EPA
REGION III

REMEDIAL ACTION PLAN

Halby Chemical Superfund Site
New Castle County, Delaware

April, 1991

1. PURPOSE OF THE PROPOSED PLAN

This Proposed Remedial Action Plan (Proposed Plan) describes the preferred alternative for addressing contaminated soils, sediments and surface water at the Halby Chemical Superfund Site located near the Port of Wilmington in New Castle County, Delaware. This Proposed Plan is issued by the Environmental Protection Agency (EPA), the lead agency for site activities, in conjunction with the Delaware Department of Natural Resources and Environmental Control (DNREC), the support agency for this Site. The Proposed Plan describes the remedial alternatives considered for **Operable Unit 1**, the preferred alternative and the rationale for its proposed selection. EPA is seeking public comments on these alternatives and will select a final remedy for the first Operable Unit of the Site only after the public comment period has ended and the information submitted during the comment period has been reviewed and considered.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Sections 113(k)(2)(B), 117(a), and 121(f)(1)(G) of the **Comprehensive Environmental Response, Compensation, and Liability Act**, as amended (CERCLA), 42 U.S.C. §§ 9613(k)(2)(B), 9617(a), and 9621(f)(1)(G). This document highlights information that can be found in greater detail in the **Remedial Investigation and Feasibility Study (RI/FS)** reports and other documents contained in the **Administrative Record** file for the Site. EPA and DNREC encourage the public to review these documents in order to gain a more comprehensive understanding of the Site and Superfund activities that have been conducted there.

The **Administrative Record** file, which contains the information upon which the selection of the response action will be based, is available at the following **information repositories:**

U.S. EPA Region III, Docket Room
Ms. Margaret Leva
841 Chestnut Building, 9th floor
Philadelphia, PA 19107
215-597-3037

Wilmington Institute Library
10th and Market Streets
Wilmington, DE 19801
302-571-7416

EPA encourages comments from the public on all alternatives and on the information that supports the alternatives. Although EPA is proposing a preferred alternative, no final decision has been made. Public comments can influence EPA's choice. As a result, the final remedial action plan, as presented in the **Record of Decision (ROD)**, may be different from the preferred alternative presented here. All comments received within the comment period will be considered and addressed by EPA. A glossary explaining terms that may be unfamiliar to the general public is attached at the end of this Proposed Plan. Glossary terms are noted by **bold** print in the text.

2. SITE DESCRIPTION AND BACKGROUND

The Halby Chemical Site is located in a highly industrialized area near the Port of Wilmington, New Castle County, Delaware (see Figure 1). The 14-acre Site is bordered by a Conrail railroad, Interstate 495, and Terminal Avenue. As shown in Figure 2, major site features include an active chemical distribution plant, a lagoon, warehouses, freight transfer facility, and a residential area (3 trailers) (see Figure 2).

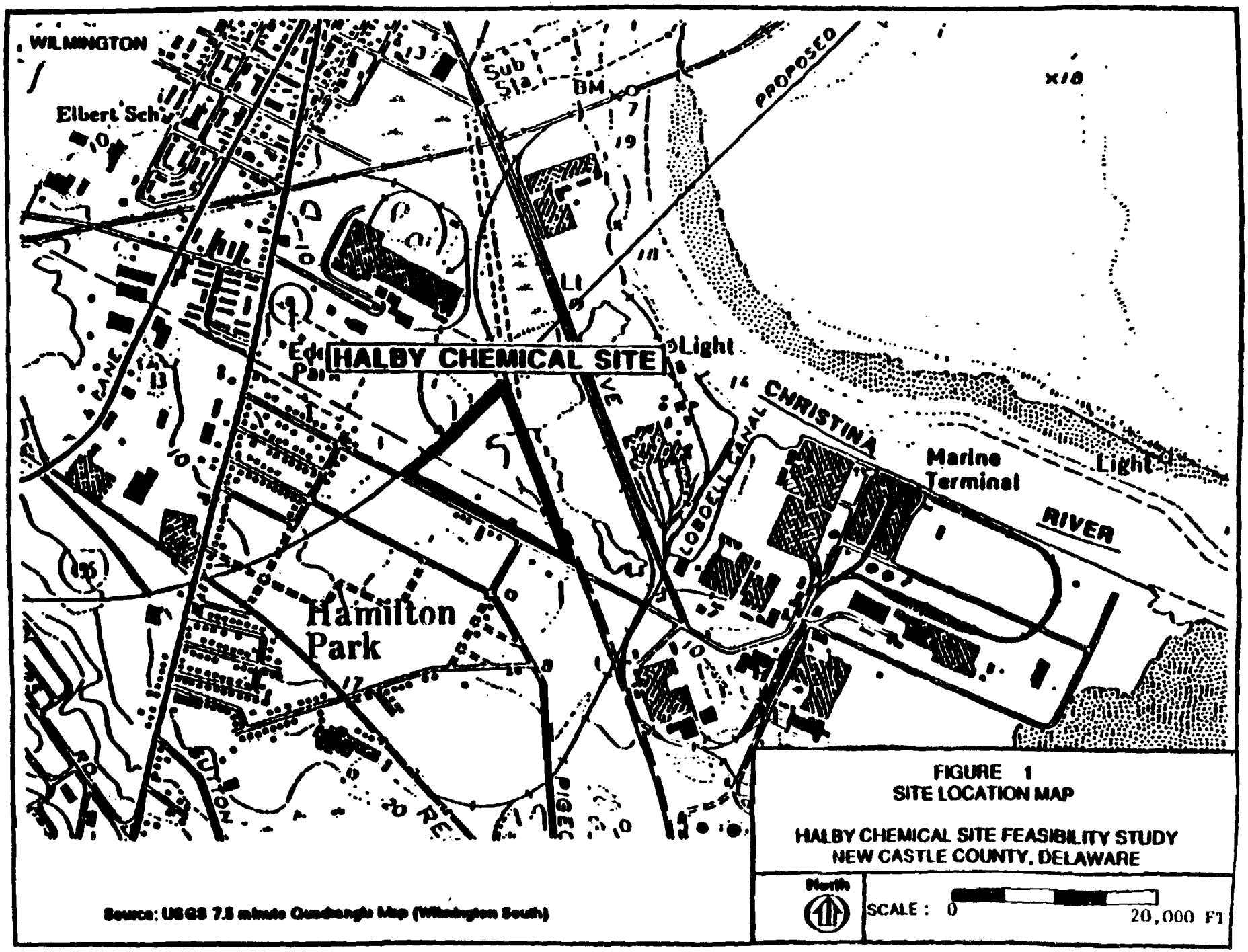
Sulfur compounds were produced at the site from 1948 to 1977. From 1948 to 1964, production wastewater and cooling water were disposed of in an unlined on-site lagoon. The lagoon drained into the adjacent tidal marsh which connected to the Lobdell Canal and, thence, the Christina River. Currently, the on-site lagoon connects to a runoff ditch, which parallels Route I-495 and drains to the Christina River.

