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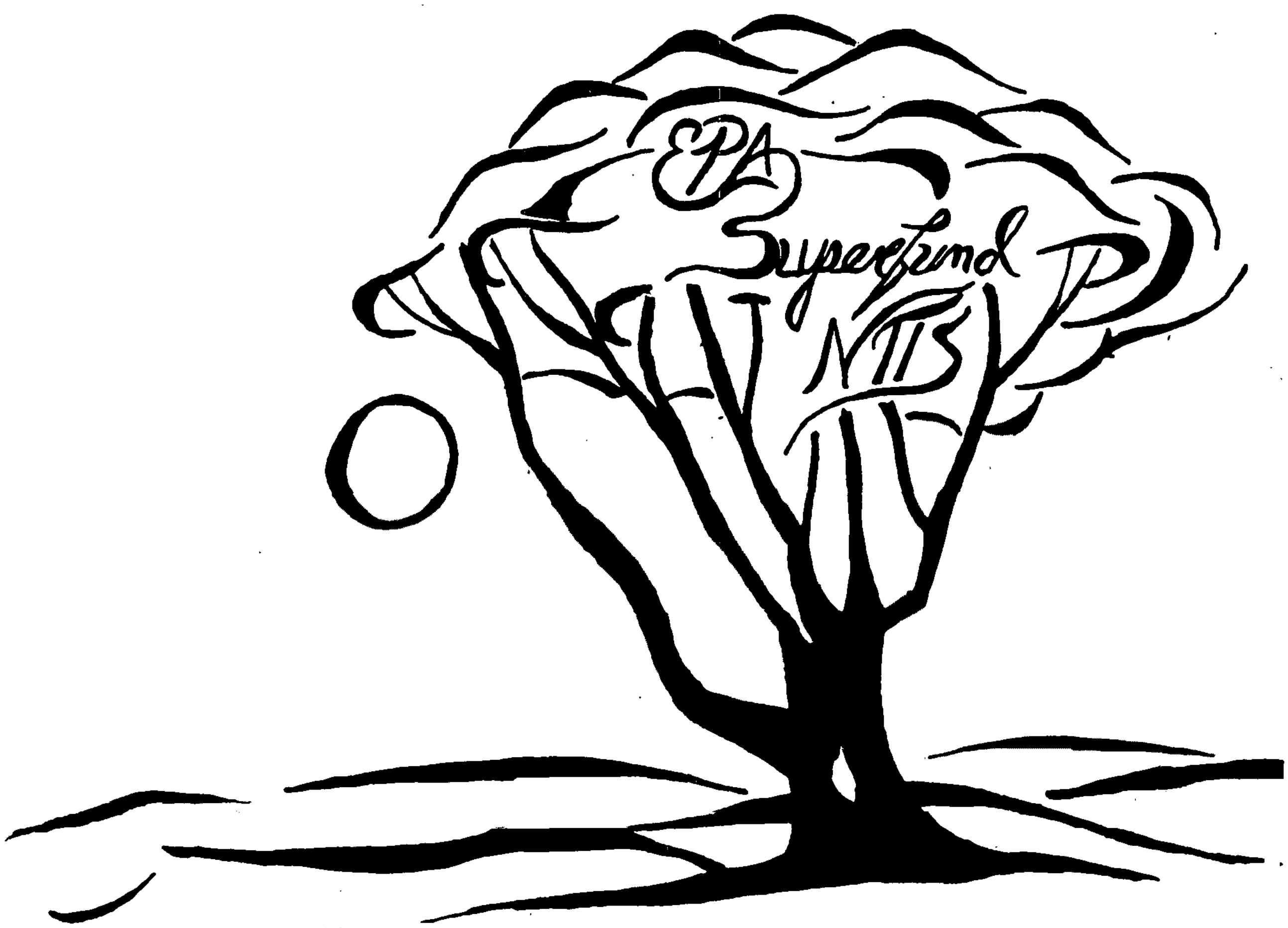
EPA Superfund Record of Decision:

Dayco Corp./L.E. Carpenter Co.
Wharton Borough, NJ
4/18/1994



SUPERFUND RECORD OF DECISION

L.E. CARPENTER/ DAYCO CORPORATION SITE
WHARTON BOROUGH
MORRIS COUNTY
NEW JERSEY

Prepared by: N.J. Department of Environmental Protection and Energy
Site Remediation Program
Bureau of Federal Case Management
April 1994

L. E. CARPENTER SITE
RECORD OF DECISION

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Site Name and Location

L. E. Carpenter / Dayco Corporation
Wharton Borough, Morris County, New Jersey

Statement of Basis and Purpose

This decision document presents the selected remedial action for the L. E. Carpenter Co./ Dayco Corporation site (hereinafter L. E. Carpenter site or site), in Wharton Borough, Morris County, New Jersey, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA) by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and New Jersey Public Law 1993, Chapter 139. This decision document explains the factual and legal basis for selecting the remedy for this site.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial threat to public health, welfare, or the environment.

Description of the Selected Remedy

The ROD addresses all contaminated media at the site including the soil and ground water. The selected remedy is "Ground Water Treatment with Reinfiltration/Soil Bioremediation".

The major components of the selected remedy include:

- Floating product/ground water extraction system installation and operation.
- Remediation via biological treatment of extracted ground water.
- Excavation and consolidation of bis(2-ethylhexyl)phthalate (DEHP) contaminated soils into soil treatment zone.
- Reinfiltration of a portion of treated ground water (with added oxygen and nutrients) into the unsaturated soil treatment zone via perforated piping to allow in situ bioremediation of contaminated soils.
- Recirculate a larger portion of treated water within the capture zone. Remaining treated ground water will be discharged into a deeper aquifer in accordance with ground water discharge criteria.

- Provide vegetative soil cover for the area of ground water infiltration system.
- Spot excavation and disposal of soils containing polychlorinated biphenyls (PCBs), lead and antimony where levels exceed the soil cleanup levels in locations other than the east soils area designated as the disposal area. Excavation and disposal of disposal area sludge/fill, which may inhibit in situ treatment.
- Environmental use restrictions on property.

Declaration of Statutory Determinations

The selected remedy 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 (or resource recovery) technologies to the maximum extent practicable, and it satisfies the statutory preference for remedies that employ treatment that reduce toxicity, mobility, or volume as their principal element.

This remedy will result in hazardous substances remaining on site while the remediation is in process. Therefore, a review may need to be conducted pursuant to CERCLA every 5 years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment until the soil remediation goals and ground water quality standards are met.

Signature
Lance Miller, Assistant Commissioner
NJDEPE

9/18/94
Date

DECISION SUMMARY

Decision Summary for the Record of Decision
L. E. Carpenter Site
Wharton Borough, New Jersey

1. *SITE DESCRIPTION*

The L. E. Carpenter Co. / Dayco Corporation site (hereinafter L. E. Carpenter site or site) is located at 170 North Main Street, Borough of Wharton, Morris County, New Jersey. The site occupies approximately 14.6 acres northwest of the intersection of the Rockaway River and North Main Street. The Rockaway River borders the site to the south; a vacant lot lies to the east; a compressed gas facility (Air Products Inc.) borders the site to the northeast. Residential properties are located on the northwestern side of the site, separated by Ross Street. Facility operation ceased in 1987. Presently the western portion of the site is used as warehouse space, the eastern portion is access restricted by a fence.

The Rockaway River provides recreational value (fishing, swimming and boating) from the Washington Forge Pond through to the Route 46 Bridge located in Dover Township. This section is currently classified as trout maintenance by NJDEPE.

Shallow ground water in the general vicinity of the site is not used as a potable water supply nor is it hydraulically linked to the city water supply wells. Potable water is supplied by the Wharton Borough Water Department. A search of available well records indicate that there are no private wells or public community water supply wells in the general area of the site.

The Borough of Wharton encompasses an area of approximately 2 square miles, with a population of approximately 5400 (Census data, 1990). The town of Dover, Mine Hill Township, Rockaway Township, Jefferson Township, and Roxbury Township are in close proximity of Wharton Borough. Approximately three quarters of the borough is zoned residential whereas the remaining is zoned commercial industrial.

2. *SITE HISTORY*

L. E. Carpenter manufactured vinyl wall coverings from 1943 to 1987. The manufacturing process involved the generation of waste solvents including xylene and methyl ethyl ketone, the collection of solvent fumes via "smog hog" condensers, the collection of particulate matter via a dust collector and the discharge of non-contact cooling water to the Rockaway River. From 1963 to 1970, waste material relating to the manufacturing operations were disposed of into an on-site impoundment. The active production of vinyl wall coverings ceased in 1987. Since that time, the portion of the facility east of the rail road tracks has been inactive and access restricted by a fence. The buildings west of the rail road tracks have been subleased as warehouse space and manufacturing operations.

NJDEPE conducted soil and ground water sampling on August 18, 1980 and March 3, 1981. Sampling results indicated the presence of volatile organic compounds, base neutral compounds, metals and polychlorinated biphenyls (PCBs). In addition, NJDEPE observed immiscible chemical compounds floating on the ground water table.

In response to the findings indicated from the sampling efforts, in 1982 L. E. Carpenter and NJDEPE entered into an Administrative Consent Order (ACO) which Carpenter agreed to delineate and remove soil and ground water contamination at the site. On February 24, 1983, an Addendum was added to the 1982 ACO to clarify its provisions.

In April of 1985, L.E. Carpenter was listed on the National Priorities List (Superfund). On September 26, 1986, the NJDEPE and Carpenter entered into and Amended ACO which superseded the previous Orders. Under the terms of the Amended 1986 ACO, L. E. Carpenter initiated a Remedial Investigation/Feasibility Study (RI/FS).

3. *ON GOING OR COMPLETED REMEDIAL PROGRAMS*

L. E. Carpenter implemented several remedial programs which have addressed some sources of contamination discovered at the site. In 1982, L. E. Carpenter removed approximately 4,000 cubic yards of sludge and soil from a former surface impoundment; excavated and removed starch drying beds; instituted, and has continued, a ground water monitoring program in 1984; and initiated a passive recovery system for the floating compounds on the ground water table. The passive recovery system has been upgraded twice, most recently in October 1993 to maximize its efficiency. In 1989, an extensive asbestos removal was completed in former Buildings 12, 13 and 14. These buildings were razed in January 1992. All underground and inactive aboveground storage tanks were decommissioned and removed from the facility in 1990 and 1991 pursuant to NJAC 58:10A.

Table 1 summarizes chronology of investigation and completed remedial activities.

Figures 1, 2, and 3 show site location; areas of contamination; and areas of study.

4. *HIGHLIGHTS OF COMMUNITY PARTICIPATION*

The following documents were made available to the public for review:

- Revised Report of Remedial Investigation Findings (June 1990)
- Supplemental Remedial Investigation (November 1990)
- Baseline Risk Assessment (January 1992)
- Bioremediation and Soil Flushing Treatability Study Report (July 1992)
- Final Supplemental Remedial Investigation Report (September 1992)
- Rockaway River Sediment Ecological Assessment (March 1993)
- Final Feasibility Study (October 1993)

The RI/FS Reports and the Proposed Plan for the L. E. Carpenter site were released to the public for comment on December 1, 1993. These documents were made available to the public in both the administrative record and an information repository maintained at the Wharton Borough Municipal Building and the Wharton Public Library. The notice of availability for these documents was published in the Daily Record on December 1, 1993. A public comment period on the documents was held from December 1, 1993 to December 31, 1993. In addition, a public meeting was held in the Borough of Wharton on December 8, 1993. At this meeting, representatives from NJDEPE, L. E. Carpenter and Roy F. Weston Inc., L. E. Carpenter's consultant, answered questions about problems at the site and the remedial alternatives under consideration. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this ROD.

A public meeting was held on June 28, 1989 in Wharton Borough which informed the public of the initiation of the RI/FS at the site. The community expressed concerns regarding suspected "satellite" dumping locations which are presently being investigated by the potential responsible party. NJDEPE also held a meeting with local officials on June 5, 1992 to brief them on the progress of the site investigation.

5. *SITE CHARACTERISTICS*

SOIL

To facilitate remedial investigations, the site was divided into three areas of study based upon former operations, specifically Area I, Area II, and Area III.

Figures 1, 2, and 3 show site location; areas of study; and areas of contamination which are applicable to the following discussion.

Area I is bounded by former Buildings 12, 13, and 14 and extends northeast along the railroad Right-of-Way (ROW), east across the site to include the drainage ditch and which is part of the Air Products property, across to the adjacent property approximately 500 feet north east into the Wharton Enterprises property to encompass the abandoned sewer line, and along the Rockaway River to the steel penstock. Shallow soil samples were collected in approximately 26 locations. Deep soil samples were collected from a depth immediately above ground water (2 to 8 feet below ground surface (BGS)) at 63 locations.

Shallow soils indicate levels of bis (2-ethyl-hexyl) phthalate (DEHP) at concentrations up to 15,000 ppm. Three surface soil samples collected at the Wharton Enterprises property indicated levels of PCBs up to 45 ppm. Metals, specifically antimony and lead, were detected at the southeast perimeter of former Building 13 and south of monitor well MW-9 at concentrations up to 413 ppm and 2230 ppm respectively.

Analysis of deep soil samples indicate levels of DEHP in concentrations up to 30,000 ppm in the area extending from former Buildings 13 and 14 in the west to the terminus of the abandoned sewer line in the east, and from the drainage ditch in the north to the Rockaway River in the south. VOCs, namely xylene at levels up to 460 ppm, and ethylbenzene up to 43 ppm were also detected. Lead and Antimony were detected at concentrations of 765 ppm and 423 ppm respectively.

Area II encompasses the western edge of Building 15 to the western edge of former Buildings 13 and 14 and the northern edge of Building 15 to the Rockaway River. A total of nine (9) shallow soil samples and four (4) deep (directly above the water table) were collected. Results indicate no contamination above the NJ soil cleanup criteria with the exception of one soil sample which indicated the presence of lead at a concentration of 2230 ppm.

Area III encompasses Buildings 2, 8 and 9, which border Ross Street and the Washington Forge Pond. A total of 18 shallow and 21 deep soil samples were collected. Area III deep soils investigation indicated elevated levels of base neutrals (BNs), mainly DEHP, at concentrations at 6,302 ppm west of Building 8. Shallow soil sampling results indicated concentrations of PCBs from non-detect (ND) to 2.9 ppm in the starch drying bed area at the northern portion of the site. Elevated levels of Antimony were found at a concentration of 828 ppm adjacent to the loading dock at Building 9.

GROUND WATER

Results of the ground water investigation at the site have determined that the extent of contamination is located in Areas I and II and restricted to the shallow aquifer which flows in a northeasterly direction, towards the Air Products drainage ditch. Ground water contamination exists in both a floating product and dissolved phase and has migrated onto the neighboring property, Wharton Enterprises. The predominant volatile organic chemicals are xylene at levels up to 120,000 ppb, and ethylbenzene at levels up to 26,000 ppb. The predominant base neutral is DEHP in concentrations from ND to 62,000 ppb. The existing floating product is being reduced using an on site passive recovery system. Metals, such as Arsenic and Antimony were detected in some of the ground water samples at concentrations up to an estimated concentration of 21.3 ppb and 540 ppb respectively.

