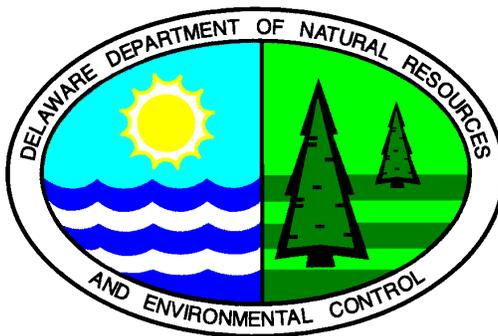


STATE OF DELAWARE

DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL SITE INVESTIGATION AND RESTORATION BRANCH

FINAL PLAN OF REMEDIAL ACTION



MAY 2005

International Petroleum Corporation of Delaware (U.S. Filter Corporation)
Wilmington, Delaware

DNREC Project No. DE-1278

This final plan of remedial action (final plan) presents the Department of Natural Resources and Environmental Control's Site Investigation and Restoration Branch (DNREC's) preferred cleanup alternative for the International Petroleum Corporation of Delaware (site) in Wilmington, Delaware. For site-related reports and more information, please see the public participation section of this document.

The purpose of the final plan is to provide specific information about the site soil and groundwater contamination and the cleanup alternatives that DNREC has considered. In addition, as required in Section 12 of the Delaware Regulations Governing Hazardous Substance Cleanup (Regulations), DNREC has provided notice to the public and an opportunity for the public to comment on the proposed plan dated March 2005. At the comment period's conclusion, DNREC has not received any written comments. The final plan designates the selected remedy for the site. All investigations of the site, the proposed plan, and the final plan constitutes the Remedial Decision Record.

This final plan summarizes the remedial investigation report, several interim remedial actions that have taken place at the site in 2003 and 2004, and the administrative record file upon which this final plan are based. Copies of these documents can be obtained or viewed at the locations listed at the end of this document.

INTRODUCTION

The International Petroleum Company (IPC) of Delaware site is located at 505 South Market Street, Wilmington, New Castle County, Delaware (FIGURE 1). The site is 6.6-acres in size and

is located along the east bank of the Christina River, just south of the City of Wilmington. The site is bordered by the Christina River to the west, by South Market Street to the east, by a lumberyard to the south and by Delaware Compressed Steel to the north (FIGURE 2). The site is labeled as tax parcel number 26-049.00-011 on the tax maps of New Castle County, Delaware. The facility is an active used oil and antifreeze recycling facility currently owned by U.S. Filter Recovery Services Mid-Atlantic, Inc. (U.S. Filter).

U.S. Filter entered into a Voluntary Cleanup Program (VCP) agreement with DNREC on November 19, 2002. Remediation of the property was to take place to achieve a Certificate of Completion of Remedy (COCR) from DNREC.

U.S. Filter subsequently completed a comprehensive Remedial Investigation (RI) at the site to assess potential contamination, specifically any adverse impacts to soil, groundwater, surface water, and Christina River sediment quality. The RI was completed in 2003, and DNREC approved the Final RI report in May 2004. The RI Report included both human health and ecological risk assessments.

SITE DESCRIPTION AND HISTORY

The site is believed to have operated as a petroleum facility since the early 1900s with reports of operation dating back to 1931. Prior to IPC, the site occupants included the Atlantic Richfield Co. (ARCO), a fuel oil distributor, and the Shotmeyer Oil Co. (Shotmeyer), a home heating-oil company. ARCO occupied the site for at least 20 years. Shotmeyer occupied the site until IPC acquired operations at the site in May 1991. IPC initiated construction for their operations in 1991 and began business operations at the site in March of 1993. U.S. Filter acquired the site from IPC in 2002.

For the past 11 years, the site has been used for recovery and recycling of used oil, antifreeze, and oil-impacted water none of which is federally classified hazardous materials or wastes. The facility receives waste oil from automobile service centers, quick lube shops, state/municipal recycling centers, and various other sources and processes it for fuel for power utility companies, major food producers, cement kilns, incinerators, and asphalt plants. The site is secured by a chain-link fence topped with barbed wire.

A gasoline service station was once located on the eastern side of the site near South Market Street. The former service station reportedly had two (2) 6,000-gallon and one (1) 5,000-gallon gasoline underground storage tanks (USTs) and one (1) 550-gallon waste oil UST. The USTs along with some petroleum-impacted soil were reportedly removed in 1992. A "No-Further Action" letter for the former service station was issued by the DNREC Tank Management Branch in 1993.

