravenna Army Ammunition Plant
Ravenna, Ohio

## WELL OBSERVATIONS

Protective Casing: (Intact) · Damaged  Locked: Yes · (No)  Key No:

Concrete Base: (Intact) · Damaged  Inner Casing: (2") · 4" · 6" · 8"  Other:

Stickup Height: 2.90 (ft)  TIC · TOC Difference: 0.3 (ft)

Vapor Readings: HNu · OVA  Background: _____  Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL | Yes · No _____ | Yes · No | |
| DNAPL | Yes · No _____ | Yes · No | LL5MW-006GW |

## CALCULATIONS

(A) Depth to Well Bottom 25.35 (ft) (TOC) · TIC · BGS (Measured) Previously Measured (circle one)

(B) Depth to Water 14.61 (ft) (TOC) TIC · BGS  Time Measured: 1434

(C) Water Column Height (A-B) 10.74 (ft)

(D) Well Diameter Factor 0.16 (gal/ft) ~~2" = 0.16~~, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) One Well Volume (C*D) 1.72 (gal)

(F) Volumes to be Evacuated 5

(G) TOTAL VOLUME TO BE EVACUATED (E * F) 8.59 (gal)

## EVACUATION METHOD

Well Evacuation Method: Bailer · Submersible Pump · (Other: Micro purge)  Device Number: _____

Purge Water Disposition: 1. Discharged Onsite 2. (Collected) And: (Stored) · Disposed (Onsite) · Offsite

Collected In: (Tanks) · Drums  No. of Containers: _____

Comments: _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | DO | |
| 1435 | 14.41 | | | 0.565 | 9.58 | 7.65 | 1000 | 8.70 | Start purging |
| 1438 | 15.32 | | | 0.562 | 10.16 | 7.61 | 1600 | 2.64 | |
| 1441 | 15.40 | | | 0.562 | 10.22 | 7.62 | 1600 | 2.03 | |
| 1444 | 15.50 | | | 0.562 | 10.34 | 7.64 | 1000 | 2.04 | |
| 1447 | 15.51 | | | 0.562 | 10.36 | 7.63 | 1000 | 2.07 | |
| 1450 | 15.53 | | | 0.562 | 10.40 | 7.64 | 1000 | 2.14 | End purging |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Sudheer Gubba (Please Print)  Reviewed By: C. Eaton

Signature: G. Subba  Date: 2/22/05

# Field Sampling Report

Location ID: LLSMW-006 GW

Date: 01/03/05

Ravenna Army Ammunition Plant
Characterization of 14 RVAAP AOCs

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| Method | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | Micro purge | X | | | Push Probe | | Plastic Liner | |
| Type/Construction | stainless steel | | | | Mattocks | | | |
| Miscellaneous | Well Purging Form (Yes) - No | | | | | | | |

Sample Collection: 1500 hrs

Sample Type: Composite - MI - (Grab)
If MI, # of increments taken: NA

Location: (Plotted on Map) - Staked in Field
Estimated - Measured - (Surveyed)

Sample Depth: 17.53 FT (below surface)

Decon: (Dedicated) - Each Day - Each Location

### Field Parameters
(at time of sample)

| | | |
|---|---|---|
| PID / FID Readings: | | |
| Background: | NT | ppm |
| Sample: | NT | ppm |
| Water Level | 15.53 | FT |
| Temperature | 10.40 | °C |
| Sp. Conductance: | 0.512 | uMHOs |
| pH | 7.64 | units |
| Turbidity | 1000 | N.T.U. |

### Analytical Parameters

| | | | |
|---|---|---|---|
| VOC | X | TPH GRO | |
| SVOC | X | TPH DRO | |
| Explosives | X | Chromium +6 | |
| Propellants | | Nitrate | X |
| TAL Metals | X | | |
| Pesticides/PCBs | X | | |
| Cyanides | | | |
| TOC | | | |
| Grain Size | | | |

### Other Parameters

| | | | |
|---|---|---|---|
| Corrosivity | | | |
| Reactivity Sulfide/Cyanide | | | |
| Ignitability | | | |
| | | | |

### QA Samples

| | | |
|---|---|---|
| MS/MSD | Yes / No | NA |
| Duplicate ID | | NA |
| Equipment Rinse ID | | NA |
| Trip Blank ID | | NA |

**Sample Description**

Not clear, No sheen, No odor
highly turbid.

**Split Sample**

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks
Parameters: Same as Above - As Listed

*Soil sample description should include:*

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

*Water sample description should include:*

*Color Odor Sheen Turbidity*

Logged By: Sudheer Gubba (Please Print)

Signature: G. Sudheer

Reviewed by: ERIC EWS (Please Print)

Signature: [signature] Date: 2/2/05

# HTRW DRILLING LOG

| | | |
|---|---|---|
| 1. COMPANY NAME: MKM Engineers Inc. | DISTRICT: Louisville | HOLE NUMBER: LL7mw-001 |
| 2. DRILL SUBCONTRACTOR: HAD Drilling Contractors | | SHEET 1 OF 3 |
| 3. PROJECT: RVAAP RE 14 | 4. LOCATION: Load Line 7 | |
| 5. NAME OF DRILLER: Sam Hollo | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME LC-60 | |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" Split Spoons; 6.25 ID HSA; 6.250D Air Rotary Hammer | 8. HOLE LOCATION: North of LB-9 | |
| | 9. SURFACE ELEVATION: 1126.90 ASL | |
| | 10. DATE STARTED: 14 Jan 05 | 11. DATE COMPLETED: 14 Jan 05 |
| 12. OVERBURDEN THICKNESS: 14.4 | 15. DEPTH GROUNDWATER ENCOUNTERED: ~21 | |
| 13. DEPTH DRILLED INTO ROCK: 15.5 | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 17.1 @ 1307 | 01/17/05 |
| 14. TOTAL DEPTH OF HOLE: 29.9 | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): — | |

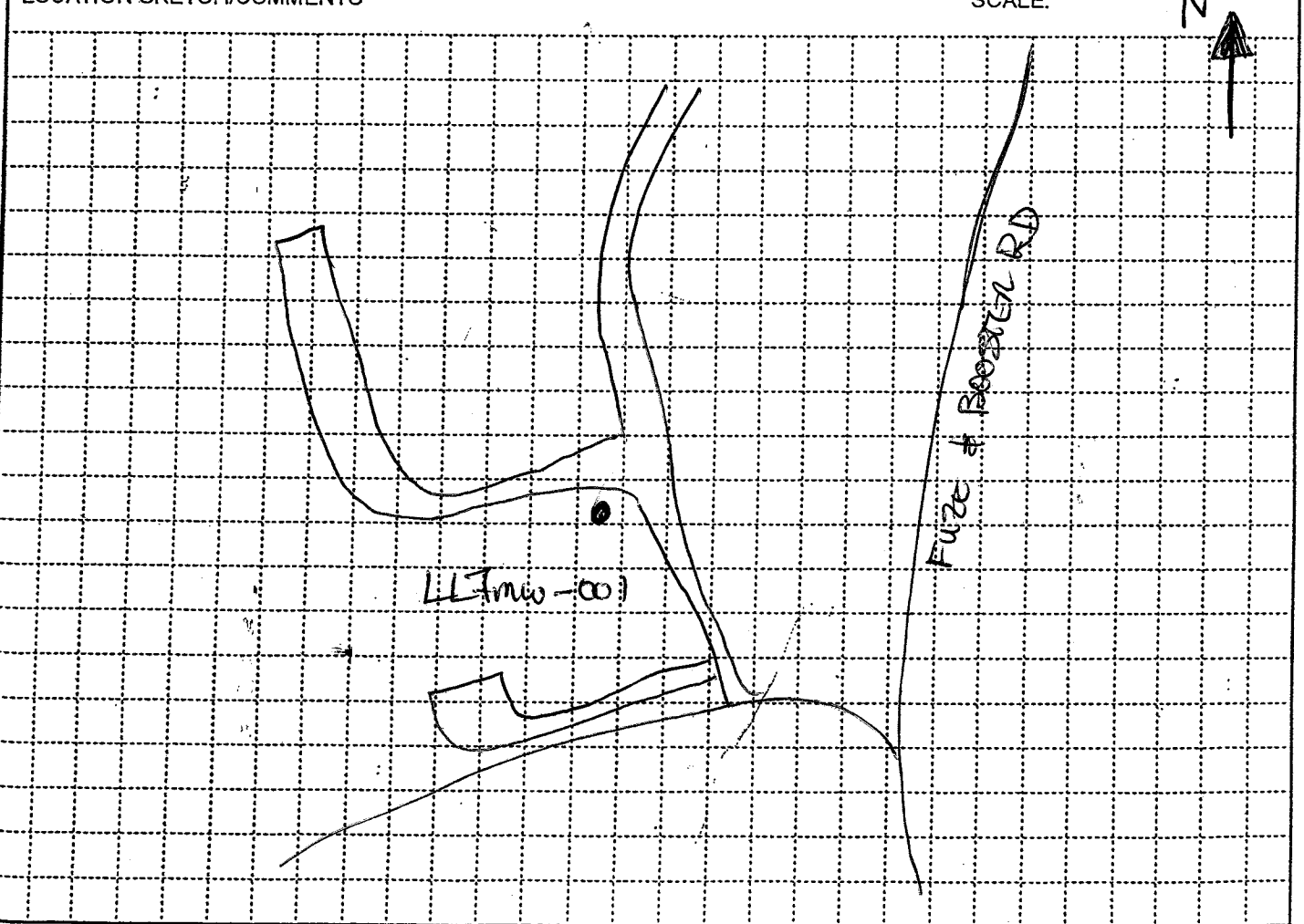
| 18. GEOTECHNICAL SAMPLES | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| NONE | — | — | 0 |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY |
|---|---|---|---|---|---|---|
| | — | — | — | — | — | — % |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | — | X | — | |

LOCATION SKETCH/COMMENTS

SCALE:




| PROJECT | HOLE NO. |
|---|---|
| RVAAP RE 14 | LL7mw-001 |

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL)mw-801

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunkley

SHEET 2 OF 3 SHEETS

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. Recovery | ANALYTICAL SAMPLE NO. USCS | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| 0845 | | 4" Topsoil | | | | | |
| | | Br. SILT 75% w/Sand Damp No Odor No Plasticity No Staining | 0.0 | 1.2 | ML | Push 1<br>3-2 | 7.5yr-5/4 |
| | 2 | Br. SILT 80% w/Sand and Clay Dry Stiff No odor No Plasticity Grey Mottling Present | 0.0 | 1.0 | ML | 1-3<br>4-5 | SAA |
| | 4 | Br. SILT 60% w/ Sand Damp No Odor No Plasticity Red Iron Staining | 0.0 | 1.7 | ML | 1-3<br>5-5 | 5yr 5/6 |
| | | Br. SILT 65% w/ Sand and Fine Gravel Dry No Odor No Plasticity No Staining | | | | | 7.5yr 5/4 |
| | 6 | Changes to wet @ 6.0 | | | | | |
| | | SHALE Rock Frag @ 7.0 | 0.0 | 1.7 | ML | 1-4<br>4-6 | SAA |
| | | Br. SILT 65% w/ Sand and Fine Gravel | | | | | |
| | 8 | Dry No Odor No Plasticity No Staining | | | | | |
| | | SAA | 0.0 | 1.6 | ML | 1-3<br>3-3 | SAA |
| | 10 | SAA | 0.0 | 1.6 | ML<br>SM | 1-4<br>7-9 | SAA |
| | | Br. SAND 20% w SILT Damp, No Odor No Plasticity No Staining | | | | | |
| | 12 | Br. SILT 65% w/ Sand and Fine Gravel Dry No Odor No Plasticity No Staining | 0.0 | 1.7 | ML | 4-7<br>13-10 | 7.5yr-6/2 |
| | | Changes to Grey @ 13.2 | | | | | |
| 0845 | 14 | Red/Br. SAND 85% w/Silt Dry weathered Bedrock 614.4 split spoon Alluvial | | 0.5 | SM | 9-50/2 | |
| | | Reddish Br. SAND SHALE, weathered Fgrn Grained | | | | | |
| | 16 | | | | | | |
| | 18 | | | | | | |
| | 20 | | | | | | |

PROJECT: RVAAP RI 14

HOLE NO.: LL)mw-801

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL7mw-001

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunlevy

SHEET 3 OF 3 SHEETS

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | ~~GEOTECH SAMPLE OR CORE BOX NO.~~ RECOVERY | ~~ANALYTICAL SAMPLE NO.~~ USGS | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| V | 20 | Wet Cuttings @ ~21 ft | | | | | |
| | 22 | | | | | | |
| | 24 | Color Changes to grey @ 24 | | | | | 7.5y-6/1 |
| | 26 | | | | | | |
| | 28 | | | | | | |
| 1030 | 30 | Bott 29.9 | | | | | Bott 29.9<br>Sand to 29.5<br>Screen from 29.5 to 19.5<br>Sand up to 16<br>Bentonite to 13<br>Grout to Surface<br>Stick up well completion<br>No Hydration water used |
| | 32 | | | | | | |

PROJECT: RVAAP RI 14

HOLE NO.: LL7mw-001

ENG FORM 5056A-R, AUG 94

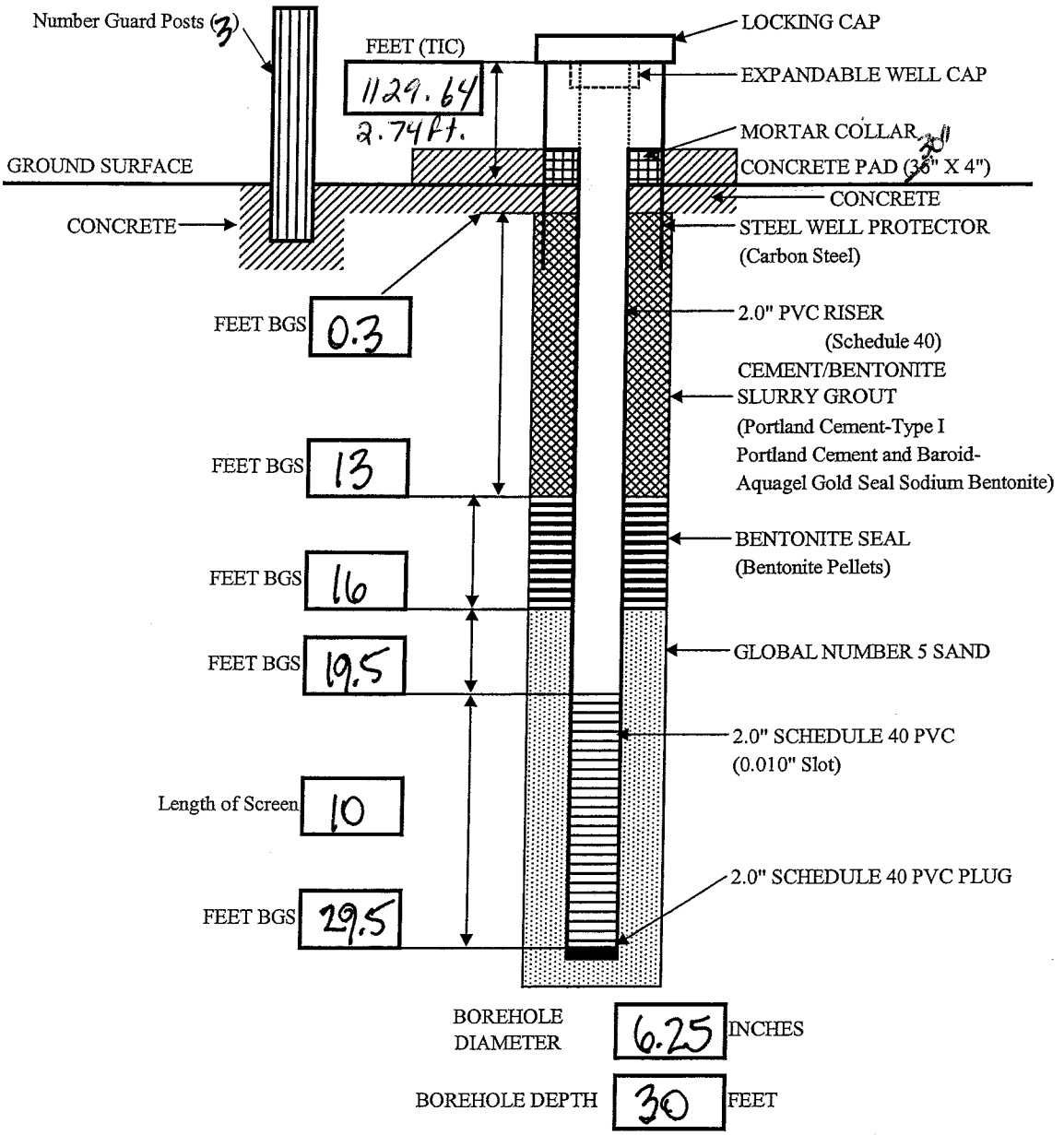
(Proponent: CECW-EG)

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:**

| | | |
|---|---|---|
| Well Number: LL7 MW-001 | Begin: 01/14/05 | End: 01/14/05 |
| Coordinates: N: 5549925.77<br>E: 2352192.91 | Elevation: 1126.90 | Reference Point: |
| Logged By: MARK DUDLEY | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: LL7MW - 001-GW
Date: 01/17/05

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP
Development Company: MKM
Development Method: Whale pump
Comments:

Well TD: 32.9 FT TIC
Water Column Height: 15.8 FT
Depth to Water: 17.1 FT
One Well Volume: 9.2 ≈ 9 Gals

Well Volume (gallons/foot): 2-Inch = 0.16, 4-Inch = 0.65, 6-Inch = 1.47, 8-Inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | CON | DO | Temp | | |
| 1307 | DSB | 17.1 | " | " | " | " | " | " | " | " |
| 1317 | DSE | 17.2 | " | " | " | " | " | " | " | " |
| 1318 | DPB | 17.2 | " | " | " | " | " | " | " | " |
| 1325 | DFM | " | " | 9 | 6.90 | 0.311 | 1.75 | 13.4 | 877 | 9 gal (1st well vol) |
| 1331 | DFM | " | " | 9 | 7.29 | 0.304 | 1.69 | 12.7 | 196 | 18 gal (2nd well vol) |
| 1337 | DFM | " | " | 9 | 7.10 | 0.308 | 1.68 | 11.6 | 0 | 27 gal (3rd well vol) |
| 1343 | DFM | " | " | 9 | 6.82 | 0.313 | 1.27 | 11.3 | 0 | 36 gal (4th well vol) |
| 1350 | DFM | " | " | 9 | 7.03 | 0.315 | 4.42 | 11.1 | 0 | 45 gal (5th well vol) |
| 1357 | DFM | " | " | 9 | 6.97 | 0.315 | 2.57 | 11.2 | 0 | 54 gal (6th well vol) |
| 1405 | DFM | " | " | 9 | 6.94 | 0.313 | 2.14 | 11.2 | -10 | 63 gal (7th well vol) |
| 1414 | DFM | " | " | 9 | 6.94 | 0.313 | 2.47 | 11.2 | 0 | 72 gal (8th well vol) (Development complete) |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Sydheer Gubba (Please Print)
Signature: S. Gubba
Reviewed By: C. Esfer
Date: 2/22/05

# Monitoring Well Purging Form

Well ID: LL7MW-0016W

Date: 01-24-05

Ravenna Army Ammunition Plant
Ravenna, Ohio

## WELL OBSERVATIONS

Protective Casing: (Intact) · Damaged  Locked: Yes (No)  Key No:

Concrete Base: (Intact) · Damaged  Inner Casing: (2") · 4" · 6" · 8"  Other:

Stickup Height: 2.74 (ft)  TIC · TOC Difference: 0.6 (ft)

Vapor Readings: HNu · OVA  Background: _____  Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL | Yes · (No) | _____ Yes · No | LL7MW-0016W |
| DNAPL | Yes · (No) | _____ Yes · No | |

## CALCULATIONS

(A) Depth to Well Bottom 33 (ft) (TOC) · TIC · BGS (Measured) Previously Measured (circle one)

(B) Depth to Water 17.25 (ft) (TOC) · TIC · BGS  Time Measured: 1440

(C) Water Column Height (A-B) 15.75 (ft)

(D) Well Diameter Factor 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) One Well Volume (C*D) 2.52 (gal)

(F) Volumes to be Evacuated 5

(G) **TOTAL VOLUME TO BE EVACUATED (E * F)** 12.6 (gal)

## EVACUATION METHOD

Well Evacuation Method: Bailer · Submersible Pump · (Other) Stainless Steel Micropurge  Device Number: _____

Purge Water Disposition: 1. Discharged Onsite 2. (Collected And) · (Stored) · Disposed (Onsite) · Offsite

Collected In: Tanks · Drums  No. of Containers: _____

Comments: _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | DO | |
| 1505 | 17.25 | | | 0.404 | 5.05 | 6.35 | 201 | 10.61 | Initial |
| 1508 | 17.45 | | | 0.41 | 7.46 | 6.64 | 165 | 5.04 | |
| 1511 | 17.57 | | | 0.401 | 8.72 | 6.74 | 119 | 3.04 | |
| 1514 | 17.70 | | | 0.396 | 6.95 | 6.76 | 72 | 2.57 | End Purging |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Shannon Fabrizio (Please Print)  Reviewed By: C. Feller

Signature: _____  Date: 2/22/05

# Field Sampling Report

**Location ID:** 67MW-001GW

**Date:** 01-24-05

**Ravenna Army Ammunition Plant**
**Characterization of 14 RVAAP AOCs**

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| **Method** | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | MicroPurge | X | | | Push Probe | | Plastic Liner | |
| **Type/Construction** | | | | | Mattocks | | | |
| **Miscellaneous** | **Well Purging Form** (Yes) - No | | | | | | | |

**Sample Collection:** 1530 hrs

**Sample Type:** Composite - MI - (Grab)
If MI, # of increments taken: NA

**Location:** (Plotted on Map) - (Staked in Field)
Estimated - Measured - (Surveyed)

**Sample Depth:** 26 FT (below surface)

**Decon:** Dedicated - Each Day - (Each Location)

## Field Parameters
(at time of sample)

| | | |
|---|---|---|
| **PID / FID Readings:** | | |
| Background: | 0.0 | ppm |
| Sample: | 0.0 | ppm |
| **Water Level** | 17.25 | FT |
| **Temperature** | 8.95 | °C |
| **Sp. Conductance:** | 0.396 | uMHOs |
| **pH** | 6.76 | units |
| **Turbidity** | 72 | N.T.U. |

## Analytical Parameters

| | | | |
|---|---|---|---|
| VOC | X | TPH GRO | |
| SVOC | X | TPH DRO | |
| Explosives | X | Chromium +6 | |
| Propellants | X | Nitrate | X |
| TAL Metals | X | | |
| Pesticides/PCBs | X | | |
| Cyanides | | | |
| TOC | | | |
| Grain Size | | | |

## Other Parameters

| | | | |
|---|---|---|---|
| Corrosivity | | | |
| Reactivity Sulfide/Cyanide | | | |
| Ignitability | | | |
| | | | |

## QA Samples

| | | |
|---|---|---|
| MS/MSD | Yes / No | NA |
| Duplicate ID | | NA |
| Equipment Rinse ID | | NA |
| (Trip Blank ID) | Trip Blank | NA |

## Sample Description

Clear waters, NO Sheen
NO Odors, Moderate Turbidity 4ft

## Split Sample

**Split Sample ID:**

**Name:**
**Agency/Company:**
**Address:**

**QA/QC Provided:** MS/MSD - Duplicate - Trip Blanks - Field Blanks
**Parameters:** Same as Above - As Listed

***Soil sample description should include:***

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

***Water sample description should include:***

*Color Odor Sheen Turbidity*

Logged By: Shahram Taherimer (Please Print)

Signature: Shahram

Reviewed by: Eric Ellis (Please Print)

Signature: Eric Ellis Date: 2/4/05

# HTRW DRILLING LOG

| | | |
|---|---|---|
| 1. COMPANY NAME: MKM Engineers | DISTRICT: Louisville | HOLE NUMBER: LL7mw-002 |
| 2. DRILL SUBCONTRACTOR: H-AD Drilling Contractors | | SHEET 1 OF 3 SHEETS |
| 3. PROJECT: RVAAP RI 14 | 4. LOCATION: Load Line 7 | |
| 5. NAME OF DRILLER: Sam Holter | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME-LC60 | |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6.25" ID HSA; 2" Split Spoon; 2" Core Barrel ID; 6.25 OD Air Rotary Hammer | 8. HOLE LOCATION: North of LB-18 | |
| | 9. SURFACE ELEVATION: 1126.70 ASL | |
| | 10. DATE STARTED: 10 Jan 05 | 11. DATE COMPLETED: 11 Jan 05 |
| 12. OVERBURDEN THICKNESS: 21.6 ft | 15. DEPTH GROUNDWATER ENCOUNTERED: ~11.5, ~19, ~23 | |
| 13. DEPTH DRILLED INTO ROCK: 24.9 | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 11.7' @ 0950 01/13/05 | |
| 14. TOTAL DEPTH OF HOLE: 26.5 | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) | |

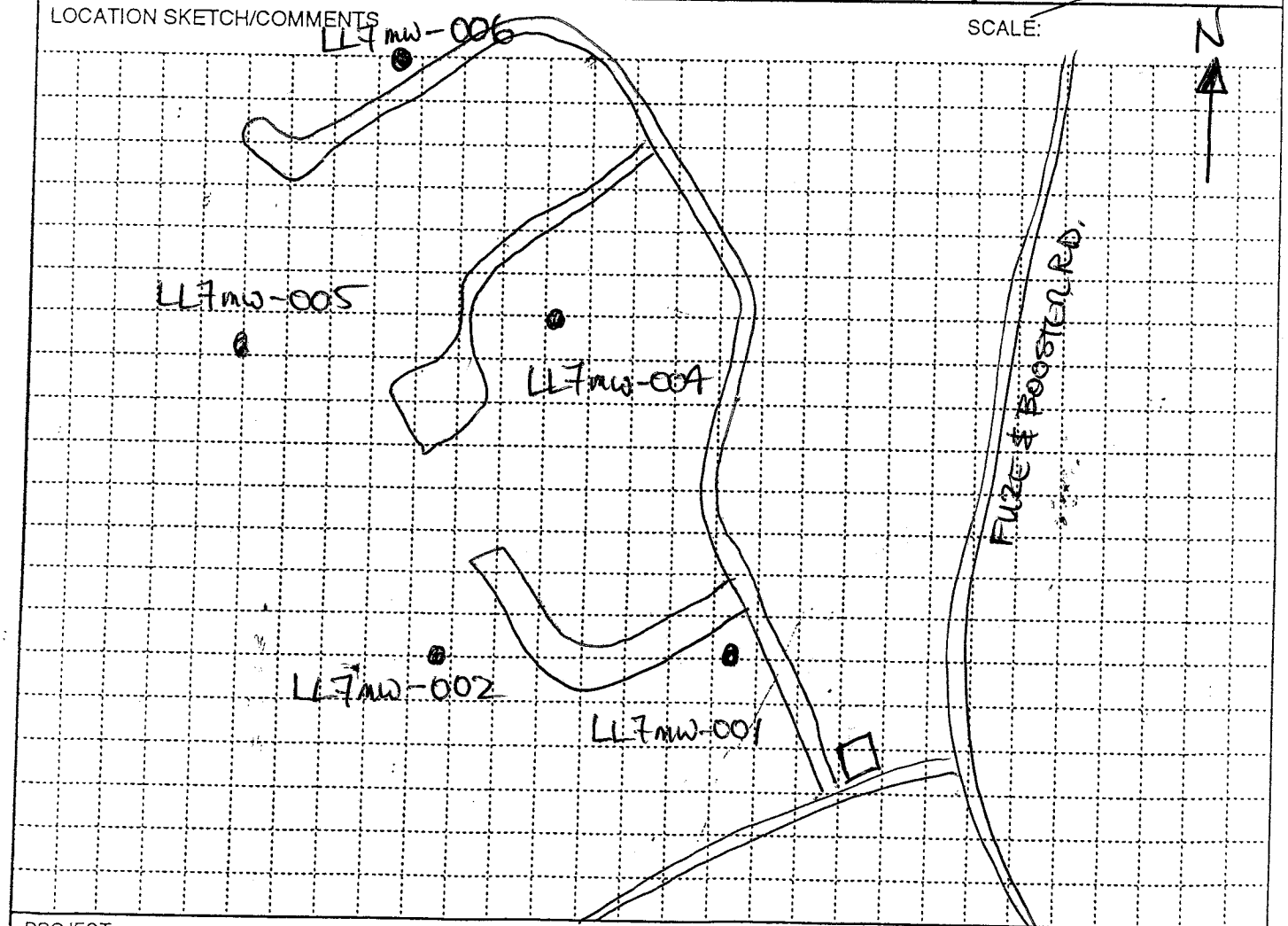
| 18. GEOTECHNICAL SAMPLES | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| NONE | — | — | 2 Boxes |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY |
|---|---|---|---|---|---|---|
| | — | — | — | — | — | 70.5% |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | — | X | — | M. Clark |

LOCATION SKETCH/COMMENTS

SCALE:




PROJECT: RVAAP RI 14

HOLE NO: LL7mw-002

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL7MW-002

PROJECT: RVAAP RI14

INSPECTOR: Mark Dunlay

SHEET 2 OF 3 SHEETS

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. RECOVERY | ANALYTICAL SAMPLE NO. USCS | BLOW COUNT - (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| 1515 | | 0.3 Topsoil Damp | | | | Weight-6 | |
| | | Br. SILT 80% w/Sand Damp No Odor No Staining no Plasticity | | 1.6 | ML | | 7.5Y-5/4 |
| | | Lt. Br. SILT 65% w/Sand No Odor Damp No Plasticity Red Iron Staining | | | | 50/5 | 7.5Y-6/4 |
| | 2 | Weathered SS 5'-15 Split Spoon Refusal | | | | | |
| | 4 | | | | | | |
| 1550 | 6 | Top of Core #1 @ 6.0 | | | | | |
| | | LT. Br. Fine Grained Sandstone horizontal to 15° Bedding Planes | | | | | Recovery = 74.4/114 = 65% |
| | | - Black Striations Present | | | | | RQD = 20.4/74.4 = 27.4% |
| | | - Iron Staining Present | | | | | |
| | 8 | | | | | | 7.5Y-7/4 |
| | 10 | | | | | | |
| | | Highly Fractured zone btw 11.5-12.2 w/Iron Staining | | | | | |
| V | 12 | | | | | | |
| | | Grey Fine Grained Sandstone w/Black Striations | | | | | |
| | 14 | Grey Very Fissle Shale, no recovery in Core due to highly fractured nature | | | | | 5Y-7/1 |
| | | | | | | | 7.5Y-5/1 |
| 1620 | | Bottom of Core #1 @ 15.5 | | | | | |
| 0900 | 16 | DK. Gray/Black SHALE very fissle small recovery due to wet nature at top of section, bottom of shale lost because of being dry | | | | | Recovery = 90.6/120 = 75.5 |
| | | | | | | | RQD = 27/90.6 = 29.8% |
| | 18 | | | | | | 7.5Y-5/1 |
| | | Grey Sandstone, Fine Grained horizontal to 15° bedding Planes | | | | | 5Y-7/1 |
| V | | - Black Striations Present | | | | | |
| | | - Black / DK. Grey Clogs present w/ thin layers of shale to 24 LT | | | | | |
| | 20 | | | | | | |

PROJECT: RVAAP RI 14

HOLE NO.: LL7MW-002

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL7 mw-002

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunlevy

SHEET 3 OF 3 SHEETS

| ELEV. (A) | DEPTH (B) | DESCRIPTION OF MATERIALS (C) | FIELD SCREENING RESULTS (D) | GEOTECH SAMPLE OR CORE BOX NO. (E) | ANALYTICAL SAMPLE NO. (F) | BLOW COUNT - (G) | REMARKS (H) |
|---|---|---|---|---|---|---|---|
| | 22 | | | | | | SAA |
| V | 24 | Grey Fine-Med. grained Sandstone Horizontal Bedding Planes, well cemented | | | | | SAA |
| 0940 | | Bottom of Core #2 @ 25.5 | | | | | |
| | 26 | | | | | | |
| | | BO # 26.5 | | | | | BO # 26.5<br>Sand to 25<br>Screen from 25 to 15<br>Sand up to 10<br>Bentonite to 7<br>Grout to Surface<br>No Hydration water used<br>Stick-up Completion |
| | 28 | | | | | | |
| | 30 | | | | | | |

