

**SECOND FIVE-YEAR REVIEW REPORT
GENZALE PLATING COMPANY SUPERFUND SITE
NASSAU COUNTY, NEW YORK**



Prepared by

**U.S. Environmental Protection Agency
Region 2
New York, New York**

September 30, 2015

Approved by:

Date:

**Walter E. Mugdan, Director
Emergency and Remedial Response Division**

Table of Contents

Executive Summary	iv
Five-Year Review Summary Form	v
Introduction.....	1
Site Chronology.....	1
Background	1
<i>Physical Characteristics</i>	<i>1</i>
<i>Site Geology/Hydrogeology.....</i>	<i>2</i>
<i>Land and Resource Use</i>	<i>2</i>
<i>History of Contamination and Initial Response.....</i>	<i>2</i>
<i>Basis for Taking Action.....</i>	<i>2</i>
Remedial Actions	2
<i>Remedy Selection</i>	<i>2</i>
<i>Remedy Implementation.....</i>	<i>4</i>
<i>System Operations/Maintenance and Monitoring</i>	<i>5</i>
Progress Since Last Five-Year Review	6
Five-Year Review Process	9
<i>Administrative Components</i>	<i>9</i>
<i>Community Involvement.....</i>	<i>9</i>
<i>Document Review.....</i>	<i>9</i>
<i>Data Review.....</i>	<i>9</i>
<i>Site Inspection.....</i>	<i>11</i>
<i>Interviews.....</i>	<i>11</i>
<i>Institutional Controls Verification.....</i>	<i>12</i>
Technical Assessment	12
<i>Question A: Is the remedy functioning as intended by the decision documents?</i>	<i>11</i>
<i>Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?.....</i>	<i>12</i>
<i>Question C: Has any other information come to light that could call into question the protectiveness of the remedy?</i>	<i>12</i>
<i>Technical Assessment Summary</i>	<i>13</i>
Issues, Recommendations and Follow-Up Actions	14
Protectiveness Statement.....	14
Next Review	15

Tables	16
<i>Table 1: Chronology of Site Events</i>	<i>16</i>
<i>Table 2a: Remediation Goals for Soil (all concentrations in µg/kg).....</i>	<i>17</i>
<i>Table 3: Documents, Data and Information Reviewed in Completing the Five-Year Review .</i>	<i>17</i>
Attachments.....	17
<i>Attachment 1: Figure</i>	<i>18</i>
<i>Attachment 2: Data</i>	<i>21</i>

Executive Summary

This is the second Five-Year Review for the Genzale Plating Company Superfund site. The site is located in the Village of Franklin Square, Nassau County, New York. The remedy for the site included excavation of contaminated soils, treatment of soils contaminated with volatile organic compounds (VOCs) with soil vapor extraction (SVE) technology, and the extraction and treatment of groundwater contaminated with metals and VOCs.

Currently, the remedy is functioning as intended by the decision documents and protective of human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Genzale Plating Superfund Site		
EPA ID: NYD980651087		
Region: 2	State: NY	City/County: Franklin Square/Nassau
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA <i>[If “Other Federal Agency”, enter Agency name]:</i> Click here to enter text.		
Author name (Federal or State Project Manager): Kevin Willis		
Author affiliation: EPA		
Review period: 9/30/2010 - 9/17/2015		
Date of site inspection: 6/16/2015		
Type of review: Statutory		
Review number: 2		
Triggering action date: 8/30/2010		
Due date (five years after triggering action date): 8/30/2015		

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
01

Protectiveness Statement(s)		
<i>Operable Unit:</i> 1	<i>Protectiveness Determination:</i> Protective	<i>Addendum Due Date (if applicable):</i> Click here to enter a date.
<i>Protectiveness Statement:</i> The remedy for the first operable unit (OU1) is protective of human health and the environment.		

Sitewide Protectiveness Statement	
<i>Protectiveness Determination:</i> Protective	<i>Addendum Due Date (if applicable):</i> Click here to enter a date.
<i>Protectiveness Statement:</i> The remedy at the Genzale Plating Company site is protective for human health and the environment.	

Introduction

This is the second Five-Year Review for the Genzale Plating Superfund site, located in Franklin Square, Nassau County, New York. This review was conducted by United States Environmental Protection Agency (EPA) Remedial Project Manager (RPM), Kevin Willis, and EPA On-Scene Coordinator (OSC), Louis DiGuardia. The Five-Year Review was conducted pursuant to Section 121 (c) of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C. §9601 et seq., and 40 CFR 300.430(f)(4)(ii) and in accordance with the Comprehensive Five-Year Review Guidance, OSWER Directive 9355.7-03B-P (June 2001). The purpose of a Five-Year Review is to assure that implemented remedies are protective of human health and the environment and that they function as intended by the decision document(s). This report will become part of the site file.

This Five-Year Review is being conducted as a statutory review. In accordance with Section 1.3.3 of the Five-Year Review Guidance, a subsequent Five-Year Review is triggered by the signature date of the last review. The trigger for this second five-year review is August 2010, the approval date of the last review. A five-year review is required at the site because, upon completion, hazardous substances will remain on site at levels that do not allow for unlimited use and unrestricted exposure.

The site remediation was performed pursuant to an operable unit 1 (OU1) 1991 Record of Decision (ROD). This decision was updated and modified by a 2004 Explanation of Significant Differences (ESD), which built on the knowledge gathered during the ongoing remedial efforts. A ROD selecting no action for downgradient groundwater (OU2) was signed in 1995.

This Five-Year Review will address the OU1 source and groundwater remedy.

Site Chronology

See Table 1 for the site chronology.

Background

The Genzale Plating Company site is located at 228 New Hyde Park Road in Franklin Square, Nassau County, New York. The site lies immediately adjacent to New Hyde Park Road and Kalb Road to the west and east, respectively. Figure 1 provides a map of the area.

Physical Characteristics

The 0.6-acre Genzale Plating Company site was formerly a metal-plating facility, Genzale Plating, Inc. (Genzale Plating Company), which included an attached two-story office building and an undeveloped backyard area which served as a parking lot and storage area. Beginning in 1915 and operating through 2000, the facility electroplated small products such as automobile antennas, parts of ball point pens, and bottle openers, and is known to have discharged wastewater containing heavy metals as well as organic contaminants into four sub-surface leaching pits at the rear of the facility. These releases resulted in the contamination of the shallow aquifer (the Upper Glacial

Aquifer) beneath the property. The predominant land use in the vicinity of the site is residential. All drinking water within the area is provided by the Franklin Square Water District. The only source of drinking water for residences in the Town is groundwater. All public water supply wells in the vicinity of the site area draw water from the deeper aquifer (the Magothy Aquifer). Public water supply wells that serve the residents near the site are located within approximately one mile and are not impacted by the site.

Site Geology/Hydrogeology

The Genzale Plating Company site is located in the outwash plain on Long Island, New York. Approximately 500 feet of interbedded sands and limited clay lenses overlay Precambrian bedrock. There are three aquifers that exist beneath the site, two of which are affected. The Upper Glacial Aquifer is the surficial unit which overlies the Magothy Aquifer, which in turn overlies the Lloyd Aquifer. The Magothy Aquifer is the primary source for public water in the area. No impeding clays were observed between the Upper Glacial and Magothy Aquifers within the study area.

Land and Resource Use

The site property is designated commercial, though the surrounding properties in the vicinity of the site are zoned as residential. The Genzale Company closed in 2000 and the facility was subsequently demolished.