ROCKAWAY RIVER AND AIR PRODUCTS DITCH

As part of the Remedial Investigation, surface water and sediment samples were taken to determine possible site impacts on the Rockaway River and sediments located adjacent to the river and the Air Products drainage ditch.

<u>Air Products Drainage Ditch</u>

The Air Products Drainage Ditch borders the L. E. Carpenter property on the north eastern portion of the property. The standing water located within the ditch eventually leads into the Rockaway River or percolates into ground water during periods of low water table. Sediment sample results indicate detectable levels of Total Base Neutrals and Metals. The predominant BN was DEHP found in concentrations from ND to 520 ppm. The predominant Metals were arsenic at concentrations up to 25.7 ppm, chromium at concentrations up to 34.7 ppm, lead at concentrations up to 503 ppm, mercury at concentration up to 21 ppm, and zinc at concentrations up to 336 ppm. Surface water samples indicate elevated levels of Volatile Organic Compounds. The predominant volatile organic compound was xylene at a detected concentration of 44 ppb.

Rockaway River

The Rockaway River borders the site from the south western portion up through the eastern portion. Sediment sampling results indicate elevated levels of Total Base Neutrals and Metals in samples on the eastern portion of the site. The predominant BN was DEHP, found in concentrations from 1.6 ppm to 76 ppm. The predominant Metals were antimony at concentrations up to 718 ppm, copper at concentrations up to 711 ppm and lead at concentration up to 339 ppm. Surface water samples indicated volatile organics at trace levels, below the Surface Water Quality Standards.

6. *SUMMARY OF SITE RISK*

Based upon the results of the Remedial Investigation, a baseline risk assessment was conducted to estimate the risks associated with current and future site conditions. The baseline risk assessment estimates the potential human health and ecological risk which could result from the contamination at the site if no remedial action were taken. Site risks are expressed in exponential terms when estimating the cancer risk. Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., 1×10^{-6} or 1E-6). An excess lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

Cancer potency factors (CPFs) 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 $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors 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.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals, that is not likely to be without an appreciable risk of adverse health effects. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

HUMAN HEALTH RISK ASSESSMENT

A four-step process is utilized for assessing site-related human health risks for a conservative estimate of reasonable maximum exposure scenario: *Hazard Identification*--identifies the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration. *Exposure Assessment*--estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., drinking contaminated well-water) by which humans are potentially exposed. *Toxicity Assessment*-- determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response). *Risk Characterization*--summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative (e.g., one-in-a-million excess cancer risk) assessment of site-related risks.

The baseline risk assessment selected site related contaminants of concern based on frequency of detection, toxicity and comparison to background levels. These contaminants included DEHP, antimony, PCBs, methylene chloride, benzene, ethylbenzene, polynuclear aromatic hydrocarbons (PAHs), chromium (hexavalent), 1,1-dichloroethane, 1,1-dichloroethene, tetrachloroethene, tricholoroethene, toluene, xylene, arsenic, lead, nickel. All of the above contaminants, except lead, antimony, ethylbenzene, xylene, and nickel are known to cause cancer in laboratory animals and are suspected to be human carcinogens. The chlorinated solvents such as 1,1,-dichloroethane, 1,1-dichloroethene, tetrachloroethene, tricholoroethene, are considered to be off-site related from the Air Products property and are above ground water quality standards.

The baseline risk assessment evaluated the health effects which could result from exposure to contamination if no action is taken to remediate sources of contamination as a result of:

* the ingestion, inhalation and skin contact with surface soil;
* ingestion, inhalation and skin contact with ground water

* incidental ingestion and skin contact with stream sediments;
* incidental ingestion and skin contact with surface water; and
* the consumption of contaminated animals (fish) from the Rockaway River.

Ground water is not currently used as a potable source at or within a 1 mile radius of the site. Therefore, human health risks associated with ingestion, inhalation and skin contact with contaminated ground water represents the hypothetical future use by a resident living on or directly adjacent to the site and using the ground water as a potable source.

Table 3 summarizes the risk estimates evaluated in the Risk Assessment.

Summary of Health Risks

Through a quantitative assessment of exposure pathways for the contaminants of concern, specific health risk levels were calculated to enable an evaluation of potential health risks for human receptors. The risk of cancer from exposure to a chemical is described in terms of the probability that an individual exposed for an entire lifetime (70) years will develop cancer. The carcinogenic risk, then, is a function of the estimated average daily intake over a lifetime and the cancer slope factor (SF) for the chemical of concern. Under the present use scenario, workers were assumed to spend 25 years at a job on site, therefore, an exposure duration of 25/70 years was used. In the future use scenario for resident exposures, carcinogenic risk was calculated based on the assumption that the resident is spending 30 years in one house, located within the site boundary. This represents 6 years of exposure as a child and 24 years exposure as an adult, therefore, exposure durations of 6/70 years and 24/70 years were used to calculate child and adult carcinogenic risk, respectively. Exposure duration considered in the child wader/swimmer scenario was based on a 6 month exposure per year over 6 years. Thus exposure durations of 6/12 months and 6/70 years were used. The quantitative health risk evaluation identified the following potential health risk for each media:

Soil

A cancer risk of 8.2×10^{-4} was established for an on-site employee; a cancer risk of 2.6×10^{-5} for a trespasser; and a cancer risk of 1.9×10^{-3} for a hypothetical future resident who is exposed to soil via incidental ingestion, inhalation and skin contact. The Hazard Index (HI) which reflects non carcinogenic effects for a human receptor was estimated to be 11 for an on-site employee, 2.1 for a trespasser, and 79 for a future resident.

Ground Water

A cancer risk was established for a hypothetical future resident for the ingestion, inhalation, and skin contact with ground water from the shallow, intermediate and deep zones who uses well water as a sole potable water source over a lifetime. The risks calculated are 4×10^{-4}; 1.3×10^{-4}; 4.0×10^{-4}; for shallow, intermediate and deep ground water respectively. The Hazard Index which reflects non-carcinogenic effects for the hypothetical future resident which ingests, inhales or has dermal contact with the ground water, was estimated to be 413 for shallow ground water, 4.4 for intermediate ground water and 6.2 for deep ground water. The carcinogenic and non carcinogenic risk for both intermediate and deep ground water have been determined to be an over estimation of the true conditions of the site because DEHP was only found to exceed the Ground Water Quality Standards in one well in each respective aquifer.

In the intermediate ground water, DEHP and arsenic exceeded the 10^{-6} carcinogenic risk levels and exceeded a HI of 1.0. DEHP was detected in one well (MW-12i at 77 ppb) above the Ground Water Quality Standard. Arsenic was detected in 1 of 14 samples below the Ground Water Quality Standard.

In the deep ground water, DEHP and 1,2-dichloroethane (1,2-DCA) exceeded carcinogenic risk levels and/or a HI of 1.0. Each compound was detected in only 1 of 10 samples. 1,2-DCA was detected as an estimated value and is below the Ground Water Quality Standard. The DEHP concentration has only been reported in one deep well (MW-11d at levels of ND, 3600 ppb and 820 ppb) in the area were ground water contamination is the highest. Since DEHP has only been detected at levels which exceed the Ground Water Quality Standard in one well, deep ground water does not warrant remediation, unless further studies conclude otherwise.

River Sediments

A cancer risk of 7.9×10^{-6} was established for a wader/swimmer who incidently ingests river sediments or through skin contact. The Hazard Index which reflects non-carcinogenic effects for a human receptor was estimated to be 0.32. An assessment of the Air Products drainage ditch determined that the ditch is inaccessible to the trespasser and too shallow to be used for wading and swimming. The potential risks due to exposure to these sediments are negligible. Thus the sediment samples taken at the drainage ditch were not included in this evaluation. Any potential contamination from the sediments will be captured by the proposed ground water recovery system.

River Surface Water and Fish Ingestion

A total carcinogenic risk of 2.1×10^{-7} was established for dermal contact of river surface water. A carcinogenic risk of 5×10^{-8} was established for the incidental ingestion of river water by waders and swimmers The Hazard Index which reflects non-carcinogenic effects for a human receptor was 0.013.

A total carcinogenic risk of 6.3×10^{-4} for consumption of fish (by both child and adult) was developed. The Hazard Index which reflects non-carcinogenic effects for a human receptor was estimated to be 1.6 (child). However, arsenic was the only identified carcinogenic substance present in surface water. Arsenic was detected in two of four of the surface water samples from the Rockaway River at an estimated value. These estimated (J) values were used in the baseline risk assessment. The risk estimate is based on consumption of a large amount (54 g/day) of fish caught from the river. It was further assumed that consumption occurred daily over a 30-year period. This approach results in a conservative overestimation of risk. Based on available information and the conservative evaluation, control of fish consumption does not appear to be warranted.

Conclusion

These calculated health risks represent a reasonable maximum exposure which represent a summation of the chemical-specific risks associated with each medium being evaluated. EPA has established a carcinogenic risk range for cleanup of contaminated sites of 1×10^{-4} to 1×10^{-6} excess cancer risk and a Hazard Index greater than 1.0 for non-carcinogenic risks. N.J.P.L. 1993 c139 requires that any proposed remedy must meet the cleanup criteria of 1×10^{-6} for each contaminant and a Hazard Index greater than 1.0 for non-carcinogenic risks. The more conservative 1×10^{-6} is used for achieving final remediation.

Actual or threatened releases of hazardous substances from this site, if not addressed by the proposed alternative may present a current or potential threat to public health, welfare or the environment.

Based on the scenarios presented, the contaminants identified in soil and shallow ground water exceed the acceptable risk established by NJDEPE of 1×10^{-6} and the EPA target risk range of 1×10^{-4} to 1×10^{-6} for carcinogenic risk and the Hazard Index of 1.0. Other scenarios that exceed the hazard index; fish consumption, intermediate and deep ground water exposure, do not indicate a need for remediation based on NJDEPE evaluation (see discussions under Ground Water and River Surface Water and Fish Ingestion on pages 9 and 10).

Estimated risk levels presented in the Risk Assessment (presented in section 5) were used to identify the primary soil contaminants. Potential risk due to exposure to soil contaminants results from ingestion of, inhalation of, or dermal contact with the soil. Exposure via each of these potential pathways would be eliminated if direct contact with the soil was prevented. The present indoor operations of the tenants at the site and any probable future use scenarios do not create a significant risk of direct soil contact by on-site workers, and the site is fenced to prevent trespassing.

If contact with the contaminated soil is not precluded, specific locations on site would have to be remediated. Hypothetical future residential use (using 95 % limit concentrations) resulted in estimated carcinogenic risks exceeding 1×10^{-6} or HI exceeding 1.0 for DEHP, Aroclor 1254, methylene chloride, benzene, ethylbenzene, five PAHs, antimony, and chromium (assuming hexavalent). Ninety percent of the carcinogenic risk was attributed to DEHP, which was found in approximately 90% of the soil samples collected.

However, based on the historical industrial use of the site, non residential use scenarios are more appropriate for estimating potential risks and identifying soil areas requiring remediation. To ensure nonresidential use of the site in the future, an environmental use restriction will be imposed. As discussed below, not all contaminants on Table 8 need to be addressed as part of the selected remedy herein.

Compliance with the soil cleanup criteria is determined using the following policy: Data generated within an area of concern, excluding any samples from a "clean" buffer zone, is what is being utilized for compliance averaging. An area of concern as first identified may be reduced or expanded based on site investigation sampling events. Only those samples which lie within the modified area of concern can be utilized for compliance averaging. The sample collection shall be from discrete six inch (6") intervals, unless poor sample recovery or other filed logistical problems occur. Samples from different depth intervals are not averaged together to determine compliance with applicable remediation criteria.

Once it has been determined which samples may be utilized for compliance averaging, the following represents NJDEPE policy on determining compliance, which incorporates using (1) arithmetic mean and 2) the multiplying factor. The arithmetic mean of the concentration of contaminant in all soil samples from the same depth interval in an area of concern must be less than or equal to the applicable soil cleanup criteria for that contaminant. The multiplying factor is dependent on the soil cleanup criteria. No single sample can exceed the applicable soil cleanup criteria for that contaminant by more that the following factors: 1) if the applicable soil cleanup criteria is ten (10) ppm or less, then the individual soil samples cannot exceed the soil cleanup criteria by more than a factor of ten (10) and cannot exceed a total of fifty (50) ppm; 2) if the applicable soil cleanup criteria is greater that ten (10) ppm but less that or equal to one hundred (100) ppm, then the individual soil samples cannot exceed the soil cleanup criteria by more than a factor of five (5) and cannot exceed a total of two hundred (200) ppm and; 3) if the applicable soil cleanup criteria is greater that one hundred (100) ppm, then the individual soil samples cannot exceed the soil cleanup criteria by more than a factor of two (2).

Methylene chloride may be attributable to some extent to laboratory contamination since it was commonly detected in blank samples. Methylene chloride was also detected in samples of fill material collected from the disposal area. The arithmetic average concentration (15.9 mg/kg) of methylene chloride in soil samples is below the NJ non residential soil cleanup criteria (210 mg/kg) and the maximum concentration (310 mg/kg) did not exceed two times the standard. Therefore, remediation of methylene chloride contaminated soils is not required.

Benzene was detected in 6 of the 97 soil samples. The arithmetic average concentration of benzene (2.85 mg/kg) is below the NJ nonresidential soil cleanup criteria (13 mg/kg) and the maximum concentration (34 mg/kg) does not exceed the cleanup criteria by a factor of five. Therefore, remediation of benzene in site soils is not required.

For each of the five PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthrene/ benzo(k)fluoranthrene, chrysene, and indeno(1,2,3,c,d)pyrene) the arithmetic average concentration did not exceed the NJ soil cleanup criteria, and the maximum concentration did not exceed the cleanup criteria by a factor of 10.

Toxicity values are not available to calculate risks due to lead, which was found in every soil sample collected, including background samples. Several hot spots of lead were detected. Excavation of lead hot spots which exceed the NJ non residential soil cleanup criteria of 600 ppm will be conducted.

ECOLOGICAL RISK ASSESSMENT

The purpose of the ecological assessment is to identify and estimate the potential ecological impacts from the release of contaminants on the aquatic resources in the Rockaway River, which is adjacent to the site.

The technical guidance for the performance of this risk assessment comes from several sources, including the *Endangerments Assessment Handbook* (EPA, 1986a); *Ecological Risk Assessment* (Urban and Cook, 1986a); and the *Interim Final Risk Assessment Guidance for Superfund: Volume II Environmental Evaluation Manual* (EPA, 1989b).