PROJECT: RVAAP RI 14

HOLE NO.: LL7 mw-002

ENG FORM 5056A-R, AUG 94

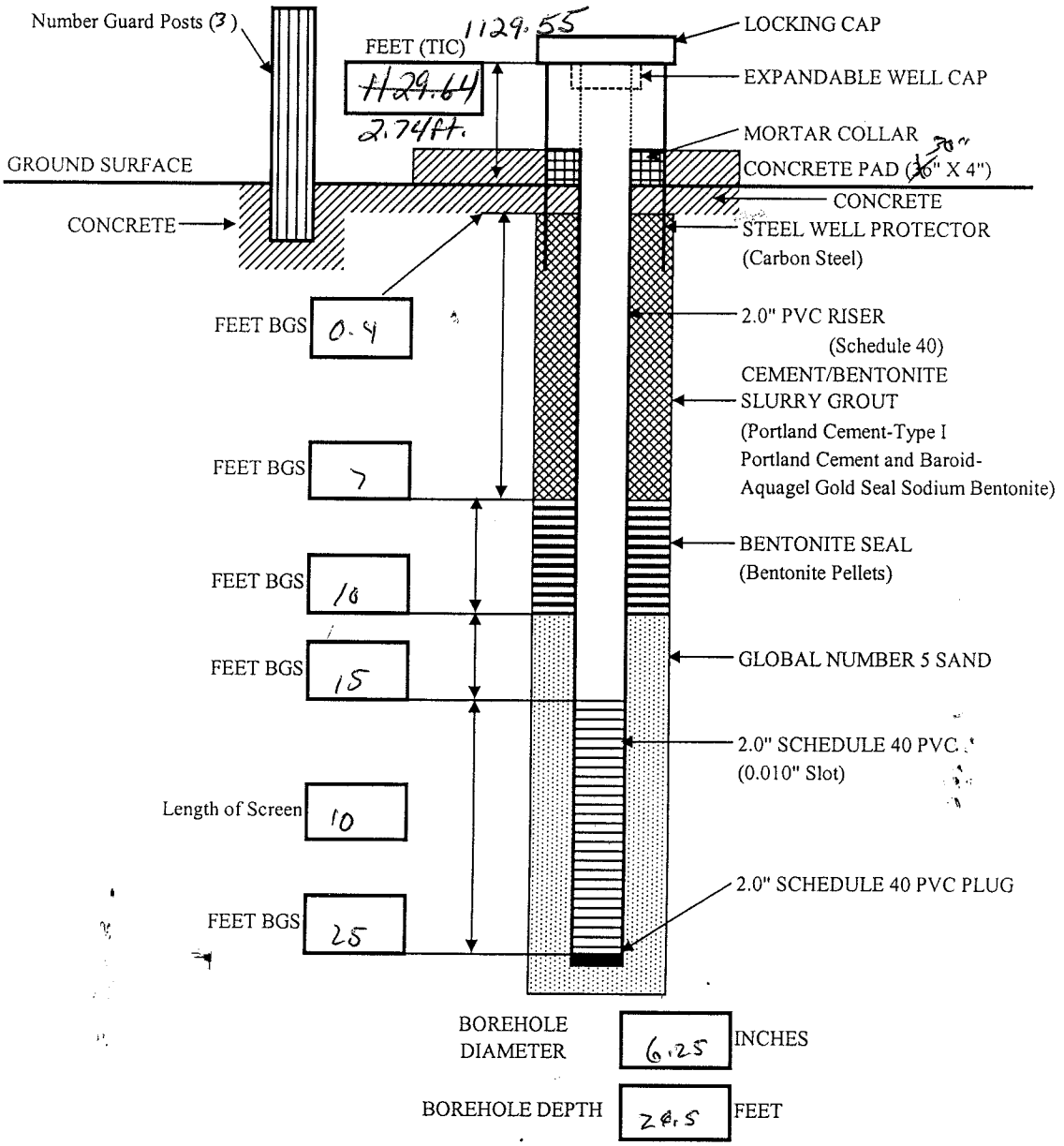
(Proponent: CECW-EG)

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:** RVAAP RI 14

| | | |
|---|---|---|
| Well Number: LL7mw-002-GW | Begin: 10 Jan 05 | End: 11 Jan 05 |
| Coordinates: N: ~~554925.77~~ 555126.55 ab<br>E: ~~2352192.94~~ 2351918.23 ab | Elevation: ~~1126.90~~ 1126.70 ab | Reference Point: |
| Logged By: | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: LL7mw-002-GW
Date: 01/13/05

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP-14
Development Company: MKM

Development Method: WHALE PUMPING
Comments:

Well TD: 27.1 FT TIC  Depth to Water: 11.7 FT
Water Column Height: 15.4 FT  One Well Volume: 9.1 Gals

Well Volume (gallons/foot): 2-inch = 0.16  6-inch = 1.47  4-inch = 0.65  8-inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | CON | DO | TEMP | | |
| 0950 | DSB | 11.7 | – | – | – | – | – | – | – | – |
| 0955 | DSE | 13.05 | – | – | – | – | – | – | – | – |
| 0957 | DPB | 13.05 | – | – | – | – | – | – | – | – |
| 1002 | DFM | – | – | 9 | 5.75 | 0.224 | 6.90 | 12.1 | 71000 | 1st well vol (9 gal) |
| 1015 | DFM | – | – | 9 | 5.85 | 0.203 | 6.90 | 12.1 | 199 | 2nd well vol (18 gal) |
| 1031 | DFM | – | – | 9 | 5.80 | 0.125 | 6.90 | 12.1 | 71000 | 3rd well vol (27 gal) |
| 1045 | DFM | – | – | 9 | 5.80 | 0.182 | 6.98 | 12.2 | 439 | 4th well vol (36 gal) |
| 1103 | DFM | – | – | 9 | 5.80 | 0.180 | 6.98 | 12.2 | −10 | 5th well vol (45 gal) |
| 1117 | DFM | – | – | 9 | 5.80 | 0.132 | 6.90 | 12.1 | −10 | 6th well vol (54 gal) |
| 1135 | DFM | – | – | 9 | 5.74 | 0.171 | 6.90 | 12.1 | −10 | 7th well vol (63 gal) |
| 1150 | DFM | 26.2 | – | 9 | 5.8 | 0.180 | 6.90 | 12.1 | −10 | 8th well vol (72 gal) |
| 1151 | DPE | 26.2 | – | – | – | – | – | – | – | Development completed. |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photolonizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: NILESH SHRINGARPURE (Please Print)
Signature: Nshringarpure

Reviewed By: C. Esler
Date: 2/22/05

# Monitoring Well Purging Form

Well ID: LL7 MW-002 GW

Date: 01-21-05

Ravenna Army Ammunition Plant
Ravenna, Ohio

## WELL OBSERVATIONS

Protective Casing: Intact · Damaged  Locked: Yes · No  Key No:

Concrete Base: Intact · Damaged  Inner Casing: 2" · 4" · 6" · 8"  Other:

Stickup Height: 2.74 (ft)  TIC · TOC Difference: 0.58 (ft)

Vapor Readings: HNu · OVA  Background: _____  Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL | Yes · No _____ | Yes · No | LL7MW-002GW |
| DNAPL | Yes · No _____ | Yes · No | |

## CALCULATIONS

(A) Depth to Well Bottom 27.1 (ft) TOC · TIC · BGS  Measured / Previously Measured (circle one)

(B) Depth to Water 13.8 (ft) TOC · TIC · BGS  Time Measured: 8.45

(C) Water Column Height (A-B) 13.5 (ft)

(D) Well Diameter Factor 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) One Well Volume (C*D) 2.13 (gal)

(F) Volumes to be Evacuated 5

(G) TOTAL VOLUME TO BE EVACUATED (E * F) 10.64 (gal)

## EVACUATION METHOD

Well Evacuation Method: Bailer · Submersible Pump · Other MicroPurge  Device Number: _____

Purge Water Disposition: 1. Discharged Onsite 2. Collected And: Stored · Disposed Onsite Offsite

Collected In: Tanks · Drums  No. of Containers: _____

Comments: _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | | |
| 0908 | 13.8 | | | 0.201 | 6.42 | 7.01 | 630 | 10.85 | Initial |
| 0911 | 14.05 | | | 0.201 | 7.14 | 6.66 | 393 | 9.43 | |
| 0914 | 14.05 | | | 0.201 | 7.36 | 6.51 | 303 | 9.32 | |
| 0917 | 14.05 | | | 0.200 | 7.49 | 6.41 | 239 | 8.90 | End Purge |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Shahram Salimian (Please Print)  Reviewed By: C. Esler

Signature: [signature]  Date: 2/22/05

# Field Sampling Report

Location ID: LL7MW-002GW

Date: 01-21-05

Ravenna Army Ammunition Plant
Characterization of 14 RVAAP AOCs

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| Method | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | MicroPurge | X | | | Push Probe | | Plastic Liner | |
| Type/Construction | | | | | Mattocks | | | |
| Miscellaneous | Well Purging Form (Yes) - No | | | | | | | |

**Sample Collection:** 0920 hrs

**Sample Type:** Composite - MI - (Grab)
If MI, # of increments taken: NA

**Location:** (Plotted on Map) - (Staked in Field)
Estimated - Measured - (Surveyed)

**Sample Depth:** 22 FT (below surface)

**Decon:** Dedicated - Each Day - (Each Location)

## Field Parameters
(at time of sample)

| | | |
|---|---|---|
| PID / FID Readings: | | |
| Background: | 0.0 | ppm |
| Sample: | 0.0 | ppm |
| Water Level | 13.8 | FT |
| Temperature | 7.49 | °C |
| Sp. Conductance: | 0.200 | uMHOs |
| pH | 6.41 | units |
| Turbidity | 239 | N.T.U. |

## Analytical Parameters

| | | | |
|---|---|---|---|
| VOC | X | TPH GRO | |
| SVOC | X | TPH DRO | |
| Explosives | X | Chromium +6 | |
| Propellants | X | Nitrate | X |
| TAL Metals | X | | |
| Pesticides/PCBs | X | | |
| Cyanides | | | |
| TOC | | | |
| Grain Size | | | |

## Other Parameters

| | | |
|---|---|---|
| Corrosivity | | |
| Reactivity Sulfide/Cyanide | | |
| Ignitability | | |

## QA Samples

| | | |
|---|---|---|
| MS/MSD | Yes / No | NA |
| Duplicate ID | | NA |
| Equipment Rinse ID | | NA |
| (Trip Blank ID) | Trip Blank | NA |

## Sample Description

Clear water, no sheen
no odor, low turbidity

*Soil sample description should include:*

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

*Water sample description should include:*

*Color Odor Sheen Turbidity*

## Split Sample

**Split Sample ID:**

**Name:**

**Agency/Company:**

**Address:**

**QA/QC Provided:** MS/MSD - Duplicate - Trip Blanks - Field Blanks

**Parameters:** Same as Above - As Listed

Logged By: Shahram Tahmasebi (Please Print)

Signature:

Reviewed by: ERIC ELLIS (Please Print)

Signature: Date: 2/4/05

# HTRW DRILLING LOG

| | | |
|---|---|---|
| | DISTRICT: Louisville | HOLE NUMBER: LL7mw-003 |
| 1. COMPANY NAME: MKM Engineers | 2. DRILL SUBCONTRACTOR: AAD Drilling Contractors | SHEET 1 OF 3 |

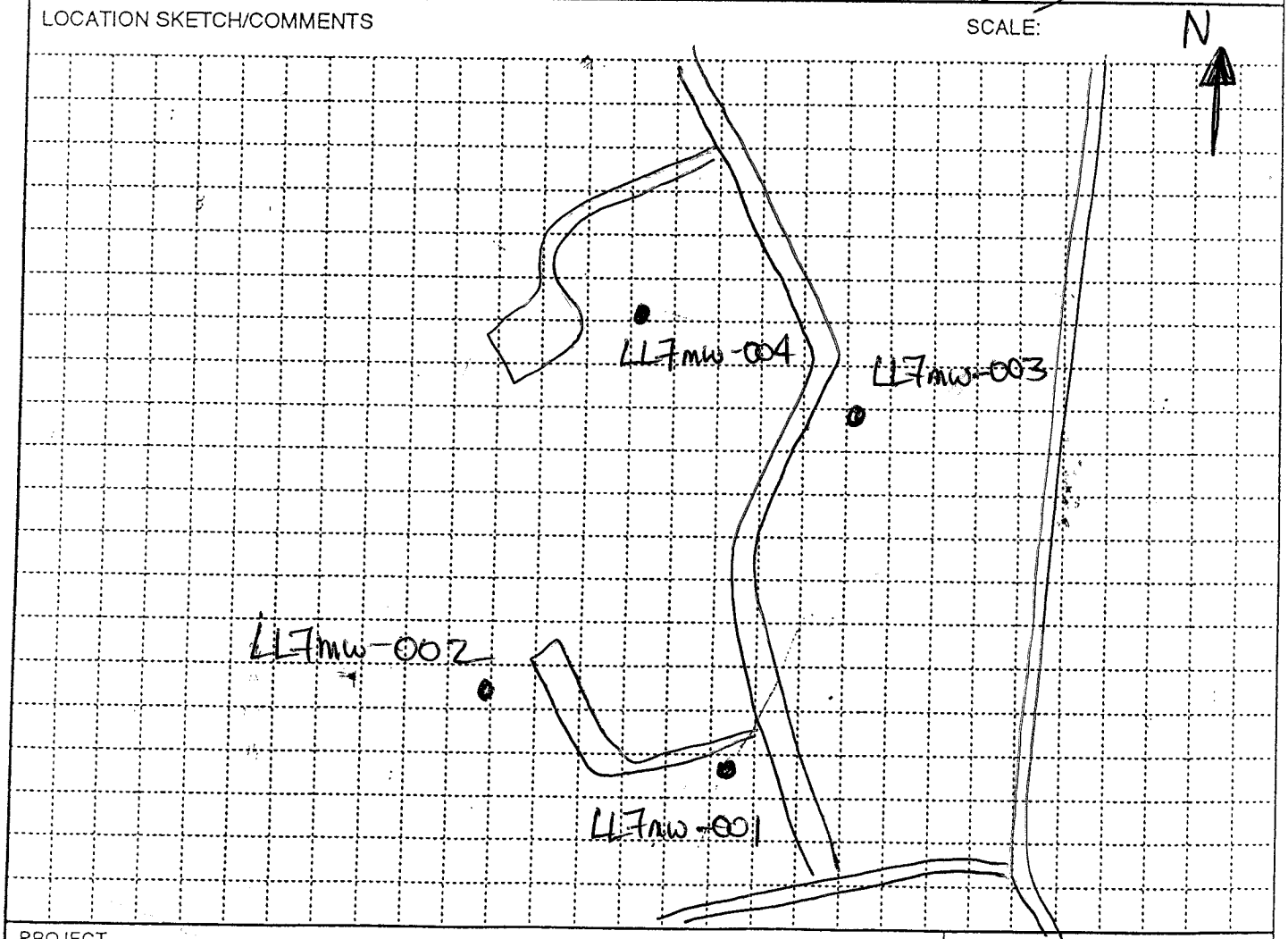
| | |
|---|---|
| 3. PROJECT: RVAAP RI 14 | 4. LOCATION: Load Line 7 |
| 5. NAME OF DRILLER: Sam Holter | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME-LC60 |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" Splitspoons; 3" Shelby Tube; 6.25" ID HSA; 2" ID Core Barrel; 6.25" OD Air Rotary Hammer | 8. HOLE LOCATION: East of IB-3 |
| | 9. SURFACE ELEVATION: 1118.23 ASL |
| | 10. DATE STARTED: 13 Jan 05 — 11. DATE COMPLETED: 13 Jan 05 |
| 12. OVERBURDEN THICKNESS: 16.9 | 15. DEPTH GROUNDWATER ENCOUNTERED: ~26 |
| 13. DEPTH DRILLED INTO ROCK: 14 | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 8.3' @ 1445 01/17/05 |
| 14. TOTAL DEPTH OF HOLE: 31.5 | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): — |

| 18. GEOTECHNICAL SAMPLES | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| SHELBY TUBE 4-6' | — | X | 1 |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY |
|---|---|---|---|---|---|---|
| | — | — | — | — | — | 47.9% |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | — | X | — | |

LOCATION SKETCH/COMMENTS — SCALE:




| PROJECT | HOLE NO. |
|---|---|
| RVAAP RI 14 | LL7mw-003 |

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL7mw-003

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunkey

SHEET 2 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. Recovery | ANALYTICAL SAMPLE NO. USCS | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| 1050 | | 6" Topsoil | | | | Push 2 | |
| | | 65 Rock Frag w/ Sand | | | | | |
| | | Dk. Br. SILT 70% w Sand Damp No Odor No Plasticity Iron Staining | 0.0 | 1.3 | ML | 4-3 | 7.5yr 4/2 |
| | 2 | Br. SILT 70% w/ Sand & Clay Dry No Odor No Plasticity Grey Mottling Present | 0.0 | 1.4 | ML | 1-3 6-7 | 7.5yr 5/4 |
| | 4 | 1100 13 Jan 05 Shelby Tube | | | | | |
| | 6 | Br. SILT 65% w/ Sand and Fine Gravel Dry No Odor No Plasticity No Staining | 0.0 | 1.9 | ML | 1-5 7-10 | 7.5yr 5/4 |
| | 8 | Br. SAND 65% w/ Silt Wet No Odor No Staining No Plasticity | 0.0 | 1.7 | SM | 1-7 5-3 | SAA |
| | 10 | Br. SILT 70% w/ Sand and Fine Gravel No Odor No Staining No Plasticity | 0.0 | 1.3 | ML | 1-10 11-13 | SAA |
| | 12 | Changes to Grey SAA | 0.0 | 1.6 | ML | 1-3 4-6 | 7.5yr 5/1 |
| | 14 | SAA | 1.0 | 1.1 | ML | 1-5 6-8 | SAA |
| | 16 | Splitspoon Refusal @ 16.9 Weathered SANDSTONE Bedrock Grey Fine Grained | 0.0 | 0/9 | | 7/50/3 | |
| | 18 | Shale encountered w/ air rotary hammer @ 19 Ft Grey/Black very Hard | 0.0 | | | | 7.5yr 4/1 |
| | 20 | | | | | | |

PROJECT: RVAAP RI 14

HOLE NO.: LL7mw-003

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL7mw-003

PROJECT: RVAAP RI (4)

INSPECTOR: Mark Dunlevy

SHEET 3 OF 3 SHEETS

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. (e) | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT - (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| 1250 | 20 | Top of Core #1 @ 20.2 | | | | | Recovery = 56.4 / 117.8 = 47.9% |
| | | Dk. Grey/Black SHALE Fissle | | | | | RQD = 56.4 / 56.4 = 19.1% |
| | | very little recovery of the shale layer due to the thin horizontal layers | | | | | 7.5yr 4/1 |
| | 22 | | | | | | |
| | 24 | | | | | | |
| | 26 | Grey Fine Grained SANDSTONE horizontal to 35° bedding planes black Striations present | | | | | 7.5yr 7/1 |
| | | 26.4 to 29.3 contained Vertical Fracture w/ Iron Staining | | | | | |
| | 28 | | | | | | |
| 1320 | 30 | Bottom of Core #1 @ 30.0 | | | | | |
| 1400 | | | | | | | |
| | 32 | BOH 31.5 | | | | | BOH 31.5<br>Sand up to 31<br>Screen from 31<br>to 21<br>Sand up to 18<br>Bentonite to 15<br>Grout to Surface<br>Stick-up Well<br>Completion<br>No Hydration<br>water used |

PROJECT: RVAAP RI (4)

HOLE NO.: LL7mw-003

ENG FORM 5056A-R, AUG 94

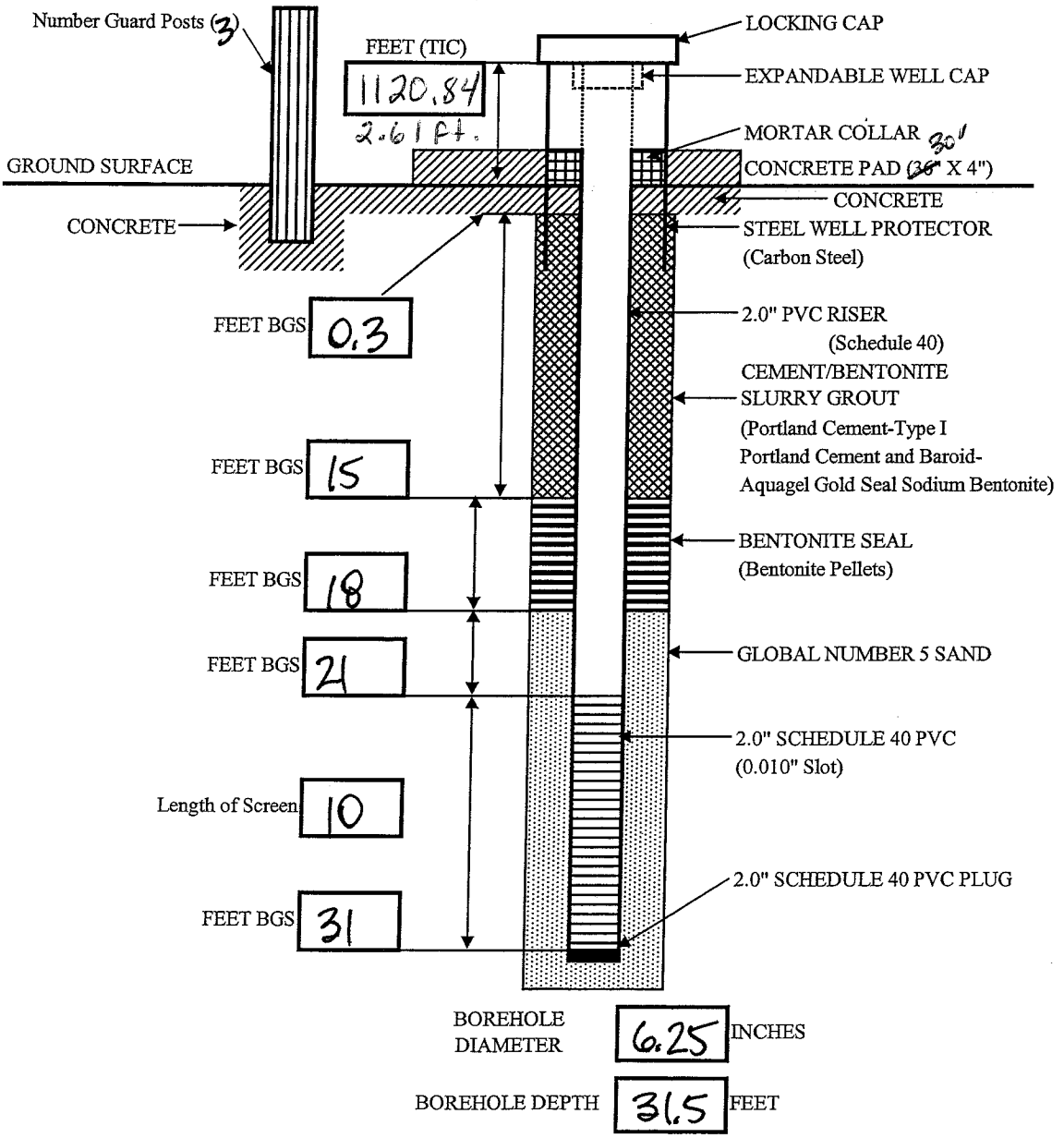
(Proponent: CECW-EG)

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:**

| | | |
|---|---|---|
| Well Number: LL7 mw -003 | Begin: 01/13/05 | End: 01/13/05 |
| Coordinates: N: 555417.04<br>E: 2352351.04 | Elevation: 1118.23 | Reference Point: |
| Logged By: MARK DUNLEVY | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: LL7MW-005-GW
Date: 01/17/05

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP
Development Company: MKM
Development Method: WHALE PUMP
Comments:

Well TD: 33.4 FT TIC
Water Column Height: 25.1 FT
Depth to Water: 8.3 FT
One Well Volume: 14.8 Gals ≈15.0

Well Volume (gallons/foot): 2-Inch =0.16, 4-Inch =0.65, 6-Inch = 1.47, 8-Inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | CON | DO | TEMP | | |
| 1445 | DSB | 8.3 | | | | | | | | |
| 1455 | DSE | 8.8 | | | | | | | | |
| 1457 | DPB | 8.8 | | | | | | | | |
| 1511 | DFM | — | — | 15gal | 7.57 | 0.145 | 3.05 | 10.5 | 35 | 1st well vol (15gal) |
| 1522 | DFM | — | — | 15 gal | 6.66 | 0.149 | 1.83 | 10.8 | 24 | 2nd well vol (30 gal) |
| 1530 | DFM | — | — | 15 gal | 6.41 | 0.150 | 2.64 | 9.1 | 0 | 3rd well vol (45 gal) |
| 1539 | DFM | — | — | 15gal | 6.56 | 0.154 | 2.38 | 10.4 | 0 | 4th well vol (60 gal) |
| 1548 | DFM | — | — | 15gal | 6.71 | 0.154 | 3.63 | 11.1 | 0 | 5th well vol (75 gal) |
| 1559 | DFM | — | — | 15gal | 6.61 | 0.156 | 1.84 | 11.2 | 0 | 6th well vol (90 gal) |
| 1607 | DFM | — | — | 15gal | 6.63 | 0.158 | 2.34 | 10.5 | 0 | 7th well vol (105 gal) |
| 1607 | DPE | 25.4 | — | — | — | — | — | — | — | — |
| | | | | | | | | | | Development Complete. |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photolonizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualatative Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Vijay Alluri (Please Print)
Signature: Vijay
Reviewed By: C. Esler
Date: 2/22/05

# Monitoring Well Purging Form

Well ID: LL7MW-003GW

Date: 01-25-05

Ravenna Army Ammunition Plant
Ravenna, Ohio

## WELL OBSERVATIONS

Protective Casing: (Intact) · Damaged  Locked: Yes · (No)  Key No:

Concrete Base: (Intact) · Damaged  Inner Casing: (2" · 4" · 6" · 8")  Other:

Stickup Height: 2.5 (ft)  TIC · TOC Difference: 0.21 (ft)

Vapor Readings: HNu · OVA  Background: _____  Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL | Yes · (No) | _____ Yes · No | LL7MW-0036W |
| DNAPL | Yes · (No) | _____ Yes · No | |

## CALCULATIONS

(A) Depth to Well Bottom ~~33.45~~ 33.45 ST (ft) (TOC · TIC · BGS)  (Measured · Previously Measured (circle one))

(B) Depth to Water ~~ST~~ 8.55 (ft) (TOC · TIC · BGS)  Time Measured: 0900

(C) Water Column Height (A-B) 24.9 (ft)

(D) Well Diameter Factor 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) One Well Volume (C*D) 3.98 (gal)

(F) Volumes to be Evacuated 5

(G) **TOTAL VOLUME TO BE EVACUATED (E * F)** 19.92 (gal)

## EVACUATION METHOD

Well Evacuation Method: Bailer · Submersible Pump · (Other: MicroPurge)  Device Number: _____

Purge Water Disposition: 1. Discharged Onsite 2. (Collected) And: (Stored · Disposed) (Onsite · Offsite)

Collected In: Tanks · Drums  No. of Containers: _____

Comments: _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | DO | |
| 0915 | 8.55 | | | 0.192 | 8.86 | 6.37 | 80 | 10.85 | Initial |
| 0918 | 8.70 | | | 0.190 | 10.2 | 6.29 | 0 | 1.75 | |
| 0921 | 8.90 | | | 0.189 | 10.36 | 6.31 | 0 | 0 | |
| 0924 | 9.05 | | | 0.189 | 10.37 | 6.36 | 0 | 0 | End Purging |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Shallscia Johnson (Please Print)  Reviewed By: L. Esker

Signature: _____  Date: 2/22/05

# Field Sampling Report

**Location ID:** LL7 MW-003-GW

**Date:** 01-25-05

**Ravenna Army Ammunition Plant**
**Characterization of 14 RVAAP AOCs**

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| **Method** | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | MicroPurge | X | | | Push Probe | | Plastic Liner | |
| **Type/Construction** | | | | | Mattocks | | | |
| **Miscellaneous** | **Well Purging Form** (Yes) - No | | | | | | | |

**Sample Collection:** 0930 hrs

**Sample Type:** Composite - MI - (Grab) If MI, # of increments taken: NA

**Location:** (Plotted on Map) - (Staked in Field) Estimated - Measured - (Surveyed)

**Sample Depth:** 27 FT (below surface)

**Decon:** Dedicated - Each Day - (Each Location)

## Field Parameters
(at time of sample)

| | | |
|---|---|---|
| **PID / FID Readings:** | | |
| Background: | 0.0 | ppm |
| Sample: | 0.0 | ppm |
| **Water Level** | 8.55 | FT |
| **Temperature** | 10.37 | °C |
| **Sp. Conductance:** | 0.189 | uMHOs |
| **pH** | 6.36 | units |
| **Turbidity** | 0 | N.T.U. |

## Analytical Parameters

| | | | | |
|---|---|---|---|---|
| VOC | X | TPH GRO | | |
| SVOC | X | TPH DRO | | |
| Explosives | X | Chromium +6 | | |
| Propellants | X | Nitrate | X | |
| TAL Metals | X | | | |
| Pesticides/PCBs | X | | | |
| Cyanides | | | | |
| TOC | | | | |
| Grain Size | | | | |

## Other Parameters

| | | | |
|---|---|---|---|
| Corrosivity | | | |
| Reactivity Sulfide/Cyanide | | | |
| Ignitability | | | |
| | | | |

## QA Samples

| | | |
|---|---|---|
| MS/MSD | Yes / (No) | NA |
| Duplicate ID ✓ | LL7MW-003-DUP | NA |
| Equipment Rinse ID | | (NA) |
| (Trip Blank ID) | TRIP BLANK | NA |

**Sample Description**

Clear water; No Sheen
No odor; No turbidity

**Split Sample**

**Split Sample ID:** LL7-MW-003-GW

**Name:** [illegible] (CERTIFIED EC)

**Agency/Company:** USACE - LOUISVILLE

**Address:** 600 DR MARTIN LUTHER KING JR PLACE
LOUISVILLE KY 40202

**QA/QC Provided:** MS/MSD - Duplicate - Trip Blanks - Field Blanks

**Parameters:** (Same as Above) - As Listed

***Soil sample description should include:***

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

***Water sample description should include:***

*Color Odor Sheen Turbidity*

Logged By: Shalinam Tambosiva (Please Print)

Signature: [signature]

Reviewed by: ERIC ELLIS (Please Print)

Signature: [signature] Date: 2/4/05

# HTRW DRILLING LOG

| | | |
|---|---|---|
| | DISTRICT: Louisville | HOLE NUMBER: LL7mw-004 |
| 1. COMPANY NAME: MKM Engineers | 2. DRILL SUBCONTRACTOR: HAD Drilling Contractors | SHEET 1 OF 3 SHEETS |
| 3. PROJECT: RVAAP RI 14 | 4. LOCATION: Load Line 7 | |
| 5. NAME OF DRILLER: Sam Holler | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME LC-60 | |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6.25" ID HSA; 2" Split Spoons; 6.250D Air Rotary Hammer | 8. HOLE LOCATION: Eastern 2B-4 | |
| | 9. SURFACE ELEVATION: 1123.30 ASL | |
| | 10. DATE STARTED: 12 Jan 05 | 11. DATE COMPLETED: 13 Jan 05 |
| 12. OVERBURDEN THICKNESS: 9.5 | 15. DEPTH GROUNDWATER ENCOUNTERED: ~21 ft | |
| 13. DEPTH DRILLED INTO ROCK: 20 | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 11.85 @ 0935 01/17/05 | |
| 14. TOTAL DEPTH OF HOLE: 29.5 | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): — | |

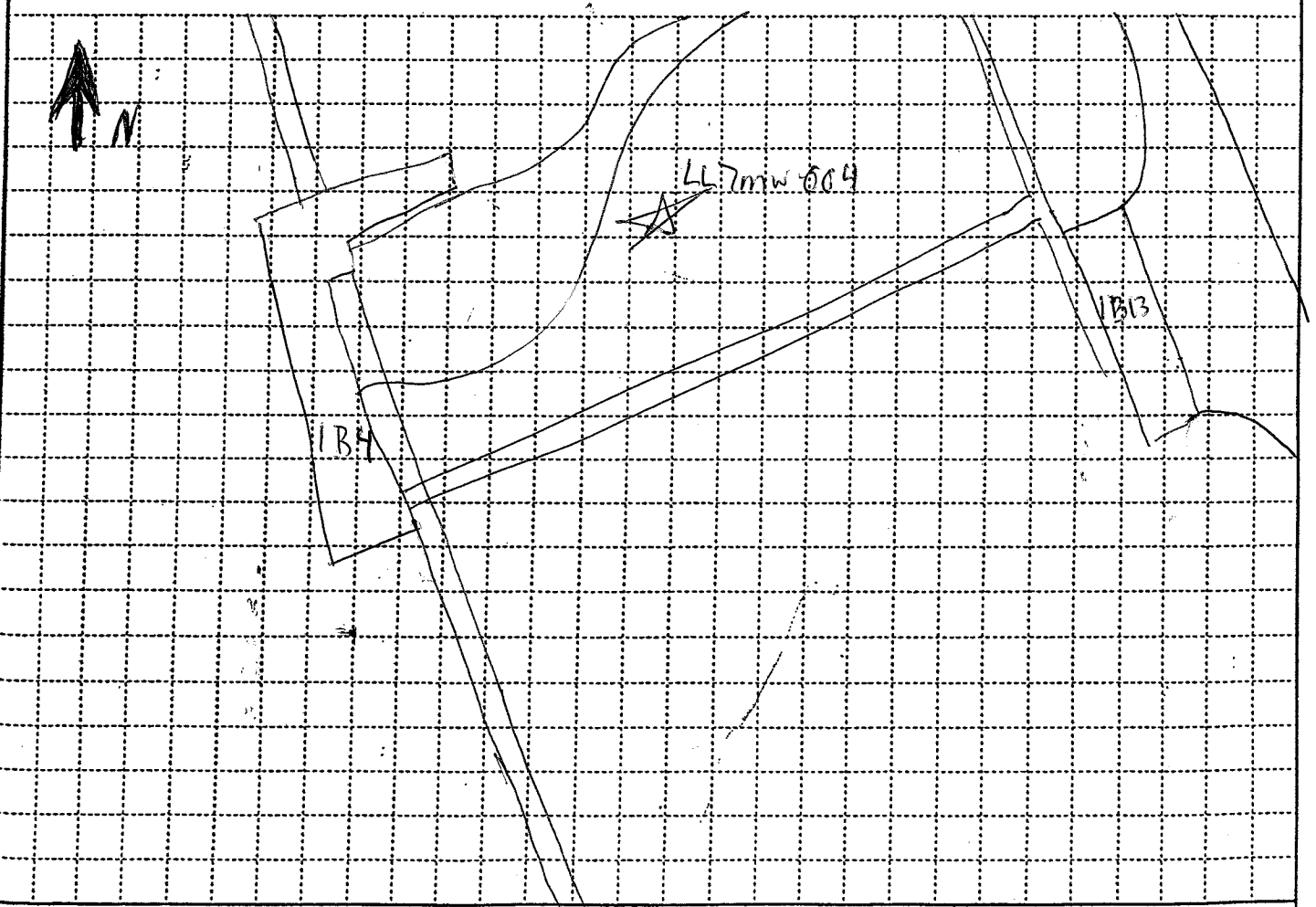
| 18. GEOTECHNICAL SAMPLES | DISTRICT | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| NONE | — | — | 0 |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY |
|---|---|---|---|---|---|---|
| | — | — | — | — | — | 0 % |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | — | X | — | |

