Periodic Review Report No. 3
November 12, 2014 – November 12, 2015
Metal Etching Co., Inc. Site (130110)

Freeport
Nassau County, New York

Prepared for

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York 12233-7017

Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
6712 Brooklawn Parkway, Suite 104
Syracuse, New York 13211
(315) 431-4610

January 2016
Version: FINAL
EA Project No. 14907.09

This page left intentionally blank

Periodic Review Report No. 3
November 12, 2014 – November 12, 2015
Metal Etching Co., Inc. Site (130110)

Freeport
Nassau County, New York

Prepared for

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York 12233-7017

Prepared by

EA Engineering, P.C. and Its Affiliate
EA Science and Technology
6712 Brooklawn Parkway, Suite 104
Syracuse, New York 13211
(315) 431-4610

Donald F. Conan, P.E. Date
Vice President

Megan Miller Date
Project Manager

January 2016
Version: FINAL
EA Project No. 14907.09

This page left intentionally blank

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

AMSL	Above mean sea level
AWQS	Ambient water quality standard
bgs	Below ground surface
btoc	Below top of casing
CVOC	Chlorinated volatile organic compound
DCE	Dichloroethene
DO	Dissolved oxygen
EA	EA Engineering, P.C. and Its Affiliate EA Science and Technology
EAR	Environmental assessment and remediations
EC	Engineering controls
EPA	United States Environmental Protection Agency
ft	Feet (foot)
ft^2	Square feet (foot)
hr	Hour(s)
IC	Institutional controls
ID	Identification
mg/L	Milligrams per liter
MNA	Monitored natural attenuation
mV	Millivolts
NA	Analyte not analyzed for during this sampling event
NYSDEC	New York State Department of Environmental of Conservation
NYSDOH	New York State Department of Health
O&M	Operation and maintenance
ORP	Oxidation-reduction potential
PCE	Tetrachloroethene
PRR	Periodic review report
RA	Remedial action
RI	Remedial investigation
ROD	Record of decision
SCG	Standards, criteria, and guidance

SCO	Soil cleanup objectives
SMP	Site management plan
SSDS	Sub-slab depressurization system
SVI	Soil vapor intrusion
TAL	Target analyte list
TCE	Tricholorethene
µg/m3	microgram per cubic meter
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
UST	Underground storage tank
VC	Vinyl chloride
VOC	Volatile organic compound
yd^3	Cubic yards

EXECUTIVE SUMMARY

The New York State Department of Environmental Conservation (NYSDEC) tasked EA Engineering, P.C. and its affiliate EA Science and Technology (EA) to provide site management services from August 21, 2012 to August 26, 2016 at the Metal Etching Co., Inc. (Metal Etching) site (Site Number [No.] 130110) in Freeport, Nassau County, New York (Figure 1). This Work Assignment is being conducted under NYSDEC Standby Engineering Services Contract No. D007624-09.

Post-closure monitoring and facility maintenance program activities were conducted at the Metal Etching site in November 2014 and May 2015 in accordance with the New York State Inactive Hazardous Waste Disposal Site Remedial Program and as stipulated in the Record of Decision (NYSDEC 2007) and Site Management Plan (EA 2014a).

ES.1 REMEDY EVALUATION

Groundwater Monitoring

Concentrations of primary chlorinated volatile organic compounds (CVOCs) were consistently detected in groundwater samples collected from the deep wells within the former source area (MW-09D and MW-08DR) during the monitoring period. Concentrations of *cis*-1,2-dichloroethene, tetrachloroethene and trichloroethene were detected exceeding the NYSDEC Ambient Water Quality Standard of 5 micrograms per liter in samples collected in November 2014 and May 2015 in shallow and deep wells at the site.

Based upon monitored natural attenuation parameter (MNA) data generated during this monitoring period, there is continued potential for natural attenuation to occur within the aquifer. Water quality parameters (dissolved oxygen and oxidation reduction potential), and concentrations of total organic carbon, dissolved oxygen, nitrate, and chloride provide moderately favorable conditions for reductive dechlorination of CVOCs to occur.

Soil Vapor Intrusion Monitoring

The sub-slab depressurization system at the site office building was operational for the monitoring period. Indoor and outdoor air of the office building was monitored during the November 2014 event and will continue to be monitored on an annual basis. No detections of site-related CVOCs were identified in the indoor air samples collected as part of the monitoring program.

Site Inspection and Maintenance

Semi-annual site inspections were completed on November 12, 2014 and May 12, 2015. Site cover material was observed to be in fair condition with some disturbance. There is some evidence of disintegration of the porous pavement cover south of the main office building.

The site cover materials continue to provide protection to human health and the environment from contaminants of concern at this time. In addition, infiltration of the permeable pavement was observed to be slow in high traffic areas due to the accumulation of sediment and debris within the pavement system.

