PROPOSED PLAN TO AMEND THE RECORD OF DECISION
DELAWARE SAND & GRAVEL SUPERFUND SITE
NEW CASTLE, DELAWARE

EPA REGION III *JULY 29, 1993*

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INTRODUCTION

This Proposed Plan identifies the revised preferred alternative for cleaning up buried drums and residually contaminated soils at the Delaware Sand & Gravel Superfund Site in New Castle, Delaware (the "Site" or "DS&G"). The plan includes a summary of the other alternative analyzed for the Drum Disposal and Ridge Areas of the Site (see Figure 1 below) and provides notice of upgrade to the design of the landfill **cap** at the Inert Area. This document is issued by the U.S. Environmental Protection Agency (EPA), the lead agency for response activities at the Site, and the Delaware Department of Natural Resources and Environmental Control (DNREC), the support agency for this response action. EPA, in consultation with DNREC, will select a final remedy for the Site only after the public comment period has ended and the information submitted during the comment period has been reviewed and considered.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the **Comprehensive Environmental Response, Compensation and Liability Act** of 1980, as amended (CERCLA). This document summarizes information that can be found in greater detail in the **Focused Feasibility Study** report and other documents contained in the **Administrative Record** file for this Site. EPA and DNREC encourage the public to review these documents in order to gain a more comprehensive understanding of the Site and Superfund activities that have been conducted there.

The administrative record file, which contains the information upon which the selection of the amended response action will be based, is available at the following locations:

Delaware DNREC
715 Grantham Lane
New Castle, DE 19720
(302) 323-4540

U.S. EPA Docket Room
Region III
841 Chestnut Bldg., 9th Fl.
Philadelphia, PA 19107
(215) 597-3037

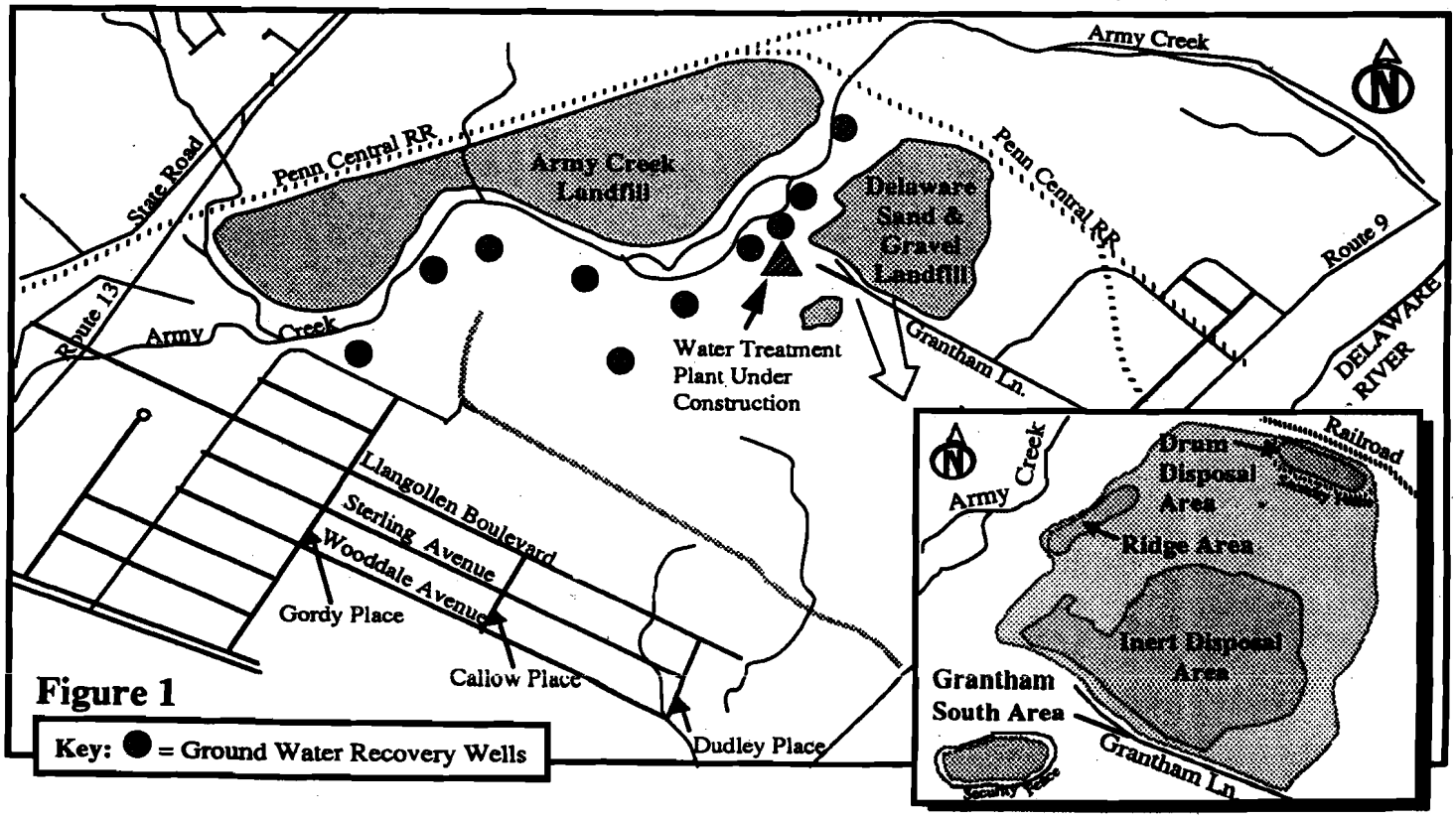

Figure 1

EPA encourages comments on each remedial alternative and on the information that supports the alternatives. Public comments can influence EPA's choice of a remedial alternative. As a result, the final **remedial action** plan, as presented in the **Record of Decision (ROD)**, may be different from the preferred alternative outlined in this Proposed Plan. A glossary of terms that may be unfamiliar to the general public is provided in the pullout page of this Proposed Plan. Terms defined in the glossary appear in **bold print** in the text.

