Department of Environmental Conservation

Division of Environmental Remediation

Environmental Restoration
Record of Decision
FORMER HUDSON PETROLEUM SITE
City of Hudson, Columbia County
Site No. B-00017-4

March 1999

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* JOHN P. CAHILL, *Commissioner*

DECLARATION STATEMENT
ENVIRONMENTAL RESTORATION RECORD OF DECISION

Former Hudson Petroleum Environmental Restoration Site
City of Hudson, Columbia County
Site No. B-00017-4

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedial action for the Former Hudson Petroleum environmental restoration site which was chosen in accordance with the New York State Environmental Conservation Law (ECL).

This decision is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the Former Hudson Petroleum environmental restoration site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A bibliography of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened release of hazardous substances and/or petroleum products from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential threat to public health and the environment.

Description of Selected Remedy

Based upon the results of the Site Investigation/Remedial Alternatives Report (SI/RAR) for the Former Hudson Petroleum site and the criteria identified for evaluation of alternatives the NYSDEC has selected in-situ bioremediation of the hot spot area and deed restrictions to prevent the use of the on-site groundwater for any purpose. The components of the remedy are as follows:

- Three applications of oxygen releasing compound (ORC), injected as a slurry into drilled or driven boreholes to a depth of 20 feet on a closely spaced grid in the hot spot area.
- Five years of groundwater monitoring to evaluate the effectiveness of the remedy.
- A deed restriction to prevent the use of on-site groundwater.

New York State Department of Health Acceptance

The New York State Department of Health concurs with the remedy selected for this site as being protective of human health.

Declaration

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 to the remedial action to the extent practicable, and is cost effective.

March 30, 1999
Date

Michael J. O'Toole, Jr., Director
Division of Environmental Remediation

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SECTION 1: SUMMARY OF THE RECORD OF DECISION

The New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health (NYSDOH) has selected a remedy to address the threat to human health and/or the environment created by the presence of hazardous substances at the former Hudson Petroleum Site. The former Hudson Petroleum site was used for bulk petroleum storage from 1949 to 1988. Over the years, spillage from operations at the site resulted in both soil and groundwater contamination from hazardous substances including volatile and semi-volatile compounds (see Sections 3 and 4 of this document for more detail on site history and extent of contamination).

The 1996 Clean Air/Clean Water Bond Act provides funding to municipalities for the investigation and cleanup of brownfields. Under the Environmental Restoration (Brownfields) Program, the State may provide a grant to the City of Hudson to reimburse up to 75 percent of eligible costs for site investigation and remediation activities. Once remediated, the property can then be reused.

In September, 1997, the City of Hudson's State assistance application for the Former Hudson Petroleum Site Environmental Restoration Project was approved by the New York State Department of Environmental Conservation (NYSDEC). The Site Investigation identified a "hot spot" of volatile organic compounds (VOCs) in the soil and groundwater in the southwest corner of the site. This has resulted in the following threat to the public health and/or the environment.

- A public health and/or environmental threat associated with the impacts of volatile organic compounds from the on-site soil, and migration into the Hudson River via shallow groundwater.

In order to eliminate or mitigate the threats to the public health and/or the environment that the hazardous substances in the soil and groundwater at the former Hudson Petroleum brownfield site have caused, the following remedy was selected to protect public health and the environment, to allow for recreational use of the site, and to protect the Hudson River:

- Bioremediation of the hot spot area and deed restrictions to prevent the use of the on-site groundwater for any purpose. Oxygen releasing compound (ORC) will be injected as a slurry in the hot spot area. The ORC will provide oxygen to enhance the natural degradation of contaminants in the soil.

The selected remedy, discussed in detail in Section 8 of this document, is intended to attain the remediation goals selected for this site in Section 6 of this Record of Decision (ROD) in conformance with applicable standards, criteria, and guidance (SCGs).

SECTION 2: SITE LOCATION AND DESCRIPTION

This site consists of approximately 3.25 acres along the eastern shore of the Hudson River in the City of Hudson, Columbia County, New York (Figure 1). There are no freshwater wetlands on or adjacent to the property, although there are two designated wetlands along the river within a mile of the site.

The site is actually comprised of five vacant tax parcels referred to as lots 8, 10, 11, 12, and 13. The site is within the flood plain of the Hudson River, and is bisected by Water Street. Lots 8 and 10 are waterfront lots located on the west side of Water Street, and lots 11, 12, and 13 are located on the east side of Water Street next to the Penn Central Railroad tracks (Figure 2). The Former Hudson Petroleum Site is bordered by the Niagara Mohawk former Manufactured Gas Plant (Water Street) Site on the south and the Hudson Powerboat Association, a private power boat club, on the north. The Water Street Site is a Comprehensive Environmental Response Cleanup and Liability Act List (CERCLIS) site, recently investigated by Niagara Mohawk in accordance with an agreement with the USEPA.

Being located at the City's waterfront, the former Hudson Petroleum site is considered crucial to the City's plan for waterfront revitalization. It is one of three properties that comprise the City of Hudson Vision Plan. A public recreational waterfront park is planned for lots 8 and 10, and commercial development with some residential use is planned for lots 11, 12, and 13. The site has a history of industrial use going back more than 100 years.

SECTION 3: SITE HISTORY

According to the Sanborn Fire Insurance Maps dating back to 1884, the site has been intensively used for a variety of industrial purposes. These included a steamboat freight house, coal storage, knitting mill, ice house, and an iron and steel foundry and molding shop. By 1949, Pulver Oil and Gas Corporation had established an oil depot on lot 10 and a rug cleaning company opened on lot 12. By 1961 the oil depot had expanded onto lot 11 and a lumber and building supply warehouse occupied lot 13. Pulver Oil and Gas eventually acquired all the property that comprises the site, and conveyed the property to Canada Oil Co. in 1981. The property was conveyed to Jolana Enterprises in 1984, then to Ajax Petroleum in 1987, who conveyed the property to Hudson Petroleum in 1988. The City of Hudson acquired the property through foreclosure in 1997.

3.1: Operational/Disposal History

When it was operational, the Hudson Petroleum site had a bulk petroleum storage capacity of 4 million gallons. There were ten large round above ground bulk petroleum storage tanks and four smaller 175 gallon petroleum storage tanks. Petroleum was pumped from oil tankers on the river into the storage tanks, then trucked off site. The average daily through put was 12,000 gallons per day. There are two 1,400 gallon underground concrete oil/water separator tanks on lot 8. Oil/water separators were used to collect storm water runoff and separate spilled oil from the water.