Between 1964 and 1972, only cooling water was reported to have entered the lagoon, while the production wastes were discharged into the sewer lines. After 1972, however, production wastewater was combined with the cooling water and runoff, treated, and again discharged into the lagoon. The lagoon presently receives runoff from the railroad tracks and the Site. It also receives flow from the floor drains within the chemical distribution plant.

The plant closed in 1977 and was sold to Brandywine Chemical Company. The process plant is currently used for the receipt and distribution of chemicals. In 1984, EPA conducted an inspection of the Halby Chemical Site and in 1985 assigned a Hazard Ranking Score of 30.90. The Site was subsequently proposed for the **National Priorities List** in September 1985 and was finalized on the List in June 1986.

3. SCOPE AND ROLE OF ACTION

The **Remedial Investigation/Feasibility Study (RI/FS)** completed for the Halby Chemical Site revealed that the contamination problem is complex. To simplify and expedite action at the Site, EPA has divided



Source: USGS 7.5 minute Quadrangle Map (Wilmington South)

FIGURE 1
SITE LOCATION MAP

HALBY CHEMICAL SITE FEASIBILITY STUDY
NEW CASTLE COUNTY, DELAWARE

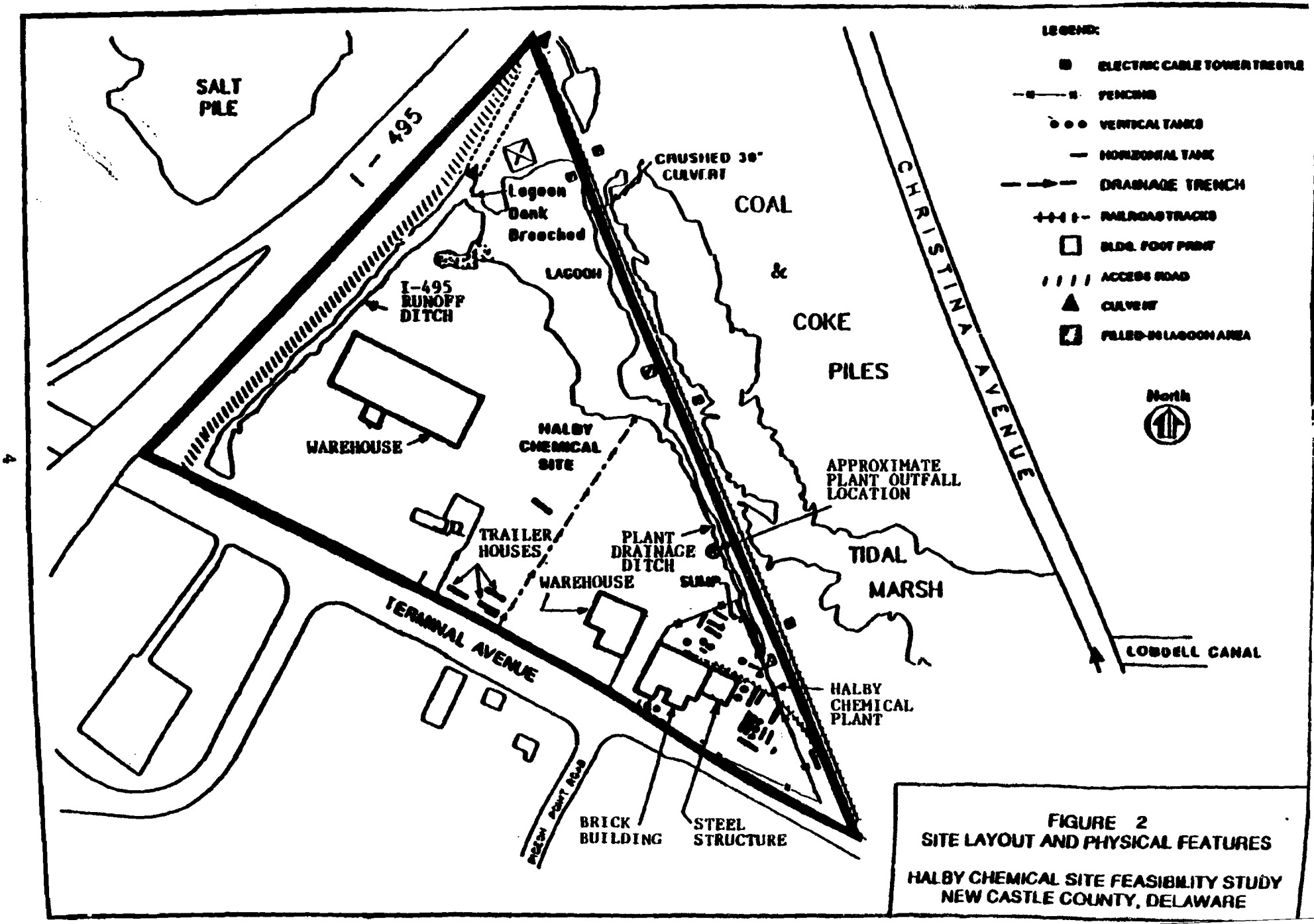


FIGURE 2
SITE LAYOUT AND PHYSICAL FEATURES

HALBY CHEMICAL SITE FEASIBILITY STUDY
NEW CASTLE COUNTY, DELAWARE

the planned remedial action into two more manageable components or **Operable Units.** The scope of both of the Operable Units can be summarized as follows:

* Operable Unit 1: Contamination in soils inside the process plant area, and sediments and surface water within the lagoon and drainage ditch next to the process plant.