SITE BACKGROUND

The Delaware Sand & Gravel Landfill is a former sand and gravel quarry comprised of 27 acres and located approximately two miles southwest of the City of New Castle. The privately owned facility, which operated twenty-four hours a day, officially began landfilling operations in 1968. Approximately 550,000 cubic yards of industrial wastes and construction debris, including at least 7,000 drums, were disposed of within four distinct disposal areas on the DS&G property (see the enlarged area of Figure 1 and refer to page 3 for further information about each disposal area). In 1976, DNREC closed the Delaware Sand & Gravel Landfill due to improper disposal and operating procedures. The Site is located adjacent to and southeast of another Superfund site, Army Creek Landfill, which was a municipal and industrial waste disposal site owned and operated by New Castle County from 1960 through 1968.

In 1984, EPA and DNREC performed an emergency **removal** of 1,644 drums from the surface of the Drum Disposal Area (DDA) of the DS&G landfill and provided a temporary fence to ensure security. This removal action successfully reduced surface contamination in the Drum Disposal Area and provided temporary site stabilization.

In the fall of 1984, EPA and DNREC began a **Remedial Investigation and Feasibility Study (RI/FS)**. The RI/FS identified the type and quantity of contaminants present, defined the areas of hazardous waste disposal, and evaluated the available options to reduce the potential risks presented by hazardous substances at the Site. EPA and DNREC completed the Remedial Investigation in December 1987 and the Feasibility Study in February 1988. On March 16, 1988, EPA held a public meeting. The community was invited to comment on all the remedial alternatives evaluated in the Feasibility Study.

In April 1988, EPA issued a ROD for the Delaware Sand & Gravel Site. In recognition of the area-specific conditions found during the RI/FS, the ROD provided for area-specific remedies. Since the ROD addressed the construction of three separate projects to deal with the conditions found at the Site, EPA divided the planned site activities into three **operable units (OUs)**. An operable unit is a portion of a Superfund site that is addressed separately from the rest of the site to allow for easier project management or a more timely response. The following is a description of the area-specific remedies selected for each OU:

Grantham South Area (Operable Unit 1) Completed September 1991

- Installing a security fence;
- Capping of the Grantham South Area to prevent the threat of direct contact and potential **leachate** generation; and
- Installing a gas venting system.

Drum Disposal and Ridge Areas (Operable Unit 2)

- Excavating wastes and contaminated soil; and
- Implementing on-site **thermal destruction** of buried drums and contaminated soil from the Drum Disposal Area and contaminated surface soil from the Ridge Area to prevent the threat of direct contact and leachate generation.

Inert Disposal Area (Operable Unit 3)

- Removing surface debris and installing a soil cover over the Inert Disposal Area to prevent the threat of direct contact with the contaminated wastes and soils.

Phasing the remedies enabled EPA to design and construct a cap at the Grantham South Area while completing the additional field work required in

preparation for a more complex **Remedial Design** for the Ridge and Drum Disposal Areas.

From 1991 to 1993, in accordance with the ROD, EPA conducted an extensive pre-design investigation in the Drum Disposal and Ridge Areas to generate additional data necessary to effectively perform the engineering design of the incineration project. The investigation indicated that the waste materials within the DDA were comprised of intact or semi-intact drums, along with contaminated subsurface soils. Information in EPA's possession prior to the pre-design field work had led the Agency to conclude that nearly all drums were emptied and/or crushed before burial. Additionally, the study found that source constituents had moved downward from the buried drums to an underlying clay layer and spread laterally creating a 5-10 foot-thick layer of contaminated soils within the saturated zone. This subsurface layer of contaminated soils, which lies beneath 25 to 30 feet of uncontaminated soils, contains levels of pollutants high enough to be considered a secondary source of contamination to the ground water.

The data collected during the pre-design investigation, taken together with data presented in the 1987 Remedial Investigation, provides a more thorough understanding of the nature and extent of contamination. Based on this more complete characterization of the DDA, EPA and DNREC have determined that the remedy selected in the ROD must be amended to address previously unrecognized site conditions.

In December 1992, a group of cooperating **potentially responsible parties (PRPs)** agreed to conduct a Focused Feasibility Study (FFS) in an effort to develop and evaluate the most appropriate remedial strategy for the DDA and Ridge Areas. Two remedial alternatives received detailed analyses in the FFS. The first alternative is the excavation and on-site incineration remedy selected in the original ROD modified to include the greater volume and specific character of materials now known to exist at the DDA. The second alternative developed in the FFS includes a combination of engineering controls, and both conventional and innovative treatment technologies.

In June 1992, EPA entered into an **Administrative Order on Consent** with 22 cooperating PRPs who agreed to design and construct a **slurry wall** around the DDA as an interim action. The slurry wall will conjoin the underlying natural clay layer and prevent contaminants from migrating from the DDA; it will also provide containment during drum removal. In the Administrative Order, the PRPs also agreed to perform the remedial design for the Inert Area. The PRP group decided to design a multi-

Delaware Sand & Gravel Landfill Disposal Areas

The Drum Disposal Area: The Drum Disposal Area occupies approximately three quarters of an acre and is located south of the railroad tracks. This area was originally a pit where drums containing liquids and sludges, including perfume, plastics, paint, and petroleum, from various industrial processes were disposed. The majority of drum contents were organics and inorganic solids. Ground water monitoring in the vicinity of the Drum Disposal Area indicates that the buried wastes are releasing contaminants into the underlying ground water.

