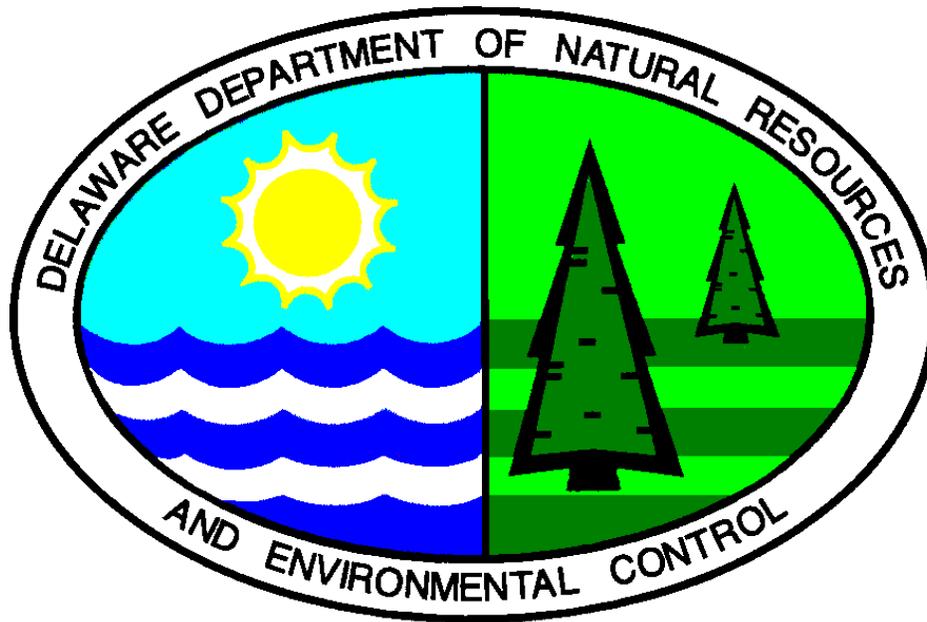


PROPOSED PLAN OF REMEDIAL ACTION



PROPOSED BIORETENTION SWALE AREA

DRAVO SHIPYARD
RDC/AMER Property
Wilmington, Delaware

DNREC Project No. DE-1092

FEBRUARY 1999

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

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I. INTRODUCTION

In April and June 1998, the Department of Natural Resources and Environmental Control (“DNREC” or “Department”) under the authority granted by the Hazardous Substance Cleanup Act (“HSCA”) (Del. C., Ch. 91) reached an agreement with the Riverfront Development Corporation (“RDC”) and Harbor Associates to oversee environmental investigation, remediation activities, and redevelopment activities at a 48 acre portion of the former Dravo Shipyard Site located on Madison Street in Wilmington, Delaware (Figures 1 and 2). The former Dravo Naval Shipyard is scheduled to be redeveloped into a catalogue outlet shopping mall, an exhibition center, and related facilities by the Riverfront Development Corporation of Delaware and Harbor Associates.

In the summer of 1998, surface and subsurface soil sampling was completed on 30 of the 48 acres of this section of the Dravo Shipyard (Figure 3). In September of 1998, DNREC issued a Proposed Plan of Remedial Action for the soil and subsoil for this first Phase or Operable Unit (OU I) which did not include the location of the proposed Bioretention Swale.

The scope of this Proposed Plan of Remedial Action includes the area defined by DNREC as the location of the proposed Bioretention Swale immediately adjacent to the '900 Building' area (Figure 3). The scope of this Proposed Plan of Remedial Action is limited to soil and subsoil for the proposed Bioretention Swale (Operable Unit III).

In the spring or early summer 1999, a Proposed Plan of Remedial Action will be issued for all environmental media in the Phase II area (or Operable Unit II) of the project - the remaining 18 acres - which will also include the groundwater on the entire 48 acre site and the sediments in the Christina River adjacent to the entire site.

This Proposed Plan is issued under provisions of the HSCA and the Regulations Governing Hazardous Substance Cleanup (“Regulations”). It presents the Department’s assessment of the potential unacceptable health and environmental risks posed by the soils in the proposed Bioretention Swale and plans for further action. This Proposed Plan does not address the groundwater media. The groundwater media will be included as part of OU II for this 48 acre portion of the Dravo Shipyard site.

The Proposed Plan of Remedial Action also includes a comparison of the remedial alternatives with respect to the following criteria: protection of public health, welfare, and the environment, and compliance with applicable laws and regulations.

