

**EPA Superfund
Record of Decision:**

**STANDARD CHLORINE OF DELAWARE, INC.
EPA ID: DED041212473
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NEW CASTLE, DE
03/09/1995**

**RECORD OF DECISION
STANDARD CHLORINE OF DELAWARE SITE**

DECLARATION

SITE NAME AND LOCATION

Standard Chlorine of Delaware
New Castle, Delaware

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the selected remedial action for the Standard Chlorine of Delaware Site in New Castle, Delaware. The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, 42 U.S.C. § 9601 et seq. and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. This decision is based on the Administrative Record for this Site.

The Delaware Department of Natural Resources and Environmental Control (DNREC), acting on behalf of the State of Delaware, has concurred with the selected remedy (See attached letter dated February 23, 1995).

ASSESSMENT OF THE SITE

Standard Chlorine of Delaware is an operating plant which continues to produce chlorinated benzenes. The remedies selected in this ROD do not address any potential risk posed by the Site in the day-to-day operations of the manufacturing facility.

Pursuant to duly delegated authority, I hereby determine, in accordance with Section 106 of CERCLA, 42 U.S.C. § 9606, that actual or threatened releases of hazardous substances from this Site, as discussed in the Summary of Site Risks, if not addressed by implementing the response action selected in this Record of Decision [ROD], may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy consists of two components: an interim action for the ground water and a final action for the soils and sediments. The interim action component will address containment of the ground water; the final action will address treatment of the contaminated soils and sediments.

Interim Action for Ground Water

The Interim action for the ground water addresses containment of ground water to minimize the continued release of contaminants. The interim action includes the following steps:

- Construct a subsurface physical barrier such as a trench or slurry wall to contain ground water and Dense Non-aqueous Phase Liquids (DNAPLs)
- Install low-volume recovery wells to remove pools of DNAPLs which are identified during remedial design
- Repair and upgrade (if necessary) the existing ground water pump-and-treat system
- Treat contaminated ground water in the existing waste water treatment plant along with treatment of all resulting air emissions
- Establish institutional controls to include deed restrictions and a Ground Water Management Zone (GWMZ)
- Determine the extent of ground water and DNAPL contamination
- Evaluate the technical practicability of remediating ground water to health-based levels.

Final Action for Soils/Sediments

The preferred final action for soils and sediments is biological treatment. This innovative technology has the potential for substantial risk reduction at a much lower cost than thermal treatment. The major steps of biological treatment are as follows:

- Conduct biological treatability/pilot-scale studies to determine the ability of biological treatment to reduce the concentration of contaminants in the soils and sediments to cleanup criteria
- Bioremediate the soils/sediments along the western drainage gully, the eastern drainage ditch, the soils adjacent to Catch Basin #1, those along the railroad tracks and along the unnamed tributary to Red Lion Creek, in addition to those soils in the waste piles and in the sedimentation basin using in situ (in place) or ex situ (excavated) treatment.

Contingency Action for Soils/Sediments

If based on the results of the treatability studies or further testing during the remedial design phase, it is determined that bioremediation is not feasible for this Site, the preferred contingency remedy is Low Temperature Thermal Desorption (LTTD). The contingency remedy (LTTD) includes the following steps:

- Excavate and treat the soils/sediments along the western drainage gully, the eastern drainage ditch, the soils adjacent to Catch Basin #1, those in the waste piles and in the sedimentation basin, as well as the soils along the unnamed tributary to Red Lion Creek
- Construct a low permeability asphalt cap along the railroad tracks and adjacent to Catch Basin #1
- Restore the wetlands damaged by the remedial action.

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy for ground water is an interim action and is protective of human health and the environment. Compliance with Federal and State requirements that are legally applicable or relevant and appropriate will be determined when EPA makes a final decision on the ground water remedy in a future ROD.

The selected final remedy for soils and sediments is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and it satisfies the statutory preference for a remedy that employs treatments that reduce toxicity, mobility, or volume as their principal element.

Because the selected remedy will result in hazardous substances remaining onsite above health-based levels, a review under Section 121(c) of CERCLA, 42 U.S.C. §9621(c) will be conducted within five years after initiation of the remedy to ensure that the selected remedy is providing protection of human health and the environment.

Thomas C. Voltaggio, Director
Hazardous Waste Management Division
Region III

Date

DECISION SUMMARY

1.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Standard Chlorine of Delaware, Inc. ("SCD" or "Standard Chlorine") Superfund Site ("Site" or "SOD Site"), approximately 40 acres in size, is located three miles northeast of Delaware City Delaware. The SCD plant facility is bounded to the north and east by property owned by Occidental Chemical Corporation (formerly Diamond Shamrock Company), to the west by Air Products and Chemicals, Inc. and to the south by Governor Lea Road and property owned by Star Enterprise and Delmarva Power and Light. Red Lion Creek is located approximately 1,000 feet north of the SCD plant facility and flows east to the Delaware River (See Figure 1). The SCD facility was constructed in 1965 on farmland purchased from the Diamond Alkali Company which had purchased the land from the Tidewater Refinery Company. SOD operations were started in 1966 with the production of chlorinated benzene compounds including chlorobenzene, paradichlorobenzene, orthodichlorobenzene, and lesser amounts of metadichlorobenzene and trichlorobenzene. Although operational production has varied over the years, these chemicals are still the primary products produced at the SOD facility.

1.1 Past Releases and Remedial Responses

In September 1981, a release of approximately 5,000 gallons of monochlorobenzene ("MCB") occurred at the SOD Site while workers were filling a railroad tank car. Some of the released chemical ran off in surface ditches toward a tributary to the Red Lion Creek. Figure 2 shows the approximate 1981 release flow pathway. In response to this spill, under the direction of the Delaware Department of Natural Resources and Environmental Control ("DNREC"), SCD moved to prevent the discharge of MCB to the Red Lion Creek. First, SCD took action to contain and recover the surface runoff. Second, SOD excavated and disposed of contaminated soils at an off-site permitted commercial facility. Finally, SCD conducted an investigation to determine the extent of contamination to the subsurface.

SCD's investigation revealed that the ground water beneath the Site was contaminated with other chlorinated benzene compounds, in addition to MOB. The primary source for the other chlorinated benzene was attributed to a leaking process drainage catch basin (CB#1), which was discovered and repaired in March 1976. SCD installed a ground water recovery and treatment system in 1982. This system has been upgraded over time. The current configuration was implemented after a second major release from the facility which occurred in 1986 and is discussed Below. Monitoring of the ground water recovery and treatment system is performed by SCD and has been documented in quarterly reports to DNREC since 1988.

The second major release occurred at the SCD facility on January 5, 1986 when approximately 400,000 gallons of paradichlorobenzene ("DCB") and approximately 169,000 gallons of trichlorobenzene ("TCB") were released at the Site due to a total above ground tank failure. The released material followed two pathways of flow, one easterly, onto asphalt paved plant property and one northerly, along the railroad tracks (Figure 3 shows the approximate flow pathways). The released material spread to the unnamed tributary of Red Lion Creek, adjacent to the SCD facility, and continued downstream to the point of confluence with Red Lion Creek (See Figure 4). At the time of the release, the tide in Red Lion Creek was high and ebbing; consequently, some of the contaminants migrated from the mouth of the tributary upstream along the southern shoreline of Red Lion Creek.

SCD used booms, dikes and a filter fence to contain and minimize further discharge of contamination through the unnamed tributary into the Red Lion Creek. Some of the spilled material was recovered for reprocessing. SCD built a sedimentation basin to store contaminated sediments. Contaminated soils and sediments were also excavated and stockpiled in waste piles adjacent to the SCD facility (identified as soil piles in Figure 4).

1.2 Enforcement Activities

In 1982, EPA and DNREC conducted a Preliminary Assessment/Site Inspection ("PA/SI") to determine if the Site was eligible for inclusion on the National Priorities List ("NPL"). As a result of the above-described releases, the SCD Site was placed on the NPL on July 1, 1987. On January 12, 1988, SCD entered into a Consent Order with DN-REC to conduct a Remedial Investigation/Feasibility Study ("RI/FS") at the Site. This Consent Order was subsequently amended in November 1988.

Pursuant to Section 113(k) (2) (B) (i-v) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), as amended, the RI/FS reports and the Proposed Remedial Action Plan ("Proposed Plan") for this Site were released to the public for comment on April 4, 1994.

2.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Proposed Plan for the Site and all other documents that were used in developing the Proposed Plan are available to the public in the Administrative Record file located at the EPA Docket Room in Region III's Philadelphia office and the DN-REC office in New Castle, Delaware. The notice of availability of these documents was published in The Wilmington News Journal on April 4, 1994. Following this announcement, EPA mailed approximately 3,000 fact sheets to residents who live within a one-half mile radius of the Site. The fact sheet summarized the six alternatives that address the long-term clean-up of the Site and outlined EPA's preferred alternative as described in the Proposed Plan.

A public comment period on the documents was originally scheduled from April 4, 1994 to May 4, 1994. However, Standard Chlorine requested a first extension, and 30 days were added to the comment period, extending it to June 4, 1994. In a letter dated May 31, 1994 Standard Chlorine requested information from EPA as well as a second extension of the public comment period. EPA had no written documentation to respond to this additional request, and in turn, EPA granted Standard Chlorine an extension until June 8, 1994 to submit comments on the Proposed Plan.

EPA held a public meeting on the Proposed Plan on April 27, 1994, at the Carpenters Local 626 Union Hall in New Castle, Delaware. The public was notified of the meeting by advertisements that ran in the April 4, 1994 edition of the Wilmington News Journal and the April 7, 1994 edition of the New Castle Weekly. The mailed fact sheet also gave notice of the public meeting. The meeting was attended by local residents, state and federal officials, and representatives from Standard Chlorine.

At this meeting, EPA representatives answered questions about conditions at the Site and the remedial alternatives under consideration. A response to the comments received during the public comment period, including those expressed verbally at the public meeting, is included in the Responsiveness Summary, which is part of this Record of Decision.

This ROD presents the selected remedial action for the Standard Chlorine of Delaware Site in New Castle County, Delaware, chosen in accordance with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. The decision for this Site is based on the Administrative Record which is available at the above-mentioned locations.

3.0 SUMMARY OF SITE CHARACTERISTICS

The RI was designed to define the extent of contamination in the soil, sediments, surface water, and ground water associated with the 1981 and 1986 releases. The RI was designed to provide data to support a feasibility study of potential remedial actions.

Data collected during the RI determined that soils, sediments and ground water at the Site are contaminated with chlorinated benzene compounds. The areas/media evaluated as part of the RI are shown on Figure 4 and include the following:

1. Soils- surface and subsurface soils in the pathways of the 1981 and the 1986 releases;
2. Sediments - in the unnamed tributary and the Red Lion Creek;
3. Surface Water - in the sedimentation basin, the unnamed tributary, and the Red Lion Creek;
4. Ground Water - throughout the Site;
5. Soil Piles and Soil Pile Runoff Areas - clean-up activities associated with the 1986 release resulted in the consolidation of soil and sediments into waste piles;
6. Sedimentation Basin- saturated soils and sediments were excavated as part of the 1986 spill clean-up and were placed in a double-lined basin. The integrity of the liner system is suspect;
7. Catch Basin #1 (CB#1)- a settling unit, fed by a process sewer line, in which the heavier chlorinated benzene compounds from SCD manufacturing operations settle and are recycled to the SCD production process; and
8. Effluent Pipeline- an underground wastewater pipeline which runs from SCD's facility to the Delaware River.

3.1 Soils/Sediments

The RI findings revealed that surface soils, subsurface soils and sediments along the pathways of the 1981 and 1986 releases were contaminated with chlorinated benzene as were the soil piles and sedimentation basin that were built following the 1986 release.

Figures 5 and 6 show the concentration of total chlorinated benzene compounds for samples collected in the pathways of the 1981 and 1986 releases. Figure 7 shows the sediment analytical results from samples collected along the unnamed tributary to Red Lion Creek and Figure 8 shows the sediment analytical results from samples collected from Red Lion Creek. The concentration of total chlorinated benzene compounds in on-site surface soils inside the existing fence of the SCD plant and noted as the SCD facility boundary on Figure 2) ranged from 1.2 mg/kg to 68.427 mg/kg with an arithmetic mean concentration of 4,452 mg/kg. Typically, the concentrations of chlorinated benzene are much lower in the subsurface. The concentration of total chlorinated benzene compounds for off-site surface soils (soils outside the existing fence of the SCD plant and noted as the SCD facility boundary on Figure 2) ranged from 1 mg/kg to 87,691 mg/kg, with an arithmetic mean concentration of 3,742 mg/kg. The concentration of total chlorinated benzene compounds for off-site sediments ranged from 0.5 mg/kg to 178,228 mg/kg with an arithmetic mean concentration of 4,199 mg/kg. Tables 1, 2 and 3 provide more detail on the range of concentrations for the individual compounds analyzed.

Sediments in the sedimentation basin are contaminated with chlorinated benzene. A composite sample from three grab samples contained 43,931 mg/kg of chlorinated benzene compounds. The presence of site-specific chemicals in the monitoring zone, located between the primary and secondary liners, indicates that the integrity of the primary or upper basin liner is suspect. Water in the sedimentation basin is periodically pumped to the SCD's existing waste water treatment plant.

Subsurface soil sampling in the vicinity of Catch Basin #1 revealed elevated levels of contaminants to a depth of approximately 32 feet below the surface. CB#1 was excavated and repaired in 1976 because of a leak. Currently, an inspection of the integrity of CB#1 is conducted annually by SCD.

3.2 Surface Water

Based on the findings of the draft Remedial Investigation ("RI"), EPA and DNREC limited the boundaries of the Red Lion Creek investigation to the area west of Route 9 (See Figure 4). Occidental Chemical Company ("Oxychem"), a company whose property is located adjacent to that of Standard Chlorine, is under an Administrative Order on Consent with EPA, under the Resource Conservation and Recovery Act ("RCRA"), to conduct a RCRA Facility Investigation and Corrective Measure Study ("RFI/CMS") (similar to a RI/FS), which will address the investigation of Red Lion Creek east of Route 9. Information obtained from Oxychem's investigation is being shared by both RCRA and CERCLA investigatory groups at EPA. Depending on the results of the RFI, EPA may require Standard Chlorine to conduct additional remedial work concerning Red Lion Creek.

Low levels of chlorinated benzene compounds were detected in surface water samples collected from the unnamed tributary to Red Lion Creek and Red Lion Creek. The concentrations ranged from 10 to 360 micrograms per liter (ug/l). The concentrations of chlorinated benzene compounds were generally higher in samples collected from surface water in the unnamed tributary to Red Lion Creek than in samples collected from the Red Lion Creek. This is probably due to the presence of contaminated soils and sediments adjacent to and along the unnamed tributary to Red Lion Creek.

Surface waters in the sedimentation basin, the unnamed tributary, and the Red Lion Creek contain chlorinated benzene compounds. An advisory issued by DNREC and the Delaware Division of Public Health on May 2, 1986 recommending that the public not consume fish taken from Red Lion Creek downstream of Route 13 is currently in effect.

3.3 Ground Water and Hydrogeology

The SCD Site lies within the Atlantic Coastal Plain Physiographic Province, which consists of a southeasterly dipping wedge of unconsolidated sands, silts, clays and gravels. The Pleistocene Age Columbia Formation, which immediately underlies the SCD Site, is comprised of orange-brown and yellow-brown fine to coarse sand with silt and gravel lenses. The observed thickness of the Columbia Formation at the Site ranges from 40 to 75 feet. The Merchantville Formation is a dark grey to black micaceous sandy silt or silty/clayey fine sand which underlies the Columbia Formation at the Site with the exception of the central portion and north central portion of the Site where it is absent. The thickness of the Merchantville Formation across the plant property ranges from 0 to less than 10 feet thick. The Potomac formation, which contains laterally discontinuous sand stringers, underlies the Merchantville Formation and the Columbia Formation where the Merchantville is absent. The Potomac

Formation observed at the Site consists of red and gray variegated, stiff, plastic clay with a sand unit encountered at approximately 130 feet below ground surface in the immediate vicinity of the Site.

The uppermost aquifer beneath the Site is the Columbia aquifer. Depth to ground water in this aquifer as measured in August, 1990 ranged from 30 to 60 feet below ground surface. This aquifer is unconfined, and the general direction of ground water flow is to the north-northwest, north, and north-northeast toward the unnamed tributary to The Red Lion Creek, and toward Red Lion Creek. The Columbia aquifer is not known to be used as a current source for drinking water at the Site in close proximity to the Site. The uppermost water-bearing sand within the Potomac Formation is located approximately 130 feet below ground surface in the Site vicinity and is referred to as the "uppermost Potomac aquifer" in the RI reports. The ground water flow direction in the uppermost Potomac aquifer at the Site is generally in a southeast direction. The Potomac aquifer is used as a drinking water source. The 60 to 70 feet combined thicknesses of the Merchantville Formation and clays of the Potomac Formation behave as an aquitard separating the Columbia aquifer and the uppermost Potomac aquifer.

The ground water investigation portion of the RI did not require or include any field investigative techniques which would aid in identifying the occurrence and extent of Dense Non Aqueous Phase Liquids ("DNAPLs") in the subsurface soils and aquifer. In accordance with a Consent Order with DN-REC, Standard Chlorine conducts quarterly ground water monitoring. The quarterly monitoring reports indicated that at least six wells have detected "free organics in well." EPA believes that the description of free organics most likely reflects DNAPLs obtained during sampling at the respective wells.

DNAPLs are hydrocarbon liquids (organic compounds) such as chlorinated solvents, which are heavier (denser) than water and immiscible with water (do not mix well with water). Gravity causes DNAPLs to migrate downward and infiltrate the subsurface soils and ground water table until the DNAPLs reach an impermeable layer. As DNAPLs move through the subsurface, some will dissolve into the ground water and most will sorb to or be trapped into the granular pore spaces in the soils as residual DNAPLs. When DNAPLs are present in large volume, some will pool as a separate distinct liquid on an impermeable layer. Since residual DNAPLs are trapped between soil grains, they are usually immobile and can be difficult to remove from the subsurface. DNAPLs which are present as a pool or lens are usually mobile and will move along the gradient at the top of an impermeable subsurface layer.

Standard Chlorine attempted to define the area of probable DNAPL occurrence by comparing the concentration of total chlorinated benzene compounds with the effective solubility of those compounds. Figure 9 shows the approximate extent of probable DNAPL contamination based on these calculations. Product, or known DNAPL, was identified in several wells during Standard Chlorine's quarterly ground water sampling.

A supplemental assessment was conducted by Standard Chlorine to address potential soil and ground water quality impacts resulting from historical leaks in the SCD effluent pipeline. Samples were collected from the monitoring wells adjacent to the effluent pipeline (See Figure 4) in November 1991. Samples taken from monitoring well #16 revealed concentrations of chlorinated benzene compounds, above the Maximum Contaminant Levels ("MCLs"). MCLs are referred to as drinking water standards and are enforceable standards for public drinking water supplies promulgated under the Safe Drinking Water Act, 42 U.S.C. §§ 300f-300j.

4.0 SCOPE AND ROLE OF REMEDIAL ACTION

As part of the RI/FS, a risk assessment was performed by Standard Chlorine to evaluate the actual and potential threats that the contamination at the Site poses to human health and to the environment. For a discussion of the results of the risk assessment, see Section 5.0 of the ROD which is titled "Summary of Site Risks."

Once EPA determines from a risk assessment that remedial action is necessary at a site, EPA characterizes waste on-site as either a principal threat waste or a low level threat waste. The concepts of principal threat wastes and low-level threat wastes as developed by EPA in the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP") are applied on a site-specific basis when characterizing source material. Source material is defined as material that includes or contains hazardous substances, pollutants, or contaminants which acts as a reservoir for migration of contamination to ground water, to surface water, to air, or which acts as a source for direct exposure. Source materials are considered to be principal threat wastes when they contain high concentrations of toxic compounds (e.g., several orders of magnitude above levels that allow for unrestricted use and unlimited exposure) or are highly mobile and cannot be reliably contained.

The principal threat wastes associated with the SCD Site are the surface soils along the 1981 and 1986 spill pathways, the material in the soil piles and the sedimentation basin, some sediments and the unnamed

tributary to the Red Lion Creek, soils adjacent to Catch Basin #1 (CB#1), and the DNAPL contamination in the subsurface.

Section 300.430(a) (1) (iii) of the NCP, 40 C.F.R. § 300.430(a) (1) (iii), states that "EPA expects to use treatment to address the principal threats posed by a site, wherever practicable," that "EPA expects to use engineering controls, such as appropriate, for waste that poses a relatively low, long-term threat or where treatment is impracticable," that "EPA expects to use institutional controls... to supplement engineering controls as appropriate "and that institutional controls "shall not substitute for active response measures... as the sole remedy unless such active measures are determined not to be practicable..."

EPA's decision for this Site consists of two components, an interim action and a final action. The interim action component will address the ground water and DNAPLs. It will also attempt to minimize the continued release of contaminants into the adjacent wetlands, the unnamed tributary to Red Lion Creek, and to Red Lion Creek itself. The final action component of this ROD will address the contaminated soils and sediments associated with the 1981 and 1986 releases.

4.1 Interim Action - Ground Water

EPA will require that the interim action at the SCD Site be implemented, while additional information is collected and evaluated during the implementation of the interim remedy to evaluate the technical practicability of ground water restoration to federal and state drinking water quality criteria. As an interim action, EPA will require that the exposure of people and the area's ecosystem to contaminated ground water be prevented, and to the extent practicable, further contaminant migration be prevented. EPA will also require the removal of DNAPL pools if identified during Remedial Design.

The remedial objectives for the interim action component of this ROD are the following:

1. Prevent exposure to the contaminated ground water.
2. Prevent further migration of the contaminated groundwater.
3. Prevent further degradation of the environment caused by the discharge of contaminated ground water to the unnamed tributary to Red Lion Creek and Red Lion Creek and to the wetlands along the unnamed tributary to Red Lion Creek.
4. Remove any pools of DNAPL which may act as a continuing source of ground water contamination, if shown to exist following additional investigation.

As part of the interim action, additional data will be collected to determine the extent of DNAPL and ground water contamination. The review of the data and of this remedy will be ongoing as EPA, in consultation with DNREC, continues to develop final remedial alternatives for the ground water and DNAPL contamination. Following implementation of the interim Action, EPA will make a final decision on the ground water remedy which will be documented in a future ROD.

4.2 Final Action - Soils/Sediments

The remedial alternatives for this final action component of the ROD address the surface and subsurface soils along the pathways of the 1981 and 1986 releases, the sediments in the unnamed tributary to Red Lion Creek, the soil piles, the sedimentation basin, and the soils adjacent to CB#1. The remedial objectives for these soils and sediments are the following:

1. Remediate soils and sediments to levels that are protective of human health and the environment;
2. Minimize infiltration, run-on, and run-off of precipitation to areas containing subsurface contaminated soils and sediments;
3. Monitor and maintain the integrity of Catch Basin #1 to ensure that it does not serve as a continuing source of contamination to subsurface soils and ground water;
4. Reduce toxicity of sediments to aquatic organisms;
5. Reduce bioaccumulation of contaminants.

Only the subsurface soils that can be excavated around CB#1 without damaging the integrity of the structure will be remediated. Integrity testing of CB#1, such as a hydrostatic test, will be required to

ensure that there are no future releases.

It should be noted that the SCD facility is an operating plant which continues to produce chlorinated benzene compounds. The remedy identified in this ROD does not cover any potential risk posed to the Site by the day-to-day operations of the manufacturing facility. EPA notes that the remedy described in this ROD addresses the human health and environmental effects of the 1981 and 1986 chlorinated benzene spills and the releases from Catch Basin #1 at the plant. EPA will require that SCD conduct additional sampling and analysis of areas ("hot spots") that may contain contaminated soils. Hot spots will be selected based on other releases; past and present operations; and storage/handling practices of solid and hazardous waste. The results of the "Hot Spot" analysis will be used to determine if additional remediation measures are required under CERCLA authorities. Environmental effects of day-to-day operations and potential releases beyond the 1981 and 1986 spills are regulated by various federal laws and regulations (e.g., including but not limited to the Resource Conservation and Recovery Act, as amended, 42 U.S.C. §§ 260.1 et seq.) as well as those of the State of Delaware (e.g., including but not limited to the Hazardous Substance Clean-up Act, 7 Del. C. Chapter. 91) and are therefore not the subject of this ROD. EPA may require additional work and this ROD may be amended if the results of the "Hot Spot" sampling identify contamination above the clean-up criteria or the soils meet the definition of a characteristic hazardous waste.

Although this is the final component of the remedy for soils and sediments planned for this Site, changes in conditions may lead to further response actions. Other possible response actions may include removal of sediments in Red Lion Creek or the remediation of other areas of the Site. Further actions would be based on, among other things, analytical results of samples collected from an investigation being conducted east of Route 9, "Hot Spot" analysis, data collected as part of an ecological monitoring plan, or other Site-related investigations.

5.0 SUMMARY OF SITE RISKS

A Baseline Risk Assessment ("BLRA") was prepared as part of the RI/FS to evaluate the potential human health impacts that may result from exposure to Site contaminants if no remediation is conducted. To determine whether there is an actual or a potential impact at the Site, a complete exposure pathway must be established. A complete exposure pathway consists of the following components:

1. A source or mechanism for contaminants to be released to the environment;
2. A medium through which contaminants may be transported such as water, soil, sediment, or air;
3. A point of actual or potential exposure or contact for humans or environmental receptors;
4. A route or mechanism such as ingestion, inhalation, or dermal contact for exposure at the contact point.