The Ridge Area: The Ridge Area runs parallel to Army Creek occupying approximately half an acre. The Ridge Area was used primarily for surface storage of drums and large storage tanks containing inorganic and organic sludges and solids. The drums and tanks have been removed, or emptied, and steam cleaned; however, contaminated surface soils remain.

The Inert Disposal Area: The Inert Disposal Area is topographically the highest waste disposal area on site and occupies nearly 11 acres. Field investigations suggest that nearly one half million cubic yards of construction rubble and scattered chemical wastes were deposited in this disposal area. The refuse was covered with a thin layer of soil. Abandoned cars, trucks, storage tanks, and other solid wastes currently occupy the surface of the Inert Disposal Area.

The Grantham South Area: The Grantham South Area is located on two acres on the southern side of Grantham Lane. An estimated 73,400 cubic yards of construction rubble and scattered chemical wastes were deposited in a layer nearly 35 feet thick. Pre-construction field investigations identified elevated levels of organic and inorganic contaminants within the refuse layer.

layer cap for the Inert Area rather than the soil cover called for in the ROD. The decision to construct the multi-layer cap will be more protective than the soil cover and eliminates the need to perform potentially expensive and time consuming intrusive pre-design investigations at the Inert Area.

SCOPE OF AMENDMENT TO EXISTING RECORD OF DECISION

The clean-up alternatives in this Proposed Plan were developed to revise the existing plan to address the Drum Disposal and Ridge Areas based on the more thorough understanding of the nature and extent of contamination at the DDA. In addition, this document provides notice of change to the profile of the landfill cap to be installed over the Inert Area. The remedial action selected for the Grantham South Area, a multi-layer landfill cap, has been completed. The actions presented in this Proposed Plan to amend the Delaware Sand and Gravel ROD are the final planned response actions at the Site.

The overall strategy of the Delaware Sand and Gravel Record of Decision, as it will be amended, addresses source control. As described in previous decision documents, the ground water contamination emanating from both the Delaware Sand and Gravel Landfill and the adjacent Army Creek Landfill is being controlled by the **recovery well network** and treatment system selected in the Army Creek Records of Decision. Once the appropriate source treatment and engineering controls have been implemented at the respective Superfund sites, the ground water quality should improve.

SUMMARY OF PRE-DESIGN INVESTIGATIONS

The model of contamination at the Drum Disposal Area is fundamentally unchanged; however, detailed studies completed over the last five years have resulted in a model that is more complete than that utilized in the remedy selection process in 1988.

Two significant findings were made during the pre-design investigation that led to the determination that a more appropriate remedial strategy may be available. First, limited trenching through the DDA revealed that a considerable number of intact or semi-intact drums containing hazardous substances remain in the uppermost fifteen feet of soil. The waste materials within the upper portion of the DDA were previously thought to be comprised of contaminated soils and crushed drums. The incineration technology is best suited to treating a homogeneous waste stream which enables the operator to optimize temperature and retention times to destroy the highest percentage of hazardous constituents. Drums and pockets of highly contaminated soils containing dissimilar wastes are more difficult to incinerate successfully. Second, contamination from the DDA has spread laterally several hundred feet along a relatively impermeable surface at the top of the Upper Potomac Formation. In addition to increasing the volume of material that would be subject to remediation under the existing ROD, the practicability of excavating a 5-10 feet-thick layer of contaminated soils overlain by 30 feet of clean soils is questionable.

The pre-design investigation confirmed the nature and extent of contamination at the Ridge Area identified in the original ROD. The only reason the Ridge Area is subject to this amendment is because the selected remedy was to incinerate the contaminated Ridge soils along with the DDA soils.

SUMMARY OF SITE RISKS

Remedial action is generally warranted at a site when the calculated carcinogenic risk level exceeds 10^{-4}, meaning that one additional person out of 10,000 exposed is at risk of developing cancer. The potential for health effects resulting from exposure to noncarcinogenic compounds is evaluated by comparing an estimated daily dose presented by site conditions to an acceptable level. If this ratio exceeds 1.0, there is a potential health risk associated with exposure to that particular chemical. These ratios can be added for exposure to multiple contaminants. The sum, known as a **Hazard Index**, is not a mathematical prediction for the severity of toxic effects, but rather a numerical indicator of the transition from acceptable to unacceptable levels.

The site risks were characterized in the original ROD and remain unchanged. Ground water is

contaminated by leachate emanating from, among other places, the Drum Disposal Area. Although the Army Creek recovery well system is preventing contaminants from both the Army Creek and Delaware Sand & Gravel sites from migrating to any known water supply sources, future use of ground water through development of domestic drinking water wells installed within or on the Site boundary would present an unacceptable carcinogenic and noncarcinogenic risk to persons ingesting the water. The Risk Assessment prepared as part of the original Remedial Investigation assessed the potential public health impacts that may result from exposure to chemicals associated with the site in the absence of active remediation. When evaluating this potential future use scenario, the Risk Assessment determined that consumption of water from ground water monitoring wells installed within the Site boundary would present a potential carcinogenic risk in excess of 10^{-3}. This means that approximately one additional person out of 1,000 using the ground water as a drinking water source would be at risk of developing cancer during a lifetime. The assessment also determined that the Hazard Index calculated for three of the wells was considerably greater than 1.0.

