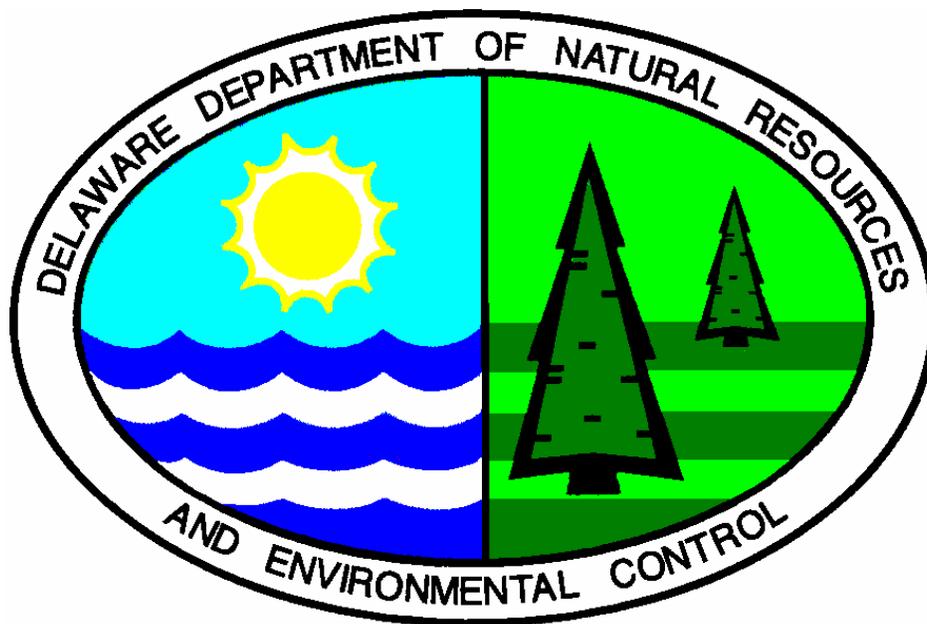


FINAL PLAN OF REMEDIAL ACTION

Clayville Dump
Christiana, DE

DNREC Project No. DE-0095



November 2002

Delaware Department of Natural Resources and Environmental Control
Division of Air and Waste Management
Site Investigation & Restoration Branch
391 Lukens Drive
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1.0 INTRODUCTION AND PURPOSE

The former Clayville Dump site (site) is located on the northern bank of the Christina River in Christiana, Delaware. The site is bordered by wooded uplands on the north and south, the Christina River on the east, and to the west by a large retail outlet, associated parking and storm water drainage basins (Figure 1). The site owner, Mr. Albert Marta, entered into the Voluntary Cleanup Program (VCP) in January 1997, as administered by the Department of Natural Resources and Environmental Control, Site Investigation and Restoration Branch (DNREC) under the provisions of the Delaware Hazardous Substance Cleanup Act (HSCA), 7 Del. C. Chapter 91. Through a VCP Agreement, Mr. Marta agreed to investigate the potential risks posed to the public health, welfare, and the environment at the site. Mr. Marta contracted Environmental Research and Consulting, Inc. (ERC) to perform a remedial investigation (RI) of the site.

Previous investigations by DNREC identified elevated concentrations of various organic compounds and heavy metals in soils at the site. The groundwater investigations conducted did not detect any chemicals of concern. The purpose of the RI was to: 1) further delineate the distribution of these organic compounds and heavy metals in site soils and Christina River sediments; 2) more fully investigate groundwater beneath the site; and 3) evaluate the potential risks of exposure from on-site contaminants to human and ecological receptors.

This document is the DNREC's final plan of remedial action (final plan) for the site. It is based on the results of the previous investigations performed at the site. This final plan is issued under the provisions of the HSCA and the Regulations Governing Hazardous Substance Cleanup (Regulations). It presents DNREC's assessment of the potential health and environmental risks posed by the site.

As described in Section 12 of the Regulations, DNREC provided notice to the public and an opportunity for the public to comment on the proposed plan. No comments were received. Therefore, the proposed plan is adopted as the final plan. All previous investigations of the site, the proposed plan, the comments received from the public, DNREC's responses to those comments, and the final plan constitute the Remedial Decision Record for the site.

Section 2.0 presents a summary of the site description and history. Section 3.0 provides a description of the remedial investigation results. Section 4.0 presents a discussion of the remedial action objectives. Section 5.0 presents the final plan. Section 6.0 presents the Director's declaration.