The maximally exposed or most sensitive receptor was selected for each medium (e.g., soil, ground water) on the assumption that future use of the Site would be restricted to commercial/industrial use. The receptors evaluated included current and future worker; current and future visitor; and hunter/fisherman.

An ecological investigation was conducted as part of the RI/FS which focused on the delineation of wetlands, fish sample collection and analysis, and an overall ecological risk assessment. The ecological risk assessment focused on identifying potential adverse effects of the Site contaminants of concern on the flora and fauna (i.e., plants and animals) in the area.

The BLRA assessed the risks associated with the Site to people and can be found in Volume 1, Section 6 of the Remedial Investigation Report, which is part of the Administrative Record for the Site. The Ecological Assessment assessed risks to plants and animals associated with the Site and can be found in Volume 1, Section 5 of the Remedial Investigation Report. EPA has determined that actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to human health and the environment.

5.1 Human Health Risk Assessment

The BLRA is divided into two categories of impacts: carcinogenic and non-carcinogenic or systemic. Many contaminants cause both types of impacts. Remedial action is generally warranted when the calculated carcinogenic risk level exceeds 1×10^{-4} (meaning that one additional person out of 10,000 is at risk of developing cancer caused by a lifetime of exposure to contaminants at the Site) under current or future conditions for any of the evaluated exposure scenarios. Remedial action is also generally warranted if

the calculated non-carcinogenic Hazard Index 1 exceeds 1.0 under current or future conditions for any of the evaluated exposure scenarios.

Since the Site is an operating industrial facility and is surrounded by other large industrial facilities, the land use that was assumed was industrial. The risks were calculated by first determining all the various ways in which humans come in contact with contaminants at the Site currently or potentially in the future. The receptors evaluated included current and future worker; current and future visitor; and hunter/fisherman. Table 4 presents the exposure scenarios and potential exposure pathways.

The second step in the risk calculations involves determining which contaminants are contributing significantly to the total risk and should be labeled as contaminants of concern. Using procedures outlined in EPA's "Risk Assessment Guidance for Superfund" EPA/540/1-89/002), a list of contaminants of concern was developed for each media in each area related to an exposure pathway.

Another part of a risk calculation is the cancer potency factors (CPFs) 2 or reference doses (RfDs)3 Used both in the screening steps and the actual risk calculations, CPFs and RfDs are estimates of the degree of a contaminant's toxicity.

Actual or potential risks are calculated by multiplying each intake factor by the proper CPF for carcinogens, or by dividing each intake factor by the proper RfD for non-carcinogens. Note that various exposure parameters are involved in the calculation of intake factors, including the concentration of each contaminant of concern for each exposure pathway.4

1 The potential for health effects resulting from exposure to non-carcinogenic compounds is estimated by comparing an estimated dose to an acceptable level, or reference dose. If this ratio exceeds 1.0, there is a potential health risk associated with exposure to that chemical. The ratios can be added for exposures to multiple contaminants. The sum, known as the Hazard Index, is not a mathematical prediction of the severity of toxic effects, but rather a numerical indicator of the transition from acceptable to unacceptable levels.

2 CPFs, also known as slope factors, have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of (mg/kg/day)⁻¹, are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

3 An RfD is a toxicity value used to estimate the potential for adverse non-carcinogenic health effects. The model to determine RfDs from the dose-response assessment assumes that there is a concentration for non-carcinogens below which there is little potential for adverse health effects over a lifetime of exposure. The RfD is designed to represent this threshold level. The RfD is calculated from the highest chronic exposure level.

4 The concentration value used is the 95% upper confidence limit (UCL) for the arithmetic mean of the levels of each contaminant found in the samples taken from the appropriate media in each area. This particular concentration value is a statistical estimate of the highest average concentration predicted to occur in 95 out of 100 sets of samples. The use of the 95% UCL produces an estimate of risks for the "Reasonable Maximum Exposure" ("RME") scenario. The 95% UCL is used to account for the fact that the actual number of samples is relatively small to accurately predict the average. This method of calculating risks is designed to provide a conservative estimate and makes the underestimation of actual risks highly unlikely.

The contaminants contributing to the risk at the Site are referred to as contaminants of concern ("COCs") and consist of:

- benzene*
- chlorobenzene
- 1,2-dichlorobenzene
- 1,3-dichlorobenzene
- 1,4-dichlorobenzene*
- hexachlorobenzene*
- nitrobenzene
- pentachlorobenzene
- 1,2,3,4-tetrachlorobenzene
- 1,2,4,5-tetrachlorobenzene
- toluene
- 1,2,3-trichlorobenzene
- 1,2,4-trichlorobenzene
- 1,3,5-trichlorobenzene

that did not cause adverse effects (the no-observed-adverse-effect level ("NOAEL")) in animals. The NOAEL is divided by a factor to account for any uncertainty such as using data on animals to predict effects on humans and an allowance for sensitive individuals. Uncertainty factors range from 1 to 10,000 based on the confidence level associated with the data. The resulting RfD (mg/kg-body weight/day) is used to quantify the risk.

Benzene is a known human carcinogen and the other starred items (*) are contaminants which are suspected human carcinogens. 1,4-dichlorobenzene poses the greatest carcinogenic risk at the Site, primarily due to the high levels detected in the soil.

In addition to the COCs listed above, metachloronitrobenzene, ethylbenzene and PCBs were identified in the BLRA as COCs. However, because of the lack of toxicity criteria on metachloronitrobenzene, the risks associated with exposure to this particular contaminant were not evaluated quantitatively in the BLRA. With regard to ethylbenzene and PCBs which were detected exclusively in sediment, the associated systemic and carcinogenic risks to hunters and fishermen were negligible.

Carcinogenic and chronic non-carcinogenic health effects were evaluated for ground water and soil ingestion, dermal contact with soil, fish ingestion, dermal exposure to surface water and sediments, and inhalation of airborne soil particles. Table 5 summarizes the carcinogenic risk and Table 6 summarizes the non-carcinogenic risk associated with the Site.

Receptors for which risks are unacceptable include the current/future worker, the future visitor, and the hunter/fisherman. Under the current worker scenario, 1,4-dichlorobenzene poses the greatest carcinogenic risk at the Site, primarily due to the high levels detected in the soil. Exposure to ground water from the Columbia aquifer accounted for most of the future risk at the Site. Currently, ground water from the Columbia aquifer in the vicinity of the Site is not used as a drinking water supply source and there is no current evidence that the contamination has entered the Potomac Formation aquifer.

5.2 Ecological Risk Assessment

The ecological investigation focused on the delineation of wetlands surrounding the unnamed tributary to Red Lion Creek, fish sample collection and analysis from two locations in Red Lion Creek and an overall ecological risk assessment. The ecological risk assessment focused on identifying potential adverse effects of the Site contaminants of concern on the flora and fauna (i.e., plants and animals) in the area.

Figure 10 delineates the extent of the wetlands in the unnamed tributary to Red Lion Creek. Generally, the wetlands were defined by the topography of the area.

The ecological assessment characterized the plant and animal species in the area impacted by the previous releases of contaminants. No endangered or threatened species were identified. Animals can be exposed to these contaminants through several routes including ingestion of surface water, fish, and vegetation, and/or contact with surface water, soil, and sediment.

The great blue heron, the white-tailed deer, and the meadow vole were selected as representative species from the area for the terrestrial portion of the ecological risk assessment. Toxicity tests were performed using earthworm, lettuce seeds and *Hyalella azteca* (a type of waterbug) as surrogates for soil fauna, soil flora, and aquatic life, respectively. The results of the assessment indicated a potential

for adverse effects to occur to the meadow vole, the earthworm (soil fauna), aquatic life of Red Lion Creek, and terrestrial vegetation (soil flora). The results of the ecological assessment can be found in Volume 1, Section 5 of the Remedial investigation Report.

Fish were collected from both upstream and downstream locations on three separate occasions in 1990 and 1991. The concentration of chlorinated benzene in the fish caught downstream (near the Rt. 9 bridge) ranged from 0.01 to 1.4 mg/kg. Analytical results for fish samples collected at the upstream sampling location near Route 13 indicate no detectable levels of chlorinated benzene. Table 7 presents the summary of the analytical results of the fish sampling in the fall of 1990 and spring of 1991. Calculations using this data indicate that the presence of chlorobenzene in fish tissue does not pose a threat to the great blue heron which was used as the representative species for this part of the ecological assessment.

In March of 1990, Standard Chlorine and EPA were unable to collect the designated type and quantity of fish. EPA conducted an independent analysis of the carp fillets collected from this sampling event. It was later determined that carp was not an appropriate species for evaluating human and ecological exposure, but was worthwhile as an indicator for defining decreasing chlorobenzene levels in the Red Lion Creek system. Table 8 presents the summary of the analytical results of the fish sampling in March 1990.

5.3 Summary of Areas Requiring Remediation

5.3.1 Interim Action

EPA has determined that the Columbia aquifer ground water is contaminated and that contamination in the aquifer must be contained as an interim measure while additional information is collected and evaluated during the implementation of the interim remedy to determine the technical practicability of Columbia aquifer ground water restoration to federal and state drinking water standards. Currently this ground water is not used as a potable source. Ground water flows toward the Red Lion Creek and serves as a continuing source of contamination to the creek. Pools of DNAPL, if they exist, could act as a continuing source of ground water contamination and will be collected and removed as part of this interim action. The nature and extent of ground water contamination in the vicinity of the effluent pipeline and the adjacent Air Products and Chemicals Inc. ("Air Products") property will also be investigated and remedial alternatives will be evaluated.

5.3.2 Final Action

Based on the potential impacts to human health and the environment, EPA has determined that the following areas of the Site warrant remediation:

- Railroad Track Area
- Western Drainage Gully
- Eastern Drainage Ditch
- Soil Piles
- Sedimentation Basin
- Sediments in the Unnamed Tributary to Red Lion Creek, and
- Catch Basin #1.

5.3.3 Clean-up Criteria

CERCLA requires that on-site remedial actions must attain federal and more stringent State applicable or relevant and appropriate requirements ("ARARs") of environmental laws and regulations. There are no chemical-specific clean-up level ARARs for soils or sediments. Therefore, the results of the human health and ecological risk assessments are used to establish acceptable exposure levels for soils and sediments.

Using the findings of the human-health risk assessment, the clean-up criteria for on-site soils and sediments (soils and sediments inside the existing fence of the SCD plant and noted as the SCD facility boundary on Figure 2) based on risk to a future worker is 625 mg/kg for total COCs with a ceiling concentration of 450 mg/kg for 1,4-dichlorobenzene. (Hereafter, the on-site clean-up criterion will be referred to as 625/450 mg/kg of total COCs.) On-site soils must also pass Toxicity Characteristic Leaching Procedure ("TCLP") analysis.

The RI suggests that these clean-up criteria represent a carcinogenic risk of 1×10^{-5} to future workers. SCD calculated these levels using two conservative assumptions. SCD assumed first, that the worker would be exposed for 24 hours a day as opposed to a typical 8 hours a day scenario. Secondly, SCD assumed that contaminants would be absorbed through the skin.

For most chemicals, there are many uncertainties associated with calculating a risk related to dermal (skin) contact with contaminated soil. Consequently, EPA does not usually recommend quantifying risks related to skin exposure. By incorporating more realistic assumptions into the calculations, i.e., an 8-hour work day and elimination of skin contact as an exposure route, EPA has determined that the actual residual cancer risk to a future worker at the Site following remediation (at the proposed clean-up levels) is approximately 1×10^{-6} .

The clean-up criteria for off site soils and sediments (soils and sediments outside the existing fence of the SCD plant and noted as the SCD facility boundary on Figure 2) is based on the risk to the ecological receptors (flora and fauna). Based on toxicity testing for the germination of lettuce seed and survival of the earthworm, the clean-up criterion is 33 mg/kg for total COCs for off-site soils and sediments. Off-site soils must also pass TCLP analysis.

Restoration of ground water to drinking water standards where DNAPLs are present may not be technically practicable. Interim measures to contain the ground water and recover DNAPL pools, if identified during Remedial Design, will be initiated while further investigation is conducted to determine the technical practicability of meeting ARAR clean-up criteria in the ground water. EPA will require that the interim action be protective of human health and the environment by preventing exposure to ground water. Each of the remedial alternatives discussed in the next section has a component for preventing exposure to ground water.

6.0 DESCRIPTION OF ALTERNATIVES

The Feasibility Study ("FS") and the Feasibility Study Addendum contain all the remedial alternatives considered by SCD for the clean-up of the soils, sediments, and ground water at the SCD Site. Five alternatives were analyzed in detail in the FS and the FS Addendum which are contained in the Administrative Record. In addition, EPA evaluated an additional alternative which is a combination of Alternatives 5A and 5B and is called Alternative 6. These alternatives, which differ in the way they deal with soil and ground water contamination at the Site, include:

- 1) No Action
- 2) Containment
- 3) Closure and In Situ Bioremediation of Wetland Sediments
- 4A) Thermal Treatment & In Situ Bioremediation of Wetland Sediments
- 4B Thermal Treatment
- 5A) Ex Situ Bioremediation
- 5B) In Situ Biological Treatment of Wetland Sediments to supplement Alternatives 3 and 4A
In Situ/Ex Situ Bioremediation

Alternatives 3 and 4A, as proposed in the Feasibility Study do not address remediation of the wetland sediments. Alternative 5B in the Feasibility Study Addendum is a description of the in situ bioremediation treatment for the wetland areas to supplement Alternatives 3 and 4A, as described in the FS. Since Alternative 5B is not a site-wide alternative, but a supplement to Alternatives 3 and 4A, it will be discussed and evaluated as a component of Alternatives 3 and 4A.

6.1 Common Elements

Each of the alternatives evaluated in detail, except for Alternative 1 - (No Action), contain certain common components which are discussed below:

Ground water - The interim action alternatives include maintenance and operation of the existing ground water extraction wells. Recovered water will be treated in the existing air stripper and then discharged under SCD's National Pollutant Discharge Elimination System ("NPDES") permit # DE0020001 requirements. The NPDES permit program establishes the requirements for the direct discharge of pollutants to waters of the United States, including the discharge of pollutants to surface waters. Air emissions from the air stripping unit will go to the existing SCD plant boilers. Since SCD is an operating facility, and is subject to process changes, the treatment technology for ground water is subject to change, based on effectiveness and/or NPDES requirements. Any changes to the ground water treatment process will comply with applicable federal and state NPDES regulations. Controls for air emissions generated from treatment of ground water will also be required. Low volume product recovery wells will be installed to attempt to recover DNAPLs. Four (4) product recovery wells were identified in the FS to develop cost estimates. The

actual number and location of recovery wells will be determined as part of the Remedial Design. The recovered DNAPL will be stored on-site temporarily, and ultimately disposed of off-site, in accordance with applicable federal and state regulations promulgated pursuant to RCRA.

In the event that SCD should reduce or cease production operations at the Site, EPA will require that the existing waste water treatment plant be modified or a new one be constructed to manage contaminated ground water. Treatment of air emissions in accordance with applicable or relevant and appropriate federal and state requirements would also be mandated.

Soils/Sediments - Each of the alternatives evaluated in the FS included the use of the sedimentation basin for consolidation of soils and sediments. Under this scenario, the sedimentation basin would have to be retrofitted to satisfy the RCRA requirements for landfills and the treated soils and sediments would have to satisfy RCRA Land Disposal Requirements ("LDRs"), promulgated at 40 C.F.R. Part 268 prior to being placed in the basin. Because the RCRA LDRs would be triggered if the sedimentation basin were used for consolidation of soils and sediments, Alternatives 4A, 4B, and 5A have been revised to mandate closure of the sedimentation basin.

There is a possibility that the on-site clean-up criterion of 450 mg/kg for 1,4-dichlorobenzene could fail TCLP analysis and in turn meet the definition of a characteristic hazardous waste under federal or state RCRA regulations. Under each of the alternatives, EPA will therefore require that all treated soils pass TCLP analysis prior to being used as backfill at the Site.

Surface Water - Surface water in the unnamed tributary to Red Lion Creek and Red Lion Creek will be addressed through remediation of the soils, sediments, and ground water. Surface water in the sedimentation basin will be pumped and treated in SCD's waste water treatment plant and air stripper and discharged under an NPDES permit.

Institutional Controls - Institutional controls for the Site will include use, access, and deed restrictions intended to limit future land and ground water use and security fences to limit access. DNREC will also implement a ground water management zone ("GWMZ") which will prevent the installation of drinking water wells in the area impacted by the releases.

Monitoring - Site monitoring will include monitoring of the ground water in both the Columbia and Potomac aquifers. A monitoring plan will be prepared during the Remedial Design phase which will describe in detail the Site monitoring activities. The ground water monitoring activity will involve the installation of additional on-site and off-site monitoring wells.

Ecological monitoring will be conducted annually with the first round prior to the start of remedial action to establish a data baseline and then annually thereafter for a period of at least five years. The ecological monitoring activities of the surface water systems present at the Site (the wetlands, the unnamed tributary to Red Lion Creek, and Red Lion Creek) will include chemical analysis of surface water, sediments and fish and muskrat tissue, and sediment bioassays.

6.2 Description of Alternatives

The following is a brief description of the alternatives which were evaluated for the Site. A summary of each of the alternatives is included in Table 9.

Alternative 1 - No Action

Estimated Capital Costs: \$0

Estimated Annual O&M Costs: \$0

Estimated Present-Worth Costs: \$0

The NCP requires that EPA consider a no action alternative for every site to establish a baseline for comparison to alternatives that do require action. Under this alternative, the operation of the existing ground water treatment and recovery system would be discontinued. The existing contaminated soils, soil piles, and sedimentation basin would remain in place. No further activities for upgrading or closure of the soil piles or sedimentation basin would occur.

Alternative 2 - Containment

Estimated Capital Costs: \$2.24 million

Estimated Annual O&M Costs: \$80,000

Estimated Present-Worth Costs: \$3.47 million

Ground Water - In addition to the components discussed above under common elements, additional extraction wells would be installed to reduce the flow of ground water to the Red Lion Creek. Five additional extraction wells were used in the FS to develop cost estimates.

Soils - Soils along the western drainage gully (to a depth of 7 feet) that exceed the "off-site" clean-up criterion of 33 mg/kg of total COCs and the soils along the eastern drainage ditch (to a depth of 3 feet) and Catch Basin #1 (to a depth of 15 feet) that exceed the "on-site" clean-up criterion of 625/450 mg/kg of total COCs would be excavated and consolidated in the existing sedimentation basin, followed by in situ stabilization/solidification. The soil pile material would be consolidated in the sedimentation basin as well. The sedimentation basin would then be capped with a multi-layer cap. The excavated and backfilled areas where elevated levels of contaminants remain in the subsurface would be capped with either asphalt or a Flexible Membrane Liner ("FML"). A low permeability asphalt cap would be applied in the area of the railroad tracks and Catch Basin to reduce infiltration (See Figure 11).

Sediments - The existing silt fences across the mouth of the unnamed tributary wetland area would be reconstructed and additional silt fences would be installed. New silt fences would be installed in the unnamed tributary to Red Lion Creek to prevent contaminated sediment migration to the Red Lion Creek. Figure 12 identifies the location of the silt fence. The sediments in the sedimentation basin would be stabilized to reduce free moisture and improve bearing strength to support the final cap. The sedimentation basin would be capped with a multi-layer cap.

Alternative 3 - Closure and In Situ Bioremediation of Wetland Sediments

Estimated Capital Costs: \$5.2 million

Estimated Annual O&M Costs: \$101,000

Estimated Present-Worth Costs: \$6.8 million

Ground Water - In addition to the components discussed above under common elements, a ground water containment system would be installed along the shorelines of the unnamed tributary and the Red Lion Creek to capture ground water before it enters the Red Lion Creek. A deep interceptor trench was described in the FS to evaluate the containment approach as well as to develop costs. Other physical barriers that could be used at the Site include sheet pilings or a slurry wall. The exact length, location, (see Figure 13) and type of physical barrier to contain contaminated ground water and DNAPLs would be based on information gathered during Remedial Design ("RD") activities. Soils excavated from the trench could be contaminated and would be analyzed to determine contaminant concentration levels. If the excavated trench soils exceed 33 mg/kg of total COCs, these soils would require treatment before disposal.

Soils - The same as Alternative 2 for surface and subsurface soils, except the sedimentation basin would be retrofitted with a new liner and leachate collection system (See Figure 14). During the public comment period and in follow-up meetings and discussions with EPA and DNREC, SCD provided clarification on the use of the sedimentation basin as a Corrective Action Management Unit (CAMU). SCD maintained that the sedimentation basin could be retrofitted to comply with the RCRA CAMU provisions and in turn comply with ARARs. A more detailed discussion of CAMU and Alternative 3 is provided in Section 7.2, the Responsiveness Summary, and the Administrative Record.

Sediments - Contaminated sediments along the unnamed tributary to Red Lion Creek and Red Lion Creek itself that exceed the off-site (sediments outside the existing fence of the SCD plant and noted as the SCD Facility Boundary on Figure 2) clean-up criterion of 33 mg/kg of total COCs which are accessible from the shorelines using conventional equipment would be excavated and consolidated into the retrofitted sedimentation basin, and treated by stabilization/solidification. The excavated sediments and the existing sediments in the sedimentation basin would be stabilized in a mechanical mixing plant prior to being placed back in the retrofitted basin. The FS states that stabilization would reduce the contaminant mobility by solidification. Those sediments that exceed the clean-up criterion of 33 mg/kg of total COCs and are difficult to access in the wetland area of the unnamed tributary to Red Lion Creek and Red Lion Creek would undergo in situ biological treatment. In situ bioremediation technology entails treating the contaminated soils in place, eliminating the need for soil excavation. The technology usually involves enhancing natural biodegradation processes by adding nutrients, oxygen, and in some cases, microorganisms. See Figure 12 for the approximate delineation of the area to be remediated in and along the wetlands.

Alternative 4 A - Thermal Treatment and In Situ Bioremediation of Wetland Sediment

Estimated Capital Costs: \$10.1 million

Estimated Annual O&M Costs: \$106,700

Estimated Present-Worth Costs: \$11.7 million

This alternative includes the treatment of soils and sediments using thermal desorption technology. Thermal desorption is the heat-induced desorption, volatilization, and capture of volatile and semi-volatile organic compounds from contaminated solids. The contaminants would be removed from the soil, collected, and concentrated in the vapor treatment system. It could be possible to return the concentrated contaminants to the SCD facility processing units for recycling. Otherwise they would be shipped to a RCRA permitted treatment or disposal facility.

Ground Water - same as Alternative 3

Soils - Soils along the western drainage gully (to a depth of 7 feet) that exceed the off-site clean-up criterion of 33 mg/kg of total COCs and the soils along the eastern drainage ditch (to a depth of 3 feet) and Catch Basin #1 (to a depth of 15 feet) that exceed the on-site clean-up criteria of 625/450 mg/kg of total COCs would be excavated. These soils along with the soils in the soil piles and the sedimentation basin, would undergo thermal desorption. Treated soils would be used as backfill where the treatment is successful in remediating the soils to the clean-up criteria or performance standards. Although the FS states that soils not remediated to the clean-up criteria would be stabilized/solidified, if necessary, and consolidated into the retrofitted sedimentation basin, EPA will require that all soils be treated to the clean-up criteria. The sedimentation basin would be closed rather than retrofitted as delineated in Alternative 3. In excavated areas, where high concentration subsurface soils remain, a Flexible Membrane Liner or asphalt would be used to cap the backfilled excavations. A low permeability asphalt cap would be applied in the area of the railroad track and Catch Basin #1 to reduce infiltration (See Figure 15).

Sediments - Contaminated sediments along the unnamed tributary to Red Lion Creek and Red Lion Creek that exceed the off-site (sediments outside the existing fence of the SCD plant and noted as the SCD facility boundary of Figure 2) clean-up criterion of 33 mg/kg of total COCs which are accessible from the shorelines using conventional equipment would be excavated, thermally treated, and used as backfill. Those sediments which exceed the clean-up criterion of 33 mg/kg of total COCs and are difficult to access in the wetland area of the unnamed tributary and Red Lion Creek would undergo in situ biological treatment as described under Alternative 3. See Figure 12 for the approximate delineation of the wetland areas to be remediated.

Alternative 4B - Thermal Treatment

Estimated Capital Costs: \$15.5 million

Estimated Annual O&M Costs: \$100,000

Estimated Present-Worth Costs: \$17.06 million

Same as alternative 4A, except all soils and sediments, including those areas which are difficult to access, that exceed the clean-up criterion of 33 mg/kg of total COCs along the unnamed tributary to Red Lion Creek and the Red Lion Creek would be excavated and thermally treated (See Figures 12 and 15).

Alternative 5A - Ex Situ Biological Treatment

Estimated Capital Costs: \$9 to 11.3 million

Estimated Annual O&M Costs: \$100,000

Estimated Present-Worth Costs: \$10.6-12.9 million

This alternative, as discussed in the FS Addendum, involves the ex situ biological treatment of contaminated soils and sediments. This treatment may take place under aerobic (the presence of oxygen) or anaerobic (absence of oxygen) conditions. The results of the treatability study conducted as part of the RI/FS to determine the viability of bioremediation technology for soils and sediments at the SCD Site were not definitive. Regardless, all of the contaminants are volatile and amenable to biodegradation, which suggests that bioremediation could be effectively used at this Site. The actual biological treatment process would be refined after additional studies including treatability studies and/or pilot scale tests were conducted during the Remedial Design.

Ground Water - Same as Alternative 3

Soils/Sediments - Soils and sediments would be excavated as delineated in Alternative 4B, only the treatment technology employed would be ex situ biological treatment rather than thermal treatment (See Figures 12 and 15).

