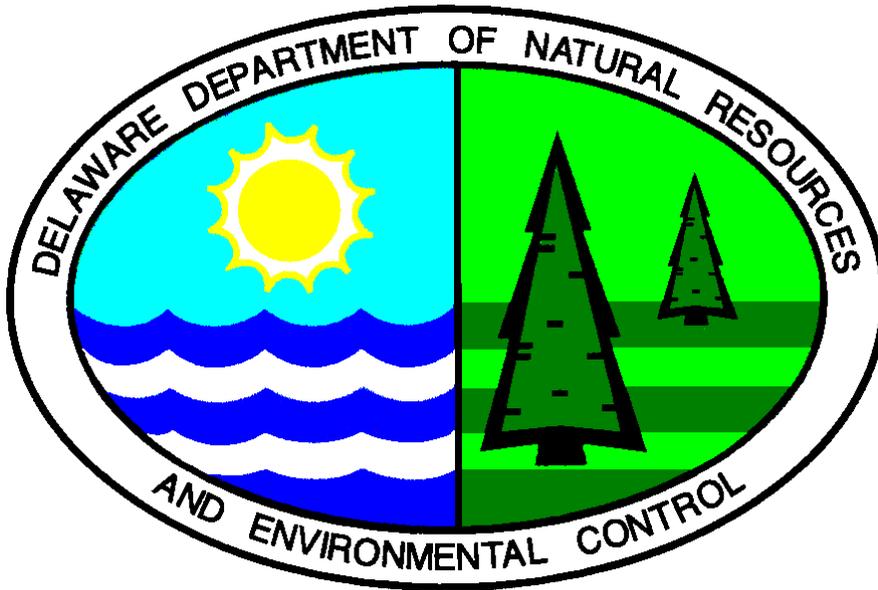


**FINAL PLAN OF REMEDIAL ACTION
FOR THE
WILMINGTON PIECE DYE SITE
WILMINGTON, DELAWARE**



**April, 2000
DNREC Project DE-1164
Project Officer: Paul W. Will**

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

TABLE OF CONTENTS

I. INTRODUCTION	1
II. PURPOSE.....	1
SITE DESCRIPTION AND HISTORY	2
III. INVESTIGATION RESULTS.....	2
IV. PROPOSED AND FINAL PLANS OF REMEDIAL ACTION.....	6
V. PUBLIC PARTICIPATION	6
VI. DECLARATION	7

LIST OF FIGURES

FIGURE 1 SITE LOCATION MAP	8
FIGURE 2 SITE FEATURES MAP	9
FIGURE 3 SUMMARY OF CONSTITUENTS OF POTENTIAL CONCERN	10
FIGURE 4 REMEDIAL GOAL OPTIONS FOR SOIL.....	11
FIGURE 5 SUMMARY OF PROBABLE COSTS FOR REMEDIAL ALTERNATIVES.....	12
FIGURE 6 NEWS JOURNAL LEGAL NOTICE	13

I. INTRODUCTION

In June 1998 RMT, Inc., Michigan (“RMT”) conducted a Remedial Investigation/Feasibility Study (“RI/FS”) at the Wilmington Piece Dye Site in Wilmington, Delaware. This RI/FS was conducted under the Delaware Department of Natural Resources and Environmental Control (“DNREC”) - approved RI/FS Work Plan in accordance with the Consent Order issued by the DNREC in the matter of the Wilmington Finishing Company site, One Mill Road, Wilmington, Delaware (June 18, 1998). The recorded owner of the site, Wilmington Finishing Company, filed for bankruptcy on May 15, 1998, and the site is now controlled by Wilmington Piece Dye (“WPD” or the “Site”) and Lanscot-Arlen Fabrics, Inc. (“Lanscot”). The Consent Order covers releases of hazardous substances to the environment which will require remedy.

The DNREC-SIRB conducted a Brownfield Preliminary Assessment II (“BPA II”) of the Site during the period from November 4–7, 1997. The DNREC has validated results of laboratory analyses from that investigation and the sample location map was utilized for RMT’s development of the RI/FS. RMT has performed additional sampling and testing as part of the RI for this site. The results of this additional sampling are contained in the completed RI for the Wilmington Piece Dye site dated May 1999.

