

# **United States Army Fort Monmouth, New Jersey**



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## **Landfill M-4 (FTMM-04)**

### **Classification Exception Area**

**U.S. Army Garrison Fort Monmouth, Main Post  
Fort Monmouth, New Jersey**

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Prepared by

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**Brinkerhoff Project No. 09BR116**

**June 2011**



New Jersey Department of Environmental Protection  
Site Remediation Program

**CLASSIFICATION EXCEPTION AREA / WELL RESTRICTION AREA  
(CEA/WRA) PERMIT FACT SHEET**

☒ Non-LSRP (Existing Cases) ☐ LSRP ☐ Subsurface Evaluator

Date Stamp  
(For Department use only)

**SECTION A. CASE INFORMATION**

Case Name: M-4 Landfill (FTMM-04) Fort Monmouth, New Jersey

Case ID/Case Number: \_\_\_\_\_ Preferred ID (PI Number): \_\_\_\_\_

**CEA Component Information**

1. **Contaminant(s):** This CEA/WRA applies only to the contaminants above the applicable numeric values established by Ground Water Quality Standards (GWQS), N.J.A.C. 7:9C, listed in the table below. List below the maximum value for all contaminants included in Exhibit A using any well or sampling point used to establish the CEA.

| Contaminant | Concentration <sup>(1)</sup> | GWQS <sup>(2)</sup> | SWQS <sup>(3)</sup> | GWSL <sup>(4)</sup> |
|-------------|------------------------------|---------------------|---------------------|---------------------|
| Lead        | 31.1 (11/2009)               | 5                   | N/A                 | N/A                 |
|             |                              |                     |                     |                     |
|             |                              |                     |                     |                     |
|             |                              |                     |                     |                     |
|             |                              |                     |                     |                     |

Notes: <sup>(1)</sup> Maximum concentration in Micrograms Per Liter

<sup>(2)</sup> New Jersey Ground Water Quality Standards, N.J.A.C. 7:9C

<sup>(3)</sup> Surface Water Quality Standards, N.J.A.C. 7:9B - Applicable only where contaminants in the CEA may discharge to a surface water body.

<sup>(4)</sup> Ground Water Screening Levels from most current NJDEP Vapor Intrusion Guidance

☐ If attaching an Addendum to list additional contaminants and associated information.

☒ **Exhibit A: Monitor Well/Sampling Point Data** – Per N.J.A.C 7:26E-8.3(b) submit a copy of a table that includes the most recent 24 months of ground water sampling.

2. **CEA Boundaries:**

**Lot(s) and Block(s) included in the areal extent of the Classification Exception Area:**

Year of tax map used: 2005

| Block(s)      | Lot(s) | Check if off-site        |
|---------------|--------|--------------------------|
| Eatontown 301 | 1      | <input type="checkbox"/> |
|               |        | <input type="checkbox"/> |
|               |        | <input type="checkbox"/> |
|               |        | <input type="checkbox"/> |
|               |        | <input type="checkbox"/> |

| Block(s) | Lot(s) | Check if off-site        |
|----------|--------|--------------------------|
|          |        | <input type="checkbox"/> |
|          |        | <input type="checkbox"/> |
|          |        | <input type="checkbox"/> |
|          |        | <input type="checkbox"/> |
|          |        | <input type="checkbox"/> |

☐ If attaching an Addendum to list additional Blocks/Lots and associated information.

☒ **Exhibit B: Site Location Maps** – USGS Quadrangle Map and Tax Lot and Block Map (N.J.A.C. 7:26E-8.3(b)3i and ii)

☒ **Exhibit C: Site Map(s) and Cross Section** – Including actual/predicted contaminant isopleths, ground water flow direction, CEA boundary, monitor well/sampling point/boring locations/IDs, area(s) of concern. N.J.A.C 7:26E-8.3(b)3iii through v.

Insert NAICS responsible for area(s) of concern, if known: \_\_\_\_\_

**Narrative description of proposed CEA:**

Due to lead exceedances, the horizontal extent of the CEA is defined by the Site monitoring well network. The vertical extent of the CEA includes the shallow part of the aquifer beneath the Site and it extends from the water table to approximately 22 feet bgs, which represents the total depth of the contaminated wells at the Site.

Name of the affected Geologic Formation/Unit: Navesink-Hornerstown

Direction of ground water flow: West

Ground Water Classification: II-A

| Vertical Depth of CEA (ft bgs and msl) | Horizontal Extent of CEA (acres or square ft) |
|----------------------------------------|-----------------------------------------------|
| 22 ft bgs ~(-10 ft msl)                | 29,314 square feet (0.67 acres)               |

☒ **Exhibit D: Vertical Contaminant Data** – A table, for the most recent 24 months of data, for each sampling point used to establish the CEA, or the subset of wells indicated in N.J.A.C. 7:26E-8.3(b)3iii, iv and v, that includes the following:

**Depth (in feet bgs and msl elevation) to:**

| Water Table                                                                                                                                                                                                                                                            | Approximate Bottom of Plume <sup>(5)</sup> | Top of Plume <sup>(6)</sup> | Thickness of Clean Water Lens <sup>(6)</sup> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------------------|----------------------------------------------|
| Notes: <sup>(5)</sup> Approximate maximum depth of contamination based on data included in Remedial Investigation Report (RIR);<br><sup>(6)</sup> Required only if plume is known to be below the water table based on vertical profiling or monitor well data in RIR. |                                            |                             |                                              |

**Exhibit E: Fate and Transport Description and Model Documentation**

- ☒ Historic Fill exemption
- ☒ All information required pursuant to N.J.A.C. 7:26E-8.3(b)2 and applicable guidance is included.

**3. Projected Term of CEA:** Based on modeling/calculations in Exhibit E

Proposed Duration in Years: Indeterminate

**SECTION B. CURRENT AND PROJECTED GROUND WATER USE DOCUMENTATION**

☒ **Exhibit F: Well Search Results** – Include most recent well search per N.J.A.C. 7:26E-1.17.