SITE INVESTIGATION HISTORY

Several investigations have taken place at the IPC facility. In 1991, WIK Associates, Inc. conducted an initial investigation of soil and groundwater quality that included the collection of eight (8) soil samples inside the diked processing and tank farm area, and the installation of seven (7) groundwater monitoring wells. The results of the 1991 investigation indicated the presence of volatile organic compounds (VOCs) and semi volatile organic compounds (SVOCs) in soil and groundwater.

In April 2001, Environmental Resources Management (ERM) conducted a limited soil and groundwater investigation at the site. Six (6) soil borings were advanced to the water table in various areas, and one (1) groundwater sample was collected from the area adjacent to the Christina River. All six (6) soil samples contained total petroleum hydrocarbons (TPH) concentrations ranging from 41 milligrams per kilogram (mg/kg) at the east end of the diked area, to 12,300 mg/kg in the west end of the diked area located east of the loading rack. The soil also contained methyl tertiary butyl ether (MTBE). The highest total VOC concentration in groundwater was 6,840 micrograms per liter ($\mu\text{g}/\text{l}$); including MTBE at 3,900 $\mu\text{g}/\text{l}$, and at the highest total SVOC concentration in site groundwater was 63.3 $\mu\text{g}/\text{l}$.

A subsequent investigation by ERM took place in October-November 2001 which focused on groundwater. Seven (7) temporary monitoring wells (TMW) were installed at the site. VOCs detected in groundwater samples included benzene, ethyl benzene, methyl ethyl ketone (MEK), MTBE, toluene, and xylene (total). Groundwater samples collected at the western portion of the site (i.e., riverside) contained the highest MTBE and total VOC concentrations.

REMEDIAL INVESTIGATION RESULTS

The activities associated with the comprehensive RI, along with a presentation and evaluation of the analytical results, are presented in the Final RI Report, May 2004, and are summarized in the following section:

ERM initiated the RI at the site in March 2003 in accordance with a DNREC-approved work plan. The RI consisted of the advancement of 20 shallow soil borings across the site and the subsequent installation of monitoring wells in 18 of those borings, to evaluate the shallow soil and groundwater quality. In addition, three (3) deeper soil borings were advanced into the underlying basal marsh clay and converted into monitoring wells. Twelve (12) shallow sediment samples were also collected and analyzed from the property waterfront along the Christina River (FIGURE 2). Soil samples were initially pre-screened by the DNREC's Site Investigation and Restoration Branch Soil Screening Laboratory (SIRB lab) for target compound list (TCL); VOCs including BTEX (benzene, toluene, ethyl benzene, and total xylenes); TCL SVOCs including polynuclear aromatic hydrocarbons (PAHs); total petroleum hydrocarbons (TPH) including volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH); Target Analyte List (TAL) metals; and TCL pesticides and polychlorinated biphenyls (PCBs).

VPH was requested as an analysis by the DNREC chemist. The Massachusetts method for VPH (MADEP-VPH-04-1.1) was used. The method provides concentrations of 15 specific compounds (including MTBE, benzene, BTEX, and naphthalene), as opposed to the gasoline range organics (GRO) method (EPA 8015-M-GRO), that provides a single total value for all of the lighter petroleum constituents compounds.

Subsequent to the SIRB lab screening, selected samples of soil, surface water, and groundwater were analyzed for these parameters by Accutest Laboratory, a DNREC-approved commercial laboratory. All analytical data received from Accutest were tabulated, checked for completeness, validated, and reviewed relative to DNREC Uniform Risk-Based Standards (URS). The URS values are guidance values, above which DNREC evaluates cleanup of the contamination for the given use of the site. The following tables provide a summary of the contaminant concentrations, as well as the respective use URS values:

SURFACE SOIL (< 2 feet below ground surface)

Contaminant	Maximum Concentration (mg/kg)	URS for Restricted Use (mg/kg)	Default Natural Background Concentration (mg/kg)
Benzo(a)pyrene	1.54	0.8	n/a
Arsenic*	109	11	11
Lead	62,100	1000	41

*Note – Approved default background value of 11 mg/kg.

SUBSURFACE SOIL (> 2 feet below ground surface)

Contaminant	Maximum Concentration (mg/kg)	URS for Restricted Use (mg/kg)	Default Natural Background Concentration (mg/kg)
Benzo(a)pyrene	0.33	0.8	n/a
Arsenic*	7.4	11	11
Lead	19.3	1,000	41

*Note – Approved default background value of 11 mg/kg.