* Operable Unit 2: Contamination of the air, **groundwater**, sediments in the outfall area adjacent to the process plant and sediments in the area east of the Halby property which includes the tidal marsh area.

This Proposed Plan addresses **Operable Unit** 1 at the Site. The contaminated soil inside the process plant area was determined to be the main threat at the Site due to the potential for direct contact health risks to on-site workers. The cleanup objective for **Operable Unit** 1 is to prevent current and future exposure to contaminated soils and sediment at the Halby Chemical Site.

Further investigations will be conducted concerning the **groundwater**, air releases, sediment in the outfall area adjacent to the process plant and the area east of the Halby property including the tidal marsh area. A separate Proposed Plan will be issued when the studies associated with **Operable Unit** 2 are completed.

4. SUMMARY OF SITE RISKS

An **Endangerment Assessment** was prepared to assess the potential health effects that may result from exposure to contaminants at the Site. Table 1 provides a summary of the Endangerment Assessment for overall Site risks. Table 2 provides a summary of risks associated with both the process plant area and the lagoon for **Operable Unit** 1. Remedial action is generally warranted at a site when the calculated **carcinogenic** risk level exceeds 10^{-4}, meaning that one additional person out of 10,000 is at risk of developing cancer. The potential for health effects resulting from exposure to noncarcinogenic compounds is estimated by comparing an estimated dose to an acceptable level. 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.

Contamination at the Site is a result of previous wastewater discharges and plant operations. Soil contamination was detected at the process plant outfall and within the plant area. Major contaminants include heavy metals (arsenic, lead, and zinc), polynuclear aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) including carbon disulfide. A risk assessment for the Site indicates that exposures to contaminating substances through a number of present and future pathways may result in cancer risks which exceed EPA's target risk range of 10^{-6} to 10^{-4}, or which result in a high potential for noncarcinogenic adverse health effects.

TABLE 1
OVERALL SITE RISKS
RISK ASSESSMENT SUMMARY

	Cancer Risk	Hazard Indices
1. Occupational Exposures		
a. Current Use		
Surface Soil	4.3×10^{-4}	.16
Lagoon	2.7×10^{-5}	.59
Marsh	4.2×10^{-6}	.31
Surface Water	1.6×10^{-7}	.004
Inhalation (Monitored)	1.5×10^{-5}	.12
Inhalation (Modeled)	1.5×10^{-7}	.04
b. Future Use		
Showering (shal. groundwater)	5.5×10^{-4}	110
Showering (int. groundwater)	2.2×10^{-5}	4.7
Subsurface soil	1×10^{-7}	.025
2. Residential Exposures		
Surface Soil	3.1×10^{-5}	1.5
Inhalation (Monitored)	2.8×10^{-4}	0.9
Inhalation (Modeled)	2.9×10^{-6}	1.0

TABLE 2
OPERABLE UNIT 1
RISK ASSESSMENT SUMMARY
PROCESS PLANT AREA

	Cancer Risk	Major Contaminants
1. Occupational Exposures		
a. Current Use		
Surface Soil	4.3×10^{-4}	Arsenic & CPAHs
b. Future Use		
Subsurface Soil	1×10^{-7}	N/A
2. Residential Exposures		
Surface Soil	3.1×10^{-5}	Arsenic & CPAHs

TABLE 2, cont.
RISK ASSESSMENT SUMMARY
LAGOON AREA

	Cancer Risk	Major Contaminants
Current Use		
Lagoon	2.7×10^{-5}	Arsenic
Surface Water	1.6×10^{-7}	N/A

BIOLOGICAL ASSESSMENT SUMMARY
LAGOON AREA

Contaminants of Concern	Clean-up Levels
ammonia	
arsenic	50 ppm
cadmium	5 ppm
carbon disulfide	
lead	300 ppm
mercury	1 ppm
thiocyanate	
zinc	260 ppm

Present use on-site exposure pathways for which the expected value of cancer risk exceed 10^{-6} include dermal contact and ingestion of surface soil, inhalation of suspended soil, dermal contact and ingestion of sediments from the lagoon, and inhalation of volatiles released from soil and surface water.

The human health risks associated with exposure to the wastes found at the Site are fully evaluated in the Public Health Evaluation Report (Risk Assessment). The environmental risks associated with exposure to the wastes found at the Site are fully evaluated in the Biological Assessment in the RI Report, Appendix E of the **Feasibility Study,** and in the draft Analytical Chemistry and Solid Phase Toxicity Bioassay Report of April 1991 in the **Administrative Record** for the site.

The remedial action objectives for each media in **Operable Unit** 1 are as follows:

Soil - The soil inside the process plant area poses an unacceptable health risk to workers because of the potential for direct contact, ingestion, or inhalation of contaminated soil. The remedial action objective is to prevent exposure to contaminated soil which would result in an excess cancer risk of greater than 1×10^{-5}, which represents the excess cancer risk value associated with the background levels of contaminants, or a **Hazard Index** greater than 1. The cleanup levels were set at background for engineering practicality. It is estimated that up to 10,300 cubic yards of contaminated soil inside the plant would require remediation.

Sediment - The sediment in the lagoon and drainage ditch poses direct contact threats and toxicity to the environment. There are no established criteria for cleanup of contaminated sediments. The remedial action objectives would be to prevent exposure to contaminated sediments which would result in adverse environmental impacts. The lagoon and plant drainage ditch sediment would require remediation for several inorganics to cleanup levels as shown in Table 2. Contaminated sediment volumes were estimated from 3,400 cubic yards to 25,000 cubic yards, depending on the extent of remediation provided.