ES.2 RECOMMENDATIONS

- Site management tasks should continue during the next period. This includes semi-annual site inspections, maintenance (as needed), semi-annual groundwater monitoring and sampling with annual collection of MNA parameters, and annual indoor air monitoring.

- Addition of methane, ethene, and ethane to the MNA parameter list is recommended. Due to the natural salinity of the aquifer (tidally influenced) chloride concentrations may not be an accurate indicator of the potential for natural attenuation within the aquifer.

- Sweeping/vacuuming of permeable pavement should be completed annually.

1. INTRODUCTION

A periodic review process is commonly implemented at environmental remediation sites to evaluate the effectiveness of the selected remedy and to determine if the remedy continues to be protective of human health and the environment, as set forth in the Site Management Plan (SMP) (EA Engineering, P.C. and its affiliate EA Science and Technology [EA] 2014a). The objectives of the periodic review for sites in the State Superfund Program are as follows:

- Evaluate if chosen remedy is performing properly and effectively, and is protective of public health and the environment.
- Determine compliance with the Record of Decision (ROD) (New York State Department of Environmental Conservation [NYSDEC] 2007) and the SMP (EA 2014a).
- Evaluate treatment system and recommend repairs, if necessary.
- Evaluate the current state and condition of the remedy.
- Determine that the intent of the institutional controls continues to be met, the engineering controls remain in-place, and both are effective and protect public health and the environment.
- Evaluate the operation and maintenance (O&M) costs of the remedy.

1.1 SITE BACKGROUND

The site is located adjacent to Freeport Creek at 435 South Main Street, Freeport, Nassau County, New York. The Metal Etching Co., Inc. (Metal Etching) site is a Class 4 site that was reclassified in April 2014, and is listed on the NYSDEC Registry of Inactive Hazardous Waste Sites (Site No. 130110).

The Metal Etching property is a 2.25-acre L-shaped area, bounded by Ray Street East and a commercial property to the north, Freeport Creek to the south and east, and Main Street and Ray Street East to the west (Figure 1). The site is currently owned by Freeport Creek Associates, Apache Realty Corporation, and BWM High & Dry; it is leased by Main Street Marina, 500 South Main Street, Freeport, New York. The Metal Etching property is designated as Section 62, Block 45, and Lots 24, 54, 144, 145, 155, 157, and 158 on the tax maps. The site is currently used as a boat dealership, marina, and boat storage yard. Boat maintenance operations at the site are conducted in a single 2,400 square foot (ft^2) warehouse building located on the northeast corner of the property. A smaller, 1,200 ft^2 building, located on the western portion of the property, has been restored, and is used for office space for the boat dealership. Minor boat restoration activities are performed within the warehouse building, as well as a sprung structure that was installed west of the warehouse building; activities include engine rebuilds, sanding, and painting/varnishing.

The former Metal Etching buildings at the site were erected prior to 1954; however, the exact date of construction is unknown. These connected buildings occupied approximately 26,650 ft^2 of the property (approximately 60 percent of the Metal Etching portion of the site). Aside from the warehouse building, which was originally a portion of the Metal Etching quarters, the Metal Etching buildings were demolished in 2001; however, the concrete slabs and footings of the buildings remained in place at the site. A 6-inch thick concrete slab covering an approximate area of 7,750 ft^2 was the foundation of the Metal Etching plating slab and is visible to the west of the warehouse building.

Historical site operations consisted of handbag manufacturing which involved decorative plating with nickel, chromium, and cadmium; followed by the manufacturing of other metal products including nameplates, instrument panels, rulers, and miscellaneous plated products. All products were etched or printed. The process of etching included anodizing, chromate conversion, and chrome/nickel plating. All operations terminated in 1999, and facility buildings were demolished around 2001.

1.2 REMEDIAL HISTORY

A remedial investigation (RI) was performed to characterize the nature and extent of contamination at the site. The RI/Feasibility Study Report prepared by Environmental Resource Management (2007) for the Metal Etching site is summarized below:

- The top 7 feet (ft) of soil in three separate areas across the site contained concentrations of metals exceeding the standards, criteria, and guidance (SCGs) used for the site.

- Concentrations of volatile organic compounds (VOCs) in soil varied across the site.

- Groundwater contained concentrations of VOCs exceeding the SCGs across the site; the highest concentrations were detected in samples collected above the clay layer west and south of the 2,400 ft^2 warehouse building. Both tetrachloroethene (PCE) and breakdown contaminants tricholorethene (TCE), dicholorethene (DCE), and vinyl chloride (VC) were detected in site groundwater samples, indicating that degradation was occurring at the site.

- Soil vapor intrusion (SVI) sampling completed in 2004 indicated that both PCE and TCE were present beneath the slabs of the 1,200 ft^2 office building and the warehouse building. A sub-slab depressurization system (SSDS) was installed in each building to address the potential SVI.

- One underground storage tank (UST) was removed from the western area of the site in 1990, prior to the RI. Two additional potential USTs were identified during the RI; the first was identified east of the office building, and the second was identified south of the warehouse building.