Table 1 - Drum Disposal Area

Carcinogen

Compound	Initial Soil Concentration*	Soil Cleanup Standard	Post-treatment Carcinogenic Risk
Benzene	11,810	831	1.00E-06
Bis(2-chloroethyl) ether	Below Detection Level	5	1.00E-06
Bis(2-chloroisopropyl) ether	1,740	576	1.00E-06
Methylene Chloride	152,860	1,000	2.00E-07
1,2-Dichloroethane	16,360	250	4.17E-06
Trichloroethylene	9,665	1,000	1.46E-07
Tetrachloroethylene	9,665	1,000	7.39E-08
Styrene	1,864	1,000	1.94E-07
PCB-1248	10,930	10,930	1.38E-07
PCB-1254	52,170	52,170	3.44E-07
Cumulative Risk			**8.26E-06**

Noncarcinogen

Compound	Initial Soil Concentration*	Soil Cleanup Standard	Post-treatment Hazard Index**
Bis(2-chloroisopropyl) ether	1,740	576	.00825
Methylene Chloride	152,860	1,000	.0166
Acetone	21,290	5,000	.025
Total Xylenes	797,220	5,000	.000364
Toluene	195,170	5,000	.00291
Phenols	1,600	5,000	.0205
Naphthalene	560	560	.000457
Ethylbenzene	45,660	45,660	.0145
Trichloroethylene	9,665	1,000	.0176
Tetrachloroethylene	9,665	1,000	.0025
2-methylphenol	485	485	.00108
4-methylphenol	1,213	1,213	.0269
Chlorobenzene	9,633	5,000	.0265
Styrene	1,864	1,000	.000426
Cumulative Risk			**.1636**

* Initial Soil Concentrations based on 95% Percentile Upper Confidence Limit of the mean soil concentration.
** Hazard Index is a value used to evaluate the potential for noncarcinogenic effects that occur in humans.
Note: All units are micrograms/kilogram or parts per billion.

As part of the Focused Feasibility Study, hydrologic and hydrogeologic modeling was performed to determine acceptable soil contaminant concentrations within the Drum Disposal and Ridge Areas. Once the drums are removed, the objective is to protect the ground water from contaminants leaching from contaminated soils. The models were applied using site specific data such as annual rain fall, permeability of the sands and underlying clays, and movement of the ground water. The models assume that ground water quality at the boundary of the Drum Disposal and Ridge Areas must meet risk-based levels. Acceptable soil concentrations (soil cleanup standards) were developed to ensure that these risk-based levels would be achieved. The model to establish soil cleanup standards for the DDA assumed the existence of the slurry wall and a multi-layer cap, as these elements are common to each of the remedial alternatives evaluated in the FFS. The model developed to simulate conditions at the Ridge Area did not include any engineering controls. Consequently, the soil cleanup standards for the Ridge Area are more stringent than those calculated for the DDA.

The models project that if each contaminant within the DDA and Ridge Area is reduced to the soil concentration listed in Tables 1 and 2, respectively, the cumulative carcinogenic risk associated with attainment of these standards is within the 10^{-6} risk range. For example, Table 1 (on the previous page) identifies soil cleanup standards for the Drum Disposal Area. If the concentration of each contaminant of concern within the DDA is reduced to its respective soil cleanup standard, the cumulative carcinogenic risk associated with exposure to the ground water would be approximately 8.0×10^{-6}, meaning that approximately one additional person out of 125,000 exposed is at risk of developing cancer during a lifetime. The potential for health effects resulting from non-carcinogens would be reduced to safe levels by reducing the Hazard Index to less than 1.0. This analysis considers the potential future use of ground water on the site as a drinking water source.

The DDA soil cleanup standards will be used to determine which soils within the DDA will be excavated if Alternative 1 (On-site Incineration) is chosen, or act as performance standards if Alternative 2 (**Soil Vapor Extraction/Bioremediation**) is chosen. Refer to page 8 for a more complete description of the two remedial alternatives. The Ridge Area soil cleanup standards will be used to determine which soils within the Ridge Area will be excavated under either of the alternatives. The soils excavated from the Ridge Area will be treated along with the contaminated soils from the DDA. Either alternative, if implemented, should reduce the concentration of contaminants to meet the soil cleanup standards.

Table 2 - Ridge Area

Carcinogen

Compound	Initial Soil Concentration*	Soil Cleanup Standard	Post-treatment Carcinogenic Risk
Bis(2-chloroethyl) ether	400	0.77	1.00E-06
Bis(2-chloroisopropyl) ether	400	93	1.00E-06
Methylene Chloride	925	812	1.00E-06
Cumulative Risk			**3.00E-06**

Noncarcinogen

Compound	Initial Soil Concentration*	Soil Cleanup Standard	Post -treatment Hazard Index**
Bis(2-chloroisopropyl) ether	400	93	.00825
Methylene Chloride	925	812	.085
Cumulative Risk			.09325

* Initial Soil Concentrations based on 95% Percentile Upper Confidence Limit of the mean soil concentration.
** Hazard Index is a value used to evaluate the potential for noncarcinogenic effects that occur in humans.
Note: All units are micrograms/kilogram or parts per billion.

The comprehensive remedial objective of the proposed action is to: (1) reduce the potential carcinogenic risk to people exposed to the Site to within the 10^{-6} risk range; and, (2) reduce the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects by decreasing the Hazard Index to less than 1.0. The contaminant-specific soil cleanup standards identified in Table 1 were developed considering the concentrations and chemical properties of the compounds present and the theoretical efficiencies of the treatment technologies proposed. The individual soil cleanup standards must be evaluated as part of the dynamic whole, as the Table was developed to reduce the cumulative risks to meet the remedial objectives identified above.

Actual or threatened releases of hazardous substances from this Site, if not addressed by the preferred alternative or one of the other active measures considered, may present an imminent and substantial endangerment to public health, welfare, or the environment.

