

**Five-Year Review Report
NL Industries, Incorporated
Pedricktown, New Jersey**



**Prepared by:
United States Environmental Protection Agency
Region 2
New York, New York**

September 2008

Executive Summary

This is the third five-year review for the NL Industries, Inc. Superfund Site. The Site is located in Pedricktown, Salem County, New Jersey. The Site is being addressed in phases or operable units (OUs) as specified in the 1991 and 1994 Records of Decision (ROD). OU2 addressed slag and lead oxide piles, debris and contaminated surfaces, and standing water which were found to be significant and continual sources of contaminant migration from the Site. The OU2 remedial action was completed in 1995. OU1 addresses contaminated groundwater, soils and stream sediments at the Site. The soil and stream sediment portion of the remedy was completed in 2003; however, additional excavation of stream sediments is expected to take place in late 2008. The groundwater remedy has yet to be implemented and is currently under review.

This five-year review found that the remedies are functioning as intended by the decision documents, or will be once completed. Furthermore, the remedies will be protective of human health and the environment upon their completion.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name (from WasteLAN): NL Industries		
EPA ID (from WasteLAN): NJD061843249		
Region: 2	State: NJ	City/County: Pedricktown/Salem
SITE STATUS		
NPL status: <input checked="" type="checkbox"/> Final <input type="checkbox"/> Deleted <input type="checkbox"/> Other (specify)		
Remediation status (choose all that apply): <input type="checkbox"/> Under Construction <input checked="" type="checkbox"/> Constructed <input checked="" type="checkbox"/> Operating		
Multiple OUs?* <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Construction completion date: N/A	
Has site been put into reuse? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> N/A		
REVIEW STATUS		
Lead agency: <input checked="" type="checkbox"/> EPA <input type="checkbox"/> State <input type="checkbox"/> Tribe <input type="checkbox"/> Other Federal Agency		
Author name: Theresa Hwilka		
Author title: Remedial Project Manager	Author affiliation: EPA	
Review period:** 09/24/2003 to 06/30/2008		
Date(s) of site inspection: 04/24/2008		
Type of review: <input checked="" type="checkbox"/> Post-SARA <input type="checkbox"/> Pre-SARA <input type="checkbox"/> NPL-Removal only <input type="checkbox"/> Non-NPL Remedial Action Site <input type="checkbox"/> NPL State/Tribe-lead <input type="checkbox"/> Policy <input type="checkbox"/> Regional Discretion		
Review number: <input type="checkbox"/> 1 (first) <input type="checkbox"/> 2 (second) <input checked="" type="checkbox"/> 3 (third) <input type="checkbox"/> Other (specify)		
Triggering action: <input type="checkbox"/> Actual RA Onsite Construction at OU #____ <input type="checkbox"/> Actual RA Start at OU#____ <input type="checkbox"/> Construction Completion <input checked="" type="checkbox"/> Previous Five-Year Review Report <input type="checkbox"/> Other (specify)		
Triggering action date (from WasteLAN): 9/24/2003 (Previous Five-Year Review)		
Does the report include recommendation(s) and follow-up action(s)? <input checked="" type="checkbox"/> yes <input type="checkbox"/> no		

* ["OU" refers to operable unit.]

** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form (continued)

Issues, Recommendations, and Follow-Up Actions

There is one follow-up action required for the sediment component of the OU1 remedy. Please see the table in Section VIII for details.

Other Comments on Operation, Maintenance, Monitoring, and Institutional Controls

NL Industries, Inc. will continue to conduct routine operation and maintenance activities and adjustments to these activities will be made on an ongoing basis as needed.

Protectiveness Statement

The OU2 remedy at the NL Industries, Inc. Superfund Site has been fully implemented and is protective of human health and the environment. Implementation of the OU2 remedy has provided for the protection of public health and the environment through the removal of lead-bearing waste from the Site, thereby eliminating the possibility of exposure to this waste.

The OU1 remedy at the NL Industries, Inc. Superfund Site has yet to be fully implemented. The OU1 remedy will be protective of human health and the environment once fully implemented. The soil and sediment portions of the OU1 remedy were completed in July 2003. However, concentrations of lead above the OU1 sediment cleanup standard of 500 parts per million (ppm) were detected in the West Stream during biological monitoring activities in 2003 and 2004. An April 2008 sampling event was conducted along the West Stream and its banks to delineate the extent of the contamination such that the affected areas can be excavated. This work is expected to take place in late 2008.

With respect to the OU1 groundwater remedy, a reevaluation of the selected extraction and treatment remedy is underway. The Potentially Responsible Party (PRP) Group submitted a draft Focused Feasibility Study (FFS) to EPA in November 2007. The FFS presents a number of remedial alternatives for groundwater taking into account the groundwater contaminant trends since the source removal and technologies that were not readily available at the time of the 1994 Record of Decision. The FFS is currently being revised by the PRP Group based on EPA's comments and EPA expects to make a final determination with respect to the groundwater remedy in 2009. Upon approval and implementation of the selected remedial alternative, the remedy will be protective of human health and the environment in the long term. In the interim, residences along Benjamin Green Road located between Pennsgrove-Pedricktown Road and Route 130 remain on the public water supply and those properties located north of the Site have been periodically monitored to ensure that site-related contaminants have not impacted their drinking water. Therefore, short-term protectiveness of human health and the environment is achieved through restricted use of groundwater wells and periodic monitoring.

I. Introduction

This five-year review was conducted by Theresa Hwilka, U.S. Environmental Protection Agency (EPA) Remedial Project Manager (RPM). This review was conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. Section 9601, et seq., and 40 C.F.R. 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 determine whether the remedies at the site are protective of human health and the environment and function as intended by the decision documents. This document will become part of the site file.

This is the third five-year review for the NL Industries, Incorporated Superfund Site (Site). The first five-year review for the Site was completed in April 1998 and determined that the implemented remedies selected for the Site were protective of human health and the environment. In May 2003, EPA conducted a second five-year review which included a site visit in addition to a review of documents, data and information. The purpose of the inspection was to assess whether the soil and sediment component of the Operable Unit 1 (OU1) remedy had been implemented as designed, as well as to determine whether current conditions at the Site were protective of human health and the environment. The 2003 five-year review determined that the implemented remedies for OU1 and Operable Unit 2 (OU2) continued to provide adequate protection of public health and the environment.

This Site is being addressed under two operable units. OU2 addressed slag and lead oxide piles, contaminated surfaces and debris, and contaminated standing water. OU2 activities were initiated in 1992 and included off-site reclamation of lead-containing materials, solidification/stabilization and off-site disposal of slag and other materials, decontamination of building floors and surfaces, off-site treatment and disposal of contaminated standing water, building demolition, and environmental monitoring. The OU2 activities were completed in September 1995.

OU1 addressed the remediation of soil, groundwater, surface water, and stream sediment. OU1 activities for the soil and stream sediment were initiated in January 2000. Cleanup activities included the excavation of soil and sediment containing greater than 500 parts per million (ppm) of lead. The excavation of soil and sediment was completed in July 2003.

The groundwater component of OU1 requires the restoration of contaminated groundwater to meet drinking water standards. The groundwater remedy selected in the 1994 OU1 Record of Decision (ROD) included the extraction and treatment (pump and treat) of the contaminated groundwater. This action has not yet been implemented, and the selected remedy is being re-evaluated.