CHRISTINA RIVER SEDIMENTS

Contaminant	Maximum Concentration (mg/kg)	NOAA ER-L (mg/kg)	NOAA ER-M (mg/kg)	URS for Sediments (mg/kg)
Arsenic	79.4	8.2	70	8
Lead	2,110	46.7	218	47
Benzo(a)pyrene	6.25	0.43	1.6	0.1
Phenanthrene	7.93	0.24	1.5	0.5
Anthracene	2.59	0.85	1.1	0.3

GROUNDWATER

Contaminant	Monitoring Well	Maximum Concentration (? g/L)	Groundwater URS (? g/L)
Benzene	MW-9S	3,470	5
Toluene	MW-15S (dup)	5,750	1000
Ethyl benzene	MW-9S	866	700
Xylenes (total)	MW-15S (dup)	3,660	10,000
MTBE	MW-18S*	40,000	20
BEHP	MW-18S*	106	6
Naphthalene	MW-15S	5,450	20
2-methyl naphthalene	MW-24S	100	12

* This well contained measurable floating NAPL during the RI groundwater-sampling event.

Soil

Benzo(a)pyrene was the only PAH that exceeded its restricted-use soil URS value. Arsenic and lead were also detected in several soil samples at concentrations exceeding their corresponding restricted use URS values. No VOCs or PCBs were detected in any soil sample in excess of their corresponding URS for restricted use.

The site-specific risk assessment concluded that under probable exposure scenarios, there was no elevated risk posed by soils at the site assuming a restricted-use setting. The cumulative carcinogenic risks for scenarios involving a construction worker and an onsite worker with potential exposure to site soils were calculated at 4.9×10^{-6} and 1.6×10^{-5} , respectively. Any potential risks to the construction worker will be handled with the deed restriction, restricting soil disturbing activities without written approval from the Department. The cancer risk for the construction worker exposure scenario is well below the HSCA threshold of 1×10^{-5} , while the cancer risk for the onsite worker scenario is slightly above the threshold value. The calculated non-carcinogenic risk, Hazard Index (HI) of 1.4 and 1.6, respectively, are slightly above the 1.0 HI value. It is important to note that the site is entirely covered by buildings and/or pavement; thus potential on-site worker exposure is unlikely to occur.

Christina River Sediments

The PAH compounds benzo(a)pyrene, phenanthrene, and anthracene and the metals, arsenic and lead were detected in sediment samples collected from the site waterfront along the Christina River. Some of the detected concentrations in the sediment samples exceeded the National Oceanographic and Atmospheric Administration (NOAA) sediment guidance values for protection of aquatic life. No VOCs or PCBs were detected in any sediment sample in excess of their corresponding URS for restricted use.

An ecological risk assessment was performed as a component of the RI to evaluate potential risks to the aquatic environment along the Christina River waterfront. The ecological risk assessment noted a potential concern from the presence of PAH-impacted sediments. However, the potential risks to wetland flora and fauna were relatively minor and were subsequently addressed in an Interim Remedial Action (IRA). See the Interim Action Section of this plan.

Groundwater

Several VOCs, PAHs, and metals exceeded their respective URS in one (1) or more of the groundwater samples. Total BTEX, methyl tertiary butyl ether (MTBE), naphthalene, bis-ethylhexyl phthalate (BEHP), 2-methyl naphthalene, arsenic, iron, magnesium, and lead were detected in one (1) or more groundwater samples exceeding their respective URS. The groundwater samples from the three (3) deep wells with screened depths of 40 – 45 feet below ground surface, MW-9D, MW-10D, and MW-15D, did not contain VOCs, SVOCs or metals with the exception of iron and manganese above the URS.

The 2003, well samples have concentrations of PAHs in excess of the URS were MW-18S and MW-15S, which also contained measurable free-product (i.e., non-aqueous phase liquid, or NAPL). These wells are located in the area of the Unloading/Loading Rack Area (ULRA) on the western portion of the property. Due to the presence of NAPL in the wells, the concentrations quantified in the samples may not accurately be representative of actual groundwater quality.

Risk Assessments

Two (2) risk assessments were conducted as part of the RI: a human-health risk assessment (HHRA) and an ecological risk assessment (ERA).