Alternative 5B - In Situ Biological Treatment

Alternative 5B is not a site-wide alternative, but a supplement to Alternatives 3 and 4A and is discussed and evaluated as a component of Alternatives 3 and 4A.

EPA evaluated an additional alternative that is a modification of the alternatives proposed in the FS which is described below as Alternative 6.

Alternative 6 - Ex Situ/In Situ Bioremediation

Estimated Capital Costs: \$4.9 to 10.8 million

Estimated Annual O&M Costs: \$90,000

Estimated Present Worth Costs: \$6.6 to 12.2 million

This alternative includes the treatment of soils and sediments using bioremediation technology and is a modification/combination of Alternatives 5A and 5B as described in the FS Addendum. The modification would include a combination of both in situ and ex situ bioremediation. The actual biological treatment process would be refined after additional studies including treatability studies and pilot scale tests were conducted during the Remedial Design.

Ground Water - Same as Alternative 3

Soils/Sediments - Soils along the western drainage gully (to a depth of 7 feet) that exceed the off-site clean-up criterion of 33 mg/kg of total COCs and the soils along the eastern drainage ditch (to a depth of 3 feet) and Catch Basin #1 (to a depth of 15 feet) that exceed the on-site clean-up criterion of 625/450 mg/kg of total COCs would either be excavated and biologically treated or biologically treated in place. All treated soils must pass TCLP before being used as backfill to demonstrate that the treated soils no longer meet the definition of a characteristic hazardous waste. After treatment, the soils adjacent to Catch Basin #1 would be capped with a low permeability asphalt cap. The soils along the railroad track area would be biologically treated in-place. If in situ biological treatment is unsuccessful in remediating the soils in the area along the railroad tracks to the on-site clean-up criterion, this area would be capped with a low permeability asphalt cap. Soils and sediments outside the existing fence that exceed the off-site clean-up criterion of 33 mg/kg for total COCs (soils and sediments outside the existing fence of the SCD plant and noted as the SOD facility boundary on Figure 2) would also be remediated with biological treatment. This alternative would remediate and cap the same soils and sediments as delineated under Alternatives 4A and 4B, only the treatment technology employed would be bioremediation. The sediments in the sedimentation basin would be removed from the basin for ex situ bioremediation.

If bioremediation were successful in remediating excavated soils/sediments to 33 mg/kg of total COCs, the sedimentation basin could be dismantled and closed in accordance with RCRA closure requirements and the ARARs identified on Table 10. Closure of the sedimentation basin would comply with the RCRA requirements as set forth in 40 C.F.R. § 264.228 and the Delaware Regulations Governing Hazardous Waste § 264.228 and would include testing of the soils underlying the existing liner to ensure that the soils are not contaminated. Any contaminated soils underlying the basin that exceed the off-site clean-up criterion of 33 mg/kg for total COCs would be remediated with biological treatment. Closure of the area formerly occupied by the sedimentation basin would entail grading, seeding and stabilizing with a variety of plants and shrubs. Species would be selected during the Remedial Design for their value in development of diversity density, and abundance of wildlife qualities.

7.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

All of the six remedial alternatives described above were assessed in accordance with the nine evaluation criteria as set forth in the NCP, 40 C.F.R. § 300.430(e) (9). These nine evaluation criteria can be categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. Below is a summary of the nine criteria that were used to evaluate the remedial alternatives for the SCD Site.

Threshold Criteria

- Overall protection of human health and the environment:

Whether the remedy provides adequate protection of human health and the environment and how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

- Compliance with ARARs:

Whether or not a remedy will meet all applicable or relevant and appropriate requirements ("ARARs") of federal and state environmental laws and regulations and/or whether there are grounds for invoking a waiver. Whether or not the remedy complies with advisories, criteria and/or guidance that may be relevant.

Primary Balancing Criteria

- Long-term effectiveness and permanence:

The ability of the remedy to afford long-term, effective and permanent protection to human health and the environment along with the degree of certainty that the alternative will prove successful.

- Reduction of toxicity, mobility or volume through treatment:

The extent to which the alternative will employ treatment technologies to reduce the toxicity, mobility, or volume of the contaminants causing the site risks.

- Short-term effectiveness:

The time until protection is achieved and the short-term risk or impact to the community, on-site workers, and the environment that may be posed during the construction and implementation of the alternative.

- Implementability:

The technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement that remedy.

- Cost:

Includes estimated capital, operation and maintenance, and net present worth costs.

Modifying Criteria

- State Acceptance:

Whether the state concurs with, opposes, or has no comment in the preferred remedial alternative.

- Community Acceptance:

Whether the public agrees with the preferred remedial alternative (this is assessed based on a review of the public comments received on the Proposed Plan).

Each alternative must first satisfy the threshold criteria as described above. Next the primary balancing criteria are used to weigh the tradeoffs or advantages and disadvantages of the various alternatives. Finally, after public comment has been obtained, the modifying criteria are considered. A summary of the relative performance of the alternatives with respect to each of the nine criteria follows. This summary provides the basis for determining which alternative provides the "best balance" of tradeoffs with respect to the nine evaluation criteria.

7.1 Overall Protection of Human Health and the Environment

A primary or threshold requirement of CERCLA is that the selected remedial action be protective of human health and the environment. A remedy is protective if it reduces current and potential risks to acceptable levels within the established risk range posed by each pathway at the Site.

Alternative 1 (no Action) would neither eliminate nor reduce to acceptable levels the threats to human health or the environment presented by contamination at the Site. It is therefore unacceptable and will not be discussed in the remainder of this analysis.

Ground Water

The actions described as necessary for ground water are the same for Alternatives 3 through 6. Based on historical data of the existing pump and treat system, it is uncertain whether the ground water system proposed in Alternative 2 would be effective in preventing contaminated ground water from entering Red Lion Creek. The ground water containment and extraction system included as a component of Alternatives 3 through 6 is protective of human health and the environment.

Soils/Sediments/Surface Water

Of the six alternatives evaluated, Alternatives 3 through 6 are protective of human health and the environment. Alternative 2 does not prevent exposure to contaminated sediments in the wetland area and therefore is not protective of the environment. Alternatives 4B, 5A and possibly 6 will, however, result in the temporary loss of some habitat during remediation. Alternative 2 includes the installation of new silt fences along the unnamed tributary to Red Lion Creek to prevent migration of contaminants into Red Lion Creek. Under Alternative 2, however, some of the contaminated sediments will be left in place which allow for continued exposure to ecological systems and is not protective of the environment. Alternative 2 will be eliminated from further consideration as a viable alternative since it is not protective of the environment.

Under Alternatives 3, 4A, 4B, 5A and 6, surface water will be addressed through remediation of the soils, sediments, and containment of ground water. Each of the alternatives would prevent contaminated ground water from migrating into Red Lion creek. Under Alternatives 3, 4A, 4B, 5A, and 6, surface water run-off would no longer come in contact with highly contaminated soils and sediments because the contaminated soils/sediments would be either remediated to the clean-up criteria, contained, and/or capped.

7.2 Compliance with ARARS

This criterion addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements ("ARARS") of federal and state environmental laws and regulations, and/or whether there are grounds for invoking a waiver.

Ground water

In accordance with EPA's Ground Water Protection Guidelines, the Columbia aquifer is classified as a Class IIB aquifer (i.e., it has the potential for use as a drinking water source). Both the federal and state Safe Drinking Water laws set minimum standards for drinking water called Maximum Contaminant Levels ("MCLs"), which are applicable under CERCLA. MCLs are not ARARS for interim action remedies consisting of containment under CERCLA because additional information is required before EPA can make a final decision on the ground water remedy. Since the remedy for ground water is an interim action for containment of ground water and DNAPLs, all of the alternatives will require that additional work be conducted to determine not only the extent of DNAPL contamination, but also the technical practicability of restoring ground water to federal and state drinking water standards and establishing alternative, protective remedial strategies if restoration is determined to be technically impracticable.

All of the alternatives will have air emissions from the ground water treatment systems which will be treated either in the existing plant boilers, or other appropriate equipment (approved by EPA in consultation with DNREC) to comply with federal and state ARARS.

All of the alternatives will discharge treated ground water to the Delaware River and will comply with the substantive requirements of the NPDES program and federal and state water laws.

Any product (i.e., non-aqueous phase liquid) which is recovered from the low volume product recovery wells will be stored on-site temporarily, and ultimately disposed of off-site in accordance with applicable federal and state regulations promulgated pursuant to RCRA.

Soils/Sediments/Surface Water

The soils and sediments are contaminated due to a release of commercial chemical products which are listed as hazardous wastes in 40 C.F.R. § 261.33. Once these soils are excavated, they must be managed in accordance with federal and state RCRA regulations. All of the alternatives in the FS proposed placing excavated, treated and/or untreated soils in the existing sedimentation basin. RCRA regulations would require that all the excavated contaminated soil be treated to satisfy Land Disposal Regulations (40 C.F.R. Part 268) and that the sedimentation basin be designed and constructed in accordance with RCRA hazardous waste treatment, storage and disposal facility regulations if it is to hold hazardous waste or contaminated soils that must be managed as a hazardous waste.

The Hazardous and Solid Waste Amendments of 1984 ("HSWA") prohibit the land disposal of untreated hazardous wastes. HSWA requires that EPA set "...levels or methods of treatment, if any, which substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the wastes..." On June 1, 1990, EPA promulgated land disposal regulations in 40 C.F.R. Part 268 for various hazardous wastes, including chlorobenzene (U037), 1,2-dichlorobenzene (U070), 1,3-dichlorobenzene (U071), and 1,4-dichlorobenzene (U072). These regulations delineated certain treatment standards and concentration based standards. 40 C.F.R. § 268.43 identifies the concentration based standards (effective December 19, 1994) of 6.0 mg/kg for chlorobenzene, 1,2-, 1,3-, and 1,4-dichlorobenzene and "reflect the performance of well designed and well operated incineration systems."

An interpretation of the federal RCRA regulations, referred to as the "Contained-in Policy" (OSW Memorandum dated November 13, 1986), is described on page 986 of the Federal Register, Volume 57, No. 6, January 9, 1992. This interpretation states that contaminated media such as soil, which contains hazardous waste must be managed as if it were a hazardous waste, subject to all treatment, storage and disposal requirements under RCRA Subtitle C, until it no longer contains hazardous waste. Under the "Contained-in Policy," contaminated soil is considered to no longer contain listed hazardous waste when hazardous constituents of the listed waste are at or below health-based levels. The clean-up criteria for the SCD Site, as discussed previously in its ROD, were developed after a thorough review of both the site-specific human health risk assessment and the site-specific ecological risk assessment which were prepared during the RI/FS. As such, the clean-up criteria or performance standards are health-based levels which, when met, will minimize the threat to human health and the environment.

The land disposal treatment standards are technology based and are more stringent than the Superfund clean-up criteria which were selected for the SCD Site using the Superfund Risk Assessment Guidance Document and the site-specific human health and ecological assessment. However, EPA believes that the clean-up criteria are protective and will minimize the threat to human health and the environment and are consistent with RCRA's Contained-in Policy. Therefore, once the Superfund contaminated soils and sediments at the Site have been treated to reduce the concentration of COCs to below the clean-up criteria (soils must also pass TCLP analysis), they need not be managed in accordance with all Subtitle C requirements provided the treated soils are managed/disposed at the SCD Superfund Site. The site-specific clean-up criteria, however, will only apply to the waste or contamination described in this ROD; they are not intended to be used as clean-up criteria or standards for any other contamination or wastes under any other circumstances.

In February 1993, EPA promulgated regulations under Subtitle C of RCRA in the Federal Register which utilized the concept of Corrective Action Management Units ("CAMUs") to address the management of remediation wastes. The regulation states that "placement of remediation wastes into or within a CAMU does not constitute land disposal of hazardous wastes." The regulations require that the CAMU satisfy specific criteria before EPA's Regional Administrator can designate an area or unit as a CAM. During the public comment period, Standard Chlorine proposed that the sedimentation basin be designated as a CAMU. Upon a review of the CAMU regulations and Standard Chlorine's comments, EPA has determined that the retrofitted sedimentation basin could not be designated as a CAMU. Further detail and discussion of this issue, beyond that discussed below, can be found in the Responsiveness Summary attached to this ROD.

Alternatives 2 and 3 would not be able to comply with LDR or the "Contained-in Policy" because neither alternative will reduce the concentration of contaminants in the soils or sediments to satisfy the Land Disposal Regulations or health based numbers. Alternatives 2 and 3, will therefore be eliminated from further consideration as viable alternatives since neither alternative will satisfy the RCRA ARARs.

EPA's internal review of the draft ROD for the SCD Site revealed the possibility that the on-site clean-up criterion of 450 mg/kg of 1,4-dichlorobenzene could possibly fail TCLP analysis. EPA's Risk Reduction Engineering Laboratory in Cincinnati, Ohio stated,

"Soil and sediment containing more than 150 mg/kg 1,4-dichlorobenzene have the potential to be characteristic hazardous wastes. The TCLP limit for this compound hazardous waste number D027) is 7.5 mg/L; 100 times higher than the drinking water MCL (at the time the TCLP standard was set) but about 10 times lower than the solubility of 1,4-dichlorobenzene in pure water."

EPA RCRA program staff agreed that soil containing 450 mg/kg of 1,4-dichlorobenzene could fail TCLP analysis. Therefore, EPA will require all excavated and treated soils be analyzed for TCLP to demonstrate that the treated soils do not meet the definition of a characteristic hazardous waste.

Additional treatability studies/pilot tests are required to determine if soils and sediments excavated and treated under Alternatives 5A and 6 would remediate the soils and sediments to the clean-up criteria and TCLP limits. Soils and sediments treated in situ under Alternatives 4A and 6 are not subject to the land disposal requirements. Previous studies have demonstrated that the thermal component of Alternatives

4A and 4B can remove 99.9% of the contaminants and in turn will be able to remediate the soils and sediments to the clean-up criteria and TCLP limits.

There are several other ARARs associated with remediation of the soils and sediments that must be complied with. For example, the Delaware Wetlands Act of 1973 and the Archeological and Historical Preservation Act of 1974 must be addressed. All of the alternatives can be designed and implemented to comply with these requirements.

There are no ARARs that establish specific clean-up criteria for soils and sediments. Therefore, the results of the human health and ecological risk assessment performed as part of the RI/FS were used to establish acceptable exposure levels for soils and sediments. Alternatives 4A, 4B, 5A, and 6 will prevent exposure to contaminated soils/sediments above the acceptable exposure levels.

Alternatives 4B and 5A will have the greatest negative impact on the surrounding wetlands, since they involve the physical removal of all contaminated soils and sediments above the established clean-up criteria. This impact is off-set by having the most assurance of satisfying Delaware Surface Water Quality Standards for Red Lion Creek. Each of the alternatives involves some impact on the wetland areas. Alternatives 4A and 6 may be the least disruptive to the habitats in the wetlands, however, each alternative includes provisions for wetlands restoration.

7.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once clean-up levels have been achieved.

Ground Water

The ground water treatment and containment systems proposed in Alternatives 4A, 4B, 5A and 6 provide a more effective barrier in containing the ground water plume than the option proposed in Alternative 2. All of the alternatives will result in hazardous substances remaining on-site above health-based levels. Since the ground water component of the remedy is an interim action, review of this portion of the remedy will be ongoing as EPA continues to develop final remedial alternatives for the ground water and DNAPLS.

Soils/Sediments/Surface Water

Previous studies have demonstrated that the thermal treatment in Alternatives 4A and 4B is capable of a 99.9% removal efficiency. There is some uncertainty associated with remediating the sediments to clean-up criteria with in situ bioremediation in Alternatives 4A and 6 and with ex situ bioremediation in Alternatives 5A and 6. If bioremediation is successful, Alternatives 4A, 5A and 6 provide for treatment of all surface soils and sediments above the clean-up criteria and therefore offer long-term effectiveness and permanence equivalent to Alternative 4B.

There are uncertainties associated with bioremediation (Alternatives 4A, 5A and 6) in satisfying performance standards or clean-up criteria, which will require treatability studies and pilot scale tests prior to implementation. In situ bioremediation and its success for treating chlorinated benzene has not been demonstrated in the field to date. In the event that treatability studies demonstrate that the technology employed pursuant to Alternatives 6 is ineffective, (i.e., cannot reduce the level of contaminants in soils/sediments to the clean-up criteria), the contingency remedy Alternative 4B, will provide for long-term effectiveness and permanence.

7.4 Reduction of Toxicity, Mobility, or Volume through Treatment

This evaluation criterion addresses the degree to which a technology or remedial alternative reduces the toxicity, mobility, or volume of a hazardous substance. Although § 121(b) of CERCLA, 42 U.S.C. § 9621(b), establishes a preference for remedial actions that permanently and significantly reduce the toxicity, mobility, or volume of hazardous substances, EPA expects to use a combination of treatment and engineering controls to achieve protection of human health and the environment, as set forth in the NCP at 40 C.F.R. § 300.430(a) (iii). EPA's expectation is that treatment should be utilized whenever principal threats occur, and that containment will be considered for wastes that pose a relatively low long-term threat or where treatment is impracticable.

Ground Water

Each of the alternatives would reduce the volume and toxicity of the contamination through the use of recovery wells at DNAPL pools if identified during the remedial design. Ground water would be treated on-site and recovered DNAPLS would be shipped off-site for treatment. The interceptor trench in

Alternatives 3 through 6 provides a more effective physical barrier than the extraction wells in Alternative 2, and in turn would be more effective in reducing the mobility of contaminated ground water and DNAPLs. The physical barrier to contain ground water would reduce the mobility of contamination as an interim action, while a final remedial solution is being developed. EPA will require that interim actions to contain ground water and remove DNAPLs at the SCD Site be implemented, while additional information is collected and evaluated and an ultimate remedy will be outlined in a final ROD for ground water at the Site.

Soils/Sediments/Surface Water

Alternatives 4A, 4B, 5A and 6 provide for maximum reduction of toxicity and mobility by permanently treating the soils. It is anticipated that bioremediation will reduce the level of contaminants to the clean-up criteria. If additional studies demonstrate that bioremediation (Alternatives 4A, 5A and 6) is ineffective, (i.e., cannot reduce the level of contaminants in soils/sediments to the clean-up criteria), Alternative 4B, would be most effective in reducing the toxicity, mobility, and volume of contamination through treatment.

7.5 Short-Term Effectiveness

This evaluation criterion addresses the effects of the alternative during the construction and implementation phase until remedial objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on human health and the environment during implementation of the remedial action.

Ground Water

Alternative 2 requires the installation of additional extraction wells which is much less intrusive than the construction of the interceptor trench which is the ground water remedial measure proposed in Alternatives 3 through 6. The trench would require more manpower and could possibly expose workers and the environment to airborne emissions and contaminated ground water during its construction. Alternative 2 would have a minimum impact on the wetlands and could be implemented more quickly than the interceptor trench. The topography of the area where the trench would be constructed is steep in some areas, resulting in space constraints and associated safety hazards. Thus, Alternative 2 would have some advantages over the remaining alternatives with respect to short-term effectiveness.

Soils/Sediments/Surface Water

Alternatives 4A, 4B, 5A and 6 require excavation of sediments which can result in additional exposure of workers and the environment to airborne emissions. Both 4B and 5A will have significant short-term negative impact on wetlands, which will be mitigated as part of the remedial action. If additional treatability studies demonstrate that in situ bioremediation can satisfy the performance standards and clean-up criteria for sediments in the unnamed tributary, Alternatives 4A, and 6 would be equivalent in short-term impacts. There is some uncertainty of the estimated time frames required for bioremediation, both in situ (Alternatives 4A, 6) and ex situ (Alternatives 5A and 6), to treat the soils and sediments to the clean-up criteria.

7.6 Implementability

Implementability refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement each component.

Ground Water

Alternative 2 is easier to implement than Alternatives 3 through 6 because of the simpler design. Ground water remediation for Alternatives 3 through 6 employs conventional construction techniques but the limited space available, as well as the specific physical barrier type selected, may affect the relative ease of implementability.

Soils/Sediments/Surface Water

Alternative 4B (Thermal Treatment) utilizes a proven technology, but would be somewhat difficult to implement at this Site due to difficulties in accessing some of the sediments, as well as the need to pre-treat the sediments to reduce the moisture content. Alternative 5A and 6 (Ex Situ Biological Treatment) utilize a developing technology and would require additional treatability studies and pilot scale tests prior to implementing on a site-wide basis. There is even less certainty associated with the implementation of an in-situ biological process (Alternative 4A and 6) due to the difficulties associated

with maintaining optimal conditions in a natural environment. Monitoring the effectiveness of in situ bioremediation may present additional uncertainties.

7.7 Cost

All Media

The costs of the alternatives shown above in Section 6 include capital costs and operation and maintenance ("O&M") costs. The cost estimates are based on a variety of information, including estimates from suppliers, construction unit costs, vendor information, and conventional cost estimate guides.

Alternatives 4A, 4B, 5A and 6 are in line with the statutory preference for treatment to reduce inherent hazards posed by principal threats. The present worth cost estimate of Alternative 4A is \$11.7 million, 4B is estimated at \$17.1 million, Alternative 5A is estimated to cost from \$10.6 million to \$12.9 million, and Alternative 6 is estimated to cost from 6.6 million to \$12.2 million.

7.8 State Acceptance

The Delaware Department of Natural Resources and Environmental Control (DNREC), acting on behalf of the State of Delaware, has concurred with the selected remedy.

7.9 Community Acceptance

Generally, local residents and concerned citizens expressed no opposition to the selected remedy at the public meeting held on April 27, 1994, provided that the additional studies conducted during the Remedial Design demonstrate that bioremediation would be successful in reducing the level of contaminants to the clean-up criteria. Standard Chlorine of Delaware submitted comments on the selected remedy and stated its preference for Alternative 3. The comments received during the public comment period concerning the various alternatives are summarized in the Responsiveness Summary which is part of this ROD.

8.0 SELECTED REMEDY: DESCRIPTION AND PERFORMANCE STANDARDS

8.1 Description of Selected Remedy

Based on the findings in the RI/FS, the nine criteria listed above, and public comments, EPA has selected Alternative 6 (Ex Situ/In Situ Bioremediation) as the remedy for the contaminated soils and sediments at the SCD Site, with a contingency to implement Alternative 4B (Low Temperature Thermal Desorption) in the event that it is determined that the bioremediation alternative cannot achieve the clean-up criteria. The selected remedy also includes a component to contain contaminated ground water and to recover DNAPLs as described below.

8.1.1 Ground Water - Interim Remedy

The selected remedy calls for the design and implementation of an interim remedial action for ground water to protect human health and the environment. The goals of this remedial action are (1) to prevent further migration of the contaminated ground water, (2) prevent further degradation of the unnamed tributary to Red Lion Creek and of Red Lion Creek, (3) to remove DNAPL pools, if identified during remedial design, which act as a continuing source of ground water contamination, and (4) to gather information to use in determining the technical practicability of remediating ground water.

Information gathered during the implementation of this interim remedial action will be evaluated to determine the technical practicability of remediating the ground water to health based levels and to ensure that hydraulic control of the contaminated plume is maintained. After EPA, in consultation with DNREC, determines that sufficient information has been collected to make a decision regarding the technical practicability of remediating ground water to health based levels, a final ROD for ground water, which specifies the final goal for the remedial action and anticipated remediation timeframe, will be prepared by EPA.

8.1.1.1 Physical Barrier

The ground water containment component of the selected remedy consists of a physical barrier such as a trench or slurry wall. The physical barrier will be installed along the shorelines of the unnamed tributary to Red Lion Creek and Red Lion Creek to capture ground water and DNAPLs before they enter the Red Lion Creek. Soils excavated from the trench may be contaminated and will be analyzed to determine the concentration of contaminants. Excavated soils exceeding the off-site clean-up criterion will undergo remediation as described below in Section 8.1.2 before appropriate disposal occurs. In addition, low

volume recovery wells will be installed to attempt to recover DNAPLs. The recovered DNAPLs will be stored on-site temporarily and ultimately disposed of off-site in accordance with applicable hazardous waste regulations. Recovered ground water will be treated in the existing air stripper and then discharged to the Delaware River under SCD's NPDES permit requirements. Off gases will be treated by either burning in the existing facility boilers or other appropriate treatment in accordance with all applicable federal and state requirements to prevent transfer of contaminants from the water to the air.

8.1.1.2 Existing Ground Water Control Systems

Repairs and upgrades (if necessary) of the existing ground water pump and treat system will be required. Historically, a few of the well pumps have not functioned at optimum capacity. At a minimum, measures to ensure that the existing recovery wells pump at design capacity will be required. In addition, routine physical testing of Catch Basin #1 will be required to minimize the possibility of future releases.

8.1.1.3 Institutional Controls

Institutional controls will include use, access, and deed restrictions. With respect to deed restrictions, notifications will be placed on the deeds to the properties that comprise the Site (includes property currently owned by Occidental and Air Products) which shall limit the future use of the Site to prevent exposure to ground water and subsurface soils. The deed restrictions shall identify the extent of ground water contamination and the areas containing subsurface contamination. Level the extent of ground water and subsurface soil contamination and the selection of an industrial use clean-up level (for on-site soils), imposition of deed restrictions is necessary to protect human health and avoid more costly and more disruptive remedial action. In addition, DNREC will implement a ground water management zone for the area.

8.1.1.4 Possible Facility Closure

The remedy includes a provision for the development of a plan to provide an alternate means of treating the ground water and DNAPLs in the event that SCD should reduce or cease operations at the Site. Any other environmental concerns at the time of possible closure of the facility will be addressed by various federal laws and regulations as well as those of the State of Delaware.