II. Site Chronology

Table 1, below, summarizes site-related events from discovery to present operation and maintenance activities:

Table 1: Chronology of Site Events	
Event/Activity	Date
Lead Smelting operations conducted at the Site by NL	1972-1982
NL cited by the New Jersey Department of Environmental Protection (NJDEP) for violations of state air and water regulations	1973-1980
NL ceases smelting operations at the Site	5/1982
Lead smelting operations conducted at the Site by National Smelting of New Jersey (NSNJ)	2/1983 – 1/1984
Final listing on EPA's National Priorities List (NPL)	9/1983
Administrative Order on Consent (AOC) for performance of Site-wide Remedial Investigation and Feasibility Study (RI/FS) by NL issued	4/1986
RI/FS conducted	1986-1993
Removal Actions conducted by EPA	1989-1996
Operable Unit Two (OU2) Record of Decision (ROD) issued	9/27/1991
OU2 Explanation of Significant Differences (ESD) issued	3/1992
Unilateral Administrative Order (UAO) issued to Potentially Responsible Parties (PRPs) for performance of the OU2 Remedial Design and Remedial Action (RD/RA)	3/31/1992
OU2 Remedial Action Performed	10/1992-9/1995
Operable Unit One (OU1) ROD issued	7/8/1994
AOC for performance of OU1 RD issued	6/10/1996
OU1 RD for soil and sediment conducted	6/1996-1/2000
First Five-Year Review completed	4/9/1998
Consent Decree finalizing settlement for PRP performance of the OU1 RA and Removal Action entered by the Federal Court	4/5/1999
OU1 ESD issued	6/21/1999
OU1 RA for soil and sediment conducted	1/18/2000-7/31/2003
Second Five-Year Review completed	9/24/2003
Post-Remedial Biological Monitoring	2003, 2004
Wetlands Monitoring	2002-2007
Residential/Commercial Water Sampling Events	2004, 2006, 2007
Groundwater Monitoring	2004, 2007
Groundwater Focused Feasibility Study Initiated	5/2008

III. Background

Physical Characteristics

The Site is situated on 44 acres of land in Pedricktown, Oldmans Township, Salem County, New Jersey. Active industrial and commercial facilities are located to the north, east and west of the Site. Pennsgrove-Pedricktown Road is located adjacent to the southern border of the Site. The nearest home is less than 1,000 feet from the Site property line. An active railroad bisects the Site. Approximately 16 acres of the Site are located north of the railroad tracks, including a closed 5.6-acre landfill. This landfill is being addressed under a state regulatory program and is not part of the CERCLA Site. The southern 28 acres contain the industrial area and landfill access road. The West and East Streams, parts of which are intermittent tributaries of the Delaware River, border and receive surface runoff from the Site. There are two large surface water bodies located between the residential and commercial properties along Route 130 and the landfill. (See Attachment C for the Site Overview Map)

Geology/Hydrogeology

The Site is underlain by three hydrogeologic units which have been defined as the unconfined aquifer, first confined aquifer, and second confined aquifer. Clay members interbedded with sands act locally as aquitards in each of the three units.

The unconfined aquifer (UA) consists of brown to gray medium sand of the Cape May Formation. Saturated thickness is 20 to 40 feet below ground surface (fbgs). Horizontal groundwater flow is generally to the northwest towards the Delaware River. Based on groundwater monitoring data, a vertical flow component exists in the UA, but is variable due to the discontinuity of the Upper Clay Member of the Raritan Formation which underlies the unit. Groundwater elevation ranges from approximately 3.5 to 7.5 fbgs, and responds rapidly to direct infiltration from the surface. Tidal fluctuations are not evident in the UA. The hydraulic conductivity was calculated to be 1.87 – 45.52 ft/day based on data collected during the Remedial Investigation (RI).

The First Confined Aquifer (FCA) consists of alternating beds of white to tan sands and red, white, and yellow clays of the Raritan Formation. A substantial groundwater elevation difference exists between the FCA and the UA which suggests a downward flow potential between the two aquifers. Based on limited monitoring well data, groundwater flow is westerly. Off-site municipal groundwater pumping potentially influences the flow direction in the aquifer.

The Second Confined Aquifer (SCA) consists of the Sayerville Sand Member of the Raritan Formation. A twenty foot thick clay layer separates the FCA from the SCA. Groundwater flow is generally easterly due to pumping from the neighboring BF Goodrich process wells.

Land and Resource Use

From 1972 to 1984, NL Industries Inc. (NL), and subsequently National Smelting of New Jersey (NSNJ), recycled lead from spent batteries and other lead-bearing waste at the Site. The facility has been inactive since January 1984. The Site is currently zoned for industrial use and is expected to remain so into the future. However, the Site is currently surrounded by industrial, commercial and residential land uses. In evaluating potential risks posed by the Site, EPA considered the possibility of future residential development.

The groundwater aquifer underlying the Site is classified as a Class IIA groundwater aquifer (potable water source) by the State of New Jersey, and is used for potable purposes in the vicinity of the Site.

History of Contamination

NL, and subsequently NSNJ, recycled lead from spent batteries and other lead-bearing waste at the Site. The batteries were drained of sulfuric acid, crushed and then processed for lead recovery at the smelting facility. The plastic and rubber waste materials resulting from the battery-crushing operation were disposed of in the on-site landfill, along with slag from the smelting process. Operations at the Site resulted in the contamination of soil, stream surface water and sediment, and groundwater. Soil at the Site was contaminated with metals, primarily lead. In addition, elevated levels of lead, copper and zinc were detected in stream sediment and surface water. Groundwater contamination detected at the Site consists primarily of lead and cadmium, with a localized area where elevated levels of volatile organic compounds (VOCs) were detected. Between 1973 and 1980, the NJDEP noticed NL with numerous violations of state air and water regulations. Water pollution violations were directed toward the battery storage area and the on-site landfill. NJDEP conducted an air-monitoring program in 1980 that detected airborne quantities of lead, cadmium, antimony and ferrous sulfate produced by the smelting process, at levels exceeding the facility's operating permits. NL ceased smelting operations in May 1982. In February 1983, the plant was sold to NSNJ and smelting operations recommenced. NSNJ ceased operation in January 1984, and filed for bankruptcy in March 1984. When the facility ceased operating, surface contamination was left behind in the form of slag waste and lead oxide piles, drums and debris, contaminated building surfaces, and contaminated surface water and sediments in basements, pits and sumps.

Initial Response

In October 1982, NL entered into an Administrative Consent Order (ACO) with NJDEP to conduct a remedial program to address contamination of some site soil, paved areas, surface water runoff, the on-site landfill, and groundwater. The Site was proposed for inclusion on the National Priorities List (NPL) in December 1982 and finalized on the NPL in September 1983. In February 1983, NL sold the facility to NSNJ who resumed secondary lead smelting operations at the Site. NSNJ subsequently entered into an amended ACO with NJDEP to clarify the

environmental responsibilities of NL and NSNJ. NSNJ ceased operation of the facility in January 1984 and filed for bankruptcy in March 1984.

In March 1989, EPA initiated a multi-phased Removal Action at the Site to address several conditions that presented a serious risk to public health and the environment. Phase I of the Removal Action, conducted in March and April 1989, consisted of construction of a chain-link fence to enclose the smelting facility and encapsulation of slag piles to provide temporary protection from wind and rain erosion. Phase II of the Removal Action, initiated in November 1989, consisted of additional encapsulation of the slag piles, securing the entrances to the contaminated buildings, and removal of over 40,000 pounds of the most toxic and reactive materials, including red phosphorus and metallic sodium, from the Site. During March 1991, EPA performed Phase III of the Removal Action. During this phase, damage to the perimeter fence was repaired and a new entrance gate was installed. In addition, the contents of all containers stored in the open were consolidated under an existing covered area at the rear of the facility, in order to reduce the potential for discharge. In July 1992, EPA conducted Phase IV of the Removal Action, which consisted of reinforcement of the slag bin retaining walls, which were in danger of collapse. Phase V of the Removal Action, which was initiated in the Fall of 1993, involved the removal of the most highly contaminated stream sediments from the West Stream.

IV. Remedial Actions

Remedy Selection and Implementation

OU2 Remedy Selection

The OU2 ROD for the Site was signed on September 27, 1991. The Remedial Action Objectives (RAOs) for the OU2 remedy focus on preventing future release and migration of hazardous materials and eliminating the areas addressed under OU2 as sources of future contamination and exposure on and off-site. The major components of the remedy selected in the OU2 ROD include the following:

- Solidification/stabilization and on-site placement of the slag and lead oxide piles;
- Decontamination and off-site treatment and disposal of debris and contaminated surfaces;
- Off-site treatment and disposal of standing water and sediments; and
- Appropriate environmental monitoring to ensure the effectiveness of the remedy.