SUMMARY OF ALTERNATIVES

The two remedial alternatives developed and evaluated in detail in the Focused Feasibility Study as possible response actions to address the risks posed by current and future exposure to contamination at the DDA and Ridge Area are listed below:

Alternative 1: On-site Incineration - Construction of a slurry wall around the DDA, de-watering of area contained by slurry wall, excavation and on-site incineration of drums and soils exceeding cleanup standards (including Ridge Area soils), construction of a multi-layer cap over the DDA, construction of a soil cap over the Ridge Area.

Alternative 2: Soil Vapor Extraction/ Bioremediation - Construction of a slurry wall around the DDA, de-watering of area contained by slurry wall, excavation and off-site treatment/disposal of buried drums and waste, excavation of contaminated soils within the Ridge Area and consolidation of those soils in the DDA, treatment of residually contaminated soils within the containment area (DDA) utilizing both soil vapor extraction and bioremediation, construction of a multi-layer cap over the DDA, construction of a soil cap over the Ridge Area.

These alternatives were evaluated using the following criteria:

1. **Overall Protection of Human Health and the Environment**
2. **Compliance with Applicable or Relevant and Appropriate Requirements (ARARS)**
3. **Long-Term Effectiveness and Permanence**
4. **Reduction of Toxicity, Mobility or Volume Through Treatment**
5. **Short-Term Effectiveness**
6. **Implementability**
7. **Cost**
8. **State Acceptance**
9. **Community Acceptance**

Common Elements: Each of the alternatives now being considered include the installation of a slurry wall around the DDA. The slurry wall will conjoin the underlying natural clay layer and prevent contaminants from migrating from the DDA; it will also provide containment during drum removal. If Alternative 1 is selected, the slurry wall would be beneficial by controlling migration of contaminants from the DDA during the potentially lengthy design and permitting process and would reduce the volume of contaminated soils to be excavated and incinerated. The slurry wall would be an integral part of Alternative 2. Each alternative includes excavation of a relatively small volume of contaminated soils from the Ridge Area and either treatment or containment of those soils along with the DDA soils. A soil cap will be constructed over the Ridge Area; a multi-layer cap over the DDA. Both of the alternatives also include long-term monitoring in compliance with requirements of RCRA Subpart F, 40 CFR 264.100, and a wetlands monitoring plan.

Alternative 1: On-site Incineration

- **Capital Cost:** $67,520,100
- **Annual O&M Cost:** $140,000
- **Present Worth:** $69,490,300
- **Years to Implement:** 5

This alternative involves removal of all drums, wastes and soils within the DDA and Ridge Areas which contain concentrations of contaminants above the cleanup standards identified in Tables 1 and 2, respectively. Based on the current understanding of the Site, and using the soil cleanup standards to estimate excavation limits, approximately 62,000 cubic yards of contaminated soil and debris will be excavated from the DDA; approximately 500 cubic yards will be removed from the Ridge Area and treated along with the materials taken from the DDA. Excavation will begin within the boundaries of the DDA and move downward to the saturated zone, where contaminated soils are located. Excavation will then proceed laterally to the boundaries of the slurry wall, with "clean" soils found above the saturated zone to be stockpiled for subsequent backfill material. After dewatering, contaminated soils within the "saturated" zone will be subjected to thermal destruction in an on-site incinerator.

An on-site incinerator will be utilized to effect thermal destruction of the contaminated soils and drummed materials excavated from the Drum Disposal and Ridge Areas. Residual ash and scrubber water from the incinerator will be analyzed and disposed of in accordance with federal and state regulations. Data obtained during the pre-design investigation indicates that ash could be placed back into the excavation without need for further treatment. A multi-layer cap which will conjoin the top of the slurry wall will then be constructed over the DDA.

Alternative 2: Soil Vapor Extraction/ Bioremediation

- **Capital Cost:** $23,325,000
- **Annual O&M Cost:** $230,500
- **Present Worth:** $25,920,400
- **Years to Implement:** 6

This alternative consists of a combination of various elements, each selected to deal with a particular source of contaminant or contaminant migration pathway. Unlike the original Feasibility Study which evaluated the feasibility of meeting remedial objectives by employing each technology independently (i.e., soil vapor extraction, incineration, bioremediation, etc.), this alternative was developed by orchestrating several treatment technologies and engineering controls.

After the slurry wall is constructed, the interior will be dewatered to create a positive gradient into the enclosed area. Initial water removal operation is projected to generate 680,000 gallons which will be either transported off site and disposed at a waste treatment facility or treated on site using an aqueous waste treatment system.

The upper 15 feet of the DDA will be excavated as a means of providing primary source reduction by removal of buried drums and highly contaminated soils directly associated with those drums. Intact drums containing liquids will be pumped out or vacuumed dry and compatible liquids bulked in tanks. The recovered materials (i.e., drum, contents, and soil in direct contact with the waste) from this removal action will be sampled and bulked according to compatibility. A decision matrix will be utilized to select the appropriate off-site treatment and/or disposal option for each category of waste. Residually contaminated soils excavated along with the drums will be segregated and stockpiled.

Contaminated soils which do not meet the cleanup standards in the Ridge Area will be excavated. Three "hot spots" (areas with soils contaminated above the cleanup levels) within the Ridge Area were defined during the pre-design investigation. Approximately 500 cubic yards of contaminated soil will be generated from these excavations. Excavated soil will be consolidated with the DDA soils prior to treatment. A soil cap will be constructed over the Ridge Area.

A Soil Vapor Extraction/**Bioventing** System (SVE/BVS) will be constructed within the excavation area created by drum removal in the DDA and will be used to treat shallow soil (soils to a depth of 15 feet). The SVE/BVS will be designed to provide physical

removal of volatile constituents and create an environment within the **soil matrix** which will stimulate growth of natural microorganisms already present in the impacted soils. Excavated soils will be homogenized, and augmented with moisture and nutrients before being placed in the SVE/BVS. Air distribution piping will be installed within the excavated soil matrix and necessary emission controls constructed to complete the system.