WPD and Lanscot had entered into the DNREC Voluntary Cleanup Program (“VCP”) for the RI/FS and the potential remediation of the project area. The purposes of the RI/FS were to (1) identify potential sources of contamination within the limits of construction and (2) develop remedial alternatives for the detected contamination that protect human health, welfare and the environment.

The RI was completed in May 1999 and the FS was completed in November 1999.

II. PURPOSE

This Final Plan of Remedial Action (“Final Plan”) is based on the RI/FS completed by RMT, on behalf of WPD and Lanscot, and presents to the public the Department’s final selection of any remedial activities to occur at the Wilmington Piece Dye Site. This Final Plan is issued under the provisions of the Delaware Hazardous Substance Cleanup Act, 7 Del. C., Chapter 91, (“HSCA”) and the Regulations Governing Hazardous Substance Cleanup (“Regulations”).

The Department provided the public with notice and opportunity to comment on the Proposed Plan in accordance with HSCA and Section 12 of the Regulations. The Final Plan, which designates the selected procedures and stipulations concerning current and future activities, the Proposed Plan, any comments received from the public, the Department’s responses to the comments, and all of the site documents forming the basis for the Proposed and Final Plans will constitute the remedial decision record required for issuing the Final Plan.

Included in Section II is a site description for the Wilmington Piece Dye site. Section III provides a description of the investigation results. Section IV presents the Proposed and Final

Plans of Remedial Action. Section V discusses public participation requirements and Section VI presents the Director's declaration.

Site Description and History

The Wilmington Piece Dye site is located at One Mill Road in Wilmington, Delaware on the banks of the Brandywine Creek (Figure 1) and consists of approximately 16 acres of land in two parcels. The primary parcel covers 15 acres and contains the site operations and over 20 buildings (Figure 2). A smaller, separate parcel is located northwest of the main site and is used exclusively as a water filtration plant as part of the processing (i.e. cooling water for machines). The property is surrounded by residential and commercial property. The site is bordered by Brandywine Creek to the east and north and by office buildings and residential properties to the west and south. This is consistent with the boundaries and responsibilities defined in the Consent Order.

The property has been in continuous operation since the early 1800's. Historical businesses in the area reportedly centered on the manufacture and dyeing of woolen and cotton fabrics, and bleaching and waterproofing of fabrics.

Operations began at the site in 1831 when Joseph Bancroft opened a cotton cloth mill. Since that time, textile finishing has been continuously ongoing. Processes conducted included dyeing, waterproofing, bleaching, and starching of cotton and wool cloth.

III. INVESTIGATION RESULTS

As mentioned in Section I, November 4 – 7, 1997 the DNREC-SIRB conducted a Brownfield Preliminary Assessment II ("BPA II") of the Site. The DNREC has validated results of laboratory analyses from that investigation and the sample location map was utilized in RMT's development of the RI/FS. RMT has performed additional sampling and testing as part of the RI for this site. The results of this additional sampling are contained in the May 1999 RI for the Wilmington Piece Dye Site.

Eighteen shallow soil samples, sixteen deep soil samples, five groundwater samples, eleven surface water samples, and fifteen sediment samples were collected during the RI and sent to a Delaware Certified HSCA laboratory for analyses using Standard Operating Procedures for Chemical Analytical Programs (DNREC 1997). A subset of the prepared data was used by RMT for preparation of the RI/FS Report. Based on the analytical results from these samples, and from samples collected during the BPA II, the nature and extent of contamination has been evaluated and can be summarized as follows:

- Polynuclear aromatic hydrocarbons (PAHs) and metals are the primary constituents of concern detected at the site. These constituents are found in the shallow and deep soil above the Restricted Non-Critical Water Resource Area Uniform Risk Based Health Standard (RNCWRA-URS). PAHs above the URS for protection of the environment were also detected in sediments of the Brandywine Creek.