Surface Water - The surface water at the Site does not pose an unacceptable health risk; however, the water must be removed in order to remediate the lagoon sediment. Since the surface water in the lagoon is contaminated by Site contaminants, treatment would be required prior to its disposal in order to comply with the State's surface water quality standards. The effluent quality should comply with the National Pollutant Discharge Elimination System (NPDES) requirements and should be equal to or better than the water quality of the Christina River.

5. ALTERNATIVES ANALYZED

The following alternatives were evaluated in detail in the **Feasibility Study** to determine which would be most effective in

achieving the goals of CERCLA, and in particular, achieving the remedial action objectives for the Site. The detailed analysis of remedial alternatives for the areas of the Site are briefly described below. The alternatives are numbered to correspond with the numbers in the RI/FS Report. The cost summaries presented with each alternative are estimates and should be used for comparative purposes only.

5.1 No Action

	Alternative S-1	**Alternative L-1**
Capital Costs:	$ 40,000	$ 0
Annual O & M:	$ 38,000	$ 0
Present Worth:	$ 655,000	$ 0

Under Section 300.430(e)(6) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 55 Fed. Reg. 8,849 (1990) (to be codified at 40 C.F.R. § 300.430(e)(6)), EPA requires that the "no action" alternative be evaluated at every site to establish a baseline for comparison to other alternatives. Under this alternative, no action would be taken to remediate the contaminated soil or sediment at the Site. Therefore, this alternative would not achieve the remedial action objectives and would not be protective of human health and the environment. The no action alternative provides for long-term **monitoring** and site reviews every five years. Long-term monitoring of the Site would examine the sediment, surface water, and **groundwater** contaminants. The program would identify any changes in the site conditions which could pose an increase in the risk from the Site. This monitoring program would include annual visual site inspections with sampling and analysis of areas that are suspect. Because this alternative does not entail contaminant removal, the Site would have to be reviewed every five years in accordance with requirements of the Superfund Amendments and Reauthorization Act (SARA).

5.2 Process Plant Soil Alternatives

The following is a summary of the alternatives that were developed to deal with the contaminated soils in the process plant area.

<u>Alternative S-2: Limited Action</u>

Capital Costs:	$ 70,000
Annual O & M:	$ 39,000
Present Worth:	$ 696,000

The limited action alternative would not include any action to remediate the on-site soil. Deed restrictions to prevent construction and well drilling on-site, an air sampling program, fencing, long-term **monitoring**, and five-year site reviews would be implemented for 30 years.

The limited action alternative would provide some protection to

human health by restricting **groundwater** use and implementing a public awareness program but will not provide protection against direct contact risks to workers. It would not reduce the toxicity, mobility, or volume (TMV) of contaminated soil on-site. This alternative is not effective in the long term. This alternative is implementable and has negligible short-term impacts.

Alternative S-3: **Capping**

Capital Costs:	$ 493,000
Annual O & M:	$ 43,000
Present Worth:	$ 1,188,000

An asphalt **cap** would be placed inside the plant area to prevent direct contact with the contaminated soils and fugitive dust migration. This alternative also includes deed restrictions, an air sampling program, fencing, long-term **monitoring**, and five-year site reviews.

The asphalt capping alternative would achieve the remedial action objectives by eliminating risks from direct contact with soil. It would not reduce the toxicity, mobility, or volume of contaminated soil. Capping would require long-term monitoring and maintenance to be effective. The asphalt cap would require maintenance and possibly replacement. This alternative is implementable and has a small short-term impact.

Alternative S-4: Surface Soils **Stabilization**/Asphalt **Cap**

Capital Costs:	$ 891,000
Annual O & M:	$ 43,000
Present Worth:	$ 1,586,000

This alternative involves the excavation of the contaminated surface soils in the process plant area followed by stabilization of these soils and replacement back to the excavated area. The excavation would include only the top six inches of soil. The contaminated soil would be mixed with stabilization agents to immobilize the contaminants of concern and would be placed back over the excavated area. The backfilled soil would be compacted to provide a stable sub-base for the asphalt cap. Any structures and outdoor equipment will be left intact. The asphalt cap would cover approximately 5,800 SY and would be placed approximately seven inches thick. The area used for truck access and parking would require some roadbed track. Prior to implementing this alternative, a treatability study would be performed to identify a proper stabilization formula. The alternative would also include deed restrictions, air sampling programs, fencing, long-term **monitoring**, and five-year site reviews.

The stabilization/capping alternative would achieve the remedial action objectives. The contaminants in the surface soil would be immobilized by **stabilization** and contained beneath the asphalt cap. Toxicity and volume of contaminants would not be changed. Location-specific and action-specific **ARARs** would be complied with. Long-term

maintenance and monitoring are required. The asphalt cap would require maintenance and possible replacement in the future.

Alternative S-4a: Modified Soils Stabilization/Asphalt Cap

Capital Costs:	$ 1,850,000
Annual O & M:	$ 43,000
Present Worth:	$ 2,700,000

This alternative is a modification of Alternative S-4. The only difference between S-4 and S-4a is that S-4a addresses soil stabilization with depth. Depth would be determined during pre-design investigations. A soil grid sampling program would be required to locate contaminants with depth that exceed a set criteria. The estimated costs were calculated based on a depth of two feet throughout the process plant area. Actual results of the soil grid sampling will be used to define exact depths to which soil would be remediated. Costs would be adjusted accordingly.

Alternative S-5: Excavation/Off-Site Disposal

Capital Costs:	$ 4,995,000
Annual O & M:	$ 38,000
Present Worth:	$ 5,610,000

This alternative involves the excavation of 10,300 cubic yards of contaminated soil to the groundwater table but not greater than a depth of five feet. The contaminated soil would be hauled to an off-site RCRA landfill for disposal. Tanks and equipment outside of the buildings would be decontaminated and dismantled prior to excavation. Excavated areas would be backfilled with clean fill material, covered with a layer of topsoil and revegetated. This alternative also includes deed restrictions, an air sampling program, long-term monitoring, and five-year site reviews.