3.2: Environmental Restoration History

Four monitoring wells were installed at the site in 1987. One of the wells reportedly showed significant concentrations of volatile and semi-volatile compounds in the groundwater (approximately 38 parts per million), while another well had trace levels of contaminants. An air stripper was found on site, and was presumably used. Sampling in June 1988 indicated a significant reduction in contaminants - 185 parts per billion of total volatile organic compounds was reportedly detected. On June 30, 1994 a spill report was filed with the Department. A subsequent inspection reveled violations and deficiencies including surface spillage from drums and small tanks, open tanks with product allowing for entry into confined spaces, and evidence that groundwater contamination had occurred at the site.

In April and May of 1997, with funding provided through the New York State Department of Parks, Recreation and Historic Preservation Local Waterfront Revitalization Program, the City of Hudson had the oil storage tanks and abandoned drums removed from the site, and the two underground oil/water separator tanks were opened and cleaned out. After the completion of this work, test pits were excavated in several areas of the site. The test pits revealed soil contamination based on visual, olfactory, and field instrument screening. The City of Hudson then removed approximately 180 cubic yards of surficial soil from the site and stockpiled it behind the City of Hudson Police Station. This was done to improve the property for public use in June 1997. The Department is currently working with the City of Hudson to develop a plan for the proper treatment and disposal of this stockpiled material.

SECTION 4: CURRENT STATUS

To determine the nature and extent of any contamination by hazardous substances of this environmental restoration site, the City of Hudson has recently completed a Site Investigation/Remedial Action Report (SI/RAR).

4.1: Summary of the Site Investigation

The purpose of the SI was to define the nature and extent of any contamination resulting from previous activities at the site. The SI was conducted from April 1998 through August 1998. A report entitled Hudson Petroleum Corp. Site Investigation/Remedial Alternatives Report, dated November 20, 1998 has been prepared which describes the field activities and findings of the SI in detail.

The SI included the following activities:

- Literature search
- Exploratory excavations
- Soil borings
- Monitoring well installation and development

- Groundwater elevation readings and groundwater contour mapping

- Soil, sediment, and groundwater sampling

Two hydrogeologic units were defined and investigated - a upper fill unit and a lower silt and fine sand unit. The average hydraulic conductivity of the lower silt and fine sand unit was determined to be 6.1 x 10^{-5} cm/sec. This silt unit was encountered at only 6 feet below grade next to the Hudson River, and was found to extend to a depth of over 36 feet below grade. The silt unit is expected to overlie the shale bedrock throughout the site area. The uppermost unit is the more permeable fill unit which is influenced by tidal fluctuations in the Hudson River. The fill unit consists of black, blue and grey poorly sorted course gravel with brick fragments and concrete debris. Thickness of this unit varies from 2 to 15 feet. The hydraulic conductivity of the fill unit was not quantified, but is expected to vary since the level of compaction of the material was found to vary considerably. A dense, varved, olive clay unit was encountered along the east side of lot # 10 at the bottom of the fill. Shale bedrock was encountered at two feet below grade on the east side of Water Street, but was not encountered on the west side of Water Street. Geologic cross-sections of the site can be found is the SI Report.

Groundwater within the fill unit discharges to the Hudson River and to the silt and sand unit below.

To determine which media (soil, groundwater, etc.) contain contamination at levels of concern, the SI analytical data were compared to environmental Standards, Criteria, and Guidance values (SCGs). Groundwater, drinking water and surface water SCGs identified for the former Hudson Petroleum site are based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part V of NYS Sanitary Code. For soils, NYSDEC TAGM 4046 provides soil cleanup guidelines for the protection of groundwater, background conditions and health-based exposure scenarios. Guidance values for evaluating contamination in surface water sediments are provided by the NYSDEC Technical Guidance for Screening Contaminated Sediments.

Based on the Site Investigation results in comparison to the SCGs and potential public health and environmental exposure routes, certain areas and media of the site require remediation. These are summarized below. More complete information can be found in the SI Report.

Chemical concentrations are reported in parts per billion (ppb) and parts per million (ppm). For comparison purposes, where applicable, SCGs are provided for each medium.

4.1.1 Nature of Contamination:

As described in the SI Report, a total of 124 soil samples were collected from the site. Each sample was logged, classified, and screened with a photoionization detector (PID). Based on the field screening, 15 soil samples were analyzed in the laboratory. In addition, 8 groundwater and 7 river shoreline sediment samples were collected and analyzed to characterize the nature and extent of contamination. These samples were analyzed for volatile organic compounds (VOCs), semi-volatile compounds (SVOCs) and metals. The primary volatile compounds associated with petroleum contamination are benzene, toluene, ethylbenzene,

and xylene (BTEX). The semi-volatile compounds associated with petroleum contamination are the polycyclic aromatic hydrocarbons (PAHs). Several VOCs and PAHs were detected at this site.

Three areas were identified where SCGs were exceeded. These are the southwest corner of the site referred to as the hot spot area, the oil/water separator, and boring B-12A, (Figure 3). The hot spot area is an area about 90 feet long and 75 feet wide. It is referred to as the hot spot area in the SI Report because soil below the water table at approximately 8 to 20 feet below grade exhibited evidence of hydrocarbon contamination. This equates to about 3,500 cubic yards of impacted soil.

4.1.2 Extent of Contamination

Table 1 summarizes the extent of contamination for the contaminants of concern in groundwater, soil, and river sediments, and compares the data with the proposed remedial action levels (SCGs) for the Site. The following are the media which were investigated and a summary of the findings.

Soil

No contaminants were detected in the surface soils. Contaminants were detected in the subsurface soils on site in boring 12A, at the oil/water separator, and within the hot spot area. The only compounds that exceeded guidance values at boring 12A and at the oil/water separator were benzo(a)pyrene and benzo(b)flouranthene at 230 ppb and 240 ppb respectively. The field measurement with the PID during sample collection in boring B-7, a boring in the hot spot area, was 687 ppm, suggesting that the soil contained a high concentration of hydrocarbons. The soil also had an oily sheen and strong petroleum odor. Laboratory analysis of soil samples in the hot spot area showed total VOCs at 16.4 ppm, which exceeds the guidance value of 10 ppm. The primary VOCs detected in the hot spot area were n-butylbenzene, n-propylbenzene, 1,3,5- trimethylbenzene, sec-butylbenzene, and isopropylbenzene.

River Sediments

Extensive sampling of the Hudson River sediments in the vicinity of this site has been conducted by Niagara Mohawk as part of their investigation of the former Water Street Manufactured Gas Plant CERCLIS site. This sampling shows fairly extensive contamination of river sediments with PAHs from the Niagara Mohawk Water Street site. Concentrations of total PAHs in river sediments ranged from 0.052 ppm to 57,250 ppm.

