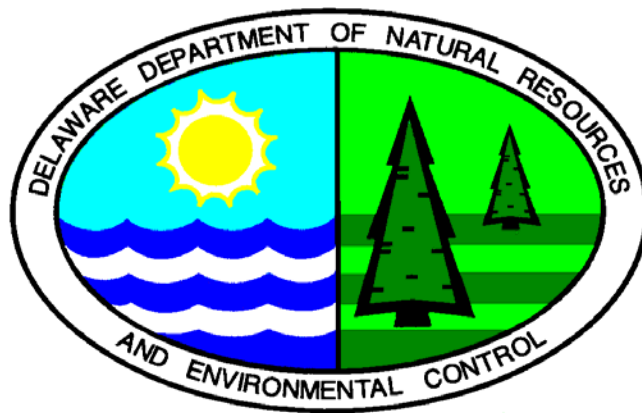


# **Final Plan of Remedial Action**

## **Denton Landfill Site**

**1057 River Road  
New Castle, Delaware**

**DE-0015**



**April 2003**

**Department of Natural Resources and Environmental  
Control Division of Air and Waste Management  
Site Investigation and Restoration Branch**

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## 1.0 Introduction

The Denton Landfill (site) is located at 1057 River Road in New Castle, Delaware, and is bordered by River Road to the northwest, residential properties and State-owned wetlands to the southwest, an undeveloped parcel owned by Bay West to the north and northeast, a residence to the northeast, and the Delaware River to the southeast (Figure 1). In order to assess the need for environmental remediation at the site, BP Amoco Chemical Company (BP Amoco) entered into a Consent Order in 1999 with the Delaware Department of Natural Resources and Environmental Control (Department or DNREC) under the provisions of the Delaware Hazardous Substance Cleanup Act (HSCA), 7 Del. C. Chapter 91. BP Amoco investigated the potential risks posed to public health, welfare, and the environment at the site.

BP Amoco contracted with RMT, Inc. (RMT) to perform a remedial investigation (RI) and risk assessment (RA) of the site. The objectives of the RI and RA were to: 1) understand the nature and extent of soil, sediment, and/or groundwater contamination at the site, and to 2) evaluate potential risks to public health, welfare, and the environment associated with identified contamination. The site was divided into separate parcels for the purpose of selecting a remedy. These parcels include the residential portion of the site and the landfill portion of the site (see Figure 2).

This document is the Department's final plan of remedial action (final plan) for the site. It is based on the results of the RI and RA 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 the Department's assessment of the potential health and environmental risks posed by the site, and the remedial action by which BP Amoco will address them. Upon completion of all required tasks in the final plan of remedial action (final plan), DNREC will issue a Certification of Completion of Remedy (COCR) to BP Amoco.

In February 2003, the Department issued the proposed plan of remedial action based on previous investigations. As described in Section 12 of the Regulations, the Department provided notice to the public and provided an opportunity for the public to comment on the proposed plan. Bp Amoco provided minor comments to the proposed plan. At the comment period's conclusion, the Department will review and consider all of the comments received and then will issue a final plan. Section 3.1 of the propose plan will changed as result of Bp Amoco's comments. The changes to the propose plan will not change the site remedy. The final plan will designate the selected remedial alternative for the site. All investigations of the site, the proposed plan, and the comments received from the public, Department responses to those comments, and the final plan will constitute the remedial decision record.

Section 2 presents a description of the site setting and project history. Section 3 provides a summary of the investigation results and the results of the human health and ecological risk assessments. Section 4 presents a discussion of the remedial action objectives (RAOs). Section 5 presents the proposed plan of remedial action for the site. Section 6 discusses public participation requirements.