History of Contamination and Initial Response

Although the facility was connected to the municipal sewer system in 1955, a 1981 Nassau County Department of Health (NCDH) inspection found that industrial wastewater continued to be discharged into several on-site leaching pits. The company was ordered by NCDH to cease the discharge and began, but never completed, the excavation of sludge and contaminated soils from the pits. The New York State Department of Environmental Conservation (NYSDEC) conducted an investigation of the site in 1983 to determine the potential threat to public health posed by potential migration of contaminants into and through the groundwater. As a result of this investigation, the site was included on the Superfund National Priorities List on July 22, 1987.

Basis for Taking Action

In 1988, EPA initiated a Remedial Investigation to determine the nature and extent of contamination at the site. The study indicated that groundwater and leaching pits located behind the facility were contaminated with both inorganic and organic contaminants. These areas of the site posed a threat to human health and the environment because of risk from possible ingestion, inhalation, or dermal contact with the soils and/or groundwater. Chemicals of concern were identified in the ROD for the soil and groundwater. The chemicals of concern in the soil are cadmium, chromium, nickel, barium, lead, copper, arsenic, trichloroethene (TCE), bis (2-ethylhexyl) phthalate, and chrysene. The chemicals of concern in the groundwater are TCE, 1,1,1-trichloroethane, 1,1-dichloroethene, tetrachloroethene (PCE), cadmium, chromium, copper, lead, and nickel. An ecological risk assessment was not conducted to support the OU1 or OU2 ROD.

Remedial Actions

Remedy Selection

OU1

In June 1991, EPA selected a remedy for the on-site soil and groundwater. The selected remedy included:

- Soil vapor extraction to address organic contaminants in subsurface soils;
- Excavation of surface soils and leaching pits. Volume of soils to be excavated will be determined during the design;
- Extraction, treatment and reinjection of contaminated groundwater; and
- Investigate and determine the need for groundwater response actions downgradient of the site.

The goal of the soil remedy was to reduce direct exposure to contaminated soils and reduce contaminant concentrations to protect groundwater. The groundwater remedy was considered an interim action. .

The “Scope and Role of Response Action” section of the OU1 ROD notes that “although the results of the RI/FS indicate the need for an interim groundwater remedial action, EPA was unable to delineate the extent of the groundwater plume beyond the facility property. An additional investigation of the nature and extent of the plume will be initiated under a second operable unit. The purpose of this interim groundwater remedy is to work toward the overall goal of aquifer restoration, but it does not constitute the final action for groundwater. The ultimate goal of groundwater remediation will be determined in a final remedial action for this site.”

The “Selected Remedy” section of the OU1 ROD indicates “this interim ground-water remedial action will be monitored carefully to determine the feasibility of achieving this goal with this method and to ensure that hydraulic control of the contaminated plume is maintained. After the period of time necessary, in EPA's judgment, in order to arrive at a final decision for the site, a final ROD for groundwater, which specifies the ultimate goal, remedy and anticipated remediation timeframe, will be prepared. Upon completion of the second operable unit RI/FS, this interim system may be incorporated into the design of the site remedy specified in the final action groundwater ROD”.

OU2

In September 1995, EPA signed a ROD for the downgradient groundwater plume. Based on the planned groundwater containment activities planned for the on-site groundwater and the relatively lower concentrations of contaminants downgradient, EPA determined that no action was necessary for the downgradient groundwater.

As stated in the 1991 ROD, the ultimate remedial goals would be determined following the completion of the RI/FS and remedy selection for OU2. However, the OU2 ROD did not clearly

define the ultimate goals for the groundwater cleanup across the entire site. EPA will be preparing a document which will clearly identify the remediation goals for the groundwater remediation currently operating at the site. This document will include a discussion of the basis for taking action identified in the 1991 ROD and will clearly establish remediation goals and state and federal drinking water standards as the specific cleanup numbers for the remaining contaminants of concern in the groundwater at the Genzale property, which are 1,1,1-trichloroethane, TCE, nickel and chromium.

Remedy Implementation:

The soils in the rear portion of the facility property were addressed by treatment by SVE technology for the VOC contamination, followed by excavation and off-site treatment and disposal of those soils contaminated with metals. EPA entered into an Interagency Agreement with the United States Army Corps of Engineers (USACE) to perform the soil remedy.

Construction activities for the SVE unit were completed in July 1995. After approximately one year of operation, in May 1996, confirmatory soil sampling established that the soils had reached cleanup levels of 1 part per million (ppm) for the VOCs and the unit was shut down and dismantled.

In June 1997, the USACE performed comprehensive sampling of the soils in order to delineate the metal contamination. It was determined that the rear portion of the Genzale property was contaminated with chromium, nickel, and cadmium above risk-based standards, particularly in the areas of the former leaching pits. A work plan was developed which stated all soils above 50 ppm of total chromium and nickel would be excavated.

Excavation of the contaminated soils began in August 1997. An area which measured 20 feet by 50 feet, which encompassed the former leaching pits, was excavated to a depth of 10'; the excavation was extended to a depth of 15 feet since it was determined that the contaminated soils under these pits extended to a greater depth. The 50 ppm concentration levels were confirmed at the excavation limits and the excavated areas were backfilled to grade. Approximately 1,100 tons of hazardous and 4,425 tons of nonhazardous soils were excavated and shipped off-site for disposal. This first action to excavate the contaminated soils was completed in the fall of 1997.

Immediately following the excavation of the site, new monitoring wells were installed to sample the aquifer beneath the property. Analysis of the groundwater showed that the soil remediation had positively impacted the groundwater quality, but the residual contaminant levels observed still warranted the construction and operation of the groundwater extraction and treatment system selected in the 1991 ROD for the site.

Construction began in July 2005 and was completed in September 2005. The system is based on ion-exchange technology and was designed to address primarily the heavy metals contamination in groundwater. The system also employs an activated carbon scrubber to address residual VOC contamination.

In May 2000, the Genzale Plating Company facility ceased operations. The Company set aside funds for the decommissioning of the operational part of the site and the removal of the wastes

generated during the decommissioning. This action was completed by the Genzale Company. The wastes were sent off-site for disposal. These initial decommissioning activities were completed in June 2000.

Following the cessation of operations at the facility, EPA performed limited sampling of the soil and groundwater underlying the vacated plant building. Sampling results indicated soil concentrations for total chromium up to 82,000 ppm, hexavalent chromium up to 28,100 ppm, and PCE up to 16 ppm. Based on these sampling results, in September 2002, a time-critical removal action was approved which included the installation of an SVE system to reduce the concentrations of VOCs within the soils in areas with high concentrations and in areas adjacent to nearby homes.

In addition, because of the instability of the Genzale facility structures as it related to, among other things, the installation of the SVE extraction wells (i.e., limited ceiling height) and the need to further delineate the extent of contamination below the facility structure, demolition of the buildings was performed to the existing grade, leaving the process building's basement and footings in place.

In 2003, EPA conducted vapor intrusion sampling at the site and surrounding residences. EPA conducted subslab sampling and then, where appropriate, indoor air sampling. Based on the results of the subslab gas and indoor air concentrations, three homes were provided with stand-alone indoor air treatment units to address vapor intrusion concerns. In addition to the indoor air treatment systems, an SVE system, similar to the system installed in 1995 as part of the OU1 remedy, was installed at the site and operated until no rebound of contamination was observed. The SVE system was effective in removing the VOC contamination which had migrated into the adjacent homes. It operated continuously until the demolition of the remaining portion of the process building began in March 2005.