This alternative would achieve the remedial action objectives. The toxicity and volume of contaminants on-site would be reduced permanently as contaminated soils are removed. The alternative would meet location- and action-specific ARARs. Long-term monitoring is required as some contaminants would still remain on-site. This alternative is implementable but would require consent from the current plant owner to shut down the plant. This alternative would have some short-term impacts.

5.3 Lagoon Sediment Alternatives

The following is a summary of the alternatives that were developed to deal with the contaminated sediments in the lagoon and drainage ditch. Please note that the deed restrictions, long-term monitoring efforts and the five year reviews which were discussed under the process plant soil alternatives would be provided to address the contaminated sediments under each of the following alternatives.

Alternative L-2: Limited Action

Capital Costs:	$ 57,000
Annual O & M:	$ 1,000
Present Worth:	$ 75,000

The limited action alternative would include fencing around the lagoon and plant drainage ditch to limit access.

The limited action alternative would not achieve the remedial action objectives. It would not reduce toxicity, mobility, or volume of contaminated sediment. As a result, the source of the surface water contamination would remain and continue to degrade the surface water and **groundwater**. This alternative would not be effective in the long-term as contaminants would remain in the lagoon. This alternative would be implementable and would have negligible short-term impacts.

Alternative L-3: Soil Barrier

Capital Costs:	$ 1,197,000
Annual O & M:	$ 5,000
Present Worth:	$ 1,266,000

The lagoon would be bermed off, pumped dry with treatment of surface water, sediments dewatered to provide a stable sub-base, and covered with one foot of soil. The top foot of contaminated sediment from the plant drainage ditch (220 cubic yards) would be consolidated into the lagoon before covering with clean fill (compatible grain size to existing sediment). The covered lagoon would then be reestablished as wetland.

The soil barrier alternative would achieve the remedial objectives by eliminating risks from direct contact for humans and biota. There are no chemical-specific **ARARs** for the sediment, however, cleanup levels derived from toxicity information were established for the lagoon sediment. This alternative would comply with location- and action-specific **ARARs**. However, the wetland would be disrupted. It would not achieve reduction in toxicity, mobility, or volume of contaminants because no treatment would be provided. The soil barrier would require long-term **monitoring** and maintenance to be effective. The alternative would have short-term impacts to the wetland.

Alternative L-4: Stabilization/On-Site Disposal

This alternative was eliminated as a possible alternative during the Feasibility Study.

Alternative L-5 : In-Situ Stabilization

Capital Costs:	$ 3,352,000
Annual O & M:	$ 5,000
Present Worth:	$ 3,421,000

Under this alternative, the lagoon would be bermed off and dewatered. The top four feet of contaminated sediment from the plant drainage ditch (900 cubic yards) would be consolidated into the lagoon. The sediment would then be stabilized in-situ to a depth of six feet and reestablished as a wetland.

The in-situ stabilization alternative would achieve the remedial action objectives. However, the wetland would be disrupted. This alternative would comply with location- and action-specific **ARARs**. Stabilization would reduce the mobility of the contaminants but not the toxicity. The volume of the contaminated sediments would actually increase as a result of the stabilization process. This alternative would meet the SARA preference for on-site treatment. Stabilization would require long-term maintenance of the **cap** and monitoring to be effective. This alternative would have short-term impacts to the wetland.

Alternative L-6: Excavation/Off-Site Disposal

Capital Costs:	$ 11,233,000
Annual O & M:	$ 0
Present Worth:	$ 11,233,000

Under this alternative, the lagoon would be bermed off and dewatered. The contaminated sediment from the lagoon (20,000 cubic yards) and drainage ditch (900 cubic yards) would be excavated, air dried, and shipped off-site for disposal. The excavated areas would then be backfilled and the lagoon reestablished as wetland.

Alternative L-6 would achieve the remedial action objectives and would comply with location- and action-specific **ARARs**. No reduction in toxicity, mobility, or volume would be achieved since no treatment would be provided. However, the excavation and disposal action would significantly reduce the toxicity and volume of on-site contaminants. As most contaminants would be removed, little long-term **monitoring** would be required. This alternative would have short-term impacts to the wetland.

6. THE PREFERRED ALTERNATIVE

The EPA preferred alternative for the two areas of concern associated with **Operable Unit** 1 at the Halby Chemical Site are as follows:

* Process Plant Soil -	Alternative S-4: Surface soils Stabilization/Asphalt **Cap**	$ 1,586,000
* Lagoon Sediment -	Alternative L-3: Soil Barrier	$ 1,266,000
	Total	$ 2,852,000

Based on current information, these alternatives appear to provide the best balance of trade-offs with respect to the nine criteria that EPA uses to evaluate alternatives. EPA believes the preferred alternative will satisfy the statutory requirements of Section 121(b) of CERCLA, 42 U.S.C. § 9621(b), which provides that the selected alternative be protective of human health and the environment, comply with **ARARs**, be cost effective, and utilize permanent solutions and treatment to the maximum extent practicable. The selection of Alternatives S-4 and L-3 is preliminary and could change in response to public comments.

The following summary profiles the performance of the preferred alternatives in terms of the nine evaluation criteria listed in Glossary, noting how it compares to the other alternatives under consideration. The following comparative analysis is provided for both the process plant soil alternatives and the lagoon sediment alternatives.

6.1 Comparative Analysis of the Process Plant Soil Alternatives

Overall Protection of Human Health and the Environment

Alternative S-5 (Excavation/Off-site Disposal) provides the most protection for human health and the environment as most contaminants would be removed from the Site. S-5 eliminates exposures through direct contact, ingestion, and inhalation of contaminated soil. The preferred alternative S-4 (Surface Soil **Stabilization**/Asphalt **Cap**), Alternative S-4a (Modified Soil Stabilization/Asphalt Cap) and Alternative S-3 (Capping) provide similar protection from contaminated soil. The asphalt cap in all alternatives and the stabilized soil in the preferred alternative would prevent direct contact, ingestion, and inhalation of contaminated soil. However, these processes are reversible (cap failure) and are not as permanent as the removal action in Alternative S-5. The preferred alternative (S-4) and Alternative S-4a are superior to Alternative S-3 in minimizing risk subsequent to a cap failure as S-4 and S-4a provide for **stabilization** of surface soil. Alternative S-2 (Limited Action) does not provide protection from contaminated soil for the process plant workers.