The ecological risk assessment focused on the potential impacts that site related contamination may have on the aquatic resources of the Rockaway River. The ecological assessment evaluated whether aquatic organisms were adversely exposed to contaminants at concentrations in the sediments based on the National Oceanic and Atmospheric Administration (NOAA) sediment-sorbed contaminant data. Comparison of surface water contaminant concentrations in the Rockaway to the Ambient Water Quality Criteria (AWQC), which are developed to be protective of 95% of all aquatic species, indicated the contaminant levels may potentially pose a threat to aquatic life. Comparison of contaminant concentration in the Rockaway River to the Surface Water Quality Criteria indicated that levels are below the daily maximum level for each contaminant. In order to supplement the findings of the Baseline Ecological Risk Assessment, L.E. Carpenter conducted a community level biological assessment of the species in the Rockaway River sediments. The objective of the biological assessment was to evaluate whether contaminants detected in river sediments have adversely impacted the benthic macroinvertebrate community of the Rockaway River. The assessment concluded that historical operations on-site and current conditions of the site do not appear to be impacting the biological community in the sediment or aquatic species of the Rockaway River.

The results of a site-wide habitat survey and direct field observations were compared to the National Heritage Program data base. The comparison indicates that the on-site habitat does not support threatened or endangered species.

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 public health, welfare, or the environment.

7. *SUMMARY OF REMEDIAL ALTERNATIVES*

CERCLA requires that each selected site remedy be protective of human health and the environment; be cost effective; comply with other statutory laws; and utilize permanent solutions, alternative treatment technologies, and resource recovery alternatives to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility, or volume of the hazardous substances. N.J.P.L. 1993 c139 requires that the development, selection, and implementation of any remediation standard or remedial action shall ensure that it is protective of public health, safety, and the environment. Permanent and nonpermanent remedies are allowed, however, permanent remedies are preferred over nonpermanent remedies. The NJDEPE shall not require a person performing a remedial action to implement a permanent remedy, unless the cost of implementing a nonpermanent remedy is 50 percent or more than the cost of implementing a permanent remedy.

The L. E. Carpenter Final Feasibility Study Report (FS) includes a preliminary screening of all potentially applicable technologies, followed by the elimination of inappropriate or infeasible technologies. The resulting number of technologies are then developed into remedial alternatives. The FS summarizes the preliminary identification of remedial technologies and process options for each of the environmental media which needs to be addressed. However, the number of potentially applicable technology types and process options are reduced by evaluating the option with respect to technical implementability, effectiveness and cost. The following are those remedial alternatives which were considered to be the most effective and technically implementable to address the contaminated media at the site.

Table 4 and Table 5 summarize the preliminary remedial alternatives and the summary for technology screening of soil and ground water.

These alternatives are:

1. No Action
2. Institutional Controls
3. Ground Water Treatment/Containment
4. Treated Ground Water with Reinfiltration/Soil Biodegradation
5. Excavation/On-site Soil Washing/Bioslurry Treatment/Treatment of Ground Water
6. Soil Excavation/Thermal Treatment/Treatment of Ground Water

A brief description of each of the remedial alternatives is provided below:

Alternative 1: No Action

The Superfund program requires that the "no action" alternative be considered as a baseline for comparison of other alternatives. Under the no action alternative, no additional remedial actions would be initiated beyond passive recovery of the floating product as specified in the 1986 Amended ACO. The no action alternative would be appropriate if the potential endangerment is negligible or if implementation of a remedial action would result in a greater potential risk. Because this alternative would result in contaminants remaining on-site in excess of health based levels, CERCLA requires that the site be reviewed every five years. If justified by the review, remedial actions may be implemented to remove or treat the waste.

(Alternative #1 continued)

Capital Cost: $ 0.00
O&M Cost: $ 79,000/year
Present Worth Cost: $ 1,215,000
Time to Implement: Immediate

Alternative #2: Institutional Controls

The alternative involves a filing of Declaration of an Environmental Restriction with the county recording officer pursuant to N.J.P.L. 1993 c139, Section 36(2); ground water use restriction; an expanded ground water monitoring program; maintenance of existing site fencing and; continuation of passive recovery of floating product. The deed notations would be written to restrict future use of the property to non-residential use due to the presence of contaminants above NJDEPE's residential standards. Ground water restriction involves designation of local ground water sources as nonpotable with delineation of a corresponding well restriction area. The expanded monitoring program requires installation and quarterly sampling of a sentinel well on the Air Products property. Because this alternative would result in contaminants remaining on-site in excess of health-based levels, CERCLA requires that the site be reviewed every five years. If justified by the review, remedial actions may be implemented to remove or treat the waste.

Capital Cost: $ 50,000
O&M Cost: $ 90,000/year
Present Worth Cost: $ 1,434,000
Time to Implement: Four months

Alternative #3: Ground Water Treatment/Containment

This alternative involves the following remedial actions; soil cover for DEHP contaminated soil; spot excavation and offsite disposal of isolated metal and PCB contaminated surficial soil; active immiscible product recovery; above ground biological treatment and carbon polishing of ground water; recirculation of a portion of extracted ground water within the capture zone; discharge of remaining extracted ground water to a deep aquifer. A soil cover would be designed to allow natural precipitation to infiltrate into the vadose zone soils to allow natural attenuation of soil contaminants to continue. The cover would mitigate the threat of direct contact, ingestion, inhalation or erosion of soil contaminants. Hot spot excavation and off-site disposal of metal and PCB contaminated soils, which exceed the soil cleanup criteria, would be performed. Contaminated soil which do not meet the land disposal requirements (LDRs) designated for off-site disposal would need to be treated prior to disposal. Phase I of the ground water remedial strategy requires active recovery of floating product prior to startup of the aerobic biological treatment system. Extracted ground water will be treated through an oil/water/solids separator. Ground water will be extracted then treated by an above ground biological treatment system with a portion of it recirculated within a capture zone. The levels of contaminants in the ground water will be expected to meet a performance standard to indicate that contamination in the ground water is being reduced. Remaining treated ground water will be discharged via reinjection into a deeper aquifer at levels in compliance with the site specific discharge criteria which can be found in Appendix A. The water being discharged to the deep aquifer will be polished by granular activated carbon after biological treatment to assure compliance with site specific discharge criteria. The biological treatment system would include equalization/nutrient mix tank, bioreactor vessel, effluent polishing treatment, and vapor phase granular activated carbon (GAC) treatment for volatile organics. Institutional controls would be required because this alternative may result in contaminants remaining on-site in excess of the NJ residential soil cleanup criteria. A site review every 5 years is required pursuant to CERCLA until health based levels are met. If justified by the review, remedial actions may be implemented to remove or treat the waste.

Capital Cost: $ 5,716,562
O&M Cost: $210,000/year
Present Worth Cost: $ 8,944,000
Time to Implement: 33 months

Alternative #4: Treated Ground Water with Reinfiltration/Soil Biodegradation

Alternative 4 consists of the following components; extraction of contaminated ground water, above ground enhanced biological treatment and the addition of oxygen and nutrients and possibly a surfactant prior to reinfiltration of ground water to the shallow aquifer zone within the treatment basin. Biological treatment will occur after all immiscible product has been removed through an active removal system (Phase I). Phase II would incorporate extraction of ground water, treatment and discharge to three distinct areas. Reinfiltration of some treated ground water (to maximum amount possible) with added oxygen and nutrients and possible surfactants will percolate through the unsaturated zone soils through an infiltration system to aid in soil in situ biological activity. A larger portion of the treated water will be recirculated within the capture zone. The levels of contaminants in the recycled treated ground water will be expected to meet a performance standard to ensure that contamination in the ground water is being reduced. The remaining water would be treated and discharged into a deeper aquifer at the discharge criteria found in Appendix A. The ground water treatment system may also include GAC treatment which can be converted to carbon adsorption (or other polishing technology) as contaminant concentrations diminish. The infiltration system will be covered by a soil cover to limit contaminant migration; limit direct contact with contaminated soil, and protect the system. In-situ biological activity is designed to clean up soils, to the remediation levels found in Appendix B, with microbes which would degrade organic contaminants adhering to soil particles. Laboratory scale treatability studies were conducted to assess the feasibility of bioremediation of soils at the site. Results indicated that a combination of bioremediation and soil flushing is technically feasible and can achieve remediation goals for site contaminants. Hotspot excavation and disposal of isolated soils located outside the treatment zone would be performed. Next, excavate and dispose of "disposal area" fill which may prove inhibitory to in situ treatment. Soils to be disposed of off-site would meet all applicable RCRA treatment and disposal criteria. Institutional controls would be required because this alternative may result in contaminants remaining on-site in excess of the NJ residential soil cleanup criteria. A site review every 5 years is required pursuant to CERCLA until health based levels are met. If justified by the review, remedial actions may be implemented to remove or treat the waste.

Figure 4 shows a schematic of the ground water treatment with reinfiltration.

Capital Cost: $ 8,452,000
O&M Cost: $ 210,000/year
Present Worth Cost: $ 11,020,000
Time to Implement: 36 months

Alternative 5: Soil Excavation/On-site Soil Washing/Bioslurry Treatment/Treatment of Ground Water

Alternative 5 consists of the following components: excavation of contaminated soil, on-site soil washing of excavated organic contaminated soils; and placement of the cleaned soil back on-site; off-site disposal of some metal and PCB contaminated soil and excavation and disposal of "disposal area" sludge/fill; treatment of ground water through above ground biological treatment after immiscible product has been removed through active recovery system as explained in Alternative 3. The soil will be treated by soil washing which would separate coarse fraction soils from fine fraction soils. Soil washing would provide scrubbing action to the coarse soils. The fine fraction soils would then be treated biologically in a bioslurry treatment by destroying the organic contaminants. The scrubbing action of the soil washing technology would remove any leachable organics and metals contained in the soils. Process wash water will be treated prior to recycling in the soil washer. All ground water process treatments described in Alternative 3 are included in this alternative. On site treated waste would be subject to land disposal restrictions (LDRs) because soil cleanup criteria is higher than the LDRs for some relevant contaminants. Institutional controls would be required because this alternative may result in contaminants remaining on-site in excess of the NJ residential soil cleanup criteria. A site review every 5 years is required pursuant to CERCLA until health based levels are met. If justified by the review, remedial actions may be implemented to remove or treat the waste.

Capital Cost: $19,872,000 to $32,191,000
O&M Cost: $205,000/year
Present Worth Cost: $34,000,000
Time to Implement: 39 months

Alternative #6: Soil Excavation/Thermal Treatment/Treatment of Ground water

Alternative 6 consists of excavation of contaminated soils greater than the soil cleanup criteria and destruction of the constituents via thermal treatment by incineration. Under this alternative, two options (A and B) are considered. Option A provides for an on-site incinerator, for example a rotary kiln incinerator, to thermally treat the contaminated soils. In Option B, all soils are transported off-site to a commercial RCRA permitted incinerator for treatment. Option A allows for potential backfilling of the excavation with stabilized incinerator ash. Option B allows the excavated area to be backfilled with clean fill. Under either option, treatment of soils must meet LDR for off or on site disposal. Option A requires various state permits for water, air, and wetlands disturbance. Option B would require meeting Federal DOT transportation and RCRA requirements. All ground water process treatments described in Alternative 3 are included in this Alternative. Institutional controls would be required because this alternative may result in contaminants remaining on-site in excess of the NJ residential soil cleanup criteria. A site review every 5 years is required pursuant to CERCLA until health based levels are met. If justified by the review, remedial actions may be implemented to remove or treat the waste.

OPTION A
On site incineration via Rotary Kiln

Capital Cost: $ 43,991,000
O&M Cost: 205,000/year
Present Worth Cost: $46,000,000
Time to Implement: 45 months

OPTION B
Off site incineration

Capital Cost: $ 85,140,000
O&M Cost: $ 205,000/year
Present Worth Cost: $88,000,000
Time to Implement: 30 months

8. *SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES*

During the detailed evaluation of remedial alternatives, each alternative was assessed against the nine CERCLA evaluation criteria, as described below:

- Overall Protection of Human Health and the Environment

  Overall Protection of Human Health and the Environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

  Alternative #1, no action, would not be protective of human health and the environment. Current levels of DEHP and PCBs in the soil and DEHP, xylene and ethylbenzene in ground water pose an unacceptable risk. By restricting access and ground water usage, Alternative #2 provides greater protection, but not to the future on-site worker and potential contact with contaminated soil. In addition, the potential for off-site migration of contaminated ground water is likely. Therefore, Alternative #2 is not considered to be protective of human health and the environment. Alternative #3 through #6 involve ground water treatment and reduction of soils contamination and reduce the potential for further off-site migration of contaminated ground water. Alternative #4 provides the potential for in situ treatment through the infiltration of oxygen and nutrients into the subsurface. Therefore, Alternative #4 would be more protective with respect to ground water contamination than the other alternatives. Alternatives #3 and #4 preclude direct contact with surface soils through the installation of a soil cover and are considered protective nonpermanent remedies. In Alternatives #5 and #6, contaminated soil is excavated and treated either on-site or off-site to residential standards and are therefore permanent remedies. The flushing of soil via ground water extraction will aid in the removal of soil contaminants in the unsaturated zone. Should institutional and engineering controls be implemented, then Alternative 3 through 6 are equally protective of human health and the environment.

- <u>Compliance with ARARs</u>

Compliance with applicable or relevant and appropriate requirements (ARARs) addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of federal and state environmental statutes and other requirements or provides grounds for invoking a waiver.

Alternatives #1 and #2 would not meet the 1×10^{-6} NJ remediation standard at the L. E. Carpenter site nor the NJ Ground Water Quality standards. Alternatives #3 through #6 employ bioremediation for ground water treatment. Bioremediation of target organic compounds will attain ARARs. Under Alternative #3, soils containing DEHP in excess of the remediation goals would remain for a period subject to natural attenuation. In situ bioremediation is effective for treating organic contaminated soils under Alternative #4 and therefore is expected to meet soil remediation goals which are protective based on a cancer risk level of 1×10^{-6}. Alternatives #5 and #6 are also expected to meet remediation goals but would be required to meet Land Disposal Restrictions (LDRs). Alternatives #3 through #6 will need to meet LDRs for some hot spot removal actions, where applicable. Wetlands mitigation for Alternatives #5 and #6 would be required to limit the negative impacts of excavation (and associated disruptions including increased siltation to the Rockaway River and possible disturbance of downstream wetlands) of large volumes of soil. All alternatives would meet the air requirements. Each alternative is anticipated to meet action and location specific ARARs at the site except for Alternatives #1, #2 and possibly #3 since soils containing DEHP in excess of the cleanup criteria would remain on site for a period subject to natural attenuation.

Table 6 summarizes how each alternative meets each identified ARAR.
Appendix B summarizes the soil remediation goals
Appendix A summarizes the NJ Class II-A Ground Water Quality Standards

- 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 cleanup criteria have been met.

  Alternatives #1 and #2 offer limited long-term effectiveness and permanence since contaminated media will remain untreated, with the exception of immiscible product collection. The potential of migration of contaminated ground water exists. Alternatives #3 through #6 offer long-term effectiveness through the ground water treatment component, although long-term maintenance and ground water monitoring are required. Alternative #3 will not be as effective in reducing vadose zone soil contamination as a potential long-term contaminant source, thus extending the time required for ground water treatment. Alternative #3 can provide long term effectiveness as long as the soil cover was properly maintained and institutional controls are in place. Alternative #4 minimizes site soil contaminants remaining through in situ treatment of the soil, Alternative #5 by excavation, removal and treatment of soil containing contaminants, and Alternative #6 through excavation and thermal treatment of contaminated soils at the site. Long-term maintenance of the soil cover will be required for Alternatives #3 and #4. Alternatives #4 through #6 permanently remove contaminants from the soil, however, all would require a use restriction on the property.