2.0 SITE DESCRIPTION AND HISTORY

Site Setting

The former Clayville Dump site is located in the north-central region of New Castle County, Delaware approximately ½ mile east/southeast from the intersection of U.S. Interstate 95 and Delaware Route 1 (Figure 1). The site comprises approximately 8.1 acres of an 18-acre parcel of

wooded land adjacent the Christina River. It is bordered to the north by a Conectiv (formerly DP & L) power line right-of-way, the Christina River and associated tidal wetlands to the south and east, and non-tidal wetlands to the west. Surrounding land use consists of a large retail complex opposite the wetlands towards the west, and wooded land and wetlands to the north, south and east (Figure 2).

Site and Project History

The Clayville Dump site was historically operated as a sand and gravel quarry prior to the early 1950s, when the site was operated as an industrial/municipal landfill under a permit from New Castle County. The landfill was in operation reportedly until 1971. There is not any available information as to what types or quantities of waste were disposed at the site. However, during recent investigations, iron and chrome automobile parts, rubber weather stripping, copious amounts of mica insulation, laboratory glassware and numerous 55-gallon drums (some containing liquid and/or solid contents) were identified on the surface and buried in the dump.

In January 1984, DNREC performed a preliminary assessment of the Clayville Dump site that documented the history and prior uses of the property, and recommended ground water sampling in the vicinity of the landfill. A site inspection (SI) was conducted at the site by DNREC in February 1987. This investigation consisted of the installation and sampling of monitoring wells, and the collection and analysis of soil samples and surface water and sediments from the Christina River. Other than low levels of polynuclear aromatic hydrocarbons (PAHs) that were detected in river sediments, there was little other contamination detected. However, a limited number of samples were collected. Only surface soil samples were collected. No drums were found. A hazard ranking of the site, based upon the results of the SI, determined that the site was ineligible for inclusion on the U.S. Environmental Protection Agency's (EPA's) National Priority List. Consequently, the Clayville Dump site was deferred to the State of Delaware.

A facility evaluation (FE) was performed by DNREC in 1994, which consisted of the excavation of numerous test pits, and sampling and analysis of surface and subsurface soils, groundwater, and surface water and sediments from the Christina River. The purpose of the FE was to identify the presence or absence of chemical contamination at the site associated with the former landfilling operations. Elevated concentrations of metals were found in a number of soil samples above the DNREC Uniform Risk-Based Remediation Standards (URS) for protection of human health. Some organic chemical contamination was noted, and several 55-gallon drums were also encountered.

As a result of the findings of the FE, DNREC contacted the property owner, who entered into a VCP agreement to perform a RI of the Clayville Dump site. Prior to the completion of the RI, DNREC requested that an investigation be conducted to further investigate the two areas where the drums had been encountered during the FE. The investigation began in November 1998 and numerous drums containing hazardous substances were found on-site. The investigation and subsequent drum excavation, removal, and disposal were all completed by July 1999.

3.0 REMEDIAL INVESTIGATION RESULTS/FEASIBILITY STUDY

ERC performed a RI at the site in 1997-98. The RI report was completed in July 1999. The RI consisted of the collection of 15 surface soil samples; the collection of one subsurface soil and one groundwater sample from each of eight subsurface boring locations; and the collection of eight sediment samples, five from the Christina River and three from the riparian wetlands between the landfill and the river.

During performance of the RI, a number of 55-gallon drums, some with varying amount of unknown materials, were identified on-site, mostly in the shallow subsurface. In November 1998, ERC began work to excavate and remove the drums that had been identified previously during the FE, as well as those recently discovered during the RI. Excavation and removal of the drums and associated contaminated soil was completed by January 1999, with subsequent waste characterization of the drum contents and disposal at approved facilities occurring in July 1999.

Soil analytical results indicated the presence of elevated concentrations of the metals, particularly lead (up to 6,380 mg/kg), antimony (up to 86.6 mg/kg), mercury (up to 21.8 mg/kg), and iron (223,000 mg/kg) in nearly all surface and subsurface soil samples. Please refer to Appendix I for a complete tabulated list of detected contaminants. One soil sample contained the polychlorinated biphenyl (PCB) Arochlor 1254, at 7.4 mg/kg, a concentration above its restricted use URS of 3 mg/kg. Several PAHs were detected in one or more Christina River sediment samples at concentrations in exceedence of their respective restricted use URS values. PAHs were not detected in the marsh sediments between the landfill and the river. However, the marsh sediments did contain arsenic, beryllium and iron at elevated concentrations in one or more samples.