- The highest concentrations of PAHs and metals (primarily benzo(a)pyrene and arsenic) were detected in TP-10 and SS-14.
- Benzo(a)pyrene was the primary PAH found across the site in excess of the RNCWRA-URS. Other PAHs that exceeded the RNCWRA-URS were limited to the areas near SS-14.
- Volatile organic compounds (VOCs) were not detected above the relevant remediation standards.
- PCBs/pesticides were generally not present in the Site media. The exception to this was the presence of aldrin in sediments above the relevant remediation standard. Aldrin was detected in sediment upstream from the WPD property boundary indicating an off-site source for this constituent.
- Several metals, benzo(a)pyrene and one (1) VOC in MW-107, had been detected in ground water at levels above the relevant remediation standards; however, ground water is only encountered intermittently due to it being almost entirely contained within the fractures of the geologic complex beneath the site. Furthermore, although ground water is a pathway, the intermittent ground water has been shown to not be a significant pathway.
- Asbestos was detected in only one of the 18 shallow soil samples collected during the RI.

The contaminants identified as exceeding the RNCWRA-URS criteria were primarily located in the surface and subsurface soils, and included several PAHs and several metals. With the exception of the area around SS-14, which included exceedences of several other PAHs, the primary contaminants of concern across the site were benzo(a)pyrene and arsenic.

A baseline risk assessment, completed as part of the RI report, assessed human health risk. Figure 3 summarizes the human health risk COPCs for surface and subsurface soil at the WPD site. The Regulations Governing Hazardous Substance Cleanup have established a value of 1.0 E-05 as the acceptable maximum limit for excess lifetime carcinogenic risk. The estimated incremental potential risks using reasonable maximum exposure (RME) assumptions for the industrial worker under current land use considerations were less than the 1.0 E-05, the acceptable risk. This assumes that the soils in the area of TP-10 and SS-14 will be removed as part of the remedy for this property. Comparatively, RME risk estimates for the hypothetical construction worker (less exposure) under future land use considerations were less than 1.0 E-06. This result indicates that incremental carcinogenic risks are unlikely with industrial worker exposure to baseline conditions at the site. The potential risk calculations and hazard index estimates for the exposure pathways quantified are summarized in the RI report.

A benthic macroinvertebrate bioassessment was performed on September 27, 1999 to evaluate risk to the ecology along Brandywine Creek, adjacent to the WPD site. The assessment followed

United States Environmental Protection Agency (“USEPA”) protocols outlined in *Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish* (USEPA document EPA 444/4-89/001, 1989). EA Engineering and Science and Technology collected biological samples at two locations chosen by the DNREC. Based on the overall score produced by this assessment, the downstream score is 85% of the reference score, which classifies it in the nonimpaired biological condition category. Therefore, it was concluded that the site is not adversely impacting biota in the Brandywine Creek.

According to HSCA regulation 8.4(1) remedial action objectives must be established for all Plans of Remedial Action. The remedial action is evaluated utilizing both the Qualitative and Quantitative Objectives. The following considerations were taken into account in the development of the Qualitative and Quantitative Objectives:

- The site is an on-going industrial facility, and
- The site is located adjacent to the Brandywine Creek.

The Qualitative Objectives for this site are:

- Minimize potential exposure of construction or other workers who may be exposed to surface or subsurface soils,
- Maintain control of the site to prevent non-industrial uses,
- Minimize potential erosion of contaminated sediments into Brandywine Creek, and
- Minimize potential contaminated surface water run-off into Brandywine Creek.

Based on the qualitative objectives, quantitative objectives are established that the Department of Natural Resources and Environmental Control’s Site Investigation and Restoration Branch (“DNREC-SIRB”) determines will meet the qualitative objectives. For the WPD site, a site-specific baseline risk assessment was performed which enabled RMT to establish Remedial Goal Options (RGOs) for the site. RGOs are media-specific remediation concentrations estimated from each constituent of concern (COC) identified from the site-specific baseline risk evaluations. The site-specific RGOs are calculated to represent an acceptable site-wide average concentration estimate for each COC. The RGOs were derived following USEPA guidance (Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, June 1997 update).