- Reduction of Toxicity, Mobility, or Volume through Treatment

  Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies a remedy may employ.

  Alternatives #1 and #2 do not meet this criteria because no active treatment, other than product recovery is implemented. Alternative #3 offers contaminant reduction through the active recovery of floating product and treatment of ground water and remediation of isolated hot spot surface soils. Some contaminants would leach from saturated soils into the ground water and also be extracted. However, much of the soil contamination would not easily leach into ground water, and would rely on natural remediation and attenuation processes.

  Alternative #4 would offer additional contaminant reduction by employing in situ treatment. Alternative #5 offers similar contaminant reduction via soil washing and subsequent biological treatment of the soil slurry. The soil washing step on Alternative #5 reduces the volume of soil to be treated by removing the relatively clean, coarse soils prior to treatment. Alternative #6 reduces the toxicity of the soil, with minimal volume reduction. Metals in the ash may need to be fixated to reduce mobility. The ground water recovery and extraction system will be designed to control the migration of immiscible product and ground water contaminants.

- Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to achieve protection from any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup criteria are achieved.

Alternative #1 will not have any short-term adverse affect because no construction or treatment is required. Alternative #2 achieves a degree of protection in a relatively short period of time and would result in minimal short-term impacts with its implementation. Alternatives #3 and #4 are anticipated to have the greatest short-term effectiveness. Some particulate emissions during the cover installation is anticipated, however, dust control methods should reduce this risk. Furthermore, most of the soil contamination is in the subsurface. Alternatives #5 and #6 offer a lower degree of short-term effectiveness due to the intrusive soil removal activities. During excavation activities, wetlands disturbances are expected due to disruption of the existing topography, and increased siltation and sediment loading. Alternative #6 would also require that the ground water collection system be temporally dismantled during the excavation due to well destruction as their supporting soils are removed.

- Implementability

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

Alternatives #1 and #2 are the simplest alternatives to implement from a technical standpoint since the passive recovery system is already in place. The ground water remediation set forth in Alternatives #3 and #4 offer a relatively high degree of implementability. Both alternatives offer a combination of well established, readily available construction methods and innovative technology which may require additional design coordination. Alternative #4 involves several additional design considerations because of the in situ soil treatment. Such consideration would include the infiltration system, rate of treated ground water recycling allowable for site hydraulics, and the reactivity (both desorption and biological degradation) of contaminants adsorbed to the site soils.

Major limitations are associated with the implementation of Alternatives #5 and #6 due to the combination of immiscible product recovery, ground water extraction and soil removal. Any soil (not including hot spot) removal conducted during the product recovery and ground water extraction would be severely hampered by the collection piping between the wells and the central collection points, as well as the wells themselves. The implementation of Alternatives #5 and #6 cannot begin until all immiscible product is removed, which may be several years. On site incinerators are usually not well received by the community and the approval process may delay the implementation of Alternative # 6A.

- Cost

  Alternative #1's present worth cost is approximately $1.2 M. The primary component would be to maintain the passive recovery system until all immiscible product had been removed. Alternative #2's present worth cost is approximately $1.4 M. The primary component would be to maintain institutional controls, passive recovery system and ground water monitoring program. Alternative #3's present worth cost is $8.9 M. The primary components are hotspot removal, maintenance of soil cover, institutional controls and ground water remediation using bioremediation. Alternative #4's present worth cost is $11.0 M. The primary components are hotspot removal, bioremediation of ground water and soil. Alternative #5 present worth cost is $34 M. The primary components are hotspot removal, soil washing, and bioremediation of ground water. Alternative #6A's present worth cost is $46 M. The primary components are hotspot removal on-site soil incineration and bioremediation of ground water. Alternative #6B's present worth cost is $88 M. The primary components are off-site soil incineration and bioremediation of ground water.

  Table 7 summarizes Preliminary cost estimates estimated for each alternative.

- EPA Acceptance

  EPA concurrence indicates whether the federal regulatory agency concurs, opposes, or has no comment on the selected remedy.

  Pursuant to the EPA/State Pilot Agreement dated December 1992, EPA concurrence on this ROD is not a prerequisite to NJDEPE selecting a remedy. However, EPA's comments on the Proposed Plan and the ROD do not raise any objections to the selected remedy.

- Community Acceptance

  Community acceptance assesses the public comments received on the RI/FS report, Baseline risk assessment, Final FS report, and Proposed Plan.

  Community concerns/comments received during the public comment period and the public meeting on December 8, 1993, are included in the responsiveness summary, together with NJDEPE responses, which is a part of this ROD. Community concerns/comments received indicate that the community accepts the preferred alternatives identified in the Proposed Plan and selected in the ROD herein.

9. ***SELECTED REMEDY***

Based on an evaluation of the various alternatives and after consideration of public comments, NJDEPE has selected Alternative #4 (treatment of ground water with reinfiltration and soil bioremediation) as the remedy for the L. E. Carpenter site because it best satisfies the requirements of N.J.P.L. 1993 c139, CERCLA and the NCP's nine evaluation criteria for the remedial alternatives.

Alternative #4 consists of two Phases which include the following components: extraction of contaminated ground water, above ground enhanced biological treatment and the addition of oxygen and nutrients and possibly a surfactant prior to reinfiltration of ground water to the shallow aquifer zone within a treatment basin. Phase I includes biological treatment which will occur after all immiscible product has been removed through an active removal system. Phase II would incorporate extraction of ground water, treatment and disposition to three distinct areas. Reinfiltration of some treated ground water (to maximum amount possible) with added oxygen and nutrients and possible surfactants will percolate through the unsaturated zone soils through an infiltration system to aid in soil in situ biological activity. A larger portion of the treated water will be recirculated within the capture zone. The levels of contaminants in the treated ground water will meet performance standards. The performance criteria shall be the least stringent of 95% removal for each parameter or an effluent limit equal to the higher of the ground water quality standard or PQL for the parameter. Should site specific conditions prove that such removal is not reasonably attainable, the effluent level for the discharged water to be recycled will be based on the Best Available Technology (BAT) for the treatment system discussed herein. The remaining water would be treated, monitored and discharged into a deeper aquifer at the following site specific discharge criteria for the major contaminants found: ethylbenzene at 350 ppb; toluene at 500 ppb; xylenes (total) at 20 ppb; bis (2-ethylhexyl) phthalate at 30 ppb; n-decane at 50 ppb; di-n-octylphthalate at 50 ppb; 1-ethyl-3-methylbenzene at 50 ppb; n-nonane at 50 ppb; 1,2,3-trimethylbenzene at 50 ppb; 1,2,4-trimethylbenzene at 50 ppb; 1,3,5-trimethylbenzene at 50 ppb; Antimony at 20 ppb; Arsenic at 8 ppb; all discharge criteria which apply to this site, including the above referenced contaminants can be found in Appendix A of this ROD. Upon determination that the ground water discharge has met the criteria for compounds which are not to be site related (i.e., the chlorinated solvents detected in the off site wells such as 1,1-dichloroethane, 1,1-dichloroethene, tetrachloroethene, and trichloroethene) and for those compounds which repeatedly indicate non-detect in the sampling rounds, monitoring will no longer be necessary. Such a change in the monitoring requirements must be requested of and approved by NJDEPE. The major contaminants listed above may not be deleted from the monitoring parameter list. The ground water treatment system may also include GAC treatment which can be converted to carbon adsorption (or other polishing technology) as contaminant concentrations diminish. The infiltration system will be covered by a soil cover to limit contaminant migration; limit direct contact with contaminated soil; and protect the infiltration system.

In-situ biological activity is designed to clean up soils with microbes which would degrade organic contaminants adhering to soil particles. Laboratory scale treatability studies were conducted to assess the feasibility of bioremediation of soils at the site. Results indicated that a combination of bioremediation and soil flushing is technically feasible and can achieve remediation goals for site contaminants. The addition and specific amount of oxygen, nutrients and surfactant will be determined during design. Hotspot excavation and disposal of isolated soils located outside the treatment zone would be performed. Soils to be disposed of off-site would meet all applicable RCRA treatment and disposal criteria.

Institutional controls would be required because this alternative may result in contaminants remaining on-site in excess of the NJ residential soil cleanup criteria. A site review every 5 years is required pursuant to CERCLA until health based levels are met. If justified by the review, remedial actions may be implemented to remove or treat the waste.

10. *STATUTORY DETERMINATIONS*

Under their legal authorities, NJDEPE's and EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under State and Federal environmental laws unless a statutory waiver is justified. The selected remedy also must be cost effective and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element.

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate requirements for the remedial action (see Table 2 which lists ARARs and TBCs), and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. This remedy will require a Declaration of Environmental Use Restriction be placed on the property. The soil remediation goals are protective of ground water. Ground water will be remediated to meet the NJ Ground Water Quality Standards which are protective of human health. Because this remedy will result in hazardous substances remaining on the site until the health based cleanup criteria are met, a review will be conducted every five (5) years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Phase I of the ground water treatment system will be to actively remove the immiscible product from the ground water. After the floating product is removed, Phase II of the system will extract and treat ground water and reinfiltrate treated ground water back into the soils to allow for in situ biodegradation. This alternative will degrade some waste completely, and most residuals remaining from incomplete degradation will be at or below the cleanup criteria. Surfactant addition, microbial activity and the increased rate of ground water flow through the treatment zone may mobilize sorbed contaminants. The mobilization of sorbed contaminants is a significant step in the biodegradative process. The other treatment options (soil washing or incineration) are projected to provide a shorter remediation time period when compared to in situ biological soil treatment, but are significantly more costly and more difficult to implement. The total cost for Alternatives #4,

#5 and #6a and #6b are $11,020,000.00, $34,000,000.00, $46,000,000.00, $88,000,000.00 respectively. Pursuant to N.J.P.L. 1993 c139, the NJDEPE shall not require a person performing a remedial action to implement a permanent remedy, unless the cost of implementing a nonpermanent remedy is 50 percent or more than the cost of implementing a permanent remedy. The least costly of the non permanent remedial alternatives evaluated is $8,944,000, the least costly of the permanent remedies is $34,000,000. It would cost more than 50% to implement a permaent remedy. Alternative #4, a nonpermanent remedy which provides additional contaminant reduction that Alternative #3, meets the selection requirements pursuant to N.J.P.L. 1993 c139.

The selected alternative will contribute to achieving the ARARS, at a significantly lower cost with minimal disturbance to the surrounding neighbors and community than the other options. The selected alternative will provide the best balance of trade-offs among all the alternatives with respect to the CERCLA nine evaluation criteria. NJDEPE has selected treated ground water with reinfiltration/soil biodegradation as the remedial alternative because it will be protective of human health and the environment, will comply with ARARs, will utilize permanent solutions and alternative treatment technologies to the maximum extent practicable, will be cost effective, and will create the least amount of disturbance to the surrounding community during the remediation process. The selected remedy will also meet the statutory preference for the use of treatment as a principal element to the maximum extent practicable.

11. *DOCUMENTATION OF SIGNIFICANT CHANGES*

There is no change from the Preferred Remedy described in the Proposed Plan and the Selected Remedy described in this ROD.

GLOSSARY

This glossary defines the technical terms used in this Record of Decision. The terms and abbreviations contained in this glossary are often defined in the context of hazardous waste management, and apply specifically to work performed under the Superfund program. Therefore, these terms may have other meanings when used in a different context.

Administrative Consent Order: A legal and enforceable agreement between EPA or the State and the potentially responsible parties (PRPs). Under the terms of the Order, the PRPs agree to perform or pay for site studies or cleanup work. It also describes the oversight rules, responsibilities and enforcement options that the government may exercise in the event of non-compliance by the PRPs. This Order is signed by the PRPs and the government; it does not require approval by a judge.

Ambient air: Any unconfined part of the atmosphere. Refers to the air that may be inhaled by workers or residents in the vicinity of contaminated air sources.

Aquifer: An underground layer of rock, sand, or gravel capable of storing water within cracks and pore spaces, or between grains. When water contained within an aquifer is of sufficient quantity and quality, it can be tapped and used for drinking or other purposes. The water contained in the aquifer is called ground water.

Backfill: To refill an excavated area with removed earth; or the material itself that is used to refill an excavated area.

Bioremediation: A cleanup process using naturally occurring or specially cultivated microorganisms to digest contaminants naturally and/or break them down (biodegrade) into nonhazardous components.

Bioslurry: A form of bioremediation which occurs in an above ground unit.

Carbon adsorption/carbon treatment: A treatment system in which contaminants are removed from ground water and surface water by forcing water through tanks containing activated carbon, a specially treated material that attracts and holds or retains contaminants.

Containment: The process of enclosing or containing hazardous substances in a structure, typically in ponds and lagoons, to prevent the migration of contaminants into the environment.

EPA/State Pilot Agreement: An agreement entered into by the EPA and NJDEPE which delineate the respective roles and responsibilities of each Party as they relate to the conduct of the oversight of this site or project.

Effluent: Wastewater, treated or untreated, that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters.

Soil Washing: A cleanup process which removes contaminants and/or fine soil particles to which they are adsorbed by contacting soil particles with reagents that consist of a water/surfactant or water/solvent solution.

Thermal Treatment: Cleanup technologies which rely upon relatively high temperatures to either destroy organic contaminants or separate them from natural materials. Incineration and Rotary Kiln Incineration are examples of "Thermal treatment".

Use Restriction: A form of institutional control in which a notice is filed with the office of the county recording officer, in the county in which the property is located, to inform prospective holders of an interest in the property that contamination exists on the property at a level that may statutorily restrict certain uses of or access to all or part of that property, a delineation of those restrictions, a description of all specific engineering or institutional controls at the property that exist and that shall be maintained in order to prevent exposure to contaminants remaining on the property, and the written consent to the notice by the owner of the property. Use restrictions are filed as DECLARATION OF ENVIRONMENTAL RESTRICTIONS.

Volatile Organic Compounds (VOCs): VOCs are made as secondary petrochemicals. They include light alcohols, acetone, trichloroethylene, perchloroethylene, dichloroethylene, benzene, vinyl chloride, toluene, and methylene chloride. These potentially toxic chemicals are used as solvents, degreasers, paints, thinners, and fuels. Because of their volatile nature, they readily evaporate into the air, increasing the potential exposure to humans. Due to their low water solubility, environmental persistence, and wide spread industrial use, most are commonly found in soil and ground water.

Wetland: An area that is regularly saturated by surface or ground water and, under normal circumstances, capable of supporting vegetation typically adapted for life in saturated soil conditions. Wetlands are critical to sustaining many species of fish and wildlife. Wetlands generally include swamps, marshes, and bogs. Wetlands may be either coastal or inland. Coastal wetlands have salt or brackish (a mixture of salt and fresh) water, and most have tides, while inland wetlands are non-tidal and freshwater. Coastal wetlands are an integral component of estuaries.