Check each item where, pursuant to N.J.A.C. 7:26E-8.3(b)4, written documentation was obtained regarding future ground water use for a 25-year planning horizon based on:

- ☒ Municipal master plans
- ☒ Zoning plans
- ☒ Local water purveyor plans and planning data pertaining to the existence of water lines and proposed future installation of water lines
- ☒ Local planning officials
- ☒ County and local boards of health
- ☒ Local and/or county ordinances restricting installation of potable wells

**SECTION C. WELL RESTRICTION INFORMATION**

For Class II-A ground water and pursuant to the GWQS at N.J.A.C. 7:9C-1.6(d), where ground water quality data indicate contaminants exceed the values listed in the Primary Drinking Water Regulations, the Department shall restrict, or require the restriction of, potable ground water uses within any CEA. Therefore, the CEA established for this site is also a Well Restriction Area, the extent of which coincides with the boundaries of the CEA.

Well Restrictions set within the boundaries of the CEA:

- ☒ Double Case Wells
- ☒ Sample Potable Wells
- ☒ Evaluate Production Wells
- ☐ Other

Notify Department that letters were sent per N.J.A.C. 7:26E-8.3(b)5 (check all applicable categories):

- ☒ Municipal and county clerk(s)
- ☒ Local, county or regional health department(s)
- ☒ Designated County Environmental Health Act agency (if applicable)
- ☒ County Planning Board
- ☐ Pinelands Commission (if applicable)
- ☐ Owners of real property overlying CEA foot print

☐ **Exhibit G: List of Names and Addresses** – Include all persons notified pursuant to N.J.A.C. 7:26E-8.3(b) based on the proposed CEA extent.

[illegible]

**SECTION E. NON-LSRP SITE REMEDIATION PROFESSIONAL STATEMENT**

First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_

Phone Number: \_\_\_\_\_ Ext: \_\_\_\_\_ Fax: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

City/Town: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Email Address: \_\_\_\_\_

*I believe that the information contained herein, and including all attached documents, is true, accurate and complete.*

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name/Title: \_\_\_\_\_ **No Changes Since Last Submittal** ☐

Company Name: \_\_\_\_\_

Completed forms should be sent to:

Bureau of Case Assignment & Initial Notice  
New Jersey Department of Environmental Protection  
Site Remediation Program  
401 East State Street  
PO Box 420  
Mail Code 401-05  
Trenton, NJ 08625

## **Exhibit A**

### **Monitoring Well/Sampling Point Data**

## EXHIBIT A

### 1.0 INTRODUCTION

This report discusses current ground water conditions and presents a ground water Classification Exception Area (CEA) for the Fort Monmouth M-4 Landfill, known as the FTMM-04 area (hereinafter referred to as the Site).

The work recently completed consisted of reviewing the most recent ground water sample collection (4<sup>th</sup> Quarter 2009 through 3<sup>rd</sup> Quarter 2010) to select the constituents of potential concern (COPCs) at the Site [the constituents with concentrations greater than the New Jersey Department of Environmental Protection (NJDEP) Ground Water Quality Standards (GWQS)].

Brinkerhoff Environmental Services, Inc. (Brinkerhoff) completed this work in accordance with current NJDEP guidelines, specifically the procedures described in the *Final Guidance on Designation of CEAs* and the *Technical Requirements for Site Remediation (Technical Requirements)*, New Jersey Administrative Code. (N.J.A.C) 7:26E-8.4, last amended on November 4, 2009.

The following sections of this report provide the information required to define the CEA for the Site. Included are the following:

- A description of subsurface stratigraphic and hydrogeologic conditions on-site;
- A description of the ground water quality at the Site;
- A list of COPCs at the Site known to be present at concentrations greater than the NJDEP GWQS;
- A determination of the horizontal and vertical extent of the CEA;
- A determination of the duration of the CEA;
- A written and mapped description of the CEA, including electronic and paper copies of the map of the CEA compatible with the NJDEP Geographic Information Systems (GIS North American Datum [NAD] 83);
- An evaluation of the area encompassed by the CEA to determine if the area is a ground water use area as defined by NJDEP; and
- Notification to the appropriate agencies of the intent to establish the CEA.

## **2.0 BACKGROUND**

### **2.1 Site Setting and History**

The M-4 Landfill is one of the Main Post areas of concern (AOCs) at the Fort Monmouth United States (U.S.) Army installation located in the Borough of Eatontown, Monmouth County, New Jersey. Landfill operations at the site began circa 1960. The types of materials reportedly disposed at the landfill have been reported to include construction debris, scrap metal, asbestos-containing materials, vegetative waste, unwashed containers which previously held hazardous materials/wastes, outdated photographic chemicals, small quantities of outdated drugs, sludge from the sewage treatment plant, soot and boiler scale, incinerator ash, oil spill debris, oil filters, batteries, fluorescent tubes, and electronic components.

### **2.2 Monitoring Well/Sampling Point Data**

The Fort Monmouth DPW sampled ground water monitoring wells at the M-4 Landfill from the 4th Quarter of 2008 through the 3rd Quarter of 2010. All ground water samples were analyzed for TAL Metals.

Six metals (antimony, arsenic, beryllium, cadmium, lead, and thallium) were detected in ground water at the Site during the last eight sampling events at concentrations exceeding NJDEP GWQS. These metals and their concentrations are presented on Table A-1 located within this exhibit.

Metals are known to migrate slowly and not degrade. Metals in ground water throughout Fort Monmouth were evaluated using statistical analyses and published literature information (Brinkerhoff, 2011 *Background Metals Evaluation*). It was concluded that the metals in ground water are likely a combination of a natural dissolved component along with input from sample turbidity. Due to the interference from sample turbidity, exceedances of the GWQS by actual dissolved-phase metals are not certain.

The presence of arsenic, antimony, beryllium, cadmium and thallium at the Site is attributed to naturally occurring background conditions. Therefore, they are not considered COPCs, and are not included in the CEA application.

Due to its common industrial use, the source of lead is less certain, and therefore it remains a COPCs and is included in this CEA. Based on the findings of Brinkerhoff's *Background Metals Evaluation*, modeling of the metals is not practical, and the CEA time-frame is therefore indeterminate. (Refer to the Background Metals Evaluation prepared by Brinkerhoff in 2011 for more information.)