The Department will provide public notice and opportunity to comment on the Proposed Plan in accordance with Section 12 of the Regulations. At the conclusion of

the comment period, the Department, after review and consideration of the comments received, shall issue a final plan of remedial action which shall designate the selected remedial action.

II. SITE DESCRIPTION AND HISTORY

Site Description

~~When the Dravo Shipyard was built in 1911, it was built on reclaimed marshland. The Dravo Shipyard is located on~~

Site History

The entire redevelopment area was historically the site of shipbuilding and other heavy industrial activities. Much of the area was reclaimed from marshland by filling with slag and other industrial waste products. Because of its previous industrial use, soil in the area has been impacted by environmental contaminants, including total petroleum hydrocarbons (TPH), heavy metals (lead, arsenic), polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs).

III. INVESTIGATION RESULTS

A total of three environmental investigations have been performed on the Dravo Shipyard area. In July and November 1997, DNREC performed two Brownfield Preliminary Assessment IIs. Soils throughout the property were found to contain significant amounts of organic and inorganic contaminants from historical operations at levels well above screening benchmarks. Primary contaminants of concern were found to be PAHs and Lead. Results indicated the relatively widespread PAH contamination of the shallow and deep soils in the project area. Toxic Characteristics Leaching Procedures (TCLP) analysis indicated that one surface soil sample exceeded the regulatory level for Lead as a hazardous waste.

In June and July 1998, EA Engineering performed a Phase I investigation of 30 acres of the former Dravo Shipyard, including the location of the proposed Bioretention Swale. A total of 160 samples were collected from the site (Figure 3). Twenty-six of these samples were collected from the proposed Bioretention Swale area, and one additional grab sample was collected after the preliminary stormwater controls were installed (Figure 4). Samples were screened initially by the DNREC – SIRB mobile lab for Carcinogenic polynuclear aromatic hydrocarbons (CaPAH) using Ohmicron immunoassay kits and for Total metals, including arsenic, cadmium, chromium, lead, and mercury using an X-ray fluorescence instrument. Additional volatile and semivolatile screening was performed at DNREC-Division of Water Resources Environmental Services Laboratory (DNREC – ESS) and Envirotech Research, Inc., Edison, New Jersey (Tables 3 - 5).

As a result of the mobile laboratory screening, a total 8 samples collected from the proposed Bioretention Swale were submitted to Lancaster Laboratories and Envirotech Research for confirmatory analysis of select parts of the United States Environmental Protection Agency (US EPA) Target Analyte List (Inorganics) and Target Compound List (Organics) (TAL/TCL) (Table 1). Toxicity Characteristic Leaching Procedure (TCLP) analysis was also performed on selected samples exhibiting high concentrations of inorganics according to the XRF screening. The specific parameters that were requested for laboratory confirmatory analysis are listed in Table 2. Samples were selected by EA and DNREC on the basis of moderate or high screening results.

The laboratory confirmed analytical data for the Bioretention swale revealed a wide range of analytical results (Tables 6 - 10). According to the site specific soil reuse levels, a majority of samples exhibited one or more analytes or compounds which exceeded the "B" criterion (Table 11). A few areas exhibited exceedences of "C" criterion following confirmatory fixed laboratory analysis. In the areas where TCLP Analysis was performed, no sample failed the criterion (i.e. hazardous waste as defined by the Resource Recovery and Conservation Act {RCRA} was not present in the proposed Bioretention Swale location).

IV. INTERIM ACTION

During the renovation of the adjacent First USA Riverfront Arts Center, parking lots were improved and constructed on the adjacent Harbor Associates Property. Temporary sediment and stormwater control measures were installed in the location of the proposed Bioretention Swale in order to manage any potential parking lot runoff. These measures were installed to prevent the use of the historic stormwater system. Approximately 5,200 cubic yards of soil and materials were excavated and placed under the area now covered by the 900 Building foundation following the Phase I investigation. A minimum of 3 feet of clean select fill was used to line the trench used as the temporary sediment and stormwater basin.

V. REMEDIAL ACTION OBJECTIVES

According to HSCA regulation 8.4(1), during a remedial investigation, remedial action objectives must be established. For the location of the Proposed Bioretention Swale, soil and subsoil environmental media only, remedial action objectives were designed based on the following factors:

- The Bioretention Swale is intended to improve the quality of storm water collected from the adjacent parking areas and building roofs and will act in place of a sealed historic stormwater system.
- Soil in the Bioretention Swale has been impacted by various chemical constituents. Based on the nature and extent of the contaminants, arsenic, lead, and PAHs have been identified as the primary contaminants of concern.
- Prevention of contact with soils in the side walls and underlying the Bioretention Swale by human and ecological receptors is a primary concern.
- The surrounding land uses are commercial and industrial.
- The site is bordered by the Christina River without a bulkhead between the site and the River.