Groundwater was found at the base of the landfill, perched on top of the underlying dense clay of the Potomac Formation. Groundwater yield was very poor, and is unusable as a potable resource. Intermittent exceedences of dissolved aluminum, beryllium, cobalt, iron, manganese, nickel and zinc were detected in groundwater samples collected from on-site monitoring wells in comparison to their respective URS values. Iron (up to 4,000 µg/l; URS of 300 µg/l), nickel (up to 112 µg/l; URS of 100 µg/l), manganese (up to 7,690 µg/l; URS of 50 µg/l), and zinc (3,700 µg/l; URS of 2,000 µg/l) exceeded their respective URS values of in the filtered samples. The most frequent of the elevated dissolved metals were iron and manganese, whose presence, in combination with a slightly acidic pH, high conductivity and low dissolved oxygen content, were indicative of landfill leachate. Groundwater loading calculations to the Christina River for the detected metals, due to the extremely low discharge rate, did not exceed Delaware Surface Water Quality Standards.

The site-specific human health and ecological risk assessments were performed under the assumption that the site would remain a former landfill, and would be zoned as such. Risks for short-term worker exposure and trespasser were calculated. The risk assessment concluded that no elevated risk existed for human trespassers to the site, or for ecological receptors. However, due to the lack of a risk-based concentration as input into the risk assessment, lead was not included in the risk assessment. Observed lead concentrations from seven surface soil samples were in excess of the restricted use URS of 1,000 mg/kg. As a result of the elevated lead, remedial action was warranted to address elevated concentrations of contaminants in site soils.

A supplemental environmental investigation to the RI was conducted in 1999-2000 at the site to delineate the extent of metal contamination in surface and subsurface soil samples along the edges of the landfill adjacent to the riparian wetlands associated with the Christina River. A total of 15 soil borings were conducted. Soil samples were collected from each boring and screened by the DNREC mobile laboratory. Based upon the results of the screening, a subset of soil samples was submitted for laboratory target analyte list /target compound list (TAL/TCL) analyses.

Concurrently with the supplemental environmental investigation, a geotechnical investigation was conducted across the extent of the landfill, consisting of the installation of 47 soil borings and 46 exploratory test pits. The purpose of the geotechnical investigation was to assess the necessary geotechnical information for use in the remedial design for the site. Soil samples were collected from each of the soil borings, and submitted for geotechnical analyses.

Results of the environmental sampling indicated that soil impacts from the landfilling activities continued up to the edge of the landfill. Elevated concentrations of metals, particularly antimony, arsenic, chromium, iron and lead, were detected at concentrations similar to those observed during the RI exceeding their respective restricted use human health URS in both surface and subsurface soils. During installation of the soil borings and excavation of the test pits, 25 additional 55-gallon drums were found, mostly on the surface and shallow subsurface. Of these, seven were empty and crushed, while the remainder contained varying amounts of unknown materials. All of the drums were excavated, removed and properly disposed off-site at an approved facility.

In the winter of 2002, a geophysical survey was conducted across the entirety of the landfill for purposes of identifying the possible presence of any drums remaining onsite. All magnetic anomalies large enough to represent potential drums were investigated through the excavation of test pits. Numerous drums were encountered, most of which were rusted, holed and crushed. Several contained a resinous product. All drums were excavated, removed and properly disposed at an appropriate off-site disposal facility, following characterization of their contents.

Upon completion of the RI, and after establishing remedial action objectives, DNREC usually requires a Feasibility Study (FS) to evaluate the various options available to remediate a site. However, for some categories of sites with a particular commonality, the U.S. EPA has developed presumptive remedies. Presumptive remedies are based on historical patterns of remedy selection and the preferred technologies typically implemented at sites with similar characteristics.

In the case of landfills, the EPA's Office of Solid Waste and Emergency Response has developed a presumptive remedy policy entitled *EPA's Presumptive Remedy for CERCLA Municipal Landfill Sites*. DNREC has reviewed this policy and concurs with EPA's approach and philosophy of utilizing established remedies for categories of sites with similar characteristics (e.g., landfills). To this end, the Department has previously adopted the EPA's presumptive remedy for municipal landfills, and will also adopt it as the FS for the Clayville Dump site. DNREC has determined that this approach will streamline the remedial process and, at the same time, provide protectiveness to public health, welfare, and the environment.