### **2.3 Regional Geology and Hydrogeology**

Fort Monmouth is located in the central-eastern portion of New Jersey in Monmouth County, approximately 45 miles south of New York City, 70 miles northeast of Philadelphia, and 40 miles north of Trenton. The Atlantic Ocean is approximately 3 miles to the east. Fort Monmouth falls within the boroughs of Eatontown, Oceanport, and Tinton Falls. The areas surrounding Fort Monmouth are characterized by a mixture of residential, commercial, and light industrial uses. Fort Monmouth occupies approximately 1,126 acres and is currently comprised of two operational areas: the Main Post and the Charles Wood Area. The two areas are located about 2 miles from one another.

Previous geologic investigations prepared for the Site have described the underlying shallow unconsolidated deposits below ground surface (bgs) as "predominantly derived from deltaic, shallow marine, and continental shelf environments", consisting of "clay, silt, sand, and gravel" (DPW Environmental Office 1997). The Soil Survey of Monmouth County classified most of the soil on the Main Post as urban land (developed land with disturbed soils) and labeled the soil as Udorthent soils, which are soils altered by excavating or filling. The small portion of the Main Post, which is otherwise classified, includes a mixture of soil types (loam, clay, sandy loam, etc.) and has low to moderate permeability and is poorly-to-well-drained. The Site is underlain by the Navesink formation and the Hornerstown sand, a class II-A aquifer.

**Table A - 1**  
**Contaminant Isoconcentration Summary Table**  
**M-4 Landfill, Fort Monmouth, NJ**  
**4th Quarter 2008**

| Notes | Well ID | Date Collected | Antimony          | Arsenic           | Beryllium         | Cadmium           | Lead              | Thallium          |
|-------|---------|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|       |         |                | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> |
|       |         |                | 6                 | 3                 | 1                 | 4                 | 5                 | 2                 |
|       | M4MW07  | 10/10/2008     | ND                | ND                | 0.597             | 0.278 ER          | ND                | ND                |
|       | M4MW08  | 10/11/2008     | 4.10 ER           | ND                | 0.272 ER          | ND                | ND                | ND                |
| D     | M4MW08  | 10/12/2008     | 10.2              | ND                | 0.591             | 0.204 ER          | ND                | ND                |
|       | M4MW09  | 10/13/2008     | ND                | ND                | 0.188 ER          | ND                | ND                | ND                |
|       | M4MW10  | 10/14/2008     | 2.52 ER           | ND                | 0.342 ER          | ND                | ND                | ND                |

Notes:

Concentrations reported in µg/L

ND - Non-Detect

NA - Not Analyzed for parameter

D - Duplicate Sample

ER - Estimated Result between Reporting Limit and Method Detection Limit for metals

**Table A - 1**  
**Contaminant Isoconcentration Summary Table**  
**M-4 Landfill, Fort Monmouth, NJ**  
**1st Quarter 2009**

| Notes | Well ID | Date Collected | Antimony          | Arsenic           | Beryllium         | Cadmium           | Lead              | Thallium          |
|-------|---------|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|       |         |                | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> |
|       |         |                | 6                 | 3                 | 1                 | 4                 | 5                 | 2                 |
|       | M4MW07  | 3/12/2009      | 5.24 ER           | 9.05              | ND                | ND                | 4.46 ER           | ND                |
|       | M4MW08  | 3/12/2009      | 18.7              | 109               | ND                | ND                | 3.62 ER           | ND                |
|       | M4MW09  | 3/12/2009      | 15                | 96                | ND                | ND                | 5.0 ER            | ND                |
| D     | M4MW09  | 3/12/2009      | 12                | 92                | ND                | ND                | 6.81              | ND                |
|       | M4MW10  | 3/12/2009      | 15.4              | 61.5              | 0.433 ER          | ND                | 11.6              | ND                |

Notes:

Concentrations reported in µg/L

ND - Non-Detect

NA - Not Analyzed for parameter

D - Duplicate Sample

ER - Estimated Result between Reporting Limit and Method Detection Limit for metals

**Table A - 1**  
**Contaminant Isoconcentration Summary Table**  
**M-4 Landfill, Fort Monmouth, NJ**  
**2nd Quarter 2009**

| Notes | Well ID | Date Collected | Antimony          | Arsenic           | Beryllium         | Cadmium           | Lead              | Thallium          |
|-------|---------|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|       |         |                | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> |
|       |         |                | 6                 | 3                 | 1                 | 4                 | 5                 | 2                 |
| D     | M4MW07  | 5/20/2009      | 1.30 ER           | 5.37              | 0.154 ER          | ND                | 2.39 ER           | ND                |
|       | M4MW07  | 5/20/2009      | 2.88 ER           | 7.36              | 0.150 ER          | ND                | 2.50 ER           | ND                |
|       | M4MW08  | 5/20/2009      | 2.28 ER           | 20.2              | ND                | ND                | 2.58 ER           | ND                |
|       | M4MW09  | 5/20/2009      | 3.71 ER           | 18.9              | ND                | ND                | 2.02 ER           | 2.02 ER           |
|       | M4MW10  | 5/20/2009      | 2.00 ER           | 17.6              | 0.320 ER          | ND                | 1.78 ER           | ND                |

Notes:

Concentrations reported in µg/L

ND - Non-Detect

NA - Not Analyzed for parameter

D - Duplicate Sample

ER - Estimated Result between Reporting Limit and Method Detection Limit for metals

**Table A - 1**  
**Contaminant Isoconcentration Summary Table**  
**M-4 Landfill, Fort Monmouth, NJ**  
**3rd Quarter 2009**

| Notes | Well ID | Date Collected | Antimony          | Arsenic           | Beryllium         | Cadmium           | Lead              | Thallium          |
|-------|---------|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|       |         |                | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> |
|       |         |                | 6                 | 3                 | 1                 | 4                 | 5                 | 2                 |
| D     | M4MW07  | 7/20/2009      | ND                | 14.8              | 0.350 ER          | 0.519 ER          | ND                | ND                |
|       | M4MW07  | 7/20/2009      | 5.21 ER           | 5.28              | 0.377 ER          | 0.906 ER          | ND                | ND                |
|       | M4MW08  | 7/20/2009      | ND                | 24.8              | ND                | 0.914 ER          | ND                | ND                |
|       | M4MW09  | 7/20/2009      | ND                | 20.8              | ND                | ND                | ND                | ND                |
|       | M4MW10  | 7/21/2009      | ND                | 17.7              | 0.096 ER          | 1.22 ER           | ND                | ND                |