Air flow through the *in situ* SVE/BVS will be induced by withdrawing air from the air-outlet piping. Final spacing of the air distribution piping is dependent upon the optimal oxygen transfer requirements for the *in situ* SVE/BVS and the resulting permeability of the DDA soil matrix after installation of the SVE/BVS. The system will be designed to provide an air flow rate that will result in soil vapor extraction and maintain aerobic conditions in the soil.

Contaminated soils located below the drum excavation (deeper than 15 feet) and in the saturated zone within the boundaries of the slurry wall will be remediated using an *in situ* Vertical Soil Vapor Extraction and Bioremediation System (VSVE/BRS). The VSVE/BRS will consist of a series of air extraction and injection wells connected to a vacuum extraction and treatment system located above-ground. Provisions will be made to allow treatment of the extracted off-gas, as required.

Active operational management of the SVE/BVS and VSVE/BRS treatment systems will continue until soil cleanup standards are achieved. Given the theoretical performance efficiencies, most site contaminants will be reduced to less than the level of their respective cleanup standards within two years; however, each system will be operated for a minimum of eight years and until a zero slope reduction condition is reached (i.e., the practical limits of the technology).

Following completion of the excavation activities and the construction of SVE/BVS and VSVE/BRS systems, a multi-layer cap designed to incorporate an appropriate number of sampling ports will be constructed over the DDA and will conjoin the top of the slurry wall. The sampling ports will allow the underlying soils to be sampled to confirm that cleanup standards have been met.

EVALUATION OF ALTERNATIVES

EPA's preferred alternative for addressing the buried drums at the DDA and the residually contaminated soils at both the Ridge and Drum Disposal Areas is Alternative 2 (Soil Vapor Extraction/Bioremediation). Based on current information, this alternative appears to provide the best balance of trade-offs among the alternatives with respect to the nine criteria that EPA uses to evaluate alternatives, which are set forth in the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**, 40 C.F.R. Section 300.430(e)(9)(iii).

The following summary profiles the performance of the preferred alternative in terms of the nine criteria, noting how it compares to the other alternative under consideration.

Overall Protection of Human Health and the Environment

Both of the alternatives would provide adequate protection of human health and the environment by eliminating, reducing, and controlling hazardous constituents through treatment and engineering controls. Treatability studies suggest that the preferred alternative will reduce the concentration of most site contaminants to less than the levels of their respective cleanup standards within two years. Operating the soil vapor extraction/bioremediation systems for an additional several years would result in all cleanup standards being met, with most contaminants being reduced to much lower levels. The slurry wall and multi-layer cap will control migration of any residual contaminants which are not removed or destroyed. The limited excavation and handling of contaminated soils involved with the *in situ* treatment reduces the short-term risk posed to site workers during construction activities. Alternative 1 would meet the cleanup standards through thermal destruction of contaminants in soils exceeding the cleanup standards. To achieve residual contaminant levels less than the cleanup standards, additional soil must be excavated and incinerated. Both Alternative 1 and 2 will be protective of human health and the environment by eliminating buried drums and treating contaminated soils.

Compliance with ARARs

The federal and state requirements or criteria with which a Superfund remedy must comply are called **Applicable or Relevant and Appropriate Requirements (ARARs)**. In this section of the Proposed Plan, EPA has identified the major ARARs that the alternatives must meet. The complete list of ARARs will appear in the Record of Decision in which EPA will select the remedy for the Site.

The primary objective of the action to be taken at the Site is to protect the ground water from contaminants which are currently leaching from buried drums and contaminated soils. Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) for public drinking water supplies have been established under the Safe Drinking Water Act and are considered relevant and appropriate standards for ground water. However, meeting the chemical-specific MCLs and non-zero MCLGs would still result in a cumulative risk in excess of 10^{-4} due to the fact that there are multiple contaminants associated with the Site. In accordance with the NCP, use of risk-based target concentrations are necessary to set a protective remediation level. Numeric modeling indicates that if the soil cleanup standards listed in Tables 1 and 2 are met, the result will lead to contaminant concentrations in the ground water that are equal to or less than the chemical-specific MCLs and non-zero MCLGs. Health Effects Assessments and U.S. EPA Health Advisories were considered in establishing ground water cleanup standards for the Site.

Soil vapor extraction in Alternative 2 would result in off-gas containing volatile organic compounds (VOCs); on-site incineration would result in potentially harmful air emissions at the stack. Air emission controls may be necessary to meet state and federal requirements. These requirements include state regulations pertaining to air emissions (7 Delaware Code, Chapter 60, Section 6003), National Ambient Air Quality Standards (NAAQS) (40 C.F.R. Part 50) and National Emissions Standards for Hazardous Air Pollutants (NESHAPS) (40 C.F.R. Part 61). The preferred alternative would also comply with the substantive portions of requirements regulating air emissions from process vents (40 C.F.R. Part 264 [Subpart AA]. The EPA guidance document entitled *Control of Air Emissions from Superfund Air Strippers at Superfund Groundwater Sites* would be considered in assessing the need for controlling air emissions for the soil vapor extraction remedy.

Alternative 1 would comply with the substantive portions of federal and state requirements regulating incinerators (40 C.F.R. Part 264 [Subpart O]). In addition, federal standards to control metals emissions in Boilers and Industrial Furnaces (40 C.F.R Part 266 [Subpart H]) and federal standards to control dioxin / furan emissions in Municipal Waste Combustors (40 C.F.R. Part 60 [Subpart Ea]) are relevant and appropriate to on-site incineration of wastes.