Because the "no action" alternative (S-1) is not protective of

human health and the environment, it is not considered further in this analysis as an option for this Site.

Compliance with ARARs

There are no chemical-specific ARARs for contaminated soil. However, the preferred alternative S-4 (Surface Soil Stabilization/Asphalt Cap), Alternative S-4a (Modified Soil Stabilization/Asphalt Cap), Alternatives S-3 (Capping) and S-5 (Excavation/Off-site Disposal) comply with health-based cleanup goals and achieve the remedial action objectives. Alternative S-2 (Limited Action) does not comply with the soil cleanup goals and does not achieve the remedial objectives.

There are no location-specific ARARs associated with the soil alternatives because the process plant is not located in a wetland, within a 100-year flood plain, in an area that is a critical habitat for endangered species, or in an area that is of historic or archeological value. All alternatives would be executed in a fashion that is in compliance with all action-specific ARARs.

Long-term Effectiveness and Permanence

Alternative S-5 (Excavation/Off-site Disposal) would be the most effective in the long term as the removal process is not reversible . Alternative S-5 removes nearly all of the contaminated soil. The preferred alternative S-4 (Surface Soil Stabilization/Asphalt Cap), Alternative S-4a (Modified Soil Stabilization/Asphalt Cap) and Alternative S-3 (Capping) would provide less protection than Alternative S-5 as all contaminants would remain on-site. Capping and stabilization of surface soil are both reversible. The asphalt cap has a finite lifetime. If the cap which would be installed under Alternate S-3 were to fail the potential risks would be similar to existing conditions; the potential risks would be less for the preferred alternative (S-4) and Alternative S-4a as the surface soil would be stabilized, thus providing a protective layer. The preferred alternative and Alternative S-4a would require a treatability study to identify an effective formula for the stabilization process.

Alternative S-2 (Limited Action) would provide limited protection by restricting access. Alternatives S-3, S-4, S-4a and S-5 would also reduce leaching into the groundwater. Alternative S-5 would require the least maintenance while the preferred alternative and Alternative S-3 would require maintenance of the caps and Alternative S-2 would require maintenance of the fence. All alternatives have identical long-term monitoring. Deed restrictions are included for all alternatives except the no action alternative. Alternative S-2 has the highest possibility of requiring future actions. The asphalt caps in the preferred alternative (S-4) and Alternative S-3 and S-4a would require replacement some time in the future. Alternative S-5 has the least possibility of requiring future actions.

Reduction of Toxicity, Mobility, or Volume

Alternative S-5 (Excavation/Off-site Disposal) reduces toxicity, mobility, and volume of contaminants on-site by providing for off-site disposal. The preferred alternative S-4 (Surface Soils Stabilization/Asphalt Cap) reduces contaminant mobility by the stabilization process. However, the treatment only extends to 6 inches below the ground surface. Subsurface soils are contaminated but are not treated. The preferred alternative (S-4) and S-3 (Capping) reduce infiltration of rain water by capping. Alternative S-2 (Limited Action) does not reduce toxicity, mobility, or volume of contaminants.

Short-term Effectiveness

Alternative S-2 (Limited Action) includes upgrading the existing fence and the installation of warning signs. Implementation of this alternative presents little risks to the community, the workers, and the environment. Alternative S-3 (Capping) involves capping of the Site and has a greater chance of releasing contaminants during implementation than Alternative S-2. The preferred alternative S-4 (Surface Soils Stabilization/Asphalt Cap) and Alternative S-4a (Modified Soils Stabilization/Asphalt Cap), and S-5 (Excavation/Off-site Disposal) involve excavating contaminated soils and have the greatest chance of air emissions. Alternative S-5 involves more soil handling and will take the longest time to implement. It also involves shipping waste off-site. It therefore has the highest short-term risks.

Implementability

Alternative S-2 (Limited Action) requires the least amount of construction, however, this alternative does not achieve the remedial action objectives. Construction requirements for Alternative S-3 (Capping) are fairly simple. Capping is a reliable technology for prevention of direct contact, ingestion, and inhalation of soil particles. However, the cap must be maintained in order for it to be effective. The preferred alternative S-4 (Surface Soils Stabilization/Asphalt Cap) and S-4a (Modified Soil Stabilization/Asphalt Cap) involve more construction activities than S-3. They include excavation, stabilization, replacement of treated soil, and capping. Alternative S-5 (Excavation/Off-site Disposal) has the most construction activities associated with it and involves the largest volume of contaminated soil. It also includes decontamination and dismantling of tanks and equipment. It would be the most difficult to implement.

All alternatives except Alternative S-5 have similar administrative feasibility. All alternatives require deed restrictions, and long-term monitoring. However, Alternative S-5 would require shutdown of the plant permanently, which would require consent from the current plant owner. All alternatives utilize proven technologies. Services and materials are readily available. However, the preferred alternative (S-4) and S-4a may utilize proprietary

stabilization formulae which may limit competition to perform the remedial action.

Cost

The construction costs (capital costs) for each of the alternatives are estimated as follows:

* Alternative S-2: Limited Action	$ 70,100
* Alternative S-3: Capping	$ 493,000
* Alternative S-4: Surface Soils Stabilization/Asphalt Cap	$ 891,000
* Alternative S-4a: Modified Soils Stabilization/Asphalt Cap	$ 1,850,000
* Alternative S-5: Excavation/ Off-Site Disposal	$ 4,995,000

6.2 Comparative Analysis of The Lagoon Sediment Alternatives

Overall Protection of Human Health and the Environment

Alternative L-6 (Excavation/Off-site Disposal) provides the most protection to humans and the environment from direct contact risks from the lagoon sediment since contaminated sediment above the cleanup levels for inorganics would be removed from the Site. Alternative L-5 (In-situ **Stabilization**) and the preferred Alternative L-3 (Soil Barrier) also provide protection from direct contact risks through placement of a soil cover. Alternative L-5 provides in-situ **stabilization** treatment to further reduce the mobility of contaminants contained within the covered area. The limited action alternative (L-2) does provide access restrictions to limit access to contaminated sediments. Because this is a tidally influenced area, sediment movement with the surface water is an active mode of contaminant transport towards human and environmental receptors.