Notes:

Concentrations reported in µg/L

ND - Non-Detect

NA - Not Analyzed for parameter

D - Duplicate Sample

ER - Estimated Result between Reporting Limit and Method Detection Limit for metals

**Table A - 1**  
**Contaminant Isoconcentration Summary Table**  
**M-4 Landfill, Fort Monmouth, NJ**  
**4th Quarter 2009**

| Notes | Well ID | Date Collected | Antimony          | Arsenic           | Beryllium         | Cadmium           | Lead              | Thallium          |
|-------|---------|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|       |         |                | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> |
|       |         |                | <i>6</i>          | <i>3</i>          | <i>1</i>          | <i>4</i>          | <i>5</i>          | <i>2</i>          |
|       | M4MW07  | 11/4/2009      | ND                | 0.68 ER           | 0.290 ER          | ND                | ND                | ND                |
| D     | M4MW07  | 11/4/2009      | ND                | ND                | 0.285 ER          | ND                | ND                | ND                |
|       | M4MW08  | 11/4/2009      | ND                | 4.36 ER           | 0.151 ER          | 9.23              | 31.1              | ND                |
|       | M4MW09  | 11/4/2009      | ND                | ND                | ND                | ND                | ND                | ND                |
|       | M4MW10  | 11/4/2009      | ND                | ND                | ND                | ND                | ND                | ND                |

Notes:

Concentrations reported in µg/L

ND - Non-Detect

NA - Not Analyzed for parameter

D - Duplicate Sample

ER - Estimated Result between Reporting Limit and Method Detection Limit for metals

**Table A - 1**  
**Contaminant Isoconcentration Summary Table**  
**M-4 Landfill, Fort Monmouth, NJ**  
**1st Quarter 2010**

| Notes | Well ID | Date Collected | Antimony          | Arsenic           | Beryllium         | Cadmium           | Lead              | Thallium          |
|-------|---------|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|       |         |                | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> |
|       |         |                | <i>6</i>          | <i>3</i>          | <i>1</i>          | <i>4</i>          | <i>5</i>          | <i>2</i>          |
| LF    | M4MW07  | 1/6/2010       | ND                | ND                | 0.117 ER          | ND                | ND                | ND                |
| LF, D | M4MW07  | 1/6/2010       | 7.58 ER           | ND                | 0.108 ER          | ND                | ND                | ND                |
| LF    | M4MW08  | 1/6/2010       | 4.94 ER           | 1.09 ER           | ND                | ND                | ND                | ND                |
| LF    | M4MW09  | 1/6/2010       | ND                | ND                | ND                | ND                | ND                | ND                |
| LF    | M4MW10  | 1/6/2010       | ND                | 1.40 ER           | ND                | ND                | ND                | ND                |

Notes:

Concentrations reported in µg/L

LF - Monitor Wells Sampled via Low-Flow Method

ND - Non-Detect

NA - Not Analyzed for parameter

D - Duplicate Sample

ER - Estimated Result between Reporting Limit and Method Detection Limit for metals

**Table A - 1**  
**Contaminant Isoconcentration Summary Table**  
**M-4 Landfill, Fort Monmouth, NJ**  
**2nd Quarter 2010**

| Notes | Well ID | Date Collected | Antimony          | Arsenic           | Beryllium         | Cadmium           | Lead              | Thallium          |
|-------|---------|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|       |         |                | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> |
|       |         |                | 6                 | 3                 | 1                 | 4                 | 5                 | 2                 |
| LF    | M4MW07  | 4/6/2010       | 11.6              | ND                | ND                | ND                | ND                | ND                |
| LF    | M4MW08  | 4/6/2010       | ND                | 1.11 ER           | ND                | ND                | ND                | ND                |
| LF    | M4MW09  | 4/6/2010       | 11.6              | 3.61 ER           | ND                | ND                | ND                | ND                |
| LF, D | M4MW09  | 4/6/2010       | 8.16 ER           | ND                | ND                | ND                | ND                | ND                |
| LF    | M4MW10  | 4/6/2010       | 7.30 ER           | 0.83 ER           | ND                | ND                | ND                | ND                |

Notes:

Concentrations reported in µg/L

LF - Monitor Wells Sampled via Low-Flow Method

ND - Non-Detect

NA - Not Analyzed for parameter

D - Duplicate Sample

ER - Estimated Result between Reporting Limit and Method Detection Limit for metals

**Table A - 1**  
**Contaminant Isoconcentration Summary Table**  
**M-4 Landfill, Fort Monmouth, NJ**  
**3rd Quarter 2010**

| Notes | Well ID | Date Collected | Antimony          | Arsenic           | Beryllium         | Cadmium           | Lead              | Thallium          |
|-------|---------|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|       |         |                | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> | <i>NJDEP GWQS</i> |
|       |         |                | 6                 | 3                 | 1                 | 4                 | 5                 | 2                 |
| LF    | M4MW06  | 7/21/2010      | ND                | 0.830 ER          | 0.198 ER          | ND                | ND                | ND                |
| LF    | M4MW07  | 7/21/2010      | 10.3 ER           | ND                | 1.28              | 1.51 ER           | ND                | ND                |
| LF    | M4MW08  | 7/21/2010      | 6.51 ER           | 1.23 ER           | ND                | 1.56 ER           | ND                | ND                |
| LF    | M4MW09  | 7/21/2010      | 7.78 ER           | ND                | ND                | ND                | ND                | ND                |
| LF, D | M4MW09  | 7/21/2010      | 9.64 ER           | 0.980 ER          | ND                | ND                | ND                | ND                |
| LF    | M4MW10  | 8/20/2010      | 9.23 ER           | 1.12 ER           | ND                | 1.26 ER           | ND                | ND                |

Notes:

Concentrations reported in µg/L

LF - Monitor Wells Sampled via Low-Flow Method

ND - Non-Detect

NA - Not Analyzed for parameter

D - Duplicate Sample

ER - Estimated Result between Reporting Limit and Method Detection Limit for metals