RESPONSIVENESS SUMMARY
RECORD OF DECISION
L. E. CARPENTER & COMPANY SUPERFUND SITE

OUTLINE:

This Responsiveness Summary is divided into the following sections:

A. Overview
B. Background on Community Involvement and Concerns
C. Summary of Comments Received During the Public Meeting and Comment Period and Agency Responses
D. Community Relations Activities at the L. E. Carpenter & Company Site

A. *OVERVIEW*

This is a summary of the public's comments and concerns regarding the Proposed Plan for Remediation at the L. E. Carpenter & Company Superfund Site and the New Jersey Department of Environmental Protection and Energy's (NJDEPE) responses to those comments.

The public comment period extended from December 1, 1993 through December 31, 1993 and provided interested parties the opportunity to comment on the Proposed Plan and the Remedial Investigation/Feasibility Study (RI/FS) Reports for the L. E. Carpenter & Company Site. On December 8, 1993 at 7:00 PM, during the comment period, the NJDEPE held a public meeting at the Wharton Borough Municipal Building to discuss the results of the RI/FS and to present the preferred remedy.

On the basis of the information contained in the above referenced documents, NJDEPE has selected the following remedy for the L. E. Carpenter & Company Site: Biological treatment of ground water with reinfiltration and soil bioremediation.

B. *BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS*

Community concerns were first expressed to NJDEPE representatives at the June 28, 1989 public meeting and focused on alleged past dumping of materials by L. E. Carpenter at other locations in and around Wharton. In response to these concerns, NJDEPE held a follow-up meeting and tour of the suspected "satellite" dumping locations on July 19, 1989. Currently, NJDEPE is continuing investigations at three of these sites.

The community has also raised issues regarding conditions and appearances of buildings on the L. E. Carpenter property and future use of the site. Congressman Dean Gallo tours the site annually and has expressed concerns related to the impact of past site activities on the Rockaway River. L. E. Carpenter has repaired or demolished some site buildings and the public seems satisfied with current site conditions. Sediment studies in the Rockaway River adjacent to the L. E. Carpenter site did not indicate an impact on the biological community from past or current site activities.

C. SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

Concerns raised during the L. E. Carpenter & Company Superfund Site Public Meeting held on December 8, 1993 are summarized below. No written comments were received during the comment period which extended from December 1, 1993 through December 31, 1993.

Comment 1: Mayor Harry Shupe of Wharton Borough stated that it was the Borough's position that anything less than the preferred alternative would not be acceptable, and asked if L. E. Carpenter has to proceed with alternative number four (the number of the preferred alternative in the proposed plan) or something more extensive.

NJDEPE Response: L. E. Carpenter will be given the opportunity to implement remedy number four or something more extensive. If they do not, NJDEPE and USEPA will use public money to implement the preferred alternative and then proceed against L. E. Carpenter for triple damages for the cost of that alternative. Alternative number four is the minimum that would occur at this site.

Comment 2: Mayor Shupe asked how long it will take to implement the remediation.

NJDEPE Response: Alternative number four would take approximately 36 months to implement. We will sign a record of decision in about two months. We hope to proceed with hot spot removal by the summer of 1994. The design for the removal and treatment of ground water should take about two years.

D. *COMMUNITY RELATIONS ACTIVITIES AT THE L. E. CARPENTER & CO. SITE*

NJDEPE established information repositories at the following locations:

Wharton Borough Municipal Building
10 Robert Street
Wharton, NJ 07885 Phone # (201) 361-8444

Wharton Public Library
1519 South Main Street
Wharton, NJ 07885 Phone # (201) 361-1333

New Jersey Department of Environmental Protection And Energy
Bureau of Community Relations
401 East State Street, CN 413
Trenton, NJ 08625 Phone # (609) 984-3081
Contact: Doreen Gordon

NJDEPE prepared a Community Relations Plan (January 1989)

NJDEPE held a public meeting in Wharton to discuss the initiation of the RI/FS on June 28, 1989.

NJDEPE held a briefing in Wharton to update local officials on the progress of site investigations on June 5, 1992.

NJDEPE held a public comment period from December 1, 1993 to December 31, 1993 and a public meeting in Wharton on December 8, 1993 to discuss the Proposed Plan for Site Remediation.

APPENDIX A

APPENDIX A
GROUND WATER DISCHARGE CRITIERIA
AND
GROUND WATER QUALITY STANDARD
L. E. CARPENTER SITE

COMPOUND	NEW JERSEY GROUND WATER QUALITY STANDARDS* (ppb)	DISCHARGE CRITERIA (ppb)
Organic Compounds		
Ethylbenzene	700	350
Toluene	1000	500
Xylenes (total)	40	20
Bis(2ethylhexyl)phthalate	30	30
n-Decane	100**	50
Di-n-octylphthalate	100	50
1-Ethyl-3-methylbenzene	100**	50
n-Nonane	100**	50
1,2,3-Trimethylbenzene	100**	50
1,2,4-Trimethylbenzene	100**	50
1,3,5-Trimethylbenzene	100**	50
Chlorobenzene	4	2
Chloromethane	30	15
1,1-Dichloroethane	70	35
1,1-Dichloroethene	2	2
cis-1,2-Dichloroethene	10	5
trans-1,2-Dichloroethene	100	50
Heptane	100**	50
Tetrachloroethene	100	1
1,1,1-Trichloroethane	30	15

Trichloroethene	1	1
1,1,2 Trichloro-1,2,2-trifluoroethane	20,000***	10,000
Carbon Tetrachloride	2	2
Acetone	700	350
Methyl Ethyl Ketone [2-Butanone]	300	150
Butylbenzylphthalate	100	50
n-Butylbenzene	100**	50
1,2-Diethybenzene	100**	50
Diethylphthalate	5000	2500
Di-n-buytlphthalate	900	450
Isopropylbenzene [Cumene]	300***	150
Naphthalene	30***	15
N-Nitrosodiphenylamine	20	20
1,2,3,4-Tetramethylbenzene	100	50
Phenol	4000	2000
2-Nitrophenol	100**	50
2,4 Dimethylphenol	100	50
Inorganic Compounds		
Beryllium	20	20
Cadmium	4	2
Chromium (total)	100	50
Copper	1000	500
Lead	10	10
Mercury	2	1
Nickel	100	50

Selenium	50	25
Silver	40	20
Zinc	5000	2720
Antimony	20	20
Arsenic	8	8

* New Jersey Class II Ground Water Quality Standards, N.J.A.C. 7:9-6 et seq.

** Interim Generic Criteria pursuant to NJAC 7:9-6.7(c)6

*** Interim Specific Criteria pursuant to NJAC 7:9-6.7(c)

APPENDIX B

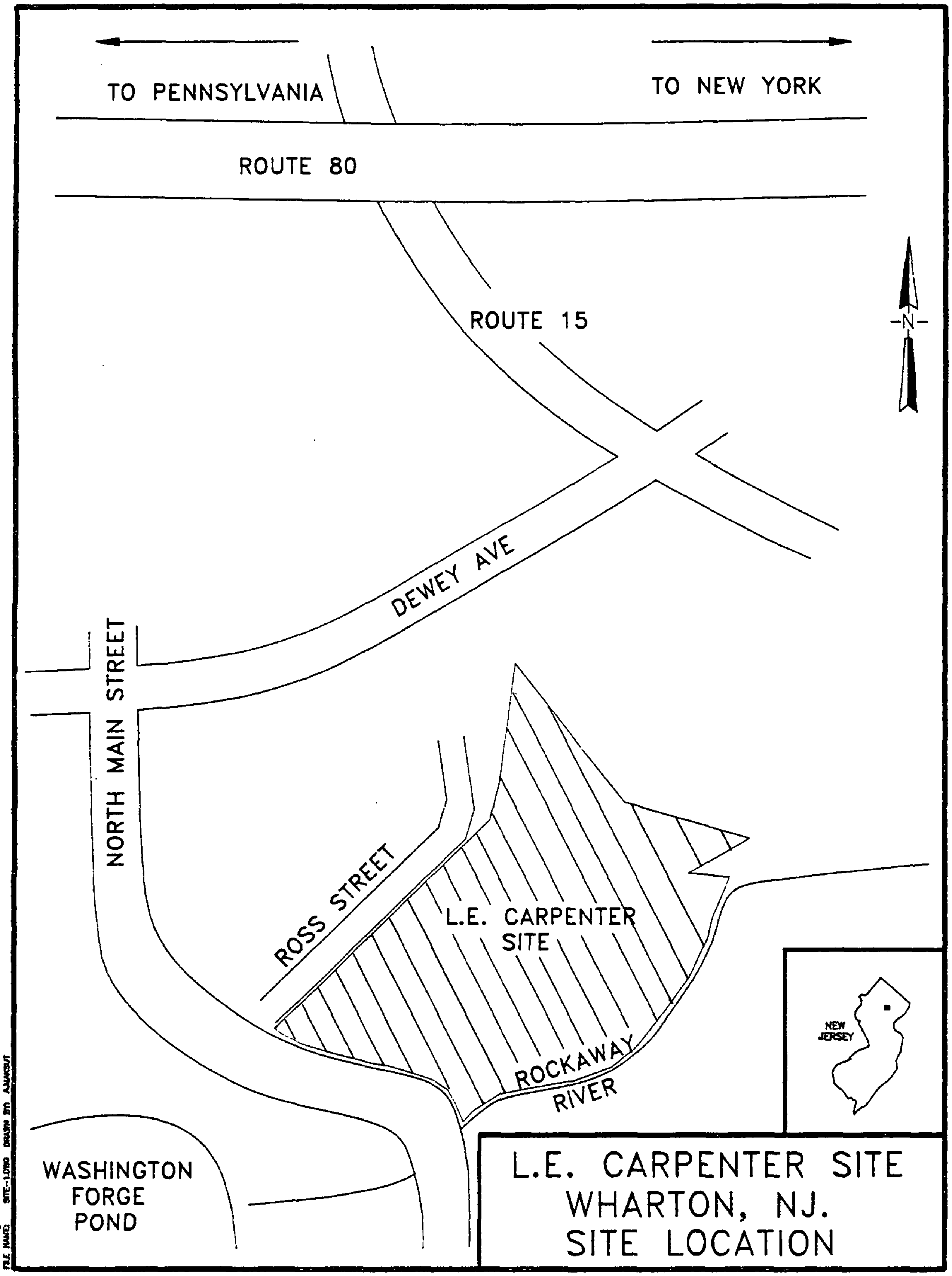
APPENDIX B
L. E. CARPENTER SOIL REMEDIATION GOALS

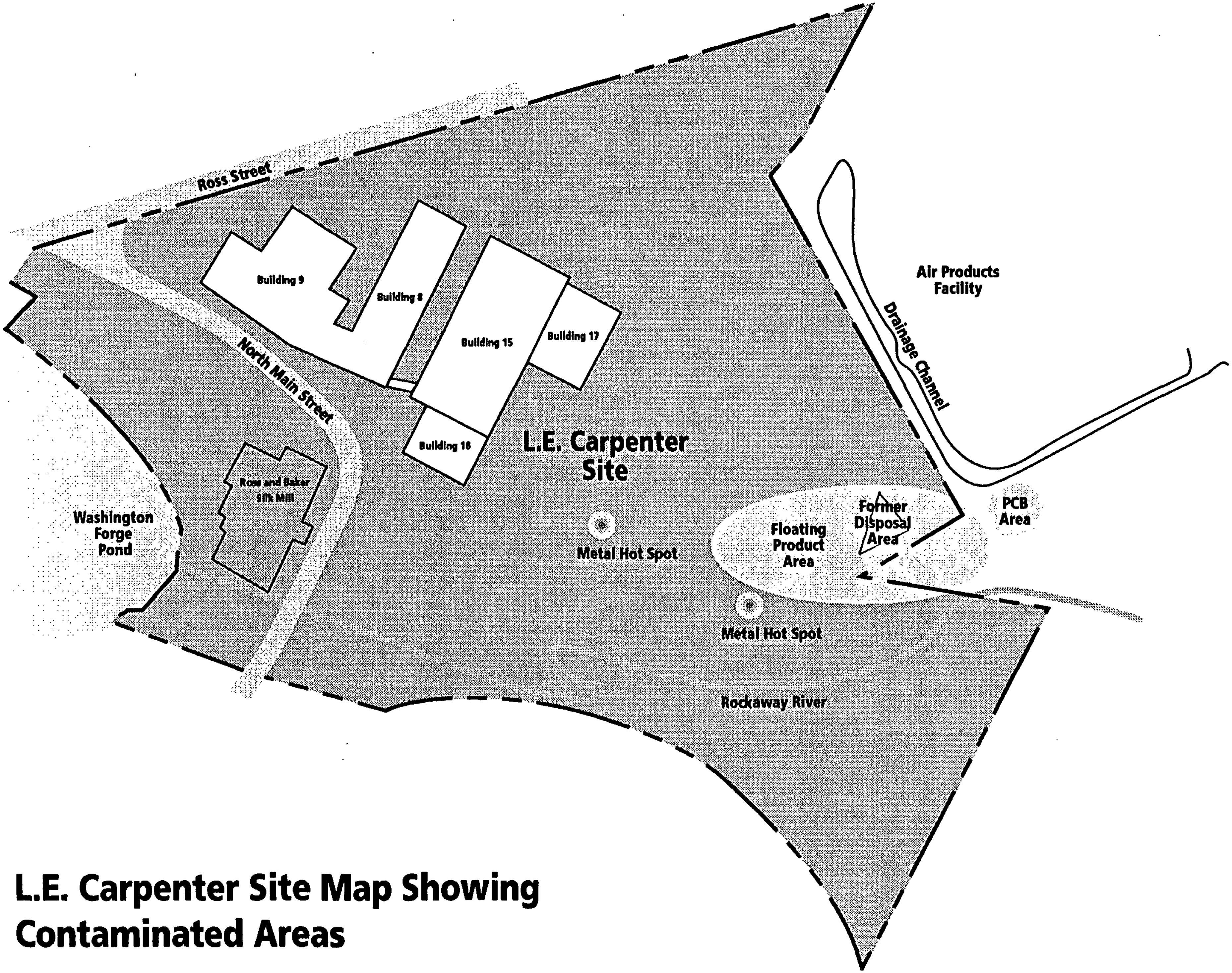
Contaminant	Non Residential Direct Contact Soil Cleanup Criteria (mg/kg)	Impact to Ground Water Soil Cleanup Criteria (mg/kg)
Organic Compounds		
Arclor 1254 (PCB)	2.0*	100
Bis(2-ethylhexyl)phthalate	210	100
Di-n-butyl phthalate	10,000	100
Ethylbenzene	1000	100
Toluene	1000	500
Xylene (total)	1000	10
Inorganic Compounds		
Antimony	340	340
Arsenic	20	*
Lead	600	*

* Based upon the enactment of a Declaration of Environmental Restriction on the Wharton Enterprises property.