8.1.2.5 Additional Investigative/Monitoring Work

Additional investigative work will be recruited to define the extent of the DNAPL and ground water contamination. This investigation will include the installation of wells on the north side of Red Lion Creek and on property currently owned by Air Products. A detailed evaluation of the restoration potential of the aquifer will also be conducted.

The FS did not address remediation of ground water in the vicinity of monitoring well number 16 ("MW #16"), which is adjacent to the effluent pipeline. Since the investigation of this area was limited to one round of sampling, additional investigation of this area will be conducted during the remedial design. Based on the results of this investigation, EPA in consultation with DNREC may require additional ground water remediation activities in the vicinity of the effluent pipeline.

Pre-remediation and post-remediation monitoring of the Site, according to a monitoring plan developed during the Remedial Design, will be required to ensure that the remedy is protective of resources at the Site. Site monitoring activities will include monitoring of the ground water in both the Columbia and Potomac Formations, off-site monitoring including monitoring wells located on adjacent properties, and monitoring of the surface water systems present at the Site (the wetlands, unnamed tributary to Red Lion Creek, and Red Lion Creek). The ground water monitoring activity will involve the installation of additional on-site and off-site monitoring wells.

8.1.2 Soils/Sediments - Final Remedy

EPA's selection of a final action to remediate the contaminated soils and sediments at the SCD Site is a modified Alternative 6 (Ex Situ/In Situ Biological Treatment) with a contingency final action of a modified Alternative 4B (Thermal Treatment), if Alternative 6 is unable to remediate contaminated soils and sediments to the clean-up criteria. The modifications of Alternatives 4B and 6, from those described in the Proposed Plan, include the following provisions:

- 1) "Hot Spot" sampling and analysis of soils where releases have occurred on the operating portion of the Site and may not have been properly remediated and/or areas where hazardous materials may have been placed or temporarily stored based on current and past operational practices;

2) TCLP analysis of remediated soils to ensure treated soils no longer meet the definition of a characteristic hazardous waste.

8.1.2.1 Sedimentation Basin

Each of the alternatives in the FS proposed using the existing sedimentation basin for consolidating contaminated and or treated soils and sediments which would not comply with ARARs (see Section 7.2 of this ROD and the Responsiveness Summary). Therefore, the selected remedy will include closure of the existing sedimentation basin in accordance with all applicable state and federal regulations.

Closure of the sedimentation basin will include testing of the soils underlying the existing liner to insure that the soils are not contaminated. Any contaminated soils underlying the basin that exceed the off-site clean-up criterion of 33 mg/kg for total COCs will be remediated. Closure of this area will include grading, placement of top soil, seeding and planting a variety of plants and grasses. The flora species will be selected for survivability and value in development of diversity, density, and abundance of wildlife quality and will include mixed herbs, grasses and shrubs.

8.1.2.2 Bioremediation Alternative

As part of Alternative 6, additional studies (treatability studies and pilot scale tests) of both ex situ and in situ bioremediation will be conducted during the Remedial Design to determine if either will be able to treat the soils/sediments to the clean-up criteria. If additional studies demonstrate that neither ex situ nor in situ biological treatment are able to remediate soils to the clean-up criteria as delineated in Section 5.3.3. of this ROD, then Alternative 4B (Low Temperature Thermal Desorption) will be implemented.

Several different types of biological treatment processes will be evaluated during the Remedial Design. Treatability studies and pilot scale tests will be performed. One type of ex situ bioremediation to be evaluated is slurry phase bioremediation, where contaminated soils and sediments are placed in a reactor (frank) and combined with water to form a slurry. Other types of ex situ bioremediation that may be considered and evaluated include solid-phase bioremediation and composting. In situ bioremediation entails the addition of nutrients, oxygen (if the process is aerobic), and possibly microorganisms to the contaminated sediments to enhance the natural biodegradation process. Several different conditions under which in situ bioremediation may be employed at this Site will also be evaluated during the Remedial Design. Additional ex situ and in situ bioremediation processes not mentioned above may also be evaluated during Remedial Design.

If, based on the results of the additional treatability studies, full-scale bioremediation is performed in the field, it must effectively reduce the concentration of contaminants to satisfy the clean-up criteria. If biological remediation is unable to achieve these levels, Alternative 4B will be implemented.

8.1.2.3 Thermal Treatment Alternative

If based on the results of further testing during the Remedial Design, it is determined that soils/sediments which are bioremediated will not be able to meet the clean-up criteria and pass TCLP analysis, the contingency Alternative 4B will be implemented. This alternative involves the Low Temperature Thermal Description ("LTDD") of contaminated soils and sediments. Under this alternative, contaminated soils/sediments will be heated at low temperatures ranging from 200° to 1000°F, driving off water and volatile contaminants. Recovered product from this treatment would be sent to the SCD plant for reuse if possible. Recovered vapors (air emissions) will be burned in an afterburner, sent to the existing boilers, captured by carbon adsorption beds or treated in some other manner consistent with ARARs.

8.1.2.4 Clean-up Criteria

The clean-up criteria for on-site soils and sediments (soils and sediments inside the existing fence of the SCD facility and noted as the SCD facility boundary on Figure 2) is 625 mg/kg of total COCs with a ceiling of 450 mg/kg for 1,4-dichlorobenzene. All on-site soils and sediments containing contamination in excess of these criteria will be remediated to the on-site clean-up criteria and pass TCLP analysis before they can be used as backfill for the on-site excavated areas. On-site soils will be remediated to the off-site clean-up criteria before they can be used as backfill for off-site excavated areas.

The selected remedial alternative will provide for treatment of contaminated soils both on and off-site. The clean-up criterion for off-site soils and sediments (soils and sediments outside the existing fence of the SCD facility and noted as the SCD facility boundary on Figure 2) is 33 mg/kg of total COCs. All off-site excavated contaminated soils and sediments will be remediated to the off-site clean-up criterion

and pass TCLP analysis before they can be used as backfill for the off-site or on-site excavated areas.

Soils along the western drainage gully (to a depth of 7 feet), soils in the waste piles, sediments in the sedimentation basin, sediments in and along the unnamed tributary that exceed the off-site clean-up criterion of 33 mg/kg of total COCs and the soils along the eastern drainage ditch (to a depth of 3 feet) and Catch Basin #1 (to a depth of 15 feet) that exceed the on-site clean-up criteria of 625/450 mg/kg of total COCs will either be excavated and treated (using ex situ bioremediation) or biologically treated in place (in situ bioremediation). If bioremediation is unable to treat the soils to the clean-up criteria, the soils will be excavated and treated with Low Temperature Thermal Desorption. Excavation beyond a depth of 15 feet may result in damage to the structural integrity of the Catch Basin. After the soils adjacent to the Catch Basin have been treated to meet the clean-up criteria, the area will be capped with a low permeability asphalt cap.

Since shunting down the railroad tracks would detrimentally affect SCD plant operations, soils along the railroad tracks that exceed the on-site clean-up criteria of 625/450 mg/kg of total COCs will be biologically treated in place. If in situ bioremediation is unable to remediate the soils in this area to the clean-up criteria, this area will be capped with a low permeability asphalt cap which will minimize infiltration.

In the event that SCD should reduce or cease operations at this Site, EPA will re-evaluate the on-site clean-up criteria since they are based on occupational exposure.

8.1.2.5 Soil and Sediment Monitoring

Ecological monitoring will be conducted annually starting prior to the start of remedial action to establish a data baseline, and then annually thereafter for a period of at least five years. The purpose of the ecological monitoring is to document that the remedial objectives are met. The ecological monitoring activities will include chemical analysis of surface water, sediments, fish and muskrat tissue, and bitassays. Decisions regarding the possible need for additional remediation activities will be made after the monitoring activities have been conducted long enough to establish trends and those trends have been thoroughly evaluated by EPA, DNREC, and any necessary support agencies. Decisions regarding the need for any possible additional remediation and/or monitoring activities at the Site will be made by EPA in consultation with DNREC.

8.1.2.6 Additional Work

EPA received comments during the public comment period concerning possible spills and releases of hazardous substances at the SCD Site that may not have been properly remediated or addressed. The EPA RCRA program has also expressed concern that areas which would typically be evaluated under a RCRA Facility Investigation, were not investigated as part of the Superfund Remedial Investigation. Therefore, the selected alternative will also require "Hot Spot" sampling and analysis. Spill areas that were identified during the Remedial Investigation will be sampled and analyzed for potential contamination. Other areas that may be included in the "Hot Spot" analysis are areas or units at the Site where hazardous material may have been placed or temporarily stored based on current and past operational practices. Soil samples collected from these areas will be analyzed to determine if they are contaminated. The "Hot Spot" investigation will include sampling and analysis of soils for various parameters including volatile organic and semi-volatile organic compounds. In addition, twenty-five per-cent (25%) of the samples will also be sampled for metals, pesticides, and Polychlorinated Biphenyls ("PCBs") EPA may require additional work if the results of the "Hot Spot" sampling identify contamination above the clean-up criteria.

8.1.2.7 Summary

Alternative 6 with a contingency of Alternative 4B, is the selected alternative for the treatment of soils, sediments and ground water at the Site, since it meets the threshold criteria, and provides the best balance of long- and short-term effectiveness, permanence, implementability, and reduction of toxicity, mobility and volume of contaminants through treatment. The NCP states that EPA will place priority on treating materials that pose the principal threat at a given site.

Alternative 6 is the selected alternative because it has the potential to achieve the same end result as Alternative 4B at a substantially lower cost. EPA and DNREC foresee the use of a combination of ex situ bioremediation and in situ bioremediation at this Site. For example, ex situ bioremediation could be used for all soils and some sediments. If successful, in situ bioremediation would be used in the railroad track area and for some of the sediments for which access is difficult along the unnamed tributary to Red Lion Creek and the Red Lion Creek.

Alternative 4B will be implemented if the additional investigation performed during the Remedial Design demonstrates that bioremediation will not be able to satisfy the clean-up criteria. Previous studies have demonstrated that this technology (Low Temperature Thermal Desorption) is capable of a 99.9% Destruction Removal Efficiency ("DRE") for the contaminants found in the soils and sediments at the Site. In addition, possible recovery and reuse of the product phase will also reduce the volume of residuals which could require further treatment.

8.2 Performance Standards/Clean-up Criteria

8.2.1 Ground Water

To reduce the risk to human health and the environment via the exposure pathways attributed to the migration of ground water from the Site, a physical barrier such as a trench or slurry wall shall be installed along the shorelines of the unnamed tributary to Red Lion Creek and Red Lion Creek to capture ground water and DNAPLs before they enter Red Lion Creek. In addition, low volume recovery wells shall be installed to attempt to recover DNAPL pools which may be identified during the Remedial Design.

The physical barrier shall be designed and constructed to prevent contaminated ground water and DNAPLs from migrating to the unnamed tributary to Red Lion Creek and to Red Lion Creek. The length, location, and material to be used for the construction of the physical barrier shall be approved by EPA, in consultation with DNREC, during the Remedial Design.

The existing ground water extraction wells (RW #1, #2, #3, #4, and #5) shall be repaired (or replaced, if necessary) so that they shall operate at original design capacity. A ground water extraction system shall be constructed to accompany the physical barrier selected during Remedial Design. The dewatering system shall collect ground water and pump it to a waste water treatment plant. The elevation of the Columbia aquifer shall be maintained so as not to exceed the seasonal high ground water table prior to construction of the physical barrier.

The extracted ground water shall be treated to comply with the substantive requirements of the Delaware Regulations Governing Control of Water Pollution for discharge to the Delaware River (Refer to Table 10 for a listing of the ARARs associated with the selected remedy).

Air emissions generated from the treatment of ground water shall be treated and shall comply with the substantive requirements of the State of Delaware Implementation Plan, the National Emissions Standards for Hazardous Air Pollutants, the Delaware Ambient Air Quality Standards, and the Delaware Regulations Governing the Control of Air Pollution.

Air residual waste generated as a result of ground water treatment shall be disposed of at an off-site facility approved by EPA.

Recovery wells shall be installed at areas identified during the Remedial Design that contain known DNAPLs. Location of wells and pumping rates shall be designed to maximize DNAPL removal. Collection and storage of DNAPLs shall comply with the substantive requirements of the Delaware Regulations Governing Hazardous Waste. Recovered DNAPLs shall be shipped off-site for disposal in accordance with applicable federal and state regulations promulgated pursuant to RCRA.

An operations and maintenance plan for the ground water containment and extraction system shall be developed. The performance of the ground water containment and extraction system shall be monitored on a monthly basis and documentation of results submitted to EPA and DNREC on a quarterly basis. Operation of the system may be modified, as warranted by the performance data collected during operation, as approved by EPA in consultation with DNREC.

All components of the ground water remedy shall be implemented in accordance with the ARARs delineated in Table 10.

8.2.1.1 Ground Water Investigation/Monitoring

Investigation

A ground water investigation shall be conducted to characterize the nature and extent of ground water and DNAPL contamination. The investigation shall provide information to determine the extent of ground water contamination as well as the technical practicability of remediating ground water to MCLs and other health-based levels. Information gathered during this investigation shall address the following areas of concern: contaminant characteristics; hydrogeological conditions; contaminant distribution and potential subsurface migration; performance of aquifer restoration and other previous response actions;

availability of alternative technologies, and an estimate of the degree of restoration that will be achievable at the Site, if applicable.

Further investigation of the effluent pipeline shall be conducted to determine the nature and extent of ground water contamination in this area. Sampling and analysis of wells located on Air Products property shall be performed. Additional monitoring wells shall be installed on the north side of Red Lion Creek and on property currently owned by Air Products.

The investigation shall provide the necessary information for EPA to make a determination of the technical practicability of ground water restoration as delineated in the OSWER Directive 9234.2-25 entitled "Guidance for Evaluating the Technical Impracticability of Ground Water Restoration" and to develop final remediation standards for ground water.

Monitoring

A ground water monitoring program shall be implemented to evaluate the effectiveness of the ground water containment system and DNAPL removal and containment systems. The exact location of monitoring wells to be included in the monitoring program shall be determined during the Remedial Design and approved by EPA in consultation with DNREC. The frequency and duration of the sampling and the analytical parameters and methods to be used shall also be approved by EPA in consultation with DNREC during the Remedial Design. In addition, an operation and maintenance ("O&M") plan approved by EPA in consultation with DNREC shall be implemented for the ground water monitoring program. Monitoring shall continue until EPA, in consultation with DNREC, makes a final decision on the ground water remedy in a ROD.

Additional monitoring wells shall be installed at locations determined during Remedial Design by EPA for the purpose of defining the nature and extent of ground water contamination.

Trench Excavation

Sampling and analysis of excavated soils from the trench (See Figure 13) shall be conducted in a statistically significant manner, to be approved by EPA in consultation with DNREC, to determine if soils require remediation. Any excavated soils from the trench which exceed the off-site clean-up criterion of 33 mg/kg of total COCs will undergo remediation as described in Section 8.1.2

8.2.1.2 Institutional Controls

DNREC shall institute a ground water management zone (GMZ) in the Site area to prevent exposure to contaminated ground water through the installation of future potable water wells.

Institutional controls will include use, access, and deed restrictions. With respect to deed restrictions, notifications shall be placed on the deeds to the properties that comprise the Site (includes property currently owned by Occidental and Air Products which shall limit the future use of the Site to prevent exposure to ground water and subsurface soils. The deed restriction shall identify the extent of ground water contamination and the areas containing subsurface contaminated soils. The notifications shall remain in effect until drinking water standards are achieved throughout the contaminated area and the subsurface soils are remediated.

Signs shall be posted at all times on the west and east side of Route 9, adjacent to Red Lion Creek, that warn the public of the advisory recommending that the public not consume fish from Red Lion Creek in the area from Route 13 to the Delaware River until the advisory is lifted by DNREC and the Division of Public Health.

8.2.2 Soils and Sediments

8.2.2.1 Performance Standards Common to Both Bioremediation and Thermal Treatment

To reduce the risk to human health and the environment, soils and sediments shall be remediated as described in Section 8.1, Description of the Selected Remedy. All components of the remedy and contingency remedy for soils and sediments shall be implemented in accordance with the ARARs delineated in Table 10.

Excavation of Soils and Sediments

Confirmatory sampling shall be conducted in a statistically significant manner, to be approved by EPA in consultation with DNREC, to determine that sufficient soils and sediments have been excavated. The excavated areas containing contaminated soils in the subsurface shall either be lined with a flexible

membrane liner prior to being backfilled or shall be capped in a manner to reduce infiltration through the contaminated subsurface soils.

Management and Disposal of Treatment Residuals

During Remedial Design, a waste management plan shall be developed to identify potential waste streams and appropriate handling and disposal mechanisms. This plan shall be approved by EPA in consultation with DNREC. In the event treatment residuals are determined to be hazardous wastes, they shall be managed in accordance with the federal and state ARARs outlined in Table 10. These wastes may include contaminated carbon filters, waste water, and recovered product.

Backfilling of Treated Soils and Sediments

The treated soils and sediments may be backfilled into excavated areas if they satisfy the clean-up criteria and pass TCLD analysis as follows: all off-site excavated contaminated soils and sediments shall be remediated to the off-site clean-up criterion (33 mg/kg of total COCs) and pass TCLP analysis before they shall be used as backfill for the on-site or off-site excavated areas; all on-site excavated soils shall be remediated to the on-site clean-up criteria (625 mg/kg of total COCs with a ceiling of 450 mg/kg of 1,4-dichlorobenzene) and pass TCLP analysis before they shall be used as backfill for on-site excavated areas. On-site excavated soils and sediments may only be used as off-site backfill if they meet the off-site clean-up criterion.

Closure of the Sedimentation Basin

Closure shall include sampling of the soils underlying the existing liner in a statistically significant manner to insure that the soils do not contain concentrations of contaminants which exceed the off-site clean-up criterion (33 mg/kg of total COCs). Following excavation the area shall be graded and a protective, vegetative soil cover shall be placed over the area. The soil cover shall: (1) support the germination and propagation of vegetation; and (2) compact well and not crack excessively when dry. EPA anticipates that following treatment, the soil will no longer "contain" hazardous wastes and thus will cease to be a hazardous waste for purposes of federal and state law. Maintenance of the area formerly occupied by the sedimentation basin shall be conducted as necessary until the area is stabilized with diverse plant growth which can support animal species common to the area.

Waste Piles

The design, operation, and closure and post-closure of the existing waste piles and waste piles generated during the stockpiling of excavated soil from either the pilot scale treatability studies or the full-scale implementation of the remedy shall comply with the substantive regulations set forth in the Delaware Regulations Governing Hazardous Waste, §§ 264.250-259 and 40 C.F.R. § 264 Subpart M - Land Treatment for bioremediation and 40 C.F.R. §264 Subpart L - Waste Piles for thermal treatment.

Tanks

The design and operation of tanks used in the treatment of contaminated soils and sediments shall comply with the substantive regulations set forth in the Delaware Regulations Governing Hazardous Waste, §§ 264.190-199 and 40 C.F.R. §§ 264.190 - 199.

Capping

The cap to be constructed in the railroad track and catch basin areas shall consist of asphalt and shall be constructed in a manner to minimize infiltration into the subsurface. The areas to be capped shall be graded to minimize ponding of water and designed to accommodate heavy traffic. Routine inspection and maintenance of the capped areas shall be required until such time as EPA determines that the subsurface soils are no longer serving as a source of ground water contamination. Maintenance shall include repairs to the asphalt cap as necessary to correct cracks and to control the effects of settling and subsidence.

Catch Basin #1 Integrity Testing

Catch Basin #1 will undergo integrity testing no less than once a year upon EPA's approval of testing plans and protocols in consultation with DNREC. The testing shall consist of a hydrostatic test or some equivalent test to determine the integrity of the catch basin. Testing plans and protocols shall be submitted during Remedial Design to EPA for approval prior to implementing the tests.

Surface Water Runoff Controls

Storm water runoff from all areas of soil disturbance resulting from Site remediation activities which may reach the waters of the state of Delaware without treatment prior to discharge shall be controlled in a manner consistent with ARARs. EPA, in consultation with DNREC, will approve the control measures to be implemented at the Site. All control measures shall be routinely inspected and maintained until EPA, in consultation with DNREC, determines that storm water runoff no longer poses a potential to contaminate waters of the state of Delaware

Wetlands

Excavation in the wetland areas, if it occurs as part of the remedy, shall meet the following criteria:

- 1) The excavated areas in the wetlands may remain at the excavated elevation and grade, no deeper than three feet, (as opposed to backfilling) if an acceptable marsh substrate exists. The substrate would be acceptable if it contained sufficient organic matter to support the growth of wetland species and contains less than 33 mg/kg of total COCs. If the substrate is not suitable for planting, a two to three inch layer of clean fill containing sufficient organic matter to support wetlands vegetation shall be applied before planting. Temporary stabilization shall include planting of water tolerant annual species in the exposed wetland area.
- 2) The upland areas and banks shall be stabilized in accordance with substantive State erosion and sedimentation control requirements. Temporary stabilization shall include planting of an acceptable annual species in the upland/bank areas. The plantings shall be maintained until the area is stabilized.
- 3) Natural succession is acceptable as long as there is a Phragmites control plan in place. The phragmites control plan shall be approved by EPA in consultation with DNREC. In the event that natural succession in the wetlands is not successful (e.g. 80% cover within 1-2 years) a contingency plan to maintain plantings shall be developed.
- 4) Prior to excavating sediments in the wetland area, a minimum of four man-days work shall be spent collecting and moving to a new environment any wildlife residing in areas to be remediated.
- 5) The excavation of contaminated sediment and soils shall be designed and performed in such a way as to minimize environmental harm.

A monitoring plan for wetland vegetation, both planted and naturally occurring, shall be developed and approved by EPA in consultation with DNREC. The wetland monitoring shall be conducted for at least five years after the remedial action is complete in order to document the successful re-establishment of a wetland community.

Any damage to the wetlands done as part of the remediation activities shall be mitigated on a one to one ratio and in accordance with Section 404 of the Clean Water Act. The wetland restoration plan shall be approved by EPA in consultation with DNREC.

Erosion Control

An erosion control plan shall be developed and implemented which outlines procedures to be used to control transport of soil and sediment. The plan shall be developed in accordance with state and/or local regulations and shall be approved by EPA in consultation with DNREC. It shall address all activities which present the potential for transport of soils and sediments.

Health and Safety

During all Site work, Occupational Safety and Health Administration ("OSHA") standards set forth at 29 C.F.R. Parts 1904, 1910, and 1926 governing worker safety during hazardous waste operations, shall be met. The Remedial Design shall include a Health and Safety Plan to be accepted by EPA.

All remedial work shall be done in such a manner as to minimize transport of airborne particulates and volatilization of contaminants. As part of the remedial action Health and Safety Plan levels of particulate and/or air contaminants considered to pose an unacceptable health risk in accordance with OSHA regulations and the National Institute for Occupational Safety and Health ("NIOSH") guidance documents shall be identified along with monitoring requirements to measure particulate counts and/or air contaminant concentrations.

An EPA-approved air monitoring program shall be established for the remedial action. This monitoring program shall provide for the protection of on-site workers and prevent the release of unacceptable emissions. Emissions from the remedial activities shall not exceed a carcinogenic risk of 1×10^{-6} . If this level is exceeded, control measures shall be implemented to reduce emissions below this level.

Air monitoring shall be done at appropriate times to ensure protectiveness of human health. If the air monitoring results indicate that particulate counts and/or air contaminant concentrations are high enough to pose unacceptable health risks to people on-site or off-site, appropriate measures shall be taken to reduce the emissions to safe levels off-site, and either to reduce the emissions to safe levels on-site or to protect the workers through personnel protective equipment.

Institutional Controls

Institutional controls will include use, access, and deed restrictions. With respect to deed restrictions, notification shall be placed on the deeds to the properties that comprise the Site (includes property currently owned by Occidental and Air Products) which shall limit the future use of the Site to prevent exposure to ground water and subsurface soils. The deed restriction shall identify the extent of ground water contamination and the areas containing subsurface contaminated soils.

Access Restrictions

The existing fence (noted as the SCD boundary on Figure 2) shall be maintained to restrict access to the operating portion of the Site. A minimum of five (5) signs shall be posted along the unnamed tributary to Red Lion Creek, the Red Lion Creek, the area around the soil piles, sedimentation basin, and the western drainage gully. The signs shall warn trespassers and any others on the property of the contamination in the area and shall be maintained until the soils/sediments are remediated to the clean-up criteria.

Ecological Monitoring

The effectiveness of the selected remedy in protecting ecological resources shall be monitored by an ecological monitoring plan that shall be developed during Remedial Design. The plan shall include monitoring of wetland soils and sediments, the stream benthic environment, and the aquatic environment. The plan shall be submitted for review and approval by EPA in consultation with DNREC. Ecological monitoring shall be conducted annually with the first round prior to the start of remedial action to establish a data baseline and then annually thereafter for a period of at least five (5) years.

The ecological monitoring activities shall include chemical analysis of surface water, soils/sediments and fish and muskrat tissue, and sediment bioassays. An ecological reference station with similar sampling protocol shall be established as part of the ecological monitoring plan. Annual sampling shall be conducted in late spring, but shall not be done directly after a storm event.

A minimum of thirteen (13) sampling stations shall be established for monitoring the wetlands along the unnamed tributary to Red Lion Creek and Red Lion Creek. Samples of both soil/sediment and surface water shall be used for chemical analysis and toxicity testing.

Fish and muskrat samples shall be chemically analyzed for residues of COCs. Tissue residue of COCs should not be significantly different than those in the same species taken at an appropriate reference site.