In March 1992, EPA issued an ESD which provided an explanation of a change which EPA made to a portion of the OU2 remedy. The 1992 ESD revised the OU2 remedy to permit off-site disposal of the slag and lead oxide piles, after treatment.

OU2 Remedy Implementation

In March 1992, EPA issued a Unilateral Administrative Order (UAO) to 31 Potentially Responsible Parties (PRPs) for design and implementation of the OU2 Remedial Action. On October 19, 1992, CWM, a contractor for the PRPs, mobilized to the Site for slag stabilization activities. CWM began stabilization of the slag piles in November 1992. Stabilization of all of the slag piles was completed in June 1993. Off-site disposal of the treated slag was completed in July 1993.

During February 1993, IDM, another contractor for the PRPs, mobilized to the Site to begin decontamination and demolition of the facility. On-site structures dismantled as part of demolition activities included the rotary kiln, baghouses, decasing and slag crushing buildings, battery crusher, truck lift, crushed battery conveyor, above-ground fuel tanks, refining building, office building, soda ash silo and underground storage tanks. Demolition of on-site structures was completed by December 2003. Contaminated sediments and wash water collected at the Site during decontamination and demolition activities were shipped off-site for treatment and disposal. Furthermore, on-site concrete found to be non-hazardous was either utilized to backfill the building basements, left in place or sent off-site for recycling. Final grading and backfilling of the former industrial area was completed in August 1994.

In October 1994, the PRPs mobilized to the Site to remove lead-contaminated acid-resistant brick from the battery breaking yard. The remaining brick was subsequently sampled and additional acid-resistant brick was excavated in January 1995. The excavated brick was disposed of off-site in June 1995. The final inspection to ensure completion of the OU2 Early Remedial Action was conducted by representatives of EPA and the New Jersey Department of Environmental Protection (NJDEP) on July 24, 1995.

The OU2 RA Report, which signifies completion of the OU2 Remedial Action, was approved by EPA on September 26, 1995.

During the OU2 remedial action, material was disposed of or recycled in the following manner: 13,149.76 tons of slag were treated and disposed of off-site as non-hazardous waste; 1,914.8 tons of scrap metal were recycled; 1,592.2 tons of lead-bearing material were sent to a secondary lead smelter for recycling; 1,486 tons of clean concrete were removed for crushing and beneficial use; 52.35 tons of asbestos containing material from the on-site buildings were disposed of at an approved non-hazardous landfill; 1,992.8 tons of material were disposed of at a hazardous landfill; and over 764,000 gallons of contaminated standing water and wash water were sent off-site for treatment.

OU1 Remedy Selection

The OU1 ROD for the Site was issued on July 8, 1994. The RAOs for the OU1 remedy are as follows:

- To leave no greater than 500 ppm of lead remaining in site soils and stream sediments; and
- To restore the contaminated unconfined aquifer to drinking water standards for all contaminants.

The major components of the remedy selected in the OU1 ROD include the following:

- Excavation of all soils contaminated with lead above the remedial action objective of 500 ppm, treatment via solidification/stabilization of those soils classified as hazardous under the Resource Conservation and Recovery Act, and disposal of the treated soils along with non-hazardous soils in a landfill to be constructed on the Site;
- Removal of contaminated stream sediments above 500 ppm of lead from the West Stream and drainage channel north of Route 130 and treatment/disposal of the sediments in a manner similar to that described for soils above;
- Extraction and treatment of contaminated groundwater with direct discharge of the treated groundwater to the Delaware River; and
- Appropriate environmental monitoring to ensure the effectiveness of the remedy.

In June 1999, EPA issued an ESD which provided an explanation of a change which EPA made to a portion of the OU1 remedy. The 1999 ESD revised the OU1 remedy to permit appropriate off-site disposal of all excavated soil and sediment, after treatment. Excavated areas were restored and graded.

OU1 Remedy Implementation

In June 1996, EPA entered into an AOC with five generator PRPs for design of the OU1 remedy. On January 13, 1997, the 1996 AOC was modified to require that the PRPs install and maintain silt fencing along the West Stream and on the north and west sides of the former plant area of the Site in order to mitigate the off-site migration of site-related contamination.

In order to expedite remediation of contaminated soil and sediment at the Site, EPA determined it appropriate to conduct the design of the soil and sediment component of the OU1 remedy separately from the groundwater component of the remedy. In September and October 1997, the PRPs' contractor, GeoSyntec, performed a pre-design investigation for soil and sediment. Data collected during this investigation regarding the extent of lead-contaminated soil and sediment was utilized to determine the approximate limits of the Soil and Sediment Remedial Action (RA). The Design Report for Soil and Sediment was approved by EPA in January 2000.

The PRPs' contractor, ENACT, mobilized to the Site during June 2000 to begin implementation of the Soil and Sediment RA. As part of the Soil and Sediment RA, 150,928 tons of contaminated soil and sediment were excavated, treated and disposed of at appropriate off-site disposal facilities. In addition, 10,887 tons of concrete were demolished, decontaminated and shipped to an off-site facility for recycling. Finally, 182 tons of scrap metal and steel rebar generated during the RA were decontaminated and shipped to an off-site facility for recycling. A final inspection of the Soil and Sediment RA was conducted by representatives of EPA and the NJDEP on May 29, 2003. With the exception of the need to apply mulch to a portion of the Site, no deficiencies were noted during the final inspection. The Operable Unit One Remedial Action Report for Soil and Sediment was approved by EPA on July 31, 2003, signifying completion of the Soil and Sediment RA.

Biological monitoring, in accordance with the Biological Monitoring Plan approved by EPA on May 4, 2000, was initiated on July 14, 2000. Subsequent post-remedial biological monitoring evaluations were conducted in 2002, 2003 and 2004 as part of an ongoing effort to ensure that the cleanup of Site soil and sediment to the OU1 remedial action objective of 500 ppm of lead remained adequately protective of the environment. As part of this biological monitoring, toxicity testing was conducted to evaluate whether the levels of lead remaining in sediment at the Site were expected to be toxic to aquatic receptors. In addition, lead levels in surface water, sediment and aquatic life, determined through biological monitoring, were used to estimate potential hazards to wildlife. Results of the 2003 and 2004 biological monitoring events indicated that there were several areas in which sediments contained greater than 500 ppm of lead. As a result, additional sediment sampling was recommended to delineate the extent of lead contamination along the West Stream Channel and both stream banks between Pennsgrave-Pedricktown Road and Route 130. A Supplemental Sediment Sampling Plan (SSSP) was submitted to EPA in November 2007 and approved in April 2008. The sediment sampling was conducted between April 21 and April 24, 2008. Approximately 380 sediment samples were taken from approximately 175 sample locations. Sample analysis is underway and the PRP Group has agreed to conduct the necessary remedial activities to address the sediment contamination.

During the pre-design phase of the groundwater component of the OU1 remedy, additional groundwater investigations were conducted from 1997 - 1999 in order to define the current groundwater quality at the Site, and to determine whether modification of the selected groundwater remedy appeared to be appropriate. The results of these investigations indicated that groundwater quality had significantly improved at the Site since lead smelting operations ceased in 1984. Based upon the findings of these pre-design investigations, in January 2000, the PRPs proposed modifying the selected groundwater remedy to provide for injection of stabilizing agents into the aquifer to enhance naturally-occurring geochemical reactions, rather than extracting and treating contaminated groundwater. Upon evaluation of this proposed modification, EPA determined that additional investigations and treatability studies would need to be conducted at the Site to determine whether the modified groundwater remedy would be appropriate. Due to the impending start of the Soil and Sediment RA, EPA postponed additional groundwater investigations until after completion of the Soil and Sediment RA.