The HHRA evaluated the analytical data with respect to continued industrial/commercial site use of the facility for the foreseeable future. The HHRA was performed to quantify risks associated with potential exposures to soil, groundwater, surface water, and sediment via ingestion, dermal contact, and inhalation of volatile and particulate emissions that could theoretically occur at the site. Based on the conclusions of the HHRA, noncarcinogenic risk, associated with the above-mentioned anticipated routine exposures, may present an unacceptable risk to humans at the site. Only potential anticipated exposure scenarios incurred by routine site worker construction activities resulted in hazards/risks above DNREC's noncarcinogenic hazard index value of 1.0 or above the acceptable cancer risk level of 1.0×10^{-5} .

Since groundwater at the site and the surrounding areas is not used as a source of drinking water, it does not pose a current risk to human health through ingestion. Public water is provided by the City of Wilmington to the entire area. Finally, the site and surrounding areas fall within the City of Wilmington Groundwater Management Zone (GMZ). The GMZ restricts use of groundwater throughout Wilmington, and prevents the extraction of groundwater for potable use.

ERM conducted groundwater to surface water loading calculations in order to assess whether the observed groundwater contamination might pose a threat to the Christina River. The results of these calculations showed that the resultant surface water contaminant concentrations were several orders of magnitude below Delaware's Surface Water Quality Standards (DSWQSs). The free-product measured on site is from a localized area around the material loading/unloading area. No free product was identified in wells along the retaining wall closest to the Christina River. In addition, except for a sheen that periodically occurs on the waterfront sediments, no free product has been observed in the wetland soils during sampling or interim remedial action activities.

A screening level ecological risk assessment (SLERA) and initial ecological field survey were conducted for the site. The results of the initial ecological field survey identified three (3) major natural habitat cover types in the area outside the fenced portion of the site along the shoreline of the Christina River: (1) an emergent tidal wetland dominated by arrow arum and pickerelweed, (2) an area of wetland dominated by Phragmites, and (3) an upland berm located between the wetland and the fence line. The most likely potential exposure pathway for aquatic receptors was through direct contact with sediments and surface water. One (1) VOC, 16 PAHs, one (1) PCB and 11 inorganic parameters had HQs greater than one (1) in sediment based on a comparison of maximum concentrations to effects range low (ERLs) or the lowest effects level (LELs). HQs were greater than 10 for the majority of the PAHs while only two (2) of the inorganic analytes, lead and zinc, had an HQ greater than 10 based on the maximum concentration compared to the Effect Range-Low (ERL) or Lowest Effects Level. ERL is defined as representing the chemical concentration below which adverse effects would be rarely observed.

INTERIM REMEDIAL ACTIONS (IRAS)

Since June 2002, ERM and the facility have completed several IRAs at the site to reduce the risks posed by the site to human health and the environment, which have included the following:

- ✍ Pavement of the unbermed tank farm in May 2003 to eliminate a potential contaminant migration pathway. At the time, impacted soil excavation and paving activities took place within the previously unpaved area at the eastern end of the property containing the large aboveground petroleum tanks;
- ✍ Installation of three (3) new oil-water separators (OSWs) in October 2003 to collect storm water runoff from the paved surface of the property, inclusive of the areas containing the active oil recovery operations;
- ✍ Installation of three (3) 6-inch diameter stainless steel passive free-product recovery wells in January 2004. The three (3) recovery wells, along with the two (2) installed during the initial IRA at the tank farm, are monitored for free-product thickness biweekly, and periodically subjected to a high-vacuum evacuation event to remove any free-product.
- ✍ Phytoremediation and wetland restoration in May 2004 was done by excavating approximately 100 cubic yards of sediment from the facility waterfront along the Christina River, replacing the petroleum-impacted sediment with clean fill and topsoil, and planting approximately 45 hybrid poplars, 15 weeping willows and over 1,000 plants consisting of native grasses and shrubs in the berm and wetland soils. The trees are particularly hardy, are recommended for phytoremediation and will serve as a hydraulic interceptor for shallow groundwater flowing to the river from the site. These trees, which are commonly used in phytoremediation projects, were densely spaced at 6-foot centers to create this hydraulic barrier. In addition to the trees along the berm soils, over 1,000 plants consisting of grasses and shrubs were planted in the wetland to both stabilize the non-vegetated sediment and to improve the aesthetic quality of the wetland (FIGURES 3 AND 4). As is typical in wetland restoration projects, some of the plants may not survive and will be replaced, as necessary over time, in accordance with the Operation and Maintenance Plan (O&M plan).