- Sediment samples collected from south of the southeast bulkhead in Freeport Creek contained concentrations of chromium and nickel at concentrations exceeding their SCGs.

- Sediment samples collected from within an existing storm drain contained metals exceeding their respective SCGs.

NYSDEC issued a ROD for the Metal Etching site in March 2007. The specific elements of this alternative (as presented in the ROD [NYSDEC 2007]) are identified below:

- A remedial design program to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program. This program included delineating the boundaries of sediment excavation within Freeport Creek.

- Hot spot excavation, to the extent practicable, of VOC and metals contaminated soil to the depth of groundwater table.

- Removal of sediment from the onsite storm water system and disposal at an approved offsite facility.

- Determination of the presence, closure, and removal of USTs onsite in accordance with NYSDEC regulations.

- Areas not previously covered, and where excavation was not practicable, were to receive a cover of asphalt or ballast underlain by a demarcation layer.

- Limited sediment removal from Freeport Creek upon completion of the additional Freeport Creek Study and delineation of site-related contamination in the area of SED-04.

- A long-term groundwater monitoring program to confirm the effectiveness of the remedy.

- Establishment of an institutional control that requires: (a) limiting the use and development of the property to commercial use, which will also permit industrial use, in conformance of local zoning, (b) compliance with the approved SMP (EA 2014a), (c) restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by New York State Department of Health (NYSDOH), and (d) submission of a periodic certification of institutional controls (ICs) and engineering controls (ECs) to the NYSDEC by the property owner.

- Development of a SMP.

- Requirement of the property owner to submit a periodic certification of ICs and ECs prepared and submitted by a professional engineer, or such other expert acceptable to the NYSDEC, until the NYSDEC notifies the property owner in writing that this certification

is no longer needed. This submittal will: (a) contain certification that the ICs and ECs put in place are still in place, and are either unchanged from the previous certification or are compliant with NYSDEC-approved modifications, (b) allow the NYSDEC access to the site, and (c) state that nothing has occurred that will impair the ability of the controls to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the NYSDEC.

1.2.1 Summary of Remedial Actions

The remedial action (RA) selected by the ROD (NYSDEC 2007) included excavation and disposal of soil/fill exceeding soil cleanup objectives (SCOs), construction of a soil cover system of asphalt or permeable pavement to prevent human exposure to contaminated soil/fill remaining, removal and disposal of contaminated sediment from the onsite storm water system, and from a limited area within Freeport Creek.

The site was remediated in accordance with the NYSDEC-approved remedial design, which was part of Contract Documents dated August 2010, and Addendums dated September 28, 2010, September 30, 2010, and October 1, 2010.

The following is a summary of the RAs performed at the site:

1. Excavation of 2,684 cubic yards (yd^3) of soil/fill exceeding SCOs within identified excavation limits, to low-tide groundwater elevation, approximately 5 ft below ground surface (bgs).

2. Construction and maintenance of a soil cover system consisting of a geotextile demarcation layer covered by asphalt or permeable pavement to prevent human exposure to contaminated soil/fill remaining at the site.

3. Execution and recording of three Environmental Notices to restrict land use to commercial or industrial uses, and prevent future exposure to any contamination remaining at the site.

4. Removal of approximately 2 yd^3 of sediment from the onsite storm water system and disposal at an approved offsite facility.

5. Closure and removal of four USTs onsite in accordance with NYSDEC regulations.

6. Limited removal of approximately 183 yd^3 of sediment from delineated area within Freeport Creek and disposal at an approved offsite facility.

7. Development and implementation of a SMP for long-term management of remaining contamination as required by the Environmental Notices, which include plans for: (1) ICs/ECs, (2) monitoring, (3) operation and maintenance (O&M), and (4) reporting.

8. Remedial activities were completed at the site in January 2012.

1.2.1.1 Remaining Contamination

Per the ROD (NYSDEC 2007), excavation depth was limited by the low-tide groundwater elevation; therefore, known contamination remains at the site. Mirafi® 180N/O non-woven geotextile was installed over the footprints of all excavations to demarcate the extent of removal and remaining contamination. The majority of the excavations were completed at a depth of 5 ft; two small excavations were completed at a depth of 1 ft.

During the RI, VOC and metals contamination was identified in various locations throughout the site deeper than the maximum excavation depth of 5 ft. Concentrations of metals and VOCs exceeded the SCOs at sampling intervals 7–8 ft bgs and 12 ft bgs. A confining clay layer was identified 31–38 ft bgs across the site.

Endpoint soil samples were collected at the excavation bottom and sidewall boundaries during the remedial action. VOCs detected in endpoint soil samples with concentrations exceeding the site-specific SCOs included xylenes, 1,2-DCE as a combination of *cis*- and *trans*-1,2-DCE, and toluene (south of the warehouse building).