LOCATION SKETCH/COMMENTS

SCALE:




| PROJECT | HOLE NO. |
|---|---|
| RVAAP RI 14 | LL7mw-004 |

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL7mw-004

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunlevy

SHEET 2 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. Retained | ANALYTICAL SAMPLE NO. LL7S | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| 1545 | | 6" Topsoil | | | | | |
| | | Lt. Br. SILT 65% w/ Sand Damp No Odor No Plasticity Grey Mottling | 0.0 | 1.7 | ML | Push-1<br>2-4 | 7.5yr 5/6 |
| | 2 | | | | | | |
| | | | 0.0 | 1.3 | ML | 1-3<br>6-7 | |
| | 4 | Br. SILT 70% w Sand Dry No Odor No Plasticity No Staining | | | | | 7.5yr 5/4 |
| | | | 0.0 | 1.8 | ML | 1-4<br>5-8 | |
| | 6 | | | | | | |
| | | SAA | 0.0 | 1.8 | ML<br>SM | 2-12<br>17-25 | SAA<br>7.5yr 6/3 |
| | 8 | Grey SAND 70% w SILT dry No Odor No Staining No Plasticity | | | | | |
| | | Br. SILT 65% w Sand dry No Odor. No Staining No Plasticity | 0.0 | 1.5 | ML | 4-10<br>4/50 | 7.5yr 5/6 |
| 1550<br>0755 | | weathered Sandstone @ 9.5 Splitspoon Refusal | | | | | |
| | 10 | Lt. Brn w/Red SANDSTONE weathered | | | | | 7.5yr 7/6 |
| | 12 | | | | | | |
| | 14 | | | | | | |
| | | Color Changes to Grey @ 15.5 | | | | | 7.5yr 6/1 |
| | 16 | Intermittent SHALE and SANDSTONE Layers between 15 and 18 ft | | | | | 7.5yr 4/1 |
| | | Black SHALE | | | | | 7.5yr 6/1 |
| | | Grey SANDSTONE | | | | | |
| | 18 | Grey Fine Grained SANDSTONE | | | | | 7.5yr 6/1 |
| | | | | | | | |
| | 20 | | | | | | |

PROJECT: RVAAP RI 14

HOLE NO.: LL7mw 004

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL7mw-004

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunlay

SHEET 3 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. (e) | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | 22 | Gray Fine Grained SANDSTONE | | | | | 7.5Y-6/1 |
| V | | Cuttings become wet @ ~21.5 ft | | | | | |
| | 22 | | | | | | |
| | 24 | | | | | | |
| | 26 | | | | | | |
| | 28 | | | | | | |
| 0850 | | | | | | | |
| | 30 | TD of 29.5 | | | | | BOH 29.5<br>Screen from 29.5<br>to 19.5<br>Sand up to 16<br>Bentonite to 13<br>Grout to Surface<br>Stick-up well<br>Completion<br>No water used<br>Tohydrate |

PROJECT: RVAAP RI 14

HOLE NO.: LL7mw-004

ENG FORM 5056A-R, AUG 94

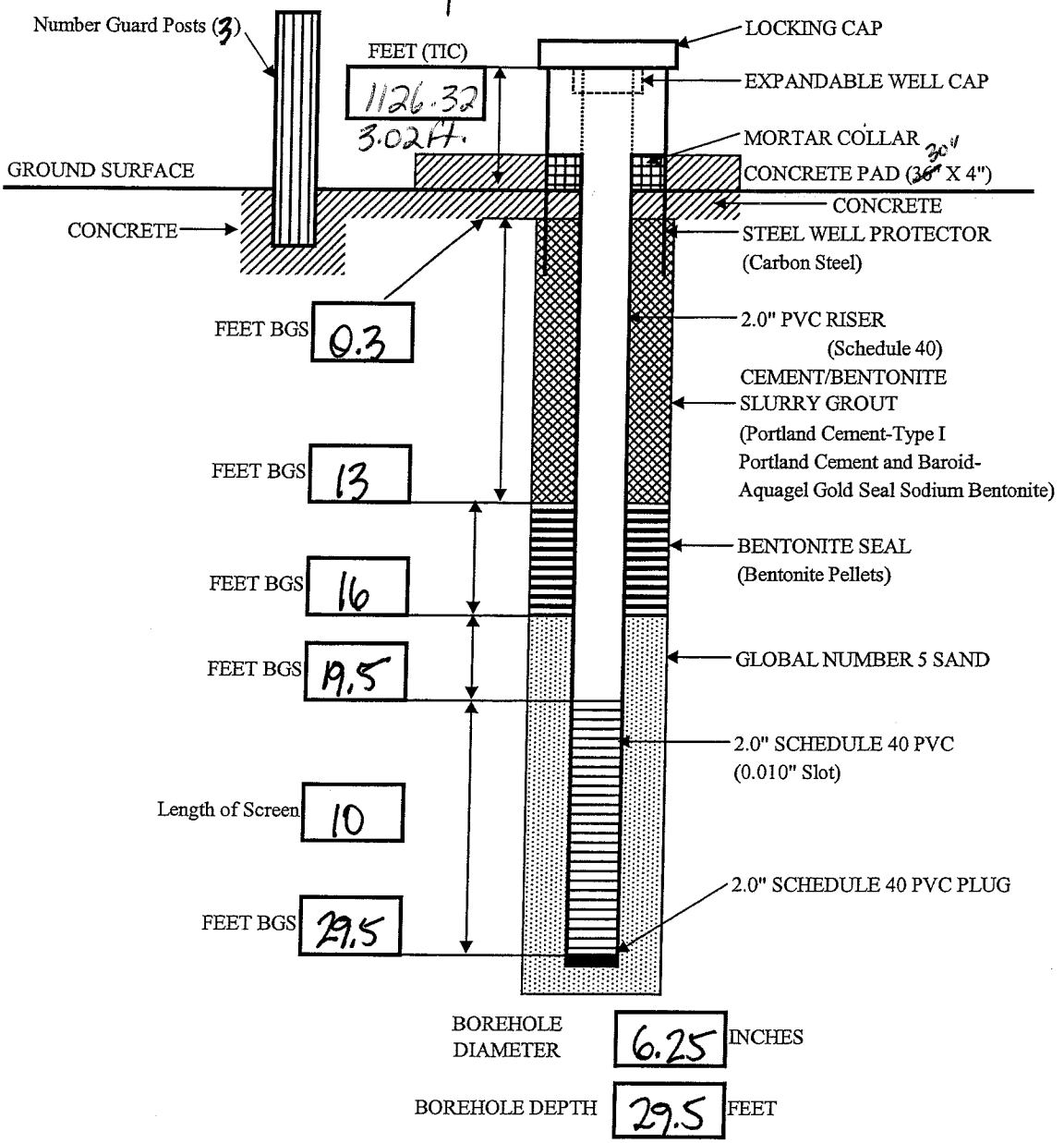
(Proponent: CECW-EG)

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:**

| | | |
|---|---|---|
| Well Number: LL7mw-004 | Begin: 01/12/05 | End: 01/13/05 |
| Coordinates: N: 555581.14<br>E: 2352035.20 | Elevation: 1123.30 | Reference Point: |
| Logged By: MARK DUSLEVY | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: LL7MW - 004 - GW
Date: 01/17/05

Ravenna Army Ammunition Plant
RVAAP 14 AOC Characterization

Project: RVAAP 14
Development Company: MKM
Development Method: Whale pump
Comments:

Well TD: 32.10 FT TIC  Depth to Water: 11.85 FT  ≈ 12gal
Water Column Height: 20.25 FT  One Well Volume: 11.9 Gals

Well Volume (gallons/foot): 2-Inch = 0.16, 4-Inch = 0.65, 6-Inch = 1.47, 8-Inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | CON | DO | TEMP | | |
| 935 | DSB | 11.85 | – | – | – | – | – | – | – | – |
| 945 | DSE | 11.84 | – | – | – | – | – | – | – | – |
| 946 | DPB | 11.84 | – | – | – | – | – | – | – | – |
| 958 | DFM | – | – | 12gal | 5.87 | 0.186 | 2.92 | 11.0 | 8 | 12gal (1st well vol) |
| 1006 | DFM | – | – | 12gal | 6.11 | 0.159 | 2.96 | 10.9 | 0 | 24gal (2nd well vol) |
| 1015 | DFM | – | – | 12gal | 5.84 | 0.143 | 4.57 | 10.4 | 0 | 36gal (3rd well vol) |
| 1024 | DFM | – | – | 12gal | 6.04 | 0.141 | 3.58 | 9.8 | 0 | 48gal (4th well vol) |
| 1032 | DFM | – | – | 12gal | 6.25 | 0.151 | 3.32 | 9.7 | 0 | 60 gal (5th well vol) |
| 1041 | DFM | – | – | 12gal | 6.18 | 0.150 | 3.00 | 9.7 | 0 | 72 gal (6th well vol) |
| 1050 | DFM | – | – | 12gal | 6.21 | 0.149 | 2.40 | 10.3 | 0 | 84 gal (7th well vol) |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | (Development complete) |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Sudheer Gubba (Please Print)
Signature: S. Gubba

Reviewed By: C. Estes
Date: 2/22/05

# Monitoring Well Purging Form

Well ID: LL7MW-004 GW

Date: 01-24-05

Ravenna Army Ammunition Plant
Ravenna, Ohio

## WELL OBSERVATIONS

Protective Casing: (Intact) · Damaged  Locked: Yes · (No)  Key No:

Concrete Base: (Intact) · Damaged  Inner Casing: (2") · 4" · 6" · 8"  Other:

Stickup Height: 2.65 3.02 (ft)  TIC · TOC Difference: 0.4 (ft)

Vapor Readings: HNu: OVA  Background: _____  Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL | Yes · (No) | _____ Yes · No | |
| DNAPL | Yes · (No) | _____ Yes · No | LL7MW-004-GW |

## CALCULATIONS

(A) Depth to Well Bottom 32.15 (ft) TOC · TIC · BGS (Measured) · Previously Measured (circle one)

(B) Depth to Water 11.9 (ft) TOC · TIC · BGS  Time Measured: 1335

(C) Water Column Height (A-B) 20.25 (ft)

(D) Well Diameter Factor 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) One Well Volume (C*D) 3.24 (gal)

(F) Volumes to be Evacuated 5

**(G) TOTAL VOLUME TO BE EVACUATED (E * F) 16.2 (gal)**

## EVACUATION METHOD

Well Evacuation Method: Bailer · Submersible Pump · (Other: Micro Purge)  Device Number: _____

Purge Water Disposition: 1. Discharged Onsite 2. Collected And: (Stored) · Disposed (Onsite) · Offsite

Collected In: Tanks · Drums  No. of Containers: _____

Comments: _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | DO | |
| 1350 | 11.9 | | | 0.296 | 9.69 | 5.64 | 0 | 7.33 | Initial |
| 1353 | 12.25 | | | 0.283 | 10.06 | 5.92 | 0 | 3.25 | |
| 1356 | 12.40 | | | 0.275 | 9.88 | 6.09 | 0 | 1.95 | |
| 1359 | 12.55 | | | 0.266 | 9.86 | 6.01 | 0 | 1.31 | End Purging |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Shannon Tarrina (Please Print)  Reviewed By: C. Esker

Signature: _____  Date: 2/22/05

# Field Sampling Report

Location ID: LL7MW-004 GW

Date: 01-24-05

Ravenna Army Ammunition Plant
Characterization of 14 RVAAP AOCs

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| Method | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | Micropurge | X | | | Push Probe | | Plastic Liner | |
| Type/Construction | | | | | Mattocks | | | |
| Miscellaneous | Well Purging Form (Yes) - No | | | | | | | |

**Sample Collection:** 1400 hrs

**Sample Type:** Composite - MI - (Grab)
If MI, # of increments taken: NA

**Location:** (Plotted on Map) - Staked in Field
Estimated - Measured - (Surveyed)

**Sample Depth:** 26' FT (below surface)

**Decon:** Dedicated - Each Day - (Each Location)

| Field Parameters (at time of sample) | | |
|---|---|---|
| PID / FID Readings: | | |
| Background: | 0.0 | ppm |
| Sample: | 0.0 | ppm |
| Water Level | 11.9 | FT |
| Temperature | 9.86 | °C |
| Sp. Conductance: | 0.265 | uMHOs |
| pH | 6.01 | units |
| Turbidity | 0 | N.T.U. |

| Analytical Parameters | | | |
|---|---|---|---|
| VOC | X | TPH GRO | |
| SVOC | X | TPH DRO | |
| Explosives | X | Chromium +6 | |
| Propellants | X | Nitrate | X |
| TAL Metals | X | | |
| Pesticides/PCBs | X | | |
| Cyanides | | | |
| TOC | | | |
| Grain Size | | | |

| Other Parameters | | | |
|---|---|---|---|
| Corrosivity | | | |
| Reactivity Sulfide/Cyanide | | | |
| Ignitability | | | |
| | | | |

**QA Samples**

| | | |
|---|---|---|
| MS/MSD | Yes / No | NA |
| Duplicate ID | | NA |
| Equipment Rinse ID | | NA |
| Trip Blank ID | Trip Blank | NA |

**Sample Description**

Clear water, no sheen
no odor, no turbidity

*Soil sample description should include:*

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

*Water sample description should include:*

*Color Odor Sheen Turbidity*

**Split Sample**

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: - Same as Above - As Listed

Logged By: Shahram Tahoriwa (Please Print)

Signature:

Reviewed by: ERIC ELLIS (Please Print)

Signature: Date: 2/4/05

# HTRW DRILLING LOG

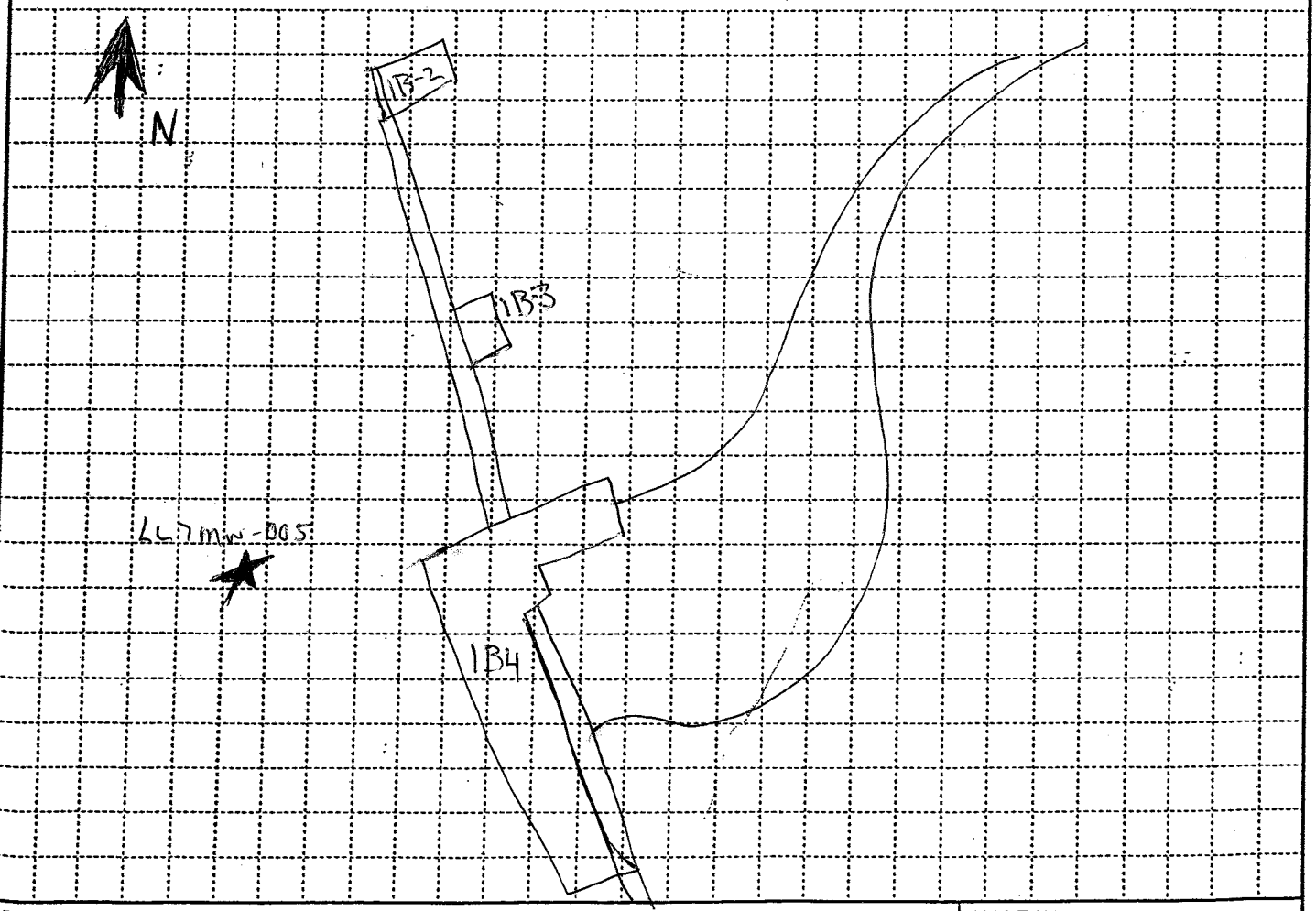
| | | |
|---|---|---|
| | DISTRICT: Louisville | HOLE NUMBER: LL7mw-005 |
| 1. COMPANY NAME: MKM Engineers | 2. DRILL SUBCONTRACTOR: HAD Drilling Contractors | SHEET: 1 OF 3 SHEETS |
| 3. PROJECT: RVAAP RE 14 | 4. LOCATION: Load Line 7 | |
| 5. NAME OF DRILLER: Sam Holler | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME-LC 60 | |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" Split Spoon; 3" Shelby Tube; 6.25" ID HSA; 6.25" OD Air Rotary Hammer | 8. HOLE LOCATION: West of 2B-4 | |
| | 9. SURFACE ELEVATION: 1133.30 ASL | |
| | 10. DATE STARTED: 11 Jan 05 | 11. DATE COMPLETED: 11 Jan 05 |
| 12. OVERBURDEN THICKNESS: 2.0 | 15. DEPTH GROUNDWATER ENCOUNTERED: ~21 | |
| 13. DEPTH DRILLED INTO ROCK: 26.2 | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 17.35' @ 1345 01/13/05 | |
| 14. TOTAL DEPTH OF HOLE: 28.2 | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) | |

| 18. GEOTECHNICAL SAMPLES | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| Shelby Tube 0-2ft | — | X | 0 |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY — % |
|---|---|---|---|---|---|---|
| | — | — | — | — | — | |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | — | X | — | D. Dunlap |

LOCATION SKETCH/COMMENTS — SCALE:




| PROJECT | HOLE NO. |
|---|---|
| RVAAP RE 14 | LL7mw-005 |

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL7mw-005

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunlay

SHEET 2 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. Recovery | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| 1415 | | 6" Topsoil | | | | Push - 2 | Shelby Tube Taken from 0-2 ft 1426 |
| | | Reddish Br. SAND 70% w/silt Damp No odor No Plasticity Red Iron Staining | 0.0 | 1.7 | | 4-7 | 7.5yr 5/6 |
| | 2 | SPLIT SPOON Refusal @ 2.0 | | | | | |
| | | Reddish Br. Sandstone highly weathered | | | | | 2.5yr 5/6 |
| | 4 | Becomes more competent @ 4.0 | | | | | |
| | 6 | | | | | | |
| | | Color Changes @ 7.0 | | | | | 7.5yr 5/6 |
| | 8 | | | | | | 7 |
| | 10 | | | | | | |
| | | DK. Grey/Black Shale very fissle Soft | | | | | |
| | 12 | | | | | | 1.5yr 4/1 |
| | 14 | | | | | | |
| | 16 | | | | | | |
| | 18 | | | | | | |
| | | Grey Sandstone hard Fine Grained | | | | | 7.5yr 7/2 |
| | 20 | | | | | | |

PROJECT: RVAAP RI 14

HOLE NO.: LL7mw-005

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL7mw-005

PROJECT: RVAAP RI IV

INSPECTOR: Mark Dunlevy

SHEET 3 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. (e) | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| ▽ | 20 | Saturated/wet Cuttings below Shale | | | | | |
| | 22 | SAA | | | | | SAA |
| | 24 | | | | | | |
| | 26 | | | | | | |
| | 28 | | | | | | |
| 1515 | | BOH 28.2 | | | | | BOH 28.2<br>Screen from 28 to 18<br>Sand up to 15<br>Bentonite to 12<br>Grout to Surface<br>Stick-up will completion<br>No Hydration water used |
| | 30 | | | | | | |

PROJECT: RVAAP RI IV

HOLE NO.: LL7mw-005

ENG FORM 5056A-R, AUG 94

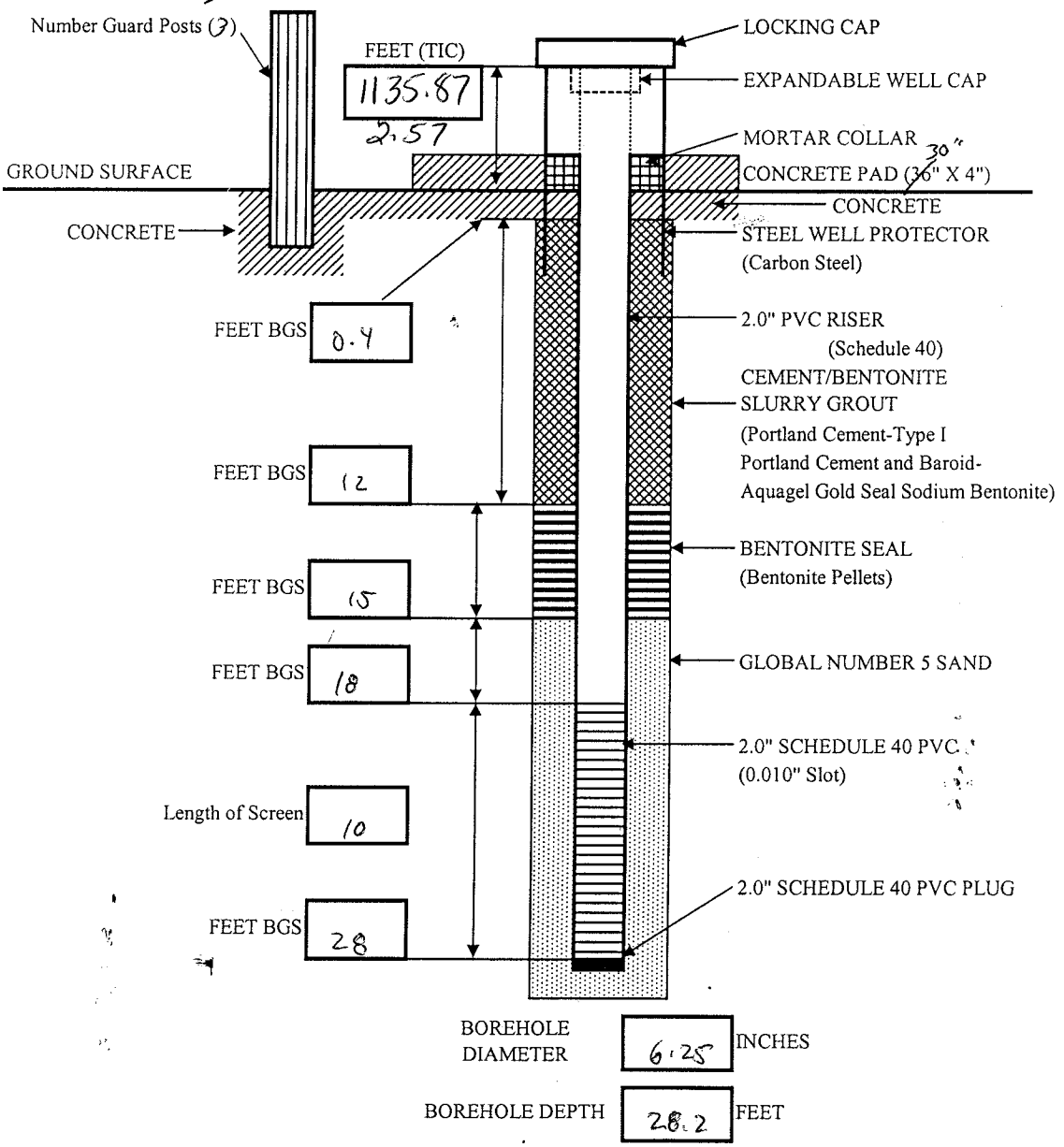
(Proponent: CECW-EG)

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:** RVAAPRFLY

| | | |
|---|---|---|
| Well Number: LL7mw-005 | Begin: 11 Jan 05 | End: 11 Jan 05 |
| Coordinates: N: 555581.80<br>E: 2351741.47 | Elevation: 1133.30 | Reference Point: |
| Logged By: | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: LL7mw-005-GW
Date: 01/13/05

Ravenna Army Ammunition Plant
RVAAP 14 AOC Characterization

Project: RVAAP-14
Development Company: MKM

Development Method: WHALE PUMPING
Comments:

Well TD: 30.2 FT TIC  Depth to Water: 17.35 FT
Water Column Height: 12.85 FT  One Well Volume: 7.5 Gals

Well Volume (gallons/foot): 2-Inch = 0.16, 4-Inch = 0.65, 6-Inch = 1.47, 8-Inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | CON | DO | TEMP | | |
| 1345 | DSB | 17.35 | - | - | - | - | - | - | - | - |
| 1350 | DSE | 17.45 | - | - | - | - | - | - | - | - |
| 1351 | DPB | 17.45 | - | - | - | - | - | - | - | - |
| 1407 | DFM | - | - | 7.5 | 6.63 | 0.103 | 7.17 | 14.7 | >1000 | 1st well vol (7.5 gal) |
| 1409 | DPE | DRY | - | - | - | - | - | - | - | 7.5 gal (DRY) |
| 1420 (~~1406~~) | DPB | 28.2 | - | - | - | - | - | - | - | - |
| 1422 | DPE | DRY | - | 1 | - | - | - | - | - | 8.5 gal (DRY) |
| 1555 | DPB | 27.55 | - | - | - | - | - | - | - | - |
| 1557 | DPE | DRY | - | 0.5 | - | - | - | - | - | 9 gal (DRY) |
| 01/14/05 0910 | DSB | 20.1 | - | - | - | - | - | - | - | - |
| 0920 | DSE | 20.3 | - | - | - | - | - | - | - | - |
| 0920 | DPB | 20.3 | - | - | - | - | - | - | - | - |
| 0926 | DPE | DRY | - | 4.5 | - | - | - | - | - | 13.5 gal |
| 01/18/05 1533 | DPB | 18.4 | - | - | - | - | - | - | - | - |
| 1534 | DFM | - | - | - | 6.66 | 0.073 | 9.23 | 10.3 | 917 | 15 gal (2nd well vol) |
| 1545 | FINAL DPE | DRY | - | 3.5 | - | - | - | - | - | 18.5 gal |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photolonizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: NILESH SHRINGARPURE (Please Print)
Signature: NShringarpure

Reviewed By: C. Eslick
Date: 2/22/05

# Well Development Record

Well ID: LL7mw-005-GW
Date: 01/19/05

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP 14
Development Company: MKM

Development Method: whale pump
Comments:

Well TD: 30.2 FT TIC  Depth to Water: 17.35 FT
Water Column Height: 12.85 FT  One Well Volume: 7.5 Gals

Well Volume (gallons/foot): 2-inch =0.16  6-inch = 1.47; 4-inch =0.65  8-inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PH | CON | DO | Temp | | |
| 0905 | DPB | 19.35 | - | - | - | - | - | - | - | - |
| 0912 | DPE | Dry | - | 3.0 | - | - | - | - | - | ~~18~~ 21.5 gal |
| 01/20/05 0850 | DPB | 18.1 | - | - | - | - | - | - | - | - |
| 0855 | DFM | - | - | 1.0 | 5.67 | 0.072 | 4.99 | 10.0 | 385 | 22.5 gal (3rd well vol) |
| 01/24/05 0940 | DPB | 18.5 | - | - | - | - | - | - | - | - |
| | | | - | - | - | - | - | - | - | - |
| 1450 | DPE | Dry | | 5.0 | - | - | - | - | - | 27.5 gal |
| 01/25/05 1101 | DPB | 19.3 | - | - | - | - | - | - | - | - |
| 1105 | DFM | | - | 2.5 | 7.34 | 0.066 | 5.75 | 9.60 | 1000 | 30 gal (4th well vol) |
| 1114 | DPE | Dry | — | 2.0 | - | - | - | - | — | 32 gal |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photolonizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Nilesh Shringarpure (Please Print)
Signature: Nilesh Shringarpure/C.E

Reviewed By: C. Esler
Date: 2/22/05

# Monitoring Well Purging Form

Well ID: LL7mw-005GW

Date: 02-22-05

Ravenna Army Ammunition Plant
Ravenna, Ohio

## WELL OBSERVATIONS

Protective Casing: (Intact) · Damaged  Locked: Yes (No)  Key No:

Concrete Base: (Intact) · Damaged  Inner Casing: (2") 4" · 6" · 8"  Other:

Stickup Height: 2.99 (ft)  TIC · TOC Difference: 0.75 (ft)

Vapor Readings: HNu · OVA  Background: _____  Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL | Yes (No) | _____ Yes · No | |
| DNAPL | Yes (No) | _____ Yes · No | LL7mw-005GW |

## CALCULATIONS

(A) Depth to Well Bottom ~~32.72~~ 30.22 (ft) (TOC) TIC · BGS  Measured · Previously Measured (circle one)

(B) Depth to Water 19.34 (ft) (TOC) TIC · BGS  Time Measured: 0920

(C) Water Column Height (A-B) 10.88 (ft)

(D) Well Diameter Factor 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) One Well Volume (C*D) 1.74 (gal)

(F) Volumes to be Evacuated 5

(G) **TOTAL VOLUME TO BE EVACUATED (E * F)** 8.70 (gal)

## EVACUATION METHOD

Well Evacuation Method: Bailer · Submersible Pump · (Other: Micropurge)  Device Number: _____

Purge Water Disposition: 1. Discharged Onsite 2. Collected And: (Stored) Disposed (Onsite) · Offsite

Collected In: Tanks · Drums  No. of Containers: _____

Comments: _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | DO | |
| 0940 | 19.34 | | | 0.094 | 10.12 | 7.51 | 0 | 8.79 | Initial |
| 0943 | 19.65 | | | 0.088 | 10.16 | 6.53 | 0 | 7.51 | |
| 0946 | 19.80 | | | 0.087 | 10.08 | 6.12 | 0 | 6.79 | |
| 0949 | 19.95 | | | 0.87 | 10.24 | 6.01 | 0 | 6.69 | End Purge |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Shannon Tilson-Hart (Please Print)  Reviewed By: C. Kepler

Signature: _____  Date: 2/22/05

# Field Sampling Report

Location ID: LL7 MW-005 GW

Date: 02-02-05

Ravenna Army Ammunition Plant
Characterization of 14 RVAAP AOCs

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| Method | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | Micropurge | X | | | Push Probe | | Plastic Liner | |
| Type/Construction | | | | | Mattocks | | | |
| Miscellaneous | Well Purging Form (Yes) - No | | | | | | | |

**Sample Collection:** 1000 hrs

**Sample Type:** Composite - MI - (Grab)
If MI, # of increments taken: NA

**Location:** Plotted on Map - Staked in Field - Estimated - Measured - (Surveyed)

**Sample Depth:** 25 FT (below surface)

**Decon:** Dedicated - Each Day - (Each Location)

## Field Parameters
(at time of sample)

| | | |
|---|---|---|
| **PID / FID Readings:** Background: | 0.0 | ppm |
| Sample: | 0.0 | ppm |
| **Water Level** | 19.34 | FT |
| **Temperature** | 10.24 | °C |
| **Sp. Conductance:** | 0.87 | uMHOs |
| **pH** | 6.01 | units |
| **Turbidity** | 0 | N.T.U. |

## Analytical Parameters

| | | | |
|---|---|---|---|
| VOC | X | TPH GRO | |
| SVOC | X | TPH DRO | |
| Explosives | X | Chromium +6 | |
| Propellants | X | Nitrate | X |
| TAL Metals | X | | |
| Pesticides/PCBs | X | | |
| Cyanides | | | |
| TOC | | | |
| Grain Size | | | |

## Other Parameters

| | | | |
|---|---|---|---|
| Corrosivity | | | |
| Reactivity Sulfide/Cyanide | | | |
| Ignitability | | | |

## QA Samples

| | | |
|---|---|---|
| MS/MSD | Yes / No | (NA) |
| Duplicate ID | | (NA) |
| Equipment Rinse ID | | (NA) |
| (Trip Blank ID) | TRIP BLANK | NA |

## Sample Description

clear water, NO sheen
NO odor, NO turbidity

***Soil sample description should include:***

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

***Water sample description should include:***

*Color Odor Sheen Turbidity*

## Split Sample

**Split Sample ID:**

**Name:**

**Agency/Company:**

**Address:**

**QA/QC Provided:** MS/MSD - Duplicate - Trip Blanks - Field Blanks

**Parameters:** Same as Above - As Listed

Logged By: Shannon Tabernik (Please Print)

Signature: [signature]

Reviewed by: ERIC ELLIS (Please Print)

Signature: [signature] Date: 2/4/05

# HTRW DRILLING LOG

| | | |
|---|---|---|
| | DISTRICT: Louisville | HOLE NUMBER: LL7mw-006 |
| 1. COMPANY NAME: MK M Engineers Inc | 2. DRILL SUBCONTRACTOR: HAD Drilling Contractors | SHEET 1 OF 3 SHEETS |

| | |
|---|---|
| 3. PROJECT: RVAAP RI 14 | 4. LOCATION: Load Line 7 |
| 5. NAME OF DRILLER: Sam Holler | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME LC-60 |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 6.25 ID HSA; 3" Shelby Tube; 2" Split Spoon; 2" ID Core Barrel; 6.25 OD Air Rotary Hammer | 8. HOLE LOCATION: NE of 1B-2 |
| | 9. SURFACE ELEVATION: 1120.70 ASL |
| | 10. DATE STARTED: 12 Jan 05 / 11. DATE COMPLETED: 12 Jan 05 |
| 12. OVERBURDEN THICKNESS: 10.1 | 15. DEPTH GROUNDWATER ENCOUNTERED: ~19 |
| 13. DEPTH DRILLED INTO ROCK: 18 | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 7.95 @ 0945 01/14/05 |
| 14. TOTAL DEPTH OF HOLE: 28.1 | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) |