While sampling to evaluate the effectiveness of the SVE system was being conducted, an area of recalcitrant contamination was identified. Upon further investigation, a buried tank was located behind the former process building. In July 2004, an ESD was issued which called for the excavation of the buried tank.

Upon decommissioning of the SVE system, EPA remobilized to the site in February 2005 to remove the tank and the remaining building foundation. At this point, what was expected to be a tank was determined to be a water production well, which was then removed. Actual excavation efforts began in 2005. During the excavation of this water well, a dry well filled with plating wastes was discovered and excavated, which was the source of the recalcitrant contamination in this area. Another similar vessel was discovered under the process building. This was excavated; the wastes were treated and shipped off-site for disposal. The remainder of the process building was demolished and disposed of off-site. Concrete which was determined to be hazardous was segregated and shipped to a hazardous waste landfill for disposal. The nonhazardous concrete was disposed off-site as construction debris. Portions of the building foundation were left in place due to its proximity to an adjoining residential property and concerns that removal of the foundation could compromise the adjacent structures.

System Operations/Maintenance and Monitoring

The groundwater treatment facility was built and began operating in September 2005. The treatment system consists of an extraction well operating at approximately 40 gallons per minute (gpm), which goes through a micron bag filter unit, one 500 pound aqueous-phase carbon vessel, a series of cation and anion exchange resin vessels, and an additional 1,000 pound aqueous phase carbon vessel before discharging into the storm sewer and on-site re-injection.

Overall, since operation has begun, the treatment system has operated greater than 98% of the time with the exception of an occasional power outage or equipment breakdown (e.g., extraction pump). At this time, EPA contractor Environmental Restoration Inc. LLC, (ER) has been tasked to perform Long Term Response Action Support (LTRA) operations at the site. ER is conducting a soil stabilization pilot test which has currently temporarily shut down the P&T system while undergoing evaluation of its effectiveness.

To confirm continued efficient system operations, process monitoring is conducted weekly at multiple locations within the treatment train, i.e., influent from the extraction well(s), after the cation resin beds, after the anion resin beds, after the aqueous phase carbon vessel and effluent, to evaluate removal efficiencies and whether the system is meeting discharge limitations. All samples are field-screened for total chromium, hexavalent chromium, and nickel. Discharge monitoring is performed quarterly for Target Analyte List (TAL) metals, hexavalent chromium and Target Compound List (TCL) analysis.

The EPA RPM and OSC perform an annual audit of the treatment system which includes monitoring and evaluating treatment plant operations. The EPA Division of Environmental Science & Assessment (DESA) continues to support the site by providing annual groundwater monitoring of all site monitoring wells.

Following the annual groundwater sampling event, a Yearly Operations Report is prepared by ER which presents the groundwater data and evaluates the effectiveness of the groundwater treatment and extraction system in remediating the chromium, nickel and residual VOC plume.

Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the site.

Progress Since Last Five-Year Review

This is the second Five-Year Review for the site. The last Five-Year Review, completed in August 2010, concluded:

The remedy has been implemented and it has been determined that it is functioning as intended and remains fully protective in the short term for human health and the environment.

The Five-Year Review identified the following issues:

Issue #1: The site monitoring plan should be periodically reviewed and adjusted. The effectiveness of the groundwater extraction and treatment system should be analyzed and adjustments to the system should be made if warranted.

Status: Since 2010, a remedial system evaluation (RSE), which is discussed in more detail below, has been conducted at the site. Several modifications to the groundwater extraction and treatment system have been undertaken since then, and are now under review. Further opportunities to adjust the site monitoring plan await the outcome of these modifications.

Issue #2: A capture zone analysis should be performed to provide additional support for the determination that the groundwater capture system is working effectively.

Status: Due to the transition to new contracts and late obligation of funding for continued system operation, the system was shut-down from November 2010 until July 2011. During this time period when the groundwater extraction system was to undergo maintenance, EPA used this opportunity to perform rebound testing of the groundwater.

With the system shutdown, wells MW-15S and 3S, showed a concentration rebound to levels of 2,400 ppb and 1,700 ppb for total chromium and 2,400 ppb and 1,000 ppb for nickel, respectively. In addition, MW-15S has showed a residual concentration of VOCs, specifically TCE at 230 ppb. These wells are in close proximity or within the former leach pits of the Genzale Plating facility.

With the completion of site maintenance, EPA restarted the treatment system in December 2011, and retesting was performed on the following monitoring wells: MW-15S, MW-15D, MW-3S, MW-3D, MW-6S, MW-18R, MW-18S and MW-18D. Samples were also taken from extraction wells GPC-EXW-1 and EPA-EXW-2D. Analytical results on wells MW-15S, MW-15D, MW-3D, MW-6S, MW-18R, MW-18S and MW-18D indicated a continuation of groundwater levels at 100 ppb or less for total chromium and nickel. Monitoring well MW-3S groundwater concentration levels, with the system operating, continue to exhibit slightly elevated concentrations of chromium and nickel. This testing also confirmed the radius of capture of the operating system.

Issue #3: Groundwater remediation goals for site-related groundwater contamination must be clearly identified and incorporated into the site via a decision document.

Status: As is discussed in more detail below, since the 2010 Five-Year Review, several recommendations for improving system performance have been implemented. EPA is now in a position to prepare the decision document to clarify the remediation goals and to document any remedy technology changes, and anticipates that this document will be completed in 2016.

Issue #4: Implement institutional controls to prevent disturbance of soils 15 feet or more below the existing ground surface, as well as remaining portions of the former building

foundation.

Status: When the property was sold in 2011, the deed was updated to prevent disturbance of soils 15 feet or below the existing ground surface.

Additional Activities Conducted Since the Last Five-Year Review

Resin Performance Evaluation

In April 2011, ER was tasked to begin system-wide maintenance of the operating system, i.e., resin and carbon replacement, general house cleaning, etc. As part of this activity, ER was tasked with evaluating updated vendor performance data on resins available for chromium and nickel treatment. In addition, ER was tasked with evaluating other material available, i.e., specialty carbon, to pre-treat and extend the operating efficiency of the system resins.

In general, ER concluded that resin efficiency had increased slightly for chromium and remained the same for nickel, but information on available specialty carbon indicated that a new product, “APT-sorb”, was capable of treating and adsorbing a large volume of nickel before saturation and breakthrough. A bench-scale treatability test was performed by the vendor on Genzale influent water, which supported this supposition. Based upon this information, EPA approved a limited pilot test of 500 pounds of “APT-sorb” for site testing. At this time, system testing has confirmed that nickel removal capabilities have improved with this product, which has resulted in extended life and operating efficiency of system resins. This information is detailed in a Technical Memorandum, *Genzale Plating Superfund Site – Groundwater Treatment System Analysis, Resin Performance*, September 2011. EPA is working with the LTRA contractor to update the system requirements and anticipated frequency of resin change out.

Remedial System Evaluation

As a result of the rebound testing performed in April and July 2011, which indicated that residual contamination continued to be present in the area surrounding MW-15S and MW-3S, EPA performed a Remedial Site Evaluation (RSE) in early 2012, to evaluate options for targeting, optimizing and accelerating groundwater cleanup operations. This information is detailed in the Technical Memorandum, *Genzale Plating Superfund Site – Groundwater Treatment System Analysis, Remedial Site Evaluation, Optimization Update*, October 2012.