COCs for the soils at the WPD site were identified from the RME risk calculations for the industrial worker and were limited to arsenic and semivolatile organic constituent benzo(a)pyrene. The calculated incremental carcinogenic risk and hazard index for the hypothetical exposure of a construction worker to the WPD site was less than 1.0 E-06 and 1, respectively. As a result, there were no COCs identified for any of the exposure pathways associated with the hypothetical construction worker.

The risk-based RGOs for the soil COCs were derived using the RME industrial worker exposure assumptions (i.e., worst case scenario) relied upon in the baseline risk assessment to maintain the conservative/protective approach for the FS. The risk-based RGOs for the WPD site are depicted in Figure 4.

The extent of remediation will be based on the RGOs discussed above using risk levels prescribed in Section 4 of the HSCA Guidance Manual. Specifically, areas to be addressed will be those that exceed the 1.0 E-05 cancer risk level or a Hazard Index (HI) of 1. Since SS-14 and TP-10 were the only areas to exceed a 1.0 E-05 cancer risk level, they will be the only areas where excavation is necessary. Since the site-specific baseline risk assessment demonstrated that the incremental cancer risk at other areas of the site were less than 1.0 E-05, then other alternatives such as no action, deed restrictions, soil treatment and engineered barriers can be considered for the site.

Five remedial alternatives were identified to address the RAOs. The alternatives identified for the surface and sub-surface soil contaminants are as follows:

- No Action.
- Institutional Control.
- Soil Removal and Disposal.
- Soil Treatment.
- Engineered Barrier.

Each of the remedial options was evaluated based on technical practicability. Specific process options for these technologies were screened based on effectiveness, operational ease, reliability and cost.

Based on the evaluation, the “No Action” approach was not considered further because it was not effective in protecting human health and the environment. The soil treatment (soil washing) approach was not considered due to hydrogeologic conditions at the site. The following remedial alternatives met the remedial objectives for the site:

- Alternative 1: Institutional Control (Deed Restriction) - Institutional control would be implemented in the form of deed restriction requiring that the future use of the property is consistent with its current use. This would ensure that the risk assessment conclusions that were based on industrial worker and construction worker exposure would remain valid.
- Alternative 2: Soil Removal and Disposal - Exposure to COCs would be eliminated by excavating and disposing of soil. The excavation would then be back-filled with clean fill.
- Alternative 3: Engineered Barrier (Capping) - Industrial worker exposure to COCs would be eliminated by interrupting the exposure pathway. This approach would place a concrete layer over areas where

COCs are evaluated and routine exposure to the industrial worker is possible. At areas where asphalt paving currently exists, this alternative may involve the repair or upgrade of the asphalt surface. Develop an Operations & Maintenance Plan (“O&M”) in order to periodically inspect the repaired or upgraded areas would be required.

Alternative 4: Engineered Barrier (Drainage Control) - Limiting the transport of surface contaminants through open drainage ditches would minimize further degradation of sediment and surface water. This alternative includes lining existing naturally occurring drainage ditches with concrete to eliminate erosion of impacted soil. Additionally, barriers would be installed to limit storm water flowing onto the site from adjacent properties. Storm water that flows across the eastern portion of the site would be channeled through a sand filter to minimize the amount of suspended solids entering the Brandywine Creek. The appropriate permits will be applied for by WPD.

The details of each remedial alternative evaluated are conveyed in the RMT FS for this project.

IV. PROPOSED AND FINAL PLANS OF REMEDIAL ACTION

Based upon the information and results of the investigation performed at the Wilmington Piece Dye property in Wilmington, Delaware, the DNREC-SIRB recommended plan of remedial action is to use a combination of several alternatives as follows:

- Deed restrict to limit site use,
- Excavate soil in the vicinity of SS-14 and TP-10 and dispose of material off-site,
- Pave or repair roads and parking areas,
- Line drainage ditches with concrete,
- Divert storm water flow from adjacent properties, and
- Use sand filter to remove suspended solids from storm water.

This combination of alternatives meets or exceeds all the criteria utilized in the evaluation of remedial alternatives that is conveyed in Subsection 8.5 of the Regulations and is the most cost effective remedy. Additional information regarding the evaluation of the remedial criteria is contained in the RMT FS for the site.