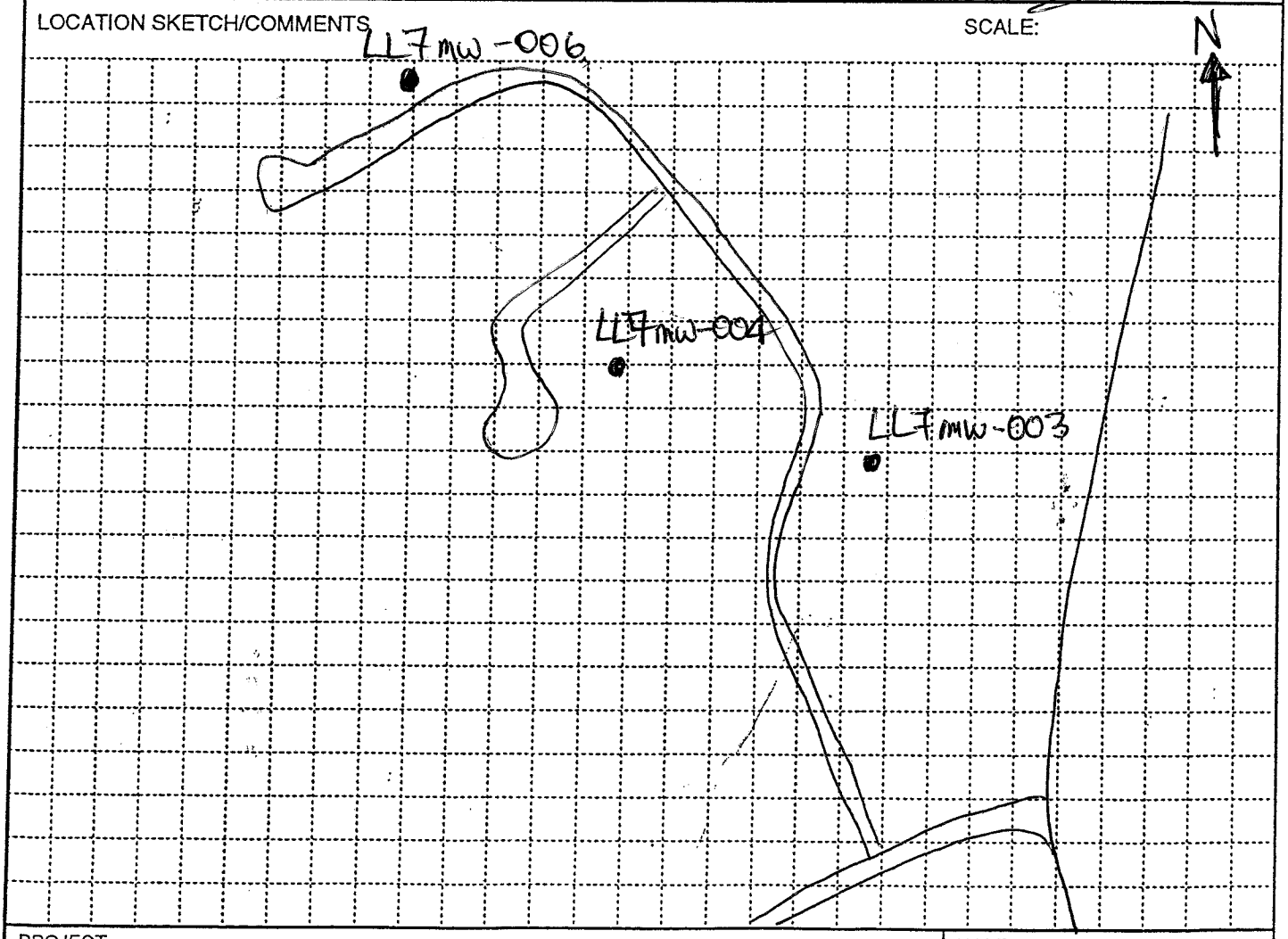
| 18. GEOTECHNICAL SAMPLES | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| SHELBY TUBE 2-A | — | X | 2 |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY |
|---|---|---|---|---|---|---|
| | — | — | — | — | — | 72.1% |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| — | — | X | — | |

LOCATION SKETCH/COMMENTS

SCALE:




| PROJECT | HOLE NO. |
|---|---|
| RVAAP RI 14 | LL7mw-006 |

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL7 mw-006

PROJECT: RVAAP RI CY

INSPECTOR: Mark Dunlevy

SHEET 2 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | ~~GEOTECH SAMPLE OR CORE BOX NO.~~ RECOVERY | ~~ANALYTICAL SAMPLE NO.~~ USCS | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| 0840 | | 6" Topsoil | | | | | |
| | | Br. SILT 70% w/Sand Damp/wet No Odor No Staining No Plasticity Grey Mottling | 0.0 | 1.7 | ML | Weight | 7.5yr 4/6 |
| | 4 | Shelby Tube | | | | | 0845 12 Jan 05 |
| | | Br. SILT 65% w/Sand Damp No odor No Plasticity No Staining | | | | 1-4 | 7.5yr 4/6 |
| | 6 | Reddish Br. SILT 70% w/Sand Damp No odor No Plasticity ~~Iron~~ Stained | | 1.7 | ML | 4-12 | 5yr 5/6 |
| | | Br. SAND 75% w/Silt Damp No Odor No Plasticity No Staining | | 1.4 | SM | 9-32 42-20 | 7.5yr 4/6 |
| | 8 | changes to Dk. Br. | | | | | |
| | | | | 1.2 | SM | 4-10 12-4 | 7.5yr 4/6 |
| | 10 | Split Spoon Refusal @ 10.1 Weathered SS Bedrock | | | | | |
| 1015 | 12 | Top of Core #1 @ 12.0 | | | | | Recovery = $\frac{61.2}{108}$ = 56.7% |
| | | | | | | | RQD = $\frac{8.4}{61.2}$ = 13.7% |
| | 14 | | | | | | |
| | | Dk. Grey/Black SHALE very fissile No Recovery in Core Barrel due to Fractured nature | | | | | |
| | 16 | | | | | | |
| | 18 | | | | | | |
| V | | | | | | | |
| | 20 | | | | | | |

PROJECT: RVAAP RI 14

HOLE NO.: LL7 mw-006

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: CL)mw-006

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunlevy

SHEET 3 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. (e) | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| 1110 | | Bottom of Core #2 @ 21.4 | | | | | |
| 1125 | | Grey fine grained Sandstone horizontal to 25° Bedding Planes Black Strutions Throughout | | | | | Recovery = $\frac{65.9}{66}$ = 99% RQD = $\frac{18}{65.9}$ = 27.5 % 7.5yr 6/1 |
| | 22 | | | | | | |
| | 24 | | | | | | |
| | 26 | | | | | | |
| 1155 | | Bottom of Core #2 @ 26.5 | | | | | |
| | 28 | BoH 28 ft | | | | | BoH 28 Sand up to 27.5 Screen from 27.5 to 17.5 Sand up to 14 Bentonite to 11 Grout to Surface Stick-up well Completion No Hydration water Used |
| | 30 | | | | | | |

PROJECT: RVAAP RI 14

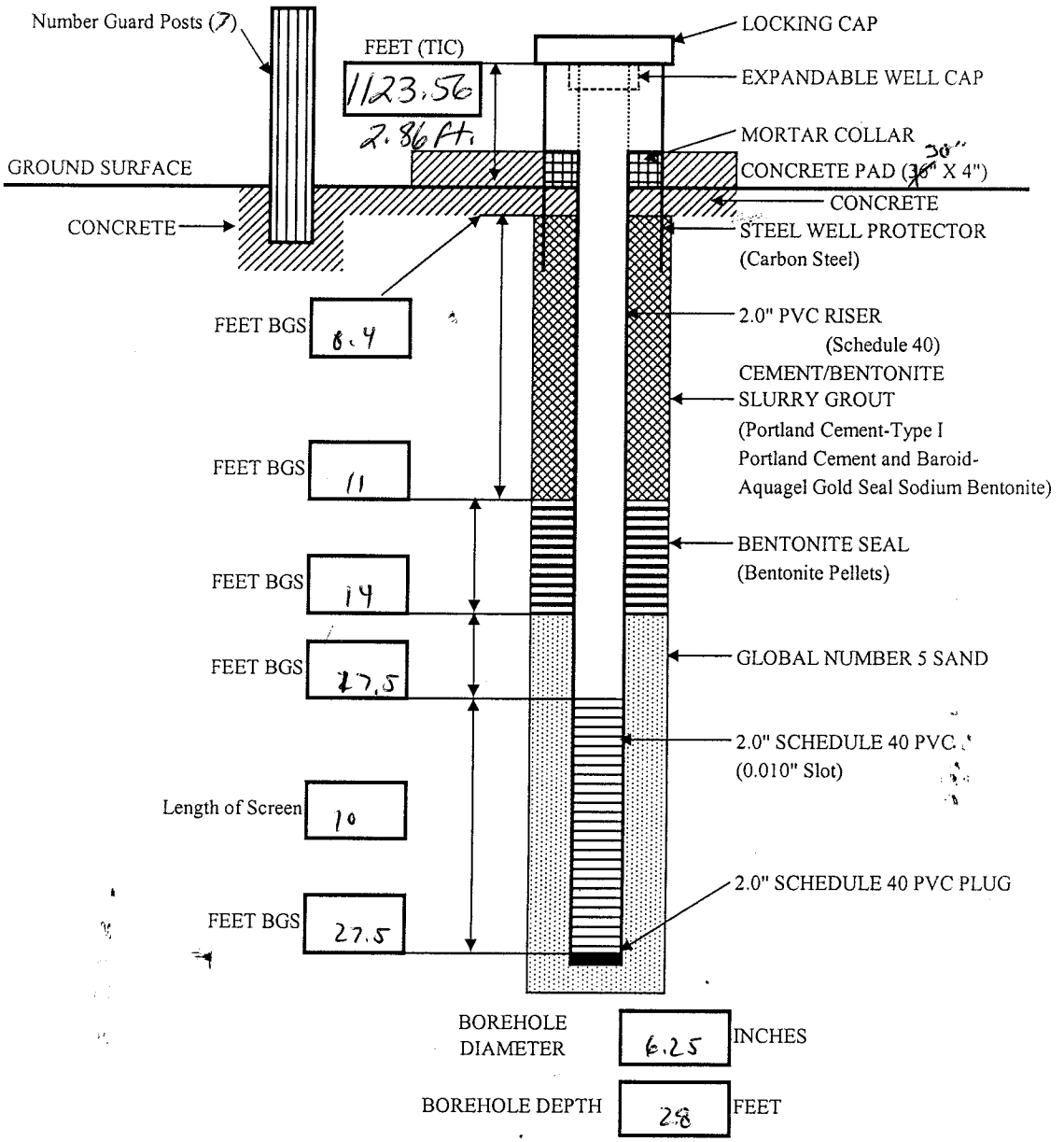
HOLE NO.: CL)mw-006

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:** RVAAPRI 14

| | | |
|---|---|---|
| Well Number: LL7mw-006 | Begin: 12 Jan 05 | End: 12 Jan 05 |
| Coordinates: N: 555990.59 E: 2351879.92 | Elevation: 1120.70 | Reference Point: |
| Logged By: M. Andy | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: L7MW-006-GW
Date: 01/14/05

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP14
Development Company: MKM

Development Method: Whale pumping
Comments:

Well TD: 30.2 FT TIC
Water Column Height: _____ FT
Depth to Water: 7.95 FT ≈ 13
One Well Volume: 12.98 Gals

Well Volume (gallons/foot)
2-Inch = 0.16 6-Inch = 1.47
4-Inch = 0.65 8-Inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | Cond | DO | Temp | | |
| 0945 | DSB | 7.95 | — | — | — | — | — | — | — | — |
| 0955 | DSE | 8.42 | — | — | — | — | — | — | — | — |
| 0957 | DPB | 8.42 | — | — | — | — | — | — | — | — |
| 1000 | DFM | — | — | 13 gal | 6.63 | 0.097 | 3.15 | 10.9 | >1000 | 1st well vol (13 gal) |
| 1007 | DFM | — | — | 13 gal | 5.68 | 0.082 | 2.80 | 11.0 | 896 | 2nd well vol (26 gal) |
| 1015 | DFM | — | — | 13 gal | 6.19 | 0.090 | 4.72 | 10.9 | 246 | 3rd well vol (39 gal) |
| 1025 | DFM | — | — | 13 gal | 6.07 | 0.90 | 5.62 | 10.6 | 3 | 4th well vol (52 gal) |
| 1036 | DFM | — | — | 13 gal | 5.87 | 0.90 | 5.06 | 10.3 | 0 | 5th well vol (65 gal) |
| 1043 | DFM | — | — | 13 gal | 5.86 | 0.90 | 5.63 | 10.3 | 0 | 6th well vol (78 gal) |
| 1055 | DFM | — | — | 13 gal | 6.03 | 0.91 | 5.64 | 10.4 | 0 | 7th well vol (91 gal) |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other _____

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Sudheer Gubbala (Please Print)
Signature: _____
Reviewed By: C. Esker
Date: 2/22/05

# Monitoring Well Purging Form

Well ID: LL7MW-006GW

Date: 01-25-05

Ravenna Army Ammunition Plant
Ravenna, Ohio

## WELL OBSERVATIONS

Protective Casing: (Intact) · Damaged  Locked: Yes (No)  Key No:

Concrete Base: (Intact) · Damaged  Inner Casing: (2") · 4" · 6" · 8"  Other:

Stickup Height: 2.6 (ft)  TIC · TOC Difference: 0.25 (ft)

Vapor Readings: HNu · OVA  Background: _____  Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL | Yes · (No) | _____ Yes · No | LL7MW-006GW |
| DNAPL | Yes · (No) | _____ Yes · No | |

## CALCULATIONS

(A) Depth to Well Bottom 30.25 (ft) (TOC) · TIC · BGS  Measured · Previously Measured (circle one)

(B) Depth to Water 8.3 (ft) (TOC) · TIC · BGS  Time Measured: 1100

(C) Water Column Height (A-B) 21.95 (ft)

(D) Well Diameter Factor 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) One Well Volume (C*D) 3.51 (gal)

(F) Volumes to be Evacuated 5 17.56 gal

**(G) TOTAL VOLUME TO BE EVACUATED (E * F) 17.56 (gal)**

## EVACUATION METHOD

Well Evacuation Method: Bailer · Submersible Pump · (Other: MicroPurge)  Device Number: _____

Purge Water Disposition: 1. Discharged Onsite 2. (Collected) And: (Stored) · Disposed (Onsite) · Offsite

Collected In: Tanks · Drums  No. of Containers: _____

Comments: _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | D.O. | |
| 1115 | 8.3 | | | 0.130 | 8.81 | 5.92 | 347 | 6.91 | Initial |
| 1118 | | | | 0.131 | 9.81 | 5.52 | 353 | 1.7 | |
| 1121 | | | | 0.132 | 10.09 | 5.46 | 238 | 0.69 | |
| 1124 | | | | 0.133 | 10.14 | 5.50 | 217 | 0.17 | |
| 1127 | | | | 0.133 | 10.15 | 5.47 | 215 | 0.05 | End Purging |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Shahram Tabesh (Please Print)

Signature: [signature]

Reviewed By: [signature]

Date: 2/22/05

# Field Sampling Report

**Location ID:** LL7MW-006GW

**Date:** 01-25-05

**Ravenna Army Ammunition Plant**
**Characterization of 14 RVAAP AOCs**

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| **Method** | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | MicroPurge | X | | | Push Probe | | Plastic Liner | |
| **Type/Construction** | | | | | Mattocks | | | |
| **Miscellaneous** | **Well Purging Form** Yes - No | | | | | | | |

**Sample Collection:** 1130 hrs

**Sample Type:** Composite - MI - (Grab)
If MI, # of increments taken: NA

**Location:** (Plotted on Map - Staked in Field)
Estimated - Measured - (Surveyed)

**Sample Depth:** 20 FT (below surface)

**Decon:** Dedicated - Each Day - (Each Location)

### Field Parameters
(at time of sample)

| | | |
|---|---|---|
| **PID / FID Readings:** Background: | 0.0 | ppm |
| Sample: | 0.0 | ppm |
| **Water Level** | 8.3 | FT |
| **Temperature** | 10.15 | °C |
| **Sp. Conductance:** | 0.133 | uMHOs |
| **pH** | 5.47 | units |
| **Turbidity** | 215 | N.T.U. |

### Analytical Parameters

| | | | |
|---|---|---|---|
| VOC | X | TPH GRO | |
| SVOC | X | TPH DRO | |
| Explosives | X | Chromium +6 | |
| Propellants | X | Nitrate | X |
| TAL Metals | X | | |
| Pesticides/PCBs | X | | |
| Cyanides | | | |
| TOC | | | |
| Grain Size | | | |

### Other Parameters

| | | |
|---|---|---|
| Corrosivity | | |
| Reactivity Sulfide/Cyanide | | |
| Ignitability | | |
| | | |

### QA Samples

| | | |
|---|---|---|
| MS/MSD | Yes / No | NA |
| Duplicate ID | | NA |
| Equipment Rinse ID | | NA |
| (Trip Blank ID) | Trip Blank | NA |

### Sample Description

Clear water, NO Sheen, NO Odor
Low to med. turbidity

### Split Sample

**Split Sample ID:**

**Name:**

**Agency/Company:**

**Address:**

**QA/QC Provided:** MS/MSD - Duplicate - Trip Blanks - Field Blanks
**Parameters:** - Same as Above - As Listed

***Soil sample description should include:***

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

***Water sample description should include:***

*Color Odor Sheen Turbidity*

Logged By: Shahram Tabersinia (Please Print)

Signature: S Shahram

Reviewed by: ERIC ELLIS (Please Print)

Signature: Eric Ellis Date: 2/4/05

# HTRW DRILLING LOG

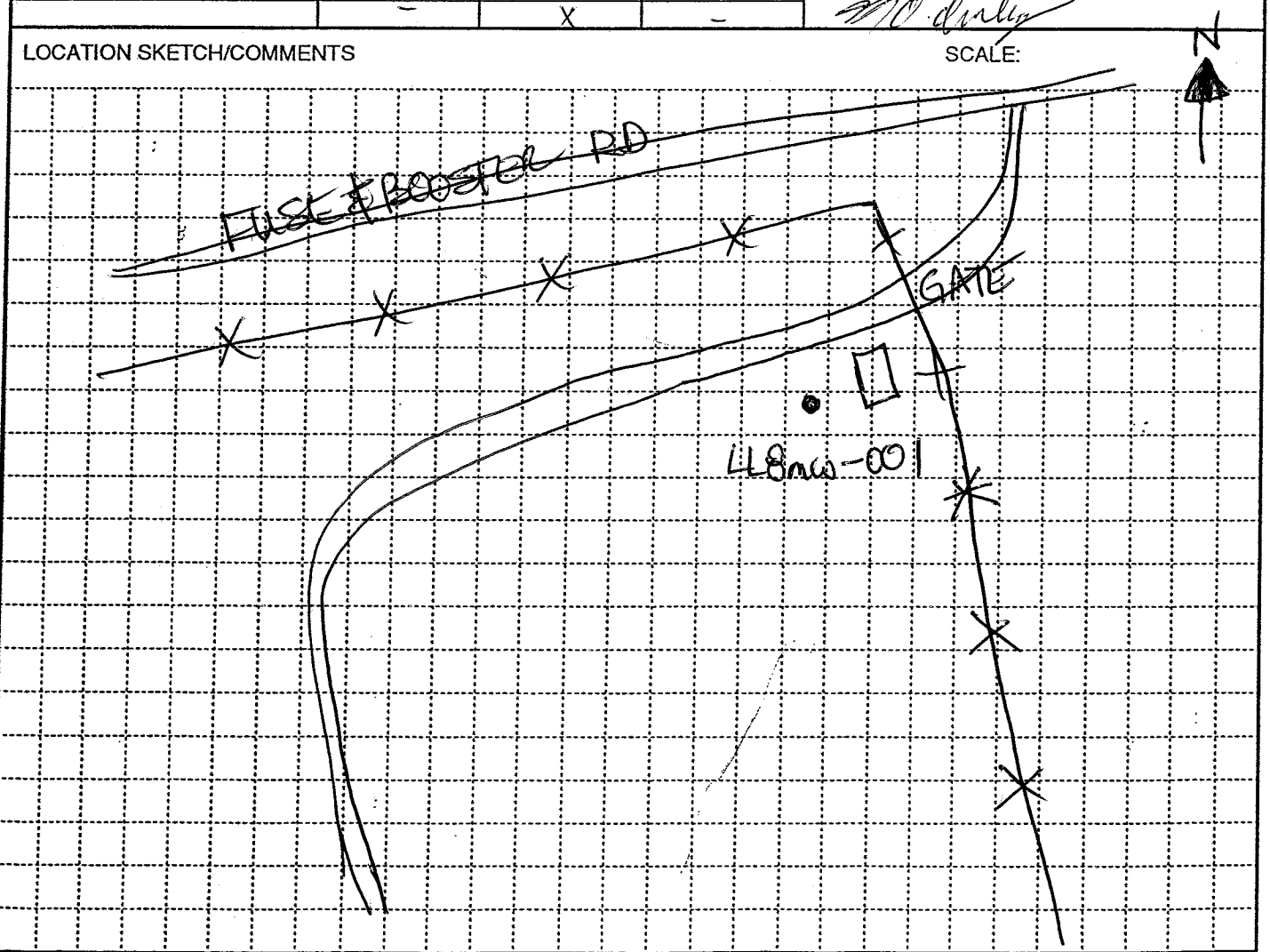
| | | |
|---|---|---|
| | DISTRICT Louisville | HOLE NUMBER LL8mw-001 |
| 1. COMPANY NAME MKM Engineers | 2. DRILL SUBCONTRACTOR A&D Drilling Contractors | SHEET 1 OF 5 SHEETS |
| 3. PROJECT RVAAP RE 14 | 4. LOCATION Load Line 8 | |
| 5. NAME OF DRILLER Sam Holler | 6. MANUFACTURER'S DESIGNATION OF DRILL CME LC-60 | |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT 8.25 OD HSA; 2" Split Spoon | 8. HOLE LOCATION Near Gate House | |
| | 9. SURFACE ELEVATION 1118.69 ASL | |
| | 10. DATE STARTED 08 Dec 04 | 11. DATE COMPLETED 08 Dec 04 |
| 12. OVERBURDEN THICKNESS 24.0 | 15. DEPTH GROUNDWATER ENCOUNTERED 16.4, 16' | |
| 13. DEPTH DRILLED INTO ROCK 0 | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 9.3' @ 0930 12/15/04 | |
| 14. TOTAL DEPTH OF HOLE 24.0 | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) — | |

| 18. GEOTECHNICAL SAMPLES | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| SHELBY TUBE 10-12' | — | X | — |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY — % |
|---|---|---|---|---|---|---|
| | — | — | — | — | — | |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | — | X | — | M.O. Darby |

LOCATION SKETCH/COMMENTS SCALE:




| PROJECT | HOLE NO. |
|---|---|
| RVAAP RE 14 | LL8mw-001 |

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: 28MW001

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunlay

SHEET 2 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. Recovery (e) | ANALYTICAL SAMPLE NO. USCS (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | | 1.5 Ft Topsoil | | | | 1-1 | |
| | | Reddish Br. SELT 65% w Sand Damp Gravel Present Moder No Staining No Plasticity | 0.0 | 1.7 | ML | 3-4 | 7.5Y-5/6 |
| | 2 | Dk Br. SELT 70% w Sand Dry No Oder No Plasticity Grey Mottling Present | 0.0 | 1.0 | ML | 2-3<br>5-7 | 7.5Y-4/4 |
| | 4 | SAA | 0.5 | 1.9 | ML | 2-6<br>1-11 | SAA |
| | 6 | SAA | 0.0 | 2.0 | ML | 2-8<br>16-22 | SAA |
| | 8 | SAA | 0.0 | 1.7 | ML | 1-2<br>10-13 | SAA |
| | 10 | 0840<br>0845 Recd<br>Shelby Tube | | | | | |
| | 12 | Br. SELT 65% w/Sand Damp No Oder No Staining No Plasticity | 0.0 | 1.6 | ML | 2-4<br>5 | 7.5Y-4/6 |
| | 14 | 1/2" Sand Layer wet<br>Br. SELT 65% w/Sand Damp No Oder No Staining No Plasticity | 0.0 | 0.7 | ML | 2-12<br>6-8 | SAA |
| ▽ | 16 | wet/Saturated<br>SAA | 0.0 | 0.9 | ML | 1-5<br>7-6 | SAA |
| ▽ | 18 | Grey SELT 65% w Sand Damp No Oder No Staining No Plasticity | 0.0 | 1.7 | ML | 1-2<br>3-5 | 7.5yr 5/1 |

PROJECT: RVAAP RI 14

HOLE NO. 28MW-001

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LLBmw-001

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunlay

SHEET 3 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. (e) | ~~ANALYTICAL SAMPLE NO.~~ USCS | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | | SAA<br>Gray SAND 85% w/ silt wet/saturated<br>No staining N Plasticity | | 1-7 | NL<br>SM | 1-2<br>1-5 | SAA |
| | 22 | SAA | | 1-6 | SM | 1-7<br>16-24 | SAA |
| | 24 | | | | | | Bolt 24<br>Screen from 24<br>to 14<br>Sand up to 6.5<br>Sand Bridged<br>Bentonite to 4<br>Grout to Surface<br>Stick-up Completion<br>5 gallons of water<br>used for Hydration |
| | 26 | | | | | | |
| | 28 | | | | | | |

PROJECT: RVAAP RI 14

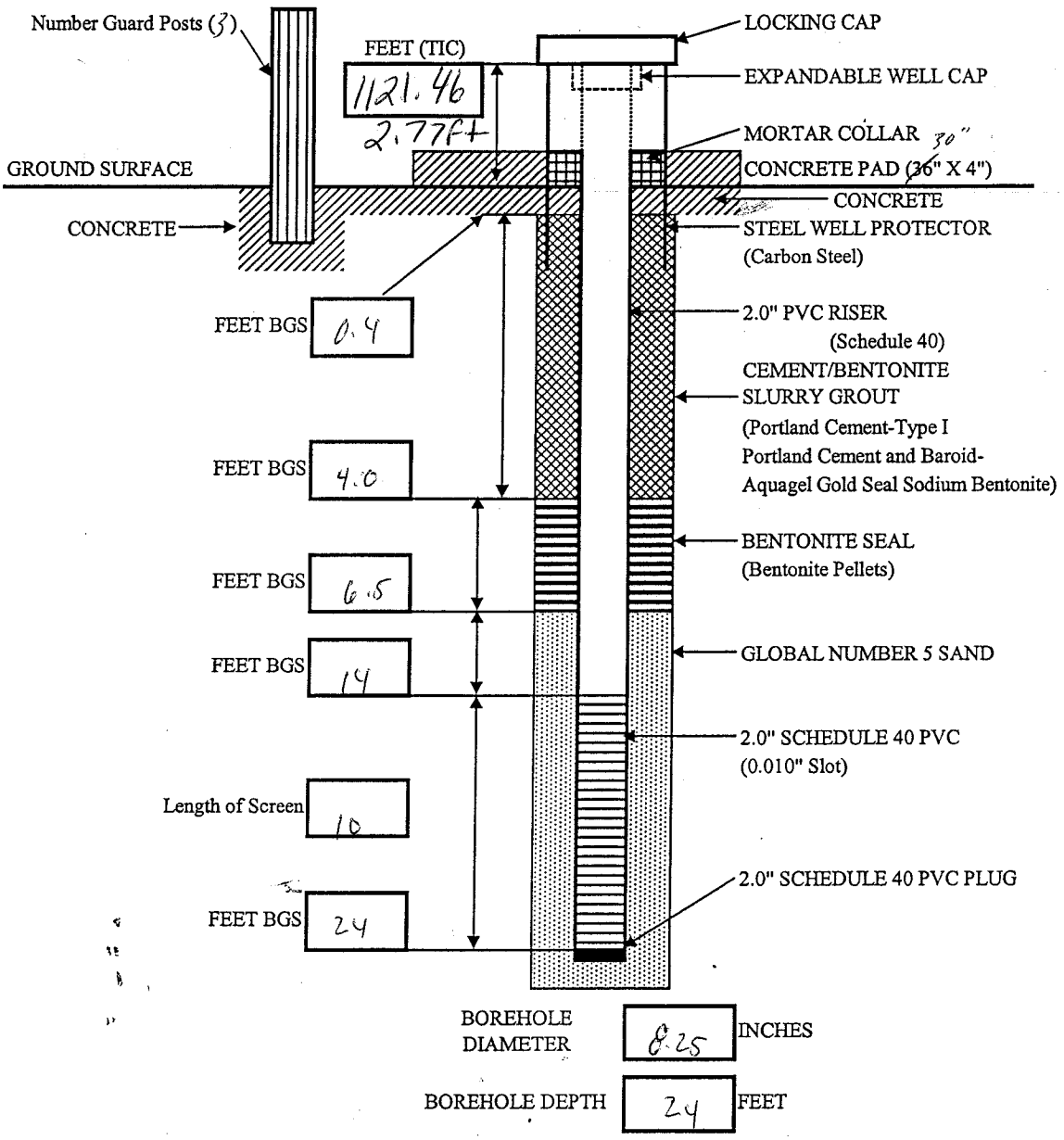
HOLE NO.: LLBmw-001

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:** RVAAP RI 14

| | | |
|---|---|---|
| Well Number: LLBmw-001 ~~PBC~~ | Begin: 08Dec04 | End: 08Dec04 |
| Coordinates: N: 552607.06<br>E: 2351666.10 | Elevation: 1118.69 | Reference Point: |
| Logged By: MD Hurley | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: LLBmw-001-GW
Date: 12/15/04

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP-14
Development Company: MKM
Development Method: whale pumping
Comments:

Well TD: 25.6 FT TIC  Depth to Water: 9.3 FT
Water Column Height: 16.3 FT  One Well Volume: 9.6 Gals

Well Volume (gallons/foot): 2-inch =0.16  4-inch =0.65  6-Inch = 1.47  8-Inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PH | COND | DO | Temp | | |
| 0930 | DSB | 9.3 | - | - | - | - | - | - | | |
| 0940 | DSE | 10.2 | - | - | - | - | - | - | | |
| 0956 | DPB | 10.2 | - | - | 7.0 | 0.33 | 0.4 | 11.0 | 1000 | Initial reading |
| 1002 | DFM | - | - | 9.6 | 7.4 | 1.1 | 2.8 | 12.0 | 1000 | 9.6 (1st well vol) |
| 1008 | DFM | - | - | 9.6 | 7.2 | 1.1 | 1.2 | 12.0 | 1000 | 19.2 (2nd well vol) |
| 1013 | DFM | - | - | 9.6 | 7.2 | 1.1 | 0.9 | 12.0 | 1000 | 28.8 (3rd well vol) |
| 1020 | DFM | - | - | 9.6 | 7.5 | 1.4 | 1.8 | 12.0 | 1000 | 38.4 (4th well vol) |
| 1026 | DFM | - | - | 9.6 | 7.3 | 1.1 | 2.6 | 12.0 | 500 | 48.0 (5th well vol) |
| 1032 | DFM | - | - | 9.6 | 7.5 | 1.1 | 2.8 | 12.0 | 520 | 57.6 (6th well vol) |
| 1040 | DFM | - | - | 9.6 | 7.4 | 1.1 | 3.1 | 11.0 | 300 | 67.2 (7th well vol) |
| 1040 | DPE | 20.2 | | - | - | - | - | - | - | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Vijay Alluri (Please Print)
Signature: Vijay
Reviewed By: C. Esker
Date: 2/22/05

# Monitoring Well Purging Form

**Well ID:** LL8 MW - 001 GW

**Ravenna Army Ammunition Plant**
**Ravenna, Ohio**

**Date :** 01/03/05

## WELL OBSERVATIONS

**Protective Casing:** (Intact) · Damaged **Locked:** Yes · No **Key No:**

**Concrete Base:** (Intact) · Damaged **Inner Casing:** (2") · 4" · 6" · 8" **Other:**

**Stickup Height:** 2.4 (ft) **TIC · TOC Difference:** 0.3 (ft)

**Vapor Readings :** HNu · OVA Background: _____ Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL | Yes · No _____ | Yes · No | |
| DNAPL | Yes · No _____ | Yes · No | LL8MW-001GW |

## CALCULATIONS

(A) **Depth to Well Bottom** 27.4 (ft) TOC · TIC · BGS (Measured) · Previously Measured (circle one)

(B) **Depth to Water** 8.11 (ft) (TOC) · TIC · BGS **Time Measured:** 9:35

(C) **Water Column Height (A-B)** 19.29 (ft)

(D) **Well Diameter Factor** 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) **One Well Volume (C*D)** 3.08 (gal)

(F) **Volumes to be Evacuated** 5

**(G) TOTAL VOLUME TO BE EVACUATED (E * F)** 15.43 (gal)

## EVACUATION METHOD

**Well Evacuation Method:** Bailer · Submersible Pump · (Other) Micropurge **Device Number:** _____

**Purge Water Disposition:** 1. Discharged Onsite 2. (Collected) And: (Stored) · Disposed (Onsite) · Offsite

Collected In: (Tanks) · Drums No. of Containers: _____

**Comments:** _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | DO | |
| 9:36 | 8.11 | | 0.0 | 0.714 | 10.12 | 6.6 | 0.0 | 9.06 | |
| 9:39 | 8.72 | | 0.0 | 0.70 | 10.67 | 6.66 | 0.0 | 3.17 | |
| 9:42 | 8.80 | | 0.0 | 0.695 | 10.94 | 6.8 | 0.0 | 1.42 | |
| 9:45 | 8.92 | | 0.00 | 0.692 | 11.07 | 6.87 | 0.0 | 0.87 | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Shaheer Gubba (Please Print) Reviewed By: C. Geller

Signature: S. Gubba Date : 2/22/05

# Field Sampling Report

**Location ID:** LL8MW-001 GW

**Date:** 01/03/05

**Ravenna Army Ammunition Plant**
**Characterization of 14 RVAAP AOCs**

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| **Method** | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | MicroPurge | X | | | Push Probe | | Plastic Liner | |
| **Type/Construction** | | | | | Mattocks | | | |
| **Miscellaneous** | **Well Purging Form** (Yes) - No | | | | | | | |