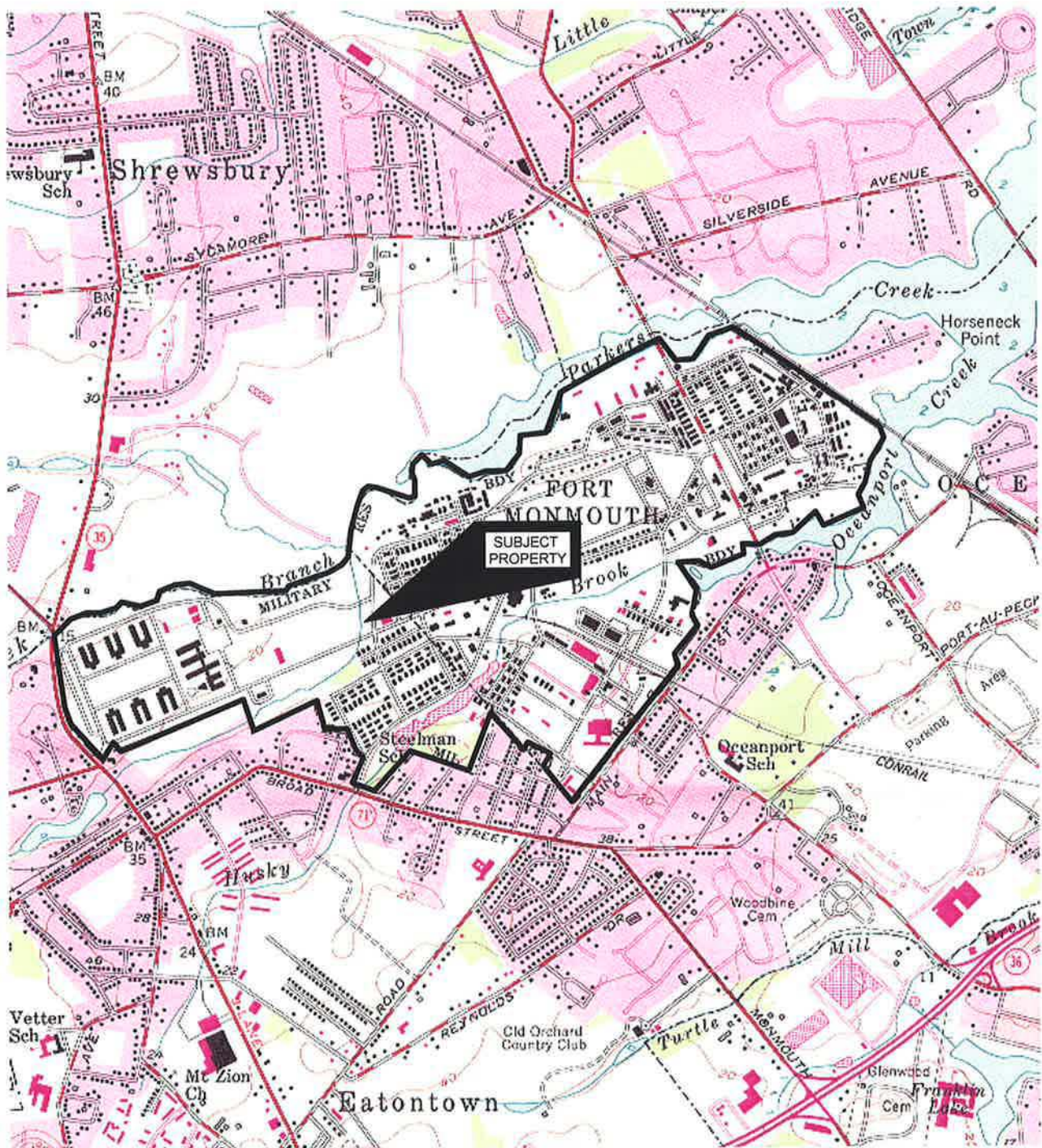
## **Exhibit B**

### **Site Location Maps**

## **EXHIBIT B**

### **1.0 SITE LOCATION MAPS**

The M-4 Landfill is located in the Borough of Eatontown (Block 301, Lot 1), Monmouth County, New Jersey. Pursuant to N.J.A.C. 7:26E-8.3(b)3i and ii, Brinkerhoff provided a United States Geological Survey (USGS) Quadrangle Map (Figure B-1) and a Tax Map with Block and Lot (Figure B-2).



0' 1000' 2000'

SCALE: 1"=2000'