V. PUBLIC PARTICIPATION

The Department of Natural Resources and Environmental Control actively solicited public comments or suggestions on the Proposed Plan of Remedial Action and welcomed opportunities to answer questions. A request for a Public Hearing was not called for.

The public comment period for the Proposed Plan of Remedial Action began December 5, 1999 and ended at the close of business (4:30 p.m.) on December 27, 1999. The legal notice advertising the Proposed Plan appeared in the December 5, 1999 issue of the Delaware News Journal (Figure 6). No comments were received by the close of business on December 27, 1999.

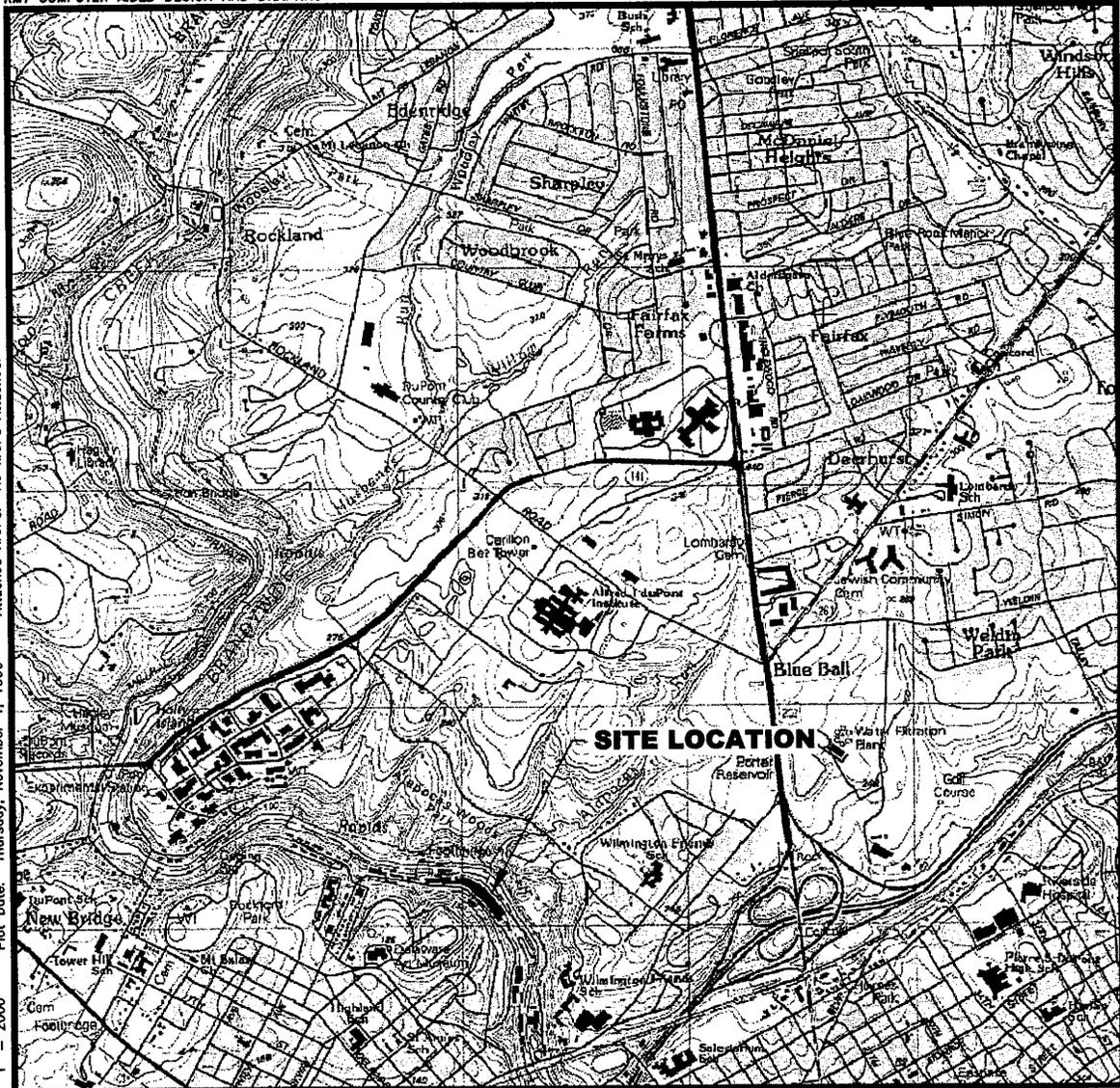
VI. DECLARATION

This Final Plan of Remedial Action for the Wilmington Piece Dye site is protective of human health, welfare and the environment and is consistent with the requirements of the Delaware Hazardous Substance Cleanup Act.

Denise Ferguson-Southard
Director, Division of Air and Waste Management

DATE

DE-1164 II B9
Pww00018.doc



Scale: 1" = 2000'

Source: BASE MAP DEVELOPED FROM THE WILMINGTON NORTH, DELAWARE-PENNSYLVANIA 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP, DATED 1993.

DELAWARE

QUADRANGLE LOCATION

SCALE IN FEET



**WILMINGTON PIECE DYE
WILMINGTON, DELAWARE**

SITE LOCATION MAP

DRAWN BY:	SJL
APPROVED BY:	JLA
PROJECT NUMBER:	69452.04
FILE NUMBER:	0401.DWG
DATE:	NOVEMBER 1999

FIGURE 1

FIGURE 3
Summary of Constituents of Potential Concern

SEMIVOLATILE ORGANIC CONSTITUENTS	INORGANIC CONSTITUENTS
Surface Soil	
Benzo(a)pyrene	Aluminum
Benzo(b)fluoranthene	Arsenic