Remedial activities causing short-term impacts to the wetland would occur in the preferred alternative L-3 and Alternatives L-5 and L-6. These activities are primarily unavoidable in order to provide access to the contaminated sediment and to allow for final grading and restoration of the wetland. In all cases, the wetland would be restored to its original use, although time would be required for biota to become reestablished in the disturbed areas. Alternative L-2 does not require disturbance of the wetland.

Because the "no action" alternative (L-1) is not protective of human health and the environment, it is not considered further in this analysis as an option for this Site.

Compliance with **ARARs**

There are no chemical-specific **ARARs** for contaminated sediments. Cleanup levels for the sediment were derived from toxicity information to protect biota at the Site. Alternative L-6 (Excavation/Off-site

Disposal) would meet the cleanup levels by excavating and removing the contaminated sediment exceeding these levels and disposing of the sediment at an off-site landfill. Alternative L-5 (In-situ **Stabilization**) does provide treatment of the sediment prior to containment, although like the preferred alternative L-3 (Soil Barrier), sediment remains on-site. The remedial action objectives would be met for these alternatives. For Alternative L-2 (Limited Action), remedial action objectives would not be attained.

Alternatives L-5, L-6 and the preferred alternative (L-3) would comply with NPDES discharge requirements for surface water pumped and treated during the dewatering of the lagoon which would occur prior to remediation.

Remedial activities at the lagoon would not necessarily comply with location-specific **ARARs** since the preferred alternative L-3 and Alternatives L-5 and L-6 involve work in the wetland and flood plain. The activities would be of short duration and the wetland will be restored. In the event that a 100-year flood occurs during remediation, a small portion of the Site would be exposed to flood waters such that the impact to the beneficial properties of the flood plain would be minimal. Alternative L-2 does not require any disturbance of the wetland or flood plain and would therefore, be in compliance with these location-specific **ARARs**. Endangered species are not present in the area of the lagoon.

All alternatives would be executed in a manner that is in compliance with action-specific **ARARs** for items such as OSHA, **RCRA** transportation and manifest documentation, and air emissions.

Long-Term Effectiveness and Permanence

Alternative L-6 (Excavation/Off-site Disposal) would be most effective in the long-term since off-site disposal of contaminated sediment is not reversible and does not require long-term maintenance. This alternative provides the highest degree of long-term effectiveness and permanence in mitigating direct contact risks to contaminated sediments. Alternative L-5 (In-situ **Stabilization**) provides treatment of the contaminated sediment which is effective and proven. However, the potential for deterioration of the in-situ stabilized material exists if low pH water comes into contact with the material. Verification of immobilization of the contaminated sediment must be evaluated based on the long-term **monitoring** program. The preferred alternative L-3 (Soil Barrier) would rely on the soil barrier to prevent direct contact of the sediment to humans and biota. Erosion of the soil barrier resulting from the tidal surface water in the wetlands could make the barrier less reliable.
Therefore, an annual inspection of the lagoon would be provided to ensure that the integrity of the soil barrier is maintained.

Alternative L-2 (Limited Action) does not provide any type of remedy for the contaminated sediment but the direct contact risk is slightly reduced because of the installation of the fence. This alternative has the highest probability of requiring future remedial actions. All alternatives employ deed restrictions and long-term

monitoring as provided in soil remedial alternatives. These institutional controls are only effective if enforcement is carried out.

Reduction of Toxicity, Mobility, or Volume

Alternative L-6 (Excavation/Off-site Disposal) reduces the toxicity, mobility, and volume of contaminated sediments at the lagoon. The mobility of the contaminants are further reduced by placement in a landfill. Alternative L-5 (In-situ Stabilization) reduces the mobility of the contaminants by immobilizing the inorganics in the stabilized sediment matrix and reduces the permeability of the material to limit leachate production from both consolidation and infiltration. A slight volume increase because of reagent addition is anticipated with the in-situ stabilization alternative. The soil barrier used for the preferred alternative L-3 (Soil Barrier) also reduces the mobility of the contaminants to some degree by reducing the direct contact of surface water with the contaminants in the sediments. The Soil Barrier would reduce the level of contaminants available for surface water runoff. Alternative L-2 (Limited Action) does not reduce the toxicity, mobility, or volume of the contaminants.

Short-Term Effectiveness

Alternative L-2 (Limited Action) includes installation of a fence at the lagoon and drainage ditch areas. Implementation of this alternative provides the least short-term risks to the community, workers, and the environment.

The preferred alternative L-3 (Soil Barrier) involves a clean soil cover over the lagoon after drainage ditch sediments are placed in the lagoon for consolidation and a significant construction activity involving dewatering the lagoon and sediment to provide a foundation for the soil cover. Workers would require protection from contact with contaminated groundwater and sediment in the lagoon area to complete the dewatering process. Alternatives L-3 and L-6 (Excavation/Off-site Disposal) require excavation of contaminated sediments. Alternative L-3 involves the least amount (220 CY) and Alternative L-6 requires the largest amount (24,900 CY). In addition, Alternative L-6 requires air drying of excavated sediments and off-site transport of contaminated sediments, posing an additional risk of contact with workers and residents. Air emissions are a consideration for conducting Alternative L-5, the in-situ stabilization process at the lagoon. Dust control methods can be implemented with these alternatives, if necessary. Additional traffic in the area from transport of materials and off-site disposal would not significantly impact workers and residents in the area since the Site is within a heavy industrial area. Alternative L-5 and Alternative L-6 have the highest short-term risks.