## **2.0 Site Description and History**

### **2.1 Site Setting**

The site is located at 1057 River Road in New Castle, Delaware and is bordered by River Road to the northwest, residential properties and State-owned wetlands to the southwest, an undeveloped parcel owned by Bay West to the north and northeast, a residence to the northeast, and the Delaware River to the southeast (Figure 1). The site consists of approximately 29± acres with the following tax parcels numbers: the landfill (28.04 acres) Tax ID #10-035-00-039, residential parcel (0.95 acres) Tax ID #10-035-00-040, residential parcel (0.28 acres) Tax ID #10-035-00-041, and residential parcel (0.136 acres) Tax ID #10-035-00-042. The site currently includes an unoccupied residence (the former Denton family home), a stone driveway, wetlands, and open space. An unused water supply well remains at the unoccupied residence; potable water is now supplied to the residence from a municipal supply. In addition, a dilapidated, partially submerged barge is located at the site, which was placed across the opening to a tidal gut by the former site owners to prevent tidal water intrusion into the landfill (Figure 2).

### **2.2 Site and Project History**

From 1968 to 1980, BP Amoco contracted with Weaver Pole Line Construction Company who utilized the Denton's property as a landfill for waste from the BP Amoco polypropylene manufacturing plant. Most of the waste disposed at the landfill by Weaver was nonhazardous atactic, a byproduct of the polypropylene process. In October 1980, an explosion at the plant ended operations at the polypropylene plant, including waste disposal at the landfill.

In December 1990, Delaware DNREC granted approval for Dureco Polymers, Inc. (Dureco) to excavate and remove recyclable polypropylene from the landfill. Approximately 500 million pounds of polypropylene were removed from the landfill. The recycled polypropylene was shipped to Italy and was sold as roofing shingle material. As of January 1999, approximately 95% of the landfill had been excavated and a substantial portion of the site was backfilled and graded with clean fill. Dureco discontinued excavation of polypropylene from the landfill in January 1999.

In November 1999, BP Amoco entered into a Consent Order with Delaware DNREC to conduct a remedial investigation and risk assessment at the site. The results of these activities are summarized in Section 3. BP Amoco purchased the landfill and residential areas from the Denton's in September 2001.

### **3.0 Site Investigation and Risk Assessment Results**

In 1984, Delaware DNREC completed a preliminary assessment (PA) of the site. The results of the PA indicated that there was no apparent threat of contamination to the environment from the site and that the removal and recycling operation at the site would eliminate any possible future threat to the environment.

In May 1985, the United States Environmental Protection Agency (USEPA) completed a potential hazardous waste site tentative disposition form. USEPA recommended that a site inspection (SI) be conducted because remaining waste material contained in the landfill may have contained hazardous substances, including semivolatile organics, volatile organics, and heavy metals.

In March 1998, Delaware DNREC collected and analyzed six soil samples. Five of the samples were collected at the Denton Landfill and the sixth sample was collected from the washed soils located at the Dureco plant, located at 950 River Road, since these materials had been excavated from the Denton Landfill and were being processed by Dureco at the former plant site. DNREC was particularly interested in analyzing the samples for the pesticide, Mirex, which had been detected in plant-related wastes at another location. Although Mirex was detected in all six of the Denton samples, the concentrations were below Delaware DNREC's Uniform Risk-based Standard (URS) value for restricted use (i.e., commercial/industrial) in a non-critical resource area.

BP Amoco conducted a remedial investigation (RI) at the Denton Landfill between November 1999 and February 2000 in order to identify and characterize any potential hazardous substances that may have been released to the environment. BP Amoco's RI consisted of approximately 30 test pit locations, 13 sediment locations, four surface water samples, and samples collected from four monitoring wells (see Figure 2). One surface, and two subsurface soil samples were collected at each test pit location and were analyzed for semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), Target Analyte List (TAL) metals, titanium, cyanide, mirex, kepone, photomirex, and Dechlorane Plus. Following the completion of the RI, a baseline human health and ecological risk assessment was performed.