With the completion of the Soil and Sediment RA, additional groundwater monitoring events were conducted in January 2004 (in accordance with the April 2003 Groundwater Monitoring Plan) and in April 2007 (in accordance with the December 2006 Groundwater Monitoring Plan). The monitoring events were conducted in order to obtain more recent data regarding the groundwater quality at the Site. The information gathered through these monitoring events is being used in the development of a Focused Feasibility Study for Groundwater (FFS). The PRP Group submitted a draft FFS to EPA in November 2007. The FFS evaluates a number of remedial alternatives for groundwater. The FFS is currently being revised by the PRP Group based on EPA's comments and EPA expects to make a final determination with respect to the groundwater remedy in 2009.

System Operations/Operation and Maintenance

Operation and Maintenance activities associated with the Soil and Sediment RA are being conducted in accordance with the Operation and Maintenance (O&M) Plan, dated April 2003. General O&M activities include inspection of site security fencing, areas of potential erosion conditions and wetlands restoration areas. Wetlands monitoring is conducted as part of the O&M activities in accordance with the Wetlands Mitigation Plan (Appendix 2 of the O&M Plan). The Wetlands Mitigation Plan pertains to areas of the Site in which the removal of soil and sediment, as per the OUI Soil and Sediment RA, resulted in wetlands disturbance.

V. Progress Since the Last Review

The second Five-Year Review (Second Review) for the Site, which was completed in September 2003, noted that the PRPs should keep the Site secure and prevent contaminated groundwater beneath the Site from being used as drinking water. Accordingly, the Second Review also noted that the residential wells in the vicinity of the Site should be re-sampled to ensure that residents are not being exposed to site-related contaminants at unacceptable levels.

Since the completion of the Second Review, the Site has remained secure. Periodic O&M inspections have ensured that the fencing surrounding the site has remained in good condition and that the access gates remain locked. Residents along Benjamin Green Road between Pennsgrove-Pedricktown Road and Route 130 remain on public water supply. Sampling events to monitor private wells were conducted in January 2004, June 2006 and April 2007. The wells sampled were located on seven properties along Route 130, north of the Site. Results from well sampling for 2004, 2006 and 2007 indicated that there were no exceedences of the New Jersey Drinking Water Standards (NJDWS) for lead and cadmium in any of the sampled wells.

Groundwater monitoring events for on-site wells were conducted in January 2004 and April 2007. Groundwater monitoring results from these events indicated that the groundwater quality of the Site has improved; however, exceedences of applicable drinking water standards for constituents of concern remain. The groundwater remedy, as stated in the 1994 OUI ROD, has not yet been implemented; however, the remedy is currently being reevaluated through a Focused

Feasibility Study for Groundwater which was submitted in draft to EPA in November 2007. The FFS evaluates a number of remedial alternatives for groundwater, taking into account the groundwater contaminant trends since the source removal, and technologies that were not readily available at the time of the 1994 ROD. The FFS is currently being revised by the PRP Group based on EPA's comments and EPA expects to make a final determination with respect to the groundwater remedy in 2009.

Biological monitoring events subsequent to the second five-year review were conducted in accordance with the Biological Monitoring Plan in November 2003 and September 2004. Although sediment remediation was completed in July 2003, during both biological monitoring events, sediment analysis indicated that several samples exceeded the RAO of 500 ppm of lead along the West Stream. Accordingly, additional sediment sampling along the West stream and the adjacent stream banks was required by EPA.

A Supplemental Sediment Sampling Plan (SSSP) to further characterize the extent of lead contamination (areas exceeding the RAO of 500 ppm of lead) was submitted to EPA in November 2007 and a final plan was approved by EPA in April 2008. Sediment sampling, in accordance with the April 2008 SSSP was conducted between April 21 and April 24, 2008. Sediment samples were taken from the West Stream Channel in the reach of the stream between Pennsgrove-Pedricktown Road and Route 130. In addition, sediment samples were collected from both banks of the West Stream from Pennsgrove-Pedricktown Road to Route 130. Review of the analytical results is expected to be completed by September 2008. The PRP Group has already agreed to remediate the affected areas once the sampling data has been validated and reviewed. Once the excavation of remaining contaminated sediment is complete, the OU1 remedy will be protective of human health and the environment. Subsequent biological monitoring will be conducted to assure protectiveness.

The Five-Year Wetlands Mitigation Plan (WMP) associated with the Soil and Sediment RA came to an end in August 2007; however, the WMP will be extended due to the upcoming excavation of sediment, containing greater than 500 ppm of lead, along the West Stream which will likely impact portions of the surrounding wetlands.

VI. Five-Year Review Process

Administrative Components

At the NL Industries Inc. Superfund Site, the five-year review process was triggered by the initiation of the OU2 remedial action in 1993. Consequently, the first five-year review was due in 1998 with subsequent reviews due every five years thereafter. The first five-year review determined that the remedies selected for the site remained protective of human health and the environment or would be protective once implemented.

In May 2003, EPA conducted a second five-year review which included a site inspection in addition to a review of documents, data and information. The purpose of the inspection was to

assess whether the soil and sediment component of the OU1 remedy had been constructed as designed as well as to determine whether current conditions at the Site were protective of human health and the environment. The 2003 five-year review determined that the implemented remedies for OU1 and OU2 continued to provide adequate protection of public health and the environment.

For this five-year review, the review team consisted of Theresa Hwilka (EPA - RPM), Amanda Gallagher (EPA - Hydrogeologist) and Julie McPherson (EPA - Risk Assessor).

Community Involvement

EPA participated in a public meeting held on October 23, 2007 in Pedricktown, New Jersey. EPA was asked by the town's Mayor to provide an update regarding Site activities. EPA gave a presentation which was followed by a question and answer period. Handouts containing a site history, description of current and future activities, and EPA contact information were provided at the meeting.

EPA published a notice in *Today's Sunbeam*, a local newspaper, on April 20, 2008, notifying the community of the initiation of the five-year review process. The notice indicated that EPA would be conducting a five-year review of the remedies for the Site to ensure that the implemented remedies remain protective of public health and the environment and are functioning as designed. It also indicated that upon completion of the five-year review, results of the review would be made available at the designated Site repositories. In addition, the notice included the RPM's address and telephone number for questions related to the five-year review process or the NL Industries, Inc. site. The Mayor's office was also contacted to inform them of the five year review and to answer any questions they may have had regarding the review or the Site in general. There were no questions at that time. The EPA RPM was not contacted by any members of the community regarding this five-year review.

Document Review

This five-year review consisted of a review of relevant documents including O&M records and monitoring data (See Attachment B for a list of Documents Reviewed)

Data Review

Results of the data review are compiled in separate sections below:

Private Property Well Sampling

Since the 2003 five-year review, groundwater monitoring of residential/commercial properties along Route 130 were conducted in 2004, 2006 and 2007. Well samples were analyzed for total and dissolved lead and cadmium. For all samples taken, no exceedances of the New Jersey Drinking Water Standards for lead and cadmium were detected. Residential properties along Benjamin Green Road between Pennsgrove-Pedricktown Road and Route 130 remain on the

public water supply. (See Attachment C for the locations of the private properties)

Groundwater Monitoring

The groundwater is classified by NJDEP as a Class IIA aquifer which is defined as a potable water source. The remedial action objective for groundwater called for restoring the contaminated unconfined aquifer to drinking water standards for all contaminants. The remedy consisted of extraction and treatment of contaminated groundwater with direct discharge of the treated ground water to the Delaware River and appropriate environmental monitoring to ensure the effectiveness of the remedy.

Since the 2003 five-year review, groundwater monitoring events were conducted in 2004 and 2007. Groundwater samples were analyzed for volatile organic compounds (VOCs), total lead and cadmium, and dissolved lead and cadmium. Depth to groundwater, pH, turbidity, dissolved oxygen and specific conductance were among the additional groundwater measurements recorded. Sampling results from the 2004 and 2007 monitoring events indicate that the total mass of contaminants has decreased over time; however, concentrations of lead, cadmium and VOCs above drinking water standards remain on-site underlying the former plant property. (See Attachment D for the 2007 Groundwater Monitoring Data)

The 2004 groundwater data indicated that in a number of monitoring wells, exceedances of the applicable drinking water standards for both total lead and cadmium were detected and, in some instances, increases in total lead and cadmium concentrations from previous measurements were recorded.