**Sample Collection:** 1000 hrs

**Sample Type:** Composite - MI - (Grab) If MI, # of increments taken: NA

**Location:** (Plotted on Map) - Staked in Field - Estimated - Measured - (Surveyed)

**Sample Depth:** 18 FT (below surface)

**Decon:** Dedicated - Each Day - (Each Location)

| **Field Parameters** (at time of sample) | | |
|---|---|---|
| **PID / FID Readings:** | | |
| Background: | 0.0 | ppm |
| Sample: | 0.0 | ppm |
| **Water Level** | 8.92 | FT |
| **Temperature** | 11.09 | °C |
| **Sp. Conductance:** | 0.692 | uMHOs |
| **pH** | 6.87 | units |
| **Turbidity** | 0.0 | N.T.U. |

| **Analytical Parameters** | | | |
|---|---|---|---|
| VOC | X | TPH GRO | |
| SVOC | X | TPH DRO | |
| Explosives | X | Chromium +6 | |
| Propellants | X | Nitrate | X |
| TAL Metals | X | | |
| Pesticides/PCBs | X | | |
| Cyanides | | | |
| TOC | | | |
| Grain Size | | | |

| **Other Parameters** | | | |
|---|---|---|---|
| Corrosivity | | | |
| Reactivity Sulfide/Cyanide | | | |
| Ignitability | | | |

| **QA Samples** | | |
|---|---|---|
| MS/MSD | (Yes) / No | NA |
| Duplicate ID | LL8MW-001-DUP | NA |
| Equipment Rinse ID | | (NA) |
| (Trip Blank ID) | TRIP BLNK | NA |

**Sample Description**

clear water, NO odor, NO sheen
No turbidity

**Split Sample**

**Split Sample ID:** LL8MW-001-GW

**Name:** JOHN JEST (CELRL-EC-ED)

**Agency/Company:** USACE - LOUISVILLE

**Address:** CEO DR MARTIN LUTHER KING JR PLAZA LOUISVILLE KY 40202

**QA/QC Provided:** MS/MSD - Duplicate - Trip Blanks - Field Blanks

**Parameters:** (Same as Above) - As Listed

***Soil sample description should include:***

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

***Water sample description should include:***

*Color Odor Sheen Turbidity*

Logged By: Budhaya Gubba (Please Print)

Signature: B. Gubba

Reviewed by: ERIC ELLIS (Please Print)

Signature: Eric Ellis Date: 2/4/05

# HTRW DRILLING LOG

| | | |
|---|---|---|
| | DISTRICT: Louisville | HOLE NUMBER: LL8mw-002 |
| 1. COMPANY NAME: MKM Engineers | 2. DRILL SUBCONTRACTOR: HAD Drilling Contractors | SHEET 1 OF 3 |
| 3. PROJECT: RVAAP RI 14 | 4. LOCATION: North of ZB-21 Load Line 8 | |
| 5. NAME OF DRILLER: Sam Holter | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME-CCGO | |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8.25 OD HSA; 2" Split Spoons | 8. HOLE LOCATION: North of ZB-21 | |
| | 9. SURFACE ELEVATION: 1121.67 ASL | |
| | 10. DATE STARTED: 03Dec04 | 11. DATE COMPLETED: 03Dec04 |
| 12. OVERBURDEN THICKNESS: 30.4 | 15. DEPTH GROUNDWATER ENCOUNTERED: 20Ft | |
| 13. DEPTH DRILLED INTO ROCK: 0.0 | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 16.3' @ 0950 12/13/04 | |
| 14. TOTAL DEPTH OF HOLE: 30.4 | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) | |

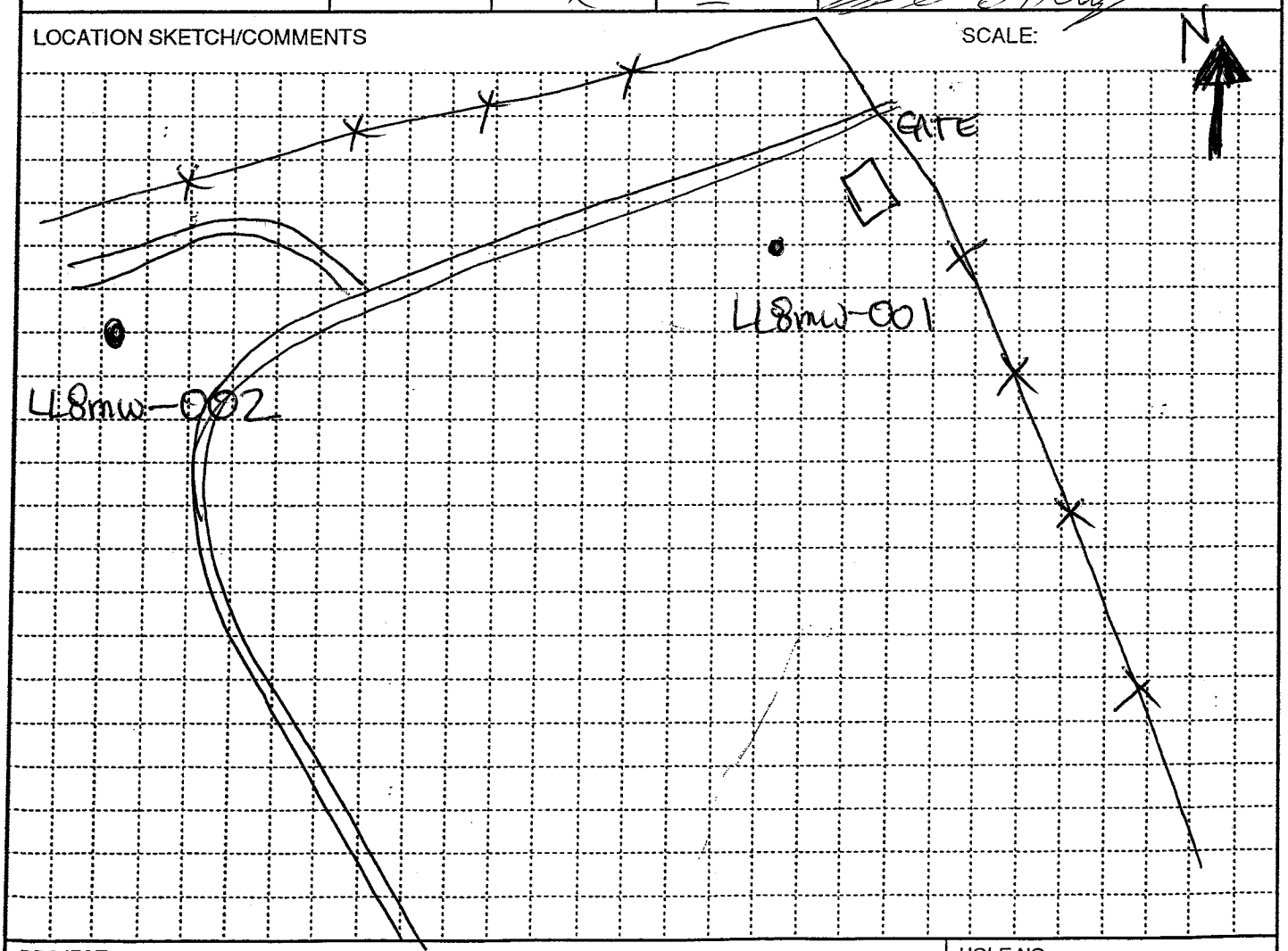
| 18. GEOTECHNICAL SAMPLES | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| NONE | — | — | — |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY — % |
|---|---|---|---|---|---|---|
| | — | — | — | — | — | |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | — | X | — | |

LOCATION SKETCH/COMMENTS

SCALE:




| PROJECT | HOLE NO. |
|---|---|
| RVAAP RI 14 | LL8mw-002 |

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LLGMW-002

PROJECT: RVAAP RI 14

INSPECTOR: Matt Dunlay

SHEET 2 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. Recovery | ANALYTICAL SAMPLE NO. USCS | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| 1110 | 0 | 4" Topsoil<br>Br. SILT 70% w/ Sand Dry Stiff<br>No Odor No Staining No Plasticity | 0.0 | 1.3 | ML | 1-2<br>3-4 | 7.5Y 5/6 |
| | 2 | SAA<br>Gray Mottles Start | 0.0 | 1.1 | ML | 2-3<br>3-5 | SAA |
| | 4 | SAA | 0.0 | 1.4 | ML | 2-4<br>9-11 | SAA |
| | 6 | Br. SILT 65% w/ Sand Dry Stiff<br>No Odor No Plasticity Gray Mottles | 0.0 | 1.6 | ML | 2-4<br>15-18 | 7.5Y 4/4 |
| | 8 | SAA | 0.0 | 2.0 | ML | 12-7<br>7-15 | SAA |
| | 10 | SAA<br>Mottles Stop @ 11 ft | 0.0 | 1.4 | ML | 12-17<br>14-21 | SAA |
| | 12 | SAA | 0.0 | 1.9 | ML | 8-11<br>19-21 | SAA |
| | 14 | SAA | 0.0 | 1.6 | ML | 1-7<br>10 14 | SAA |
| | 16 | SAA | 0.0 | 1.5 | ML | 1-3<br>5-9 | |
| | 18 | Gray SILT 80% w/ clay No odor Damp<br>No Staining Low Plasticity | 0.0 | 1.8 | ML | 1-3<br>6-7 | 7.5Y 5/1 |
| | 20 | Br. SILT 60% w/ Sand Damp<br>No odor No Staining | | | | | 7.5Y 4/4 |

PROJECT: RVAAP RI 14

HOLE NO. LLGMW-002

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL8mw-002

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunlay

SHEET 3 OF 3 SHEETS

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. (e) | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | 20 | Gray/Br. SILT 65% w/Sand wet/Saturated No Odor No Staining No Plasticity Damp @ 21.5 | | 1.7 | ML | 1-3 5-5 | 7.5Y-5/2 |
| | 22 | SAA | | 2.0 | ML | 1-2 5-6 | SAA |
| | 24 | SAA | | 1.4 | ML | 1-2 4-5 | SAA |
| | 26 | SAA | | 1.7 | ML | 1 | SAA |
| | 28 | Gray SAND 85% w/Silt Fine Grained Saturated No Odor No Staining No Plasticity | | 1.6 | SM | 1-2 | SAA |
| | 30 | Gray SILT 65% w/Sand Damp No Odor No Staining BGH 30.4 | | | | 5-7 | BGH 30.4<br>Sand to 30<br>Screen from 30 to 20<br>Sand up to 16<br>Bentonite to 13<br>Grout to Surface<br>Stick-up Completion<br>No water used for Hydration |
| | 32 | | | | | | |
| | 34 | | | | | | |

PROJECT: RVAAP RI 14

HOLE NO.: LL8mw-002

ENG FORM 5056A-R, AUG 94

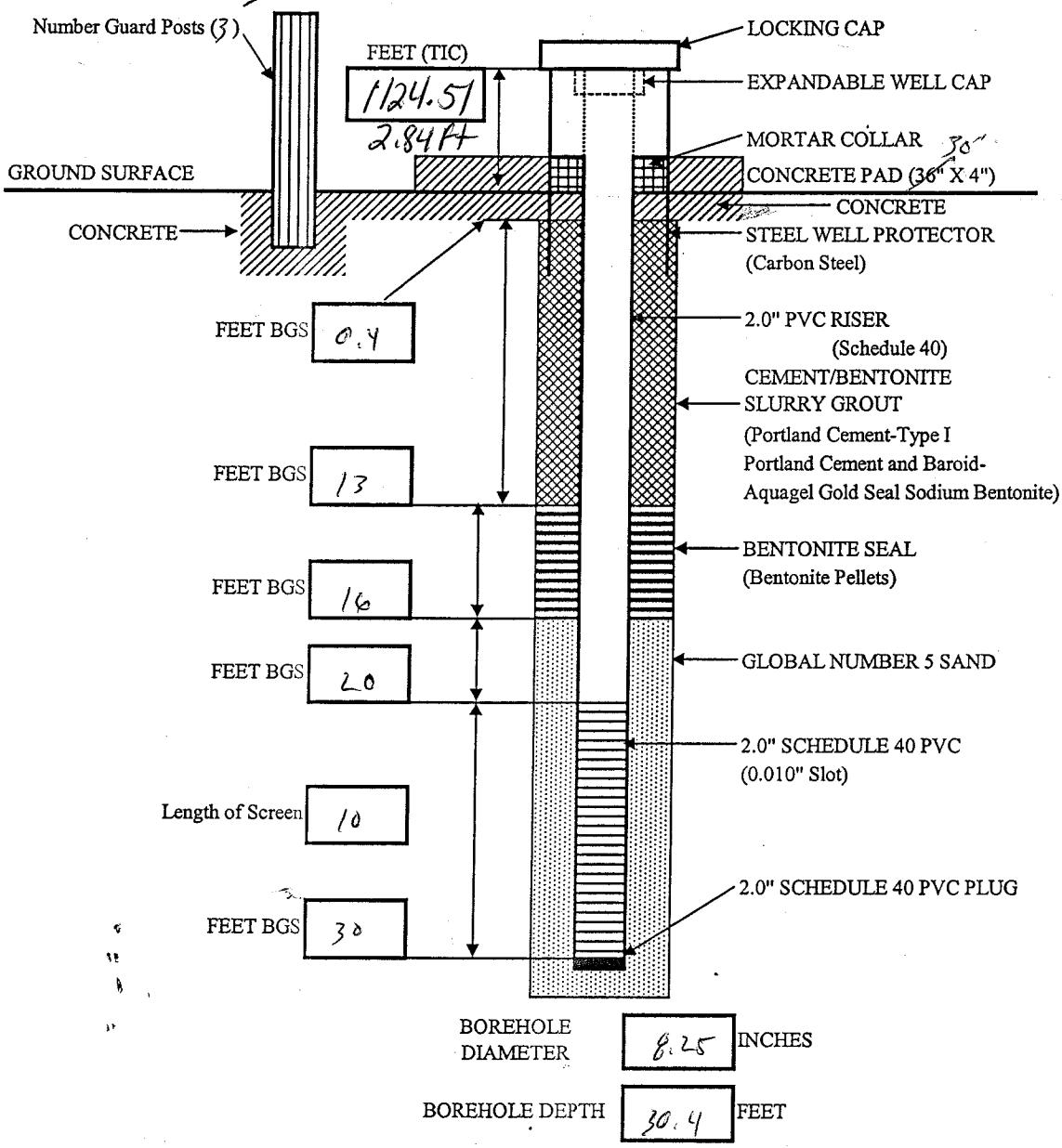
(Proponent: CECW-EG)

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:** RVAAP RI 14

| | | |
|---|---|---|
| Well Number: LL8mw-002 | Begin: 03Dec04 | End: 03Dec04 |
| Coordinates: N: 552408.18<br>E: 2351010.33 | Elevation: 1121.67 | Reference Point: |
| Logged By: | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: LL8MW-002-GW
Date: 12/13/04

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP14
Development Company: MKM

Development Method: Whale pumping
Comments:

Well TD: 29.7 FT TIC  Depth to Water: 16.3 FT  ≈8 gl
Water Column Height: 13.4 FT  One Well Volume: 7.906 Gals

Well Volume (gallons/foot): 2-inch =0.16  4-inch =0.65  6-inch = 1.47  8-inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ~~pH~~ PH | con | DO | Temp | | |
| 0950 | DSB | 16.3 | — | — | — | — | — | — | — | — |
| 1000 | DSE | 17.0 | — | — | — | — | — | — | — | — |
| 1005 | DPB | 17.0 | — | — | — | — | — | — | — | — |
| 1012 | DFM | — | — | 8 | 6.07 | 0.680 | 5.15 | 10.3 | >1000 | 8 gal (1st well vol) |
| 1030 | DFM | — | — | 8 | 6.95 | 0.700 | 4.30 | 10.7 | >1000 | 16 gal (2nd well vol) |
| 1045 | DFM | — | — | 8 | 7.24 | 0.634 | 4.40 | 11° | >1000 | 24 gal (3rd well vol) |
| 1103 | DFM | — | — | 8 | 7.50 | 0.668 | 4.83 | 11.1 | >1000 | 32 gal (4th well vol) |
| 1116 | DFM | — | — | 8 | 7.43 | 0.668 | 4.19 | 11.6 | >1000 | 40 gal (5th well vol) |
| 1133 | DFM | — | — | 8 | 7.52 | 0.602 | 4.51 | 11.5 | >1000 | 48 gal (6th well vol) |
| 1145 | DFM | — | — | 8 | 7.73 | 0.656 | 4.41 | 11.8 | >1000 | 56 gal (7th well vol) |
| 1150 | DPE | 24.5 | — | — | — | — | — | — | — | — |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Sudheer Gubba (Please Print)
Signature: G. Sudheer

Reviewed By: T. Esler
Date: 2/22/05

# Monitoring Well Purging Form

**Well ID:** LL8mw-002GW

**Date:** 12/21/04

Ravenna Army Ammunition Plant
Ravenna, Ohio

## WELL OBSERVATIONS

**Protective Casing:** (Intact) · Damaged **Locked:** (Yes) · No **Key No:**

**Concrete Base:** Intact · Damaged **Inner Casing:** (2") · 4" · 6" · 8" **Other:**

**Stickup Height:** 3.0 (ft) **TIC · TOC Difference:** 0.22 (ft)

**Vapor Readings :** HNu · OVA Background: _____ Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL | Yes · (No) | _____ Yes · No | LL8MW-002GW |
| DNAPL | Yes · (No) | _____ Yes · No | |

## CALCULATIONS

(A) **Depth to Well Bottom** 32.5 (ft) (TOC) · TIC · BGS **Measured · Previously Measured** (circle one)

(B) **Depth to Water** 16.2 (ft) (TOC) · TIC · BGS **Time Measured:** _____

(C) **Water Column Height (A-B)** 16.3 (ft)

(D) **Well Diameter Factor** 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) **One Well Volume (C*D)** 2.61 (gal)

(F) **Volumes to be Evacuated** 5

**(G) TOTAL VOLUME TO BE EVACUATED (E * F)** 13.04 (gal)

## EVACUATION METHOD

**Well Evacuation Method:** Bailer · Submersible Pump · Other: Micro purging **Device Number:** _____

**Purge Water Disposition:** **1.** Discharged Onsite **2.** (Collected And:) (Stored) · Disposed (Onsite) · Offsite

Collected In: (Tanks) · Drums No. of Containers: _____

**Comments:** _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | DO | |
| 1050 | 16.2 | | | 0.830 | 9.69 | 7.08 | 999.0 | 11.72 | Initial reading |
| 1053 | 16.1 | | | 0.695 | 10.37 | 7.22 | 999.0 | 13.47 | |
| 1056 | 16.3 | | | 0.844 | 10.55 | 7.27 | 999.0 | 13.43 | |
| 1059 | 16.4 | | | 0.839 | 10.64 | 7.29 | 999.0 | 13.58 | |
| 1102 | 16.43 | | | 0.836 | 10.67 | 7.31 | 999.0 | 13.46 | |
| 1105 | 16.4 | | | 0.858 | 10.70 | 7.30 | 999.0 | 13.44 | End purging |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Vijay Alluri (Please Print) Reviewed By: C. Esler

Signature: Vijay Date: 2/22/05

# Field Sampling Report

Location ID: LL8-MW-0026GW

Date: 12/21/04

Ravenna Army Ammunition Plant
Characterization of 14 RVAAP AOCs

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| Method | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | Micro purging | X | | | Push Probe | | Plastic Liner | |
| Type/Construction | | | | | Mattocks | | | |
| Miscellaneous | Well Purging Form (Yes - No) | | | | | | | |

Sample Collection: 1110 hrs

Sample Type: Composite - MI - (Grab) If MI, # of increments taken: NA

Location: (Plotted on Map - Staked in Field) Estimated - Measured - (Surveyed)

Sample Depth: 26 FT (below surface)

Decon: Dedicated - Each Day - (Each Location)

## Field Parameters
(at time of sample)

| | | |
|---|---|---|
| PID / FID Readings: | | |
| Background: | 0.0 DO: 13.44 | ppm |
| Sample: | 0.0 | ppm |
| Water Level | 16.9 | FT |
| Temperature | 10.70 | °C |
| Sp. Conductance: | 0.858 | uMHOs |
| pH | 7.30 | units |
| Turbidity | 999.0 | N.T.U. |

## Analytical Parameters

| | | | |
|---|---|---|---|
| VOC | X | TPH GRO | |
| SVOC | X | TPH DRO | |
| Explosives | X | Chromium +6 | |
| Propellants | X | Nitrate | X |
| TAL Metals | X | | |
| Pesticides/PCBs | X | | |
| Cyanides | | | |
| TOC | | | |
| Grain Size | | | |

## Other Parameters

| | | | |
|---|---|---|---|
| Corrosivity | | | |
| Reactivity Sulfide/Cyanide | | | |
| Ignitability | | | |
| | | | |

## QA Samples

| | | |
|---|---|---|
| MS/MSD | Yes / No | NA |
| Duplicate ID | | NA |
| Equipment Rinse ID | | NA |
| (Trip Blank ID) | Trip Blank | NA |

**Sample Description**

Dark grey, No odor, No sheen, High turbidity

**Split Sample**

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

*Soil sample description should include:*

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

*Water sample description should include:*

*Color Odor Sheen Turbidity*

Logged By: Vijay Alluri (Please Print)

Signature: Vijay

Reviewed by: ERIC ELLIS (Please Print)

Signature: [signature] Date: 2/4/05

# HTRW DRILLING LOG

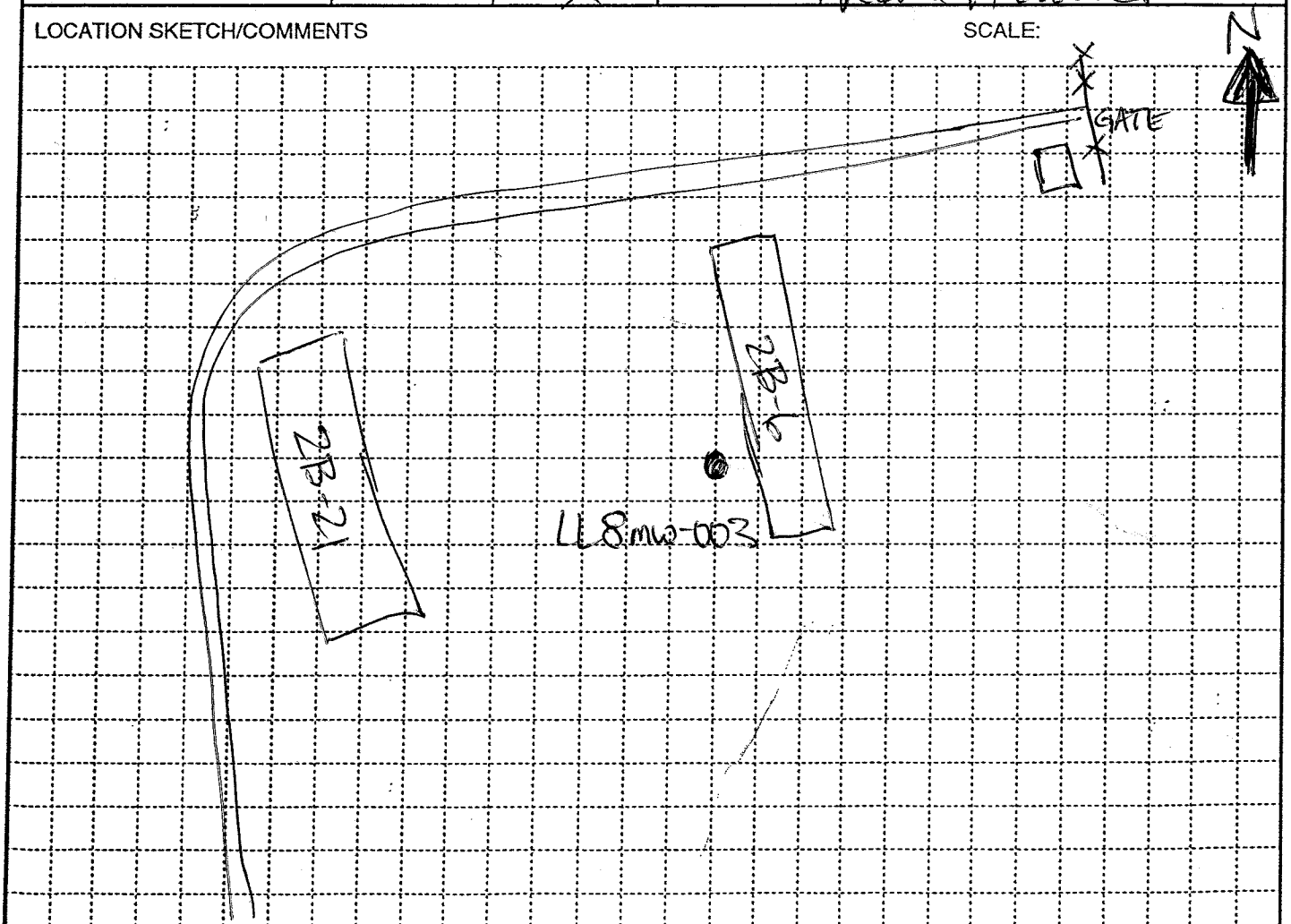
| | | |
|---|---|---|
| DISTRICT: LOUISVILLE | | HOLE NUMBER: LL8 mw-003 |
| 1. COMPANY NAME: MKM ENGINEERS | 2. DRILL SUBCONTRACTOR: HAD DRILLING | SHEET 1 OF 3 |
| 3. PROJECT: RVAAP-RI 14 | 4. LOCATION: LOADLINE 8 | |
| 5. NAME OF DRILLER: SCOTT HEISER | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME-55 | |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID HSA; 1½" ID X 24" SPLIT SPOON | 8. HOLE LOCATION: WEST OF BLDG 2B-6 | |
| | 9. SURFACE ELEVATION: 1116.30 ASL | |
| | 10. DATE STARTED: 11/30/04 | 11. DATE COMPLETED: 11/30/04 |
| 12. OVERBURDEN THICKNESS: — | 15. DEPTH GROUNDWATER ENCOUNTERED: ~14' BGS | |
| 13. DEPTH DRILLED INTO ROCK: — | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 10.45 @ 1340 12/13/04 | |
| 14. TOTAL DEPTH OF HOLE: 21' BGS | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) | |

| 18. GEOTECHNICAL SAMPLES | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| | | | |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY % |
|---|---|---|---|---|---|---|
| | | | | | | |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | — | X | — | David A. Earnest |

LOCATION SKETCH/COMMENTS — SCALE:




| PROJECT: RVAAP-RI 14 | HOLE NO.: LL8 mw - 003 |
|---|---|

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL8 MW-003

PROJECT: RVAAP-RI IA | INSPECTOR: DKEARNEST | SHEET 2 OF 3

930

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. RECOVERY | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | 2 | FILL GREY BROWN SANDY SILT W/ CRUSHED ROCK, GRASS; REDDISH BROWN SILTY SAND (60%) W/ CRUSH ROCK (35%) (10%) MED DENSE | 0 | 1.1 | ML | 9/10<br>10/7 | 10YR 2/2<br>5YR 4/4 WET |
| | 4 | SAA BROWN W/ GREY TRACE SANDY CLAY (20%) SILT (10%) (10%) MED DENSE TRACE SAND TRACE ROCK FRAGS (5%) | 0 | 1.3 | ML | 4/5<br>7/7 | 10YR 4/4 |
| | 6 | SAA LITTLE TO NO PLASTIC 5-10% SMALL GRAVEL ROCK FRAG SOME ANG SOME ROUNDED | 0 | 1.4 | ML | 1/8<br>14/16 | DRY |
| | 8 | SAA | 0 | 1.7 | ML | 4/11<br>16/20 | 10YR 5/4 |
| | 10 | SAA BROWN V. STIFF (40%) SILTY CLAY (60%) LITTLE TO NO PLASTIC | 0 | 1.8 | CL | 4/11<br>15/22 | 10YR 5/4 DRY |
| | 12 | SAA V. STIFF | 0 | 1.8 | CL | 2/14<br>15/24 | DRY |
| | 14 | (10%) SILTY CLAY W/ (5%) GRAVEL BROWN SAND (85%) MED TO COARSE 6-8" THICK | 0 | 1.8 | CL SP | 5/10<br>16/24 | |
| | 16 | BROWN SILT (80%) SOME SAND (20%) LITTLE TO NO PLASTIC MED DENSE | 0 | 1.8 | ML | 2/3<br>9/14 | SAND WET 10YR 5/4 |
| | 18 | (20%) BROWN SILTY SAND (75%) W/ TRACE ROUNDED GRAVEL (5%) MED DENSE MED TO FINE GRAINED | 0 | 1.5 | SM | 2/10<br>10/12 | 10YR 5/4 WET |
| | 20 | GREY SANDY SILT (40%) (60%) | 0 | 1.5 | ML | 2/5<br>5/9 | 10YR 4/2 |

PROJECT: RVAAP-RI IA | HOLE NO.: LL8 MW-003

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL8MW-003

PROJECT: RVAAP-RI 14

INSPECTOR: DK EARNEST

SHEET 3 OF 3 SHEETS

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | ~~GEOTECH SAMPLE OR CORE BOX NO.~~ RECOVERY | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | 20 | GREY SILTY SAND (20%) (80%) | 0 | 1.0 | SM/SP | — | SAT |
| | | TO MED TO COARSE SAND | | | | — | |
| | 22 | BOH 21' | | | | | |
| | | SAMPLED TO 22' | | | | | |
| | | DRILLED TO 21' | | | | | |
| | | WELL SET AT 20.5 | | | | | |
| | | SCREEN AT 10.5-20.5 BGS | | | | | |
| | | SAND TO 8.5' BGS | 8 BAGS #7 SAND | | | | |
| | | SEAL TO 6.5 BGS | | | | | |
| | | NO WATER ADDED | | | | | |

PROJECT: RVAAP-RI 14

HOLE NO.: LL8MW-003

ENG FORM 5056A-R, AUG 94

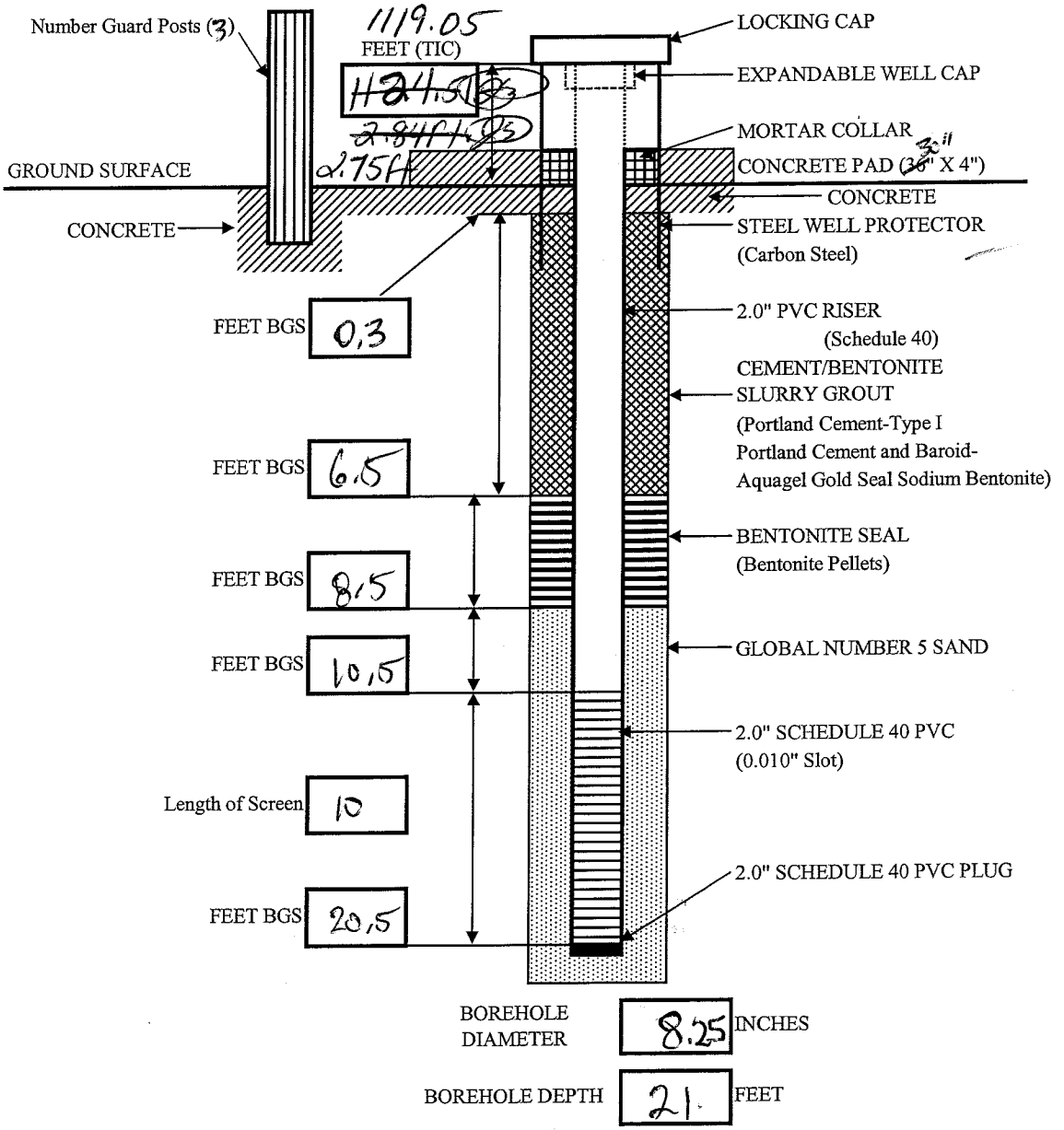
(Proponent: CECW-EG)

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:**

| | | |
|---|---|---|
| Well Number: LL8mw-003 | Begin: 11/30/04 | End: 11/30/04 |
| Coordinates: N: 552231.14<br>E: 2351359.25 | Elevation: ~~1121.65~~ 1116.30 | Reference Point: |
| Logged By: DK EARNEST | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: LL8MW-003-GW
Date: 12/13/04

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP14
Development Company: MKM

Development Method: Whale pumping
Comments:

Well TD: 22.9 FT TIC  Depth to Water: 10.45 FT ≈ 7.5
Water Column Height: 12.45 FT  One Well Volume: 7.3 Gals