Qualitative Remedial Objectives

Based on the above factors, the following qualitative remedial action objectives were developed:

- Mitigate discharge and/or release of sediment and soil contaminants from the Bioretention Swale area to the Christina River.
- Prevent future site users from directly contacting the surface and subsurface soils,
- Prevent future construction workers from directly contacting the surface and subsurface soils,
- Ensure no material exceeding regulatory limits for TCLP remains in place,
- Dispose offsite all material exceeding DNREC decision criteria for onsite reuse.

Quantitative Remedial Objectives

Based on the above qualitative remedial action objectives, the following quantitative remedial action objectives for the soil and subsoil environmental media were developed:

- Prevent release of contaminated sediment from the site to the Christina River in exceedence of the DNREC Uniform Risk Based Remediation Standards (URS) for protection of the environment.
- Prevent human contact with soil having an arsenic concentration greater than 60 mg/Kg.
- Prevent human contact with soil having a lead concentration greater than 400 mg/Kg.
- Prevent human contact with soil having a carcinogenic PAH concentration greater than 1 mg/Kg.
- Prevent human contact with soil having a C5 through C8 Aliphatic Hydrocarbons concentration greater than 100 mg/Kg.
- Prevent human contact with soil having a C9 through C12 Aliphatic Hydrocarbons concentration greater than 1000 mg/Kg.
- Prevent human contact with soil having a C9 through C18 Aliphatic Hydrocarbons concentration greater than 1000 mg/Kg.
- Prevent human contact with soil having a C19 through C36 Aliphatic Hydrocarbons concentration greater than 2500 mg/Kg.
- Prevent human contact with soil having a C9 through C10 Aromatic Hydrocarbons concentration greater than 100 mg/Kg.

The quantitative remedial action objectives are based on the DNREC “Final Draft Remediation Standards Guidance Under the Delaware Hazardous Substance Cleanup Act” (February 1998). These objectives are protective of potential human and environmental receptors.

VI. PROPOSED REMEDIAL ACTION PLAN

Potential Remedial Alternatives

To accomplish the described remedial action objectives, three (3) potential remedial alternatives were reviewed for the soil and subsoil environmental media for the project area. These are listed below and discussed further in the following section:

1. No further Action - Construct the Bioretention Swale in accordance with applicable sediment and stormwater regulations without any additional measures to prevent contaminated soil/sediment discharge.
2. Containment of remaining contaminated soils with the impermeable liner in the side wall and underlying the proposed Bioretention Swale. Removal of any materials which fail TCLP standards (i.e. according to laboratory analysis a sample that fails TCLP is considered a hazardous waste and therefore must be disposed of at a hazardous waste facility) or meet 'Z' site specific criterion.
3. Complete removal of soils exceeding site specific unrestricted reuse criterion.

Alternative 1: No Further Action

Under this alternative, the remaining affected soils within the Bioretention Swale would remain in place without a containment system. Alternative 1 would allow the Bioretention Swale to be constructed in accordance with the Regulations governing DNREC's Sediment and Stormwater Program, not taking into account the presence of the remaining contaminated soils.

Alternative 2: Containment to Impacted Soils

This option involves placing an impermeable liner along the bottom of the Bioretention Swale and along the sides of the Bioretention Swale to effectively cap the remaining contaminated soils. The liner along the bottom would prevent the collected stormwater from infiltrating into the remaining impacted materials underlying the Bioretention Swale. The liner along the side walls would prevent the collected stormwater from contacting the impacted materials in place in the Bioretention Swale. A 2 ft. thick mixture of sand and topsoil would be placed on top of the liner, further isolating the impacted soils from the public, from ecological receptors and from direct contact by rain and uncollected surface water discharge. This alternative would also require that a deed restriction would be placed on the site barring non-residential usage and requiring notification and approval from DNREC prior to any future intrusive activity in the project area.

Alternative 3: Complete removal of Impacted Materials

This alternative would require the removal of all the affected material (i.e. soils that exceed site specific unrestricted reuse criterion andURS values for protection of the environment)

within the proposed Bioretention Swale area. Approximately 12 additional feet of fill materials would be excavated - totaling approximately 30,000 cubic yards of material. Extensive dewatering would be necessary to allow excavation below the encountered groundwater. To allow dewatering to occur, sheet piling would be required to prevent groundwater and river water from entering the excavation area.