### 3.1 Remedial Investigation Soil/Sediment Results

Contaminants of potential concern (COPCs) were identified based on a comparison of analytical results from soil and sediment samples collected at the site to the DNREC URS. The COPCs were those constituents where the maximum observed concentration exceeded DNREC’s conservative URS screening values and, therefore, warranted further evaluation through a site-specific risk assessment. As outlined in Section 4.0 of the Remediation Standards Guidance

Under the Delaware Hazardous Substance Cleanup Act (Guidance), initial screening against URS values is intended to be a generic conservative approach to the protection of human health and the environment, and as such, does not take into consideration site-specific elements which change the assumptions used to derive the URS values.

The following tables identify only those chemicals detected during the remedial investigation that exceeded URS values. These tables conservatively compare the maximum chemical concentrations detected in surface soils, subsurface soils and on-site sediments to their corresponding Human Health URS value for unrestricted (i.e., residential) use in a critical water resource area. Sediment samples were also screened against an ecological URS for protection of the environment. Based on the results of this initial screening, the risks posed by these identified chemicals were further evaluated by conducting a site-specific human health and ecological risk assessment.

**Table 1: Landfill Area - Surface Soil (0 - 2 feet) Human Health Screening**

<b>COMPOUND</b>	<b>ANALYTICAL RESULTS (Maximum Detected Concentration) (mg/kg)</b>	<b>URS-UNRESTRICTED/ CRITICAL WATER RESOURCE AREA (Action Level) (mg/kg)</b>
Antimony	59	3
Manganese	530	160
Vanadium	140	55
Mirex	0.72	0.70
Benzo(a)pyrene	1.5	0.09
Benzo(a)anthracene	1.5	0.9
Indeno(1,2,3-cd)pyrene	1.6	0.9

**Table 2: Landfill Area - Subsurface Soil (2 feet to 8 feet) Human Health Screening**

<b>COMPOUND</b>	<b>ANALYTICAL RESULTS (Maximum Detected Concentration) (mg/kg)</b>	<b>URS-UNRESTRICTED/ CRITICAL WATER RESOURCE AREA (mg/kg)</b>
Benzo(a)anthracene	0.98	0.9
Benzo(a)pyrene	0.9	0.09
Mirex	3	0.7
Arochlor 1248	0.42	0.3
Antimony	330	3
Arsenic	58	11*
Cobalt	25	22
Manganese	630	160

\* Delaware Default Background Level

**Table 3A: Residential Lot - Surface Soil (2 feet to 8 feet) Human Health Screening**

<b>COMPOUND</b>	<b>ANALYTICAL RESULTS (Maximum Detected Concentration) (mg/kg)</b>	<b>URS-UNRESTRICTED/ CRITICAL WATER RESOURCE AREA (Action Level) (mg/kg)</b>
<b>SURFACE SOILS</b>		
Benzo(a)pyrene	0.68	0.09

**Table 4: Sediments - Ecological Screening**

<b>COMPOUND</b>	<b>ANALYTICAL RESULTS (Maximum Detected Concentrations) (mg/kg)</b>	<b>URS ECOLOGICAL (Action Level) (mg/kg)</b>
Benzo(a)anthracene	0.51	0.1
Benzo(a)pyrene	0.48	0.1
Fluoranthene	0.88	0.8
Phenanthrene	0.88	0.5
4,4-DDD	0.06	0.008
4,4-DDE	0.04	0.03
Antimony	140	2
Arsenic	42	8
Barium	120	20
Cadmium	14	1
Chromium	110	81
Copper	81	34
Lead	160	47
Mercury	0.85	0.2
Nickel	34	21
Zinc	600	150

The site includes both the landfill portion of the property, the former Denton residence on the eastern portion of the site, as well as three (3) small residential lots near Highway 9.

### **3.2 Groundwater Results**

The groundwater results from the RI indicated that there were no exceedances of the Federal Maximum Contaminant Levels (MCLs) as defined in the Safe Drinking Water Act. However, because some constituents in groundwater were present at concentrations above the conservative Delaware screening URS for the protection of the environment, groundwater loading values were calculated to evaluate the possible effects of groundwater discharge from the site to the Delaware River. Loading values for any organic or inorganic analyte detected in groundwater during the RI were calculated based upon the approximate measured groundwater flow rate at the site and its relation to the Delaware River. Based on these calculations, it was determined that Delaware's Surface Water Quality Standards would not be exceeded from the flow of site groundwater into the Delaware River (Appendix A).