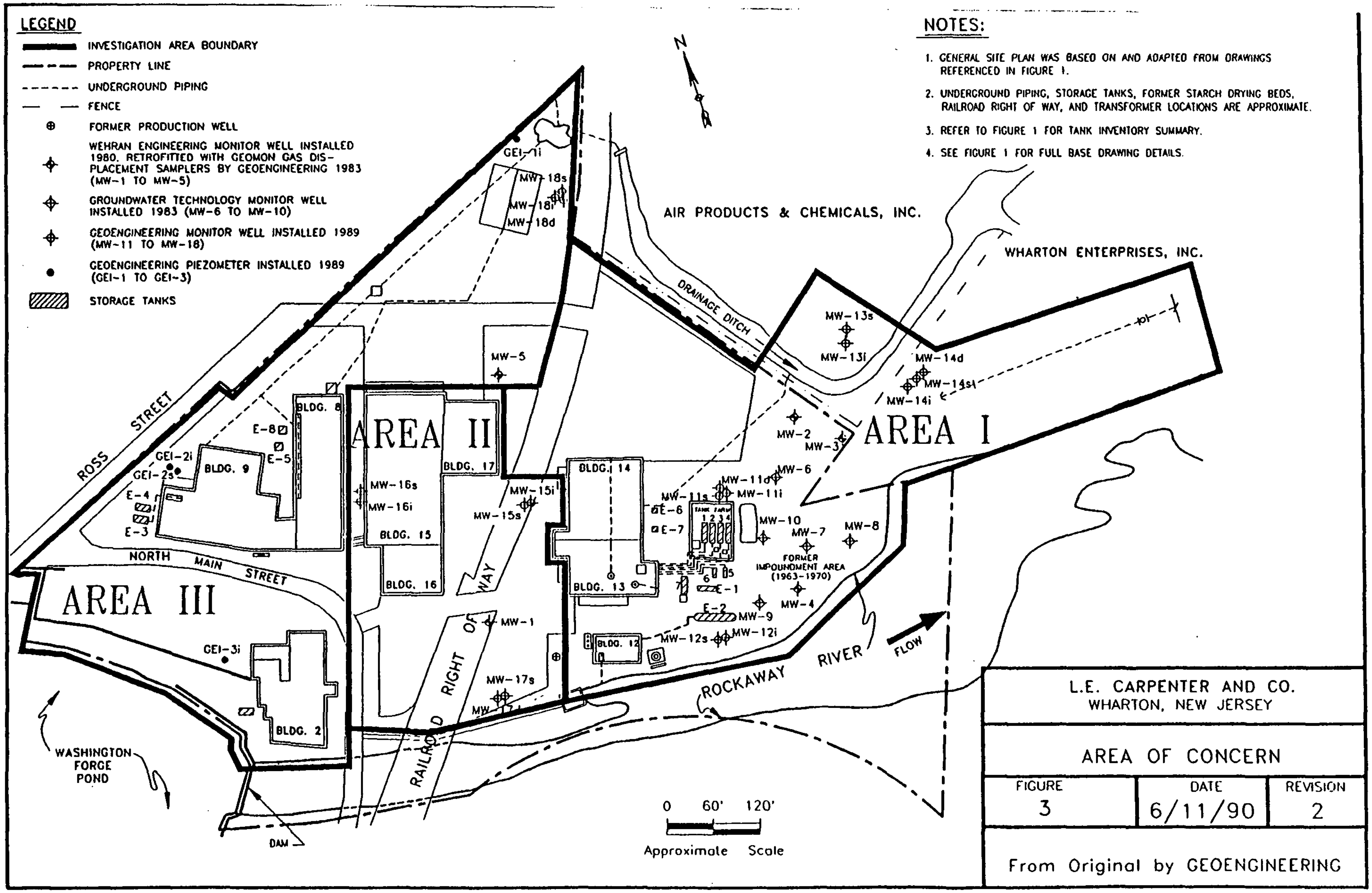
FIGURES

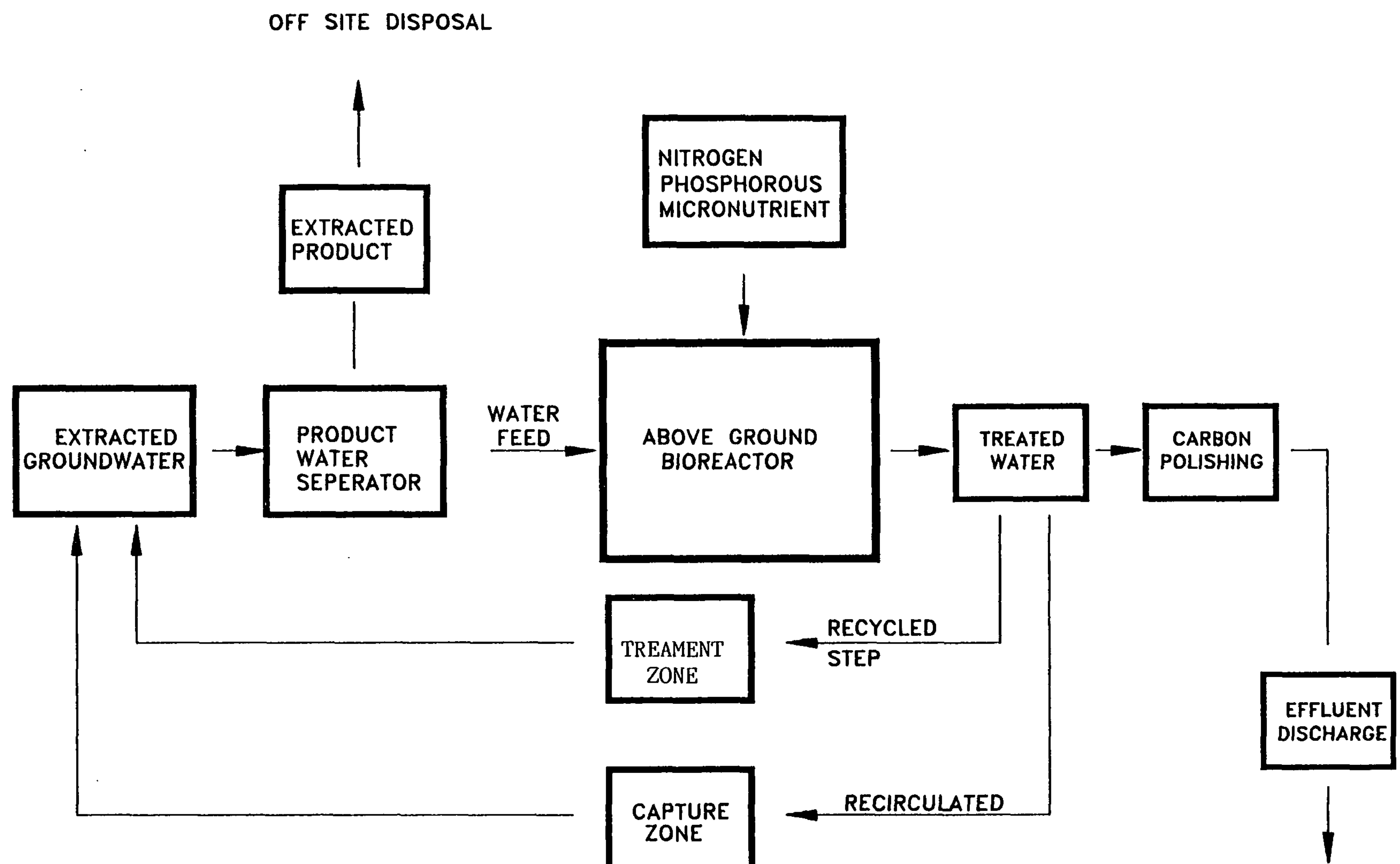
FIGURE 1


TO PENNSYLVANIA
TO NEW YORK
ROUTE 80
ROUTE 15
N
DEWEY AVE
NORTH MAIN STREET
ROSS STREET
L.E. CARPENTER
SITE
ROCKAWAY
RIVER
NEW
JERSEY
WASHINGTON
FORGE
POND
L.E. CARPENTER SITE
WHARTON, NJ.
SITE LOCATION



L.E. Carpenter Site Map Showing Contaminated Areas


LEGEND
INVESTIGATION AREA BOUNDARY
PROPERTY LINE
UNDERGROUND PIPING
FENCE
FORMER PRODUCTION WELL
WEHRAN ENGINEERING MONITOR WELL INSTALLED 1980. RETROFITTED WITH GEOMON GAS DISPLACEMENT SAMPLERS BY GEOENGINEERING 1983 (MW-1 TO MW-5)
GROUNDWATER TECHNOLOGY MONITOR WELL INSTALLED 1983 (MW-6 TO MW-10)
GEOENGINEERING MONITOR WELL INSTALLED 1989 (MW-11 TO MW-18)
GEOENGINEERING PIEZOMETER INSTALLED 1989 (GEI-1 TO GEI-3)
STORAGE TANKS
NOTES:
1. GENERAL SITE PLAN WAS BASED ON AND ADAPTED FROM DRAWINGS REFERENCED IN FIGURE 1.
2. UNDERGROUND PIPING, STORAGE TANKS, FORMER STARCH DRYING BEDS, RAILROAD RIGHT OF WAY, AND TRANSFORMER LOCATIONS ARE APPROXIMATE.
3. REFER TO FIGURE 1 FOR TANK INVENTORY SUMMARY.
4. SEE FIGURE 1 FOR FULL BASE DRAWING DETAILS.
N
AIR PRODUCTS & CHEMICALS, INC.
WHARTON ENTERPRISES, INC.
DRAINAGE DITCH
AREA I
AREA II
AREA III
ROSS STREET
NORTH MAIN STREET
RAILROAD RIGHT OF WAY
ROCKAWAY RIVER
FLOW
WASHINGTON FORGE POND
DAM
BLDG. 2
BLDG. 8
BLDG. 9
BLDG. 12
BLDG. 13
BLDG. 14
BLDG. 15
BLDG. 16
BLDG. 17
TANK FARM
FORMER IMPOUNDMENT AREA (1963-1970)
GEI-1i
GEI-2i
GEI-2s
GEI-3i
E-1
E-2
E-3
E-4
E-5
E-6
E-7
E-8
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
MW-8
MW-9
MW-10
MW-11s
MW-11d
MW-11i
MW-12s
MW-12i
MW-13s
MW-13i
MW-14d
MW-14s
MW-14i
MW-15i
MW-15s
MW-16s
MW-16i
MW-17s
MW-18s
MW-18i
MW-18d
0 60' 120'
Approximate Scale
L.E. CARPENTER AND CO.
WHARTON, NEW JERSEY
AREA OF CONCERN
FIGURE 3
DATE 6/11/90
REVISION 2
From Original by GEOENGINEERING



ALTERNATIVE 4: GROUNDWATER TREATMENT WITH REINFILTRATION

TABLES

TABLE 1

CHRONOLOGY OF INVESTIGATIVE AND REMEDIATION ACTIVITIES

DATE	ACTIVITY	DESCRIPTION
1982	Remediation of surface impoundment Remediation and closure of starch drying beds	Excavation of 4,000 cubic yards of sludge and contaminated soils from former surface impoundment. Excavation and removal of starch drying beds.
1982	Installation of groundwater monitoring system and immiscible product recovery wells	Installation of a network of ten groundwater monitoring wells used to monitor extent of groundwater contamination and free product thickness. Five of the wells were equipped with skimmer pumps to recover floating product.
1984	Initiation of passive recovery of floating product	Passive recovery system utilizing skimmer pumps in monitoring/recovery wells began operation.
1989	Completion of remedial investigation	Completion of a soil gas survey, test pit and soil sampling, monitoring well installation and sampling, air sampling, and stream sediment and surface water sampling.
August 1989	Supplemental remedial investigation	Additional sampling of soil, test pit installation, surface water sediment, and background soils/sediment.
Sept. 1989	Asbestos removal	Building 12, 13, and 14
January - March 1991	Decommissioning and tank closure	Decontamination and excavation of 16 storage tanks in accordance with NJDEPE approved Closure Plan.
March 1991	Additional sediment sampling	Collection of seven sediment samples from the Rockaway River including two from upgradient locations.
June 1991	Additional groundwater sampling	Sample collection from MW-13s and MW-S3i to confirm presence/absence of phthalate compounds. Also included installation and monitoring of MW-21 on Wharton Enterprises.
June 1991	Installation of recovery wells	Installation of three additional recovery wells as part of the enhancement of the immiscible product recovery system.

DATE	ACTIVITY	DESCRIPTION
Sept. 1991	Decontamination and decommissioning of structures in Buildings 13 and 9	Decontamination and dismantling of former process piping, tanks, etc. in Building 13; decontamination of building 9 interior.
Dec. 1991 - January 1992	Demolition of Buildings 12, 13, 14	Buildings 12, 13, 14 razed.
January 1992	Disposal area investigation	Installation of nine test pits in order to investigate and delineate the aerial extent of a former disposal area.
February 1992	Installation and sampling of additional groundwater wells	Installation and monitoring of four new shallow groundwater wells; two on Air Products property and two on Wharton Enterprises property.
Sept. 1992	Ecological Assessment of Rockaway River	Collection of sediment samples at six location to characterize Rockaway River environments upstream, adjacent to and downstream of L.E. Carpenter and evaluate potential biological impairment.
January - February 1993	Well Point Installation	Installation of twenty-three temporary well points to further delineate extent of floating product at site.
March 1993	Gamma Logging Program	Geophysical logging via down-hole natural-gamma ray logging of thirty-four wells, well points and piezometers to develop a better understanding of site stratigraphy.