One of the recommendations of the RSE was to accelerate recovery of chromium and nickel contaminants by reinjecting “conditioned” (low pH) water into recalcitrant areas on-site (i.e., at MW-15S and 3S). Lowering the pH would mobilize metals that would then be captured by the pump and treat system. To implement this recommendation, EPA modified existing wells MW-18S, MW-18R and MW-18D (upgradient of MW-15S and MW-3S) for re-injection of low pH water from the treatment system at approximately 10 gpm (the injection capacity of the wells). This flushing action, which started in October 2013, was suggested to increase metals mass removal from within the contaminated area and to reduce site cleanup timeframes. Treatment system data, after the initiation of re-injection, has indicated a slow but gradual increase of chromium, nickel and TCE concentrations in the system influent. The flushing action continued

until the initiation of the in-situ stabilization pilot in April 2015. This information is detailed in a Technical Memorandum, *Genzale Plating Superfund Site – In-Situ Soil Flushing – Remediation Technology Analysis*, December 2012.

In addition to the soil flushing action recommended by the RSE, it was also suggested to modify and concentrate groundwater extraction from the recalcitrant wells MW-15S and MW-3S. In January 2013, submersible pumps with variable frequency drives to control extraction rates were installed in MW-15S and MW-3S to optimize groundwater recovery from these areas.

Monitoring of influent concentrations from these wells have indicated concentrations as high as 418 ppb for total chromium and 546 ppb for nickel with long-term pumping levels averaging at 321 ppb for chromium at MW-3S and 247 ppb for MW-15S, and nickel levels at MW-3S and MW-15S at 149 ppb and 403 ppb, respectively. Site data also indicated a correlation of higher nickel influent concentrations following a site rainfall event. This information is detailed in a Technical Memorandum, *Genzale Plating Superfund Site – Optimization Pilot – Modified Extraction – MW-3S & MW-15S*, December 2012.

In-situ Stabilization Pilot Study

In January 2015, after two years of optimizing extraction rates from these recalcitrant wells and reinjection of conditioned water, EPA evaluated additional options for *in-situ* stabilization and treatment of these remaining residual areas. As a result of this evaluation, EPA tasked ER to issue a Request for Quotation for a pilot, to treat residual contaminant areas in and around monitoring wells MW-3S, and MW15S for total chromium, nickel and TCE.

After careful evaluation and consideration of proposals, which included an evaluation of similar projects completed by the vendors, in April 2015, Redox Tech, LLC (Redox), was awarded the contract to perform the pilot. Redox proposed to introduce a proprietary formulation, Anaerobic Biochem Plus (ABC+) promoting anaerobic biodegradation and reductive dechlorination of halogenated solvents in groundwater. This product, ABC+, incorporates Zero Valent Iron (ZVI) which allows for the rapid and complete dechlorination of the target compounds (i.e., does not result in the formation of residual daughter products). ABC+, will last up to 12 to 24 months in the subsurface environment due to slow releasing compounds, allowing for long-term anaerobic biodegradation. In addition, by creating a reducing environment, ABC+ has the ability to provide long-term immobilization of heavy metals.

During the period April 7 to 9, 2015, Redox performed injection operations. In order to more directly target the contamination, the ABC+ solution was injected directly through a truck mounted Geoprobe. A total of eleven locations, nominally spaced within 5 to 7 feet of each other, were selected for injection of the ABC+ solution.

Approximately, 5,500 gallons of ABC+ was injected into these eleven locations using a total of 7,000 pounds of ABC+. The solution was pre-mixed using a hopper and poly tank on-site and then injected as a single mixture (20% weight. solution) using the truck mounted Geoprobe rig. Each injection location received approximately 500 gallons of ABC+ solution divided up between depth intervals of 30, 33, 36, 39, and 42 feet below ground surface. The specified amount of solution was injected through a sacrificial tip at the bottom of the Geoprobe rods.

After each injection point was completed, it was sealed with bentonite.

Operation of the pump and treat system ceased during this injection event and for a 6-month period following injection in order to perform treatment and to allow the material time to work. As part of this *in-situ* pilot study and in order to evaluate the effect of this injection event, a site monitoring program is being conducted at MW-3S, MW-15S and select, surrounding wells on a monthly basis. Monitoring began in June 2015. Samples will be field-screened for total chromium, hexavalent chromium, and nickel, with select samples analyzed for TAL metals, hexavalent chromium and TCL organics. The injection vendor recommended, based upon monitoring data, that the P&T system remain temporarily off for continued evaluation. It is anticipated that the system will be re-started in October 2015.

Five-Year Review Process

Administrative Components

The EPA Five-Year Review team consisted of Kevin Willis (RPM), Louis DiGuardia (OSC), Marian Olsen (Human Health Risk Assessor), Mindy Pensak (Ecological Risk Assessor), Cecilia Echols (Community Involvement Coordinator), and Robert Alvey (Hydrogeologist).

Community Involvement

The EPA Community Involvement Coordinator (CIC) for the Genzale Plating site, Cecilia Echols, published a notice on May 26, 2015, notifying the community of the initiation of the Second Five-Year Review process. The notice indicated that EPA would be conducting a Second Five-Year Review of the remedy for the site to ensure that the implemented remedy remains protective of human health and is functioning as designed. It was also indicated that once the second Five-Year Review is completed, the results will be made available in the local site repositories.

Document Review

The documents, data, and information which were reviewed in completing the, Second Five-Year Review are summarized in Table 2.

Data Review

At the time of remedy selection, the main groundwater contaminants of concern at the site were TCE, 1,1,1-TCA, 1,1-dichloroethene, PCE, cadmium, chromium, copper, lead and nickel.

Groundwater monitoring has been conducted for site-wide monitoring wells and extraction wells and analyzed for groundwater contaminants, including hexavalent chromium, to determine the extent of the plume and the progress of the remediation. In addition, groundwater elevations are measured in all monitoring wells and extraction wells to evaluate the capture zone of the extraction field. A capture zone analysis confirmed containment and control of the on-site contamination source (see Figure 3).

Over the last 10 years and since the start of the pump and treat system in September 2005, there has been a reduction in the extent of the plume exceeding the state or federal drinking water standards of 100 ppb total chromium, 100 ppb nickel, and 5 ppb TCE. With the exception of on-site wells MW-15S and MW-3S, and off-site well MW-6S, all other monitoring wells show nickel and chromium concentrations of less than 100 ppb. Historical information indicates that these on-site wells are in close proximity of or within the former leach pits of the Genzale Plating facility. Figure 3 presents a total chromium and nickel isoconcentration map, which demonstrates the reduction in size of the plume.

The latest February 2015 system sampling event show elevated levels of total chromium at MW-3S and MW-15S at 421 ppb and 473 ppb, respectively. Hexavalent chromium has shown an increase at MW-3S and MW-15S at 317 ppb and 332 ppb, respectively. These levels have increased over the last five years. The increases are attributed to the targeted reinjection and flushing action of the low pH solution which began in October 2012.

It should be noted that elevated concentrations of cadmium (up to 17 ppb), copper (up to 520 ppb) and nickel (up to 580 ppb) are also found at MW-3S and MW-15S during the June 2014 sampling event, which is attributed to the targeted re-injection and flushing action of the low pH solution which began in October 2012 and targeted extraction from these wells. No other monitoring wells exceeded MCLs for any contaminants.