Seven shoreline river sediments were collected and analyzed as part of this site investigation. Only one sample indicates a concentration of SVOCs above guidance values. Sample SS-4 shows 47.82 ppm of total SVOCs. The location of this sample and the results of other sediment, soil and groundwater samples indicate that the SVOCs detected in sample SS-4 are related to the Niagara Mohawk Water Street site. Contamination from the Niagara Mohawk Street site is being investigated under an agreement with the USEPA. Also, the Niagara Mohawk Water Street Site has recently been listed as a Class 2 Inactive Hazardous Waste Disposal Site, and this contamination will also be addressed under the State Superfund program.

Groundwater

The only area of the site where contaminants were detected in groundwater above SCGs was the hot spot area. Total VOCs in the fill unit groundwater in the hot spot area ranged from 527 ppb to 908 ppb. Ethylbenzene, 1,3,5- trimethylbenzene, and n-propylbenzene were the individual compounds that had concentrations above 50 ppb. The NYS Groundwater Standard for each of these compounds is 5 ppb. Analysis for inorganic parameters(metals) indicated elevated levels with respect to the NYS Groundwater Standards. However, due to the very high levels of suspended solids, elevated metal concentrations are expected. Groundwater sampling in monitoring well MW-3 showed 22,000 ppb of lead, and the NYS Groundwater Standard for lead is 25 ppb. A subsequent sample filtered with a 0.25 micron filter had 3 ppb of lead. It can be concluded that the high lead concentration in the unfiltered sample is directly related to the suspended solids in the turbid groundwater.

4.2 Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the health risks can be found in Section VI of the SI Report.

An exposure pathway is how an individual may come into contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Pathways which are known to or may exist at the site include:

- leaching of site contaminants, over time, from the soil and migration via the shallow groundwater into the Hudson River, a Class A water body with suitability for drinking, cooking, and recreation.

Although soils at the site are contaminated with VOCs and SVOCs, these soils are below the surface at a depth of 8 to 20 feet. Surficial soils are not contaminated, therefore, there is no direct pathway for human exposure to the contaminated soils.

4.3 Summary of Environmental Exposure Pathways:

This section summarizes the types of environmental exposures which may be presented by the site. The following pathway for environmental exposure has been identified:

- benthic organisms contacting contaminated river sediments.

Although exposure to contaminated river sediments is considered a potential complete exposure pathway, the results of sediment, soil and groundwater samples from both this SI and the Site Investigation of the Water Street Site indicate that contamination in the Hudson River sediments in the site vicinity is attributable to the Niagara Mohawk Water Street site. The Fish and Wildlife Impact Assessment included in Section VI of the SI presents a more detailed discussion of the potential impacts to fish and wildlife

resources. As noted above in Section 4.2, surficial soils are not contaminated, therefore, there is no direct pathway for environmental exposure to the contaminated soils.

SECTION 5: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past owners and operators, waste generators, and haulers.

The Potential Responsible Parties (PRP) for the site, documented to date, include any or all of the previous owners and operators of the site.

The PRPs are subject to legal actions by the State for recovery of all response costs the State has incurred. The City of Hudson will assist the State in their efforts by providing all information to the State which identifies PRPs. The City of Hudson will also not enter into any agreement regarding response costs without the approval of the NYSDEC.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS AND FUTURE USE OF THE SITE

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. The overall remedial goal is to meet all Standards, Criteria, and Guidance (SCGs) and be protective of human health and the environment. At a minimum, the remedy selected will eliminate or mitigate all significant threats to the public health and to the environment presented by the hazardous substances disposed at the site through the proper application of scientific and engineering principles.

The proposed future use for the former Hudson Petroleum Site will be a public recreational waterfront park on the west side of Water Street, and commercial development with some residential use on the east side of Water Street. The goals selected for this site are:

- Protection of the Hudson River from the migration of volatile organic contaminants by addressing the source of contamination.
- Eliminate any potential impact to benthic organisms in the Hudson River from on-site contaminants.
- Provide for attainment of SCGs for groundwater quality at the limits of the area of concern (AOC), to the extent practicable.
- Ensure that the site will provide an environmentally safe and clean public river front park area, suitable for residential, recreational, and commercial uses.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy will be protective of human health and the environment, be cost effective and comply with other statutory requirements. Potential remedial alternatives for the former Hudson Petroleum site were identified, screened and evaluated in a Remedial Alternatives Report. This evaluation is presented in Section IX of the Hudson Petroleum Corp. Site Investigation/Remedial Alternatives Report, dated November 20, 1998.

A summary of the detailed analysis follows. As presented below, the time to implement reflects only the time required to implement the remedy, and does not include the time required to design the remedy or procure contracts for design and construction.

For each alternative, the annual operation and maintenance costs (O&M) are, at a minimum, costs associated with groundwater monitoring to assess the effectiveness of the remedy. The annual O&M is projected to last for 5 years.

7.1: Description of Alternatives

The potential remedies are intended to address the contaminated soils, and groundwater at the site.

Alternative 1
No Action with Institutional Controls

Present Worth:	$ 0
Capital Cost:	$ 0
Total O&M:	$ 0

The no action alternative is typically evaluated as a procedural requirement and as a basis for comparison. It allows the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment other than through institutional controls which would include deed restrictions and notifications in public registries.

Alternative 2
In-situ Bioremediation with Oxygen Releasing Compound (ORC)

Present Worth:	$ 131,000
Capital Cost:	$ 121,000
Total O&M:	$10,000
Time to Implement	1 year

In-situ bioremediation is a remediation technique that encompasses a wide variety of treatment technologies designed to enhance the subsurface environment for existing native microbial populations which degrade contaminants. One of the most efficient ways to increase and accelerate the degradation of VOCs in the soil is to increase the indigenous microbial population by providing oxygen to the subsurface.

This can be done by injecting an oxygen releasing compound (ORC) as a slurry into drilled or driven boreholes.

Implementation of this alternative would involve driving a geoprobe to a depth of 20 feet on a closely spaced grid in the hot spot area. The ORC would be injected as the probe is withdrawn. This would provide a passive, cost-effective, long term oxygen source to the subsurface soils. It is anticipated that this would be repeated in the hot spot area three times, approximately six months apart. Deed restrictions would be included with Alternative 2, as well as Alternatives 3 and 4 below to prevent the use of on site groundwater until groundwater standards are met.

Alternative 3
Air Sparging/Soil Vapor Extraction

Present Worth:	$ 371,000
Capital Cost:	$ 276,000
Total O&M:	$ 95,000
Time to Implement	1 year - 3 years

Air sparging coupled with soil vapor extraction (AS/SVE) is a treatment technology that addresses hydrocarbon contamination in both the saturated and unsaturated zones. An appropriate AS/SVE system, given the site conditions, would consist of vertical air sparge wells coupled with horizontal soil vapor extraction wells that pull air from the soil. Contaminants in the hot spot area would be driven into the vadose zone by the sparge wells and captured by the vapor extraction wells. The number of wells would be determined by a pilot test. Based on the concentrations of VOCs in the soil, it is anticipated that treatment of the air stream with a treatment unit such as a thermal oxidizer or vapor phase activated carbon, would not be necessary.