Any on-site storage of hazardous wastes would comply with the substantive portions of federal and state requirements regulating containers (40 C.F.R. Part 264 [Subpart I]), tanks (40 C.F.R. Part 264 [Subpart J]), surface impoundments (40 C.F.R. Part 264 [Subpart K]), waste piles (40 C.F.R. Part 264 [Subpart L]), and closure and post-closure care of storage units (40 C.F.R. Part 264 [Subpart G]).

Both alternatives include on- or off-site treatment of water extracted from the interior of the slurry wall. Effluent from the treatment of aqueous waste would comply with state and federal requirements pertaining to point source discharges to surface water including effluent limitations under the Clean Water Act (40 C.F.R. Part 122), state surface water quality standards and federal ambient water quality criteria established pursuant to Section 304 of the Clean Water Act (33 U.S.C. Section 1314) which apply to the protection of aquatic life.

The implementation of either alternative would result in the generation of residual wastes. Any residual wastes would be evaluated in accordance with the hazardous waste identification requirements of 40 C.F.R. Part 261, Subpart C. On-site handling of any residual wastes found to exhibit a characteristic of a hazardous waste would comply with the substantive portions of federal and state regulations that pertain to generators of hazardous waste (40 C.F.R. Subpart 262) and transporters of hazardous waste (40 C.F.R. Subpart 263) including

the federal land disposal restrictions (40 C.F.R. Subpart 268).

Both alternatives would meet their respective applicable or relevant and appropriate requirements of federal and state environmental laws (ARARs).

Long-term Effectiveness and Permanence

Both alternatives use treatment technology that is permanent and irreversible. The preferred alternative is versatile in that it can be operated in the soil vapor extraction mode or at a slower bioremediation mode. During the soil vapor extraction mode contaminants are stripped from the soils and, if necessary, captured as off-gas in an emission control unit. When air is pulled through the soils at a slower rate, the increased oxygen levels stimulate microorganisms which are already present in the contaminated soils. The microorganisms degrade the contaminants. On-site incineration thermally destroys the contaminants. Both alternatives employ a slurry wall/multi-layer cap containment system to isolate the residual source constituents from the environment.

Reduction of Toxicity, Mobility, and Volume

Both alternatives reduce the volume of contaminated media through the removal of sources of contamination within the upper level of the DDA. Toxicity is reduced by the preferred alternative through *in situ* biodegradation of contaminants or removal and off-site treatment in the soil vapor extraction mode. Alternative 1 would provide even greater reduction of toxicity through thermal destruction of organic compounds. Both alternatives significantly reduce the mobility of source constituents through the construction of the containment system.

Short-term Effectiveness

The preferred alternative involves relatively limited excavation and handling of contaminated soils. The *in situ* treatment reduces the short-term risk posed to site workers during construction activities compared to the full scale excavation entailed with Alternative 1. Both alternatives entail potential air emissions; however, emissions will be effectively monitored and controlled to prevent unacceptable levels of exposure. Alternative 1 may pose an additional short-term risk to workers and neighboring populations due to the non-homogeneous waste stream, or in the event of a malfunction of the on-site incinerator. These risks would be reduced through implementation of an air monitoring program, emission controls, and continuous monitoring of the thermal treatment system combined with automatic shut-off features.

Implementability

The preferred alternative would utilize technology that is readily available and standard equipment that is available locally. Contamination in relatively inaccessible areas is treated *in situ*, simplifying the logistics. The remedial design would take less than one year to complete and no administrative delays are anticipated. The majority of the cleanup standards would be met within two years of the start of operations. Alternative 1 would employ a readily available and well understood technology. The presence of both PCBs and certain metals in the waste stream means that the incinerator feed stock must be pre-characterized so that the temperature and retention time can be managed to minimize problematic emissions. Efforts to acquire all necessary permits and regulatory approvals to site a new incinerator, even on a temporary basis, routinely result in delays.

Cost

The present worth of the preferred alternative (Alternative 2) is estimated at $25,920,400. Alternative 2 is less costly than Alternative 1, the present value of which is $69,490,300, yet provides the same degree of risk reduction.

State Acceptance

DNREC supports the preferred alternative (Alternative 2) but reserves its final concurrence until community comments are evaluated.

Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be discussed in the Record of Decision for the Site.

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SUMMARY OF THE PREFERRED ALTERNATIVE

In summary, the preferred alternative (Alternative 2) would achieve substantial risk reduction through treatment of the principal threat remaining at the Site (i.e., buried drums and highly contaminated soils) and by providing for *in situ* treatment and the safe management of other material that will remain on site. Alternative 2 achieves this risk reduction at substantially less cost than the on-site incineration option. Therefore, the preferred alternative is believed to provide the best balance of trade-offs among the alternatives with respect to the evaluation criteria. Based on the information available at this time, EPA and DNREC believe the preferred alternative would be protective of human health and the environment, would comply with ARARs, would be cost effective, and would utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Because it would treat the organic contaminants in the soil, the remedy also would meet the statutory preference for the use of a remedy that involves treatment as principal element.

COMMUNITY PARTICIPATION IN THE SELECTION PROCESS

EPA has set a public comment period from July 29, 1993, through September 13, 1993, to encourage public participation in the selection process. The Agency encourages comments on both of the alternatives described above and on all the information which supports them which may be found in the Administrative Record file. Although EPA has proposed a preferred alternative (Alternative 2 - Soil Vapor Extraction/Bioremediation), a final decision will be deferred until EPA has reviewed comments received during the comment period. As a result of comments received during the public comment period, the final remedy presented in the Record of Decision may be different from the preferred alternative presented here.