From January 2015 to April 2015, EPA conducted a pilot study by injecting a proprietary reducing agent, ABC+, to immobilize heavy metals in the suspected subsurface soil source area. With the completion of this *in-situ* injection pilot in April 2015, early post-injection sampling was performed in June 2015 which indicated a substantial reduction in inorganic contaminant concentrations in MW-3S and MW-6S to 12 ppb and 70 ppb for total chromium and 94 ppb and 5U ppb for nickel, respectively. This early sampling results for MW-15S has shown an increase of both total chromium and nickel with concentrations of 1,300 ppb and 1,100 ppb, respectively. Monitoring will continue to be performed in order to evaluate the long-term impact of the injection event.

Site Inspection

A site inspection was conducted on May 22, 2015. The following parties were in attendance:

Kevin Willis, EPA, RPM
Louis DiGuardia, EPA, On-Scene Coordinator

During the inspection it was noted that the new property owner uses the back portion of the property to store construction equipment. Their operation does not impact the on-going remediation.

Institutional Controls Verification

In addition to documenting the need to address additional areas of contamination, the 2004 ESD also noted that "institutional controls may need to be established to ensure that soil contamination left at the site, if any remains, is undisturbed and inaccessible." After issuance of the ESD, institutional controls (ICs) were put in place to address the potential for disturbance of subsurface soils and remaining building foundations, as well as other limited contamination that may be present in other soils at depth on the site. The IC states that future excavation at the site must be limited to a depth of less than 15 feet below the existing ground surface, and which prevents disturbance of the remaining portions of the facility foundation has been implemented through an updated deed notice in 2011, after the property was sold. Although not a component of the remedy, drinking water withdrawal in the area is restricted by state law.

Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The ROD, as modified by the ESD called for, among other actions, soil vapor extraction, excavation of soils, and extraction and treatment of contaminated groundwater. The property is zoned commercial. The removal of majority of contaminated building materials and soils to 15 feet has interrupted potential exposures from direct contact with the soils. At the current time, the property is fenced to prevent potential access to the site. An IC is in place which states that future excavation at the site must be limited to a depth of less than 15 feet below the existing ground surface and which prevents disturbance of the remaining portions of the facility foundation.

The pump and treat remedial action is currently not operating to allow for post-*in-situ* stabilization pilot studies to be evaluated. To date, the pump and treat system has been successful in extracting and treating organic and inorganic contaminants. The plume extent is now limited to two on-site source area monitoring wells and one downgradient well. In order to expedite groundwater restoration, pilot studies have been conducted in the areas of the former source areas (MW-15S and MW-3S). Activities have included the reinjection of low pH water to mobilize residual metals in soils and, most recently, the application of a reducing agent (ABC+) to immobilize residual metal contamination in the source area. Groundwater monitoring will continue to evaluate efficacy of the pilot studies, necessity of reinstituting the pump and treat system, and ultimately demonstrating restoration of the aquifer to beneficial use.

Although the selected remedy did not select ICs preventing groundwater use, at the current time, all residents obtain potable water from the Nassau County Water District.

In addition, restrictions currently exist on the use of the aquifer immediately underlying the site for drinking water. New York State law restricts to a large degree the future use of groundwater at this site. New York Environmental Conservation Law Section 15-527 provides that on Long Island (which includes Nassau County):

“No person or public corporation shall hereafter install or operate any new or additional wells...to withdraw water from underground sources for any purpose or purposes whatsoever where the installed pumping capacity of any such new well or wells singly or in the aggregate, or the total installed pumping capacity of old and new wells on or for use on one property is in excess of forty-five gallons a minute without a permit pursuant to this title.”

Furthermore, the New York Sanitary Code (Title 10 of the New York Code of Rules and Regulations Section 5-2.4) states that

“No person shall construct or abandon any water well unless a permit has first been secured from the permit issuing official.”

Question B: Are the (a) exposure assumptions, (b) toxicity data, (c) cleanup levels and (d) remedial action objectives used at the time of the remedy still valid?

The exposure assumptions, toxicity data, cleanup levels and remedial action objectives used at the time of the remedy remain valid.

Soil. The exposure assessment considered industrial use under the current conditions and residential use under future conditions. Removal of the contaminated soils down to 15 feet has removed the potential for direct contact with the soils provided that future construction does not occur at the site which results in disturbance of potentially contaminated soils 15 feet below the existing ground surface. Other toxicity data and the remedial action objectives have not changed; however, EPA’s Integrated Risk Information System (IRIS) program has updated the toxicity values for TCE and PCE. These changes have not changed the protectiveness of the remedy for human health and the environment. In addition, IRIS is re-evaluating the toxicity of chromium and when this value is updated, the impacts will be evaluated in future Five-Year Reviews.

Groundwater. The evaluation of groundwater focused on two primary exposure pathways -direct ingestion of groundwater as a potable water source, and potential vapor intrusion. The evaluation of current groundwater use showed that all residents are receiving public water from the Franklin Square Water District municipal supply which is screened in the deeper Magothy Aquifer. The public water supply wells are approximately one mile from the site and have not been impacted. As noted above, the final groundwater remediation goals will be clearly documented for the site in a future decision document. The IRIS toxicity values for TCE and PCE have been updated; however the MCL is valid. EPA has not selected a final remedial goal for the groundwater at the site. When the ROD is updated, the cleanup levels for groundwater contaminants of concern will be selected to ensure protective levels for future users of groundwater for potable use.

Vapor Intrusion. In 2003, subslab gas sampling was conducted along with indoor air sampling. Based on the results of this analysis, three homes were temporarily provided with individual indoor air carbon filtration systems to address vapor intrusion concerns. With the implementation of the supplementary SVE remediation (2004-2005), resampling of residential homes indicated no detections for all indoor air samples for site-related contaminants.

The IRIS toxicity value for TCE was updated, but the vapor values (non-detect) are below screening levels, so no further actions are required.

Ecological Risk Assessment. Based on a review of existing data, there are no potential exposure pathways for ecological receptors at the Site. As noted in the OU2 ROD the only potential route of exposure to wildlife is by contaminant transport through the groundwater and discharge via groundwater into surface waters. The nearest surface water bodies to the Site are 3.2 miles southwest and 3 miles southeast at Valley Stream State Park and Hempstead Lake State Park, respectively. Based on the results of the RI, impacts to ecological receptors from contamination associated with the Site are unlikely.

The Genzale Plating site itself is less than 1 acre in size and is located in a highly developed area. The entire Genzale Plating property has no surface water bodies upon it. The depth to groundwater at the site) is approximately 50 feet and groundwater is unlikely to affect any surface water bodies.

Question C. Has any other information come to light that could call into question the protectiveness of the remedy?

No.

Technical Assessment Summary

The remedy was designed to remove contaminated soil, to control migration of contaminated groundwater, and to treat groundwater contamination. Currently, the soil exposure pathways for human health have been eliminated, and the groundwater pathway is not complete because the drinking water for residents in the area (municipal water) is a significant distance from the site and drawn from the Magothy unit, a deeper aquifer unaffected by the site. Groundwater contamination is still present at two on-site monitoring wells and one off-site well. EPA is evaluating the results of an *in-situ* treatment effort which that was designed to eliminate the remaining residual contamination at the site. Given the progress observed so far, the remedy is functioning as intended.

Issues, Recommendations and Follow-Up Actions

This Five-Year Review did not identify any issues that impact current or future protectiveness.

This report includes suggestions for improving, modifying, and/or adjusting ongoing site activities.