Alternative 4
Excavation and Ex-situ Treatment

Present Worth:	$ 594,000
Capital Cost:	$ 584,000
Total O&M:	$10,000
Time to Implement	6 months

Excavation of hydrocarbon contaminated soils with off-site treatment is one of the most common remedial alternatives as it quickly removes contaminated soils preventing continued impact to the groundwater resource. Implementation of this alternative would involve stripping and stockpiling the top 6 feet of soil in the hot spot area(1,500 cubic yards). The hot spot, 3,500 cubic yards of soil beneath the watertable, would have to excavated and trucked off site to a permitted facility. Off-site treatment options at permitted facilities include thermal desorption and asphalt mixing. Due to the relatively high watertable, 5 to 7 feet below grade, it is anticipated that some form of dewatering of the excavation would be necessary. This could be done by installing sheet pilings around the excavation and pumping groundwater. Upon completion of the excavation of the hot spot, the excavation would be backfilled with the stripped stockpiled soil and clean backfill.

7.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of environmental restoration project sites in New York State (6 NYCCR Part 375). For each of the criteria, a brief description is provided followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is included in the Remedial Alternatives Report.

The first two evaluation criteria are termed threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance. SCGs for this site include NYS Groundwater Standards for groundwater; STARS Memo #1 and TAGM 4046 for soil and Technical Guidance for Screening Contaminated Sediments, dated March 1998, for sediments.

Alternative 1 would not provide for compliance with SCGs. Institutional controls should prevent human exposure to site contaminants and natural attenuation should result in the attainment of SCGs over a long period of time, perhaps several decades. Alternatives 2 and 3 should result in the attainment of SCGs for soil within about 2 years. Alternative 3 would attain SCGs for soil within 6 months. Alternatives 2, 3 and 4 should result in the attainment of SCGs for groundwater within several years. In the interim, although the groundwater in the area of the hot spot is contaminated, the levels of contamination are not high enough to have any significant impact to the Hudson River.

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

All four alternatives would be protective of human health and the environment to varying degrees. Alternative 1 would provide the lowest level of human health protection. Institutional controls protect human health by ensuring that contaminated groundwater will not be directly consumed. Alternatives 2, 3 and 4 would also provide this protection through a deed restriction, but they provide the additional protection of eliminating the source of groundwater contamination. Although the impact on human health from contaminated groundwater discharging to the Hudson River has not been measured, Alternatives 2, 3 and 4 would reduce this potential by removing the source of contamination. They also prevent the ongoing leaching of site contaminants from the soil, and migration of those contaminates by the shallow groundwater into the Hudson River, a Class A water body with suitability for drinking, cooking, and recreation.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared

against the other alternatives. In the short term, the most effective remedy will be protective during the remedial action and will minimize environmental impacts during the remedial action.

Alternatives 1, 2, and 3 would result in little worker and/or community exposure during the remedial action, although Alternative 1 would not be effective in achieving clean up levels in the short term. Alternatives 2 and 3 would result in desired clean up levels being reached in the soil in the hot spot area within a few years under optimal conditions. Because they are in-situ remedies, potential community or worker exposure would be minimal. Alternative 4 would be effective in achieving clean up levels in the short term, but would have the greatest short term potential for community and worker exposure during the remedial action. However, the community would be protected by air monitoring and fencing during the remedial action, and workers would be protected by the use of personal protective equipment.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

Alternative 1 would result in contaminants being left on site unremediated, however institutional controls would reduce the risk of exposure. The cleanup goal could be achieved over a long period of time, perhaps several decades, through the natural attenuation of contaminants. Alternatives 2, 3, and 4 would be effective in the long term after the duration of the respective actions. Alternatives 2, 3, and 4 would eliminate or significantly reduce the source of contamination within the hot spot area. This would result in the attainment of groundwater goals within several years.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the substances at the site.

Alternatives 2 and 3 would breakdown and destroy VOCs in the soil, while Alternative 1 would rely on natural processes alone. With all alternatives, toxicity and mobility would be reduced over time. Alternative 4 would immediately reduce the movement of contaminants from the soil to the groundwater as the contaminant source would be physically removed, however the toxicity and volume of the contamination would not reduced.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc..

Alternative 1 would be the easiest alternative to implement as no field work is required. Alternatives 2, 3, and 4 would be implemented as experienced contractors are available for the implementation of each technology. Alternative 3 would likely require feasibility tests or pilot tests prior to implementation.

7. Cost. Capital, operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 2.

Other than legal and administrative costs for implementing institutional controls, there would be no costs associated with Alternative 1. The estimated total capital cost for Alternative 2 is $ 121,000; Alternative 3 is $ 370,000 (based on the concentrations of VOCs in the soil, it is anticipated that treatment of the air stream with a treatment unit would not be necessary); and Alternative 4 is $ 584,000 (due to the relatively high watertable it is assumed that some form of dewatering of the excavation would be necessary). The total O&M costs for Alternatives 2 and 4 are estimated at $10,000(5 years of groundwater monitoring to access effectiveness), and
$ 95,000 for Alternative 3.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the SI/RAR reports and the Proposed Remedial Action Plan have been evaluated. A "Responsiveness Summary" included as Appendix A presents the public comments received and how the Department will address the concerns raised. The public comments received were supportive of the selected remedy.

SECTION 8: SUMMARY OF THE SELECTED REMEDY

Based upon the results of the SI/RAR, and the evaluation presented in Section 7, the NYSDEC is selecting Alternative 2, in-situ bioremediation with oxygen releasing compound (ORC), as the remedy for this site. This selection is based upon an evaluation of the seven evaluation criteria discussed in Section 7 above.

Alternative 2 was selected because:

1. It will eliminate or significantly reduce the source of contamination (contamination in the soil below the water table in the hot spot area) within 1 to 3 years, resulting in attainment of SCGs for soil and allowing for attainment of SCGs in groundwater within several years thereafter.

2. It is the most cost effective alternative that meets the remediation goals for the site. It will reduce the toxicity and volume of contamination at the site.

3. It will be a relatively short term remedy requiring less disturbance than the other alternatives, with no harmful byproducts or vapors. Contamination will be destroyed in place, rather than being transferred to the air.

4. It is a passive remedy, not requiring pumps, blowers, piping, electricity or equipment buildings.

Alternative 1 was not selected because it does not meet the remedial goals for the site. Alternatives 3 and 4 were not selected because they were more expensive and also had greater short-term impacts.