TABLE 2
POTENTIAL ACTION AND LOCATION-SPECIFIC ARARs
AND TBCs FOR THE L.E. CARPENTER SITE

Relevant and Appropriate	To Be Considered
ACTION-SPECIFIC	
RCRA-40 CFR 261, 263, 264	• EPA document EPA/450/1-90-002
RVRSA policy prohibiting discharge from groundwater remediations	• EPA document EPA/450/3-87-017
N.J. P.L. 1993 c139	• Required pretest protocol
NJDEPE DWR Order No. 60-Groundwater Cleanup Criteria	• Protocol - continuous emission monitors DEQ
NJAC 7:14A-6 - Additional Requirements for Discharges to Groundwater	• Guidelines for review of application for toxic substances emissions
NJAC 7:14A - New Jersey Pollutant Discharge Elimination System	• Equipment compliance with NJ Air Pollution Control Regulations
NJAC 7:27 - Air Pollution Control	• Technical Guidance Study EPA/450/4-90-014
NJAC 7:26 - New Jersey Hazardous Waste Regulations	• Guidance on Ambient Air Monitoring, EPA/450/4-89-015 and EPA/450/4-90-005
NJAC 7:14A-5 - Requirements for Wells Infiltrating Liquid Wastes	• Hazardous Waste Incineration Guidance Series EPA /625/6-86/012, EPA/625/6-89/019, and EPA/625/6-89/021
NJAC 7:14A-12 and 13 - Wastewater Treatment Requirements	• EPA Seminar Publication: Requirements for Hazardous Waste Landfill Design, Construction, and Closure
NJAC 7:9-9 - Sealing of Abandoned Wells	• Draft RCRA Guidance Document: Landfill Design, Liner Systems and Final Cover PB87-157657
NJAC 7:9-7 - Well Installation	• Guidance on Delisting NPL sites, OSWER directive 9320.2 - 3A
NJAC 7:26E - Technical Requirements for Site Remediation	• OSWER Directive 9234.1-06: Applicability of LDRs to RCRA and CERCLA Groundwater Treatment Reinjection
NJAC 7:9-6 - Ground Water Quality Criteria	

TABLE 2 (Continued)

POTENTIAL ACTION AND LOCATION-SPECIFIC ARARs AND TBCs FOR THE L.E. CARPENTER SITE

Relevant and Appropriate	To Be Considered
LOCATION-SPECIFIC	
Treatment facility location: • In 100-year Flood Plain - 40 CFR 18 • In Lowlands - Executive Order 11988 • NJAC 7:13 - Flood Hazard Area Regulations • National Historic Preservation Act (16 USC 470) Fish and Wildlife Coordination Act: NJAC 7:7E-3 - Flood Plains, Wetlands, Endangered Species/Habitat NJAC 7:2-11 - Description of Natural Areas of State Wetlands: • Wetlands Act of 1970 (NJSA 13:9A-1) • Freshwater Wetlands Protection Act	New Jersey's threatened plant species list

TABLE 3
L. E. CARPENTER & COMPANY
Risk Assessment Summary

Risk Estimates - Current Conditions

RECEPTOR	TOXICITY ASSESSMENT	SOIL Ingestion Inhalation Dermal	SEDIMENTS Ingestion Dermal	SURFACE WATER Ingestion Dermal	FISH INGESTION (*)
On-Site Worker	HI	11	NC	NC	NC
	CA	$8x10^{-4}$	NC	NC	NC
Trespasser	HI	2.1	NC	NC	NC
	CA	$2.6x10^{-5}$	NC	NC	NC
Wader/Swimmer	HI	NA	0.32	0.013	NC
	CA	NA	$7.9x10^{-6}$	$2.1x10^{-7}$	NC
Child/Adult	*HI*	*NC*	*NC*	*NC*	*1.6*
	CA	NC	NC	NC	$6.3x10^{-4}$

* Calculations are based at the upper 95% confidence limit
HI = Hazard Index (Noncarcinogenic)
CA = Cancer Risk (Carcinogenic)
NC = Not Calculated

Current Conditions are based on:
(a) no current groundwater use on-site

Risk Estimates - Future Conditions

RECEPTOR	TOXICITY ASSESSMENT	SHALLOW GROUNDWATER Ingestion Inhalation Dermal	INTERMEDIATE (*) GROUNDWATER Ingestion Inhalation Dermal	DEEP (*) GROUNDWATER Ingestion Inhalation Dermal	SOIL	SEDIMENTS Ingestion Dermal	SURFACE WATER Ingestion Dermal	FISH INGESTION
Hypothetical Future	HI	413	4.4	6.2	79	.32	.013	1.6
Resident	CA	$1.5x10^{-2}$	$1.3x10^{-4}$	$4.0x10^{-4}$	$1.9x10^{-3}$	$7.9x10^{-6}$	$2.1x10^{-7}$	$6.3x10^{-4}$

Future Conditions are based on: assumptions of future groundwater use on-site at levels comparable to overall site groundwater quality
(*) Based in available information and the conservative risk evaluation, control of fish consumption and remediation of intermediate and deep ground water does not seem warranted.

TABLE 4

REMEDIAL TECHNOLOGIES EVALUATED FOR THE L.E. CARPENTER SITE

Environmental Media	General Response Actions	Remedial Technology Types	Process Options
Soil/Sediment	No Action	No Action	
	Institutional Controls	Restricted access	Fencing deed restriction
	Containment	Surface runoff controls	Regrading, drainage ditches, and silt fencing
		Capping/covering/consolidation	Soil, clay, asphalt, concrete, or multimedia liners
	Removal	Excavation	Excavation
	Treatment	Physical treatment	Soil washing, stabilization, supercritical fluid extraction
		Chemical treatment	Wet air oxidation, supercritical water oxidation
		Thermal treatment	On-site incineration, off-site incineration, low-temperature thermal treatment
		Biological treatment	Solid phase treatment/composting, slurry bioremediation
		In-situ treatment	Bioreclamation, soil flushing, in situ volatilization, electromagnetic heating, vitrification
	Disposal	Landfill	On-site, off-site

TABLE 4
(Continued)

REMEDIAL TECHNOLOGIES EVALUATED FOR THE L.E. CARPENTER SITE

Environmental Media	General Response Actions	Remedial Technology Types	Process Options
Groundwater	No Action	No Action	Monitoring
	Institutional Controls	Restricted use Alternate water supply Point-of-use treatment	Deed restriction Public water hookup, bottled water Carbon filters
	Containment	Subsurface diversion	Slurry walls, grout injection, sheet piling, electroosmosis
	Collection	Floating product collection	Product recovery wells, interceptor trenches
		Groundwater collection	Extraction wells, interceptor trenches
	Treatment	Physical treatment	Liquid phase separation, air stripping, steam stripping, carbon adsorption, membrane separation, resin adsorption
		Chemical treatment	UV/chemical oxidation, high-energy electron beam
		Biological treatment	Aerobic, anaerobic, spray irrigation, artificial wetland
		In situ treatment	Biodegradation, permeable treatment beds
	Disposal	Groundwater discharge	To POTW, to surface water, to groundwater

Table 5-1

Summary of the Technology Screening for Soil

Remedial Technology	Process Option	Effectiveness	Implementability	Cost
No Action	No Action	Will not significantly reduce the risk to human health or the environment within the foreseeable future	No further implementation required	Minimal
Institutional Controls	Deed & Permitting Restrictions	Effectively limits future-use risk scenario and prevents potential exposure pathways	Implementable	Low
Surface Runoff Controls	Regrading, Drainage Ditches, and Silt Fencing	Reduces soil migration via erosion	Readily implemented	Low capital and O&M
Capping/Covering	Clay, Soil, Asphalt, Concrete, or Multimedia Liners	Prevents exposure to and migration of soil contaminants. Reduces leaching of contaminants to groundwater from percolated rainwater.	Readily implemented (pavement currently covers 42% of the site)	Low to moderate capital and O&M
Excavation	Excavation	Removes contaminated soil	Readily implemented although structures and activity at the site may hinder implementation	Moderate to high capital

Table 5-1
(continued)

Remedial Technology	Process Option	Effectiveness	Implementability	Cost
Physical Treatment	Soil Washing	Well-suited for high-permeability soils. A multistage process could extract organics and inorganics. Useful in reducing soil volume for subsequent treatment steps.	Laboratory testing required	Moderate capital and O&M
	Stabilization	Applicable primarily to metals. Not well suited for organic contamination unless proprietary additives are used. Some leaching of contaminants possible. Does not reduce contaminant volume.	Land disposal restrictions may apply. Would require treatability and performance tests.	Moderate capital, low to moderate O&M
	Supercritical Fluid Extraction	Potentially effective for DEHP	Technology in developmental phase. Would require treatability tests.	High capital and O&M
Chemical Treatment	Wet Air Oxidation	Effective only for organics at high concentration	Applicability to soil slurry is unproven. Would require treatability tests.	High capital and O&M
	Supercritical Water Oxidation	Effective only for organics at high concentration	Applicability to soil slurry is unproven. Would require treatability tests.	High capital and O&M
Thermal Treatment	Incineration	Effective destruction of organics. Metals remain in ash.	Mobile/transportable units available. Local opposition to on-site treatment anticipated.	High capital and O&M
	Low-Temperature Thermal Treatment	Effective for volatile organics. Less effective for DEHP.	Pilot tests required to confirm effectiveness.	High capital, moderate O&M

Table 5-1
(continued)

Remedial Technology	Process Option	Effectiveness	Implementability	Cost
Biological Treatment	Solid Phase Treatment Composting	Potentially effective for organics. Metals remain in soil.	Space constraints and VOC emissions make it infeasible	Moderate capital, low O&M
	Slurry Bioremediation	Removes readily degradable organics	Laboratory or pilot-scale tests would be required for DEHP	High capital, moderate O&M
In Situ Treatment	In Situ Bioremediation	Effectiveness hinges on oxygen distribution. Native microbes effective in degrading organic contaminants of concern.	Treatability testing performed. No excavation or delisting required.	Moderate capital and O&M
	Soil Flushing	Nonuniform permeability hinders solvent contact.	Contaminant migration needs to be controlled. Can be implemented in combination with insitu bioremediation.	Moderate capital and O&M
	In Situ Volatilization	Not effective for DEHP. Effective for volatiles.	Readily implementable	Moderate capital and O&M
	Electromagnetic Heating	Better semivolatile volatilization than ISV, but not effective for DEHP	Readily implementable. Potential flammability hazard.	High capital and O&M
	In Situ Vitrification	Permeability and nonuniformity of soils impairs vitrification. Stabilizes metals.	Implementable	High capital and O&M

Table 5-1
(continued)

Remedial Technology	Process Option	Effectiveness	Implementability	Cost
Disposal Option	Onsite RCRA Landfill	Isolates contaminants to inhibit leaching. No contaminant reduction.	Space limitations, and land use prohibitions. Future liability.	High capital, low O&M
Disposal Option	Offsite RCRA Landfill	Isolates contaminant to inhibit leaching. No contaminant reduction.	Subject to RCRA restrictions. Future liability.	Low capital, low O&M

Table 5-2

Summary of the Technology Screening for Groundwater and Immiscible Product

Remedial Technology	Process Option	Effectiveness	Implementability	Cost
No Further Action	Monitoring	Would not reduce the extent of contamination	No further implementation required	Minimal
Institutional Controls	Deed Restriction, Public Water Hookup, or Point of Use Treatment	Prevents use of contaminated water. No contaminant reduction.	Readily implemented	Low
Subsurface Diversion	Slurry Walls	Effective in reducing migration of floating product. Bedrock is too deep to form a complete groundwater barrier. Can reduce extraction of clean groundwater.	Readily implemented	Moderate capital, low O&M
	Grout Curtains	This technology has proven to be ineffective in *soils with varying permeability.*	Readily implemented	Moderate capital, low O&M
	Sheet Piling	Effective in reducing migration of floating product. Bedrock is too deep to form a complete groundwater barrier.	Boulders in the overburden make installation impractical	Moderate capital, low O&M
	Electro-Osmosis	Unclear how floating product would be affected	Unproven technology. Field testing required.	Low to moderate capital, high O&M

Table 5-2
(continued)

Remedial Technology	Process Option	Effectiveness	Implementability	Cost
Collection	Floating Product Recovery	Effectiveness would be increased if used in combination with pump and treat technologies	In operation at the site since May 1984. EIPRS currently operating.	Low incremental capital and O&M
	Extraction	Effective in permeable soils for floating product and groundwater	Extracted groundwater would require treatment and permitting	Moderate capital and O&M
	Interceptor Trenches	Also effective for floating product and shallow groundwater, but less flexible than extraction wells.	Readily implemented	Moderate capital and O&M

Table 5-2
(continued)

Remedial Technology	Process Option	Effectiveness	Implementability	Cost
Physical Treatment	Carbon Adsorption	Effective for organics, as long as suspended solids concentrations are not excessive	Readily implemented	Moderate capital, high O&M
	Air Stripping	Effective for VOCs and could be used to reduce total organics mass loading prior to further treatment for DEHP.	Readily implemented. Would require treatment and permitting of off gases.	Moderate capital and O&M
	Steam Stripping	Effective for VOCs. Unlikely to be effective for DEHP.	Readily implemented	High capital and O&M
	Membrane Separation	Effective for higher molecular weight compounds and metals. Substantial pretreatment and maintenance requirements. Not durable. Retained only if metals removal becomes necessary.	Membranes subject to fouling and degradation.	High capital and O&M
	Supercritical Fluid Extraction	May be effective for DEHP.	Technology in developmental phase	High capital and O&M
	Resin Adsorption	Can be tailored to inorganics or organics. Not effective for concentrated contaminants. Retained only if metals removal becomes necessary.	Treatability test required	High capital and O&M
	Phase Separation	Effective on water/organic mixtures. Separated products would require further treatment/disposal.	Readily implemented	Low capital and O&M

Table 5-2
(continued)

Remedial Technology	Process Option	Effectiveness	Implementability	Cost
Chemical Treatment	Supercritical Water Oxidation	Effective for concentrated organics, some metals, and floating product. Not effective for dilute contaminants.	Treatability test required	Very high capital, high O&M
	Advanced Oxidation	Effective for organics and some metals	Treatability test required	High capital and O&M
	Wet Air Oxidation	Effective for concentrated organics. Not effective for floating product or dilute contaminants.	Treatability test required	High capital and O&M
	High-Energy Electron Beam	Effectiveness similar to other oxidation type treatment. Works for both dilute and concentrated contaminants.	Several years away from commercial availability	High capital and O&M
Biological Treatment	Aerobic	Removes readily degradable organics. Treatability study indicated effective for DEHP, xylenes, and ethylbenzene	Treatability study indicated favorable implementability.	Moderate capital, moderate O&M
	Anaerobic	Removes degradable organics. Susceptible to upsets. Reported to be unsuitable for DEHP.	Laboratory and pilot-scale tests would be required	High capital, moderate O&M
	Spray Irrigation	Removes volatiles and readily degradable organics. No DEHP removal.	Problems with VOC emissions and space constraints	Low capital and O&M
	Artificial Wetland	Removes organics. Not effective for metals or PCBs.	Problems with VOC emissions and space constraints	Low capital and O&M

Table 5-2
(continued)

Remedial Technology	Process Option	Effectiveness	Implementability	Cost
In Situ Treatment	In Situ Bioremediation	Similar to aerobic degradation in an activated sludge system. Potentially effective on contaminants sorbed to soil.	Laboratory or pilot-scale tests required. Treatability study indicated favorable implementability.	Moderate capital and O&M
	Permeable Treatment Beds	Effective only for organics in shallow groundwater for short duration	Readily implementable	Moderate capital and O&M
Groundwater Discharge	To Surface Water	Effective. Could use existing outfall to drainage ditch.	Would require pretreatment and permitting procedure	Low
	To POTW	RVRSA not accepting discharge from GW remediations	Would require pretreatment and permitting procedure	Low
	To Groundwater	Tile fields, injection wells, well points, or infiltration galleries would be effective.	Would require pretreatment, and permitting procedure, and demonstration of containment.	Low

TABLE 6

ARARs COMPLIANCE SUMMARY

	1 No Action	2 Institutional Controls	3 Groundwater Treatment	4 Groundwater Treatment with Reinfiltration	5 Excavation/On-Site Soil Washing/Bioslurry Treatment	6 Excavation/ Thermal Treatment
Chemical-Specific						
Groundwater	MCLs and NJ Class II-A cleanup standards[a] exceeded	MCLs and NJ Class II-A cleanup standards exceeded	Expected to meet	Expected to meet	Expected to meet	Expected to meet
Soil	New Jersey draft cleanup criteria[a] exceeded	New Jersey draft cleanup criteria exceeded	New Jersey proposed cleanup standards exceeded	Expected to meet	Expected to meet	Expected to meet
RCRA Toxicity Characteristic (Treated Soil, Used Carbon)	NA	NA	NA	Expected to meet	Expected to meet Coarse soil may require additional treatment	Expected to meet
Action-Specific						
Clean Closure (40 CFR 264.111)	NA	NA	NA	Will meet	Will meet	Will meet
Closure with Waste in Place (40 CFR 264.228)	Will not meet	Will not meet	Will not meet	NA	NA	NA
Solid Waste Disposal (40 CFR 241.200-212)	NA	NA	Will meet (disposal of used activated carbon)	NA	See Alternative 3	Nonhazardous residuals will be disposed off site/on site dependent on analyses.