- Groundwater remediation goals, and the changes from the technologies selected in the 1991 ROD, need to be incorporated into a final groundwater decision document.
- With the completion of the *in-situ* injection pilot study in April 2015, EPA plans to continue to monitor groundwater to evaluate efficacy of this pilot study.
- EPA will evaluate whether the currently suspended pump and treat system should be

restarted, or whether the *in-situ* (pilot study) injections are sufficient.

- Based on future sampling results for site contaminants in MW-6S and efficacy of the *in-situ* stabilization pilot study, EPA will evaluate the need for additional *in-situ* stabilization activities in the vicinity of this well.

Protectiveness Statement

Protectiveness Statement(s)		
<i>Operable Unit:</i> 01	<i>Protectiveness Determination:</i> Protective	<i>Addendum Due Date (if applicable):</i> Click here to enter a date.
<i>Protectiveness Statement:</i> The OU1 remedy is protective of human health and the environment.		
Sitewide Protectiveness Statement		
<i>Protectiveness Determination:</i> Protective.		<i>Addendum Due Date (if applicable):</i> Click here to enter a date.
<i>Protectiveness Statement:</i> The remedy at the Genzale Plating Company site is protective of human health and the environment.		

Next Review

The next Five-Year Review for the Genzale Plating site is required five years from the completion date of this review.

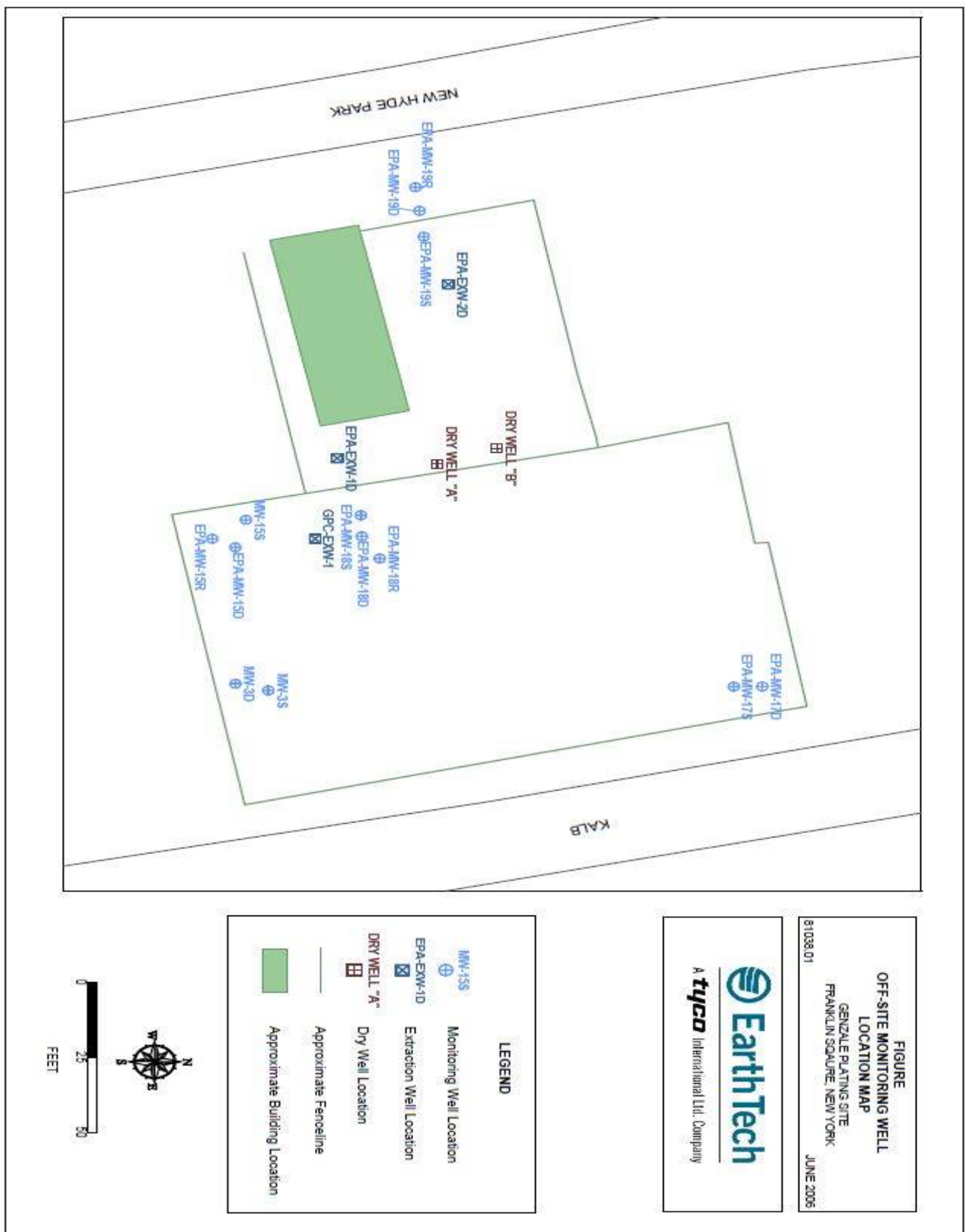
Tables

Table 1 : Chronology of Site Events	
Event	Date
Listing on National Priorities List	July 1987
ROD for OU1 Signed	September 1991
Initial Site Mobilization	April 1995
Completion of Initial SVE and Soils Excavation	September 1997
OU2 Investigation Starts	March 1993
OU2 Record of Decision Signed	September 1995
Building Demolition Begins	May 2003
Installation of Second SVE System	June 2003
Issuance of Explanation of Significant Differences	July 2004
Complete Building Demolition/Soil Excavation	June 2005
Complete Groundwater Treatment Plant Construction	September 2005
Final Inspection with EPA and NYSDEC of Completed RA	September 28, 2005
Final Inspection of Operational Groundwater Extraction & Treatment System	September 26, 2006
Groundwater Extraction & Treatment System - Operating	Sept. 2006 - Present
Evaluation Reporting – Resin Performance Analysis	September 2011
Evaluation Reporting - Remedial Site Evaluation, Optimization	October 2012
Evaluation Reporting – In-Situ Soil Flushing	Dec. 2012 - Present
Evaluation Reporting - Optimization Pilot – Modified Extraction	Dec. 2012 - Present