The most recent 2007 groundwater data indicates all VOCs were detected at concentrations below applicable health-based standards and criteria with the exception of tetrachloroethene and vinyl chloride. Tetrachloroethene and vinyl chloride exceeded the applicable drinking water and groundwater quality standards in a few well locations. The 2007 data further indicates that lead concentrations exceeding the 5 parts per billion (ppb) drinking water standard persist in approximately 6 wells in concentrations of up to 388 ppb; however, the total mass of lead in groundwater has decreased from approximately 220 lbs in 1983 to approximately 1.2 lbs in 2007. Cadmium data indicated that there were approximately 11 wells in which cadmium concentrations exceeded the drinking water standard of 4 ppb in concentrations of up to 163 ppb; however, the overall mass of cadmium in the groundwater decreased from approximately 70 lbs in 1998 to approximately 6.2 lbs in 2007. Compared to lead, cadmium concentrations have decreased to a lesser extent.

Based on an analysis of groundwater data over the years, current groundwater conditions, and new groundwater remediation technologies, the pump and treat remedy selected in the 1994 ROD is undergoing a reevaluation. The PRP Group submitted a draft FFS to EPA in November 2007. The FFS evaluates a number of remedial alternatives for groundwater taking into account the groundwater contaminant trends since the source removal and technologies that were not readily available at the time of the 1994 ROD. The FFS is currently being revised by the PRP Group

based on EPA's comments and EPA expects to make a final determination with respect to the groundwater remedy in 2009.

Biological Monitoring

Biological monitoring, in accordance with the Biological Monitoring Plan approved by EPA on May 4, 2000, was initiated on July 14, 2000. Subsequent post-remedial biological monitoring evaluations were conducted in 2002, 2003 and 2004 as part of an ongoing effort to ensure that the cleanup of Site soil and sediment to the OU1 cleanup standard of 500 ppm of lead remained adequately protective of the environment. Results of the 2003 and 2004 biological monitoring events indicated that there were areas in which sediments contained significantly greater than 500 ppm of lead. As a result, additional sediment sampling in the West Stream was required.

Sediment Sampling

Given the results from the 2003 and 2004 biological monitoring events, the PRP Group performed two rounds of sediment evaluations in 2005 and 2006 using varying methods to obtain samples and analyze for lead. Data from the evaluations led to the conclusion that the method used to obtain samples affected apparent results. When 6-inch cores of sediment are obtained, homogenized and analyzed, lead concentrations were well below the cleanup standard for lead at the Site of 500 ppm. This finding is consistent with data obtained during the remedial action and previously reported to EPA in the RA Report. However, when a sampling dredge was used to obtain a two-inch deep sediment sample, lead concentrations in a number of samples exceeded the cleanup standard. Samples of sediment obtained below the two-inch depth contained lead concentrations well below 500 ppm. The maximum concentration of lead was detected within the top two inches of the sediment surface.

To further delineate the extent of lead contamination in the sediment along the West Stream, the PRP Group submitted a Supplemental Sediment Sampling Plan (SSSP) and associated Quality Assurance Project Plan (QAPP) to EPA in November 2007. The SSSP and the QAPP were approved by EPA in April 2008. The SSSP described the procedures to be used to obtain sediment samples along the West Stream from the stream channel and the adjacent banks. Sampling, in accordance with the SSSP was conducted between April 21, 2008 and April 24, 2008. Grab samples were obtained from the West Stream and the adjacent banks between Pennsgrove-Pedricktown Road and Route 130. Approximately 380 sediment samples were collected from approximately 175 sample locations. Sample analysis is underway and the PRP group has agreed to conduct the necessary remedial activities, which will likely include excavation of the affected sediment.

Wetlands Monitoring

The Wetlands Mitigation Plan (WMP) was prepared to restore and enhance wetland areas that were disturbed by the Sediment component of the OU1. The WMP was implemented upon completion of the OU1 sediment remedy and was conducted on an annual basis for a five-year period, ending in August 2007. During this mitigation period, the affected wetland areas were undergoing restoration in accordance with the WMP; however, in May 2006, beaver dams caused a blockage in the culvert beneath the railroad tracks. As a result, the wetland area south of the

railroad tracks was flooded and damage to the planted stock material was observed. The blockage was removed in June 2006 and replanting of damaged vegetative material occurred in October 2006. Post-planting inspections along with routine O&M activities were conducted thereafter until August 2007. Given the recent discovery of lead-contaminated areas, as described in the previous section, the Wetlands Mitigation close-out inspection was postponed and a new mitigation plan will be developed once the areas of lead contamination have been excavated. EPA will be working with the PRP Group and NJDEP to develop the plan.

Site Inspection

An inspection of the NL Industries, Inc. Site was conducted on April 24, 2008. The following parties were in attendance:

Theresa Hwilka, EPA Region II Project Manager
Amanda Gallagher, EPA Region II Hydrogeologist,
Julie McPherson, EPA Region II Risk Assessor
Jeffrey Leed, Leed Environmental Inc., PRP Project Coordinator
Jeffrey Moore, CSI Environmental, LLC, PRP Project Manager

The site inspection consisted of a physical inspection of the former plant area, security fence, monitoring wells, West Stream and surrounding wetland areas, stream culverts and surface water bodies north of the landfill.

The inspection team met with Jeff Leed and Jeff Moore near the entrance to the landfill access road and noted that both the PRP Group and EPA's sampling teams were at the Site conducting their final day of sediment sampling in accordance with the April 2008 SSSP. The Site inspection commenced at the southwest side of the property, near the landfill access road entrance. The inspection team walked east along the perimeter of the former plant site and recorded relevant observations, including the condition of visible groundwater monitoring wells and the site security fence. After walking through the former plant site, the inspection team proceeded to cross the railroad tracks and walk the length of the West Stream up to Route 130. Along the way, flagged sediment sampling locations were noted. The inspection team also traversed the eastern side of the West Stream to observe the surface water bodies located north of the landfill, just south of Route 130.

The following sections present the results of the site inspection broken down by each inspected element.

Groundwater Monitoring Wells

There were a number of wells on-site that had not been decommissioned, but are no longer part of the sampling plan. If the PRP no longer intends to sample these wells, they should propose appropriate abandonment to EPA in writing.

Security Fencing

Upon inspection, no deficiencies were noted regarding the site security fencing. Fencing was visible around the perimeter of the former plant area from the southwest corner near the landfill access road, along Pennsgrove-Pedricktown Road continuing along the eastern side of the former plant area and along the railroad tracks, ending near the landfill access gate. Limited access to the Site is present along the West stream via the residential properties that abut the West Stream between Pennsgrove-Pedricktown Road and Route 130, as well as access via the active railroad tracks which bisect the Site.

West Stream Culverts and Wetland Areas Adjacent to the West Stream

The West Stream Culvert, located beneath the railroad tracks southwest of the landfill entrance, was inspected. No blockages or debris were noted and water was flowing through the culvert. New vegetative growth was observed in the surrounding wetland areas.

Surface Water Bodies

The age of the water bodies described below is not known at this time. The water bodies had not appeared on historical site maps; however, they were noted in a site map of the most recent Groundwater Monitoring Report. The two surface water bodies are located north of the landfill, adjacent to commercial and residential properties along Route 130. The surface water body in closest proximity to the West Stream was observed to be significant in size and depth. It was abutted by a commercial property which largely consisted of a paved parking lot enclosed by a fence. Due to thick vegetation, private property fencing and the depth of the water, the inspection team was not able to walk around the first surface water body to observe the second water body. The sediment sampling team did, however, access both surface water bodies for the purposes of obtaining sediment samples in April 2008 in accordance with the SSSP.

Residences

While walking along the West Stream from Pennsgrove-Pedricktown Road toward Route 130, residential properties west of the West Stream were visible. A wooden structure, which appeared to be a hunting stand, was also noted to the east of the West Stream between the stream and the landfill.