LONG BRANCH, N. J.  
40073-C8-TF-024

1954  
PHOTOREVISED 1981  
DMA 6164 I SE-SERIES V822



QUADRANGLE LOCATION

**BRINKERHOFF**  
ENVIRONMENTAL SERVICES, INC.

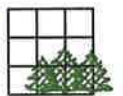
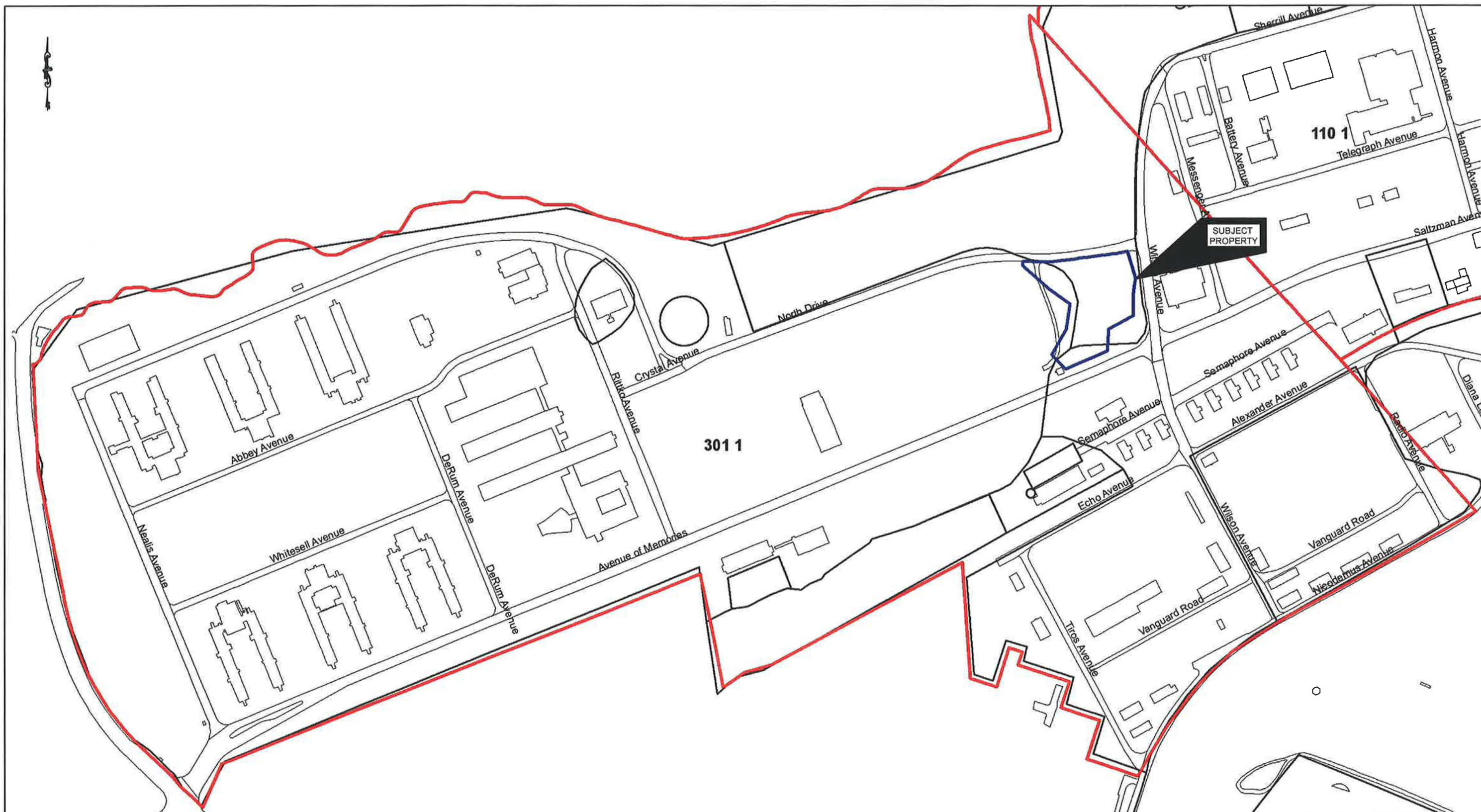


FIGURE B-1  
U.S.G.S. TOPOGRAPHIC LONG BRANCH, NJ QUAD  
US ARMY FORT MONMOUTH  
MAIN POST - M-4 AREA  
FORT MONMOUTH, NEW JERSEY

DATE: 6/2/11

JOB NO.: 09BR116

SCALE: 1" = 2000'



0' 175' 350'  
SCALE: 1"=350'

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FIGURE B-2 - TAX MAP  
US ARMY FORT MONMOUTH  
MAIN POST - M-4 AREA  
BLOCK 301, LOT 1  
FORT MONMOUTH, NEW JERSEY

DATE: 6/2/11 JOB NO.: 09BR116 SCALE: 1" = 350'

## **Exhibit C**

### **Site Map and Cross Section**

## **EXHIBIT C**

### **1.0 CLASSIFICATION EXCEPTION AREA (CEA) BASIS**

The NJDEP requires that the CEA application specify the constituents that will require an exception to the NJDEP's GWQS. These are constituents necessitating the institution of a CEA because they are either currently detected or are anticipated to be detected in the future at concentrations exceeding applicable NJDEP GWQS.

As indicated in Exhibit A, the presence of arsenic, antimony, beryllium, cadmium and thallium at the Site is attributed to naturally occurring background conditions. They are therefore not considered COPCs, and are not included in the CEA application.

Due to its common industrial use, the source of lead is less certain, and therefore it remains a COPC and is included in this CEA.

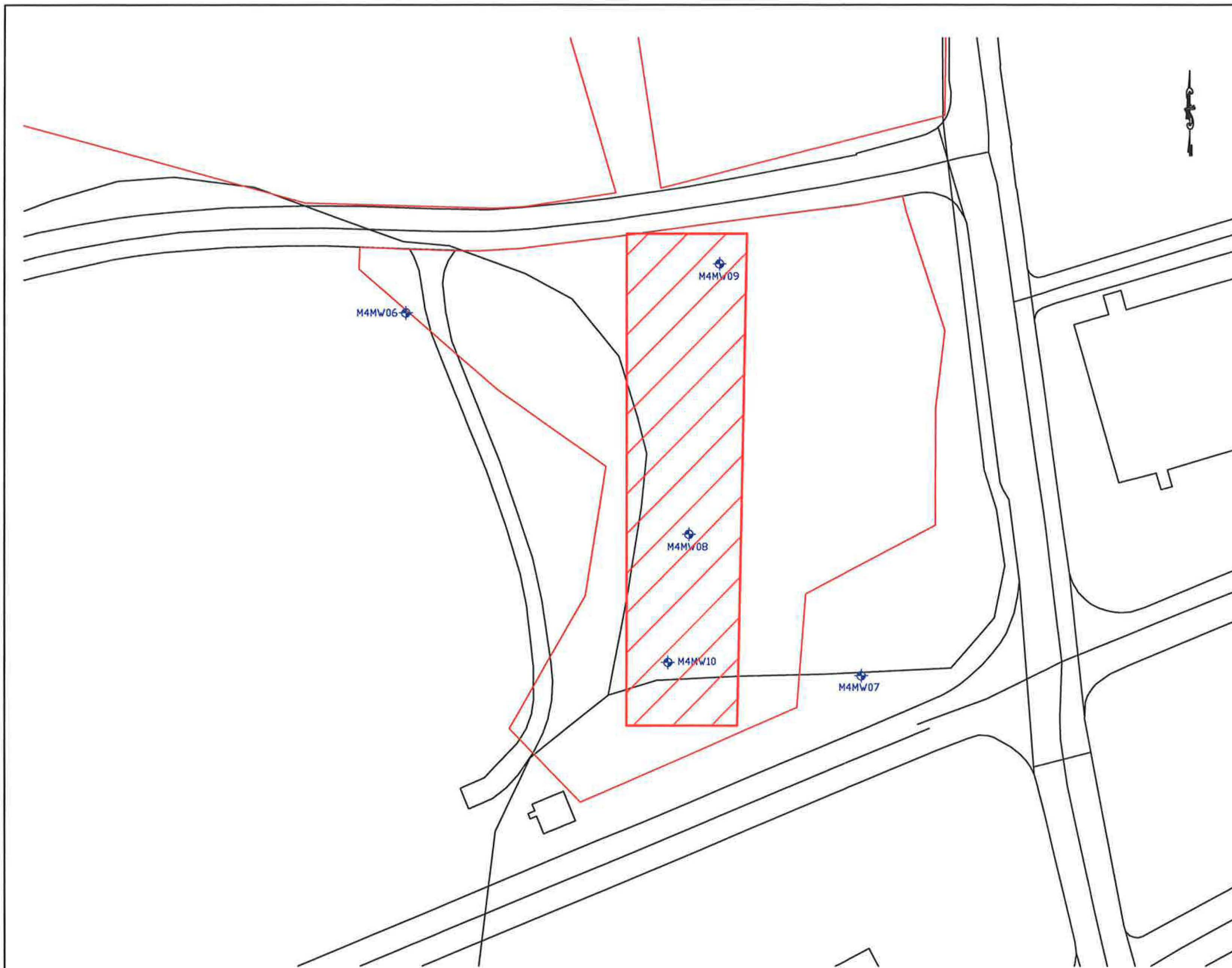
### **2.0 EXTENT OF THE CLASSIFICATION EXCEPTION AREA (CEA)**