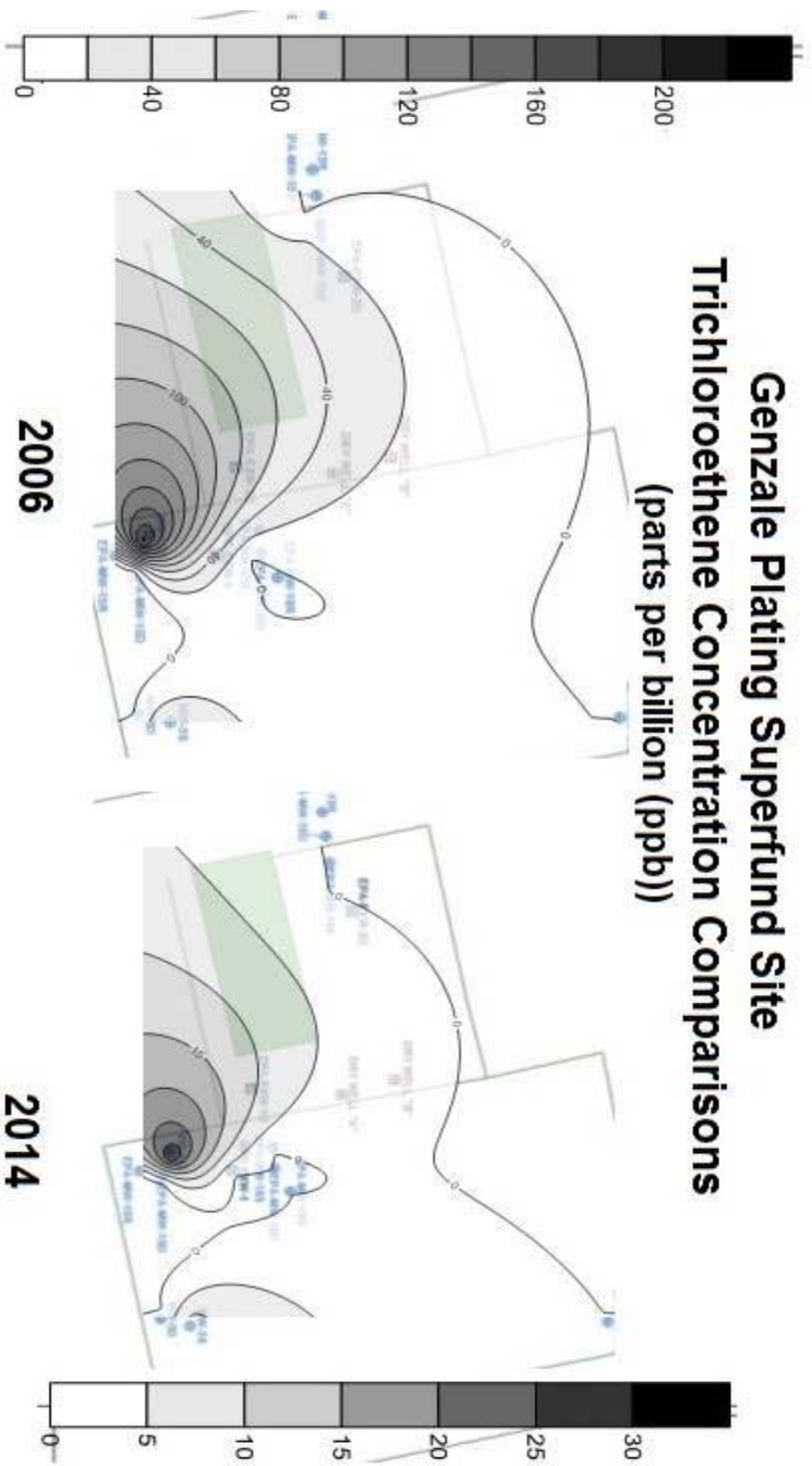
Table 2: Remediation Goals for Soil (all concentrations in µg/kg) From the 1991 ROD			
Contaminants of Concern	Soil - Protection of Groundwater	Human Health Risk	Remediation Goals
cis-1,2-Dichloroethene	500	-	500
Tetrachloroethene (PCE)	1,000	100,000	1,000
Trichloroethene (TCE)	500	-	500
Vinyl chloride	500	-	500

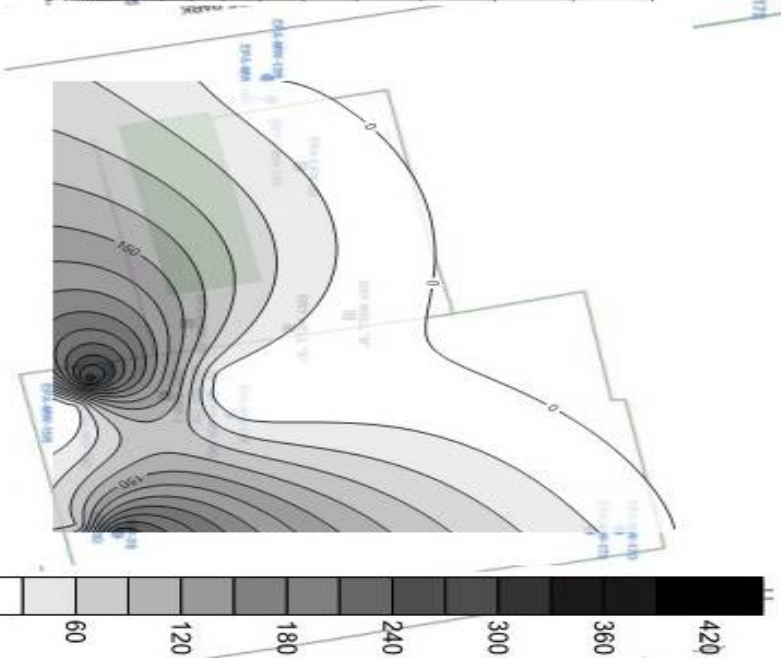
Table 3: Documents, Data and Information Reviewed in Completing the Five-Year Review		
Table 2 : Documents Reviewed		
Author	Date	Title/Description
EPA	03/29/1991	OU1 Record of Decision
EPA	09/29/1995	OU2 Record of Decision
EPA	07/23/2004	Explanation of Significant Differences
EPA	2005-2009	Results of Annual Groundwater Sampling; DESA; 2005-2014
EPA	09/2011	Technical Memo – Resin Performance Analysis
EPA	10/2012	Technical Memo - Remedial Site Evaluation, Optimization Update
EPA	12/2012	Technical Memo – In-Situ Soil Flushing
EPA	12/2012	Technical Memo - Optimization Pilot – Modified Extraction

Attachment 1: Figures



Genzale Plating Superfund Site Trichloroethene Concentration Comparisons (parts per billion (ppb))





Attachment 2: Data (optional)

**GENZALE PLATING WELL SAMPLING RESULTS 2011-15
LONG TERM REMEDIAL ACTION**

Well MW-15S	Contaminants (µg/L)				
Date	TCE	PCE	Total Cr	Hex Cr	Ni
7/12/2011* ¹	230	13	2400	2200	2400
12/13/2011**	U	U	59.7	U	70.6
4/17/2012*	U	U	71	53	100
3/14/2013**	29	1.8	235	230	394
4/18/2013**	37	2.6	297	300	422
6/25/2013*	NS	NS	NS	NS	NS
10/7/2013**	24	1.2	393	262	346
2/12/2014**	17.7	0.96	188	210	320
5/5/2014**	35	2.4	418	375	546
6/25/2014*	19	U	400	400	390
2/4/2015**	34.7	2.1	473	332	616
6/16/2015 ^{2*}	55	U	1300	1300	1100

¹- Extraction well had been off for extended period of time (rebound effect)

²- **Yellow Highlight denotes** Post ABC+ Injection Sampling; Increase in Total Cr is a result of the ongoing chemical reaction from the post ABC+ Injection

*-DESA GW Sampling Event

**- ERRS System Sampling

NS- Not sampled

Well MW-15R	Contaminants (µg/L)				
Date	TCE	PCE	Total Cr	Hex Cr	Ni
7/12/2011 ¹ *	U / U	U / U	15 / 15	13 / 15	69 / 70
12/13/2011**	NS	NS	NS	NS	NS
4/17/2012*	U	U	33	17	190
3/14/2013**	NS	NS	NS	NS	NS
4/18/2013**	NS	NS	NS	NS	NS
6/25/2013*	U	U	13	U	52
10/7/2013**	NS	NS	NS	NS	NS
2/12/2014**	NS	NS	NS	NS	NS
5/5/2014**	NS	NS	NS	NS	NS
6/24/2014*	U	U	17	13	55
2/4/2015**	NS	NS	NS	NS	NS
6/16/2015*	U	U	12	11	54