Chemical analysis of sediments shall be conducted according to the EPA-approved monitoring plan. Samples shall be split for toxicity testing. Samples shall be collected from areas estimated to have a minimum of 50% fines (percentage of sediments that can pass through a 74 micron sieve).

Sediment toxicity testing shall be conducted according to the EPA-approved monitoring plan. A 30% or greater reduction in survival compared to the control sample shall be considered a significant impact. No significant impacts should be observed.

If EPA, in consultation with DNREC determines that these monitoring data indicate that the Site-specific clean-up criteria are no longer protective (for example, the chlorinated benzene compounds remaining in the sediments become more bioavailable due to changing conditions and cause a greater impact), additional remedial measures beyond those described in this ROD may be required.

A determination of success in the recovery of the ecological resources at the Site and the possible need for additional remediation activities based on the ecological monitoring will only be made after the ecological monitoring activities have been conducted and after evaluation by EPA, DNREC, and any necessary support agencies using state of the art risk assessment methods. Decisions regarding the need for any possible additional remediation activities at the Site will be made by EPA in consultation with

DNREC.

Operation and Maintenance

An Operation and Maintenance ("O&M") Plan shall be developed for review and approval by EPA in consultation with DNREC. The O&M Plan shall include requirements for the maintenance of the former sedimentation basin, Catch Basin #1, capped areas, on-site soil disposal areas and storm water controls. The O&M Plan shall include formats to be used for documentation of inspections and maintenance which shall be submitted to EPA and DNREC for review.

8.2.2.2 Performance Standards for Bioremediation

Treatability Studies

A workplan for the Bioremediation Treatability Study shall be developed during the initial phases of the Remedial Design and submitted for approval by EPA in consultation with DNREC. The treatability study shall be conducted in accordance with appropriate EPA guidance including but not necessarily limited to EPA's "Guide for Conducting Treatability Studies under CERCLA: Aerobic Biodegradation Remedy Screening, Interim Guidance," EPA/540/2-91/013A, July 1991.

The treatability study shall be designed to evaluate the technical feasibility of using in situ and ex situ biological treatment for remediating various portions of the SCD site. It shall include an evaluation of technologies such as solid and slurry phase bioremediation. It shall evaluate the possibility of implementing aerobic and anaerobic bioremediation.

The effects that the hydrogeology of various portions of the Site may have on the bioremediation alternative under consideration shall be addressed in the treatability study.

The treatability study shall focus on stimulation of indigenous microorganisms to degrade the chlorobenzene.

The treatability study shall include measures to account for volatilization resulting from stirring or agitation. Mass balance calculations shall be provided in a report of the findings of the treatability study(s).

If EPA determines, in consultation with DNREC, that based on the results of the pilot scale test ex situ or in situ bioremediation can achieve the soil/sediment clean-up criteria, then bioremediation shall be implemented in the field.

Conditions Triggering Implementation of Contingency Remedy

If the results of the treatability studies and/or pilot scale tests demonstrate that bioremediation technology can not meet the soil/sediment clean-up criteria outlined in Section 8.1 above, Low Temperature Thermal Desorption technology will be used to treat the contaminated soils and sediments.

8.2.2.3 Performance Standards for the Contingency Alternative Low Temperature Thermal Desorption

If it is determined by EPA in consultation with DNREC, that bioremediation is not capable of achieving either the on-site or off-site clean-up criteria for contaminated soils/sediments, the soils and sediments shall be treated using Low Temperature Thermal Desorption ("LTTD"). In addition to the performance standards common to both bioremediation and thermal treatment described above, the specific performance standards for LTTD are described below:

The operation and closure of the thermal desorption unit shall comply with the regulations outlined in 40 C.F.R. Part 264, Subpart X - Miscellaneous Units. Storage of all residual wastes shall comply with the substantive regulations set forth in the Delaware Regulations Governing Hazardous Waste, Part 264.170-178 and Part 264.190-199 (storage of hazardous waste in containers and tanks).

Treatment of Air Emissions from the Thermal Desorption Unit

Contaminants in the effluent air from the thermal desorption unit shall be removed with a treatment unit, the specifications of which shall be determined during the Remedial Design and subject to EPA approval in consultation with DNREC. The treatment unit(s) shall be designed and operated in accordance with the ARARs listed in Table 10.

Pre-design testing of the LTDD process will be conducted to establish operating parameters. Based on the pre-design testing results, an Operations and Maintenance Plan will be prepared for EPA's approval in consultation with DNREC.

9.0 STATUTORY DETERMINATIONS

EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, § 121(b) of CERCLA, 42 U.S.C. § 9621, establishes several other statutory requirements and preferences. These requirements specify that when complete, the selected remedial action for each site must comply with applicable or relevant and appropriate ("ARARs") environmental standards established under federal and state environmental laws unless a statutory waiver is invoked. The selected remedy also must be cost effective and utilize treatment technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that permanently and significantly reduce the volume, toxicity or mobility of hazardous substances. The following sections discuss how the selected remedy for this Site meets these statutory requirements.

9.1 Protection of Human Health and the Environment

Ground Water

The selected interim remedy for ground water protects human health and the environment by controlling exposure to contaminated ground water associated with the Site. Ground water containment will prevent further migration of contamination from the Site to the unnamed tributary to Red Lion Creek and Red Lion Creek. Recovery of DNAPLs will reduce and/or eliminate a principal threat by removing a continuing source of contamination.

Institutional controls, which provide for the establishment of a ground water management zone and deed restrictions, will prevent future exposure to contaminated ground water and subsurface soils by prohibiting the future installation of wells in the contaminated aquifer and shall identify the areas containing subsurface contaminated soils. Air emissions produced by the treatment of ground water will either be treated in the existing plant boilers or other appropriate equipment (approved by EPA in consultation with DNREC). Any residual waste generated as a result of air treatment will be shipped off-site to a treatment or disposal facility approved by EPA. Treated ground water will be discharged to the Delaware River in accordance with the Clean Water Act and NPDES requirements. This interim remedy will be protective of human health and the environment while additional information is collected for EPA to make a final decision regarding ground water remediation in a subsequent ROD.

Soils and Sediments

The selected remedy and the contingency remedy for soils and sediments protect human health and the environment by eliminating direct contact with contaminants in the soils and sediments by treating the contaminated soils and sediments to health-based numbers. The railroad track area and Catch Basin #1 will be capped to minimize infiltration and reduce the migration of contaminated subsurface soils (greater than 15 feet in the area adjacent to Catch Basin #1). Catch Basin #1 will be physically tested on a periodic basis (not less than once a year) to ensure that it does not serve as a continuing source of contamination to the ground water.

Air emissions which might be produced by either the selected remedy or the contingency remedy will be captured by air pollution control equipment. Ecological monitoring of the Red Lion Creek will ensure that the selected remedy is protective of the environment. Through monitoring, institutional controls and treatment, this remedy will be protective of human health and the environment during and upon completion of the remedial action. It should be noted that the scope of the selected remedy was designed primarily to address the impacts associated with the spills which occurred in 1981 and 1986. As noted in Section 4.2 Final Action - Soils/Sediments, this remedy does not address any potential risk associated with the ongoing day-to-day operations at the SCD manufacturing facility.

9.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Ground Water

EPA is selecting an interim remedy for the containment and treatment of ground water; and containment and source removal of known or identified DNAPLs. As part of the interim remedy, work will be conducted to reduce the migration of the plume and data will be gathered to determine the technical practicability of remediating ground water to state and federal standards that are potentially ARARs. Since the remedy for ground water is an interim remedy, the standards for drinking water are not applicable at this time and will be evaluated in a subsequent ROD. The ground water containment system will be constructed to comply

with the ARARs listed in Table 10.

Soils and Sediments

The selected remedy and the contingency remedy shall attain all action, location, and chemical-specific applicable or relevant and appropriate requirements for the Site which are listed in Table 10. Also included in the table are criteria, advisories or guidance to be considered ("TBCs") for implementation of this remedy.

9.3 Cost Effectiveness

Ground Water and Soils/Sediments

The interim remedy component is the same for both the selected remedy and the contingency remedy. The NCP requires EPA to evaluate cost-effectiveness by first determining if the alternative satisfies the threshold criteria: protection of human health and the environment and compliance with ARARs. The effectiveness of the alternative is then determined by evaluating the following three of the five balancing criteria: long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, and short-term effectiveness. The selected remedy meets these criteria and is cost-effective because the costs are proportional to its overall effectiveness. The estimated present worth cost range for the selected remedy is \$6.6 to \$12.2 million. In the event that the selected remedy is not effective in remediating the soils and sediments to the clean-up criteria, than the contingency remedy will be implemented at a present worth cost of \$17.06 million.

The interim remedy for ground water and the selected remedy and the contingency remedy for soils and sediments are cost effective in mitigating the risks posed by the contaminants associated with the Site, they meet all other requirements of CERCLA, and afford overall effectiveness proportionate to costs.

9.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

Ground Water

The interim remedy for ground water consists of a containment system and a pump and treat system. The treatment of extracted ground water represents permanent treatment of the contaminants. Removal of subsurface DNAPLs represents a permanent solution in eliminating a potential continuing source of ground water contamination. Additional investigation and evaluation is required to determine the practicability of restoring the contaminated ground water to health-based standards which would be a permanent solution.

Soils/Sediments

EPA has determined that the selected remedy satisfies the statutory preference for treatment as a principal element and represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for remediation of the Site. This is accomplished by treating all contaminated soils and sediments to health-based numbers. Although the process of bioremediation has been utilized for decades in the field of wastewater engineering, its application to soils and sediments at hazardous waste sites is new and still undergoing intensive development. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the selected remedy provides the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost, while also considering the statutory preference for treatment as a principal element and considering state and community acceptance. The contingency remedy also fulfills the requirement of using permanent solutions and alternative treatment technologies to the maximum extent practicable.

9.5 Preference for Treatment as a Principal Element

Ground Water

The treatment of extracted ground water is a major component of the remedy. The containment of ground water and recovery of DNAPLs is an interim remedy while additional information is collected and evaluated to determine the feasibility of restoring ground water to drinking water standards.

Soils/Sediments

The selected remedy and the contingency remedy use treatment to address the threats posed by contaminants in the soils and sediments at the Site. This preference for treatment as a principal element is satisfied since treatment of chlorinated benzene compounds are the principal elements of either remedy.

10.0 Documentation of Significant Changes

The following changes have been made since the Proposed Plan was issued on April 4, 1994:

1. EPA will require that all treated soils/sediments be sampled for TCLP analysis prior to being used as backfill material to verify that the treated soils are not a characteristic hazardous waste.
2. EPA received comments during the public comment period concerning possible spills and releases of hazardous materials at the SCD Site that may not have been properly remediated or addressed. Based on this information, EPA will now require "Hot Spot" sampling and analysis as part of the selected remedy. Spill areas that were identified during the Remedial investigation will be investigated. Other areas that may be included in the "Hot Spot" analysis are other areas or units where hazardous material may have been placed or temporarily stored based on present and past operations.

**Descriptive Statistics for Chemicals of Concern in On-site Surface Soils
(mg/kg)**

ND- Not Detected

**Descriptive Statistics for Chemicals of Concern in On-site Surface Soils
(mg/kg)**

ND- Not Detected

**Descriptive Statistics for Chemicals of Concern in On-site Surface Soils
(mg/kg)**

ND- Not Detected

TABLE 4

Exposure Scenarios and Potential Exposure Routes

Current Worker

- Incidental soil ingestion
- Dermal absorption from soil
- Inhalation of airborne soil

Future Worker

- Incidental soil ingestion
- Dermal absorption from soil
- Inhalation of airborne soil
- Ingestion of groundwater

Current Hunter/Fisherman

- Incidental soil ingestion
- Dermal absorption from soil
- Inhalation of airborne soil
- Ingestion of fish
- Dermal absorption from surface water
- Dermal contact with sediment

Current Visitor

- Incidental soil ingestion
- Dermal absorption from soil
- Inhalation of airborne soil

Future Visitor

- Incidental soil ingestion
- Dermal absorption from soil
- Inhalation of airborne soil
- Ingestion of groundwater

TABLE 5					
SUMMARY OF CARCINOGENIC RISKS ¹					
EXPOSURE SCENARIOS	POTENTIAL RECEPTORS				
	Current Worker	Current Visitor	Future Worker	Future Visitor	Hunter/Fisherman
Soil Ingestion	2.13E-05	4.27E-06	2.13E-05	4.27E-06	2.54E-06
Soil Dermal Contact	1.00E-04	2.00E-05	1.00E-04	2.00E-05	1.62E-05
Soil Dust Ingestion	1.77E-07	1.77E-08	1.77E-07	1.77E-08	2.11E-08
Ground Water Ingestion	NA ²	NA	4.38E-04	4.38E-04	NA
Fish Ingestion	NA	NA	NA	NA	0.00E+00
Surface Water Dermal Contact	NA	NA	NA	NA	9.61E-06
Sediment Dermal Contact	NA	NA	NA	NA	2.19E-05
TOTAL RISK*	1.22E-04	2.43E-05	4.50E-03	4.62E-04	5.03E-05

*Risk values represent the increased likelihood of developing cancer as a result of exposure to contaminants via each scenario.
 A risk values of 1 X e-04 or 1 X 10-4 in determining the need for remediation at a site.
 1 Risk based on the upper 95% confidence limit exposure concentrations
 2 Not applicable

TABLE 6						
SUMMARY OF NON-CARCINOGENIC HAZARD INDICES ¹						
EXPOSURE SCENARIOS	POTENTIAL RECEPTORS					
	Current Worker	Current Visitor	Future Worker	Future Visitor	Hunter/Fisherman	
Soil Ingestion	0.837	0.167	0.837	0.167	0.105	2.54E-06
Soil Dermal Contact	4.44	0.888	4.44	0.888	0.768	
Soil Dust Ingestion	0.006	0.0008	0.006	0.0006	0.0007	
Ground Water Ingestion	NA ²	NA	324	32.4	NA	
Fish Ingestion	NA	NA	NA	NA	0.00005	
Surface Water Dermal Contact	NA	NA	NA	NA	0.239	
Sediment Dermal Contact	NA	NA	NA	NA	0.21	
TOTAL RISK*	5.28	1.08	329	33.4	1.32	

TABLE 8

**EPA Analytical Data
March 1990 Fish Sampling Event
Red Lion Creek**

Parameters	Units	Carp Fillet Identification	
		F-1	F-2
Methylene Chloride	ug/Kg	51	65
Acetone	ug/Kg	240	870
Carbon disulfide	ug/Kg	24	130
Benzene	ug/Kg	95	*
Toluene	ug/Kg	10	*
Chlorobenzene	ug/Kg	870	*
1,3 Dichlorobenzene	ug/Kg	660	*
1,4 Dichlorobenzene	ug/Kg	4,000	*
1,2 Dichlorobenzene	ug/Kg	3,100	*
Isophorone	ug/Kg	370	*
1,2,4 Trichlorobenzene	ug/Kg	7,100	*
Bis(2-Ethylhexyl)phthalate	ug/Kg	450	620
4,4-DDE	ug/Kg	1,700	*
Aroclor- 1,200	ug/Kg	4,700	*
Barium	ug/Kg	1.7	2.6
Calcium	ug/Kg	2,100	4,240
Copper	ug/Kg	6.6	1.8
Iron	ug/Kg	99.9	31.4
Lead	ug/Kg	7.2	1.2
Magnesium	ug/Kg	1,320	1,500
Manganese	ug/Kg	3.3	5.9
Mercury	ug/Kg	2.7	0.97
Potassium	ug/Kg	19,600	19,000
Selenium	ug/Kg	10.8	4.7
Sodium	ug/Kg	1,690	1,980
Zinc	ug/Kg	35.1	37.4

* - Analyte not detected.

Bioremediation

(B) Thermal Treatment

TABLE 10
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
AND TO BE CONSIDERED MATERIAL (TBCs)
STANDARD CHLORINE SITE

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
I. CHEMICAL SPECIFIC				
A. Water				
1. Clean Water Act	Clean Water Act, Section 303	Relevant and Appropriate	Water quality criteria set at levels to protect human health for water and fish ingestion and protection of aquatic life in streams, lakes, and rivers.	Surface water in the wetlands and the Red Lion Creek must attain these standards.
2. Health Effects Assessment		To be considered	Non-enforceable toxicity data for specific chemicals for use in public health assessments. Also "to be considered" are Carcinogenic Potency Factors and Reference Doses provided in the Superfund Public Health Evaluation Manual.	To be considered where remedial action addresses risk-based criteria or when setting clean-up standards for the protection of human health.
3. EPA Health Advisories	EPA Office of Drinking Water	To be considered	Non-enforceable toxicity data for specific chemicals for use in public health assessments. Also to be considered are Carcinogenic Potency Factors and Reference Doses provides in the Superfund Public Health Evaluation Manual.	To be considered where remedial action addresses risk-based criteria or when setting clean-up standards for the protection of human health.
4. Delaware Comprehensive Water Resources Management Committee Reports, December 13, 1983		To be considered	The reports were adopted as policy by the DNREC Secretary. Among these reports is the Groundwater Quality Management Report, July 1983, which provided Delaware with a number of tools for dealing with ground-water contamination.	To be considered for ground-water monitoring.
B. Air				
1. Clean Air Act	42 U.S.C. § 7401			
a. National Emissions Standards for Hazardous Air Pollutants	40 C.F.R Part 61	Relevant and Appropriate	Standards promulgated for air emissions from specific source categories. Not applicale but may be relevant and sites.	Relevant and appropriate for potential releases resulting from soil/sediment and ground-water
Appropriate for emissions from air strippers at Superfund treatment.				
b. State of Delaware Implementation Plans for Attainment and Maintenance of National Ambient Air Quality Standards	40 C.F.R Section 52, 420-460 Subpart I	Relevant and Appropriate	Sets forth the State's Implementation Plan for Attainment of Air Quality Standards.	Applicable for potential releases from air stripping of ground water excavation work or other remedial actions.
2. Delaware Ambient Air Quality Standards	Title 7, Delaware Code, Ch 60, Regulation 3, Section 6003	Applicable	Establishes ambient air quality standards.	Applicable for potential relese from air stripping of ground water, excavation work, or other remedial actions.

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
II. LOCATION SPECIFIC				
1. Coastal Zone Management Act of 1972; Coastal Zone Act Reauthorization Amendments of 1990	16 U.S.C., 1451 et seq. 15 C.F.R. Part 930	Applicable	Requires that Federal agencies conducting or supporting activities directly affecting the coastal zone, conduct or support those activities in a manner that is consistent with the approved appropriate State coastal zone management program. (See Delaware's Comprehensive Update and Routine Program Implementation, March 1993)	Remedial actions are required to be consistent, to the maximum extent practicable, with Delaware's coastal zone management program. EPA must notify Delaware of its determination that the actions are consistent to the maximum extent practicable.
2. The Archaeological and Historical Preservation Act of 1974	16 U.S.C. § 469	Applicable	Requirements relating to potential loss or destruction of significant scientific, historical, or archaeocological data	Further action will be taken to identify resources and, if identified, action will be taken to mitigate any adverse effects on those resources that would result from constriction. If resources happen to be identified in other areas (although no specific actions will be taken to find), action will be taken to mitigate any adverse effects ont hose resources that would result from implementation of t he remedial action.
3. Protection of Floodplains	40 C.F.R. Part 6, Appendix A	Applicable	Sets fourth EPA policy for carrying out provisions of Executive Order 11988 (Floodplain Management) which requires actions to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values.	Applicable since much of the remedial action will take place within the 100-year floodplain.
4. Protection of Wetlands	40 C.F.R. Part 6,	Applicable	Sets forth EPA policy for carrying out provisions of Executive Order 11990 (Protection of Wetlands) which requires actions to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values.	Applicable to any portion of the remedy which may affect the wetlands.
5. Delaware Coastal Zone Act, 7 Delaware Code Chapter 70; Coastal Zone Act Regulations, 6/9/93	7 Delaware Code Sections 7003, 7004	To be considered	Controls the location, extent, and type of industrial development in Delaware's coastal areas.	Will be considered for consistency since the remedial action is located in Delaware's coastal area.
6. Delaware Wetlands Regulations Revised June 29, 1894	Sections 1,2,7	Applicable	Requires activities that may adversely affect wetlands in Delaware to be permitted. Permits must be approved by the county or municipality having jurisdiction.	Any substantive requirements shall be met since wetlands may be dredged (or excavated) and restored along the unnamed tributary. Since all of the wetland remediation is considered "on-site", pursuant to Section 121 of CERCLA, no permit will be obtained.
7. Delaware Regulations Governing the Use of Subaqueous Lands, amended September 2, 1992.	Sections 1,3,4	Applicable	Requires activities that affect public or private subaqueous	Any substantive requirements shall be met since the lands in the State be permitted. remediation may involve dredging or excavating of the unnamed tributary. Since all of the wetland remediation is considered "on-site", pursuant to Section 121 of CERCAL, no permit will be obtained.
8. Delaware Executive Order 56 on Freshwater Wetlands (1988)		To be considered	General policy to minimize the adverse effects to freshwater wetlands.	To be considered for wetland remediation and restoration.
9. Governor's Roundtable Report on Freshwater Wetlands (1989)		To be considered	General policy to minimize the adverse effects to freshwater wetlands.	To be considered for wetland remediation and restoration.
10. Ground Water Protection	EPA 440/6-84-002	To be considered	Identifies ground water quality to be achieved during remedial actions based on aquifer characteristics and use.	The EPA aquifer classification will be taken into consideration during design and implementation of the treatment remedy.

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
III. ACTION SPECIFIC				
A. Miscellaneous				
1. Delaware Regulations Governing Hazardous Substance Cleanup, 1/93	Section 9	Relevant and Appropriate	Establishes clean-up criteria for hazardous waste sites.(1x10-5; Hazard Index of 1; or natural background if higher). Only criteria considered relevant and appropriate are for soils and sediment.	1. Soils and sediments will be remediated to 1X10-6. 2. Will be considered during ground water investigation.
B. Water				
1. Clean Water Act (CWA); National Pollutant Discharge Elimination System Requirements	40 C.F.R. Part 122-125	Applicable	Enforceable standards for all discharges to waters of the United States.	Discharge limits shall be met for all on-site discharges to surface water including treated ground water. If ground water treatment is provided by a means other than the existing wastewater treatment facility, only substantive requirements need by met and no permit shall be obtained.
2. State of Delaware Regulations Governing the Construction of Water Wells, January 20, 1987	Sections 3,4,5,6,7,8,9 10	Applicable	Contain requirements governing the location, design, installation, use, disinfection, modification, repair, and abandonment of all wells and associated pumping equipment.	Installation of any monitoring and recovery wells and the abandonment of wells shall meet all substantive requirements.
3. Delaware Water Quality Standards, as amended, February 26, 1993	Sections 3-6, 8-10, 11.1, 11.2, 11.3, 11.4, 11.6, 12	Applicable	Standards are established in order to regulate the discharge into state waters in order to maintain the integrity of the water.	Applicable should the ground-water treatment system involve discharge to surface water.
4. Delaware River Basin Commission (DRBC) Water Quality	DRBC Ground Water Protected Area Regulation, No. 4, 6(f) 9, 10; Water Code of the Basin, Sections 2.20-4, 2.50.2	Applicable	Regulate restoration, enhancement, and preservation of waters in the Delaware River basin.	Applicable if remedial action involves discharge of >50,000 gallons/day average over any month or a withdrawal of ground water of 100,000 gallons/day or more average over any month.
5. Delaware Regulations Governing the	Sections 1,3,5.05	Applicable	Contain information pertaining to water allocation permits and criteria for their approval.	May be applicable for the ground-water recovery system. No permit required.

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
6. State of Delaware Groundwater		To be considered	Policy for ground-water management.	To be considered in setting the ground water management zone.
7. Delaware Regulations Governing Control of Water Pollution, amended 6/23/83	Section 7,8,9,10,11,12, 13	Applicable	Contain water quality regulations for discharge int surface and ground water.	Applicable for discharge of treated ground water into surface water. Also applicable for stormwater runoff into the unnamed tributary and Red Lion Creek.
C. Air				
1. Control of Air Emissions from Air Strippers at Superfund Ground Water Sites, June 15, 1989	EPA OSWER Directive 9355.0-28	To be considered	Policy to guide the selection of controls for air strippers at groundwater sites according to the air quality status of the site's location (i.e., ozone attainment or non-attainment area).	To be considered in determining if air emissions controls are necessary for an air stripper because New Castle is in an ozone non-attainment area. Sources most in need of controls are those with emissions rates in excess of 3 lbs./hour of 15 lbs./day or a potential rate of 10 tons/year of total VOCs.
2. Delaware Regulations Governing the Control of Air Pollution	Regulations Number 2, 19,24	Applicable	Sets fourth the requirement that a permit is necessary to operate an air stripper if emissions will exceed 2.5 lbs./day. Section 2 describes general conditions. Section 19 deals with odor. Section 24 deals with volatile organic compounds.	If emissions exceed 2.5 lbs./day then the substantive requirements of the regulation must be met. In addition, the emissions from the air stripper must meet the Ambient Air Quality Standards set forth in Regulation 3 of 7 Delaware code, Chapter 60, Section 6003.
D. Sediments/ Solids				
1. Delaware Sediment and Stormwater Regulations January 23, 1991	Section 3,6,9,10,11,15	Applicable	Establishes a statewide sediment and stormwater management program.	A stormwater and sediment management plan consistent with Delaware requirements must be approved by Delaware before construction disturbing over 5,000 square feet of land can begin.
E. Waste Handling and Disposal				
1. Delaware Regulations Governing Solid Waste	Sections 2,5,6	Relevant and Appropriate	Establishes regulations to implmeent an improved solid waste management program.	May be relevant and appropriate for the residual waste generated from the treatment of ground water, soils, and sediments.