Metals detected in endpoint soil samples collected near the warehouse building with concentrations exceeding the site-specific SCOs include chromium, copper, nickel, and zinc.

Near the office building, zinc was detected in endpoint samples exceeding the site-specific SCO.

Many of the endpoint samples collected northeast and east of the warehouse building contained copper, nickel, and zinc exceeding the site-specific SCOs. One sample directly east of the warehouse building contained chromium at a concentration exceeding the site-specific SCOs.

Sediment was removed from a 2 ft excavation within Freeport Creek directly adjacent to the easternmost portion of the southern bulkhead. Endpoint samples collected following dredging activities contained arsenic, copper and mercury at concentrations exceeding their respective SCGs.

A full discussion of remaining contamination including tables and figures can be found in the Final Engineering Report (EA 2014b).

1.2.1.2 Final Engineering Report

The Final Engineering Report (EA 2014b) was completed in October 2012 following the RA, and updated in April 2014 to include the Environmental Notices. The Final Engineering Report details the remedial activities conducted at the Metal Etching site.

1.2.1.3 Site Management Plan

The SMP was originally completed by EA in August 2012 and provided direction for maintenance and monitoring of the remedy selected by the ROD (NYSDEC 2007) for the Metal Etching site. The SMP (EA 2014a) was revised in April 2014 to include the Environmental Notices as an appendix and to update the groundwater monitoring well network based on field changes. A full copy of the SMP is provided in Appendix A.

1.3 SITE GEOLOGY AND HYDROGEOLOGY

The site is located adjacent to Freeport Creek at an elevation of 5 ft above mean sea level. Freeport Creek and site groundwater is tidally influenced and ranges from 5 to 2.5 ft bgs at the site.

The top 3–4 ft of soil at the site consists of compacted fill material which includes sand, gravel, brick and wood debris. Fill is underlain by organics and shells to approximately 11 ft bgs. Some fill was excavated, disposed offsite, and replaced with clean granular fill during the 2011 RA. Glacial outwash sediments including sand and silt form the layer beneath the fill to a layer of clay at approximately 31–38 ft bgs. The glacial outwash is underlain by the Magothy formation, which consists of sand and gravel with some clayey sands.

Depth to groundwater ranges from 3 to 5 ft bgs and is highly influenced by tides, as discussed in the RI Report (Environmental Resource Management 2007). Groundwater flow is to the southeast across the site during low tide, and to the northwest during high tide. Groundwater flow as observed during the November 2014 and May 2015 monitoring events is shown in Figures 2 and 3, respectively.

1.4 SITE MANAGEMENT OBJECTIVES

Environmental monitoring points at the Metal Etching site have been maintained and sampled during the monitoring period in accordance with the SMP (EA 2014a). This included collection of groundwater samples at various locations across the site, inspection of the site cover material, and site maintenance. Indoor air and outdoor air samples were collected in November 2014. Sampling locations, sampling methodology, list of analytes, analytical methods, cover material inspection methodology, and site maintenance objectives are documented in the SMP.

The following are objectives of the monitoring and maintenance program:

- Collect representative groundwater samples and evaluate the data to confirm the remedy continues to be effective in protecting public health and the environment.

- Collect indoor air samples and evaluate the data to monitor effectiveness of the existing SSDS and determine necessity.

- Periodically inspect the site and provide routine maintenance, as necessary.

- Document and report this information to the NYSDEC.

1.5 PERIODIC REVIEW REPORT

The purpose of this Periodic Review Report (PRR) is to summarize the results of the November 2014 and May 2015 semi-annual groundwater monitoring and site inspection events; and to provide sufficient documentation that the remedy remains in place, is performing properly and effectively, and is protective of public health and the environment. Specifically, this report provides the following information:

- Results of groundwater and indoor air monitoring
- Evaluation of the current groundwater quality conditions
- Results of site inspections
- Maintenance activities performed to date.

This page left intentionally blank

2. EVALUATION OF REMEDY PERFORMANCE, EFFECTIVENESS, AND PROTECTIVENESS

2.1 SITE INSPECTION

Inspection of the site and its appurtenances was conducted on November 12, 2014 and May 12, 2015. Findings and observations were recorded on the site-specific field forms, which are provided in Appendix B.

2.1.1 Site Cover

Overall, the site was in good condition. There were several spots that appeared to show settling/rutting of the porous pavement to the south of the site's office building and around the warehouse. There is also evidence of some disintegration of the porous pavement cover south of the main office building.

The porous pavement was tested for permeability with several gallons of water in three areas. Infiltration occurred at a moderately slow pace, with water spreading out before it started to infiltrate. There is some evidence of ponding on the porous pavement – the puddles were small in size, and evident based on dried dirt/staining in an area that looked as though it had settled.