REMEDIAL ACTION OBJECTIVES

According to Section 8.4(1) of the Regulations, site specific Remedial Action Objectives (RAOs) must be established for all plans of remedial action. The Regulations require that DNREC set objectives for land use, resource use, and cleanup levels that are protective of human health and the environment.

Qualitative objectives describe, in general terms, what the ultimate result of the remedial action, if necessary, should be. The following qualitative objectives are determined to be appropriate for the site:

- ✍ Continued removal of free-phase petroleum product to the extent practicable.
- ✍ Minimize and control human residential exposure to petroleum-impacted soil.

- ✍ Minimize and control human exposure to impacted groundwater.

These objectives are consistent with the current commercial use of the site for an oil recovery operation, New Castle County zoning policies, and state regulations governing water supply, and worker health and safety.

Quantitative objectives define specific levels of remedial action to achieve protection of human health and the environment. Based on the qualitative objectives, the quantitative objectives are:

- ✍ Prevent human exposure via engineering and institutional controls to petroleum-impacted soil and groundwater that would result in a carcinogenic risk exceeding 1×10^{-5} , or a non-carcinogenic hazard index value of 1.0; and
- ✍ Continued removal of free-phase petroleum product on a monthly basis by use to the extent practicable by the methods of pumping into tank trucks, which then will be added to the on site treatment system. The wells will be measured to determine quantity of free product and quantity of removal would be determined based on field measurements.

FINAL PLAN OF REMEDIAL ACTION

Based on DNREC's evaluation of the site information, the above remedial action objectives and the interim remedial actions already undertaken at the site, the remedial actions for the site shall include the following:

1. Continue the site's inclusion in the existing City of Wilmington Groundwater Management Zone. The GMZ is an internal DNREC document restricting the use of groundwater at the site.
2. Placement of a deed restriction on the property within ninety-days following DNREC's adoption of the final plan: (a) prohibiting current and future residential use of the property; (b) prohibiting any digging, drilling, excavating, grading, constructing, earth moving, or any other land disturbing activities on the property without the prior written approval of the DNREC; and (c) prohibiting the installation of any water well on, or use of groundwater at, the site without the prior written approval of DNREC, as well as noting the site's location within a GMZ.
3. Prepare and submit to DNREC for approval an O&M Plan, which will include a groundwater management plan and semi-annual review within ninety-days following DNREC's adoption of the final plan. Subsequent to DNREC approval, implement the O&M Plan.
4. Monitor the status of the phytoremediation and wetland restoration effort along the facility waterfront. Replace stressed or dead vegetation as necessary to stabilize the waterfront berm soils and wetland soils. Continue to monitor and control any *Phragmites* encroachment. A plan for the phytoremediation and wetland restoration will be submitted to DNREC for approval within 60 days of the issuance of the final plan.

Interim Action for Groundwater

1. Continue monitoring, recovery, and removal of free-product petroleum from the on-site product recovery wells until DNREC determines that this activity is no longer necessary.
2. An evaluation of the current groundwater contamination shall be conducted and submitted to DNREC within 60 days of the date of the final plan of remedial action. An evaluation will be done to determine if an active treatment system is required to handle the MTBE contamination at the site. The active system evaluation shall not be limited to pump and treat systems. At the time the evaluation is complete, it will be determined if further remedial action is necessary to address the MTBE contamination at the site. If the evaluation requires an active treatment system, the design of that system shall be submitted to the DNREC within 90 days of the determination.
3. This final plan includes remedial actions for groundwater based on the Department's best understanding of the current and anticipated future use of groundwater at or near the site. Groundwater is considered a valuable resource in the State of Delaware. Therefore, if the actual or potential future use of the groundwater resource at or near the site changes or if it becomes known that groundwater conditions result in an unacceptable risk to public health and/or the environment additional remedial actions shall be required.

PUBLIC PARTICIPATION

The Department actively solicited public comments or suggestions on the proposed plan and welcomed opportunities to answer questions. The comment period began April 6, 2005 and ended at the close of business (4:30 p.m.) April 25, 2005. No written comments or requests for a public hearing were received by DNREC.

DECLARATION

This final plan of remedial action for the International Petroleum Corporation of Delaware Site is protective of human health, welfare and the environment and is consistent with the requirements of the Delaware Hazardous Substance Cleanup Act.

James Werner, Director
Division of Air and Waste Management

Date