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
2. Delaware Regulations Governing Hazardous Waste	SEE BELOW E.4, E.5, E.6, E.7, E.8, E.9, E.10, E.11, E.13.	SEE BELOW	Delaware Regulations Governing Hazardous Waste Part 261 define "hazardous waste". The regulations listed below apply to the handling of such hazardous waste.	SEE BELOW
3. Resource Conservation and Recovery Act of 1976; Hazardous and Solid Waste Amendments of 1984	SEE BELOW E.4, E.5, E.6, E.7, E.8, E.9, E.10, E.11, E.12, E.13, E.14, E.15E, E.16 Federal RCRA regulations would not apply for those regulations which Delaware has the authority from EPA to administer.	SEE BELOW	Regulations the management of hazardous waste, to ensure the safe disposal of wastes, and to provide resource recovery from the environment by controlling hazardous wastes "from cradle to grave."	SEE BELOW
4. Standards Applicable to Generators of Hazardous Waste	Delaware Regulations Governing Hazardous Waste, (DRGHW) Part 262.10-58 EPA Regulations, 40 C.F.R part 262.10-58	Applicable	Establishes standards for generators of hazardous wastes including waste determination manifests and pre-transport requirements.	Applicable to the wastewater treatment plant and residual waste generated by the treatment of soils & sediments if the waste generated by the treatment system(s) is a RCRA-hazardous waste.
5. RCRA Requirements for Use and Management of Containers	DRGHW Part 264.170-178 EPA Regulations, 40 C.F.R Part 264.170-178	Applicable	Requirements for storage of hazardous waste in storage containers.	Applicable for temporary storage containers and on-site site treatment systems.
6. RCRA Requirements for Tanks Systems	DRGHW Part 264.190-199 EPA Regulations, 40 C.F.R Part 264.190-199	Applicable	Requirements for storage or treatment of hazardous waste in tank systems.	Only applicable for onsite treatment systems and temporary storage tanks containing hazardous waste.

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
7. Standards for owners and operators of facilities that store or treat hazardous waste in surface impoundments	DRGHW Part 264.220-231 EPA Regulations 40 C.F.R Subpart K 264.220-231	Applicable	Requirements for storage or treatment of hazardous waste in surface impoundments.	§264.228 is applicable to the existing surface impoundment. §264.220-231 are applicable to any soils and sediments which are excavated and store in a surface impoundment prior to or during treatment.
8. Standard for owners and operators of facilities that store or treat hazardous waste in waste piles	DRGHW Part 264.250-258 EPA Regulations, 40 C.F.R Subpart L	Applicable	Requirements for storage or treatment or hazardous waste in waste piles 264.250-258	§264.258 is applicable to the existing soil piles. §264.250-258 are applicable to any soils and sediments which are excavated and stored in waste piles prior to, or during treatment.
9. Standards for owners of operators of facilities that treat or dispose of hazardous waste in land treatment units	DRGHW Part 264.270-283 EPA Regulations, 40 C.F.R Subpart – 264.270-283	Applicable	Requirements for storage or treatment of hazardous waste in land treatment units	Applicable to Existing bioremediation if a land treatment unit is selected for the bioremediation technology.
10. Standards for owners or operators of facilities that treat or dispose of hazardous waste in incinerators	DRGHW Part 264.340-351 EPA Regulations, 40 C.F.R Subpart O 264.340-351	Applicable	Requirements for storage or treatment of hazardous waste in incinerators	Applicable to low temperature thermal desorption of soils and sediments.
11. Standards for owners or operators of facilities that treat or dispose of hazardous waste in miscellaneous units	DRGHW Part 264.600-603 EPA Regulations, 40 C.F.R Subpart X 264.600-603	Applicable	Requirements for storage or treatment of hazardous waste in miscellaneous units	Applicable to low temperature thermal desorption of soils and sediments.
12. Standard for owners or operators of facilities that treat or dispose of hazardous waste.	EPA Regulations C.F.R Subpart AA 264.1030-1037	Applicable	Applies to process vents associated with air stripping operations that manage hazardous wastes.	Applies to treatment of ground water in an air stripper.

ARAR or TBC	Legal Citation	ARAR Class	Requirement Synopsis	Applicability to Selected Remedy
13. The Hazardous Waste Permit Program	DRGHW Part 122	Applicable	Requires a permit for the treatment, storage, or disposal or any hazardous waste as identified or listed in Part 261.	Any Substantive requirements will be met. But no permit will be required for on-site activities.
	EPA Regulations, 40 C.F.R Part 270			
14. Identification and Listing of Hazardous Wastes	DRGHW Part 261	Applicable	Identifies solid wastes which are regulated as hazardous wastes.	Use to determine which materials must be managed as a hazardous waste.
	EPA Regulations, 40 C.F.R Part 261			
15. Standards Applicable to transporters of hazardous waste	DRGHW Part 263	Applicable	Establishes standards for transportation of hazardous waste.	Applicable to residual waste generated by the treatment of soils and sediments and recovered DNAPL.
	EPA Regulations 40,			
	EPA Regulations 40, C.F.R Part 263.10-31			
16. RCRA Land Disposal Restrictions	DRGHW Part 268	Applicable	Restrictions on land disposal of hazardous wastes.	Applicable for off-site land disposal of hazardous waste generated from the treatment of groundwater, soils and sediments.
	EPA Regulations,40 C.F.R Part 268			

RESPONSIVENESS SUMMARY

STANDARD CHLORINE OF DELAWARE, INC. DELAWARE CITY, NEW CASTLE COUNTY DELAWARE

The Responsiveness Summary documents public concerns and comments expressed during the public comment period. The summary also provides EPA's response to those comments. The information is organized as follows:

- I Overview
- II. Background on Community Involvement
- III. Summary of Comments and EPA Responses from:
 - (1) The Public Meeting
 - (2) Citizens
 - (3) Potentially Responsible Parties (PRPs)
 - Air Products
 - Occidental
 - Standard Chlorine of Delaware
 - (4) Natural Resource Trustees
 - National Oceanic and Atmospheric Administration
 - Fish and Wildlife Service

I. OVERVIEW

A public comment period was held from April 4, 1994 through May 4, 1994 to receive comments from the public on the Remedial Investigation/Feasibility Study (RI/FS) Reports, the Proposed Remedial Action Plan (PRAP), and EPA's preferred alternative for the Standard Chlorine of Delaware Superfund Site. The public comment period for written and oral comments on these documents was extended to June 6, 1994 due to a timely request from Standard Chlorine. In a letter dated May 31, 1994 Standard Chlorine of Delaware requested additional information from EPA as well as an extension of time to provide comment on the PRAP. EPA had no written documentation to respond to this additional request and in turn EPA granted Standard Chlorine an extension to June 8, 1994 to submit comments.

To facilitate commenting, EPA held a public meeting on April 27, 1994 in Carpenters Union Hall, 626 Wilmington Road, New Castle, Delaware at 7:00 P.M. At the meeting, EPA discussed the Remedial Investigation (RI), including the Risk Assessment (RA), and the Feasibility Study (FS) Reports which were developed for the Site. EPA also presented the Proposed Plan for eliminating and/or mitigating the public health and environmental threats posed by the contamination detected in environmental media at the

At this meeting, EPA explained that the preferred alternative consisted of two components: one for ground water and the other for soils and sediments. The preferred alternative for ground water is an interim remedy to contain ground water with a physical barrier, such as a trench or slurry wall, to prevent it from migrating to the Red Lion Creek. The preferred alternative for soils and sediments is a final remedy which consists of treating this contaminated media, either in situ or ex situ with bioremediation technology. If bioremediation is unsuccessful in treating the soils and sediments to the clean-up criteria, then the soils and sediments would be excavated and treated with low temperature thermal desorption.

The April 27, 1994 public meeting also provided the opportunity for the public to ask questions and express opinions and concerns. The comments and questions received at the public meeting, along with EPA responses, are summarized in Section III of this document.

II. BACKGROUND ON COMMUNITY INVOLVEMENT

Community involvement at the site has been moderate throughout the Superfund process. Interest has focused primarily on issues of groundwater contamination and the safety of consuming fish from Red Lion Creek. EPA initiated several community involvement activities to obtain public input on remedial activities at the Site. These activities included:

- Development of a mailing list, which included the addresses of residents who live within a ½ mile radius of the site.
- Opening the public comment period for the Proposed Remedial Action Plan, April 4, 1994 to June 8, 1994.
- Distribution a fact sheet which summarized EPA's Proposed Remedial Action Plan.
- Hosting a public meeting on the Proposed Remedial Action Plan on April 27, 1994.

The public comment period was announced in the April 4, 1994 edition of the Wilmington News Journal and the April 7, 1994 edition of the New Castle Weekly. Following the announcements, EPA mailed approximately 3000 copies of the fact sheet to residents in the area which summarized the six alternatives that addressed the long-term clean-up of the Site.

III. SUMMARY OF COMMENTS AND EPA'S RESPONSES

1. PUBLIC MEETING

Approximately 30 people attended the public meeting, including residents, representatives from EPA, the State, and industry. The meeting lasted two and one-half hours. As discussed in Section I of this document, EPA presented an overview of the Site, including a history of releases, findings of the studies conducted to date, and the alternatives evaluated for remediation, including EPA's preferred alternative.

Several residents asked questions for clarification of EPA's presentation. These questions were answered at the meeting. There were other questions and comments relating to health effects posed by the Site, the quality of fish in the Red Lion Creek and Delaware River, worker and residential exposure to releases at the Site, and specific comments on EPA's recommended alternative. These questions and comments are summarized later in this Responsiveness Summary.

The primary concerns voiced by the citizens involve the following:

- The impact of the ground water contamination and the proposed remedy on residential wells;
- The quality of fish in Red Lion Creek and the Delaware River and the need for proper posting of signs to inform the public;
- Impact of dredging sediments on aquatic life in Red Lion Creek and the Delaware River;
- Overall industrial practices of Standard Chlorine resulting in spills, worker exposure, and air releases impacting the community;
- The inability of bioremediation to treat the soils/sediments to the clean-up criteria, the long-term impact of bioremediation, and the time frame for remediation.

A copy of the public meeting transcript and letters forwarded by citizens are located in the Administrative Record. questions and comments presented at the April 27, 1994 meeting are summarized briefly in this section and are grouped according to subject. The EPA response follows each of the questions or comments presented.

1.1 Comment

Two residents at the public meeting were concerned that the contaminated ground water at the SCD Site could migrate off-site and contaminate private drinking wells. One resident identified the location of her well in relationship to the Site.

EPA Response

EPA explained that the Remedial investigation demonstrated that the contamination of ground water is limited to the Columbia aquifer. Typically, domestic or private wells in this area are located in the Columbia aquifer. The water in the Columbia aquifer at the SCD Site flows underneath the Standard Chlorine Site to the Red Lion Creek. The private wells identified at the meeting are not in the pathway of ground water flow from the Site and therefore should not be impacted by any ground water contamination at the Site.

EPA explained that although it is unlikely that the SCD Site is impacting any private wells, there may be other sources of contamination that could impact private wells. EPA recommended that residents with concerns about the quality of their water from private wells have their wells sampled and analyzed on a periodic basis.

1.2 Comment

A few residents were concerned that the recommended remedial alternative for ground water would lower the water table and possibly dry up or deplete ground water necessary for the private wells.

EPA's Response

EPA explained that the existing pump and treat system at the Site would be maintained and would not impact private wells. The existing pump and treat system was originally designed to prevent ground water from entering the Red Lion Creek. The pumping rate and capacity of the existing pump and treat system is too low and too far removed from residential wells to dry up or deplete ground water from private wells. The physical barrier that was proposed as the interim remedy for ground water would contain ground water and would minimize any ground water discharge into Red Lion Creek, but would not impact any private wells.

1.3 Comment

A few residents asked if it was safe to eat fish from Red Lion Creek or the Delaware River in the area where Red Lion Creek discharges into the Delaware River. One resident asked what the impact of dredging of Red Lion Creek or the Delaware River would have on the quality of fish.

EPA's Response

EPA explained that currently there is a health advisory in effect warning the public not to consume fish from Red Lion Creek. Samples of fish from the Delaware River were not collected as part of the investigation at the Site. While there is the possibility that contamination from the Standard Chlorine Site has migrated to the Delaware River, the level of contamination would be lower than it is at the Site. It is worth noting however, that there are many other sources of contamination contributing to the contamination of water, sediments, and fish in the Delaware River including industrial discharges and storm water run-off. While the Standard Chlorine Site may be contributing somewhat to the contamination in the Delaware there are also other sources of contamination that may pose a risk or make the fish unsafe to eat.

The remedy for the sediments in the wetland area may entail excavation or dredging. Dredging of the sediments in the wetland area will result in a temporary loss of habitat for aquatic life, but the overall long-term impact will be beneficial for the aquatic life along the unnamed tributary to Red Lion Creek and the Red Lion Creek itself by removing the source of contamination. Controls will be required during the dredging operations to minimize the release of particulate matter into Red Lion Creek. EPA is not requiring dredging of the Delaware River as part of this Superfund Remedial Action.

1.4 Comment

A few residents requested that signs be posted along Red Lion Creek warning the public not to consume fish from Red Lion Creek.

EPA's Response

The State of Delaware determines the necessity of issuing fish consumption health advisories through a formalized multi-department review process. A health advisory may be publicized in any of the following ways: legal notice in a newspaper of statewide circulation and at least one local newspaper, a press release, posting of signs by the Department of Health and Social Services (DHSS) in the waters from which the fish are limited for consumption, publication in the annual Delaware Fishing Guide, or other publications that may reach the angling public. The purchase of an annual fishing license by freshwater

fisherman is required by the State of Delaware. A copy of the annual Delaware Fishing Guide, containing the list of fish consumption advisories, is given to each license purchaser.

The State of Delaware has publicized the advisory for Red Lion Creek in a number of ways and intends to continue to publicize the advisory for as long as it is in effect. Sign posting in the common fishing area in Red Lion Creek has been done in the past and will continue in the future.

1.5 Comment

A few residents asked who would pay for the clean-up and who would conduct the clean-up. One resident implored that EPA reconsider having Standard Chlorine take part in the clean-up.

EPA's Response

EPA stated it would take appropriate steps to ensure that the responsible parties would pay for the clean-up. If Standard Chlorine or any of the other Potentially Responsible Parties (PRPs) agree to perform the clean-up, they would retain an established environmental consultant who would actually implement the remedy under EPA's oversight. It is cost effective for government and industry to have the responsible party(s) conduct the remedial design and remedial action at a Superfund Site. All work conducted by the consultant would be reviewed by EPA's technical staff, an oversight contractor, and the State. EPA is confident that if Standard Chlorine or any of the other PRPs were to implement the selected remedy, sufficient controls would be in place to ensure that the activities were conducted in accordance with EPA's Record of Decision and other appropriate guidance on remedial actions.

1.6 Comment

A Standard Chlorine employee read a statement at the meeting. In summary, the employee expressed concerns that Standard Chlorine continues to release contaminants into the environment without notifying appropriate authorities. The employee is also concerned that workers as well as residents are exposed to these chemicals. The employee requested that EPA conduct a detailed inspection for leaking pipes and tanks.

EPA's Response

In response to this comment, EPA has incorporated a significant change in the ROD from the Proposed Plan which was issued on April 4, 1994. The ROD contains a provision for area-wide sampling and analysis of site soils to determine if concentrated areas of contamination (not spots) which require remediation exist. If the results of the hot spot sampling and analysis suggest that additional areas beyond those currently identified in the ROD contain contamination above the specified clean-up criteria, there are a variety of federal enforcement authorities which EPA might utilize to ensure that these areas are properly addressed.

Following the public meeting, EPA contacted the Occupational Health and Safety Administration (OSHA) to arrange for an inspection. EPA was informed that an OSHA inspection had been conducted on March 8, 1994. At that time, OSHA found no violation of its standards.

In January, 1995, Standard Chlorine participated in a voluntary EPA chemical safety audit for the purpose of identifying methods, procedures, etc. to minimize releases from pipes, tanks, and associated equipment. In addition to the hazardous waste regulations, Standard Chlorine is subject to water and air regulations which may entail periodic physical inspections and record keeping review.

1.7 Comment

A few residents raised questions on the recommendation of using bioremediation at the Site and requested information that documents the effectiveness of bioremediation on soils contaminated with chlorinated benzene compounds.

EPA's Response

Bioremediation, the process by which hazardous substances are degraded by microorganisms, is an innovative technology which has been selected, and is being considered, at many Superfund sites around the country. An EPA Engineering Bulletin entitled "In Situ Biodegradation Treatment" contains a table that lists sites around the country where in situ bioremediation is either in the process or planning stages. A copy of this document can be found in the Administrative Record.

Various laboratory studies using different microorganisms, demonstrated that 1,4-dichlorobenzene is amenable to biodegradation. Copies of the articles which discuss these studies and were published in

professional journals are found in the Administrative Record.

1.8 Comment

One resident objected to capping of any areas and requested that EPA consider excavating all contaminated soils and sediments for off-site disposal.

EPA's Response

The selected remedy entails capping of the railroad track area if in situ bioremediation is unsuccessful in remediating the contaminated soils. EPA recognizes that Standard Chlorine is an operating facility and that the railroad line is vital to the production process, and in turn will not require the excavation of soils in this area when there is another alternative that is protective of human health and the environment.

The area around Catch Basin #1 will also be capped after soils to a depth of 15 feet are excavated for treatment. The subsurface soils in this area contain elevated levels of chlorinated benzene compounds which will migrate downward over time and eventually be captured by the physical barrier for containing ground water and DNAPL. Capping of this area is appropriate for the nature and location of the contamination.

The remainder of the soils and sediments that are contaminated above the specified on-site or off-site clean-up criteria will be treated using either in-situ/ex-situ bioremediation or low temperature thermal desorption. The selected remedy is protective of human health and the environment and is cost effective. While it is true that excavation and off-site disposal of the contaminated soils and sediments could also be implemented in a manner which would be protective of human health and the environment, it would also be much more costly to implement. Thus, EPA believes that the selected remedy provides the best balance among the alternatives available for this site.

1.9 Comment

A resident asked how long it would take to remediate the Site.

EPA's Response

EPA explained that there were several legal steps required prior to having the remedy actually implemented. EPA would first attempt to negotiate a Consent Decree with the PRPS to perform the work at the Site. The Consent Decree would provide the mechanism under which the PRPs would be required to complete this work on an enforceable schedule.

Assuming a Consent Decree is successfully negotiated, the PRPs would prepare a work plan for EPA's approval. The work plan would provide the details on implementing the work delineated in the Record of Decision.

The selected remedy calls for treatability studies to be conducted to determine if bioremediation can successfully treat the contaminated soils and sediments. The treatability studies will also help identify the length of time required for bioremediation to achieve the clean-up levels. If as a result of these studies it is determined that bioremediation will not be successful, the design of the Low Temperature Thermal Desorption Process will begin.

In view of the uncertainties associated with the length of time required for various steps in the process, the various options which may be implemented, and the time required for bioremediation to achieve the clean-up levels, it is difficult to predict with any certainty when the bioremediation process will be completed.

1.10 Comment

A resident asked that the entire area where the soils and sediments are contaminated be fenced or posted to warn hunters and fishermen.

Response

EPA agrees that this area should be posted with warnings to alert hunters and fishermen. The Record of Decision requires posting of this area until the remedial action is complete. It should be noted, however, that persons who are hunting in the site area are trespassing on private property.

2. CITIZENS

EPA received two letters from citizens concerning the Proposed Plan.

2.1 Comment

In one letter, a citizen was concerned about the impact of the contaminated ground water on a domestic well.

EPA's Response

EPA called the citizen and determined the location of the domestic well to be upgradient and out of range of the ground water contamination at the Site. See EPA's response to Comment

2.2 Comment

The other letter agreed with EPA's recommended alternative along with a statement that EPA should require Standard Chlorine to pay for the remedial action.

EPA's Response

See response to Comment 1.5.

3. POTENTIALLY RESPONSIBLE PARTIES (PRPs)

Air Products

EPA received written comments from Air Products and Chemicals, Inc. which is located immediately adjacent to the Standard Chlorine property.

3.1 Comment

Air Products expressed concern that the RI Reports suggested what ground water underneath the property owned by Air Products may be contaminated. "Air Products would like (i) a resampling of the two wells on its property to determine what changes, if any, have occurred since 1990; and (ii) a further investigation of the ground water plume to determine its extent under Air Products' property."

EPA's Response

As noted in the Proposed Plan and the Record of Decision, the decision for remediating the ground water is an interim remedy. EPA agrees that additional investigation is required to determine the extent of ground water contamination. As part of the additional investigation, EPA will require that the two wells on Air Products property be sampled and analyzed.

3.2 Comment

Air Products requested "the opportunity to participate in any decisions regarding the placement of additional monitoring wells and the design of the ground water remediation plan that may affect the extent of the contaminant plume under Air Products' property or the length of time that plume may exist."

EPA's Response

Air Products will have access to the information generated during the additional investigation to determine the extent of the ground water contamination via the Administrative Record which will be placed in the Site Repository. Air Products will also have the opportunity to comment on any recommended alternatives for the final ground water remediation remedy during the public comment period for the Proposed Plan.

If the selected final remedy for the Site involves the installation of wells or other structures on Air Products property, EPA will also make the information developed during remedial design available for Air Products review and comment.

Occidental Chemical Corporation

EPA received written comments from Occidental Chemical Corporation which is the landowner immediately east and north of the Standard Chlorine property east and west of Route 9.

3.3 Comment

Occidental states that it is under a Consent Order with EPA to conduct an investigation that includes the pipeline and Red Lion Creek east of Route 9. The analytical results of the Standard Chlorine RI showed the presence of chlorobenzenes in the ground water, adjacent to the pipeline, and west of route 9. Occidental states that Standard Chlorine should be responsible for addressing contamination which originates from and is contiguous with the Standard Chlorine Site.

Response

EPA will require that an interim action at the Standard Chlorine Site be implemented, while additional information is collected and evaluated to make a decision in a final ROD for the ground water. If the results of the ground water investigation demonstrate a need for ground water remediation in the vicinity of the pipeline (both the east and west side of route 9), EPA would use it's legal authorities to have the work conducted by the PRPs.

Standard Chlorine of Delaware, Inc.

Standard Chlorine had comments on the RI/FS as well as the PRAP. Detailed comments were provided on behalf of Standard Chlorine by BCM Engineers and Lowenstein, Sandler, et.al. The comments are divided into the following categories:

Human Health Risk Assessment

Ecological Risk Assessment

Clean-up Criteria

EPA's Recommended Alternative

Ground Water
Soils/Sediments

Comparative Analysis of Alternative 3

SCD's Proposed Plan

Alternative 3 and Compliance with ARARs

Questions and EPA's responses to the questions and comments in each of these categories are summarized below:

HUMAN HEALTH RISK ASSESSMENT

3.4 Comment

Standard Chlorine stated that ingestion of ground water should not be considered in evaluating human health risk. Institutional controls such as prohibition of drinking water wells and deed restrictions will insure that ingestion of ground water is not a pathway of future exposure of contaminants.

EPA's Response

The Preamble to the NCP (F.R. Vol 55, No.46 page 8711, March 8, 1990) states that "The effectiveness of the institutional controls in controlling risk may appropriately be considered in evaluating the effectiveness of a particular remedial alternative, but not as part of a baseline risk assessment."

Since it is the Superfund program's goal to return usable ground waters to their beneficial uses wherever practicable, it is appropriate that ingestion of ground water be considered in evaluating human health risk under a future-use scenario.

3.5 Comment

Standard Chlorine stated that the clean-up goal of soils should be amended to reflect risk without dermal contact because EPA guidance (EPA/600/8-91/011B) states that dermal contact with soils should not be quantified due to the many uncertainties associated with dermal contact. Standard Chlorine also states that "assuming an acceptable risk of 1×10^{-5} , a clean-up goal is required only for 1,4-dichlorobenzene at a goal of 2,400 mg/kg."

EPA's Response

In a meeting with Standard Chlorine on April 27, 1992, and in follow-up telephone conversations with consultants representing Standard Chlorine, EPA stated that the Agency's most recent guidance at the time recommended that dermal contact with soils not be quantified. Despite EPA bringing this matter to the attention of Standard Chlorine, the revised Risk Assessment prepared by consultants for Standard Chlorine, included calculations for the dermal pathway.

Standard Chlorine assumed an acceptable risk of 1×10^{-5} and proposed clean-up criteria of 625 mg/kg of total COCs with a ceiling of 450 mg/kg for 1,4-dichlorobenzene. This number was calculated assuming dermal exposure. Traditionally, EPA Region III uses 1×10^{-6} as a point of departure in determining acceptable risks. In turn, EPA conducted a rough calculation of the risk eliminating the dermal pathway and determined that 625 mg/kg of total COCs was within the 1×10^{-6} risk range.

Although Standard Chlorine states that a clean-up goal for 1,4-dichlorobenzene should only be 2,400 mg/kg at a 1×10^{-5} risk, no supporting calculations were provided. Assuming that these calculations are correct, EPA would require remediation to an acceptable risk of 1×10^{-6} which would be a clean-up level of 240 mg/kg for 1,4-dichlorobenzene. EPA approved the Remedial Investigation Reports which included the Baseline Risk Assessment and is confident in the calculations used to develop the clean-up criteria for on-site soils. EPA maintains that 625 mg/kg of total COCs with a ceiling of 450 mg/kg for 1,4-dichlorobenzene is protective of workers at the Site.

ECOLOGICAL ASSESSMENT

Standard Chlorine states that a review of the ecological studies conducted during the RI identified deficiencies in the data and confounding factors which must be addressed to establish ecological risk. Each issue is discussed separately.