2.1.2 Site Security

The site was generally found to be in good condition during both inspections. There was no evidence of vandalism. The front fence along Ray Street East and Main Street was fully intact. The concrete around the east drain is cracking. Both onsite drains are less than half full of debris. There was no obvious evidence of any spilled liquids onsite. Monitoring wells are in generally good condition and serving the intended purpose. Monitoring wells MW-04 and MW-06 showed some minor cracking around the well collars.

2.1.3 Sub-Slab Depressurization Systems

The sub-slab depressurization system on the office building was in operation at the time of the site inspections. The manometer read 3.9 pounds per square inch in November 2014, and 3.01 pounds per square inch in May 2015. The exhaust pipe was observed to be cracked and broken during the May 2015 inspection; damage is not affecting system operation. The system on the warehouse was decommissioned and no longer in operation.

2.1.4 Porous Pavement Maintenance

Due to slow infiltration of the porous pavement observed during the November 2014 and May 2015 inspections, Environmental Assessment and Remediations (EAR) used a vacuum-sweeper to clean porous pavement areas where accessible. Low traffic areas were swept with one pass of the sweeper, while high traffic areas that had previously been observed with poor infiltration rates were swept with a minimum of three passes of the sweeper. In October 2015, spot testing

was completed after vacuum-sweeping activities at three locations. Each location yielded poor infiltration and pooling and run-off was observed. Asphalt repairs were also made in October 2015 to a 3 ft x 2 ft patch located at the center of the site. A report with field notes and photos is provided by EAR in Appendix C.

2.2 MONITORING PLAN COMPLIANCE REPORT

This PRR assesses whether the Metal Etching site has been remediated and managed as set forth in the SMP (EA 2014a) and ROD (NYSDEC 2007). The Monitoring Plan includes a description of the methods and rationale to be used for assessing the remedy effectiveness, including the following elements:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air).
- Assessing compliance with applicable NYSDEC SCGs, particularly Ambient Water Quality Standard (AWQS).
- Assessing achievement of the remedial performance criteria.
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.

2.3 CONFIRM COMPLIANCE WITH MONITORING PLAN

The following table identifies the SMP monitoring plan requirements on an annual and semi-annual basis for the first year of the plan, and demonstrates compliance with the monitoring plan has been achieved prior to the end of the reporting period.

Monitoring Program Activity	Required Frequency		Compliance Dates
	Semi-Annually	Annually	
Groundwater Monitoring/Sampling	X		November 2014 and May 2015
Site Cover Inspection	X		November 2014 and May 2015
Indoor Air Monitoring		X	November 2014

2.4 GROUNDWATER MONITORING

2.4.1 Groundwater Monitoring and Sampling

Semi-annual groundwater monitoring including gauging and sampling has been continuously performed at the site since completion of the RA in 2012. During the reporting period (November 2014 through November 2015), two groundwater monitoring and gauging events were completed at the site. Site monitoring wells were gauged prior to each sampling event in November 2014 and May 2015.

The site monitoring well network has changed since the completion of the RA. Monitoring wells

MW-01 and MW-05, which were originally included in the SMP (EA 2014a) monitoring well network, have not been located onsite since the completion of the RA. A records review indicates these monitoring wells had not been sampled since before the RA, and were likely either paved over or decommissioned. In addition, a concrete pad was poured by the property owner to the west of the warehouse building between Fall 2012 and Spring 2013, which covered monitoring well cluster MW-8. In July 2013, monitoring wells MW-08SR and MW-08DR were installed off the southwest corner of the warehouse, and MW-05R was installed to the southeast of the warehouse. In April 2014, two monitoring wells, MW-11S and MW-11D, were installed along Ray Street behind the warehouse. Monitoring well locations are shown on Figures 2 and 3.

The Metal Etching site is located directly adjacent to Freeport Creek, which connects to the Atlantic Ocean through a series of salt marshes; and therefore, is tidally influenced. Due to the proximity of the site to these waters, site groundwater elevation is tidally influenced, and typically ranges between 3-5 ft bgs. Groundwater gauging events in November 2014 and May 2015 took place at different points in the tidal cycle. The November 2014 gauging event took place during the 4-hour (hr.) period leading up to low tide. The May 2015 gauging event took place during the 4-hr period surrounding low tide. Water elevation data for each gauging event conducted are summarized in the table below.

Well Identification	Well Casing Elevation (ft AMSL)	Depth to Water (ft btoc) November 12, 2014	Water Elevation (ft AMSL) November 12, 2014	Depth to Water (ft btoc) May 12, 2015	Water Elevation (ft AMSL) May 12, 2015
MW-06	4.34	3.82	0.52	4.05	0.29
MW-05R	4.02	2.04*	1.98	1.87	2.15
MW-04	6.02	5.53	0.49	5.82	0.20
MW-08DR	5.24	5.20	0.04	5.38	-0.14
MW-08SR	5.41	5.00	0.41	5.25	0.16
MW-9D	4.16	4.36	-0.20	5.30**	-1.14
MW-9S	4.27	4.45	-0.18	4.40**	-0.13
MW-10D	5.30	5.43	-0.13	5.63	-0.33
MW-10M	5.37	5.51	-0.14	6.74	-1.37
MW-10S	5.09	5.12	-0.03	5.25	-0.16
MW-11S	4.05	3.43	0.62	4.71**	-0.66
MW-11D	3.96	3.64	0.32	4.00**	-0.04