Well Volume (gallons/foot): 2-Inch =0.16  4-Inch =0.65  6-Inch = 1.47  8-Inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | Cond | DO | Temp | | |
| 1340 | DSB | 10.45 | | | | | | | | |
| 1350 | DSE | 11.1 | | | | | | | | |
| 1352 | DPB | 11.1 | | | | | | | | |
| 1358 | DFM | — | — | 7.5 | 7.83 | 0.452 | 3.49 | 12.5 | >1000 | 7.5 (1st well vol) |
| 1420 | DPE | Dry | — | 5.5 | — | — | — | — | - | 13 gal |
| 1443 | DPB | 18.0 | — | | | | | | | |
| 1446 | DFM | — | — | 2.0 | 7.75 | 0.706 | 11.53 | 11.6 | >1000 | 15 gal (2nd well vol) |
| 1501 | DPE | Dry | — | 3.5 | — | — | — | — | — | 18.5 gal |
| 1525 | DPB | 18.65 | — | — | — | — | — | — | — | — |
| 1534 | DPE | — | — | 3.5 | 7.81 | 0.716 | 7.80 | 11.2 | >1000 | 22.5 gal (3rd well vol) |
| 2/14/04 0905 | DSB | 16.30 | — | — | — | — | — | — | — | — |
| 0910 | DSE | 16.70 | — | — | — | — | — | — | — | — |
| 0915 | DPB | 16.70 | — | — | — | — | — | — | — | — |
| 0930 | DPE | Dry | | 7.5 | 7.72 | 0.742 | 7.60 | 11.4 | >1000 | 30.0 gal (4th well vol) |
| | | | | | | | | | | |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other _____

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Sudheer Gubba (Please Print)  Reviewed By: C. Eddy
Signature: G. Sudheer  Date: 2/22/05

# Well Development Record

Well ID: LL8mw-003GW
Date: 12/15/04

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP-14
Development Company: MKM
Development Method: Whale Pumping
Comments:

Well TD: 22.9 FT TIC  Depth to Water: 10.45 FT  ~7.5
Water Column Height: 12.45 FT  One Well Volume: 7.3 Gals

Well Volume (gallons/foot): 2-Inch =0.16  6-Inch = 1.47  4-Inch =0.65  8-Inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PH | CON | DO | Temp | | |
| 0845 | DSB | 11.15 | | | | | | | | |
| 0855 | DSE | 11.2 | | | | | | | | |
| 0855 | DPB | 11.2 | | | | | | | | |
| 0857 | DPE | Dry | | 6 | | | | | | 36 gal |
| 1425 | DPB | 11.2 | | | | | | | | |
| 1432 | DFM | -- | - | 1.5 | 7.7 | 1.1 | 8.4 | 12.0 | 800 | 37.5 gal (5th well vol) |
| 1440 | DPE | Dry | - | 5 | - | - | - | - | - | 42.5 gal |
| 12/16/04 1233 | DSB | 10.9 | - | - | - | - | - | - | - | |
| 1240 | DSE | 11.2 | - | - | - | - | - | - | - | |
| 1240 | DPB | 11.2 | - | 2.5 | ~~7.34~~ | ~~0.74~~ | ~~8.5~~ | | ~~1000~~ | |
| 1243 | DFM | | - | 2.5 | 7.34 | 0.74 | 8.51 | 9.0 | 1000 | 45 gal (6th well vol) |
| 1245 | DPE | Dry | - | - | - | - | - | - | | |
| 1335 | DPB | 12.4 | - | - | - | - | - | - | | |
| 1340 | DPE | Dry | - | 7.5 | 7.26 | 0.99 | 10.39 | 10.0 | 1000 | 52.5 gal (7th well vol) |
| | | DFM | - | - | - | | | | | |
| | FINAL | | | | | | | | | Completed |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Vijay Alluri (Please Print)  Reviewed By: C. Eaton
Signature: Vijay  Date: 2/22/05

# Monitoring Well Purging Form

**Well ID:** LL8MW-003-GW

**Date :** 01/03/05

**Ravenna Army Ammunition Plant**
**Ravenna, Ohio**

## WELL OBSERVATIONS

**Protective Casing:** (Intact) · Damaged **Locked:** Yes · (No) **Key No:**

**Concrete Base:** (Intact) · Damaged **Inner Casing:** (2") · 4" · 6" · 8" **Other:**

**Stickup Height:** 2.75 (ft) **TIC · TOC Difference:** 0.29 (ft)

**Vapor Readings :** HNu · OVA Background: _____ Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL | Yes / (No) | _____ Yes · No | LL8MW-003-GW |
| DNAPL | Yes (No) | _____ Yes · No | |

## CALCULATIONS

(A) **Depth to Well Bottom** 9.7 (ft) (TOC) · TIC · BGS **Measured · Previously Measured** (circle one) 22.89

(B) **Depth to Water** 9.7 (ft) (TOC) · TIC · BGS **Time Measured:** 1330

(C) **Water Column Height (A-B)** 13.19 (ft)

(D) **Well Diameter Factor** 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) **One Well Volume (C*D)** 2.11 (gal)

(F) **Volumes to be Evacuated** 5

**(G) TOTAL VOLUME TO BE EVACUATED (E * F)** 10.55 (gal)

## EVACUATION METHOD

**Well Evacuation Method:** Bailer · Submersible Pump · Other: Micro purge **Device Number:** _____

**Purge Water Disposition:** **1.** Discharged Onsite **2.** (Collected And:) (Stored) · Disposed (Onsite) · Offsite

Collected In: (Tanks) · Drums No. of Containers: _____

**Comments:** _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | DO | |
| 1340 | 9.7 | | | 0.894 | 10.71 | 7.17 | 0.0 | 9.31 | Started purge. |
| 1343 | 9.83 | | | 0.92 | 10.77 | 7.15 | 0.0 | 9.34 | |
| 1346 | 10.26 | | | 0.94 | 10.83 | 7.26 | 0.0 | 9.66 | |
| 1349 | 11.40 | | | 1.14 | 10.86 | 7.23 | 0.0 | 9.80 | End purging. |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Scott Gubbins (Please Print) Reviewed By: C. Keller

Signature: R. Keller Date : 2/20/05

# Field Sampling Report

**Location ID:** LL8MW-003-GW

**Date:** 01/03/05

**Ravenna Army Ammunition Plant**
**Characterization of 14 RVAAP AOCs**

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| **Method** | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | Micro Purge | X | | | Push Probe | | Plastic Liner | |
| **Type/Construction** | Stainless Steel | | | | Mattocks | | | |
| **Miscellaneous** | **Well Purging Form** (Yes) - No | | | | | | | |

**Sample Collection:** 1400 hrs

**Sample Type:** Composite - MI - (Grab)
If MI, # of increments taken: NA

**Location:** (Plotted on Map) (Staked in Field)
Estimated - Measured - (Surveyed)

**Sample Depth:** 15 FT (below surface)

**Decon:** (Dedicated) - Each Day - Each Location

## Field Parameters
(at time of sample)

| | | |
|---|---|---|
| **PID / FID Readings:** | | |
| Background: | NT | ppm |
| Sample: | NT | ppm |
| **Water Level** | 11.40 | FT |
| **Temperature** | 10.86 | °C |
| **Sp. Conductance:** | 1.14 | uMHOs |
| **pH** | 7.23 | units |
| **Turbidity** | 0.0 | N.T.U. |

## Analytical Parameters

| | | | |
|---|---|---|---|
| VOC | X | TPH GRO | |
| SVOC | X | TPH DRO | |
| Explosives | X | Chromium +6 | |
| Propellants | | Nitrate | X |
| TAL Metals | X | | |
| Pesticides/PCBs | X | | |
| Cyanides | | | |
| TOC | | | |
| Grain Size | | | |

## Other Parameters

| | | |
|---|---|---|
| Corrosivity | | |
| Reactivity Sulfide/Cyanide | | |
| Ignitability | | |
| | | |

## QA Samples

| | | |
|---|---|---|
| MS/MSD | Yes / No | NA |
| Duplicate ID | | NA |
| Equipment Rinse ID | | NA |
| Trip Blank ID | Trip Blank | NA |

**Sample Description**

No Odor, No Sheen, No turbidity
Clear Water

**Split Sample**

**Split Sample ID:**

**Name:**

**Agency/Company:**

**Address:**

**QA/QC Provided:** MS/MSD - Duplicate - Trip Blanks - Field Blanks
**Parameters:** Same as Above - As Listed

***Soil sample description should include:***

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

***Water sample description should include:***

*Color Odor Sheen Turbidity*

Logged By: Sridhar Gubba (Please Print)

Signature:

Reviewed by: ERIC ELLIS (Please Print)

Signature: Date: 2/4/05

# HTRW DRILLING LOG

| | | |
|---|---|---|
| | DISTRICT: Louisville | HOLE NUMBER: LL8mw-004 |
| 1. COMPANY NAME: M&M Engineers | 2. DRILL SUBCONTRACTOR: HAD Drilling Contractors | SHEET 1 OF 2 SHEETS |
| 3. PROJECT: RVAAP RI 14 | 4. LOCATION: Load Line 8 | |
| 5. NAME OF DRILLER: Sam Holler | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME LC-60 | |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8.25 OD HSA; 2" Split Spoons | 8. HOLE LOCATION: West Center of LL | |
| | 9. SURFACE ELEVATION: 1112.73 ASL | |
| | 10. DATE STARTED: 06 Dec 04 | 11. DATE COMPLETED: 06 Dec 04 |
| 12. OVERBURDEN THICKNESS: 20.5 | 15. DEPTH GROUNDWATER ENCOUNTERED: 13.5 | |
| 13. DEPTH DRILLED INTO ROCK: 0.0 | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 9.61' @ 0945 12/14/04 | |
| 14. TOTAL DEPTH OF HOLE: 20.5 | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) | |

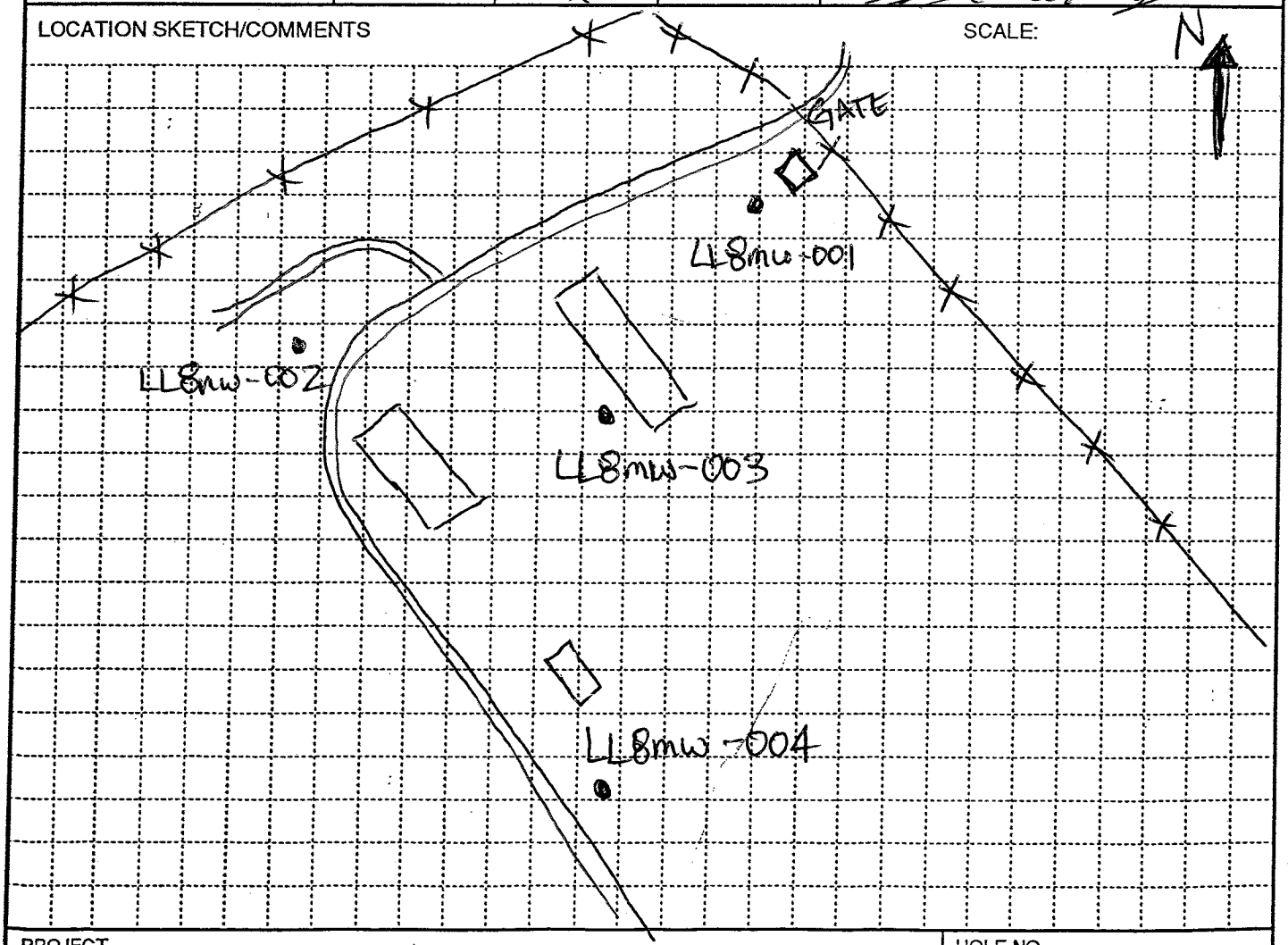
| 18. GEOTECHNICAL SAMPLES | DISTRIBUTED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| SHELBY TUBE 6-8' | — | X | — |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY |
|---|---|---|---|---|---|---|
| | — | — | — | — | — | — % |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | — | X | — | |

LOCATION SKETCH/COMMENTS

SCALE:




| PROJECT | HOLE NO. |
|---|---|
| RVAAP RI 14 | LL8mw-004 |

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LC8mw-804

PROJECT: RVAAP FI 14

INSPECTOR: Matt Dunlevy

SHEET 2 OF 2 SHEETS

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. (e) | ANALYTICAL SAMPLE NO. USCS | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| 1295 | | 4" Topsoil | | | | | |
| | | Lt Br. SILT 65% w/ Sand Moist No Odor No Staining No Plasticity | 1.2 | 1.5 | ML | 1-1<br>1-1 | 7.5y-6/2 |
| | 2 | Redish Br SILT 60% w Sand Moist No Odor No Staining No Plasticity Rock Frag Present (Fill) | 0.6 | 1.5 | ML | 1-5<br>7-5 | 7.5y-5/6 |
| | 4 | Color Changes to Br | | | | | 7.5y-4/6 |
| | | Br. SAND 70% w SILT Damp No Odor No Staining No Plasticity | 0.0 | 1.7 | SM | 2-6<br>7-9 | |
| | 6 | Dk Br. SILT 75% w/ Clay Dry Stiff No Odor No Staining No Plasticity | | | ML | | |
| | | 1255 06 Dec 04 Shelby Tube | | | | | |
| | 8 | Br. SILT 85% w/ Clay Dry Stiff No Odor No Staining No Plasticity | 0.0 | 2.0 | ML | 3-11<br>13-16 | 7.5y-4/4 |
| | 10 | changes to damp | | | | | |
| | | Damp SILT 70% w/ Sand No Odor No staining No Plasticity | 0.0 | 2.0 | ML | 1-6<br>9-9 | SAA |
| | | Br. SILT 85% w/ Clay Damp No Odor No Staining No Plasticity | | | | | |
| | 12 | Br. SILT 85% w/ Sand wet/Saturated No Odor No Staining No Plasticity | 0.0 | 2.0 | ML | 2-8<br>14-16 | SAA |
| | 14 | | 0.0 | 2.0 | ML | 9-8<br>12-15 | SAA<br>7.5y-5/6 |
| | 16 | Red Br SILT 60% w/ SAND Damp No Odor No Staining No Plasticity | | | | | |
| | | Br. SAND 85% w Silt wet No Odor No Staining No Plasticity | 0.0 | 2.0 | SM | 11-7<br>19-23 | BOH 20.5<br>Sand to 20<br>Screen from 20 to 10<br>Sand up to 7<br>Bent to nite to 5<br>Grout to surface |
| | 18 | | | | | | No Hydration Water used |
| | | Br SAND 60% w Silt Damp No Odor No Staining No Plasticity | 0.0 | 1.6 | SM | 2-8<br>13-17 | |
| | 20 | | | | | | |

PROJECT: RVAAP FI 14

HOLE NO.: LC-8mw-804

ENG FORM 5056A-R, AUG 94

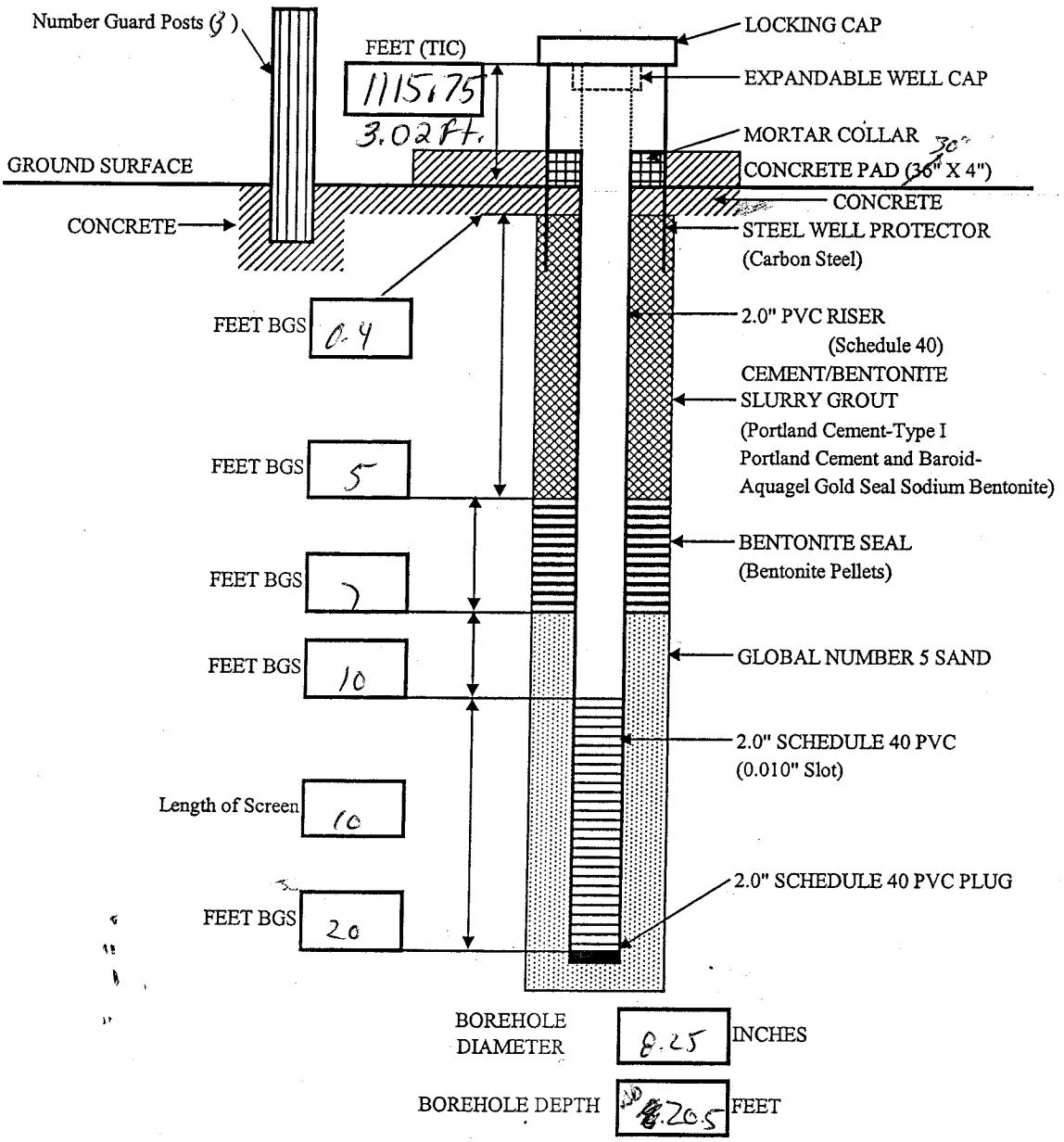
(Proponent: CECW-EG)

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:** RVAAP RI-14

| | | |
|---|---|---|
| Well Number: LCSmw-004 | Begin: 06Dec04 | End: 06Dec04 |
| Coordinates: N: 551807.58<br>E: 2351261.83 | Elevation: 1112.73 | Reference Point: |
| Logged By: M. Daly | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: LLBMW-004-GW
Date: 12/14/04

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP14
Development Company: MKM

Development Method: Whale pumping
Comments:

Well TD: 22.2 FT TIC  Depth to Water: 9.6 FT  ≈ 7.5
Water Column Height: 12.6 FT  One Well Volume: 7.434 Gals

Well Volume (gallons/foot)
2-inch =0.16  6-inch = 1.47
4-inch =0.65  8-inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | Cond | DO | Temp | | |
| 0945 | DSB | 9.6 | | | | | | | | |
| 0955 | DSE | 10 | | | | | | | | |
| 0957 | DPB | 10.0 | | | | | | | | |
| 0900 | DFM | — | — | 7.5 | 6.76 | 0.498 | 2.95 | 11.0 | 71000 | 7.5 gal (1st well vol) |
| 1007 | DFM | — | — | 7.5 | 7.09 | 0.475 | 3.95 | 11.6 | >1000 | 15 gal (2nd well vol) |
| 1008 | DPE | Dry | — | 3.5 | — | — | | — | — | 18.5 gal. |
| 1035 | DPB | 9.7 | — | — | — | — | — | — | | |
| 1039 | DFM | — | — | 4.0 | 7.64 | 0.455 | 3.58 | 12.0 | 1000 | 22.5 gal (3rd well) |
| 1045 | DFM | — | — | 7.5 | 7.45 | 0.441 | 4.61 | 11.9 | 1000 | 30.0 gal (4th well) |
| 1051 | DFM | — | — | 7.5 | 7.42 | 0.480 | 4.19 | 11.6 | 1000 | 37.5 gal (5th well) |
| 1058 | DFM | — | — | 7.5 | 7.33 | 0.480 | 12.44 | 11.5 | 1000 | 45.0 gal (6th well) |
| 1102 | DFM | — | — | 7.5 | 7.80 | 0.442 | 11.21 | 11.5 | 742 | 52.5 gal (7th well vol) |
| 1110 | DPE | 20.5 | — | — | — | — | — | — | — | Final reading |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Vijay Alluri (Please Print)  Reviewed By: C. Eddy
Signature: Vijay  Date: 2/22/05

# Monitoring Well Purging Form

**Well ID:** LL8mw-0046w

**Ravenna Army Ammunition Plant**
**Ravenna, Ohio**

**Date :** 12/21/04

## WELL OBSERVATIONS

**Protective Casing:** Intact · Damaged **Locked:** Yes · No **Key No:**

**Concrete Base:** Intact · Damaged **Inner Casing:** 2" · 4" · 6" · 8" **Other:**

**Stickup Height:** 3.1 (ft) **TIC · TOC Difference:** 0.2 (ft)

**Vapor Readings :** HNu · OVA Background: _____ Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| **LNAPL** | Yes · No _____ | Yes · No | LL8mw-0046w |
| **DNAPL** | Yes · No _____ | Yes · No | |

## CALCULATIONS

(A) **Depth to Well Bottom** 22.6 (ft) TOC · TIC · BGS Measured · **Previously Measured** (circle one)

(B) **Depth to Water** 8.7 (ft) TOC · TIC · BGS **Time Measured:** 0909

(C) **Water Column Height (A-B)** 13.9 (ft)

(D) **Well Diameter Factor** 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) **One Well Volume (C*D)** 2.22 (gal)

(F) **Volumes to be Evacuated** 5

**(G) TOTAL VOLUME TO BE EVACUATED (E * F)** 11.12 (gal)

## EVACUATION METHOD

**Well Evacuation Method:** Bailer · Submersible Pump · Other: Micro Purging **Device Number:** _____

**Purge Water Disposition:** **1.** Discharged Onsite **2.** Collected And: Stored · Disposed Onsite · Offsite

Collected In: Tanks · Drums No. of Containers: _____

**Comments:** _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | DO | |
| 0910 | 8.7 | | | 0.563 | 9.68 | 5.91 | 1000 | 8.45 | Initial reading |
| 0913 | 8.55 | | | 0.548 | 9.71 | 6.43 | 999 | 10.07 | |
| 0916 | 8.9 | | | 0.545 | 9.43 | 6.52 | 999 | 10.75 | |
| 0919 | 9.0 | | | 0.547 | 9.41 | 7.12 | 999 | 11.31 | |
| 0922 | 9.1 | | | 0.543 | 9.32 | 6.94 | 999 | 11.25 | |
| 0925 | 9.1 | | | 0.545 | 9.30 | 6.98 | 999 | 10.75 | End purging |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Vijay Alluri (Please Print) Reviewed By: C. Esler

Signature: Vijay Date : 2/22/05

# Field Sampling Report

**Location ID:** LL3-MW-004GW

**Date:** 12/21/04

**Ravenna Army Ammunition Plant**
**Characterization of 14 RVAAP AOCs**

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| **Method** | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | Micro Purging X | | | | Push Probe | | Plastic Liner | |
| **Type/Construction** | | | | | Mattocks | | | |
| **Miscellaneous** | **Well Purging Form** (Yes) - No | | | | | | | |

**Sample Collection:** 0930 hrs

**Sample Type:** Composite - MI - (Grab) If MI, # of increments taken: NA

**Location:** (Plotted on Map) - (Staked in Field) Estimated - Measured - (Surveyed)

**Sample Depth:** 18 FT (below surface)

**Decon:** Dedicated - Each Day - (Each Location)

## Field Parameters
(at time of sample)

| | |
|---|---|
| **PID / FID Readings:** | |
| Background: | 0.0 ppm |
| DO : | 10.75 |
| Sample: | 0.0 ppm |
| **Water Level** | 3.7 FT |
| **Temperature** | 9.30 °C |
| **Sp. Conductance:** | 0.545 uMHOs |
| **pH** | 6.98 units |
| **Turbidity** | 999 N.T.U. |

## Analytical Parameters

| | | | |
|---|---|---|---|
| VOC | X | TPH GRO | |
| SVOC | X | TPH DRO | |
| Explosives | X | Chromium +6 | |
| Propellants | ~~X~~ BDE | Nitrate | X |
| TAL Metals | X | | |
| Pesticides/PCBs | X | | |
| Cyanides | | | |
| TOC | | | |
| Grain Size | | | |

## Other Parameters

| | | | |
|---|---|---|---|
| Corrosivity | | | |
| Reactivity Sulfide/Cyanide | | | |
| Ignitability | | | |

## QA Samples

| | | |
|---|---|---|
| MS/MSD | Yes / No | NA |
| Duplicate ID | | NA |
| Equipment Rinse ID | | NA |
| Trip Blank ID | Trip Blank | NA |

**Sample Description**

Dark grey color, NO Odor, No sheen, very high turbidity

**Split Sample**

**Split Sample ID:**

**Name:**

**Agency/Company:**

**Address:**

**QA/QC Provided:** MS/MSD - Duplicate - Trip Blanks - Field Blanks

**Parameters:** Same as Above - As Listed

***Soil sample description should include:***

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

***Water sample description should include:***

*Color Odor Sheen Turbidity*

Logged By: Vijay Alluri (Please Print)

Signature: Vijay

Reviewed by: Eric Lewis (Please Print)

Signature: Eric Lewis Date: 2/4/05

# HTRW DRILLING LOG

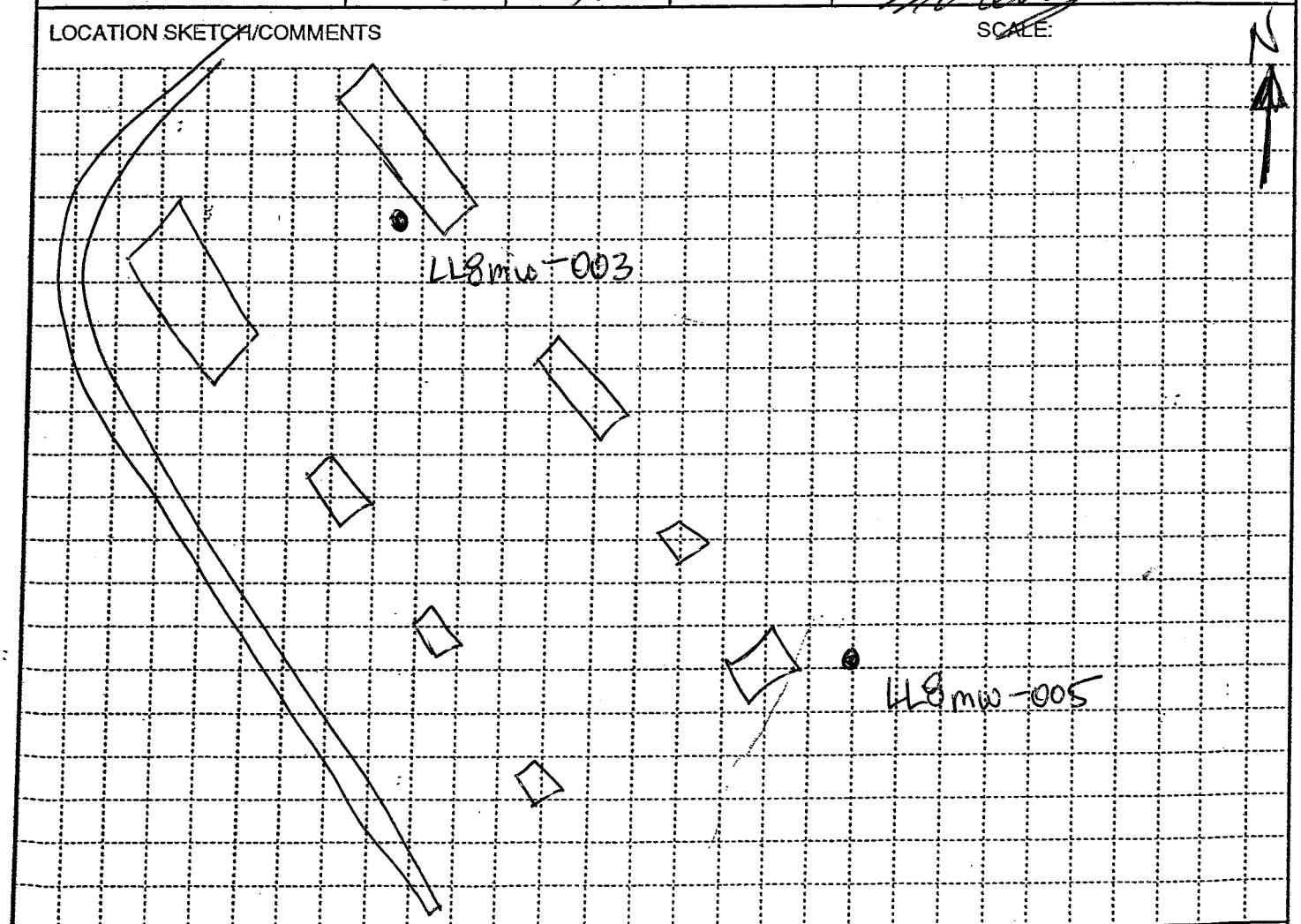
| | | |
|---|---|---|
| | DISTRICT: LOUISVILLE | HOLE NUMBER: LL8mw-005 |
| 1. COMPANY NAME: MKM ENGINEERS | 2. DRILL SUBCONTRACTOR: HAD DRILLING | SHEET 1 OF 3 SHEETS |
| 3. PROJECT: RVAAP RI 14 | 4. LOCATION: LOADLINE 8 | |
| 5. NAME OF DRILLER: SAM ~~HOFFER~~ | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME LC60 | |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8.25 HSA; 2" SPLIT SPOON | 8. HOLE LOCATION: SE WELL LOCATION ADJACENT TO BLDG 2B-2 | |
| | 9. SURFACE ELEVATION: 1112.51 ASL | |
| | 10. DATE STARTED: 12/07/04 | 11. DATE COMPLETED: 12/07/04 |
| 12. OVERBURDEN THICKNESS: 23.5 | 15. DEPTH GROUNDWATER ENCOUNTERED: 14.0, 17.6 | |
| 13. DEPTH DRILLED INTO ROCK: 0.5 WEATHERED | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 9.7' @1035 12/16/04 | |
| 14. TOTAL DEPTH OF HOLE: 24.0 | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) | |

| 18. GEOTECHNICAL SAMPLES | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| | — | X | — |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY % |
|---|---|---|---|---|---|---|
| | — | — | — | — | — | — |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | — | X | | |

LOCATION SKETCH/COMMENTS — SCALE:




| PROJECT | HOLE NO. |
|---|---|
| RVAAP - RI 14 | LL8mw-005 |

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL8mw-005

PROJECT: RVAAP RI 14

INSPECTOR: Mark Duntley

SHEET 2 OF 3 SHEETS

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | ~~GEOTECH SAMPLE OR CORE BOX NO.~~ Recovery | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | | 6" Topsoil | | | | | |
| | | Br. SILT 70% w/Sand Damp No Odor No Staining No Plasticity | 4.6 | 1.1 | ML | 1-1<br>2-4 | 7.5yr 4/6 |
| | 2 | Grey Mottles present | 7.7 | 1.4 | ML | 1-1<br>2-2 | 7.5yr 5/6 |
| | 4 | SAA | 0.0 | 1.6 | ML | 1-1<br>3-5 | SAA |
| | 6 | SAA | 6.0 | 1.8 | ML<br>SM<br>ML | 3-7<br>10-11 | 7.5yr 5/2 |
| | | 2" Grey SAND 70% w/Silt No Odor No Staining No Plasticity | | | | | |
| | 8 | Reddish Br. SILT 60% w/Sand and Gravel No Odor No Staining No Plasticity | 0.0 | 1.0 | ML | 1-7<br>10-4 | 7.5yr 5/4 |
| | 10 | | | | | | |
| | | Br. SILT 75% w/Sand Damp No Odor No Staining No Plasticity | 1.0 | 0.9 | ML | 1-7<br>13-4 | 7.5yr 4/6 |
| | 12 | | | | | | |
| | | Grey SILT 80% w/Clay Damp No Odor No Staining Med. Plasticity | 13.4 | 1.5 | ML | 2-2<br>5-5 | |
| ▽ | 14 | Saturated @ 14.0 | | | | | 7.5yr 5/1 |
| | | changes to damp @ 15.0 | 4.6 | 1.6 | ML | 4-2<br>3-2 | |
| | 16 | | | | | | |
| ▽ | | | 1.7 | 1.8 | ML<br>SM | 1-2<br>4-6 | |
| | | Grey Fine Grained SAND 85% w/Silt Saturated No Odor No Staining No Plasticity | | | | | |
| | 18 | | 12.4 | 1.6 | SM | 1-1<br>5-7 | 7.5yr 5/2 |
| | 20 | | | | | | |