3.6 Comment

Standard Chlorine states that confounding factors (dry substrate that may have impacted the mortality of the earthworm) may have affected the results of the earthworm bioassay making the findings unreliable. Even if the confounding factor (the dry substrate) "did not affect the results of the bioassay, the difference between the NOEL (33 mg/kg) and the LOEL (486 mg/kg) is too great (453 mg/kg) to define a clean-up goal." Standard Chlorine further states a clean-up goal of 33 mg/kg is too conservative and additional bioassays are necessary.

EPA's Response

EPA agrees that confounding factors may have had an impact on the results of the earthworm bioassay tests. However, the off-site clean-up level was not arrived at solely on the basis of these tests. While Standard Chlorine has suggested that the clean-up levels of 33 mg/kg is too conservative, literature searches suggest that a clean-up level of 33 may be too high to be protective of all ecological resources. EPA also agrees that additional bioassay tests are necessary and will be required as part of the ecological monitoring plan.

Conducting ecological assessments at hazardous waste sites is a new and developing area of investigation and there are inherent difficulties associated with interpreting the data obtained from an ecological assessment. Based upon the information available at this time, EPA maintains that the clean-up criterion of 33 mg/kg for off-site soils and sediments, in conjunction with an ecological monitoring plan, is protective of human health and the environment.

Due, in part, to the inherent difficulties associated with obtaining precise results from any ecological assessment, EPA is requiring an ecological monitoring plan to monitor the effectiveness of the selected remedy. If new information becomes available during or after the Remedial Design/Remedial Action that demonstrates that the off-site clean-up criterion is not protective, EPA, in consultation with DNREC and other support agencies, may require additional remediation.

3.7 Comment

Standard Chlorine states that the results of the bioassays do not suggest a dosage response relationship between the chemicals of concern and germination of lettuce seeds. The bioassays for lettuce seed lacked sufficient data to determine if the results were due to levels of contaminants in the soil or physical characteristics of the soil (e.g. nutrient availability, etc.).

EPA'S Response

Contrary to SCD's view, the lettuce seed test showed reliable results. The lettuce seed test was a valid test in that it was successful in identifying a NOEL (2.2 mg/kg; 77% survival) and a LOEL (32.8 mg/kg; 38% survival). All concentrations above 32.8 mg/kg had less than 38% survival. Whether or not there was a dosage response relationship for all concentrations above the LOEL is irrelevant to the validity of the test.

Although physical characteristics of the soil were not measured, the effects of site-specific soils on the germination of lettuce seeds were evaluated. The findings from this test in conjunction with other testing, literature searches and input by federal and state biologists and scientists were used to develop the clean-up criterion for off-site soils and sediments.

Based on the information available at this time, EPA maintains that the clean-up criterion of 33 mg/kg for off-site soils and sediments, in conjunction with an ecological monitoring plan, is protective of human health and the environment.

3.8 Comment

Standard Chlorine disagrees with a comment from the National Oceanic and Atmospheric Administration (NOAA) on the PRAP about the bioassay for *Hyallolella azteca*. Specifically, NOAA stated that the bioassay for *Hyallolella azteca* indicated a statistically significant decrease in percent survival at 1.7 mg/kg, whereas Standard Chlorine states that the RI did not report this decrease in percent survival at a concentration of 1.7 mg/kg (See Comment 4.4).

EPA's Response

The bioassay data that NOAA referenced was in Appendix K of the RI report. The consultants who prepared the RI stated that they did not use this bioassay data, instead relying on the bioassays conducted in Appendix J. The reported reason for not using bioassay data from Appendix K was that chronic level effects could not be determined as a result of test concentrations used. NOAA states it does not know how the RI intended to use these data, or exactly why they were disregarded. NOAA's evaluation of the bioassay results in Appendix K indicated a statistically significant reduction of survival (variance testing with Dunnett's procedure) in samples SDT-4 and SDT-6 as compared to controls. The RI reported that these sediment samples contained total chlorinated benzenes at concentrations of 109 mg/kg in SDT-4 and 1.7 mg/kg in SDT-6. Therefore, NOAA concludes that these data suggest that detrimental effects to *Hyallolella azteca* could occur at concentrations as low as 1.7 mg/kg.

CLEAN-UP CRITERIA

3.9 Comment

Standard Chlorine states that the clean-up criterion of 33 mg/kg for off-site soils and sediments represents the worst case effects identified in the RI Reports and fails to account for uncertainties, suitability to habitat, and other confounding factors. Standard Chlorine further states that "application of the worst case effect to all habitats is inappropriate and overly conservative." To support its comments, Standard Chlorine provided the following data:

Lettuce seed germination test results

Lowest Observable Effects Level (LOEL)	33 mg/kg
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Earthworm toxicity test results

Lowest Observable Effects Level (LOEL)	486 mg/kg
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Hyallolella azteca sediment toxicity test results

No Observable Effects Level (NOEL)	136 mg/kg
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EPA's Response

There is no single universally accepted and standardized "cook book" approach to addressing sediment quality and clean-up criteria. EPA used the results of the Ecological Assessment as identified in the RI report to develop the clean-up criterion for off-site soils and sediments. In addition, EPA and NOAA conducted a literature search to substantiate the RI findings. The results of the sediment toxicity tests, the earthworm toxicity tests and the lettuce seed germination tests were evaluated and used to develop the off-site clean-up criterion of 33 mg/kg. Biologists and scientists from EPA, DNREC, the Fish and Wildlife Services (F&WS) and the National Oceanic and Atmospheric Administration (NOAA) reviewed and commented on the data reported in the Ecological Assessment.

[Standard Chlorine stated in their comments that the NOEL for Hyallela azteca was identified at 136 mg/kg. EPA was unable to substantiate this statement. Page 6-209 of the RI report states the no-observable-adverse-effect-level (NOEL) was determined to be 68 mg/kg for the Hyallela azteca.]

EPA disagrees with the NOEL for the Hyallela azteca as stated in Standard Chlorine's comment. Page 6-209 of the RI report states that the NOEL for the Hyallela azteca is 68 mg/kg. Comparison of NOEL for each of the tests results is as follows:

Lettuce seed germination test results

No Observable Adverse Effects Level (NOEL)	2 mg/kg
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Earthworm toxicity test results

No Observable Adverse Effects Level , [NOEL)	33 mg/kg
--	----------

Hyallela azteca sediment toxicity test results

No Observable Effects Level (NOEL)	68 mg/kg ²
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As Standard Chlorine states, there are uncertainties associated with each of the tests, but even with these uncertainties, the NOEL levels are very close in range. The clean-up criterion of 33 mg/kg does not represent a worse case scenario, but rather a mid-range value that is not overly conservative.

The species typically used in bioassay tests are selected due to their hardiness and their ability to tolerate hostile living conditions. The Hyallela azteca is a hardy species and therefore the findings of the sediment bioassays do not take into consideration the impact of the contamination on a sensitive species that could be an ecological receptor at this Site.

EPA's literature search has revealed that background value established by Canada for chlorobenzenes is 100 ug/kg which is substantially lower than the clean-up criterion of 33 mg/kg. Another study revealed that terrestrial fauna can be adversely affected by levels of chlorobenzene as low as 144 ug/kg. EPA recognizes that the literature search does not carry as much weight as the site specific data in developing clean-up criteria, but should be considered in conjunction with site specific data to develop clean-up criteria.

Therefore, EPA does not agree that the soil/sediment clean-up criterion is too low. In fact, the literature search suggests that the number may be too high. EPA has determined that a clean-up criterion of 33 mg/kg of total COCs in conjunction with an Ecological Monitoring Plan will be protective of the environment at this Site.

[2 As stated under comment 3.8, information contained in Appendix K of the RI report shows the lower survival rate for Hyallela azteca at sampling locations with concentrations as low as 1.7 mg/kg. Page 6-209 of the RI report states that the results of the toxicity tests presented in Appendix K were not discussed in the RI report because chronic level effects could not be determined as a result of the test concentrations.]

3.10 Comment

Standard Chlorine recommended that additional studies be conducted that are designed to reduce or eliminate confounding factors and establish habitat specific clean-up goals.

EPA's Response

EPA agrees that additional testing should be conducted, however, we believe that the testing should be designed to confirm that the remedial activities have successfully protected the ecosystem of the Site as opposed to developing new clean-up criteria. As stated in responses to Comments 3.9, 3.12, and 3.13, the clean-up level of 33 mg/kg is based on several studies and EPA believes it is an appropriate value to be used as the off-site clean-up criterion. EPA's Region III is always open to review sound scientific data and in turn, Standard Chlorine may independently gather additional information or conduct additional studies for EPA's review.

3.11 Comment

Standard Chlorine stated that the proposed clean-up level of 33 mg/kg appears to impact only the germination of lettuce. The off-site areas proposed for clean-up include areas (drainage swale, soil piles, and wetlands) that would not support herbaceous upland vegetation because of heavy flows due to intense precipitation events. Standard Chlorine stated that the use of germination success for lettuce, an upland species, for sediments in wetlands which may be saline (estuarine) is not ecologically

appropriate.

EPA's Response

EPA's recommendation of the clean-up criterion of the drainage swale, soil piles, and wetlands is predicated upon two views; 1) it is both an indirect source of contamination to downgradient receptors and is a pathway for movement of upgradient sources; and 2) it possesses habitat potential in and of itself and thus contamination located there poses a potential for risk to any ecological receptors that may live there. EPA does not agree that heavy flows due to precipitation events in the drainage swale will present a long-lasting obstacle to eventual colonization by flora and fauna. The swale has the ability to support vegetation and therefore the results of the lettuce seed germination are appropriately applied to this area.

Prior to the 1986 spill, the soils in the soil piles did provide a habitat for species in the area. Remediation of these soils will convert the material from waste to soil and in turn the soils can be used to support flora and fauna.

EPA agrees that the germination success for lettuce may not be an appropriate test for developing clean-up criterion for the wetlands. The results of bioassays of the *Hyallela azteca* would be more appropriate in developing clean-up criterion for the wetland area. Although the RI reported the results of the bioassay for *Hyallela azteca* as having a NOEL of 68 mg/kg, the data in Appendix K of the RI report suggested detrimental effects at concentrations as low as 1.7 mg/kg (See response to comment 3.8). EPA believes that bioassays of the *Hyallela azteca* are appropriate in developing clean-up criteria for wetlands.

Based on the data in the RI, along with information obtained as part of a literature search, EPA has determined that a clean-up criterion of low of 33 mg/kg of total COCs, for both the off-site soils and sediments, in conjunction with an Ecological Monitoring Plan will be protective of the environment at this Site.

3.12 Comment

Standard Chlorine stated that detailed studies of the biological communities utilizing the sediments of the tributary are necessary to determine the ecological resources that have been impacted by the 1986 spill or will be disrupted and destroyed if the sediments are excavated under Alternative 4B.

EPA's Response

The ecological studies conducted as part of the RI were typical of most Superfund Ecological Assessments. EPA does not typically require a level of study that would offer full survey data for all habitats found within the area of impact.

After the public comment period closed, SCD submitted a workplan (dated August 1994) for additional studies to clarify points raised during the public comment period. The purpose of the studies proposed in the workplan is to serve as a baseline for the ecological monitoring plan and to establish a clean-up goal for the unnamed tributary. Both EPA's Biological Technical Assistance Group (BTAG) and DNREC have reviewed the work plan. BTAG contends that sufficient site-specific data has been used in developing the clean-up level and recommends proceeding with the existing clean-up level in conjunction with an ecological monitoring plan. DNREC believes that the technical approaches in parts of the work plan have merit and could be useful in combination with the ecological monitoring program. The detailed comments are included in the Administrative Record. EPA will consider incorporating portions of the proposed studies as components of the ecological monitoring plan.

The clean-up criterion of 33 mg/kg for off-site soils and sediments is based on bioassays of three species representing different habitats and EPA believes it will be protective given the conditions found at this Site. While it is true that excavation of these off-site areas will have a significant short term impact to the existing biological communities, these negative impacts will be outweighed by the positive results expected as a result of the long-term clean-up in these areas.

3.13 Comment

Standard Chlorine recommended that additional studies of the tributary to Red Lion Creek be undertaken to define appropriate clean-up levels based on site specific field studies.

EPA's Response

EPA maintains that sufficient site specific studies have been conducted as part of the RI to develop clean-up criteria for the unnamed tributary to Red Lion Creek. See responses to Comments 3.6, 3.7, 3.9, 3.10, 3.11, and 3.12.

3.14 Comment

Standard Chlorine commented on NOAA's comment which referenced that the clean-up criterion of 33 mg/kg is two orders of magnitude above the apparent effects threshold (AET") for 1,4-dichlorobenzene three orders of magnitude above the /LET for 1,2,4-trichlorobenzene. Standard Chlorine contends that the AETs cited by NOAA were based on regional studies (e.g. Puget Sound) that consider multiple chemicals or groups of chemicals and therefore are unable to attribute observed effects to specific chemicals. Standard Chlorine contends that additional studies are necessary to develop site specific AETs. Standard Chlorine proposes establishing site specific AETs based on sediment chemistry compared to benthic community indices.

EPA's Response

EPA agrees that the AET's cited by NOAA may be based on studies that consider multiple chemicals or groups of chemicals. At the same time, EPA recognizes that the clean-up criteria of 33 mg/kg is for multiple contaminants, primarily chlorinated benzene compounds, (i.e. the COC's identified in the RI/FS and the ROD) and not just 1,4-dichlorobenzene or 1,2,4-trichlorobenzene.

Benthic community data, as proposed by Standard Chlorine, may be difficult to interpret for several reasons. First, coastal plain streams, in general, tend to have a low diversity of macroinvertebrates, making it difficult to apply the EPA Rapid Bioassessment Protocol. Second, Red Lion Creek is an example of a physically- and chemically-altered system. The presence of other manufacturing and disposal sites along the Creek may also impact the health of the system. Therefore, the benthic assessment must do more than simply demonstrate the spatial pattern of richness and abundance in Red Lion Creek. It will be necessary to identify one or more "reference" streams (DNREC has proposed Dragon Run as an appropriate reference stream) consisting of other tide-gate impacted systems which are free of chemical facilities. Finally, genetic studies will not provide any information on the chemical status of the fish community which has been impacted as a result of contamination in the Creek and is the subject of a fish consumption advisory. Refer to the Administrative Record for BTAG's specific comments on Standard Chlorine's "Workplan for Additional Ecological Studies" dated August 1994 which proposes benthic macroinvertebrate studies.

3.15 Comment

Standard Chlorine stated that the requirements for the ecological monitoring plan in the PRAP were vague and consisted of chemical assays as opposed to ecological studies.

EPA's Response

The Ecological Monitoring Plan, as described in the Performance Section of the ROD, includes bioassays, chemical monitoring of sediments, toxicity testing, habitat characterization, and measurements of contaminant concentrations in fish and muskrat tissue.

GROUND WATER

3.16 Comment

Standard Chlorine proposed that the ROD include an interim action to contain ground water and DNAPL and include language that addresses the uncertainty in achieving required clean-up levels.

EPA's Response

The ground water component of the ROD is an interim action and the clean-up criteria has not been defined. The ROD requires containment of ground water and recovery of known DNAPL (if identified), as well as additional investigation to determine the technical practicability of remediating ground water.

3.17 Comment

Standard Chlorine stated that "it is not practical that a remedial goal of MCLs be considered."

EPA's Response

EPA agrees that it may not be practical to restore ground water to MCLs in areas where there is known or

suspected DNAPLs. The analysis of ground water samples from monitoring wells during the RI demonstrate that there are areas that contain known or suspected DNAPL. On the other hand, there are areas that show lower concentrations of contaminants (e.g. MW 16) that indicate dissolved contaminants which may be amenable to restoration to MCLs. A determination of final clean-up criteria and of possible additional remedial action will be made in a subsequent ROD for ground water.

3.18 Comment

Standard Chlorine stated that EPA's concern of a low point within the Columbia Formation at a location north of the SCD Site in the vicinity of monitoring wells MW-6 and MW-7 is based on misinterpretations of data used to develop figures in a 1983 hydrogeologic report on the SCD Site. Standard Chlorine stated that additional information will be collected during the RD to determine the length and location of the physical barrier to contain ground water.

EPA's Response

EPA agrees that additional information would be useful in determining whether a low point does exist within the Columbia Formation beneath the Standard Chlorine Site. EPA agrees that additional information is required as part of the RD to determine the length and location of the physical barrier to contain ground water and DNAPL. In addition, EPA will require that additional monitoring wells be installed to insure that contaminated ground water and or DNAPL have not migrated northward beyond Red Lion Creek.

SOILS/SEDIMENTS

3.19 Comment

Standard Chlorine stated that in situ remedies have advantages over ex situ remedies. Standard Chlorine proposed to identify and evaluate additional in situ technologies that could prove successful as contingency remedies for bioremediation. Standard Chlorine suggested that the ROD allow for the inclusion of such technologies as contingencies to Alternative 6.

In a letter dated September 16, 1994, Standard Chlorine proposed conducting additional treatability studies to identify other technologies that may be more successful than bioremediation in remediating the Site. In this letter, SCD proposed investigating ex-situ soil vapor extraction utilizing the sedimentation basin as a containment cell.

EPA's Response

EPA agrees that in situ treatment, if capable of remediating soils/sediments to the clean-up criteria, has some advantages over ex situ treatment. The Feasibility Study identified numerous in situ technologies for consideration at the Standard Chlorine Site. All of these in situ technologies, with the exception of bioremediation, were eliminated at different phases of the screening and evaluation process for various reasons. In their comments, Standard Chlorine did not propose a specific in situ treatment technology or new information that would make it reasonable to revisit an in situ technology that was previously eliminated. Therefore, EPA cannot justify the evaluation of other in situ technologies either as a contingency to in situ bioremediation or as a substitute for bioremediation.

EPA maintains that sufficient information is available to make a final decision on remediating the soils and sediments at the Site. EPA Region III will always review sound scientific data and in turn, Standard Chlorine may independently gather additional information or conduct additional studies for EPA's review. However, the ROD will not require these additional studies, and the schedule for the design of the selected remedy will not be delayed in order to allow for the performance of these additional investigations.

3.20 Comment

Standard Chlorine states that the location of the railroad track area precludes implementation of biological treatment and the ROD should identify that this area will be capped with asphalt.

EPA's Response

EPA recognizes that the railroad track area of the plant is an integral part of the industrial operations. At the same time, EPA contends that the area may be amenable to in situ bioremediation and that this remediation could take place without shutting down the railroad tracks. Placement of an asphalt cap will entail downtime along the railroad tracks and/or coordination of deliveries and shipments. In situ bioremediation would have a similar impact on the railroad track but would have the long term benefit of remediating the soils as opposed to capping to prevent exposure.

3.21 COMPARATIVE ANALYSIS OF ALTERNATIVE

Standard Chlorine stated that Alternative 3 complies with ARARs and provided a description of Alternative 3 as it was presented in the FS along with a detailed comparative analysis of Alternative 3 To EPA's recommended alternative (Alternative 6). The analysis breaks out the media by ground water and soil/sediments. The following is a brief summary of Standard Chlorine's comparison for each of the criteria and EPA's response for each criterion.

3.21(a) Overall Protection of Human Health and the Environment

GROUND WATER

Comment

Standard Chlorine states that Alternative 3 and Alternative are equally protective of human health and the environment. Standard Chlorine states that "it is not technically feasible to restore ground water in the area as a future water supply resource." SCD also states that through the implementation of institutional controls, such as the designation of a ground water management zone, it is possible to preclude the use of the site ground water as a future potable source.

EPA's Response

EPA agrees that Alternative 3 and Alternative 6 are equally protective of human health and the environment. EPA agrees that it may not be technically practicable to restore ground water containing DNAPLs to drinking water standards, but that there are areas of ground water at the Site which may not be contaminated with DNAPLs and may in turn be amendable to restoration to MCLs. §300 430(a) (iii) (F) of The National Oil and Hazardous Substance Pollution Contingency Plan (NCP) states:

"EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site."

Also see response to comment 3.17.

SOILS/SEDIMENTS

Comment

Standard Chlorine states that Alternative 3 and Alternative are equally protective of human health and the environment. Standard Chlorine also states that in situ technology would be less disruptive to the wetlands and in turn more protective and that other in situ remedies should be evaluated as contingencies for bioremediation.

EPA's Response

EPA agrees that both Alternative 3 and Alternative 6 are protective of human health and the environment. EPA also agrees that in situ technology would be less disruptive to the wetlands than ex situ technology. Also see response to Comment 3.19.

3.21 (b) Compliance with ARARs

GROUND WATER

Comment

Standard Chlorine commented that it is not technically feasible to restore ground water in the area to MCLs.

EPA's Response

See response to comments 3.17 and 3.21(a).

SOILS AND SEDIMENTS

Comment

Standard Chlorine commented that Alternative 3 could comply with ARARs according to the provisions of RCRA that apply to corrective action management units ("CAMUs").

EPA's Response

The existing sedimentation basin does not satisfy the requirements outlined in the regulations and therefore EPA cannot consider designating the basin as a CAMU and in turn Alternative does not comply with ARARs. This issue is discussed in more detail in comments and responses 3.23(a) through 3.23(e).

3.21 (c) Long-Term Effectiveness and Permanence

GROUND WATER

Comment

Standard Chlorine states that both Alternative 3 and Alternative 6 offer long-term effectiveness and permanence.

EPA's Response

EPA agrees with this comment.

SOILS/SEDIMENTS

Comment

Standard Chlorine states that in situ treatment is preferred for the sediments in the wetland area as opposed to excavation which would disrupt the wetland area. Standard Chlorine also states that Alternative 3 is equivalent to Alternative 6 in long-term effectiveness and permanence because the accessible soils and sediments would be treated via stabilization and provide for containment in a disposal unit.

EPA's Response

Although EPA agrees that in situ treatment of the sediments would be less disruptive to the wetlands, EPA nonetheless believes that excavation and removal of the contaminated sediments offers long-term effectiveness and permanence. Moreover, specific in situ technologies and their impact on the wetlands would need to be evaluated.

EPA does not agree that Alternative 3 is equivalent to Alternative 6 in long term effectiveness and permanence. Alternative 3 relies on containment of solidified/stabilized contaminated soils and sediments in a lined and capped disposal unit. The long-term stability of the stabilized soils/sediments is not known. No information was presented nor were studies conducted on the effects of freezing/thawing, wetting/drying, aging, contact with liner materials, and contact with cap materials. Alternative 6 entails treatment of the contaminated soils and sediments to a health-based number and therefore provides for long-term effectiveness and permanence. EPA considers Alternative 3 primarily containment, and in turn the long-term effectiveness and permanence is not equivalent to Alternative 6 or the contingency Alternative 4B. Also see response to Comment 3.21(d).

3.21 (d) Reduction in Toxicity Mobility or Volume

GROUND WATER

Comment

SCD states that both Alternative 3 and Alternative 6 satisfy the statutory preference for reduction of toxicity, mobility, or volume through treatment of the principal threat to human health and the environment.

EPA's Response

The ground water component of Alternative 3 and Alternative 6 are the same. The remedy for ground water is an interim remedy and is primarily a containment remedy in that a physical barrier will be constructed to contain ground water. A ground water investigation will be conducted to determine the technical practicability of restoring ground water to MCLs.

SOILS/SEDIMENTS

Comment

SCD states that Alternative 3 addresses treatment of accessible soils and sediments via solidification/stabilization and provides for containment in a disposal unit resulting in reduction of toxicity and mobility.

EPA's Response

EPA does not agree that solidification/stabilization results in reduction of toxicity. Although the mobility of the waste will be less due to containment in a lined disposal unit, stabilization has not been demonstrated to reduce the mobility of the contaminants in the soils/sediments causing the site risks.

The stabilization of the contaminated soils and sediments as described in the FS does not constitute treatment. The FS report states:

Stabilization of the material in the basin is primarily directed toward improving the load bearing strength to support the final cover. Stabilizing agents must be selected via treatability testing to meet this [remedial] design objective. Some chemical fixation may result, however it [is] not the primary objective.

There is a statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce the toxicity, mobility, or volume of the hazardous substances as a principal element. The preamble to the NCP (55 Fed. Reg. 8721) states:

EPA is establishing, as a guideline, that treatment as part of CERCLA remedies should generally achieve reductions of 90 to 99 percent in the concentration of mobility of individual contaminants of concern, although there will be situations where reductions outside the 90 to 99 percent range that achieve health-based or other site-specific remediation goals (correspondence to greater or lesser concentration reductions) will be appropriate.

In a letter dated September 16, 1994, SCD requested that EPA consider "A reduction less than 90%... where the treatment is employed in conjunction with a RCRA minimum technology disposal unit". The regulations require that treated soils meet Land Disposal Regulations (LDR) to be placed in a RCRA minimum technology disposal unit. LDR requires that the soils be treated to levels equal to or greater than the 90% reduction.

An OSWER Draft publication 9380.3-07FS, February 1991, titled "Immobilization as Treatment" states;

"Solidification alone is not included as a treatment technology under The Superfund definition of immobilization because it does not satisfy the statutory preference for treatment to reduce the toxicity, mobility, or volume (TMV) under Superfund. The term "solidification" implies a treatment technology which is intended to produce a monolith for purposes of structural integrity. Since the principal purpose of solidification is structural integrity, it does not qualify as treatment under Superfund for purposes of reduction in TMV."

The document further states, "Immobilization is not deemed to constitute treatment to reduce TMV in the following circumstances:

- Immobilization of volatile organics
- Immobilization of semi-volatile and non-volatile organics where a treatability study producing data meeting the above mentioned criteria is not performed, planned and/or referenced."