Therefore, DNREC has placed a copy of *EPA's Presumptive Remedy for CERCLA Municipal Landfill Sites* and a supporting document entitled *Conducting Remedial Investigations/Feasibility Studies for CERCLA Landfill Sites* on file at its Lukens Drive office.

4.0 REMEDIAL ACTION OBJECTIVES

According to Section 8.4 (1) of the Regulations, site-specific remedial action objectives (RAOs) must be established for all plans of remedial action. The Regulations provide that DNREC set objectives for land use, resource use and cleanup levels that are protective of human health and the environment.

Qualitative objectives describe in general terms what the ultimate result of the remedial action, if necessary, should be. Based on the presumptive remedy policy developed for landfill sites, and in consideration of the proposed commercial land use scenario and the requirements contained within the DNREC *Regulations Governing Solid Waste*, the following qualitative objectives are determined to be appropriate for the site:

1. Prevent human exposure to impacted media.
2. Prevent movement or migration of site contaminants.
3. Prevent environmental impacts, specifically to the Christina River, due to impacted media at the site.
4. Prevent ecological exposure to impacted media and restore ecological habitat.

These objectives are consistent with the current and proposed use of the site as a commercial use in a suburban setting adjacent to high-quality habitats and sensitive ecosystems, New Castle County zoning policies, and State regulations governing water supply.

Based on the qualitative objectives, the quantitative objectives are:

- Prevent human exposure to soils contaminated by VOCs, PAHs, and metals;
- Prevent percolation of precipitation through the landfill waste that could leach soil contaminants into groundwater, or entrain contaminated soil and discharge to surface water bodies via drainage runoff;
- Prevent ecological exposure to soils with concentrations of VOCs, PAHs, and metals;
- Improve riparian and upland habitat by concentrating landfill waste into a smaller area and restoring and revegetating areas that had previously been disturbed by landfilling activities; and

5.0. FINAL PLAN OF REMEDIAL ACTION

In consideration of the presumptive remedy policy adopted for landfill sites, the proposed land use scenario, the *Regulations Governing Solid Waste*, and the interim remedial actions already undertaken, the following remedial actions are proposed to ensure the long-term protectiveness to public health, welfare, and the environment:

1. Concentrate the landfill waste into a smaller area by excavating and moving waste material from the edges towards the center of the landfill. Restore and revegetate the newly exposed riparian and upland habitats that had previously been disturbed or covered by the landfill, with all activities based upon a DNREC-approved workplan and schedule;
2. Construct and install a landfill cap, based upon a DNREC-approved workplan and schedule, over the waste material to prevent both exposure to humans and wildlife by contaminated soils and percolation of precipitation, through the landfill waste that could leach contaminants into groundwater;
3. Construct a drainage system, based upon a DNREC-approved workplan and schedule, to divert surface water away from the landfill, thereby preventing erosion of the landfill cap as well as preventing downward percolation of precipitation through the waste; and
4. Place a deed restriction on the property that: a) restricts use of the property to those uses allowed following landfill post-closure under the *Regulations Governing Solid Waste* and EPA's *Reuse of CERCLA Landfills and Containment Sites Guidance*, b) prohibits digging, excavation or any disturbance of the soil cap, c) prohibits the installation of any water well on, or groundwater use at, the site without the explicit, written approval of DNREC, and d) places the site within a Groundwater Management Zone that will prohibit the installation of water wells at the site.

The Department actively solicited public comments and suggestions on the proposed plan of remedial action. No comments were received. The comment period began on Monday, July 29, 2002, and ended at the close of business (4:30 p.m.) Monday, August 19, 2002.

6.0. DECLARATION

This final plan of remedial action for the Clayville Dump Site is protective of human health, welfare and the environment, and is consistent with the requirements of the Delaware Hazardous Substance Cleanup Act.

John Blevins
Director, Division of Air and Waste

Date

**Figures from Remedial Investigation Report and
Supplemental Environmental and
Geophysical Investigation Report**

Figure 1: Site Location/Topographic Map

Figure 2: Remedial Investigation Sampling Locations

Figure 3: Supplemental Environmental Investigation Sampling Locations

Appendix I