[a] New Jersey draft cleanup criteria are not ARARs but are TBCs.

TABLE 6

ARARs COMPLIANCE SUMMARY (Continued)

	1 No Action	2 Institutional Controls	3 Groundwater Treatment	4 Groundwater Treatment with Reinfiltration	5 Excavation/On-Site Soil Washing/Bioslurry Treatment	6 Excavation/ Thermal Treatment
NPDES (40 CFR 122-125) and NJPDES NJAC 7:9-4.1 et seq. and NJAC 7:15 A-5)	NA	NA	Permit requirements for surface water discharge will be fulfilled.	Permit requirements for groundwater/ surface water discharge will be fulfilled.	See Alternative 3	See Alternative 3
Ambient Water Quality Standards (CWA 402 (a)(1))	NA	NA	Compliance will occur by meeting NPDES limitations	See Alternative 3	See Alternative 3	See Alternative 3
Air Emissions (from Excavations) (NJAC 7:27-16)	NA	NA	NA	NA	Will meet	Will meet
Location-Specific						
RCRA Location of TSD Facility in 100-Year Floodplain (40 CFR 264.18)	NA	NA	Will meet	Will meet	Will meet	Will meet
Floodplain Management - Evaluate Potential Effects of Actions, Avoid Adverse Impacts (40 CFR 6, App. A)	NA	NA	Will meet	Will meet	May require exemption for low-lying area near Wharton Enterprises.	See Alternative 5
State Siting Standard for New Incineration	NA	NA	NA	NA	NA	Expected to meet substantive requirements

TABLE 7

PRELIMINARY COST ESTIMATE: ALTERNATIVE 1
NO ACTION

Description	Estimated Quantity	Unit	Unit Price Material and Labor	Estimated Amount

No capital costs are associated with Alternative 1.

Note:

This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.

TABLE 7 (continued)

PRELIMINARY COST ESTIMATE: ALTERNATIVE 2
INSTITUTIONAL CONTROLS

Description	Estimated Quantity	Unit	Unit Price Material and Labor	Estimated Amount
Deed Notation	-	Lump sum	$35,000	$35,000
Additional Monitoring Well	1	Well	$5,000	$5,000
			Subtotal	$40,000
			Contingencies (25%)	$10,000
			Total	$50,000

Note:

This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.

TABLE 7 (continued)

PRELIMINARY COST ESTIMATE: ALTERNATIVE 3 GROUNDWATER TREATMENT

Description	Estimated Quantity	Unit	Unit Price Material and Labor	Estimated Amount
Deed Notation	-	lump sum	$35,000	$35,000
Phase I Wells: extraction/monitor well[1]	4	each	$15,000	$60,000
Phase I Wells: recirculation well	4	each	$10,000	$40,000
Phase II Wells: extraction/monitor well[1]	6	each	$20,000	$120,000
Phase II Wells: recharge well	5	each	$15,000	$75,000
Phase II Wells: discharge well	1	each	$25,000	$25,000
Treatability Testing	-	lump sum	$100,000	$100,000
Permit Applications	-	lump sum	$60,000	$60,000
Groundwater Treatment System [2]	-	lump sum	$443,000	$443,000
Soil Cover	3.5	acre	$28,300	$99,000
Hot Spot Excavation	1,100	cu. yd.	$23	$25,000
Hot Spot Transport & Disposal[3]	1,100	cu. yd.	$2,095	$2,305,000
			Subtotal	$3,387,000
			Engineering, Construction Management (25%)	$846,750
			Mobilization, Demobilization, Site Services(10%)	$338,700
			Subtotal	$4,572,450
			Contingencies (25%)	$1,143,112
			Total	$5,715,562
			Rounded to	$5,716,000

Notes:

This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.

[1] - Includes pumps and controllers.

[2] - Includes treatment building, utility hookups, clarifier, equalization tank, fixed film submerged aerobic bioreactor, granular activated carbon (GAC) beds for effluent polishing, GAC vapor phase treatment, and associated pumping and piping.

[3] - Includes post excavation sampling - assumes incineration as disposal method for costing purposes.

TABLE 7 (continued)

PRELIMINARY COST ESTIMATE: ALTERNATIVE 4 GROUNDWATER TREATMENT WITH REINFILTRATION

Description	Estimated Quantity	Unit	Unit Price Material and Labor	Estimated Amount
Deed Notation	-	lump sum	$35,000	$35,000
Phase I Wells: extraction/monitor well[1]	4	each	$15,000	$60,000
Phase I Wells: recirculation well	4	each	$10,000	$40,000
Phase II Wells: extraction/monitor well[1]	6	each	$20,000	$120,000
Phase II Wells: recharge well	5	each	$15,000	$75,000
Phase II Wells: discharge well	1	each	$25,000	$25,000
Phase II reinfiltration network	50,000	sq. ft.	$10	$497,000
Treatability Testing	-	lump sum	$100,000	$100,000
Permit Applications	-	lump sum	$70,000	$70,000
Groundwater Treatment System[2]	-	lump sum	$443,000	$443,000
Nutrient/Hydrogen Peroxide Addition System	-	lump sum	$42,000	$42,000
Soil Cover	3.5	acre	$28,300	$99,000
Hot Spot Excavation	1100	cu. yd.	$23	$25,000
Hot Spot Transport & Disposal[3]	1,100	cu. yd.	$2,100	$2,305,000
Hot Spot Excavation (Deep Soils)	1130	cu. yd.	$28.5	$32,000
Hot Spot Disposal (Deep Soils)	300[4]	cu. yd.	$3,470	$1,041,000
			Subtotal	$5,009,000
			Engineering, Construction Management (25%)	$1,252,250
			Mobilization, Demobilization, Site Services(10%)	$500,900
			Subtotal	$6,762,150
			Contingencies (25%)	$1,690,538
			Total	$8,425,688
			Rounded to	$8,452,000

Notes:

This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.

(1) - Includes pumps and controllers.

(2) - Includes treatment building, utility hookups, clarifier, equalization/nutrient mix tank, fixed film submerge aerobic bioreactor, granular activated carbon (GAC) beds for effluent polishing, GAC vapor phase treatment, and associated pumping and piping.

(3) - Includes post excavation sampling - assumed incineration as disposal method for costing purposes.

(4) - Due to nature of waste, assume materials to be drummed for shipment. Remaining 830 cu. yd. consolidated within CAMU.

TABLE 7 (continued)

PRELIMINARY COST ESTIMATE: ALTERNATIVE 5 EXCAVATION/ON-SITE SOIL WASHING/BIOSLURRY TREATMENT*

Description	Estimated Quantity	Unit	Unit Price Material and Labor	Estimated Amount
Deed Notation	-	lump sum	$35,000	$35,000
Phase I Wells: extraction/monitor well[1]	4	each	$15,000	$60,000
Phase I Wells: recirculation well	4	each	$10,000	$40,000
Site Preparation (Staging/Equip. Area)	4,200	sq. ft.	$24	$100,000
Treatability Testing	-	lump sum	$360,000	$360,000
Permit Applications	-	lump sum	$70,000	$70,000
Groundwater/Washwater Treatment System	-	lump sum	$565,000	$565,000
On-site Laboratory[2]	8	months	$40,000	$320,000
Bulk Excavation	31,500	cu. yd.	$15.40	$485,000
Bulk Treatment/Disposal	31,500	cu. yd.	$263.5 to $495	$8,300,000 to $15,600,000
Hot Spot Transport & Disposal [3]	300	cu. yd.	$3,470	$1,041,000
Site Restoration (Backfill/grading)[4]	3,150	cu. yd.	$5.70	$180,000
Phase II Wells: extraction well[1]	6	each	$20,000	$120,000
Phase II Wells: recharge well	5	each	$15,000	$75,000
Phase II Wells: discharge well	1	each	$25,000	$25,000
			Subtotal	$11,776,000 to $19,076,000
			Engineering, Construction Management (25%)	$2,944,000 to $4,769,000
			Mobilization, Demobilization, Site Services (10%)	$1,177,600 to $1,907,600
			Subtotal	$15,897,600 to $25,752,600
			Contingencies (25%)	3,974,400 to $6,438,150
			Total	$19,872,200 to $32,190,750
			Rounded to	$19,872,000 to $32,191,000

Notes:

- This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.

(1) - Includes pumps and controllers.

(2) - Laboratory to provide post excavation analysis, post treatment analysis, and verification of suitability of material for backfill.

(3) - Assumes material excavated from waste disposal area not suitable for soil washing process.

(4) - Assumes all soil except fines (assumed 20% by volume) are suitable for backfill after treatment.

TABLE 7 (continued)

PRELIMINARY COST ESTIMATE: ALTERNATIVE 6A EXCAVATION/THERMAL TREATMENT (ON-SITE INCINERATION

Description	Estimated Quantity	Unit	Unit Price Material and Labor	Estimated Amount
Deed Notation	-	lump sum	$35,000	$35,000
Phase I Wells: extraction/monitor well[1]	4	each	$15,000	$60,000
Phase I Wells: recirculation well	4	each	$10,000	$40,000
Site Preparation (Staging/Equip. Area)	9,170	sq. ft.	$24	$220,000
Treatability Testing	-	lump sum	$100,000	$100,000
Permit Applications	-	lump sum	$20,000	$20,000
Groundwater Treatment System	-	lump sum	$425,000	$425,000
On-site Laboratory[2]	20	months	$50,000	$1,000,000
Bulk Excavation	31,500	cu. yd.	$15.4	$485,000
Incinerator Permitting/Trial Burn	-	lump sum	$2,000,000	$2,000,000
Thermal Treatment	31,500	cu. yd.	$675	$21,263,000
Site Restoration (Backfill/grading)[3]	31,500	cu. yd.	$6.4	$201,000
Phase II Wells: extraction well[1]	6	each	$20,000	$120,000
Phase II Wells: recharge well	5	each	$15,000	$75,000
Phase II Wells: discharge well	1	each	$25,000	$25,000
			Subtotal	$26,069,000
			Engineering, Construction Management (25%)	$6,517,250
			Mobilization, Demobilization, Site Services(10%)	$2,606,900
			Subtotal	$35,193,150
			Contingencies (25%)	$8,798,288
			Total	$43,991,438
			Rounded to	$43,991,000

Notes:

This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.

(1) - Includes pumps and controllers.

(2) - Laboratory to provide burn characteristic analysis, post excavation analysis, post treatment analysis (including PCDD and PCDF analyses), and verification of suitability of material for backfill.

(3) - Assumes incinerator ash and oversize material suitable for backfill.

TABLE 7 (continued)

PRELIMINARY COST ESTIMATE: ALTERNATIVE 6B
EXCAVATION/THERMAL TREATMENT (ON-SITE INCINERATION)

Description	Estimated Quantity	Unit	Unit Price Material and Labor	Estimated Amount
Deed Notation	-	lump sum	$35,000	$35,000
Phase I Wells: extraction/monitor well[(1)]	4	each	$15,000	$60,000
Phase I Wells: recirculation well	4	each	$10,000	$40,000
Site Preparation (Staging/Equip. Area)	4,600	sq. ft.	$24	$110,000
Treatability Testing	-	lump sum	$100,000	$100,000
Permit Applications	-	lump sum	$20,000	$20,000
Groundwater Treatment System	-	lump sum	$425,000	$425,000
Bulk Excavation	31,500	cu. yd.	$15.4	$485,000
Waste Characterization Analysis	45	each	$1,200	$54,000
Transportation to Incineration	31,500	cu. yd.	$125	$3,938,000
Off Site Thermal Treatment	31,500	cu. yd.	$1,950	$61,425,000
Site Restoration (Backfilling/grading)	31,500	cu. yd.	$15.45	$487,000
Phase II Wells: extraction well[(1)]	6	each	$20,000	$120,000
Phase II Wells: recharge well	5	each	$15,000	$75,000
Phase II Wells: discharge well	1	each	$25,000	$25,000
			Subtotal	$67,399,000
Engineering, Construction Management (25%)[(2)]				$509,000
Mobilization, Demobilization, Site Services(10%)[(2)]				$203,100
			Subtotal	$68,111,600
			Contingencies (25%)	$17,027,900
			Total	$85,139,500
			Rounded to	$85,140,000

Notes:

This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.

(1) - Includes pumps and controllers.

(2) - Cost factors applied to subtotal less transportation and thermal treatment costs since these factors are applicable to on-site services.

ROD FACT SHEET

SITE

Name : L. E. Carpenter/Dayco Corporation
Location/State : Wharton Borough, Morris County, New Jersey
EPA Region : II
HRS Score (date): 46.13 (April 1985)
Site ID # : NJD002168748

ROD

Date Signed: April 18, 1994 (signed by NJDEPE under USEPA/State Pilot Agreement)

Remedies: Ground water treatment with re-infiltration; soil off-site disposal and in situ bioremediation

Operating Unit Number: OU-1

Construction Completion: 36 months

Capital cost: $ 8,452,000 (in 1993 dollars)
O & M: $ 210,000 (in 1993 dollars)
Present worth: $11,020,000 (7.1% discount rate, 30 years O & M assumed)

LEAD

Remedial: N.J. Department of Environmental Protection and Energy
Primary contact: Christina H. Purcell (609)-633-1455
Secondary contact: Sharon Jaffess (212)-637-4396
Main PRP: L. E. Carpenter Co.
PRP Contact (phone): Christopher R. Anderson (216)-589-4020

WASTE

Type: volatile organics, base neutral compounds, metals, PCB, PAH
Medium: soil, groundwater
Origin: manufacture of vinyl wall coverings from 1943 until 1987
Estimated quantity: 14.3 acre site includes 2230 cu.yds. soil to be excavated and disposed off-site; also 20 wells for extraction and 50,000 sq. ft. reinfiltration network

Note on Superfund Record of Decision (ROD)
L. E. Carpenter Site
Wharton Borough, Morris County, New Jersey

The L. E. Carpenter site is part of the USEPA/State Pilot agreement program wherein the State is given full authority to produce a CERCLA quality cleanup at the site. The Record of Decision (ROD) signed April 18, 1994, is the first formal ROD under a pilot agreement with USEPA to eliminate duplicative government agency review. Pursuant to the Pilot agreement "Support agency concurrence on lead agency RODs is not required". All USEPA comments regarding this ROD have been addressed and incorporated. The USEPA decision not to concur on the ROD should not be construed to mean that USEPA disagrees with the remedy proposed in the ROD or with the rationale described in the ROD. The New Jersey Department of Environmental Protection has selected Biological Treatment of ground water with reinfiltration and soil bioremediation as the remedy for the L. E. Carpenter Site. This selected remedy best satisfies the requirements of the NCP's nine evaluation criteria for the remedial alternatives. A site review will be conducted every five years of execution of the ROD until health based levels are met.