VII. EVALUATION OF REMEDIAL ALTERNATIVES

The remedial alternatives were evaluated in accordance with the criteria set forth in the HSCA Regulations. The application of these criteria are as follows;

Protection of public health, welfare and the environment - Alternative 1 does not offer the required protection since the contaminated materials are neither removed nor contained. Alternative 2 mitigates risk to human health and the environment by eliminating the exposure pathway of the impacted materials to both the public to the ecological receptors and subsequently through the prevention of the release of contaminants to the Christina River sediments. Alternative 3 presents an elimination of the source of the risk by the removal of the impacted materials.

Compliance with all applicable local, state and federal laws - Alternative 1 does not comply with all applicable local, state and federal laws as the impacted materials are not removed nor are they contained. A risk of exposure remains to human and ecological receptors from the contaminated materials. Alternatives 2 and 3, if implemented properly, comply with all applicable laws and regulation.

Community acceptance - Alternative 1 is not anticipated to be acceptable to the community. Alternatives 2 and 3 are expected to meet community acceptance. This criteria will be fully evaluated during the public comment period.

Monitoring required - Alternative 1 would require ongoing monitoring to assess if the contaminants of concern are being discharged into the Christina River. Alternative 2 would require additional monitoring if site conditions are altered. Alternative 3 would not require any monitoring since all source materials would be eliminated.

Technical practicability - Alternatives 1 and 2 are technically practicable, although Alternative 1 does not offer protectiveness to the environment. Alternative 3 is not expected to be technically practicable as extensive dewatering and excavation would be required.

Reduction in toxicity, mobility and volume - Alternative 1 would not reduce toxicity, mobility or volume of the contaminated material. The remedial action objectives would not be met since water entering the Bioretention Swale would come in contact with soils exceeding HSCA URS for the protection of human health and the environment.

This alternative would not provide a method to mitigate the potential migration of impacted sediment/soil into the Christina River as the collected stormwater discharges. Alternatives 2 and 3 would effectively reduce or remove the toxicity, mobility and volume of the contaminated soil in the project area.

Long term effectiveness - Alternative 1 does not offer any long term effectiveness. Alternative 2 offers long term effectiveness for the life of the Bioretention Swale. Future changes (if any) to site conditions may alter the effectiveness of this remedy. Alternative 3 is a permanent remedy.

Short term effectiveness - Alternative 1 does not offer this protection. Alternatives 2 and 3 are effective in protecting public health, welfare and the environment in the short term.

VIII. PROPOSED REMEDIAL ACTION PLAN

Based on the above criteria, Alternatives 2 and 3 are considered viable alternatives and offer protection of human health, welfare and the environment.

Alternative 2 (containment of the impacted material with an impermeable liner and use of clean fill) is expected to offer appropriate protectiveness to human health and the environment as a maintained remedial alternative. Alternative 2 meets the stated remedial action objectives. Stormwater will not contact the impacted soils during the tidal fluctuations of groundwater or during average rain event. The mean tide elevation is 3.99 ft, and the discharge of the Bioretention Swale is at elevation 4.3 ft. Stormwater collected within the Bioretention Swale will discharge prior to reaching the top of the liner along the side walls. By preventing the stormwater from contacting the impacted soil materials within the Bioretention Swale, the potential for the migration of the impacted soil/sediment into the river is eliminated. Soils will be further isolated by the placement of a liner to the top of the contaminated soil layer.

Alternative 3 (complete removal of impacted soils) is rejected because it is not expected to be technically practicable to dewater the proposed Bioretention Swale area to the depth that is needed to remove all the fill materials. In addition, the costs to implement Alternative 3 are expected to be prohibitive.

Therefore, the most appropriate remedial action is Alternative 2.

IX. PUBLIC PARTICIPATION

The Department actively solicits public comments or suggestions on the Proposed Plan and welcome opportunities to answers questions. A Public Meeting will be held on Wednesday March 3rd at the Dennison's Girls Club Please direct written comments to:

DNREC Site Investigation and Restoration Branch
Attn: Ann L. Breslin
391 Lukens Drive
New Castle, DE 19720

The comment period begins on Tuesday February 23, 1999 and ends March 14, 1999. Comments and/or requests for a public hearing may be submitted in writing to Ann Breslin by the close of business (4:30 p.m.) on March 14, 1999 at the above referenced address.

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