Benzo(a)anthracene	Iron
Dibenzo(a,h)anthracene	Lead
Indeno(1,2,3-cd)pyrene	
Subsurface Soil	
Benzo(a)pyrene	Aluminum
Benzo(a)anthracene	Arsenic
Benzo(b)fluoranthene	Beryllium
Indeno(1,2,3-cd)pyrene	Iron

Figure 4
Remedial Goal Options for Soils
Industrial Worker

CONSTITUENT OF CONCERN	EXPOSURE POINT CONCENTRATION (mg/kg)	CARCINOGENIC RISK ⁽¹⁾	REMEDIAL GOAL OPTIONS (mg/kg) CARCINOGENIC ⁽²⁾ TARGET RISK		HAZARD QUOTIENT ⁽³⁾	REMEDIAL GOAL OPTIONS (mg/kg) NON-CARCINOGENIC ⁽⁴⁾ TARGET HAZARD QUOTIENTS		
			1E-05	1E-06		0.1	1	3
Inorganics Arsenic	5.94	1.11E-06	54	5	0.006	99	990	2970
Semivolatile Organics Benzo(a)pyrene	0.9	2.97E-06	3	0.3	NC	NA	NA	NA

(1) Carcinogenic Risk is the cumulative risk of the ingestion, dermal, and inhalation exposure pathways
(2) RGO = Exposure Point concentration * (Target Risk / Calculated Risk)
(3) Hazard Quotient is the cumulative hazard of the ingestion, dermal, and inhalation exposure pathways
(4) RGO = Exposure Point Concentration * (Target Hazard Quotient / Calculated Hazard Quotient)
NC = A Hazard Quotient was not calculated for this constituent due to a lack of toxicity values.
NA = Not applicable.

Figure 5
Summary of Probable Costs for Remedial Alternatives
Wilmington Piece Dye

Alternative #	Remedial Alternative	Total Capital Cost	O&M Costs Over 10 Years	Total Present Worth Over 10 Years
1	Deed Restriction	\$ 2,000	\$ -	\$ 2,000
2	Excavate/Dispose soil at SS-14 and TP-10	\$ 40,000	\$ -	\$ 40,000
3	Cap	\$ 20,000 - 200,000	\$ 20,000	\$ 40,000 - 220,000
4	Drainage Control	\$ 59,000 - 68,000	\$ 10,000	\$ 69,000 - 78,000