The Denton Landfill is downgradient from two federal superfund sites. The groundwater utilization must be minimized to prevent migration of contaminants from two federal superfund sites to the Denton Landfill by adopting a groundwater management zone.

### **3.3 Results of Risk Assessments**

Under Section 5.0 of the Remediation Standards Guidance under the Delaware Hazardous Substance Cleanup Act (HSCA), a Quantitative Risk Assessment approach is most appropriate for sites such as the Denton Landfill where multiple pathways for exposure exist or various media are impacted. At the Denton site, human health and ecological risk assessments were conducted consistent with DNREC guidance documents to evaluate whether any potential risks would be posed to people or the environment from the COPCs identified in the preliminary URS screening process. Various species that are indigenous to Denton Landfill were evaluated as ecological receptors (Appendix B). The ecological risk assessment indicated that COPC concentrations did not exceed the Hazard Quotient Index of 1 under the Regulations except for aluminum. The aluminum concentrations are at background levels for New Castle County area. Therefore, the ecological risk assessment concluded that the Denton Landfill, in its current state, poses no potential adverse effects to ecological receptors at the site. The ecological risk assessment is detailed in the Ecological Risk Assessment report, prepared by RMT Inc. for BP Amoco, dated September 2001, revised May 2002.

The human health constituents of concern (COCs), benzo(a)pyrene, antimony and arsenic, did have the potential to pose an unacceptable risk to certain segments of the human population (i.e., a construction worker, adult and adolescent resident and commercial/industrial worker) in limited areas of the property. The antimony and arsenic, which presented a risk for potential exposure, were present only in subsurface soils ranging in depth from four (4) feet to eighteen (18) feet and only in specific locations of the site (i.e., test pits TP-4, TP-6, TP-11 and TP-13). Because it is highly unlikely that anyone will come into contact with soils at depths greater than 4 feet, and there are no potential risks associated with contact with surface soils shallower than 4 feet, institutional control measures can be put in place to eliminate potential exposure to the deeper subsurface soils in these limited areas.

Benzo(a)pyrene was detected in surface soils above URS unrestricted use screening values on the three residential lots along Route 9. The Department considered the concentration to be within background levels for the area. In any event, Bp Amoco conducted a human health risk assessment on an adult and adolescent resident and determined that no risk was posed from the COC (Appendix.C). The human health risk assessment indicated that the COC did not exceed carcinogenic risk of  $1 \times 10^{-5}$  under the regulations. The human health risk assessment is detailed in the Human Health Risk Assessment report, prepared by RMT, Inc. for Bp Amoco, dated September 2001, revised May 2002, February 2003.

### **4.0 Remedial Action Objectives**

According to Subsection 8.4(1) of the Regulations, site-specific Remedial Action Objectives (RAOs) must be established for all plans of remedial action. The Regulations require 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. The three residential lots do not require a remedy. However, remedial action is required on portions of the Denton landfill, which includes the former Denton residence. The following qualitative objectives are determined to be appropriate for the landfill:

- Prevent potential human exposure (dermal, inhalation, and ingestion) to impacted subsurface site soils; and
- Prevent potential drinking water use of site groundwater.

These objectives are consistent with the current and proposed use of the site for non-residential use in an urban setting, State regulations governing water supply, and worker health and safety.

Quantitative objectives define specific levels of remedial action needed to achieve protection of human health and the environment. To meet the qualitative objectives identified above, quantitative objectives will ensure that future site users, such as site workers, construction workers, visitors, and trespassers, are not exposed to subsurface soils that contain contaminants above the risk-based targets defined by the-site specific risk assessment. The following quantitative objective is determined to be appropriate for the landfill:

- Prevent human exposure to subsurface soils (at depth) contaminated by chemicals that would result in a carcinogenic risk exceeding  $1 \times 10^{-5}$  or a hazard index (HI) of 1.0.