EPA will hold a public meeting during the comment period. The public meeting is scheduled for 7:00 p.m. on September 2, 1993, and will be held at the Carpenters' Union Hall, 626 Wilmington Road, New Castle, Delaware 19720. No 6210

Written comments must be postmarked on or before September 13, 1993. Following the conclusion of the public comment period, and after consultation with DNREC, EPA will select a remedy based on the information in the Administrative Record and the comments received during the public comment period. The selected remedy will be documented in the Record of Decision, which will summarize EPA's decision process and provide responses to comments received from the public.

To send written comments or obtain further information, please contact one of the two EPA representatives listed below:

EPA CONTACTS:

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GLOSSARY FOR ALTERNATIVE EVALUATION CRITERIA

Overall Protection of Human Health and the Environment: Addresses whether the remedy provides adequate protection and describes how risk posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

Compliance with ARARs: Refers to whether or not a remedy will meet all Applicable or Relevant and Appropriate Requirements (ARARs) of federal and state environmental statutes and/or provides grounds for involving a waiver. It also addresses whether or not the remedy complies with advisories, criteria and guidance that EPA and DNREC have agreed to follow.

Long-Term Effectiveness and Permanence: The ability of the remedy to maintain reliable protection of human health and the environment over time once the cleanup standards have been met.

Reduction of Toxicity, Mobility or Volume Through Treatment: Relates to the anticipated performance of the treatment technologies with respect to these criteria.

Short-Term Effectiveness: Refers to the period of time needed to achieve protection, and any adverse impacts on human health and the environment that may be posed during the construction and implementation, until cleanup standards are achieved.

Implementability: The technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

Cost: The following costs are evaluated: estimated capital, operation and maintenance, and net present worth.

State Acceptance: This indicates whether, based on its review of the FFS and the Proposed Plan, the state concurs with, opposes, or has no comment regarding the preferred alternative.

Community Acceptance: Will be assessed in the Record of Decision following a review of the public comments received on the Administrative Record and the Proposed Plan.

GLOSSARY

Administrative Order on Consent: An enforceable agreement signed between EPA and the potentially responsible parties (PRPs) whereby PRPs agree to perform or pay for site cleanup activities. The agreement describes actions to be taken at a site and may be subject to a public comment period. An administrative order does not have to be approved by a judge.

Administrative Record: An official compilation of documents, data, reports, and other information that is considered important to the status of and decisions made relevant to a Superfund site. The record is placed in the **information repository** to allow public access to the material.

Applicable or Relevant and Appropriate Requirements (ARARs): The federal and state requirements that a selected remedy must attain. These requirements may vary among sites and alternatives.

Bioventing: A technique which provides a means of introducing added oxygen to the subsurface environment to maximize microbial activity. Many environmental contaminants are subject to degradation by naturally occurring microorganisms. The rate at which the degradation proceeds is related to soil/waste characteristics and in many cases is hindered by an inadequate supply of oxygen or nutrients.

Cap: A cover installed over a landfill to reduce the potential for surface water and rain water coming into contact with the buried materials. A cap is usually made from synthetic liners, compacted clay, or both.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and amended in 1986 by the Superfund Amendments and Reauthorization Act. The Act created a Trust Fund, known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Focused Feasibility Study: A study using information gained during previous studies regarding the nature and extent of site contamination to develop and evaluate remedial alternatives for cleaning up a specific problem or area at a site.

Hazard Index: A value used to evaluate the potential for noncarcinogenic effects that occur in humans.

In situ: Literally, in the original location or position.

Information Repository: A location where documents and data related to a Superfund project are placed to allow public access to the material.

Leachate: A liquid resulting when water percolates or trickles through waste materials and collects components of those wastes. Leaching may occur at landfills and may result in hazardous substances entering soil, surface water, or ground water.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The federal regulation that guides the determination and manner in which sites will be corrected under the Superfund program.

Operable Units: Portions of a Superfund site conceptually separated from the rest of the site to allow for easier management or a more timely response.

Potentially Responsible Party (PRP): Any individual(s) or company(ies) that is potentially responsible for contributing to the contamination problems at a Superfund site.

Present Worth: A term used to indicate the discounting of sums to be received in the future to their present value equivalent, or the amount which will accumulate to that sum if invested at prevailing interest rates.

Record of Decision (ROD): A legal document that summarizes problems posed by a site, analyzes methods to address those problems, documents EPA's decision-making process, and describes the final remedial action selected.

Recovery Well Network: A series of wells placed in line, close enough to each other so the slow moving ground water is captured. This prevents any contamination in the ground water from moving past these wells.

Remedial Action (RA): The actual construction and implementation of the chosen remedial alternative.

Remedial Design (RD): The process by which plans and specifications for the chosen remedial alternative are developed.

Remedial Investigation/Feasibility Study (RI/FS): A two-part study including the RI, which is conducted to identify the types of contaminants present and to determine the nature and extent of the contamination at or near the site, and the FS, which uses the information obtained from the RI to develop and evaluate remedial alternatives for addressing cleaning up contamination at the site.

Removal: EPA addresses an immediate threat to human health or the environment through a removal action. An emergency response team is sent out to undertake emergency stabilization activities.

Slurry Wall: An underground wall constructed from the surface to the underlying natural clay layer which prevents the movement of hazardous substances.

Soil Matrix: A matrix is a surrounding substance, in this case soil, within which the hazardous substances are contained.

Soil Vapor Extraction/Bioremediation: A treatment technology in which a network of air withdrawal and injection wells installed in the ground draw air through the soil, enhancing the stripping of contaminants into the air stream. The withdrawn air is treated prior to discharge to the atmosphere. The addition of air into the subsurface (and the possible addition of nutrients into the soil) also enhances the biodegradation of contaminants by indigenous bacteria.

Thermal Destruction: High temperature burning of materials to destroy hazardous compounds.