PROJECT: RVAAP RI 14

HOLE NO.: LL8mw-005

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL8mw-005

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunlevy

SHEET 3 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | ~~GEOTECH SAMPLE OR CORE BOX NO.~~ Recovery | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | 22 | SAA | 0.0 | 1.4 | SM | 1-7<br>5-5 | SAA |
| | 24 | Weathered Gray SS Fine Grained | 0.0 | 1.5 | SM | 5-11<br>13-18 | SAA |
| | | BOH 24 Ft. | | | | | BOH 24<br>Screen from 24 to 14<br>Sand up to 11<br>Bentonite to 8<br>Grout to surface<br>Stick-up well Completion<br>5 gallons of water used to hydrate |
| | 26 | | | | | | |
| | 28 | | | | | | |

PROJECT: RVAAP RI 14

HOLE NO. LL8mw-005

ENG FORM 5056A-R, AUG 94

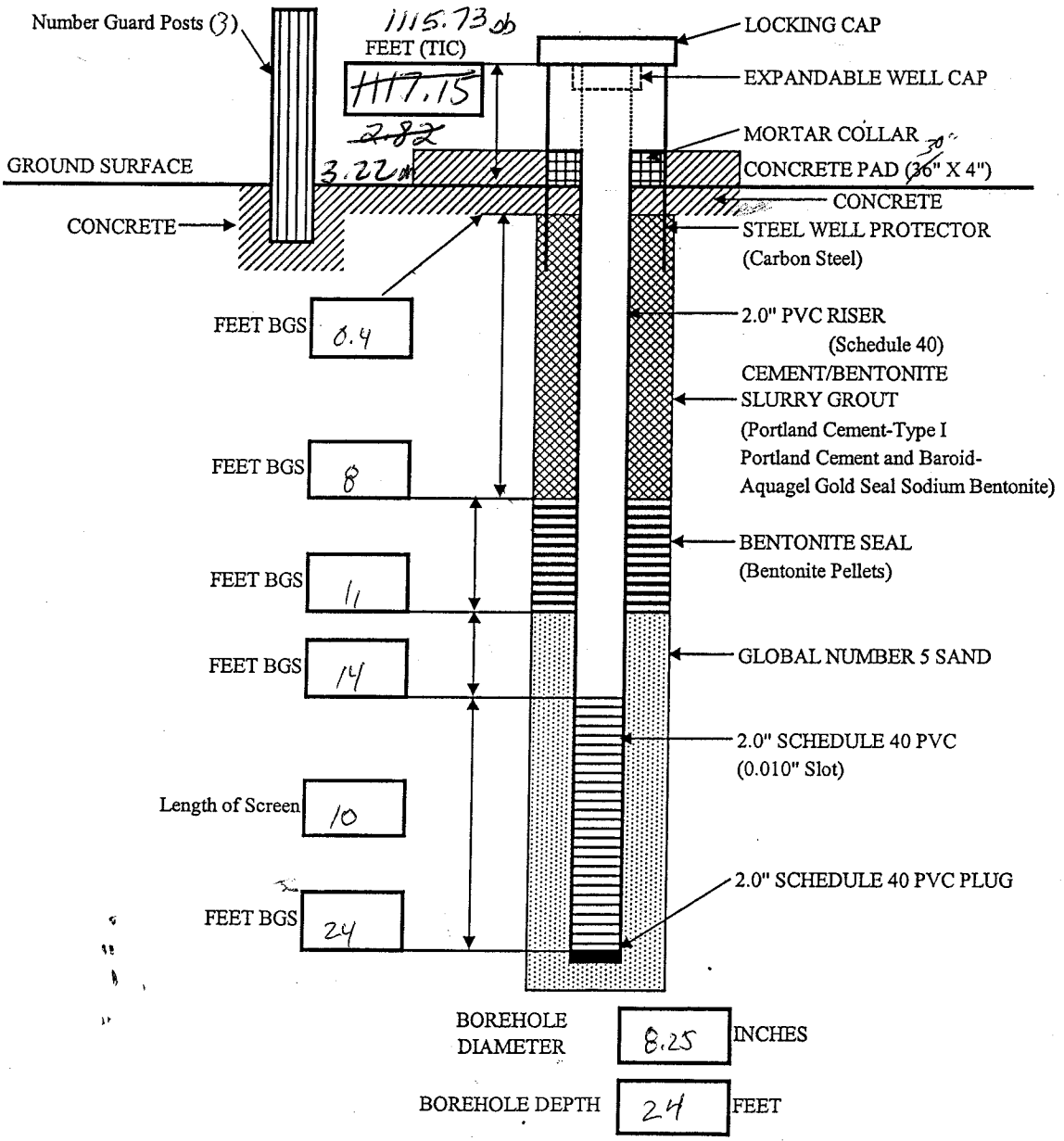
(Proponent: CECW-EG)

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:** RVAAP RI 14

| | | |
|---|---|---|
| Well Number: LC8mw-005 | Begin: 07 Dec 04 | End: 07 Dec 04 |
| Coordinates: N: 551522.48<br>E: 2351748.32 | Elevation: ~~1114.33~~ 1112.51 nab | Reference Point: |
| Logged By: | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: LLBmw-005GW
Date: 12/16/04

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP-14
Development Method: whale Pumping
Development Company: MKM
Comments:

Well TD: 24.8 FT TIC  Depth to Water: 9.7 FT  Well Volume (gallons/foot)  2-inch =0.16  6-inch = 1.47
Water Column Height: 15.1 FT  One Well Volume: 3.9 ~ 9 Gals  4-inch =0.65  8-inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PH | COND | DO | Temp | | |
| 1035 | DSB 1035 | 9.7 | - | - | - | - | - | - | - | - |
| 1045 | DSE | 10.25 | - | - | - | - | - | - | - | - |
| 1050 | DPB | 10.25 | - | - | - | - | - | - | - | - |
| 1103 | DPE | Dry | - | 3.5 | - | - | - | - | - | 3.5 |
| 1320 | DPB | 10.00 | - | - | - | - | - | - | - | - |
| 1325 | DPE | Dry | - | 3.5 | - | - | - | - | - | .7 gal |
| 01/06/05 1300 | DSB | 8.7 | - | - | - | - | - | - | - | - |
| 1305 | DSE | 9.0 | - | - | - | - | - | - | - | - |
| 1308 | DPB | 9.0 | - | - | - | - | - | - | - | - |
| 1311 | DFM | - | - | 2 | 6.25 | 0.446 | 2.06 | 10.6 | >1000 | 1st well vol (9 gal) |
| 01/11/05 1035 | DSB | 9.9 | - | - | - | - | - | - | - | - |
| 1042 | DSE | 10.3 | - | - | - | - | - | - | - | - |
| 1044 | DPB | 10.3 | - | - | - | - | - | - | - | - |
| 1050 | DPE | DRY | - | 4.5 | - | - | - | - | - | 13.5 gal (DRY) |
| | | | | | | | | | | |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Vijay Alluri (Please Print)  Reviewed By: C. Esler
Signature: Vijay  Date: 2/22/05

# Well Development Record

Well ID: LLBmw-005GW
Date: 01/14/05

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP-14
Development Company: MKM

Development Method: Whale Pumping
Comments:

Well TD: 24.8 FT TIC
Water Column Height: 15.1 FT

Depth to Water: 9.7 FT
One Well Volume: 8.9 Gals

Well Volume (gallons/foot): 2-Inch = 0.16, 4-Inch = 0.65, 6-Inch = 1.47, 8-Inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PH | CON | DO | Temp | | |
| 0840 | DSB | 10.2 | | | | | | | | |
| 0850 | DSE | 10.2 | | | | | | | | |
| 0850 | DPB | 10.2 | | | | | | | | |
| 0900 | DFM | — | - | 4.5 | 6.40 | 0.321 | 6.53 | 9.6 | 1000 | 18 gal (2nd well vol) |
| 0905 | DPE | Dry | - | 0.5 | - | - | - | - | - | 18.5 gal |
| 1114 | DPB | 14.3 | - | - | - | - | - | - | - | |
| 1121 | DPE | — | - | 4.0 | - | - | - | - | - | 22.5 gal |
| 01/18/05 0912 | DSB | 9.65 | - | - | - | - | - | - | - | |
| 0922 | DSE | 9.70 | - | - | - | - | - | - | - | |
| 0923 | DPB | 9.70 | - | - | - | - | - | - | - | |
| 0927 | DPE | Dry | - | 3.5 | - | - | - | - | - | 26.0 gal. |
| 1515 | DPB | 9.6 | DFM | 1.0 | 5.86 | 0.339 | 7.85 | 9.2 | 1000 | 27.0 gal (3rd well vol) |
| 01/19/05 1523 | DPE | Dry | - | - | - | - | - | - | - | |
| 0935 | DPB | 9.3 | - | - | - | - | - | - | - | |
| 0945 | DPE | Dry | - | 4.5 | - | - | - | - | - | 31.5 gal |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photolonizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Vijay Alluri (Please Print)
Signature: Vijay Alluri/SB

Reviewed By: C. Eder
Date: 2/22/05

# Well Development Record

Well ID: LL8mw-005GW
Date: 01/20/05

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP-14
Development Company: MKM

Development Method: whale pumping
Comments:

Well TD: 24.8 FT TIC  Depth to Water: 9.7 FT
Water Column Height: 15.1 FT  One Well Volume: 3.9 ≈ 9 Gals

Well Volume (gallons/foot): 2-inch =0.16, 4-inch =0.65, 6-inch = 1.47, 8-inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PH | CON | DO | Temp | | |
| 1600 | DPB | 9.51 | | | | | | | | |
| 1610 | DPE | Dry | | 3.5 | | | | | | |
| 01/20/05 0950 | DPB | 9.52 | | | | | | | | 35.0 gal |
| 0952 | DFM | | | 1.0 | 6.68 | 0.295 | 2.27 | 8.6 | 1000 | 36 gal (4th well vol) |
| 0958 | DPE | Dry | - | 2.5 | - | - | - | - | - | 38.5 gal |
| 1555 | DPB | 9.6 | - | | - | - | - | - | | |
| 1606 | DPE | | | 3.5 | - | - | - | - | | 42.0 gal |
| 0904 | DPB | - | - | | - | - | - | - | | |
| 0914 | DFM | - | - | 3 | 6.64 | 0.38 | 4.69 | 8.0 | 875 | 45 gal (5th well Vol) |
| 0915 | DPE | Dry | - | 1.5 | - | - | - | - | - | 46.5 gal |
| 1503 | DPB | 9.81 | - | - | - | - | - | - | - | - |
| 1509 | DPE | Dry | - | 4.5 | - | - | - | - | - | 51 gal |
| 1130 | DPB | 9.85 | - | - | - | - | - | - | | |
| 1140 | DFM | | | 3 | 6.62 | 0.324 | 3.84 | 9.6 | 854 | 54 gal (6th well vol) |
| 1140 | DPE | Dry | - | - | - | - | - | - | - | |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Vijay Alluri (Please Print)
Signature: Vijay Alluri B.B

Reviewed By: C. Eden
Date: 2/22/05

# Monitoring Well Purging Form

Well ID: LL8mw-005gw

Date: 02-02-05

Ravenna Army Ammunition Plant
Ravenna, Ohio

## WELL OBSERVATIONS

Protective Casing: (Intact) · Damaged  Locked: Yes · (No)  Key No:

Concrete Base: (Intact) · Damaged  Inner Casing: (2") · 4" · 6" · 8"  Other:

Stickup Height: 3.22 (ft)  TIC · TOC Difference: .022 (ft)

Vapor Readings: HNu · OVA  Background: _____  Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL | Yes · (No) | _____ Yes · No | LL8mw-0056W |
| DNAPL | Yes · (No) | _____ Yes · No | |

## CALCULATIONS

(A) Depth to Well Bottom 27.07 (ft) (TOC) TIC · BGS  (Measured) · Previously Measured (circle one)

(B) Depth to Water 10.54 (ft) (TOC) TIC · BGS  Time Measured: 1338

(C) Water Column Height (A-B) 16.53 (ft)

(D) Well Diameter Factor 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) One Well Volume (C*D) 2.64 (gal)

(F) Volumes to be Evacuated 5

(G) **TOTAL VOLUME TO BE EVACUATED (E * F)** 13.22 (gal)

## EVACUATION METHOD

Well Evacuation Method: Bailer · Submersible Pump · (Other: MicroPurge)  Device Number: _____

Purge Water Disposition: 1. Discharged Onsite  2. (Collected) And: (Stored) Disposed (Onsite) · Offsite

Collected In: Tanks · Drums  No. of Containers: _____

Comments: _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | DO | |
| 1340 | 10.54 | | | 0.425 | 9.30 | 6.60 | 186 | 7.20 | Initial |
| 1343 | 10.65 | | | 0.442 | 9.26 | 6.75 | 125 | 3.06 | |
| 1346 | 10.85 | | | 0.443 | 9.24 | 6.87 | 82 | 0.35 | |
| 1349 | 10.95 | | | 0.442 | 9.29 | 6.90 | 0 | 0 | End Purging |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Shawna Talarico (Please Print)

Signature: [signature]

Reviewed By: C. Eder

Date: 2/22/05

# Field Sampling Report

Location ID: LL8 MW - 005 GW

Date: 02 - 02 - 05

Ravenna Army Ammunition Plant
Characterization of 14 RVAAP AOCs

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| Method | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | Micro Purge | X | | | Push Probe | | Plastic Liner | |
| Type/Construction | | | | | Mattocks | | | |
| Miscellaneous | ~~Well Purging Form~~ Yes - No | | | | | | | |

**Sample Collection:** 1400 hrs

**Sample Type:** Composite - MI - (Grab)
If MI, # of increments taken: NA

**Location:** (Plotted on Map) - (Staked in Field)
Estimated - Measured - (Surveyed)

**Sample Depth:** 19 FT (below surface)

**Decon:** Dedicated - Each Day - (Each Location)

### Field Parameters
(at time of sample)

| | | |
|---|---|---|
| **PID / FID Readings:** | | |
| Background: | 0.0 | ppm |
| Sample: | 0.0 | ppm |
| **Water Level** | 10.54 | FT |
| **Temperature** | 10.24 | °C |
| **Sp. Conductance:** | 0.087 | uMHOs |
| **pH** | 6.01 | units |
| **Turbidity** | 0 | N.T.U. |

### Analytical Parameters

| | | | | | |
|---|---|---|---|---|---|
| VOC | X | TPH GRO | | | |
| SVOC | X | TPH DRO | | | |
| Explosives | X | Chromium +6 | | | |
| Propellants | ~~X~~ ST | Nitrate | X | | |
| TAL Metals | X | | | | |
| Pesticides/PCBs | X | | | | |
| Cyanides | | | | | |
| TOC | | | | | |
| Grain Size | | | | | |

### Other Parameters

| | | | |
|---|---|---|---|
| Corrosivity | | | |
| Reactivity Sulfide/Cyanide | | | |
| Ignitability | | | |
| | | | |

### QA Samples

| | |
|---|---|
| MS/MSD | Yes / No (NA) |
| Duplicate ID | (NA) |
| Equipment Rinse ID | LL8MW-005-ER NA |
| Trip Blank ID | Trip Blank ~~NA~~ 03 |

### Sample Description

Clear water, no Sheen
No odor, no Turbidity

*Soil sample description should include:*

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

*Water sample description should include:*

*Color Odor Sheen Turbidity*

### Split Sample

**Split Sample ID:**

**Name:**

**Agency/Company:**

**Address:**

**QA/QC Provided:** MS/MSD - Duplicate - Trip Blanks - Field Blanks

**Parameters:** Same as Above - As Listed

Logged By: Shilynn Taherian (Please Print)

Signature:

Reviewed by: Eric Ellis (Please Print)

Signature: Eric Ellis Date: 2/4/05

# HTRW DRILLING LOG

| | | |
|---|---|---|
| | DISTRICT: LOUISVILLE | HOLE NUMBER: LL8mw-006 |
| 1. COMPANY NAME: MKM ENGINEERS | 2. DRILL SUBCONTRACTOR: HAD DRILLING | SHEET 1 OF 3 SHEETS |
| 3. PROJECT: RVAAP - RI 14 | 4. LOCATION: LOAD LINE 8 | |
| 5. NAME OF DRILLER: SAM HOEFER | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME-LC60 | |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8.25 OD HSA; 2" SPLITSPOON | 8. HOLE LOCATION: SOUTHEND OF LL | |
| | 9. SURFACE ELEVATION: 1114.33 ASL | |
| | 10. DATE STARTED: 12/07/04 | 11. DATE COMPLETED: 12/07/04 |
| 12. OVERBURDEN THICKNESS: 20' | 15. DEPTH GROUNDWATER ENCOUNTERED: 17.5 | |
| 13. DEPTH DRILLED INTO ROCK: 4' WEATHERED | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 18.7 @0930 12/16/04 | |
| 14. TOTAL DEPTH OF HOLE: 24' | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) | |

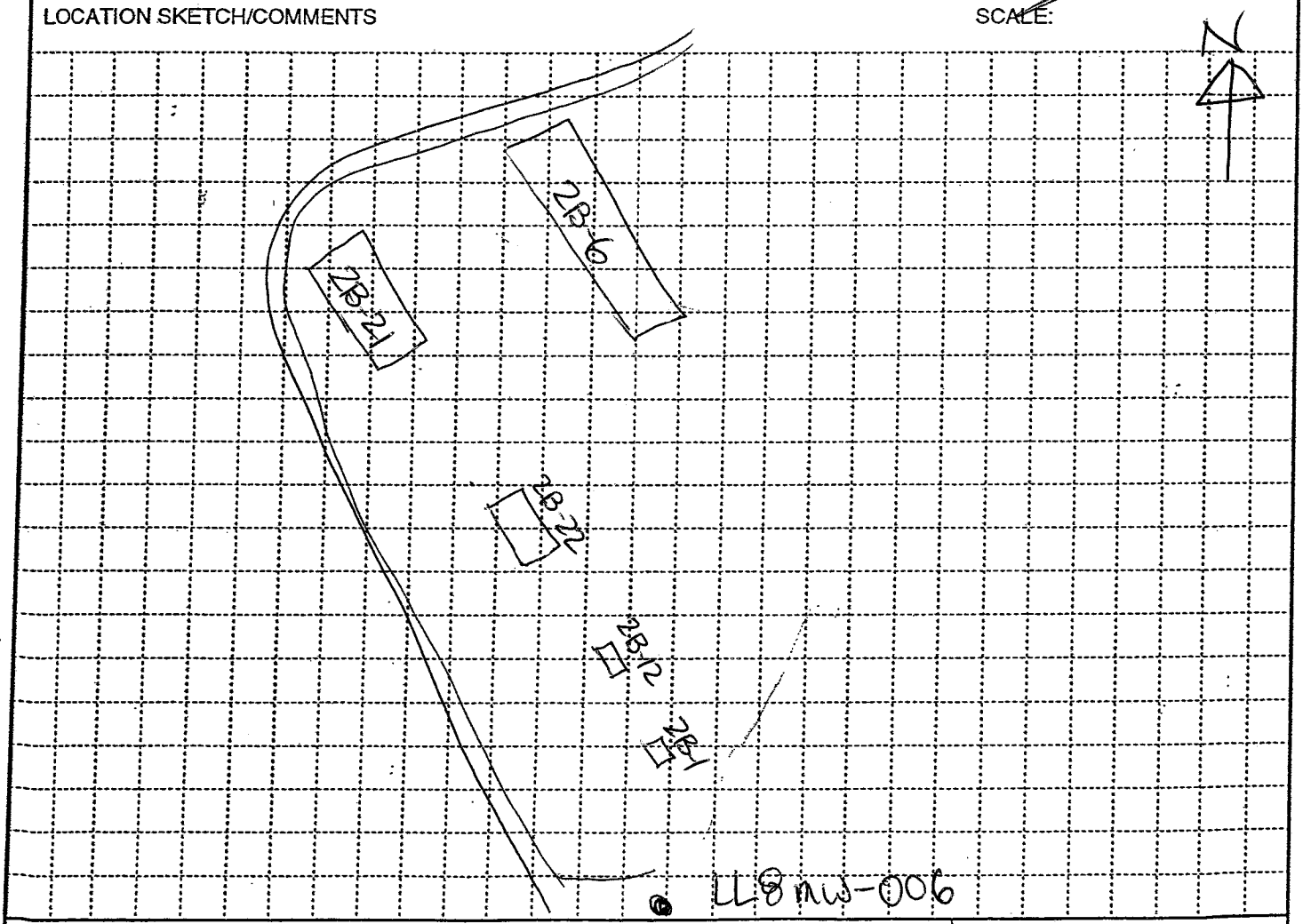
| 18. GEOTECHNICAL SAMPLES | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| SHELBY TUBE 8'-10' | — | X | — |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY % |
|---|---|---|---|---|---|---|
| | — | — | — | — | — | |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | | X | | |

LOCATION SKETCH/COMMENTS

SCALE:




| PROJECT | HOLE NO. |
|---|---|
| RVAAP - RI 14 | LL8mw-006 |

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LLSmw-006

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunlevy

SHEET 2 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. Recovery | ANALYTICAL SAMPLE NO. USCS | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | | 1" Topsoil<br>Lt. Br. SILT 65% w/ Sand Damp No Odor No Plasticity Crop Mottling | 0.0 | 1.3 | ML | 1-1<br>2-4 | 7.5yr 6/6<br>7.5yr 4/4 |
| | 2 | Changes to Stiff and Dry | 5.0 | 1.5 | ML<br>SM | 2-7<br>9-12 | |
| | 4 | Br. SAND 70% w/ Silt Dry No Odor No Staining No Plasticity<br>Br. SILT 70% w/ Sand No Odor No Staining No Plasticity Dry | 4.0 | 1.5 | ML | 2-6<br>5-7 | SAA |
| | 6 | SAA | 3.0 | 1.8 | ML | 2-4<br>8-9 | SAA |
| | 8 | Shelby Tube | | | | | |
| | 10 | Br. SILT 70% w/ Sand Dry No Odor No Staining No Plasticity<br>DK. Reddish Br. SS Frag.<br>Br. SILT 70% w/ Sand Dry No Odor No Staining No Plasticity | 1.8 | 1.2 | ML<br>ML | 1-4<br>10-12 | 7.5yr 4/4 |
| | 12 | SAA | 2.1 | 2.0 | ML | 4-11<br>13-11 | SAA |
| | 14 | Becomes Damp<br>SAA | 1.0 | 1.4 | ML | 2-4<br>7-14 | SAA |
| ▽ | 16 | Gry SILT 85% w/ Clay Damp No Odor No Staining Mod Plasticity | 0.0 | 1.5 | ML | 2-6<br>8-18 | 7.5yr 5/1 |
| | 18 | Br. SILT 65% w/ Sand Saturated No Odor No Staining No Plasticity<br>Weathered Gray/White SS / Sand | 0.0 | 1.3 | SS | 2-13<br>12-5 | 7.5yr 5/3<br>7.5yr 6/1 |

PROJECT: RVAAP RI 14

HOLE NO.: LLSmw-006

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LL8mw-006

PROJECT: RVAAP RI 14

INSPECTOR: Mark Dunlevy

SHEET 3 OF 3 SHEETS

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | ~~GEOTECH SAMPLE~~ OR CORE BOX NO. Recovery | ~~ANALYTICAL SAMPLE NO.~~ USCS | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | 22 | SAA | 0.0 | 1.2 | SS | 10-12<br>17-23 | SAA |
| | 24 | SAA | 0.0 | 1.4 | SS | 5-6<br>9-10 | SAA |
| | | Bott 24.2 | | | | | Bott 24.2<br>Sand to 24<br>Screen from 24 to 14<br>Sand up to 11<br>Bentonite to 8<br>Grout to Surface<br>Stick-up well completion<br>5 gallons of water ~~Used~~ |
| | 26 | | | | | | |
| | 28 | | | | | | |

PROJECT: RVAAP RI 14

HOLE NO.: LL8mw-006

ENG FORM 5056A-R, AUG 94

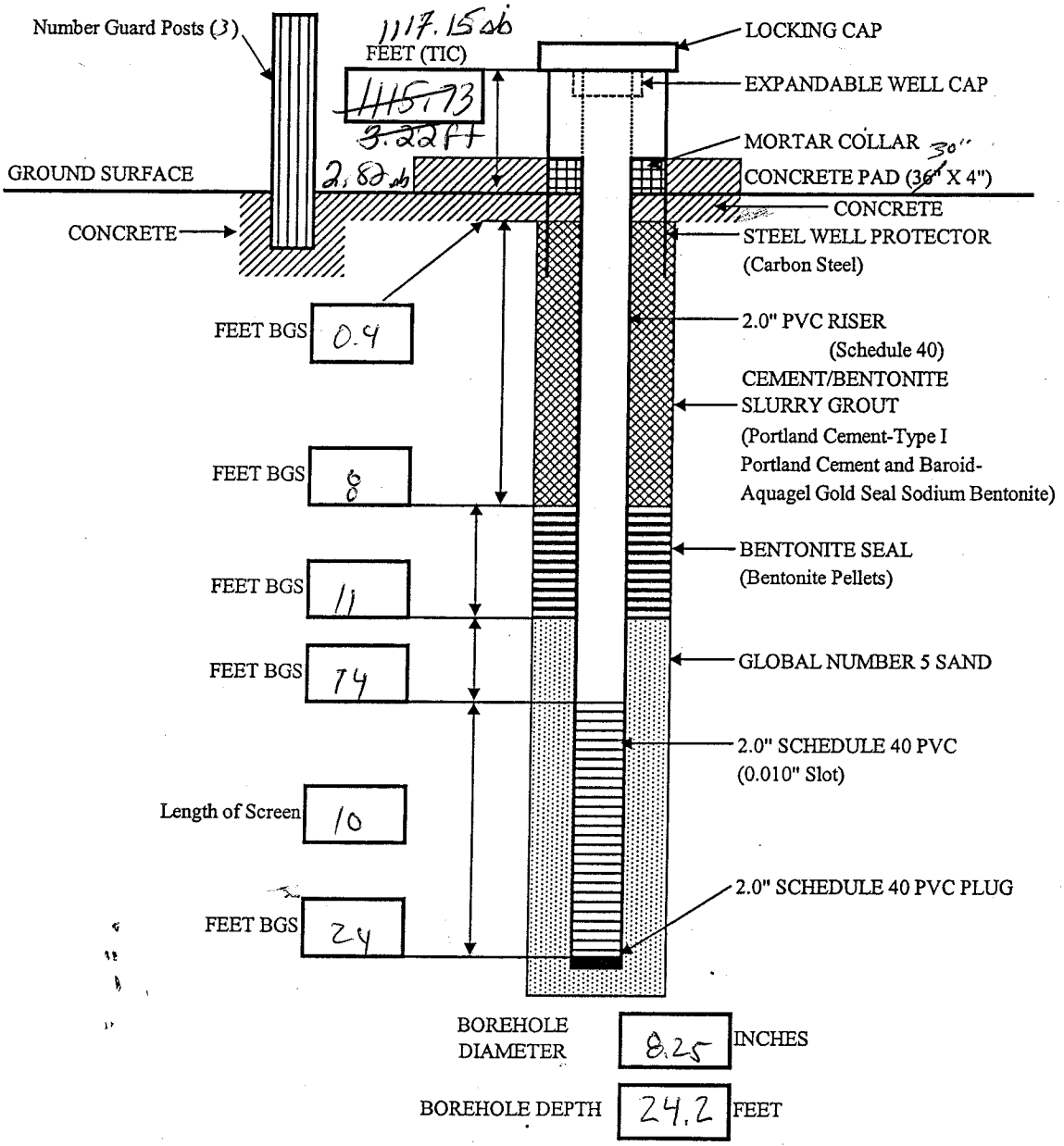
(Proponent: CECW-EG)

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:** RVAAP RI 04

| | | |
|---|---|---|
| Well Number: LL8mw-006 | Begin: 07 Dec 04 | End: 07 Dec 04 |
| Coordinates: N: 551296.77<br>E: 2351483.58 | Elevation: ~~1112.51~~ 1114.33 sb | Reference Point: |
| Logged By: | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: LL8mw-006 GW
Date: 12/16/04

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP-14
Development Method: Whale Pumping
Development Company: MKM
Comments:

Well TD: 26.2 FT TIC  Depth to Water: 18.7 FT
Water Column Height: 7.5 FT  One Well Volume: 4.42 Gals

Well Volume (gallons/foot): 2-inch =0.16  4-inch =0.65  6-inch = 1.47  8-inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PH | cond | DO | Temp | | |
| 0930 | DSB | 18.7 | | | | | | | | |
| 0940 | DSE | 20.0 | | | | | | | | |
| 0942 | DPB | 20.0 | | | | | | | | |
| 0950 | DFE | Dry | | 3.5 | 7.28 | 0.313 | 4.43 | 11.1 | 1000 | Initial reading |
| 1010 | DPB | 22.0 | — | — | — | — | — | — | | |
| 1018 | DFM | | — | 1 | 6.61 | 0.374 | 3.59 | 10.3 | 1000 | 4.5 (1st well vol) |
| 1018 | DPE | Dry | — | 2.5 | — | — | — | — | | 7.0 |
| 1255 | DPB | 19.0 | — | — | — | — | — | — | | |
| 1300 | DFM | Dry | — | 2.0 | 7.07 | 0.364 | 11.76 | 10.4 | 1000 | 9.0 (2nd well vol) |
| 1300 | DPE | Dry | — | — | — | — | — | — | — | — |
| 11/06/05 1402 | DSB | 16.35 | — | — | — | — | — | — | — | — |
| 1409 | DSE | 17.00 | — | — | — | — | — | — | — | — |
| 1414 | DPB | 17.00 | — | — | — | — | — | — | — | — |
| 1416 | DFM | — | — | — | 7.31 | 0.491 | 4.86 | 11.1 | >1000 | 13.5 (3rd well vol) |
| 1417 | DPE | DRY | — | — | — | — | — | — | — | 13.5 gal (dry) |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: Vijay Alluri (Please Print)  Reviewed By: C. Esler
Signature: Vijay  Date: 2/22/05

# Well Development Record

Well ID: LL8mw-006-GW
Date: 01/06/05

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP-14
Development Company: MKM
Development Method: WHALE PUMP.
Comments:

Well TD: 26.2 FT TIC  Depth to Water: 18.7 FT  ≈45
Water Column Height: 7.5 FT  One Well Volume: 4.42 Gals

Well Volume (gallons/foot): 2-inch =0.16  4-inch =0.65  6-inch = 1.47  8-inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | CON | DO | TEMP | | |
| 1450 | DPB | 16.35 | – | – | – | – | – | – | – | – |
| 1453 | DFM | – | – | 4.5 | 7.29 | 0.490 | 4.84 | 11.1 | >1000 | 4th well volume (18 gal) |
| 1454 | DPE | DRY | – | 1.0 | – | – | – | – | – | 19 gal (DRY) |
| 01/10/05 1517 | DPB | 17.96 | – | – | – | – | – | – | – | – |
| 1519 | DFM | | – | 3.5 | 7.79 | .330 | 3.97 | 10.4 | 999 | 22.5 (5TH VOL) |
| 1521 | DPE | DRY | – | – | – | – | – | – | – | 22.5 DRY |
| 1535 | DPB | – | – | – | – | – | – | – | – | – |
| 1538 | DPE | DRY | – | 3.5 | – | – | – | – | – | 26.0 (@ DRY) |
| 01/11/05 1014 | DSB | 16.42 | – | – | – | – | – | – | – | – |
| 1019 | DSE | 16.49 | – | – | – | – | – | – | – | – |
| 1020 | DPB | 16.49 | – | – | – | – | – | – | – | – |
| 1024 | DFM | – | – | 4.5 10 | 7.5 | 0.44 | 3.97 | 10.1 | 71000 | 6th vol (27 gal) |
| 1031 | DFM | – | – | 4.5 | 7.5 | 0.486 | 5.20 | 10.1 | 71000 | 7th vol (31.5 gal) |
| 1033 | DPE | DRY | – | 2.5 | – | – | – | – | – | 34 gal dry |
| | | | | | | | | | | (development complete) |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: NILESH SHRINGARPURE (Please Print)  Reviewed By: C. Esler
Signature: NShringarpure  Date: 2/22/05

# Monitoring Well Purging Form

Well ID: LL8mw-0066w

Date: 01-21-05

Ravenna Army Ammunition Plant
Ravenna, Ohio

## WELL OBSERVATIONS

Protective Casing: (Intact) · Damaged  Locked: (Yes) · No  Key No:

Concrete Base: (Intact) · Damaged  Inner Casing: (2") · 4" · 6" · 8"  Other:

Stickup Height: 2.82 (ft)  TIC · TOC Difference: 0.27 (ft)

Vapor Readings: (HNu) · OVA  Background: _____  Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL Yes · (No) | _____ | Yes · No | LL8mw-0066w |
| DNAPL Yes · (No) | _____ | Yes · No | |

## CALCULATIONS

(A) Depth to Well Bottom 27 (ft) (TOC) · TIC · BGS  (Measured) · Previously Measured (circle one)

(B) Depth to Water 16.65 (ft) (TOC) · TIC · BGS  Time Measured: 1020

(C) Water Column Height (A-B) 10.35 (ft)

(D) Well Diameter Factor 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)

(E) One Well Volume (C*D) 1.64 (gal)

(F) Volumes to be Evacuated 5

(G) **TOTAL VOLUME TO BE EVACUATED (E * F)** 8.28 (gal)

## EVACUATION METHOD

Well Evacuation Method: Bailer · Submersible Pump · (Other: MicroPurge)  Device Number: _____