The horizontal extent of the CEA encompasses the area illustrated on Figure C – 1.

The horizontal extent of the CEA is defined by the Site monitoring well network, as exceedances of the GWQS for lead was identified for multiple wells during recent sampling events.

The CEA at the M-4 Landfill is based on the area outlined by ground water monitoring wells M4MW08, M4MW09, and M4MW10, encompassing an area of approximately 29,314 square feet or 0.67 acres.

The vertical extent of the Site CEA includes the shallow part of the aquifer beneath the Site and it extends from the water table to approximately 22 feet bgs, which represents the total depth of the contaminated wells at the Site.



#### LEGEND

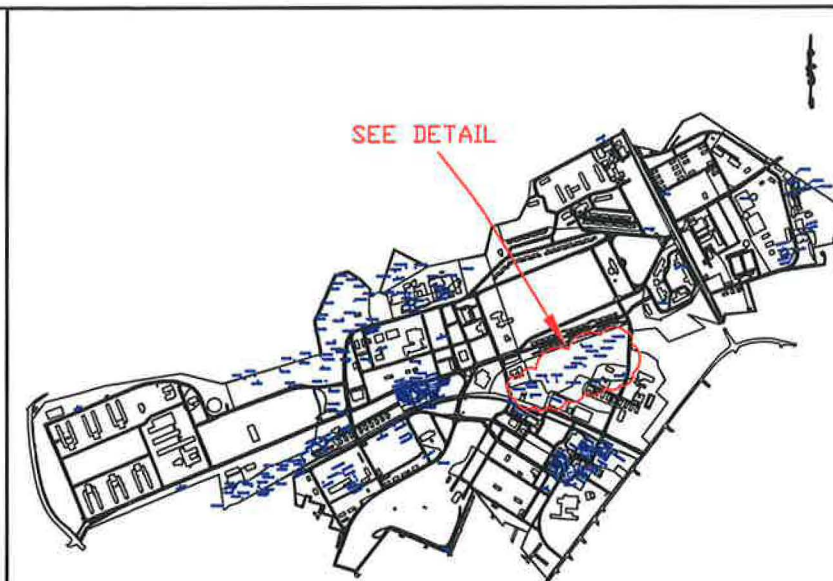
 - CEA BOUNDARY 29,314.25 SQUARE FEET, 0.67 ACRES

 - MONITORING WELL LOCATION

M4MW07

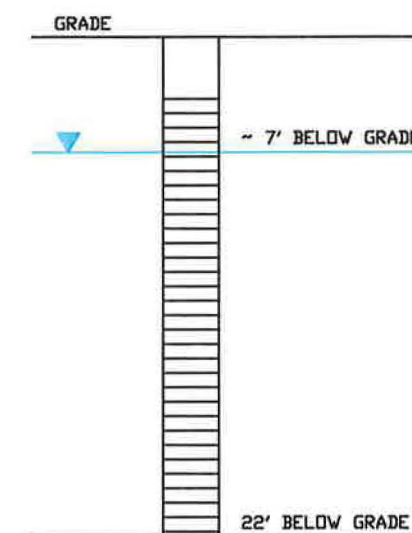
0' 40' 80'

SCALE: 1"=80'



#### KEY MAP

0' 1250' 2500'  
SCALE: 1"=2500'



#### GENERALIZED CROSS SECTION

**BRINKERHOFF**   
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FIGURE C-1  
CEA BOUNDARY MAP  
MAIN POST - AREA M-4  
US ARMY FORT MONMOUTH  
FORT MONMOUTH, NEW JERSEY

DATE: 5/31/11

JOB NO.: 09BR116

SCALE: AS SHOWN

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## **Exhibit D**

### **Vertical Contaminant Data**

## **EXHIBIT D**

### **1.0 VERTICAL CONTAMINANT DATA**

Pursuant to N.J.A.C 7:26E-8.3(b)3 iii, iv, and v, Brinkerhoff Environmental Services, Inc. has provided vertical contaminant data for the Site in Table D-1. The vertical extent of the Site CEA includes the shallow part of the aquifer beneath the Site, and it extends from the water table to approximately 22 feet bgs, which represents the total depth of the contaminated wells at the Site.

There is no known clean water lens as contamination is believed to be at water table elevation.