¹- Duplicate sample taken of this well

*-DESA GW Sampling Event

**-ERRS System Sampling Event

Yellow Highlight denotes Post ABC+ Injection Sampling

NS- Not Sampled

Well MW-15D	Contaminants (µg/L)				
Date	TCE	PCE	Total Cr	Hex Cr	Ni
7/12/2011*	U	U	23	18	U
12/13/2011**	U	U	12.9	U	U
4/17/2012*	U	U	17	U	U
3/14/2013**	NS	NS	NS	NS	NS
4/18/2013**	NS	NS	NS	NS	NS
6/25/2013*	U	U	19	U	U
10/7/2013**	NS	NS	NS	NS	NS
2/12/2014**	NS	NS	NS	NS	NS
5/5/2014**	NS	NS	NS	NS	NS
6/24/2014*	U	U	22	13	U
2/4/2015**	NS	NS	NS	NS	NS
6/16/2015*	U	U	20	U	U

*-DESA GW Sampling Event

**-ERRS GW Sampling Event

Yellow Highlight denotes Post ABC+ Injection Sampling

NS- Not Sampled

Well MW-18S	Contaminants (µg/L)				
Date	TCE	PCE	Total Cr	Hex Cr	Ni
7/12/2011 ^{*1}	U	U	150	130	150
12/13/2011**	U	U	15.1	U	U
4/17/2012*	NS	NS	NS	NS	NS
3/14/2013**	NS	NS	NS	NS	NS
4/18/2013**	NS	NS	NS	NS	NS
6/25/2013*	NS	NS	NS	NS	NS
10/7/2013**	NS	NS	NS	NS	NS
2/12/2014**	NS	NS	NS	NS	NS
5/5/2014**	NS	NS	NS	NS	NS
6/25/2014*	NS	NS	NS	NS	NS
2/4/2015**	NS	NS	NS	NS	NS
6/16/2015*	U	U	410	430	41

¹-Extraction well had been off for extended period of time (rebound effect)

*-DESA GW Sampling Event

** - ERRS GW Sampling

MW-18S was used as a re-injection well during the system optimization study (no samples could be taken from 2012-14)

Yellow Highlight denotes Post ABC+ Injection Sampling

NS- Not Sampled

Well MW-18R	Contaminants (µg/L)				
Date	TCE	PCE	Total Cr	Hex Cr	Ni
7/12/2011 ^{*1}	U	U	70	62	30
12/13/2011**	U	U	22.7	U	27
4/17/2012*	NS	NS	NS	NS	NS
3/14/2013**	NS	NS	NS	NS	NS
4/18/2013**	NS	NS	NS	NS	NS
6/25/2013*	NS	NS	NS	NS	NS
10/7/2013**	NS	NS	NS	NS	NS
2/12/2014**	NS	NS	NS	NS	NS
5/5/2014**	NS	NS	NS	NS	NS
6/25/2014*	NS	NS	NS	NS	NS
2/4/2015**	NS	NS	NS	NS	NS
6/16/2015	U	U	31	19	44

¹-Extraction well had been off for extended period of time (rebound effect)

*-DESA GW Sampling Event

** - ERRS GW Sampling

MW-18R was used as a re-injection well during the system optimization study (no samples could be taken from 2012-14)

Yellow Highlight denotes Post ABC+ Injection Sampling

NS- Not Sampled

Well MW-3S	Contaminants (µg/L)				
Date	TCE	PCE	Total Cr	Hex Cr	Ni
7/12/2011 ^{*1}	23	U	1700	2100	1000
12/14/2011**	U	U	1220	70	20.7
4/17/2012*	U	U	4200	U	150
3/14/2013**	5.4	U	194	200	157
4/18/2013**	5.0	U	199	180	130
6/25/2013*	NS	NS	NS	NS	NS
10/7/2013**	5.4	0.61	168	114	185
2/12/2014**	5.3	0.7	180	180	115
5/5/2014**	11	U	364	316	121
6/25/2014*	9.6	U	380	370	190
2/4/2015**	10	1.6	421	317	170
6/16/2015	U	U	12	U	94

¹- Extraction well had been off for extended period of time (rebound effect)

Yellow Highlight denotes Post ABC+ Injection Sampling

*-DESA GW Sampling Event

** - ERRS System Sampling

NS- Not Sampled

Well MW-3D	Contaminants (µg/L)				
Date	TCE	PCE	Total Cr	Hex Cr	Ni
7/12/2011 ¹	U	U	150	12	28
12/14/2011**	U	U	207	U	27.8
4/17/2012*	U	U	36	U	34
3/14/2013**	NS	NS	NS	NS	NS
4/18/2013**	NS	NS	NS	NS	NS
6/25/2013*	U	U	91	U	160
10/7/2013**	NS	NS	NS	NS	NS
2/12/2014**	NS	NS	NS	NS	NS
5/5/2014**	NS	NS	NS	NS	NS
6/24/2014*	U	U	25	U	44
2/4/2015**	NS	NS	NS	NS	NS
6/16/2015*	NS	NS	NS	NS	NS

¹-Extraction well had been off for extended period of time (rebound effect)

*-DESA GW Sampling Event

** -ERRS GW Sampling Event

NS- Not Sampled

GPC-EXW-1	Contaminants (µg/L)				
Date	TCE	PCE	Total Cr	Hex Cr	Ni
4/26/2011** ¹	U	U	476	430	597
7/12/2011*	NS	NS	NS	NS	NS
12/12/2011**	U	U	122	110	401
4/16/2012*	U	U	64	55	180
3/14/2013**	NS	NS	NS	NS	NS
4/18/2013**	NS	NS	NS	NS	NS
6/25/2013*	NS	NS	NS	NS	NS
10/7/2013**	NS	NS	NS	NS	NS
2/12/2014**	NS	NS	NS	NS	NS
5/5/2014**	NS	NS	NS	NS	NS
6/25/2014*	NS	NS	NS	NS	NS
2/4/2015**	NS	NS	NS	NS	NS
6/17/2015*	23	U	700	770	270

¹-Extraction well turned on for grab sample after being off for months (rebound effect)

*-DESA GW Sampling Event

** -ERRS GW Sampling Event

Yellow Highlight denotes Post ABC+ Injection Sampling

NS- Not Sampled

Well MW-6S	Contaminants (µg/L)				
Date	TCE	PCE	Total Cr	Hex Cr	Ni
7/13/2011* ¹	U	U	2400	U	51
12/12/2011** ²	U / U	U / U	248 / 320	U / U	16.6 / 18.7
4/18/2012*	U	U	450	U	23
3/14/2013**	NS	NS	NS	NS	NS
4/18/2013**	NS	NS	NS	NS	NS
6/27/2013*	U	U	190	19	U
10/7/2013**	NS	NS	NS	NS	NS
2/12/2014**	NS	NS	NS	NS	NS
5/5/2014**	NS	NS	NS	NS	NS
6/24/2014*	U	U	230	13	U
2/4/2015**	NS	NS	NS	NS	NS
6/18/2015*	U	U	70	U	U

¹-Extraction well had been off for extended period of time (rebound effect)

²- Duplicate sample taken of this well

*-DESA GW Sampling Event

**-ERRS GW Sampling Event

Yellow Highlight denotes Post ABC+ Injection Sampling

NS- Not Sampled