The estimated present worth cost to implement the remedy is $131,000. This cost includes three applications of ORC at the site over a one year period and five years of groundwater monitoring to assess the effectiveness of the remedy. A detailed estimate of the capital costs is shown on Table 3.

The elements of the selected remedy are as follows:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the implementation, operation and maintenance. Any uncertainties identified during the SI/RAR will be resolved.

2. Three applications of oxygen releasing compound (ORC), injected as a slurry into drilled or driven boreholes to a depth of 20 feet on a closely spaced grid in the hot spot area.

3. Groundwater monitoring to evaluate the effectiveness of the remedy for a five year period.

4. A deed restriction to prevent the use of on-site groundwater.

SECTION 9: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the Former Hudson Petroleum Site environmental restoration process, a number of Citizen Participation (CP) activities were undertaken in an effort to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

- Repositories for documents pertaining to the site were established. All pertinent documents, including the Site Investigation/Remedial Alternatives Report (SI/RAR) and the Proposed Remedial Action Plan (PRAP), were placed in the document repositories and were made available for public review. The document repositories for the site are:

City of Hudson
Clerk's Office
520 Warren Street
Hudson, New York 12534
(518) 828-1030

NYSDEC
Division of Environmental Remediation
50 Wolf Road - Rm. 228
Albany, New York 12233-7010
(518) 457-5677

Hudson Area Association Library
400 State Street
Hudson, New York 12534
(518) 828-1792

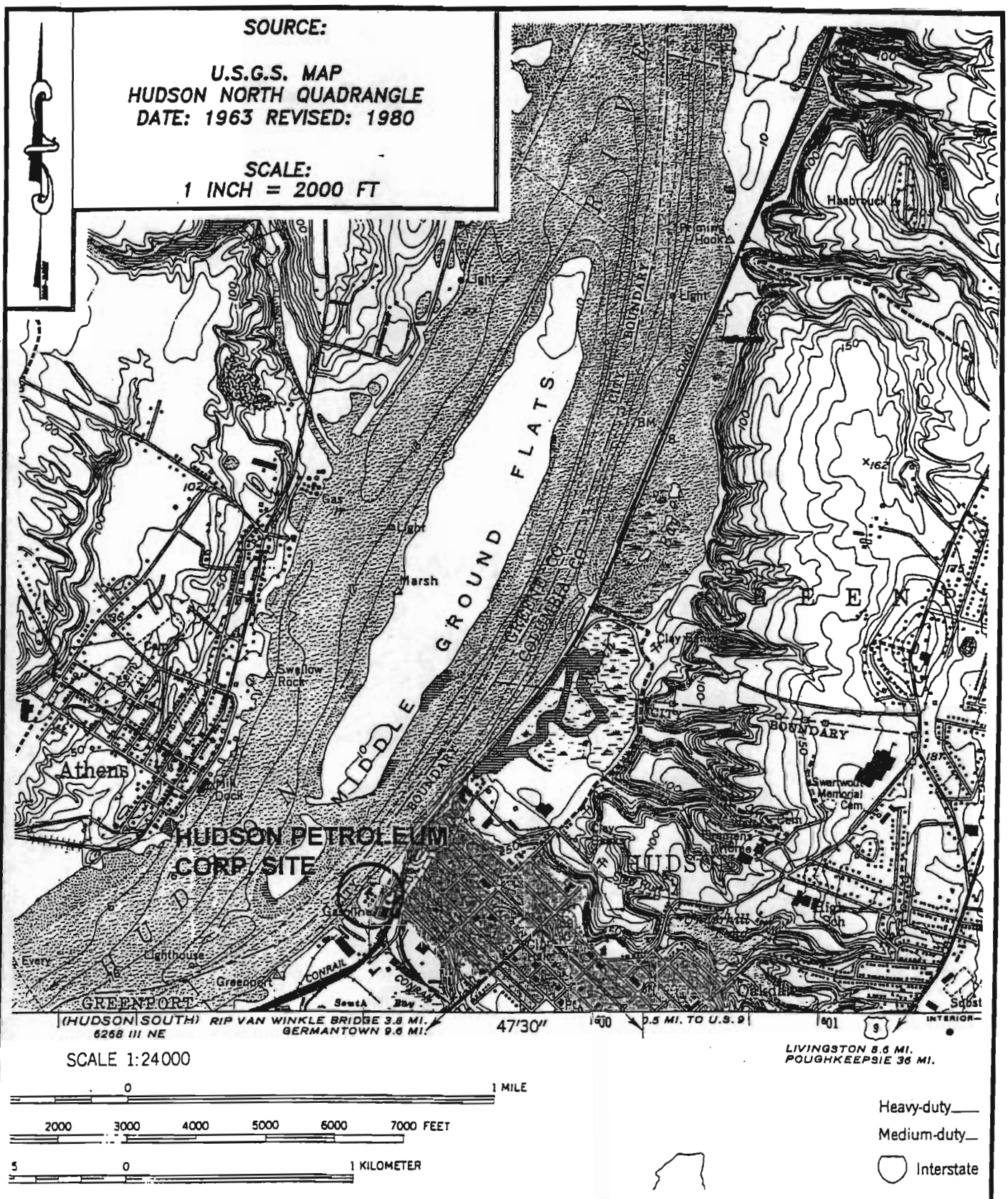
Columbia Hudson Partnership
444 Warren Street
Hudson, New York 12534
(518) 828-4718

- A site mailing list was established which included nearby property owners, local political officials, local media, and other interested parties.

- A Site Fact Sheet was mailed out to everyone on the site mailing list.

- A Public Meeting was held on February 24, 1999 at Hudson City Hall. The Public Meeting included a presentation of the SI/RAR as well as a discussion of the proposed remedy.

- In March 1999 a Responsiveness Summary was prepared and made available to the public, to address the comments received during the public comment period for the PRAP.



HUDSON PETROLEUM CORP. SITE INVESTIGATION
CITY OF HUDSON — COLUMBIA COUNTY, N.Y.