**Table D - 1**  
**Vertical Contaminant Data**  
**M-4 Landfill**  
**Fort Monmouth, New Jersey**  
**9/29/2010**

| Well ID | Water Table |          | Approximate Bottom of |          | Top of Plume |          | Thickness of Clean Water |          |
|---------|-------------|----------|-----------------------|----------|--------------|----------|--------------------------|----------|
|         | Feet bgs    | Feet msl | Feet bgs              | Feet msl | Feet bgs     | Feet msl | Feet bgs                 | Feet msl |
| M4MW6   | 10.32       | 3.99     | 20.00                 | -5.69    | 10.32        | 3.99     | N/A                      | N/A      |
| M4MW7   | 9.8         | 5.64     | 15.50                 | -0.06    | 9.8          | 5.64     | N/A                      | N/A      |
| M4MW8   | 7           | 2.38     | 19.00                 | -9.62    | 7            | 2.38     | N/A                      | N/A      |
| M4MW9   | 8.76        | -0.4     | 22.00                 | -13.64   | 8.76         | -0.4     | N/A                      | N/A      |
| M4MW10  | 8.9         | 2.25     | 18.00                 | -6.85    | 8.9          | 2.25     | N/A                      | N/A      |

bgs - below ground surface  
msl - mean sea level elevation

## **Exhibit E**

### **Fate and Transport Description and Model Documentation**

## **EXHIBIT E**

### **1.0 Duration of Classification Exception Area (CEA)**

Metals are known to migrate slowly and not degrade. Metals in ground water throughout Fort Monmouth were evaluated using statistical analyses and published literature information (Brinkerhoff, 2011 Background Metals Evaluation). It was concluded that the metals in ground water are likely a combination of a natural, dissolved component along with input from sample turbidity. Due to the interference from sample turbidity, exceedances of the GWQS by actual dissolved-phase metals are not certain, and modeling of the fate and transport is not practical. The CEA time-frame is therefore indeterminate.

As indicated in Exhibit A, the presence of arsenic, antimony, beryllium, cadmium and thallium at the Site is attributed to naturally-occurring background conditions. Therefore, they are not considered contaminants of concern, and are not included in the CEA application.

Due to its common industrial use, the source of lead is less certain, and therefore it remains a COPCs and is included in this CEA.

Future sampling should aim to reduce the input from sample turbidity, and thus better represent the actual concentrations of dissolved-phase lead. Upon completion of each sampling event, the data should be compared to the GWQS. Lead concentrations laboratory-determined to be in compliance with the GWQS should be removed from further consideration.

### **2.0 Written and Mapped Description of the CEA**

N.J.A.C. 7:26E-6.2(a)17 requires submittal of a map of the CEA compatible with the NJDEP's Geographic Information Systems both as a paper hard copy and electronically by means of a computer disk. Exhibit C, Figure C-1, with supporting written documentation provided above, represents a paper copy, and an electronic copy of the map of the CEA, as a shape file, is provided along with Metadata as Attachment I to this submittal.

### 3.0 References

Brinkerhoff. 2010. MODFLOW Groundwater Modeling - US Army, Fort Monmouth, Main Post and Charles Wood Areas.

Brinkerhoff. 2011. Background Metals Evaluation - US Army, Fort Monmouth, Main Post and Charles Wood Areas.

Directorate of Public Works Environmental Office. 1997. Installation Action Plan for Defense Environmental Restoration Project Sites - Fort Monmouth, New Jersey - FTM-079.pdf.

Newell, W. L., Powars, D.S., Owens, J.P., Stanford, S.D., and Stone, B.D. 2000, Surficial Geologic Map of Central and Southern New Jersey. U.S. Geological Survey, Miscellaneous Geologic Investigations Series, Map I 2540 D, 3 sheets, Scale: 1:100,000.

Pfafflin, J. R. and E. Ziegler. 2006. Encyclopedia of Environmental Science and Engineering. CRC Press. Taylor and Francis Group. Boca Raton, Florida.

United States Department of the Interior Geological Survey. 1982. Physical Properties of Rocks. Reston, Virginia. Open-File Report 82-166.

United States Environmental Protection Agency. 1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water - Part II. (Revised 1985). EPA/600/6-85/002b.

Zapczka, O. S., 1989, Hydrogeologic Framework of the New Jersey Coastal Plain: U. S. Geological Survey Professional Paper 1404-B, 49 p., 24 pl.

**Attachment I**  
**Diskette METADATA**

**Diskette Metadata**

Site Name: Fort Monmouth -- M-04 Landfill

Case Name: FTMM-04

CSL ID # N/A

Lead Program ID: N/A

Lead Program (Letter Abbreviation)

Street Address of Facility

Municipality: Eatontown

County: Monmouth

Start Date: September 2010

Duration: Indeterminate

Contaminants: Lead

CEA Depth: Approximately 22 feet below ground surface.

Engineering controls: NA

**Map Metadata ID Information**

Description: Site plan showing CEA boundary.

Abstract: Includes base map and the CEA boundary.

Purpose/Brief Description: Fulfill CEA requirements.

Supplemental Information: None.

Currentness Reference: Based upon current information, September 2010

**Map Metadata Data Quality Information**

Attribute Accuracy: Monitoring wells have surveyed coordinates. Base map accuracy visually consistent with site observations.

Quantitative Attribute Accuracy Assessment

Completeness Report: Base map provided by client's GIS department. Monitoring wells were surveyed.

Lineage: Manually digitized

Source Scale Denominator

Type of Source Media: Paper Maps

Source Currentness Reference

Process Date: May 2011

### **Map Metadata Spatial Data Organization**

Direct Spatial Reference Method: Vector

### **Map Metadata Spatial Reference**

Grid Coordinate System: NJ State Plane feet

Horizontal Datum Name: NAD83

### **Map Metadata Attribute Information**

Attribute Label

### **Map Metadata Reference Information**

Metadata Date: May 2011

Metadata Contact: Brinkerhoff Environmental Services, Inc.

### **Map Metadata Citation Information**

Originator: Brinkerhoff Environmental Services, Inc.

Title: FTMM-04

Author's Notes: Variable in Time.

**Map Metadata Contact Information**

Contact Person Primary: Gary G. DiMartinis, LSRP

Contact Organization: Brinkerhoff Environmental Services, Inc.

Contact Address: 1913 Atlantic Avenue, Suite R5, Manasquan, New Jersey 08736

Contact Voice Telephone: 732-223-2225