Interviews

During the Site inspection, EPA spoke with representatives of the PRP Group and their contractors. No significant issues related to the five-year review inspection were noted. Prior to the Site inspection, EPA also spoke with representatives of NJDEP regarding the remedies and NJDEP indicated that they did not have any specific concerns regarding the selected remedies to report at this time.

VII. Technical Assessment

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

A review of site-related documents, Applicable or Relevant and Appropriate Requirements (ARARs), risk assumptions, monitoring data and the results of the Site inspection indicates that the remedies are functioning as intended by the RODs, as modified by the ESDs, or will function as intended by the decision documents, once implemented.

The remedy selected for OU2 in 1991 addressed slag and lead oxide piles, debris and contaminated surfaces and standing water and sediments. The remedy included (1) solidification/stabilization and on-site placement of the slag and lead oxide piles, (2) decontamination and off-site treatment and disposal of debris and contaminated surfaces, (3) off-site treatment and disposal of standing water and sediments, and (4) appropriate environmental monitoring to ensure the effectiveness of the remedy. The remedy selected has been implemented and has interrupted the exposure pathway. As part of the OU2 remedy, 13,149.76 tons of lead-bearing slag, 1,592.2 tons of other lead-bearing materials, and 1,992.8 tons of hazardous material were permanently removed from the Site and either disposed of at a landfill or recycled. The remedy is considered functioning as intended.

The remedy selected for OU1 in 1994 included (1) excavation of all soils contaminated with lead above the remedial action objective of 500 ppm, treated via solidification/stabilization of those soils classified as hazardous under RCRA and disposing of the treated soils in a landfill constructed on the Site, (2) removal of contaminated stream sediments above 500 ppm of lead from the West Stream and drainage channel north of Route 130 and treatment/disposal in a manner similar to that described for soil, and (3) extracting and treating contaminated groundwater and discharging to the Delaware River.

In 1999, an Explanation of Significant Differences (ESD) was issued and implemented to address the remedial alternative selected for the soils and sediments on the Site. Based on time, cost-effectiveness and comparable protectiveness, the contaminated soils and sediments were disposed of off-site rather than on-site, after treatment.

The remedy selected for the soils has been implemented at the Site. Since the Site land use is designated as industrial/commercial, the cleanup goal for lead in soil (500 ppm) is considered protective of human health and ecological receptors. The remedy selected for the soils is functioning as intended and is considered protective.

The remedy selected to address the sediment was also implemented and was completed in 2003. However, post-remediation biological monitoring in 2003 and 2004 identified areas of the West Stream that did not meet the cleanup goal for lead in sediment (500 ppm). A Supplemental Sediment Sampling Plan (SSSP) has recently been submitted and implemented to define the nature and extent of lead greater than 500 ppm in the sediment. EPA is awaiting the laboratory results. The delineated areas of lead contamination will be addressed via excavation of the

affected sediment. This is expected to occur in late 2008.

The groundwater remedy selected in the 1994 ROD has not yet been implemented. The results of aquifer testing indicated that technologies other than groundwater pump and treat may be more effective. Accordingly, a draft FFS was submitted to EPA in November 2007. The FFS evaluates a number of remedial alternatives for groundwater taking into account the groundwater contaminant trends since the source removal and technologies that were not readily available at the time of the 1994 ROD. The FFS is currently being revised by the PRP Group based on EPA's comments and EPA expects to make a final determination with respect to the groundwater remedy in 2009. Upon approval and implementation of the selected remedial alternative, the remedy will be protective of human health and the environment in the long term.

As stated above, once the groundwater remedy is completed, the remedy will be protective of human health and the environment. In the interim, short-term protectiveness of human health and the environment is achieved through restricted use of groundwater wells and periodic monitoring. Currently, the land use downgradient of the Site is residential and commercial. Groundwater use is not expected to change in this area. Initial actions were taken to connect those homes along Benjamin Green Road to the public water supply in 1975, thereby eliminating their exposure to the contaminated groundwater. The homes along Route 130 are not connected to the public water supply; however, groundwater monitoring events have been conducted to ensure that the homes along Route 130 are not impacted by contaminated groundwater. Sampling of private wells along Route 130 was conducted in 2004, 2006 and 2007. The most recent results from the 2006 and 2007 sampling events show that site-related lead and cadmium were either non-detect or below NJDEP action levels. Since no active remedy is in place to address the groundwater, the sentinel wells located between the Site and the homes located along Route 130 will continue to be periodically monitored to determine if contamination in the groundwater is migrating toward downgradient residential wells. Currently, residents downgradient are not being impacted by site-related contaminants.

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

Some chemical-specific toxicity values have changed since the Site was originally assessed. In order to account for changes in toxicity values since the baseline human health risk assessment was performed, the maximum detected concentrations of the contaminants of concern (COCs) identified during the 2004 and 2007 sampling period were compared to residential groundwater Preliminary Remediation Goals (PRGs), National Primary Drinking Water Standard Maximum Contaminant Levels (MCLs) and their respective New Jersey Department of Environmental Protection (NJDEP) Groundwater Quality Criteria. MCLs are promulgated standards that apply to public water systems and are intended to protect human health by limiting the levels of contaminants in drinking water. PRGs are a human health risk-based value that is equivalent to a cancer risk of 1×10^{-6} or a hazard index of 1.0. The results indicate that the concentrations of lead and cadmium continue to exceed their respective criteria in several wells on the NL property. The RAO for groundwater is to restore unconfined aquifer to drinking water standards

for all contaminants. Although this RAO has not been achieved as of yet, the RAO still remains valid.

The soil remedy was also reviewed to address the protectiveness of the remedy presented in the 1994 ROD. The cleanup goal established for lead in soil is 500 ppm. EPA's current cleanup guideline for lead on industrial/commercial properties is 800 ppm, which is protective of a worker exposed to contamination at the Site. Since the cleanup goal established in the 1994 ROD is lower than EPA's current action level for lead on a commercial/industrial property, the remedy is considered to be currently protective for industrial use. However, at the time of the ROD, 500 ppm of lead in soils and sediments was considered protective for residential exposure. Currently, EPA and NJDEP use a standard of 400 ppm of lead to assure protectiveness of human health in a residential exposure scenario. While EPA had achieved the 500 ppm cleanup goal for lead in soils and will achieve the 500 ppm cleanup goal for lead in sediments upon completion of the stream sediment excavation, a site-wide evaluation of all post-excavation samples will be conducted to determine the actual cleanup levels that were achieved. If the site-wide lead levels are below 400 ppm for all soils and sediments, the Site will have achieved the current residential cleanup standard and will not require land use restrictions for site soils and sediments. However, if the 400 ppm residential lead standard was not achieved, EPA will evaluate the need for institutional controls to restrict site land use to industrial/commercial use.

The protectiveness of the sediment remedy, as presented in the 1994 ROD, was reviewed. The initial ecological risk assessment studied contaminant uptake by ecological receptors located at the Site, as well as bioaccumulation modeling of contaminant uptake by higher organisms. The ecological risk assessment for the Site concluded that, at levels greater than 500 ppm of lead in sediments at the Site, there is a potential for adverse ecological effects. EPA has determined that a cleanup goal for lead is adequately protective of ecological receptors at this Site. To date, there has been no conclusive evidence to indicate otherwise; therefore, the current cleanup goal of 500 ppm for lead in stream sediments remains valid.

Soil vapor intrusion was not previously evaluated as a potential future exposure pathway. The health-based screening criteria provided in the Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (USEPA, 2002) was used for this five-year review to evaluate this exposure pathway. This guidance provides calculations of concentrations in groundwater associated with indoor air concentrations at acceptable levels of cancer risk and noncancer hazard. This review compared the maximum detected concentrations of the chemicals of potential concern with the vapor intrusion screening criteria. The maximum detected concentrations of Trichloroethylene (TCE) and Perchloroethylene (PCE) were detected in only MW-11 and found to be within the risk range (10^{-6} – 10^{-4}). This indicates that a vapor intrusion problem would not occur if a building were to be erected over the area. Based on the concentrations in this isolated area, it is not anticipated that this exposure pathway is a concern at this Site. In addition, there are no buildings overlying the affected area; therefore, the exposure pathway is incomplete.