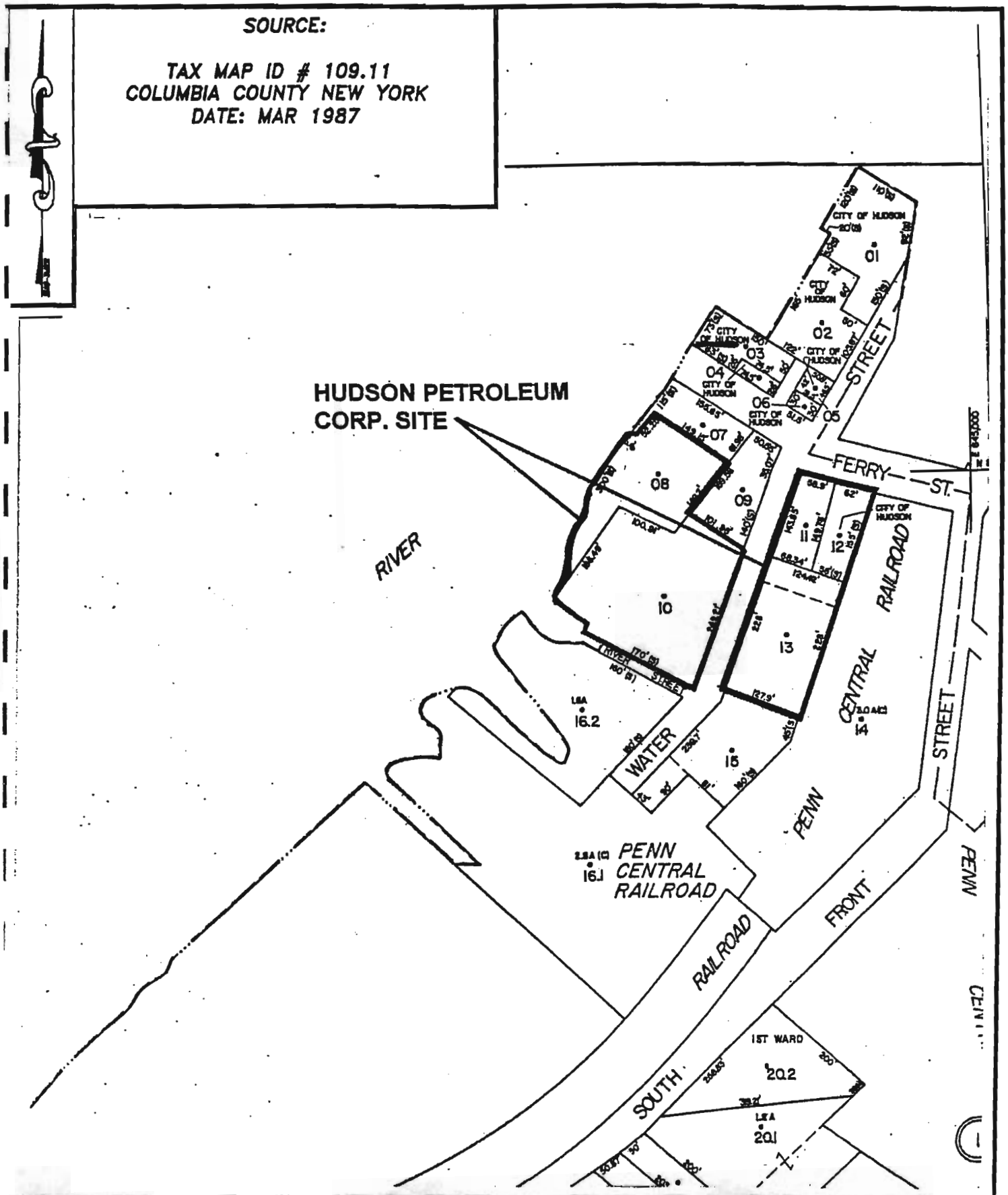
USGS TOPOGRAPHIC MAP—FIGURE 1

CRAWFORD & ASSOCIATES
ENGINEERING CONSULTANTS
561 Warren Street, Hudson New York 12534

DATE	SCALE	C&A JOB#	
7/2/96	-	HO140.0	H:\JOBS\HO140.0\EXHIBIT.DWG

SOURCE:

TAX MAP ID # 109.11
COLUMBIA COUNTY NEW YORK
DATE: MAR 1987



HUDSON PETROLEUM CORP. SITE INVESTIGATION
CITY OF HUDSON — COLUMBIA COUNTY, N.Y.

SITE TAX MAP – FIGURE 2

H&A CRAWFORD & ASSOCIATES
ENGINEERING CONSULTANTS
551 Warren Street, Hudson New York 12534

DATE	SCALE	C&A JOB#	H:\WORK\H0140.0\[illegible]
7/2/96	-	H0140.0	

G POINTS
PLE ID #
WESTSIDE), SO-10-02 (WESTSIDE) (EASTSIDE)
DUPLICATE OF SO-10-07
2 MATRIX SPIKE/MATRIX SPIKE DUPLICATE

G LOCATION
G WELL LOCATION
OCATION
SAMPLE LOCATION
AND PIEZOMETER PLACEMENT LOCATION

ABELED MW-1 THROUGH MW-10 ARE OFF-SITE WELLS
ED DURING THE SITE INVESTIGATION FOR NIAGARA MOHAWK POWER
CTED BETWEEN 1995 AND 1997. THE ACCESS TO THESE WELLS IS LIMITED;
LEVEL ELEVATIONS WERE MEASURED IN THE WELLS SHOWN ON MAY 1, 1998.

BELED AS COMW-1 IS LOCATED ON THE CONRAIL PROPERTY. (LOT 16.1)

REA IS COMPRISED OF LOTS 8, 10, 11, AND 13.

OT COMPLETED.

FROM SURVEY INFORMATION BY ROBERT J. MILENBURG, P.L.S., DATED
BORING AND WELL LOCATIONS (AND ELEVATIONS) WERE ADDED TO THE
MILENBURG, P.L.S., ON MAY 4, 1998, N.Y.S. P.L.S. #49374, MAP # 96-22.

REV. No.	ZONE		DATE	BY

SOIL, SEDIMENT AND GROUNDWATER SAMPLING LOCATIONS

CITY OF HUDSON *COLUMBIA COUNTY, N.Y.*

HUDSON PETROLEUM SITE INVESTIGATION REPORT

C&A CRAWFORD & ASSOCIATES
ENGINEERING CONSULTANTS, PLANNERS, GEOLOGISTS
591 Warren Street, Hudson New York 12534

NEW YORK
ANY PERSON
PRODUCTIONS
UNLESS HE IS
ION OF A
INEER.