NOTE: btoc = Below top of casing.
AMSL = Above mean sea level.
* = MW-05R inaccessible during full round of gauging; measurement taken.
** = 11/11/14 – four hrs before low tide
MWs -11S, -11D, -9S, and -9D inaccessible during full round of gauging; MWs -11S, -11D, and -9D gauged on 5/13/15 two hrs before low tide. MW-9S gauged later in day on 5/12/15 one hr after low tide. These wells were not used for the development of the groundwater contours presented in Figures 2 and 3.

Interpreted groundwater potentiometric surface flow patterns for the November 2014 and May 2015 gauging events are presented on Figures 2 and 3, respectively. Groundwater fluctuates with the tides, and typically flows from northwest to southeast across the site during

low tides and southeast to northwest during high tides. The November 2014 gauging event took place during low tide, with groundwater flowing in a southeast direction. The May 2015 gauging event took place while the tide was ebbing; groundwater was generally flowing in a southeast direction, with an upwelling near Freeport Creek due to the tidal fluctuation.

Groundwater monitoring wells were sampled in November 2014 and May 2015 during this monitoring period. Each well was purged using low-flow techniques (submersible pumps), and water quality readings were allowed to stabilize prior to sample collection. Purge forms are provided in Appendix D; daily field reports are provided in Appendix E. Samples were submitted to Con-Test Analytical Laboratory, East Longmeadow, Massachusetts for analysis of VOCs via United States Environmental Protection Agency (EPA) Method 8260C and target analyte list (TAL) metals using EPA Method 6010, in accordance with the NYSDEC Analytical Services Protocol. During the November 2014 event, samples were also analyzed for monitored natural attenuation (MNA) parameters including chloride, sulfate, sulfide, nitrate, and total organic carbon.

Groundwater sampling results for each event were compared to NYSDEC AWQS for Class GA waters (NYSDEC 1998). Analytical results from both events are summarized in Tables 1 through 3. Figure 4 shows the interpreted PCE isopleths from November 2014 and May 2015. Data usability summary reports are provided in Appendix F.

2.4.2 Volatile Organic Compounds

Eleven VOCs were detected during the November 2014 and May 2015 groundwater sampling events; six of the 11 VOCs, including acetone, *cis*-1,2-DCE, PCE, TCE, tert-butyl alcohol and methyl tert-butyl ether (MTBE), were detected at concentrations exceeding the NYSDEC AWQS. The majority of groundwater exceedances were detected at monitoring wells MW-04, MW-08DR, MW-08SR, MW-09D, MW-10M, and MW-11D. Shallow groundwater samples detected concentrations of CVOCs during the ebb-tide sampling event (November 2014) below the AWQS; however, concentrations of CVOCs remained relatively stable above the AWQS in samples collected from deep monitoring wells during both sampling events. This may indicate that a residual soil source (e.g., sorbed or diffused CVOCs in soil) may remain in the areas of monitoring well sets MW-08, MW-09 and MW-11 and are continuing to impact shallow groundwater during periods of high tides.

2.4.3 Inorganic Compounds

Prior to collecting groundwater samples, monitoring wells were purged until the turbidity readings as measured using a Horiba U-52 were less than 50 nephelometric turbidity units (ntu). Based on the unfiltered analyses, nine organic compounds (i.e., arsenic, antimony, beryllium, copper, iron, magnesium, manganese, silver and sodium) were detected at concentrations greater than their applicable NYSDEC AWQS during the November 2014 and May 2015 groundwater sampling events. Arsenic, antimony, beryllium, copper, iron, magnesium, manganese, silver and sodium were detected in exceedance in all twelve monitoring wells and remained consistent for both sampling events.

2.4.4 Monitored Natural Attenuation Parameters

As part of the groundwater monitoring program, groundwater samples collected in November 2014 were submitted for MNA parameter analysis including chloride, sulfate, sulfide, nitrate, and total organic carbon and are summarized along with prior sampling results in Table 3. Natural attenuation of the chlorinated volatile organic compounds present in the groundwater at the site primarily occurs under anaerobic conditions that are reflected by dissolved oxygen (DO) concentrations below 0.5 milligrams per liter (mg/L) and oxidation-reduction potential (ORP) less than 0.0 millivolts (mV).

Discussed are the notable monitored natural attenuation parameters:

- A total organic carbon concentration less than 20 mg/L is a limiting factor in the availability of electron donors required for reductive dechlorination of chlorinated volatile organic compounds. Total organic carbon was not detected at concentrations greater than 20 mg/L at any of the site monitoring wells in November 2014.