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

There is no other information that calls into question the protectiveness of the OU1 and OU2 remedies.

Technical Assessment Summary

According to the reviewed data, the site inspection and the interviews, the OU2 and OU1 soil and groundwater remedies are functioning as intended by the decision documents or will be functioning as intended once implemented.

VIII. Issues, Recommendations and Follow-up Actions

Issue	Recommendations & Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Soil and Sediment standards for lead currently exceed the Residential standard of 400 ppm.	Upon completion of the removal of lead contaminated stream sediments, evaluate the potential need for institutional controls	EPA	EPA	December 2009	N	Y

IX. Protectiveness Statement

The OU2 remedy at the NL Industries, Inc. Superfund Site has been fully implemented and is protective of human health and the environment. Implementation of the OU2 remedy has provided for the protection of public health and the environment through the removal of lead-bearing waste from the Site, thereby eliminating the possibility of exposure to this waste.

The OU1 remedy at the NL Site has yet to be fully implemented. The OU1 remedy will be protective of human health and the environment once fully implemented. The soil and sediment portions of the OU1 remedy were completed in July 2003. However, concentrations of lead above the OU1 sediment cleanup standard of 500 ppm were detected in the West Stream during biological monitoring activities in 2003 and 2004. An April 2008 sampling event was conducted along the West Stream and its banks to delineate the extent of the contamination such that the affected areas can be excavated. This work is expected to take place in late 2008.

With respect to the OU1 groundwater remedy, a reevaluation of the selected extraction and treatment remedy is underway. The PRP Group submitted a draft FFS to EPA in November 2007. The FFS presents a number of remedial alternatives for groundwater taking into account

the groundwater contaminant trends since the source removal and technologies that were not readily available at the time of the 1994 Record of Decision. The FFS is currently being revised by the PRP Group based on EPA's comments and EPA expects to make a final determination with respect to the groundwater remedy in 2009. Upon approval and implementation of the selected remedial alternative, the remedy will be protective of human health and the environment in the long term. In the interim, residences along Benjamin Green Road located between Pennsgrove-Pedricktown Road and Route 130 remain on the public water supply and those properties located north of the Site have been periodically monitored to ensure that site-related contaminants have not impacted their drinking water. Therefore, short-term protectiveness of human health and the environment is achieved through restricted use of groundwater wells and periodic monitoring.

X. Next Review

The next Five-Year Review for the NL Industries, Inc. Site should be completed before September 2013.

Approved:

for John S. Fusco
George Pavlou, Acting Director
Emergency and Remedial Response
Division

9/4/08
Date

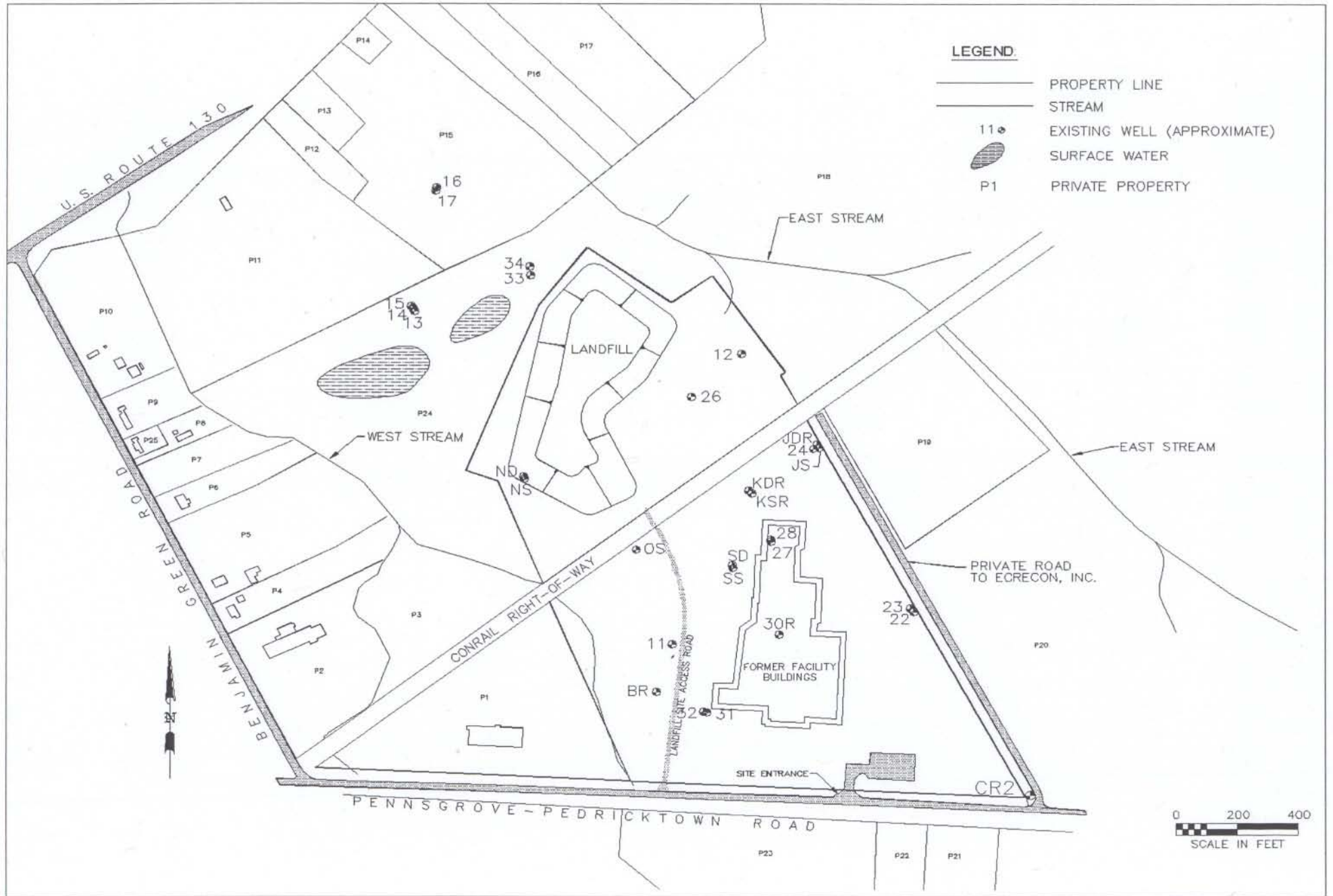
ATTACHMENT A - LIST OF ACRONYMS

ACO	Administrative Consent Order
ARARs	Applicable or Relevant and Appropriate Requirements
COC	Contaminant of Concern
EPA	(United States) Environmental Protection Agency
ESD	Explanation of Significant Differences
FFS	Focused Feasibility Study
GWQS	Groundwater Quality Standard
MCL	Maximum Contaminant Level
NJDEP	New Jersey Department of Environmental Protection
NSNJ	National Smelting of New Jersey
O&M	Operation & Maintenance
OU1	Operable Unit One
OU2	Operable Unit Two
ppb	Parts Per Billion
ppm	Parts Per Million
PRG	Preliminary Remediation Goals
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RD/RA	Remedial Design/Remedial Action
RI	Remedial Investigation
ROD	Record of Decision
SSSP	Supplemental Sediment Sampling Plan
UAO	Unilateral Administrative Order
USACE	United States Army Corps of Engineers
VOCs	Volatile organic compounds
WMP	Wetlands Mitigation Plan