An EPA Engineering Bulletin (EPA/540/S-92/015), dated May 1993, titled "Solidification/Stabilization of Organics and Inorganics" states:

"Based on present information, the Agency [EPA] does not believe that immobilization [solidification/stabilization] is an appropriate treatment alternative for volatile organic compounds (VOCs). Selection of immobilization of semi-volatile compounds (SVOCs) and non-volatile organics generally requires the performance of a site-specific treatability study or non-site-specific treatability study data generated on waste which is very similar (in terms of type of contaminant, concentrations, and waste matrix) to that to be treated and that demonstrates, through Total Waste Analysis (TWA), a significant reduction (e.g 90 to 99 percent reduction) in the concentration of chemical constituents of concern Although this policy represents EPA's strong belief that TWA should be used to demonstrate effectiveness of immobilization for organics, other leachability tests may also

Be appropriate in addition to TWA...."

In response to SCD's comment, EPA requested that SCD provide additional information to support their claim that stabilization satisfies the NCP definition of treatment. In a letter dated September 16, 1994, SCD provided information on leachate test protocols to demonstrate compliance with treatment goals. SCD stated that they do "not believe that the use of Total Waste Analysis (TWA) accurately reflects the reduction in mobility achieved by stabilization/solidification and emplacement in a RCRA minimum technology disposal unit". In turn, SCD proposed that the American Nuclear Society Leach Test be utilized for determining if treatment is successful.

Since the soils and sediments are contaminated with a listed hazardous waste, the Land Disposal Restrictions would apply. Regulation 40 C.F.R. 268.40 states "A restricted waste identified in § 268.41 may be land disposed only if an extract of the waste or of the treated residue of the waste developed using the test method in appendix II of part 261 (Method 1311 Toxicity Characteristic Leaching Procedure (TCLP)) does not exceed the value shown in Table..." The American Nuclear Society Leach Test is not identified in the regulations as an appropriate test method for determining compliance with LDR. Thus any evaluation of the effectiveness of a proposed stabilization process would have to satisfy both the requirement to demonstrate a significant reduction (90 to 99% reduction demonstrated via TWA or some other appropriate analysis) in the contaminants of concern and the regulatory requirements for testing referenced in 40 C.F.R. 268.40.

For stabilization to be considered treatment under CERCLA, the process in itself must reduce the mobility, toxicity, or volume of the contaminant. As the FS states, the main objective of stabilization in Alternative 3 is to improve the bearing strength, and is not necessarily accompanied by reduction in contaminant mobility. The toxicity of chlorobenzenes would not be expected to decrease from the proposed treatment. The volume of material containing the contaminants typically increases during stabilization/solidification processing.

EPA recognizes that stabilization/solidification is used as treatment in many RODs, but is typically part of a treatment train involving some other form of treatment for sites containing soils contaminated with organic compounds. EPA has no data or literature to support that stabilization, as proposed in the Feasibility Study, will reduce the toxicity (Total Waste Analysis or Leachability testing) of the contaminated soils/sediments. In addition, there is no information to evaluate the long-term stability of the proposed stabilization process, the effects of freezing/thawing, wetting/drying, aging, contact with liner materials, contact with cap materials, and contact with precipitation or ground water that infiltrates the containment barriers.

EPA maintains that Alternative 6, and the Contingency Alternative 4B are more effective in reducing the toxicity, mobility, and volume of contamination through treatment.

3.21 (e) Short-Term Effectiveness

GROUND WATER

Comment

SCD states that both Alternative 3 and Alternative 6 would implement the same remedial components to contain, collect, and treat contaminated ground water and DNAPL which may result in minimal, if any, impacts to human health and the environment during the construction period.

EPA's Response

EPA agrees with this comment.

SOILS/SEDIMENTS

Comment

SCD states that EPA's contingency alternative (4B-thermal treatment) would be less protective of human health and the environment during implementation than Alternative 3. Thermal treatment would involve:

- Excavation in wetlands and loss of habitat during remediation;
- Generation of residuals requiring further treatment and/or ultimate disposal;
- Greater potential short-term exposure to humans

EPA Response

Alternative 6, the selected alternative, minimizes short term impacts by conducting in situ treatment, if it is determined to be effective, which will minimize impact on wetlands and habitat. In the event that bioremediation (Alternative 6) is ineffective in remediating the soils and sediments to the clean-up criterion, then thermal treatment (Alternative 4B) will be implemented. Both Alternative 3 and Alternative 4B have a short-term risk associated with excavation of contaminated soils and sediments.

Chlorinated benzene compounds are volatile. Many stabilization processes generate heat, either chemically (hydration reactions) or mechanically (mixing) and in turn Alternative 3 may have substantial volatilization of contaminants. A modeling study performed by Battelle for EPA (Contract 68-C0-0003, work assignment 13,1993) estimated that volatilization of 1,2-dichlorobenzene could be substantial at temperatures above 20°C (1,4-dichlorobenzene was not modeled).

The results of this study suggest that Alternative 3 could generate residuals, i.e. capturing and treatment of air emissions, which would require further treatment and/or ultimate disposal. In addition, workers could be exposed to air emissions from the volatilization of the contaminants. In turn, Alternative 3, which is a stabilization process, also has short-term risk associated with it, and may present a greater risk to human health than Alternative 6 or the contingency Alternative 4B.

3.21(f) Implementability

GROUND WATER

Comment

The limited space may affect the implementability of the interceptor trench.

EPA's Response

EPA agrees with this comment.

SOILS/SEDIMENTS

Comment

SCD stated that thermal treatment would be more difficult to implement than in situ bioremediation of sediments in the wetland area. Thermal treatment of the sediments in the wetland area would entail disruption/destruction of wetland areas.

EPA's Response

EPA's selected remedy is bioremediation which would be easier to implement in the wetland area than thermal treatment. In the event that bioremediation is unsuccessful in remediating the sediments to the clean-up criterion, then thermal treatment would be used to treat the contaminated wetlands. EPA agrees that thermal treatment would be disruptive to the wetlands and has included a requirement in the ROD calling for the development of a wetlands restoration plan.

3.21 (g) Cost

Comment

SCD states that the present worth cost of Alternative 6 is greater than the \$12.2 million described in the PRAP, while Alternative 3 is estimated at \$6.8 million. SCD also states that Alternative 3 would provide equivalent risk reduction to Alternative 6 at a potentially lower cost.

EPA's Response

EPA utilized unit cost figures provided in SCD's FS to develop the estimated present worth cost of Alternative 6. The cost is higher than Alternative 3 because the remedy includes treatment of all soils and sediments above the clean-up criterion resulting in a more permanent solution. As stated in response 3.21(a), both Alternative 3 and Alternative 6 are protective of human health and the environment.

3.22 Comment

Standard Chlorine provided a comprehensive description of their proposed remedy for the Site. EPA has

summarized SCD's comments and grouped them into four categories: Additional Work during Remedial Design, Ground Water, Soils/Sediments and Institutional Controls.

3.22(a) Additional Work During Remedial Design

Comment

Standard Chlorine had two pages of comments relating to element that they believe should be included in the Remedial Design. These elements included monitoring and investigative approaches for determining the extent of the DNAPL and ground water contamination.

EPA's Response

Many of the tasks proposed appear reasonable and will be evaluated further during the Remedial Design phase of the project.

3.22(b) Ground Water

Comment

SCD stated that the three components of long-term ground water remediation (interceptor trench, aqueous phase recovery wells, and DNAPL zone recovery wells) would be finalized during Remedial Design and an achievable clean-up criteria will be based on the optimally designed integrated recovery system.

EPA's Response

The intent of the interim remedy for ground water is to contain the ground water and recover known DNAPL. Clean-up criteria for ground water will be identified in the final remedy which will be based on the findings of the additional investigation.

3.22 (c) Soils and Sediments

3.22(c) (1) Comment

SCD maintains that there is no evidence that the soils underlying the sedimentation basin are contaminated.

EPA's Response

The FS reported that the primary liner had been breached and therefore the liner of the sedimentation basin "was suspect". EPA agrees that there is no analytical data to document that the soils underlying the sedimentation basin are contaminated because no soil samples were obtained from this area. Based on the findings of the FS, EPA believes that the soils underlying the basin may be contaminated so once samples are obtained and analyzed, further remediation may be necessary.

3.22 (c) (3) Comment

SCD proposed to conduct additional work to identify habitat information to be used to recompute the clean-up criterion for off-site soils and sediments.

EPA's Response

As stated previously, EPA believes that the off-site clean-up criterion established in the ROD will be protective of human health and the environment. Thus there is no need to recompute a clean-up criterion. Further, EPA maintains that the additional work to evaluate habitat conditions will not be necessary to develop clean-up criterion. The Ecological Assessment conducted during the Remedial Investigation entailed numerous studies including, but not limited to, fish tissue sampling and analysis toxicity testing, wetland delineation, and analysis of ecological receptors. The off-site clean-up criterion was identified only after an analysis of all of the results from the ecological assessment. As noted in the ROD, an Ecological Monitoring Plan will be developed and implemented to ensure that the remedy is and remains protective.

3.22 (c) (3) Comment

SCD proposed to conduct additional treatability studies for bioremediation and other applicable technologies.

EPA's Response

EPA's Region III is always open to reviewing additional information regarding treatment alternatives. However, EPA believes that the RI/FS provides sufficient information to select a remedy for this Site. The ROD will not require additional treatability studies, and the schedule for the design of the selected remedy will not be delayed to allow time for the performance of these studies.

3.22(d) Institutional Controls

Comment

SCD states that institutional controls would be implemented under their plan to include site monitoring, site access restrictions, and deed restrictions. In addition, DNREC would implement a ground water management. zone for the area.

EPA's Response

EPA agrees that these elements should be included in the remedial action and these elements are included in the ROD.

3.23 Applicability of "CAMU" and Alternative 3

Standard Chlorine submitted several pages of comments discussing the Corrective Action Management Unit ("CAMU") provisions of RCRA. SCD states that the CAMU provisions of RCRA are ARARs for the soil and sediment related components of SCD's recommended remedial alternative (Alternative 3) for this Site and that SCD's preferred alternative would comply with these ARARs.

3.23 (a) Comment

SCD stated that Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §9621 and 40 C.F.R. §300.430(f) (1) (i) (A) of EPA's National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), require compliance with ARARs as a threshold requirement which each alternative remedy must meet in order to be eligible for selection.

EPA's Response

EPA agrees with this comment.

3.23(b) Comment

SCD stated that remediation of soils and sediments at the Site is governed by action-specific ARARs in the absence of chemical-specific and location-specific ARARs. SCD stated that "EPA should select these technology-based or activity-based requirements by determining the management actions necessary to address the risk to human health and the environment or exposure posed by the hazardous substances in the source area being addressed". SCD further stated that SCD's recommended alternative (Alternative 3) is "just as protective of human health and the environment as the remedy selected in the PRAP, since all soils and sediments exceeding clean-up criteria would be treated and/or contained in a lined and capped unit".

EPA's Response

EPA agrees that both Alternative 3 and Alternative 6 are protective of human health and the environment. EPA maintains that the stabilization of soils and sediments prior to consolidation in a lined and capped unit does not constitute treatment. See response to comment 3.21(d).

3.23 (c) The Applicability, Relevance and Appropriateness of RCRA

Comment

SCD stated that for several reasons, including the fact that the soils and sediments are contaminated with a RCRA hazardous waste, RCRA requirements are relevant and appropriate to the SCD Site even if they are not applicable.

EPA's Response

EPA agrees with this comment.

3.23 (d) The Applicability, Relevance, and Appropriateness of the CAMU Provisions of the Corrective Action Management Regulations

Comment

SCD stated that the preamble to the CAMU regulations states that the CAMU requirements "will also become RCRA ARARs for hazardous waste management activities at CERCLA sites". SCD also stated that "SCD's preferred remedial alternative [Alternative 3] will provide long-term and short-term effectiveness and permanence that is equivalent to the levels that would be provided by the remedial alternative selected by EPA in the PRAP".

EPA's Response

The CAMU regulations are not AR3LRs for the Standard Chlorine Site and would only be considered ARARs if EPA were to designate the sedimentation basin as a CAMU. 40 C.F.R. § 264.552 (b) (1) specifies requirements for designating regulated units as CAMUs. Specifically 40 C.F.R. § 264.552(b) (1) (i) states:

"The regulated unit is closed or closing, meaning it has begun the closure process under § 264.113 or § 265.113; and

(ii) Inclusion of the regulated unit will enhance implementation of effective, protective and reliable remedial actions for the facility."

The closure process has not begun for the existing sedimentation basin and therefore EPA cannot consider designating the basin as a CAMU. EPA does not agree that Alternative 3 provides long-term and short-term effectiveness and permanence that is equivalent to that of the selected remedy. See responses to comments 3.21(c) and (e) for a more detailed explanation.

3.23 (e) Implementation of the CAMU Provisions at the SCD Site

3.23 (e) (1) Comment

SCD stated that "Selection and implementation of SCD's preferred alternative would be consistent with the CAMU provisions of RCRA both in terms of the portions of the SCD site that would be designated as a CAMU and placement of excavated and treated wastes. from the site back into a reconstructed and capped unit."

EPA's Response

40 C.F.R. § 264.552 defines the requirements to be used by the Regional Administrator to designate an area of a facility as a CAMU. Neither the FS nor Standard Chlorine's comments on the PRAP provide sufficient detail to determine if the sedimentation basin would satisfy the requirements in 40 C.F.R. § 264.552. For example, 40 C.F.R. §§ 264.552(c) and (d) contain specific requirements which EPA must evaluate and address before it can designate an area as a CAMU. This information was not provided by Standard Chlorine and thus EPA is not in a position to make a determination that Alternative 3 could be implemented in compliance with the CAMU provisions of RCRA. Standard Chlorine has not demonstrated that the soils and sediments would undergo treatment as required by the CAMU regulation 40 C.F.R. § 264.552(c) (6), prior to placement in the reconstructed and capped unit. See response to comment 3.21(d).

The soils and sediments which were placed in the sedimentation basin were contaminated with a listed hazardous waste and as such are required by RCRA regulations to be managed as a hazardous waste. In turn, the sedimentation basin is a regulated hazardous waste unit because it received a hazardous waste. 40 C.F.R. § 264.552(b) (1) (i) requires that a regulated unit be closed or undergoing closure in order to be designated as a CAMU. Since SCD never obtained a permit for storage/disposal of hazardous waste in the sedimentation basin, and the basin is not closed or undergoing closure, EPA can not consider designating the sedimentation basin as a CAMU and in turn the CAMU regulations are not ARARs.

3.23 (e) (2) Comment

SCD stated that if EPA designated the sedimentation basin as a CAMU, SCD would be able to place remediation wastes into the CAMU without triggering RCRA LDRs. SCD further states that "this exemption from the LDRs would encompass any wastes generated as part of the CERCLA cleanup, no matter where the wastes originated within the SCD site".

EPA's Response

EPA agrees that by designating the sedimentation basin as a CAMU, LDRs would not be triggered. However

the intent of the CAMU regulations is not to by-pass LDR requirements, but to allow for more flexibility in management of remediation wastes. Prior to the CAMU concept, many remedies were limited to capping in place because the only other alternative was excavating incinerating to LDR requirements and ultimate off-site disposal at a RCRA Subtitle C facility which would result in high costs.

The preamble to the final CAMU regulations (58 Fed. Reg. 8658, 8660) states the CAMU concept is

".. estimated to result in more treatment of wastes using more effective treatment technologies than would occur under the other regulatory options considered by the Agency. In addition, today's rule is predicted to result in more on-site waste management (vs. off-site management); lesser reliance on incineration; greater reliance on innovative technologies; and a lower incidence of capping waste in place without treatment."

The preamble also states (58 Fed. Reg. 8658, 8682) that the CAMU alternative" ... would likely provide a greater degree of certainty of long-term effectiveness ... by encouraging greater use of ex-situ treatments other than incineration and reduced use of management in place."

Regulation 40 C.F.R. §264.552(c) (6) states "The CAMU shall enable the use, when appropriate, of treatment technologies, (including innovative technologies) to enhance the long-term effectiveness of remedial actions by reducing the toxicity, mobility, or volume of wastes that will remain in place after closure of the CAMU".

As stated previously (See EPA's response 3.21 (c) and 3.21 (d), as well as the ROD, stabilization, as proposed in SCD's preferred alternative (Alternative 3) does not constitute treatment or a reduction in toxicity, mobility or volume (See 40 C.F.R. § 264.552 (c) (6) and in turn would not satisfy the CAMU regulations. Also see response to 3.23(e) (i).

3.23(e) (3) Comment

SCD states that according to the preamble to the final CAMU regulations, "a facility owner required to remediate a surface impoundment (e.g., by removing or treating some or all of the sludges) need not comply with LDRs when it redeposits residuals back into the impoundment if EPA designates the impoundment as a CAMU or part of a CAMU. Under this same reasoning, SCD would not have to comply with the LDRs or Minimum Technology Requirements ("MTRs") with respect to excavated wastes placed into a reconstructed and capped unit pursuant to implementation of SCD's preferred remedial alternative.

EPA's Response

EPA agrees that the preamble to the final CAMU regulations states that the placement of remediation wastes into a CAMU will not trigger LDRs or MTRs. For reasons identified in response to comment 3.23 (e) (1), EPA may not designate the sedimentation basin as a CAMU and SCD is required to comply with LDRs and MTRs because they are ARARs.

3.23 (e) (4) Comment

SCD states that "the remedial alternative [Alternative 3] described in the FS and in the letter to you [EPA], dated June 6, 1994, should be governed by the CAMU provisions of RCRA, which are ARARs for that remedy". SCD states that their preferred alternative, [Alternative 3] would satisfy CERCLA's threshold requirement that the chosen remedy comply with ARARs.

EPA's Response

EPA does not agree that the CAMU provisions of RCRA are ARARs for the SCD Site. The CAMU provisions would only be ARARs if EPA designated a unit at the SCD Site as CAMU. As stated in response to comment 3.23(e) (1), EPA may not designate the sedimentation basin as a CAMU and in turn the CAMU provisions are not ARARs. EPA has determined that Alternative 3 does not satisfy CERCLA's threshold criteria for compliance with ARARs, and this is discussed in Section 7 of the ROD.

3.23 (e) (5) Comment

SCD states that "The SCD preferred remedy [Alternative 3] would provide long-term and short-term risk reduction and protectiveness levels that correspond to the levels that would be achieved through implementation of the remedy chosen by EPA in the PRAP, at a potentially significant cost savings"

EPA's Response

See EPA's responses 3.21(c) and 3.21(e).

3.23 (e) (6) Comment

SCD states that selection of Alternative 3 in a manner consistent with RCRA's CAMU provisions would promote EPA's objective of removing regulatory impediments which, when applied to contaminated soils and sediments at the SCD Site, could impede EPA's ability to select and implement a reliable, protective, and cost-effective remedy at the SCD Site.

EPA's Response

As stated in response to comment 3.23(e) (1), EPA may not designate the sedimentation basin as a CAMU and in turn the CAMU provisions of RCRA are not ARARs. Alternative 3 is eliminated as a viable alternative because it does not comply with ARARs. EPA has selected a remedy which utilizes innovative technology (bioremediation) and is cost effective with a present-worth cost of \$6.6 to 12.2 million. In the event that bioremediation is unsuccessful in remediating the soils/sediments to the clean-up criteria, the contingency remedy is a proven technology that will remediate the soils/sediments to the clean-up criteria.

4. NATURAL RESOURCE TRUSTEES

National Oceanic and Atmospheric Administration (NOAA)

4.1 Comment

NOAA requested that "trigger values" that would cause additional clean-up of Red Lion Creek east of Route 9 be addressed more fully. NOAA also requested copies of the reports being prepared under the Consent Order between Occidental Chemical Corporation and EPA.

EPA's Response

EPA is requiring that Standard Chlorine conduct ecological monitoring to demonstrate that the remedy is protective of the environment. If the results of the ecological monitoring along with the findings of the investigation being conducted by Occidental Chemical Corporation suggest that additional remedial action is needed, EPA will require that this additional work be conducted. Due to the nature of the ecological studies that will be conducted, it is difficult to identify an exact "trigger value" at which remediation would be required.

Copies of all the reports prepared by Occidental Chemical Corporation under the Consent Order can be made available to NOAA.

4.2 Comment

NOAA commented that page 5 of the PRAP did not address sediments in Red Lion Creek in two separate references.

EPA's response

The first reference identifies the principal threat wastes associated with the Standard Chlorine Site and the sediments in to Red Lion Creek are not considered principal threats (Note, however, that some of the sediments in the unnamed tributary to Red Lion Creek are considered principal threat wastes). The second reference describes the final action component for remediation of soils and sediments. EPA is not requiring Standard Chlorine to remediate the sediments in Red Lion Creek at this time, since the monitoring data indicates that the concentrations of contaminants in Red Lion Creek are below the off-site clean-up criterion.

4.3 Comment

NOAA requested that EPA collect additional sediment and surface water data from the unnamed tributary to Red Lion Creek and Red Lion Creek to define the extent of contamination.

EPA's Response

Numerous sediment samples were collected from the unnamed tributary to Red Lion Creek and Red Lion Creek during the Remedial Investigation and the nature and extent of contamination has been defined for a clean-up criterion of 33 mg/kg of total COCs. In the event that the results of the ecological monitoring suggest that the clean-up criterion are not protective of the environment, EPA will require that

additional data be collected at that time.

4.4 Comment

NOAA expressed concern that the clean-up criterion of 33 mg/kg of total COCs for soils/sediments in the unnamed tributary to Red Lion Creek and Red Lion Creek may not be protective based on: the interpretation of the bioassay data conducted as part of the Ecological Assessment (Also see comment and response 3.8). NOAA recommends that the tests be repeated using proper QA/QC and validation guidelines to determine a clean-up level protective of aquatic resources.

EPA's Response

EPA recognizes that there are uncertainties associated with the findings of the bioassay data referenced by NOAA. However, as noted in our response to Comment 3.10, the off-site clean-up criterion of 33 mg/kg of total COCs is based on the results of several studies and EPA believes it is an appropriate value to be used as the off-site clean-up criterion. Further, to ensure that this level is in fact protective of ecological receptors, the ROD calls for an extensive ecological monitoring plan to be developed and implemented as part of the selected remedy.

4.5 Comment

NOAA requested that chemical analyses of surface water, sediments, fish tissue, and sediment bioassays be included in the ecological monitoring plan.

EPA's Response

The ROD calls for the development of an ecological monitoring plan which will include these elements.

Comment

NOAA requested that the ecological monitoring plan not be limited to six years in the event that the remedy is not successful.

EPA's Response

The ROD requires that the ecological monitoring be conducted for "at least five years"

4.7 Comment

NOAA expressed concern that the on-site clean-up criteria for soils and sediments (625 mg/kg) is an order of magnitude higher than the off-site clean-up criterion (33 mg/kg) and may act as a source of contamination for the off-site soils and sediments.

EPA's Response

Performance Standards in the ROD require control of storm water run-off from all areas of the Site that may potentially contaminate the waters of the State of Delaware.

Comment

NOAA requested "some explanation as to why the treatability studies were not definitive".

EPA's Response

The objective of the treatability study was to evaluate the technical feasibility of utilizing bioremediation at the SCD Site. Flask tests were conducted in a laboratory for a period of 60 days. EPA's review of the test results identified problems with the experiment design, which in turn impacted the interpretation of the data.

Overall, the treatability studies were not definitive based on the following: (1) variability of the concentration of total chlorobenzenes observed in the flasks and the associated lack of confidence in the data, (2) the potential for volatile losses from the reactor flasks, (3) inconclusive stoichiometric release of chlorides, (4) no nutrient consumption, and (5) lack of microbial data.

U.S. Fish and Wildlife Service (F&WS)

4.9 Comment

F&WS commented that the ecological monitoring plan should contain all the elements identified in the PRAP.

EPA's Comment

The Ecological Monitoring Plan called for by this Record of Decision incorporates all of the ecological monitoring activities identified in the PRAP.

4.10 Comment

F&WS believes the time frame for the ecological monitoring plan should be left open ended.

EPA's Response

See Response to Comment 4.6

4.11 Comment

F&WS is concerned that the on-site clean-up criteria for soils and sediments (625 mg/kg) is higher than the off-site clean-up criterion (33 mg/kg) and may act as a source of contamination for the off-site soils and sediments. F&WS recommends an erosion control plan supported by monitoring.

EPA's Response

See Response to 4.7.

4.12 Comment

F&WS had specific comments on items that should be included in the wetland mitigation plan.

EPA's Response

EPA will provide the F&WS the opportunity to review and comment on the wetland mitigation plan prior to EPA issuing approval of the plan.

State of Delaware
Department of Natural Resources
& Environmental Control
DIVISION OF AIR & WASTE MANAGEMENT
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February 23, 1995

Peter H. Kosmayer (3RA00)
U.S. EPA, Region III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

RE: State of Delaware Concurrence with Record of Decision
Standard Chlorine of Delaware, Inc. Superfund Site
Delaware City, New Castle County, Delaware

Dear Mr. Kostmayer:

The Department of Natural Resources and Environmental Control has reviewed the February 1995 Record of Decision (ROD) for the Standard Chlorine of Delaware, Inc. Superfund site. This correspondence represents the Department's official concurrence with the selected remedy described in the ROD for the Standard Chlorine site. As you are aware, the Department has been actively involved throughout the Superfund process as it pertains to this site and plans to continue to do so.

Director
Division of Air and Waste Management

AVE: dw
AVH94128.wp
DE-053 II B-9

pc: N. V. Raman
Karl Kalbacher
Anne Hiller

Delaware's good nature depends on you!