- If nitrate concentrations are less than 1 mg/L, along with DO concentrations less than 0.5 mg/L and increased sulfide concentrations, it can be concluded that anaerobic conditions exist at the site. Nitrate concentrations were less than 1 mg/L at all of the monitoring wells at the site. Sulfide was not detected in any of the groundwater samples.

- Sulfate concentrations greater than 20 mg/L can cause competitive exclusion of reductive dechlorination. Sulfate concentrations were less than 20 mg/L in MW-05R, MW-06, MW-09S, and MW-10D.

- Chloride is typically detected above 250 mg/L in all twelve site monitoring wells; however, it is a major contributor to the ion composition of natural seawater, typically found at concentrations of roughly 19,000 mg/L. Therefore, it is not a reliable metric for measuring MNA in sites influenced by tides.

2.5 INDOOR AIR MONITORING

The SMP (EA 2014a) requires annual indoor air sampling in both the office and warehouse buildings during the heating season to monitor the effectiveness of the SSDSs; however, both systems were damaged during Superstorm Sandy in 2012. A SVI evaluation was conducted in November 2013 and March 2014 to determine the continued necessity of the SSDSs in both buildings. Indoor air, outdoor air, and sub-slab vapor samples were collected in November 2013 from both buildings and again in March 2014 from the warehouse building to confirm results, and it was determined the warehouse SSDS could be shut down with no further monitoring.

In November 2014, indoor air and outdoor air samples were collected from the office building. Samples were collected using laboratory clean-certified Summa® canisters regulated for a 24-hr sample collection. Samples were submitted to Con-Test Analytical Laboratory, East Longmeadow, Massachusetts for analysis of VOCs using EPA Method TO-15. Air sampling

forms are provided in Appendix G.

Results were compared to NYSDOH Air Guidance Values (2006). Analytical results are summarized in Table 4. Data usability summary reports are provided in Appendix F.

During the November 2014 sampling event, various VOCs were detected, but none were detected above NYSDOH Air Guidelines, and no detections of site-related CVOCs were observed.

2.6 CONFIRM THAT PERFORMANCE STANDARDS ARE BEING MET

Tables 1 through 3 provide a summary of groundwater results for the reporting period. Natural attenuation of primary CVOC compounds (PCE/TCE) is a long-term process and will continue to be monitored. Previous soil vapor intrusion monitoring indicated that the existing SSDS in the warehouse building did not need to be returned to operation. The presence of TCE and PCE beneath the slab in the office building, which is regularly occupied during business hours, indicated the office SSDS needed to be returned to operation. TCE and PCE concentrations in the indoor air were lower during the November 2014 sampling event than the previous sampling event, indicating that the SSDS is serving its purpose.

2.7 SITE MAINTENANCE

Annual site maintenance is completed utilizing a vacuum-sweeper to remove silts/dirt from the porous asphalt.

3. INSTITUTIONAL CONTROLS/ENGINEERING CONTROLS CERTIFICATION PLAN REPORT

As previously noted, the SMP is included under Appendix A of this PRR and includes the ICs/ECs Plan. The SMP was revised in April 2014 to include the environmental notices and the updated groundwater monitoring well network. ICs and ECs at the Metal Etching site currently include the following:

- EC – Cover system that includes permeable and standard asphalt pavement areas, rip rap, and concrete building slabs/foundations that prevent incidental contact or ingestion of remaining contaminated subsurface soil at the majority of the site. An excavation work plan included as an appendix to the SMP, identifies the procedures and protocols required to be implemented should the cover system be breached, penetrated, or temporarily removed, and any underlying remaining contamination is disturbed

- EC – Operation and maintenance of the SSDSs in the site buildings

- IC – Establishment of Environmental Notices and compliance with the SMP.

3.1 INSTITUTIONAL CONTROL/ENGINEERING CONTROL REQUIREMENTS AND COMPLIANCE

Determination of compliance with the ICs and ECs at the Metal Etching site is made on the following criteria:

- The ICs and ECs applied at the site are in place and unchanged since completion of the remedial activities and issuance of the SMP

- No changes or occurrences of activity have impaired or impacted the ability of such controls to protect human health and the environment, or constitute a violation or failure to comply with any element of the SMP for such controls

- Access to the Metal Etching site will continue to be provided to the Department for evaluation of the remedy, including access to the site monitoring network and other controls (e.g., SSDS) for continued monitoring and/or maintenance.

3.2 INSTITUTIONAL CONTROLS/ENGINEERING CONTROLS CERTIFICATION FORM

The IC/EC certification forms from the owner and EA are included as Appendix H of this PRR.

This page left intentionally blank

4. COST EVALUATION

4.1 SUMMARY OF COSTS

Costs for EA site management services, including groundwater monitoring and sampling, site inspection and air sampling, was $53,296 for the reporting period. Costs for EAR maintenance activities including permeable pavement maintenance and repair was $3,730. A breakdown of major costs for November 2014 to November 2015 is provided in the table below.