ATTACHMENT B - DOCUMENTS REVIEWED

- Applied Ecological Services, Inc., "*Wetland Mitigation Monitoring Program, Fifth and Final Monitoring Report*," Jackson, New Jersey, August 2007.
- Applied Ecological Services, Inc., "*Wetland Monitoring Report for NL Industries Site – Report #4*," Jackson, New Jersey, May 2006.
- CDR Environmental Specialists, Inc., "*Biological Monitoring Report for NL Industries Superfund Site*," Hollywood, Florida, July 2004.
- CDR Environmental Specialists, Inc., "*Biological Monitoring Report for NL Industries Superfund Site*," Hollywood, Florida, June 2005.
- CSI Environmental, LLC, "*Groundwater Monitoring Plan*," Annapolis, Maryland, October 2003.
- CSI Environmental, LLC, "*Groundwater Monitoring Report*," Annapolis, Maryland, April 2004. (Also contains 2004 Residential Groundwater Monitoring)
- CSI Environmental, LLC, "*Residential Water Sampling Plan*," Annapolis, Maryland, May 2006.
- CSI Environmental, LLC, "*Residential Water Sampling Report*," Annapolis, Maryland, September 2006.
- CSI Environmental, LLC, "*Groundwater Monitoring Plan*," Annapolis, Maryland, December 2006.
- CSI Environmental, LLC, "*Residential Water Sampling Report*," Annapolis, Maryland, July 2007.
- CSI Environmental, LLC, "*Groundwater Monitoring Report*," Annapolis, Maryland, September 2007, Revised May 2008.
- CSI Environmental, LLC, "*Supplemental Sediment Sampling Workplan*," Annapolis, Maryland, November 2007, Revised April 2008.
- CSI Environmental, LLC, "*Quality Assurance Project Plan for Supplemental Sediment Sampling*," Annapolis, Maryland, April 2008.
- ENTACT, "*Final Operable Unit One Remedial Action Report for Soil and Sediment*," July 2003.
- Leed Environmental, Inc., "*Operation and Maintenance Plan*," Reading, Pennsylvania, April 2003.
- Leed Environmental, Inc., Comment Letter Regarding Wetland Monitoring Report #2, Dated June 29, 2005.
- Leed Environmental, Inc., "*Administrative Order on Consent for Remedial Design Progress Report #117-143*," Reading, Pennsylvania, February 2006-April 2008.
- Leed Environmental, Inc., "*Consent Decree—Progress Report #81-107*," Reading, Pennsylvania, February 2006-April 2008.
- Leed Environmental, Inc., "*Operation and Maintenance Activities—Inspection Report*," Reading, Pennsylvania, April 2006-April 2008.
- U.S. Environmental Protection Agency, "*EPA Superfund Record of Decision: NL Industries, Inc. Site, Pedricktown, NJ*," Region 2, New York, New York, July 1994.
- U.S. Environmental Protection Agency, "*Five-Year Review Report, NL Industries, Incorporated Superfund Site, Pedricktown, Salem County, New Jersey*," Region 2, New York, New York, September 2003.

ATTACHMENT C – SITE LOCATION & OVERVIEW MAP



ATTACHMENT D - APRIL 2007 GROUNDWATER MONITORING SAMPLING RESULTS

Parameter (ug/L)	Well Number																	Comparison Criteria	
	11	12	13	14	15	16	17	22	60	24	26	27	MW-100*	28	30R	31	102***	NJGWS, NJMCL or PQL	EPAMCL
Inorganics																			
Total Cadmium	110 J	ND	ND	ND	ND	ND	ND	7.3 J	25.8 J	ND	12.6 J	8.5	149	151	163 J	1.5 J	1.2 J	4	5
Dissolved Cadmium	113 J	ND	ND	ND	ND	ND	ND	7.2 J	26.7 J	ND	13 J	7.1	154	163	169 J	1 J	ND	NA	NA
Total Lead	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4 J	6.2	ND	ND	ND	20.6 J	17 J	5	15*****
Dissolved Lead	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.6	ND	ND	1.6 J	ND	ND	NA	NA
Organics																			
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	700	NA
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.66 J	ND	ND	ND	ND	ND	ND	ND	1	5
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6	80
Isobutane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2 (7 in ROD)
1,1-Dichloroethane	0.99	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	70	50
cis-1,2-Dichloroethene	0.68	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10	70
Methylene Chloride	0.39 U	ND	0.64 U	0.42 U	0.36 U	0.26 U	0.31 U	ND	ND	ND	ND	0.4 U	0.29 U	0.35 U	ND	3.0 U	ND	2	5
Methyl tert-butyl Ether	ND	ND	ND	ND	ND	0.69	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	700	700
Tetrachloroethene	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	1 (5 in ROD)
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,000	1,000
1,1,1-Trichloroethane	2.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	26	200
Trichloroethene	0.29 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	5
Vinyl Chloride	ND	9.3	ND	ND	ND	ND	ND	ND	ND	4.9	ND	ND	ND	ND	ND	ND	ND	5	2

J = Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero. The concentration given is an approximate value.

U = Parameter was flagged in data validation and are considered non-detects.

* 100 is a duplicate sample obtained from monitoring well 28.

** 101 is a duplicate sample obtained from monitoring well KDR.

*** 102 is a duplicate sample obtained from monitoring well 31.

**** Two rinsate blanks were collected (RB-1 and RB-2), RB-1 was collected from the pump used at well 17, RB-2 was collected from the pump used at well 26, both samples were collected using field blank water supplied by Chemtech.

***** FB-1 is a field blank collected with water supplied by Chemtech, water used for final rinse during decontamination events.

***** 15 is the Action Level for lead. An Action Level is the level of lead which, if exceeded, triggers treatment or other requirements that a water system must follow.

N/A = Not Applicable

ND = Non Detect

RDL = Required Detection Limit (Contract)

MDL = Method Detection Limit (Instrument)

MCL = Maximum Contaminant Level

ATTACHMENT D - CONTINUED - APRIL 2007 GROUNDWATER MONITORING SAMPLING RESULTS

Parameter (ug/L)	Well Number														Comparison Criteria	
	32	33	34	JS	JDR	KSR	KDR	101**	SS	SD	NS	ND	OS	BR	NJGWQS, NJMCL or PQL	EPA MCL
Inorganics																
Total Cadmium	ND	3.0 J	ND	3.9 J	54.5 J	7.8 J	141 J	139 J	10.6 J	149 J	1.5 U	ND	3.9 J	ND	4	5
Dissolved Cadmium	ND	ND	ND	3 J	60.8 J	3.8 U	166 J	144 J	11.8 J	156 J	1.4 U	ND	4.2 J	1.1 U	NA	NA
Total Lead	ND	ND	16.3	1.0 J	ND	ND	ND	ND	82.9	31	41.6 J	22.2 J	388	ND	5	15*****
Dissolved Lead	ND	ND	ND	ND	ND	ND	ND	ND	13	90.4	ND	ND	320	ND	NA	NA
Organics																
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	700	NA
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.68	ND	ND	ND	ND	700	NA
Chloroform	ND	ND	ND	ND	ND	ND	ND	0.98	ND	2.4	ND	ND	ND	ND	6	80
Isobutane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2 (7 in ROD)
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	70	50
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.35 J	ND	ND	ND	ND	700	700
Methylene Chloride	ND	0.45 U	0.36 U	ND	0.5 U	0.33 U	0.28 U	ND	ND	0.5 U	ND	ND	ND	ND	2	5
Mehtyl tert-butyl Ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.41 J	ND	ND	70	NA
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	1 (5 in ROD)
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5 J	ND	ND	ND	ND	1,000	1,000
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	26	200
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5	2
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	ND	ND	ND	ND	1,000	10,000

J = Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero. The

U = Parameter was flagged in data validation and are considered non-detects.

* 100 is a duplicate sample obtained from monitoring well 28.

** 101 is a duplicate sample obtained from monitoring well KDR.

*** 102 is a duplicate sample obtained from monitoring well 31.

**** Two rinsate blanks were collected (RB-1 and RB-2), RB-1 was collected from the pump used at well 17, RB-2 was collected from the pump used at well 26, both samples were collected using field blank water supplied by Chemtech.

***** FB-1 is a field blank collected with water supplied by Chemtech, water used for final rinse during decontamination events.

***** 15 is the Action Level for lead. An Action Level is the level of lead which, if exceeded, triggers treatment or other requirements that a water system must follow.

N/A = Not Applicable

ND = Non Detect

RDL = Required Detection Limit (Contract)

MDL = Method Detection Limit (Instrument)

MCL = Maximum Contaminant Level