Implementability

Alternative L-2 (Limited Action) which would provide for the installation of a fence around the lagoon and drainage ditch could be implemented easily. This alternative does not achieve the remedial action objectives for the lagoon sediment.

The preferred alternative L-3 (Soil Barrier) includes the installation of a soil barrier. The installation of the soil barrier would be accomplished using relatively common construction equipment and materials. Dewatering of the sediments may be necessary in order to provide a stable base for movement of equipment during regrading of the lagoon base. In addition, a stable base would be required in order to minimize uneven settlement of the sediments. The load bearing capacity of the sediment would be determined during the remedial design phase. If the sediment should have sufficient load bearing capacity, dewatering may not be necessary. If this is not the case proper equipment for low load bearing capacity sediments would be required.

Alternative L-5 (In-situ Stabilization) also would require the services of a specialty contractor. Many vendors are available to perform treatability studies and in-situ stabilization. A performance based specification would be developed during the remedial design to allow the vendors to apply their proprietary processes to the site conditions. The placement of the soil cover over the stabilized material will be simpler than the preferred alternative L-3 since the stabilized material will actually provide the solid foundation for the construction equipment for placement of the cap.

Alternative L-6 (Excavation/Off-site Disposal) involves the largest volume of contaminated sediments but excavation, air drying, and transport to an off-site landfill would use common equipment and procedures. The movement of excavation equipment may be difficult because of the low bearing capacity of the sediments in the lagoon. Removal of the sediments at the plant outfall area would require a staging area for separation of clean and contaminated materials. Clean material will be used for backfill into the excavation area. All alternatives involve deed restrictions, and long-term monitoring which was previously detailed in the soil remedial alternatives for the entire Halby Chemical Site. All alternatives use proven technologies with services and materials readily available.

Cost

The construction costs (Capital Costs) for each of the alternatives are estimated as follows:

* Alternative L-2: Limited Action	$ 57,000
* Alternative L-3: Soil Barrier	$ 1,197,000
* Alternative L-5: In-Situ Stabilization	$ 3,352,000
* Alternative L-6: Excavation/ Off-Site Disposal	$ 11,233,000

State Acceptance of Alternatives S-4 & L-3

The State of Delaware supports the preferred alternative for the plant process area; however the State does not concur with the preferred alternative for the lagoon. The State of Delaware prefers that the decision for remedial action for the lagoon be deferred to Operable Unit 2 so that further studies on the lagoon can be conducted. The State will take comments received during the public comment period into account before finalizing its position on the proposed remedy.

Community Acceptance of Alternatives S-4 & L-3

Community acceptance of the preferred alternatives will be evaluated after the public comment period ends and will be described in the **Record of Decision (ROD)** for the Site.

7. COMMUNITY PARTICIPATION

EPA has identified Alternatives S-4 and L-3 as the preferred alternative for the Site. EPA relies on public input to make sure that the alternative(s) selected for each Superfund site is not only effective but meets the needs of the local community. For this reason, EPA is providing a public comment period on the Proposed Plan. This comment period will allow the public to comment on the alternatives in the FS and on the preferred alternative in particular. EPA will select a remedy based on the findings of the FS and the comments received during the public comment period. The selected remedy will be documented in a **Record of Decision** that summarizes EPA's decision process and responds to comments received from the public.

Copies of the FS and other Site-related documents are available for public review in the **Administrative Record** file identified in Section 1 of this Proposed Plan.

EPA will hold a public meeting at 7:00 p.m., May 2, 1991, at the De La Warr Center, 500 Rogers Road, New Castle, DE, to present a summary of the RI/FS and the preferred alternative. Interested citizens also will have an opportunity to ask questions and provide comments. The public comment period begins on April 19, 1991, and concludes on May 20, 1991. Comments must be postmarked on or before May 20, 1991. EPA encourages citizens to review Site-related documents and submit written comments to one of the following people:

Francesca Di Cosmo(3EA21)
Community Relations Coordinator
U.S. EPA Region III
841 Chestnut Building
Philadelphia, PA 19107
(215) 597-6924

Roberta Riccio (3HW25)
Remedial Project Manager
U.S. EPA Region III
841 Chestnut Building
Philadelphia, PA 19107
(215) 597-9238

GLOSSARY FOR ALTERNATIVE EVALUATION CRITERIA

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

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

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

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

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

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

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

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

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

HALBY CHEMICAL SITE GLOSSARY

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

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

Cap: A low-permeability layer placed over contaminated areas to reduce or eliminate the amount of precipitation that seeps through contaminated materials. By reducing the volume of precipitation that seeps through contaminated materials, the cap reduces the movement of contaminants from the site. Capping also prevents direct human contact with the contamination.

Carcinogenic: Cancer-causing.

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

Endangerment Assessment, or Risk Assessment: A means of estimating the amount of harm which a Superfund site could cause to human health and the environment. The objectives of an endangerment assessment are (1) to help determine the need for action by estimating the harm if the site is not cleaned up, (2) to help determine the levels of chemicals that can remain on the site and still protect human health and the environment, and (3) to provide a basis for comparing different cleanup methods.

Groundwater: Water found beneath the earth's surface that fills pores between soil, sand, and gravel particles to the point of saturation. Groundwater often flows more slowly than surface water. When it occurs in sufficient quantity, groundwater can be used as a water supply.

Hazard Index: The ratio between the average daily dose of a toxicant received by a human population and the reference dose. The reference dose is an average daily lifetime dose believed to be without adverse effects in human populations.

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

Monitoring: Ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action.

National Priorities List: EPA's list of the nation's top priority hazardous waste sites that are eligible to receive federal money for response under Superfund.

ppm: Part per million, when referring to a solid such as soil, concentration corresponding to one milligram per kilogram (mg/kg).

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

Record of Decision (ROD): A legal document that describes the final remedial actions selected for a Superfund site, why the remedial actions were chosen and others not, how much they will cost, and how the public responded.