Site Management Activity	EA Cost Incurred for the period of November 2014 – November 2015	EAR Cost Incurred for the period of November 2014 – November 2015
Monitoring, Sampling, Inspection, Oversight, Supplies/Equipment, Travel, and Reporting (EA)	$45,426	NA
Analytical Laboratory (Con-Test Analytical)	$6,899	NA
Data Validation (EDS, Inc.)	$971	NA
Permeable Pavement Maintenance	NA	$3,730

The monitoring, sampling, inspection, oversight, and reporting costs, which are billed by EA, include costs associated with project management, quality assurance, and periodic reporting throughout the reporting period. These monitoring and reporting costs are based on fiscal data generated and tracked by an EA internal financial management system, and includes travel expenses, equipment/supply costs, and other direct charges.

The permeable pavement maintenance activities completed and billed by EAR are expected to be completed annually.

The analytical costs, billed by Con-Test Analytical of East Longmeadow, Massachusetts covered semi-annual groundwater analyses and annual air analyses. Under the next performance monitoring period Con-Test will again be providing analytical services for the groundwater monitoring and sampling program. Data generated during the reporting period was validated by Environmental Data Services, Inc. of Williamsburg, Virginia.

This page left intentionally blank

5. RECOMMENDATIONS

5.1 GROUNDWATER MONITORING

Semi-annual groundwater monitoring should continue during the next monitoring period. VOCs, such as PCE, TCE, and *cis*-1,2-DCE, are consistently detected in monitoring wells located near the former source area (MW-09S, MW-09D, MW-08SR, and MW-08DR). Inorganics, such as arsenic, iron, manganese, and sodium are consistently detected at concentrations greater than respective NYSDEC AWQS across the site monitoring well network, although sodium is expected to be due to the salinity of the groundwater in this area.

While the concentrations of CVOCs appear to be declining in part due to natural attenuation, this could also be attributed to the point in the tidal cycle during which the samples were collected. Further sampling is necessary to identify consistent trends during both high and low tides, and to identify an effective long-term management strategy for residual contaminants. In addition, chloride concentrations may not be indicative of groundwater quality as related to the natural attenuation process due to the natural salinity of the groundwater. The MNA parameters analyte list should be supplemented with methane, ethane, and ethene to better understand natural attenuation at the site.

Groundwater monitoring for CVOCs at the site has been completed twice annually for the last three years; groundwater samples from the site monitoring wells have been analyzed for MNA parameters three times up to the end of this reporting period. It is recommended that biannual monitoring for VOCs and annual monitoring for MNA parameters be completed for an additional two years before evaluating for the need for additional groundwater treatment.

5.2 INDOOR AIR MONITORING

Onsite indoor and outdoor air monitoring was completed in November 2014 and should continue during the next monitoring period to support continued operation of the SSDS at the site office building, and ensure the system is providing adequate mitigation for vapor intrusion.

5.3 SITE INSPECTION AND MAINTENANCE

5.3.1 Site Cover

The site cover system and surrounding areas were observed to be in good condition with minimal damage during the inspections. Although some minor areas exist where the cover material has been punctured due to ongoing site activities, the damage does not pose a threat to human health.

5.3.2 Sub-Slab Depressurization Systems

The warehouse's SSDS system will remain out of operation as long as building use does not change. Due to repairs that were completed in April and May 2014, the office system is fully functioning and is to remain in operation.

5.4 SUMMARY

The following actions are recommended:

- Site management tasks should continue. This includes semi-annual site inspections and groundwater sampling. The first site inspection and groundwater sampling event of the next reporting period (November 2015 – November 2016) was completed in November 2015. The next inspection and groundwater sampling event is scheduled for June 2015.

- Addition of methane, ethene, and ethane to the MNA parameter list is recommended. Due to the natural salinity of the aquifer (tidally influenced) chloride concentrations may not be an accurate indicator of the potential for natural attenuation within the aquifer.

- Sweeping of permeable pavement should be completed annually.

6. REFERENCES

EA Engineering, P.C., and Its Affiliate EA Science and Technology. 2014a. *SMP. Final.* Metal Etching Site, Nassau County, Freeport, New York. April.

——. 2014b. *Final Engineering Report. Final.* Metal Etching State Superfund Site, Nassau County, Freeport, New York. April.

Environmental Resource Management. 2007. *Remedial Investigation Report, Metal Etching Co. Inc. Site (NYSDEC Site No. 1-30-110).* Freeport, New York. January.

New York State Department of Environmental Conservation (NYSDEC). 1998. *Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.* June.

——. 2007. *Record of Decision, Metal Etching Site, Freeport, Nassau County, Site Number 130110.* March.

New York State Department of Health (NYSDOH). 2006. *Guidance for Evaluating Soil Vapor Intrusion in the State of New York. Division of Environmental Health Assessment, Center for Environmental Health.* October.