Purge Water Disposition: 1. Discharged Onsite (2. Collected And:) (Stored) · Disposed (Onsite) Offsite

Collected In: Tanks · Drums  No. of Containers: _____

Comments: _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | DO | |
| 10.21 | 16.65 | | | 0.040 | 2.24 | 6.37 | 175 | 13.35 | Initial |
| 10.24 | 16.64 | | | 0.085 | 5.20 | 6.45 | 75 | 12.52 | |
| 10.27 | 16.95 | | | 0.085 | 6.71 | 6.45 | 62 | 12.25 | |
| 10.30 | 16.09 | | | 0.085 | 7.43 | 6.49 | 30 | 12.22 | End Purging |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Shahram Tahernia (Please Print)

Signature: Shahram

Reviewed By: C. Cole

Date: 2/22/05

# Field Sampling Report

Location ID: LL8 MW-006 GW

Date: 1-21-05

Ravenna Army Ammunition Plant
Characterization of 14 RVAAP AOCs

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| Method | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | Microphurge | X | | | Push Probe | | Plastic Liner | |
| Type/Construction | | | | | Mattocks | | | |
| Miscellaneous | Well Purging Form (Yes) - No | | | | | | | |

Sample Collection: 1040 hrs

Sample Type: Composite - MI - (Grab)
If MI, # of increments taken: N/A

Location: (Plotted on Map) - Staked in Field
Estimated - Measured - (Surveyed)

Sample Depth: 22 FT (below surface)

Decon: Dedicated - Each Day - (Each Location)

## Field Parameters
(at time of sample)

| | | |
|---|---|---|
| PID / FID Readings: | | |
| Background: | 0.0 | ppm |
| Sample: | 0.0 | ppm |
| Water Level | 16.65 | FT |
| Temperature | 7.43 | °C |
| Sp. Conductance: | 0.485 | uMHOs |
| pH | 6.45 | units |
| Turbidity | 30 | N.T.U. |

## Analytical Parameters

| | | | |
|---|---|---|---|
| VOC | X | TPH GRO | |
| SVOC | X | TPH DRO | |
| Explosives | X | Chromium +6 | |
| Propellants 5T | X | Nitrate | X |
| TAL Metals | X | | |
| Pesticides/PCBs | X | | |
| Cyanides | | | |
| TOC | | | |
| Grain Size | | | |

## Other Parameters

| | | |
|---|---|---|
| Corrosivity | | |
| Reactivity Sulfide/Cyanide | | |
| Ignitability | | |
| | | |

## QA Samples

| | |
|---|---|
| MS/MSD | Yes / No (NA) |
| Duplicate ID | (NA) |
| (Equipment Rinse ID) | LL8mw-006-ER NA |
| (Trip Blank ID) | Trip Blank (NA) Yes |

## Sample Description

Clear water, no sheen
no odor, low turbidity

*Soil sample description should include:*

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

*Water sample description should include:*

*Color Odor Sheen Turbidity*

## Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Shahram Tahesilia (Please Print)

Signature:

Reviewed by: ERIC ELLIS (Please Print)

Signature: Date: 2/4/05

# HTRW DRILLING LOG

| | | |
|---|---|---|
| DISTRICT: LOUISVILLE | | HOLE NUMBER: L10MW-001 |
| 1. COMPANY NAME: MKM ENGINEERS | 2. DRILL SUBCONTRACTOR: HAD DRILLING | SHEET 2 OF 3 SHEETS |
| 3. PROJECT: RVAAP-R14 | 4. LOCATION: RAVENNA, OH LOADLINE 10 | |
| 5. NAME OF DRILLER: GREG / ANDY | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME-LC60 | |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID HSA; 1½" ID X 2' SPLIT SPOON; 3" DIA SHELBY TUBE; 6¼" ID HSA; 2" DIA CORE BARREL | 8. HOLE LOCATION: NORTH OF BLDG PE-1 | |
| | 9. SURFACE ELEVATION: 1130.00 ASL | |
| | 10. DATE STARTED: 12/16/04 | 11. DATE COMPLETED: 12/20/04 |
| 12. OVERBURDEN THICKNESS: 15 | 15. DEPTH GROUNDWATER ENCOUNTERED: ~17' BGS | |
| 13. DEPTH DRILLED INTO ROCK: 13' | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 22.6' @ 1100 01/03/05 | |
| 14. TOTAL DEPTH OF HOLE: 28' | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): — | |

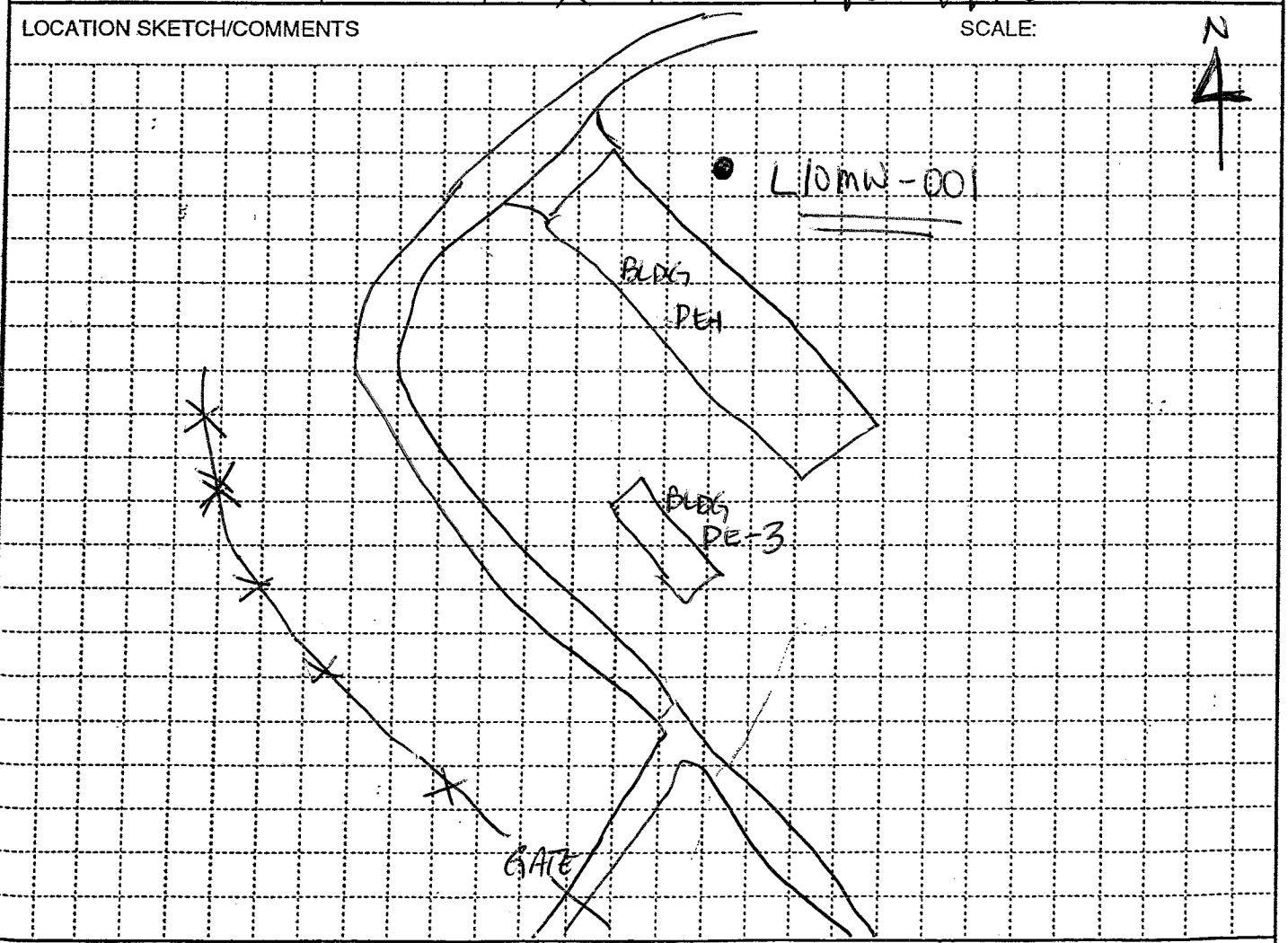
| 18. GEOTECHNICAL SAMPLES | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| 6-8' SHELBY TUBE | | X | 1 |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY % |
|---|---|---|---|---|---|---|
| — | — | — | — | — | — | |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | — | X | — | David K Eaman |

LOCATION SKETCH/COMMENTS

SCALE:




| PROJECT: RVAAP-R14 | HOLE NO.: L10MW-001 |
|---|---|

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: L10MW-001

PROJECT: RVAAP - RI 14

INSPECTOR: DK EARNEST

SHEET 2 OF 3 SHEETS

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. (e) | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | 2 | 3" TOPSOIL GREY CL SILT (25%) BROWN CLAYEY SILT (60%) NONPLASTIC FINE GRAINED (10%) STIFF TRACE FINE GRAVEL (5%) | 0 | 1.1 | ML | PUSH | DRY 10YR 5/4 |
| | 4 | SAA MED DENSE | 0 | 1.7 | ML | 5/5 9/10 | |
| | 6 | SAA LOOSE TO MED DENSE | 0 | 1.0 | ML | 5/9 11/11 | |
| | 8 | SHELBY TUBE | | N.R | | NR | SHELBY TUBE 13:45 |
| | 10 | SAA TRACE FINE TO SMALL ROUNDED GRAVEL LOOSE | 0 | 1.8 | ML | 3/2 5/6 | |
| | 12 | SAA | 0 | 1.0 | ML | 5/6 5/6 | |
| | 14 | SAA ROCK FRAG & SAND | 0 | 1.0 | ML | 4/10 9/50/4 | |
| | 16 | TAN/LT BROWN WEATHERED SANDSTONE FINE GRAINED WELL SORTED <10% FINES, 90% SAND | AUGER REFUSAL 15.3± | 0.2 | | 50/1 | SPOON REFUSAL DRY 10YR 8/3 |
| | 18 | TAN/LT BROWN SANDSTONE <10% FINES, 90% SAND FINE TO MED GRAINED WELL SORTED HARD VISIBLE BEDDING PLANES LAMINATED; WELL CEMENTED SLIGHTLY WEATHERED CORED TO 20.5' | | | | | 10YR 7/3 |
| | 20 | | | | | | RECOVERY OF 52" |

PROJECT: RVAAP - RI 14

HOLE NO.: L10MW-001

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LHMW-001

PROJECT: RVAAP-R14

INSPECTOR: DK GARNEST

SHEET 3 OF 3

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. (e) | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | 22 | SAA<br>HEAVY PETROLEUM STAINING IN FRACTURES FROM ABOUT 20.75' - 22.5' | | | | | 2ND CORE<br>20.5-28.3<br>SLIGHT PETROL ODOR<br>20.5-21.0 |
| | 24 | MICACEOUS FLAKES IN SOME FRACTURES | | | | | |
| | | 45° DIP ON BEDDING PLANES.<br>@ 25'-28'<br>LT BROWN & GREY SAND LAYERS | | | | | |
| | 26 | | | | | | |
| | 28 | BOH 28' | | | | | |
| | | CORED TO 28'<br>SET WELL AT 27'<br>SCREEN AT 17'-27' BGS<br>SAND TO 15'<br>SEAL TO 12' BGS | | | | | |

PROJECT: RVAAP-R14

HOLE NO.: LHMW-001

ENG FORM 5056A-R, AUG 94

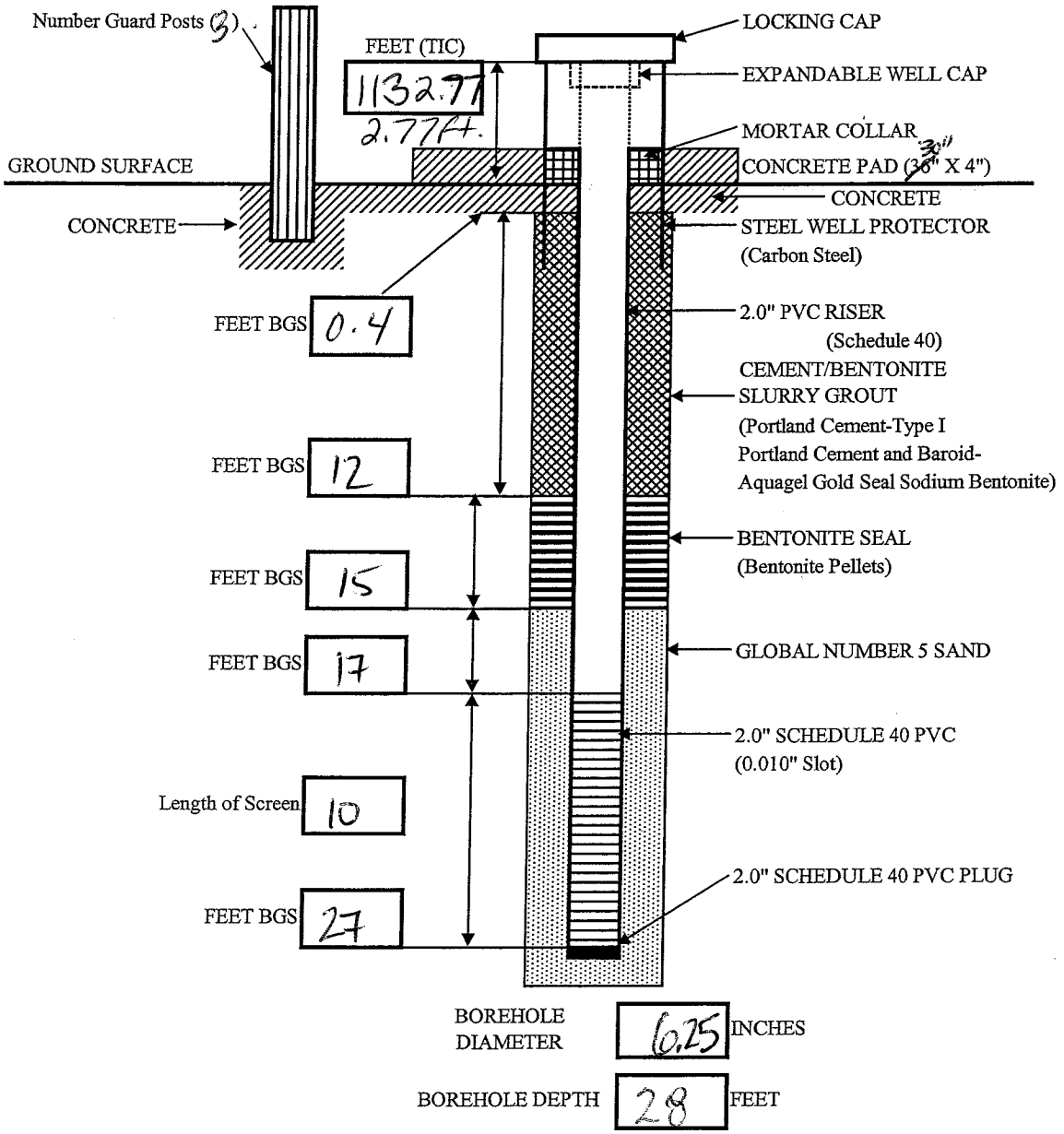
(Proponent: CECW-EG)

# MONITORING WELL CONSTRUCTION DIAGRAM

## RAVENNA ARMY AMMUNITION PLANT

**Project:** RVAAP RI14

| | | |
|---|---|---|
| Well Number: LIOMW-001 | Begin: 12/16/04 | End: 12/20/04 |
| Coordinates: N: 555816.25<br>E: 2355272.22 | Elevation: 1130.00 | Reference Point: |
| Logged By: DAVID K. EARNEST | | |




Notes:

1) Figure not drawn to scale.
2) BGS = Below Ground Surface.
3) Well head protected with three guard posts set in triangle configuration about the concrete pad.

# Well Development Record

Well ID: ~~LL10mw-001-mw~~ L10
Date: 1/3/25

Ravenna Army Ammunition Plant-
RVAAP 14 AOC Characterization

Project: RVAAP
Development Company: MKM
Development Method: WHALE PUMPING
Comments:

Well TD: 29.6 FT TIC  Depth to Water: 22.6 FT
Water Column Height: 7 FT  One Well Volume: 4 gal Gals

Well Volume (gallons/foot): 2-inch =0.16  4-inch =0.65  6-inch = 1.47  8-inch = 2.61

| Time | Well Dev. Code | Depth to Water (ft) | Purge Rate (gpm) | Purge Volume (gal) | Field Measurements | | | | Turbidity | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | CON | DO | TEMP | | |
| 1100 | DSB | 22.6 | | | | | | | | |
| 1105 | DSE | 22.75 | | | | | | | | |
| 1107 | DPB | 22.75 | | | | | | | | |
| 1109 | DFM | 25.28 | ~ | 4 | 7.21 | 0.449 | 8.1 | 11.6 | >1000 | 1st well vol (4 gal) |
| 1133 | DFM | 26.39 | ~ | 4 | 7.40 | 0.486 | 8.1 | 11.6 | >1000 | 2nd well vol (8 gal) |
| 1135 | DPE | DRY | ~ | ~ | ~ | ~ | ~ | ~ | ~ | 8 gal dry. |
| 1304 | DPB | 23.75 | ~ | ~ | ~ | ~ | ~ | ~ | ~ | ~ |
| 1309 | DFM | ~ | ~ | 4 | 7.54 | 0.486 | 8.12 | 12.2 | >1000 | 3rd well vol (12 gal) |
| 1342 | DFM | ~ | ~ | 4 | 7.6 | 0.480 | 8.1 | 12.0 | 339 | 4th well vol (16 gal |
| 1413 | DFM | ~ | ~ | 4 | 7.68 | 0.480 | 8.1 | 11.8 | >1000 | 5th well vol (20 gal) |
| 1447 | DFM | ~ | ~ | 4 | 7.60 | 0.480 | 8.1 | 12.2 | >1000 | 6th well vol (24 gal) |
| 1522 | DFM | ~ | ~ | 4 | 7.70 | 0.471 | 11.71 | 12.0 | 10.00 | 7th well vol (28 gal) |
| | | | | | | | | | | Development |
| | | | | | | | | | | complete |
| | | | | | | | | | | |
| | FINAL | | | | | | | | | |

**WELL DEVELOPMENT CODES**

DPB - Begin Pumping
DPE - End Pumping
DSB - Begin Surge Blocking
DSE - End Surge Blocking
DFM - Field Measurements
DBB - Begin Bailing
DBE - End Bailing
DXB - Begin Other
DXE - End Other
Other:

**FIELD MEASUREMENT CODES**

MTP - Temperature
MSC - Specific Conductance
MPD - Photoionizer (eg. HNu)
MFD - Flame Ionizer (eg. OVA)
MDO - Dissolved Oxygen
MPH - pH
MEH - eH
MOT - Other

**TURBIDITY**

Enter Turbidity Meter Reading
(Final should be < 5 NTU)
OR
Enter Qualattaive Observations

H - High: Muddy/Silty
M - Medium: Cloudy/Translucent
L - Low: Transparent
N - None: Clear/No Sediment

Logged By: NILESH SHRINGARPURE (Please Print)  Reviewed By: C. Esker
Signature: Nilesh Shringarpure  Date: 2/22/25

# Monitoring Well Purging Form

Well ID: ~~LLO~~ LIO mw-001 GW

Date: 9/10/05

Ravenna Army Ammunition Plant
Ravenna, Ohio

## WELL OBSERVATIONS

Protective Casing: Intact · Damaged  Locked: (Yes) No  Key No:
Concrete Base: Intact · Damaged  Inner Casing: (2") · 4" · 6" · 8"  Other:
Stickup Height: 2.8 (ft)  TIC · TOC Difference: 0.24 (ft)
Vapor Readings: HNu · OVA  Background: _____  Inside Well Casing:

| | Present | Depth | Sampled Sample ID |
|---|---|---|---|
| LNAPL | Yes · (No) | _____ Yes · No | LLIOMW-001GW |
| DNAPL | Yes · (No) | _____ Yes · No | |

## CALCULATIONS

(A) Depth to Well Bottom 29.4 (ft) (TOC) · TIC · BGS (Measured) · Previously Measured (circle one)
(B) Depth to Water 21.8 (ft) (TOC) · TIC · BGS Time Measured: 1036
(C) Water Column Height (A-B) 7.6 (ft)
(D) Well Diameter Factor 0.16 (gal/ft) (2" = 0.16, 4" = 0.65, 6" = 1.47, 8" = 2.61 GAL/FT)
(E) One Well Volume (C*D) 1.22 (gal)
(F) Volumes to be Evacuated 5
**(G) TOTAL VOLUME TO BE EVACUATED (E * F)** 6.1 (gal)

## EVACUATION METHOD

Well Evacuation Method: Bailer · Submersible Pump · (Other: micro purging) Device Number: _____

Purge Water Disposition: 1. Discharged Onsite 2. (Collected And: (Stored) · Disposed (Onsite) · Offsite

Collected In: Tanks · Drums No. of Containers: _____

Comments: _____

| TIME | DEPTH TO WATER (ft) | PURGE RATE (gpm) | Field Measurements | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | HNu | Spec Cond | Temp | pH | Turb | Do | |
| 1037 | 21.8 | — | | 0.466 | 10.07 | 7.01 | 0 | 8.85 | Initial reading |
| 1040 | 22.2 | | | 0.503 | 10.67 | 7.26 | 0 | 8.82 | |
| 1043 | 22.4 | | | 0.507 | 10.87 | 7.41 | 0 | 8.84 | |
| 1046 | 22.6 | | | 0.517 | 10.95 | 7.49 | 0 | 9.02 | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Logged By: Sudhees Gubba (Please Print)  Reviewed By: C. Esler
Signature: [signature]  Date: 2/22/05

# Field Sampling Report

Location ID: ~~LL0~~ GW LIO MW - 001 GW

Date: 01/10/05

Ravenna Army Ammunition Plant
Characterization of 14 RVAAP AOCs

## Sampling Information

| Source | Groundwater / Product | | Surface Water | | Soils / Sediments / Sludge | | | |
|---|---|---|---|---|---|---|---|---|
| Method | Bailer | | Sample Bottle | | Scoop | | Trowel | |
| | Pump | | Bacon Bomb | | Bowl | | Hand Auger | |
| | Micro purging X | | | | Push Probe | | Plastic Liner | |
| Type/Construction | | | | | Mattocks | | | |
| Miscellaneous | Well Purging Form (Yes) - No | | | | | | | |

**Sample Collection:** 1100 hrs

**Sample Type:** Composite - MI - (Grab)
If MI, # of increments taken: NA

**Location:** (Plotted on Map) (Staked in Field)
Estimated - Measured - (Surveyed)

**Sample Depth:** 25 FT (below surface)

**Decon:** Dedicated - Each Day - (Each Location)

| Field Parameters (at time of sample) | | Analytical Parameters | | | | Other Parameters | | | |
|---|---|---|---|---|---|---|---|---|---|
| PID / FID Readings: | | VOC | X | TPH GRO | X | Corrosivity | | | |
| Background: | 0.0 ppm | SVOC | X | TPH DRO | X | Reactivity Sulfide/Cyanide | | | |
| DO | 9.02 | Explosives | X | Chromium +6 | | Ignitability | | | |
| Sample: | 0.0 ppm | Propellants FALSE | X | Nitrate | | | | | |
| Water Level | 21.8 FT | TAL Metals | X | | | | | | |
| Temperature | 10.95 °C | Pesticides/PCBs | X | | | QA Samples | | | |
| Sp. Conductance: | 0.517 uMHOs | Cyanides | X | | | MS/MSD | Yes / No | | NA |
| pH | 7.49 units | TOC | | | | Duplicate ID | | | NA |
| Turbidity | 0 N.T.U. | Grain Size | | | | Equipment Rinse ID | | | NA |
| | | | | | | (Trip Blank ID) | Trip Blank | | NA |

**Sample Description**

No color, No odor, No sheen, No turbidity

*Soil sample description should include:*

*Munsell Color Odor Staining Texture Sorting Plasticity Moisture*

*Water sample description should include:*

*Color Odor Sheen Turbidity*

**Split Sample**

**Split Sample ID:**

**Name:**

**Agency/Company:**

**Address:**

**QA/QC Provided:** MS/MSD - Duplicate - Trip Blanks - Field Blanks

**Parameters:** Same as Above - As Listed

Logged By: Sudheer Gubba (Please Print)

Signature: S Gubba

Reviewed by: Eric Ellis (Please Print)

Signature: [signature] Date: 2/4/05

# HTRW DRILLING LOG

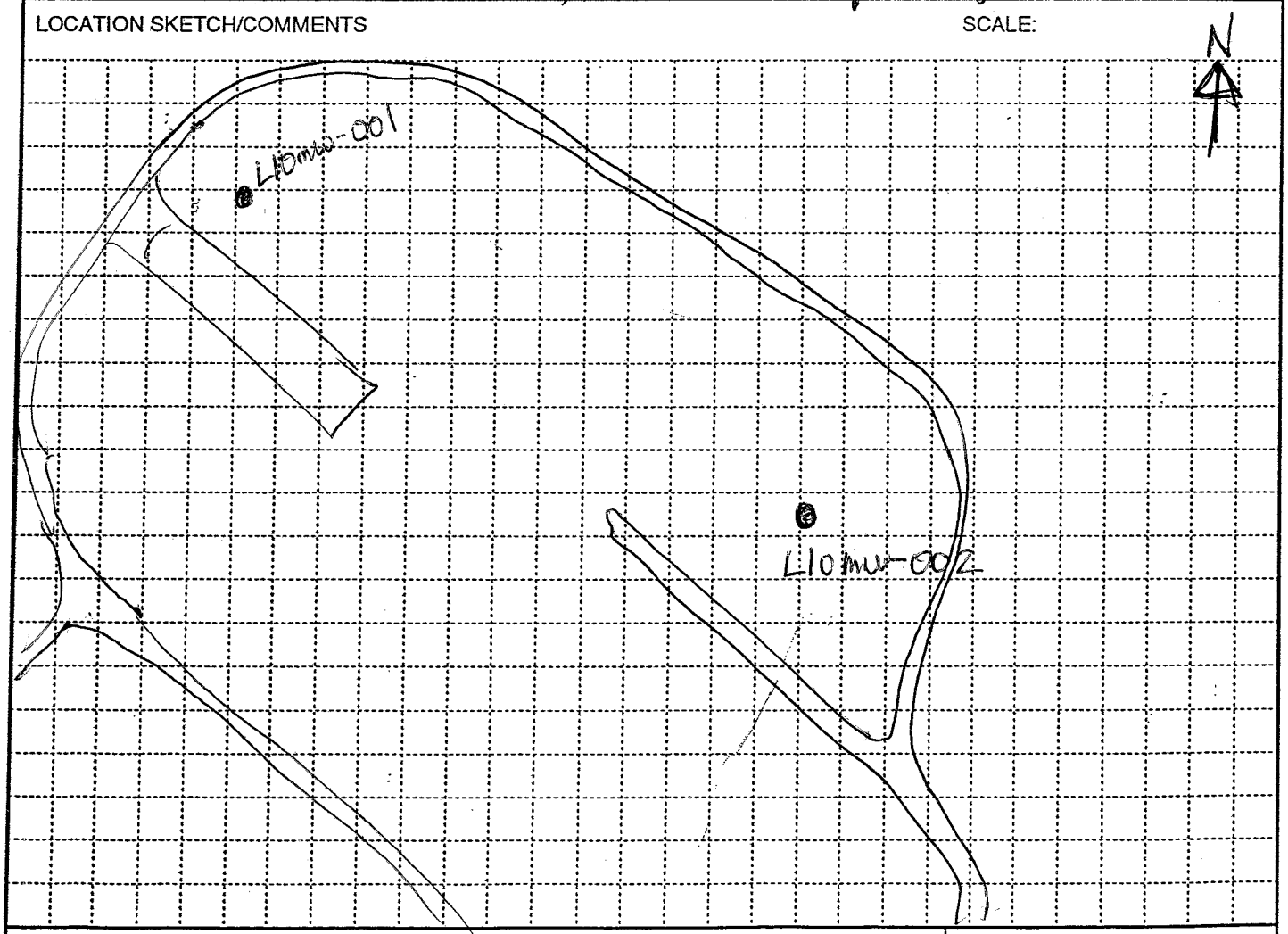
| | | |
|---|---|---|
| | DISTRICT: LOUISVILLE | HOLE NUMBER: L10MW-002 |
| 1. COMPANY NAME: MKM ENGINEERS | 2. DRILL SUBCONTRACTOR: HAD DRILLING | SHEET 1 OF 3 SHEETS |
| 3. PROJECT: RVAAP-R1 14 | 4. LOCATION: RAVENNA, OH LOADLINE 10 | |
| 5. NAME OF DRILLER: GREG | 6. MANUFACTURER'S DESIGNATION OF DRILL: CME-LC60 | |
| 7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID HSA; 1½" ID X 2' SPLIT SPOON; 6¼" ID HSA; 2" DIA CORE BARREL | 8. HOLE LOCATION: EAST OF BLDG DE-19 | |
| | 9. SURFACE ELEVATION: 1124.40 ASL | |
| | 10. DATE STARTED: 12/20/04 | 11. DATE COMPLETED: 12/21/04 |
| 12. OVERBURDEN THICKNESS: 15' | 15. DEPTH GROUNDWATER ENCOUNTERED: 14' BGS | |
| 13. DEPTH DRILLED INTO ROCK: 13' | 16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 14.55' @0915 01/03/05 | |
| 14. TOTAL DEPTH OF HOLE: 28' | 17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) | |

| 18. GEOTECHNICAL SAMPLES | DISTURBED | UNDISTURBED | 19. TOTAL NUMBER OF CORE BOXES |
|---|---|---|---|
| — | — | — | 2 |

| 20. SAMPLES FOR CHEMICAL ANALYSIS | VOC | METALS | OTHER (SPECIFY) | OTHER (SPECIFY) | OTHER (SPECIFY) | 21. TOTAL CORE RECOVERY % |
|---|---|---|---|---|---|---|
| — | — | — | — | — | — | |

| 22. DISPOSITION OF HOLE | BACKFILLED | MONITORING WELL | OTHER (SPECIFY) | 23. SIGNATURE OF INSPECTOR |
|---|---|---|---|---|
| | — | X | — | David Earnest |

LOCATION SKETCH/COMMENTS — SCALE:




| PROJECT | HOLE NO. |
|---|---|
| RVAAP-R1 14 | L10mw-002 |

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: L10MW-002

PROJECT: RVAAP-R114

INSPECTOR: DK GARNEST

SHEET 2 OF 3 SHEETS

1245

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. RECOVERY | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | 0 | 2" topsoil | | | | | |
| | | DK BROWN CL SILT (40%) TRACE SAND (20%) & FINE GRAVEL (5%) LOW PLASTIC (5%) LOOSE | 0.0 | 1.4 | ML | PUSH | MOIST 7.5YR 3/1 |
| | 2 | BROWN SILTY CLAY (60%) MOTTLED W/ RED & GREY (30%) | 0.0 | 2.0 | ML | 2/3 | MOIST |
| | | | | | CL | 4/5 | 7.5YR 5/3 |
| | 4 | SAA MED PLASTIC TRACE SAND & FINE GRAVEL (5%) (5%) STIFF | 0.0 | 0.5 | CL | 3/7 9/8 | |
| | 6 | SAA | 0.0 | 2.0 | CL | 8/8 7/8 | |
| | 8 | SAA | 0.0 | 1.8 | CL | 5/4 4/6 | |
| | 10 | DENSE FINE (40%) BROWN SANDY SILT (60%) LITTLE CLAY (10%) LOW PLASTIC | 0.0 | 1.8 | ML | 9/8 20/24 | 7.5YR 5/4 |
| | 12 | BROWN SILTY (20%) SAND (70%) W/ ROCK FRAG (10%) NON PLASTIC MED DENSE | 0.0 | 1.8 | SM | 14/11 10/12 | 7.5YR 6/4 |
| | 14 | | 0.0 | 0.5 | SM | 6/50+ | |
| | 16 | TAN/LT BRN SANDSTONE FINE GRAINED WELL SORTED HARD WELL CEMENTED VISIBLE BEDDING PLANES | | | SS | | 1ST CORE 16-26 10YR 6/4 |
| | 18 | STAINING (OXIDE) ALONG FRACTURES, CLOSE TO INCL LAMINATED PLANES FRACTURES | GREY SANDSTONE | | | | 2.5Y 6/1 @ 19-20' BGS * SOME HEAVY PETROLEUM |
| | 20 | | | | | | |

PROJECT: RVAAP-R114

HOLE NO.: HOMW-002

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

* RESIDUE IN FRACTURES, ODOR SIMILAR TO USED/BURNT OIL, SLIGHT ODOR, NO PID RESULTS
OILY RESIDUE ON FINGERS

# HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: LIOMW-002

PROJECT: RVAAP-RI 14

INSPECTOR: DK EARNEST

SHEET 3 OF 3 SHEETS

| ELEV. (a) | DEPTH (b) | DESCRIPTION OF MATERIALS (c) | FIELD SCREENING RESULTS (d) | GEOTECH SAMPLE OR CORE BOX NO. (e) | ANALYTICAL SAMPLE NO. (f) | BLOW COUNT (g) | REMARKS (h) |
|---|---|---|---|---|---|---|---|
| | 22 | NEARLY HORIZONTAL BEDDING; SANDSTONE<br>MICACAEOUS FLAKES IN FRACTURE PLANES | | | | | |
| | | LITTLE OXIDE STAINING BELOW ~22.5 | | | | | 12"/120 = 135 |
| | 24 | LAMINATED BEDDING PLANES AFTER ~24'<br>DIP OF BEDDING INCREASE TO ~30° AFTER ~24.5 | | | | | |
| | 26 | VERY THIN CARBONIFEROUS SEAM AT 25.9'<br>SAA | | | | | 2ND CORE<br>26'-28'<br>13.5/24 = 56.3 |
| | | THIN COAL SEAM | | | | | |
| | 28 | BOH 28' | | | | | |
| | | CORED TO 28'<br>SET WELL AT 27'<br>SCREEN AT 17'-27'<br>SAND TO 15'<br>SEAL TO 12' BGS<br>5 BAGS SAND — NO WATER ADDED | | | | | |

PROJECT: RVAAP-RI 14

HOLE NO.: LIOMW-002

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)