Mass loading calculations, using a worst-case scenario, indicate that site-related contaminant concentrations reaching the Delaware River would be well below the applicable “Surface Water Quality Criteria for the Protection of Aquatic Life.” The groundwater investigation did not evaluate the cumulative effect of releases from any potential off-site sources.

Based on the results of the RI and RA, the contaminant concentrations present in groundwater do not pose a risk to human health or the environment. However, because groundwater concentrations did not exceed Federal MCLs, consumption of site groundwater was not evaluated in the RA.

## **5.0 Final Plan of Remedial Action**

As stated in Section 3 of this final plan, subsurface soils (at depth) in specific areas at the site contain levels of contaminants that could pose a potential risk to certain segments of the human population if those areas are accessed. The future use of the landfill is tentatively planned to be a nature preserve. However, the final design of the preserve has not yet been determined. The final plan of remedial action for the landfill calls for the following:

1. Implement a deed restriction on the landfill portion of the property identified on Figure 3, limiting the property to restricted land use (i.e., non-residential).

2. The deed restriction shall also include prohibiting any land disturbing activity such as digging, trenching, or excavation at depths greater than four feet in the restricted Subsurface Activity Zone illustrated on Figure 3 without prior approval of DNREC.
3. Add the Groundwater Management Zone (GMZ) to the deed restriction at the site to prohibit use of the shallow groundwater for a source of drinking water without prior approval of DNREC.
4. Revegetate the site to control site erosion and maintain the protective cover.
5. Properly abandon the four existing monitoring wells on the landfill property.
6. Due to illegal dumping of solid and hazardous waste at this facility, and because the existing fence is not preventing access to the property, under Chapter 61 of the Solid Waste Regulations, the property owners must secure the entrance way of the landfill to prevent illegal dumping.
7. Stabilize the bank north of the main access road to the site with a geotextile fabric and riprap or seed to prevent soil erosion.
8. Develop an Operations and Maintenance Plan to maintain the area.

## **6.0 Declaration**

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

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Date

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John Blevins, Director  
Division of Air and Waste Management

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**Figure 1: Project Location Map**

**Figure 2: Test Pit and Sample Location Map**

**Figure 3: Deed Restricted Area**

**Appendix A: Groundwater Loading Calculations**

**Table 5: Groundwater Loading Calculations**

<b>COMPOUND</b>	<b>MAXIMUM CONCENTRATION IN GROUNDWATER (mg/L)</b>	<b>ESTIMATED MASS LOADING TO DELAWARE RIVER FROM GROUNDWATER SEEPAGE (mg/day)</b>	<b>ESTIMATED WORSE CASE CONCENTRATION TO THE RIVER (mg/L)</b>	<b>DELAWARE SURFACE WATER QUALITY STANDARD (mg/L)</b>
Acetone	0.110	0.319	2.46-E-06	NSE
Benzene	0.0019	0.006	4.25-E-08	NSE
Dechlorane Plus	0.210	0.609	4.69-E-06	NSE
Aluminum	0.370	1.072	8.27-E-06	0.087
Arsenic	0.015	0.043	3.35-E-07	0.036
Iron	140	406	0.0031	1.0
Magnesium	270	782	0.0060	NSE
Manganese	31	89.8	6.93E-04	NSE
Nickel	0.150	0.435	3.35E-06	0.0083
Sodium	350	1.014	0.0078	NSE

NSE No surface water standard established for this contaminant.

**Appendix B: Ecological Risk Assessment - Hazard Quotient Calculations**

**(Ecological Risk Assessment)**

prepared by RMT, Inc. for BP Amoco Chemical Co.  
September 2001, revised May 2002



**Appendix C: Human Health Risk Calculations**

**(Human Health Risk)**

prepared by RMT, Inc. for BP Amoco Chemical Co.  
September 2001, revised May 2002, February 2003