DATE	Measured On	GMC	H:\WORK\H0740\SAMP-LOC.DWG
7/15/98	Drawn On	JAB	
SCALE	Designed On	DMV	C&A JOB# H0740.8
1"=50'	Approved On	DJC	DRAWING PLAN 1

Table 1
Nature and Extent of Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY OF EXCEEDING SCGS	SCG * (ppb)
Groundwater	Volatile Organic Compounds (VOCs)	Toluene	0.5-10	2 of 8	5
		Benzene	12-16	2 of 8	2
		Ethylbenzene	3-70	2 of 8	5
		m,p-Xylene	3-30	2 of 8	5
		o-Xylene	0.8-3.7	0 of 8	5
		isopropylbenzene	1-50	2 of 8	5
		n-propylbenzene	2-120	2 of 8	5
		1,3,5-Trimethylbenzene	12-570	3 of 8	5
		tert-Butylbenzene	1-22	1 of 8	5
		1,2,4-Trimethylbenzene	17-22	3 of 8	5
		sec-Butylbenzene	0.6-30	2 of 8	5
		Naphthalene	4-15	2 of 8	5
		Bromodichloromethane	1	0 of 8	50
		Methyl tertiary Butyl Ether (MTBE) *	1	0 of 8	5
		Methylene Chloride	0.7-1	0 of 8	5
		Chloroform	1.2-23	0 of 8	100
	Semivolatile Organic Compounds (SVOCs)	Phenols	3-5	2 of 8	1
		4-Methylphenol	3	1 of 8	1
		Naphthalene	2-15	1 of 8	10
		2-Methylnapthalene	2-13		
		Phenanthrene	1-2	0 of 8	50
		bis (2-Ethylhextl)phthalate	1-7	0 of 8	50
		Benzo(a)pyrene	1	1 of 8	ND
		acenaphthlene	1		
		dibenzofuran	1		
		flourene	3	0 of 8	50

Table 1
Nature and Extent of Contamination (Continued)

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY OF EXCEEDING SCGS	SCG * (ppb)
Soils	VOC	Benzene	0.9-53	1 of 15	14
		Toluene	0.7-120	0 of 15	100
		Chloroform	3-8		300
		Ethylbenzene	1-610	2 of 15	100
		m,p-Xylene	0.5-480	2 of 15	100
		o-Xylene	67-170	1 of 15	100
		isopropylbenzene	0.7-1300	2 of 15	100
		n-Propylbenzene	290-3800	3 of 15	100
		1,2,4-Trimethylbenzene	0.74-4400	2 of 15	100
		1,3,5-Trimethylbenzene	37-5400	2 of 15	100
		4-Isopropyltoluene	150-1000		
		n-Butylbenzene	15-6200	2 of 15	100
		tert-Butylbenzene	0.8-2		
		sec-Butylbenzene	0.7-1500	2 of 15	100
		Naphthalene	2-98	0 of 15	200
	SVOC	2-Methylnaphthalene	45-2100		
		Phenanthrene	72-440	0 of 15	1,000
		Anthracene	56-120	0 of 15	1,000
		Fluoranthene	55-280	0 of 15	1,000
		Pyrene	45-260	0 of 15	1,000
		Benzo(a)anthracene	43-170	5 of 15	.04
		Benzo(b)fluoranthene	44-240	6 of 15	.04
		Chrysene	42-160	5 of 15	.04
		Benzo(a)pyrene	46-230	5 of 15	.04
		Benzo(g,h,i)perylene	49-110	3 of 15	.04
		Indeno(1,2,3-cd)pyrene	51-110	4 of 15	.04
		Fluorene	57-340	0 of 15	1,000
		bis (2-Ethylhexy)phyhalate	68-590	0 of 15	50000
		n-Nitrosodiphenylamine	44		
		Napthalene	150-1900	1 of 15	200

Table 1
Nature and Extent of Contamination (Continued)

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY OF EXCEEDING SCGS	SCG * (ppb)
Sediment	SVOC	Acenaphtlylene	63	0 of 7	1130
		2-Methylnaphthalene	450	1 of 7	340
		Acenaphthene	110-820		
		Phenanthrene	110-11000	1 of 7	1440
		Fluoranthene	67-9800	0 of 7	10200
		Pyrene	75-5200	0 of 7	9610
		Benzo(a)anthracene	93-3900	2 of 7	120
		Benzo(g,h,i)perylene	66-130		
		Dibenzofuran	86-730		
		Dibenz(a,h)anthracene	70-530		
		Indeno(1,2,3-cd)pyrene	61-1200		
		Fluorene	140-100	2 of 7	80
		bis (2-Ethylhexy)phthalate	79		
		Naphthalene	490	1 of 7	300

* Standards Criteria and Guidance (SCGs) include: Part 703 NYS Groundwater Standards for groundwater; Soil Cleanup Objectives and Cleanup Levels (TAGM 4046) and STARs Memo #1 Alternative Guidance Values for soil; and NYSDFW Technical Guidance, March 1998 value for chronic toxicity.

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost	O&M	Total Present Worth
No Action with Institutional Controls	$0	$0	$0
Insitu Bioremediation with ORC	$121,000	$10,000	$131,000
Air Sparging/Soil Vapor Extraction	$276,000	$95,000	$371,000
Excavation and Ex-situ Treatment	$584,000	$10,000	$594,000

Table 3
Detailed Cost Estimate for Proposed Remedy

Remedial Testing and Baseline Samples	
(additional water samples)	$ 1,000
Capital Costs	
Monitoring Well Installation	
2 wells to 15 feet	$ 2,000
Geoprobe operators (5 days) and	
Slurry equipment and supplies	$ 6,000
Bulk ORC (5000# @ $10/#)	$ 50,000
Implementation Subtotal	$ 59,220
Engineering Design (10% subtotal)	$ 5,922
Contingency (20% subtotal)	$ 11,844
Implementation Total	$ 76,986
ORC Application No. 2 (if needed)	
50% of original cost	$ 28,110
Monitoring samples	$ 1,000
ORC Application No. 3 (if needed)	
25% of original cost	$ 14,055
Monitoring samples	$ 1,000
Additional Application Total	$ 44,165
TOTAL REMEDY CAPITAL COSTS	**$121,151**

APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

Former Hudson Petroleum Site
Environmental Restoration Proposed Remedial Action Plan
City of Hudson, Columbia County
Site No. B00017-4

The Proposed Remedial Action Plan (PRAP) for the Former Hudson Petroleum Site, was prepared by the New York State Department of Environmental Conservation (NYSDEC) and issued to the local document repository on February 9, 1999. This plan outlined the preferred remedial measure proposed for the remediation of the contaminated soil and sediment at the Former Hudson Petroleum Site. The preferred remedy is in-situ bioremediation through three applications of oxygen releasing compound (ORC), injected as a slurry into drilled or driven boreholes to a depth of 20 feet on a closely spaced grid in the hot spot area; five years of groundwater monitoring to evaluate the effectiveness of the remedy; and a deed restriction to prevent the use of on-site groundwater.

The release of the PRAP was announced via a notice to the mailing list, informing the public of the PRAP's availability.

A public meeting was held on February 24, 1999 which included a presentation of the Site Investigation (SI) and Remedial Alternatives Report (RAR) as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. These comments have become part of the Administrative Record (see Appendix B) for this site. The public comment period for the PRAP ended on March 26, 1999. No written comments were received.

This Responsiveness Summary responds to all questions and comments raised at the February 24, 1999 public meeting.

The following are the comments received at the public meeting, with the NYSDEC's responses:

COMMENT 1: How long will it be before the site is usable?

RESPONSE 1: The site is usable now, and one of the advantages of the proposed remedy is that it will not delay or interfere with the City's plans for the waterfront park. The city can proceed with it's plans, and develop and use the park as the remediation is ongoing. The remediation will only require bringing a truck mounted geoprobe or small drill rig onto the park lawn three times over the course of one year.

COMMENT 2: Will the groundwater monitoring wells be at grade level?

RESPONSE 2: Yes, it is anticipated that groundwater monitoring wells will be completed with flush mount "curb boxes". Curb boxes allow for subsurface completion of monitoring wells. The monitoring wells will look like small manhole covers on the park lawn.

COMMENT 3: Could you clarify the costs and duration of the proposed remedy?

RESPONSE 3: The estimated present worth cost to implement the remedy is $131,000. This includes the capital cost of three applications of ORC ($121,000) and five years of groundwater monitoring ($10,000). It is estimated that system could be designed this spring, and actually start this summer. The three applications of ORC could then be completed by late summer, 2000.

COMMENT 4: Could you tell us about the adjacent [Niagara Mohawk Water Street MGP] site?

RESPONSE 4: The Water Street Site is a former Manufactured Gas Plant (MGP) located just south of this site. It is a Comprehensive Environmental Response Cleanup and Liability Act List (CERCLIS) site, recently investigated by Niagara Mohawk in accordance with an agreement with the USEPA. It has been listed as a Class 2 Inactive Hazardous Waste Disposal Site, and the NYSDEC and NYSDOH will be working with Niagara Mohawk and USEPA to ensure that site is properly remediated. There are higher levels of contamination associated with that site than the former Hudson Petroleum site.

COMMENT 5: Is there any concern that contaminants from that site are moving toward the area that we are cleaning up?

RESPONSE 5: Groundwater contour mapping indicates the groundwater in the area moves to the south and to the west toward the Hudson river, and therefore contaminants from the Water Street MGP site are not moving toward this site.

COMMENT 6: By injecting this slurry, do you expect to displace any more pollutants into the river?

RESPONSE 6: No, the Oyxgen Releasing Compound (ORC) slurry will be injected into holes as the probe is withdrawn. It would be injected using a grout pump with relatively low pressure. The ORC will react with the source, the contaminated soil below the watertable in the hot spot area. It will not drive contaminants into the river.

COMMENT 7: On this property, several years ago, a lot of soil was removed and put through a kiln to decontaminate it, is that soil still on the property?

RESPONSE 7: The work that you are referring to was done under the NYSDEC Spills program in 1988 on the Lockwood property, part of the Water Street Site just to the south of this site. Contaminated soil was excavated, stockpiled, treated with an aeration system, and then removed.

COMMENT 8: Were these tests done at this site after the City of Hudson removed the 180 cubic yards of soil from this site?

RESPONSE 8: Yes. In June, 1997 the City of Hudson removed 180 cubic yards of surficial soil to improve the property for public use. The Site Investigation work was conducted from April 1998 through August 1998.

COMMENT 9: Thank you for such an informative presentation, it is refreshing. Could you explain what "ORC" stands for?

RESPONSE 9: ORC stands of Oxygen Releasing Compound. It is a magnesium peroxide compound that is activated with moisture. It is mixed with water to form a slurry that is injected into the subsurface. It provides oxygen to stimulate the indigenous microbial growth to enhance degradation of volatile organic compounds in the soil.

COMMENT 10: Does it reverse the situation, or is there anything a community should do to ensure that contamination does not reoccur? Is this a solution unto itself?

RESPONSE 10: It will be a permeant remedy. Once the contaminants have been degraded, contamination will not reoccur.

COMMENT 11: What about the reference to brick and fill? Is this a good place to build?

RESPONSE 11: Much of the property along the river is fill. It has been used for industrial purposes for over one hundred years. The only building planned for this property is on east side of Water Street. There, bedrock is within a few feet of the surface, so it should be structurally safe to build on.

COMMENT 12: I think that it is wonderful that this technology exists to correct these problems and that the state is actively pursuing this program. Are you aware that this City administration is currently pursuing a company to come in and recycle toxic waste just a few hundred yards from this site? I just wonder if this is going to have any bearing on spending taxpayer money on something that is going to be actively undone, or potentially actively undone quite close by?

RESPONSE 12: The Department has no action before it for any such plans, but they would be subject to the State Environmental Quality Review Act (SEQRA) as well as local zoning and planning reviews. Our focus here is on this site, the Former Hudson Petroleum site, and ensuring that this site will provide an environmentally safe and clean public river front park area.

COMMENT 13: Will this remediation serve all potential purposes or will more remediation have to be done?

RESPONSE 13: This proposed plan is intended to remediate the site for all proposed uses. The proposed remedy does include deed restrictions to prevent the use of on-site groundwater for any purpose. This restriction would remain in effect until it could be demonstrated that groundwater standards have been achieved.

COMMENT 14: How is the groundwater restriction put into effect?

RESPONSE 14: Groundwater use would be restricted by a deed restriction. This would be done by the NYSDEC program attorney working with the city attorney to ensure that the groundwater use restriction is attached to the deed for the property.

COMMENT 15: Excluding Alternative 1 which doesn't meet your standards for clean up, is it correct to assume that as you go from Alternative 2, to Alternative 3, to Alternative 4, that you are creating a cleaner site?

RESPONSE 15: No, Alternatives 2, 3, and 4 are all effective in achieving the remedial objectives. Alternatives 3 and 4 would not necessarily result in a cleaner site than Alternative 2.

COMMENT 16: So, Alternatives 2, 3 and 4 are all equivalent in terms of meeting your state regulatory standards, but the latter two are more expensive because of the technology, so the virtues of Alternative 2 are that it meets regulatory standards and is more cost effective. Is that pretty much a good summary of why Alternative 2 was selected?

RESPONSE 16: The fact that Alternative 2 is more cost effective is part of the reason it was selected. It would also require less disturbance than other alternatives, with no harmful vapors or by products. Contamination would be destroyed in place rather than being transferred to the air, and it would be a passive remedy, not requiring pumps, blowers, piping, electricity or equipment buildings.

APPENDIX B

Administrative Record

Administrative Record
Former Hudson Petroleum Site # B00017-4

Record Of Decision, Former Hudson Petroleum Site, City of Hudson, Columbia County Site # B-00017-4, New York State Department of Environmental Conservation, March 1999

Proposed Remedial Action Plan, Hudson Petroleum Site, City of Hudson, Columbia County Site # B-00017-4, New York State Department of Environmental Conservation, February 1999

Hudson Petroleum Corp. Site Investigation/Remedial Alternatives Report, Crawford & Associates, November 20, 1998

Final Work Plan, Site Investigation/Remedial Alternatives Report, Former Hudson Petroleum Site, Crawford & Associates, March 12, 1997