Record of Decision
Marathon Battery Company Site
New York

SITE LOCATION AND DESCRIPTION

Site Location

The Marathon Battery Company site (Site) is situated in the Village of Cold Spring in Putnam County, New York. It is across the Hudson River and slightly north of the United States Military Academy at West Point, and approximately 40 miles north of New York City. The Site is located within the incorporated boundaries of Philipstown (Figure 1).

Site Description

The Site is comprised of three study areas: Area I, which consists of East Foundry Cove Marsh and Constitution Marsh; Area II, which encompasses the former battery plant, presently serving as a book repository, the surrounding grounds, and a vault with cadmium-contaminated sediments dredged from East Foundry Cove in the 1970s; and Area III, which includes East Foundry Cove, and the Hudson River in the vicinity of the Cold Spring pier (Figure 2).

This Record of Decision (ROD) addresses the Area II portion of the Site.

The former battery plant grounds are approximately 11 acres in size, and are generally flat to slightly rolling. The most prominent features of the property are the former battery manufacturing facility of approximately 114,000 square feet, a Butler building of approximately 2,500 square feet, a production well, and a 500,000 gallon water tower. In addition, the property is littered with building debris from renovations of the main building, and with wooden pallets from the operation of the book repository. Approximately 30% to 40% of the interior space of the former battery plant is occupied with books inside and outside of packing boxes. Some of these books are wrapped in shrinkwrap plastic and appear to be relatively clean while others are heavily coated with dust.

The dredge spoils vault is fenced and encompasses 15,000 square feet with the cap being 3 to 4 feet below grade. The surface of the vault is covered with dense vegetation and several trees approximately 15 to 20 feet in height. The vault contains approximately 5,000 cubic yards of sediment with concentrations ranging from 1000 mg/kg to 3000 mg/kg.

Houses along Constitution Drive directly behind the former battery plant are located approximately 15 feet above the northern portion of the former battery plant grounds.

Ground surface elevations on-site range from a low of 27 feet above mean sea level in the northwest portion of the Site to a height of 45 feet above mean sea level in the southwest portion of the Site. There is approximately a 20 foot drop in elevation in the southeast fence line of the Site, trending south towards East Foundry Cove. Such a surface topography is common to areas of glacial deposits.

The overall groundwater flow at the Site is to the southeast, towards East Foundry Cove. In the west corner of the Site where the bedrock is situated 2.5 feet below the ground surface, groundwater is non-existent. Based on the hydraulic parameters generated, it is concluded that the aquifer under the Site is highly transmissive. The aquifer is not presently used as source of drinking water; the area residents receive their water from municipal water supplies.

Site History and Enforcement Activities

The source of contaminants found throughout Area II is the former nickel-cadmium battery manufacturing plant located on Kemble Avenue in the Village of Cold Spring (Figure 3).

The facility was designed and constructed in 1952 by the U.S. Army Corps of Engineers (USACE) for the U.S. Army Signal Corps. Initial operation of the facility was contracted by the Signal Corps to Sonotone Corporation (Sonotone). The first batteries manufactured were used in the NIKE Missile Program. In 1957, the facility began production of aircraft batteries for military jet fighters.

In September 1962, Sonotone Corporation purchased the plant and its equipment from the United States. In 1963, thirty-five thousand square feet of production area were added and production of nickel-cadmium batteries for commercial customers was initiated.

ROD DECISION SUMMARY

MARATHON BATTERY COMPANY SITE - AREA II
COLD SPRING, PUTNAM COUNTY, NEW YORK

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
NEW YORK

In December 1967, Sonotone became a wholly-owned subsidiary of Clevite, Incorporated (Clevite) which operated the facility for slightly over 18 months. In July 1969, Clevite merged with Gould, Incorporated (Gould); however, Gould was required to divest itself of the plant due to its ownership of other battery facilities. As a result, the plant appears to have been operated by Gould for only one week.

In July 1969, the plant was sold to Business Funds, Incorporated, which subsequently changed its name to Marathon Battery Company. Production increased to near capacity, and expansion of the assembly operations was undertaken in the company's plant in Waco, Texas. Eventually, all operations were transferred to the Texas plant. The last manufacturing operations performed in the Village of Cold Spring were during March 1979.

The facility, with the equipment removed, was purchased in November 1980 by Merchandise Dynamics, Incorporated (Merchandise Dynamics) for use as a book storage and distribution facility. Merchandise Dynamics has filed for Chapter 7 bankruptcy.

On September 22, 1970, a complaint was filed (70 Civ. 4110) in the U.S. District Court, Southern District of New York, by the United States against Marathon Battery Company et al for violation of Sections 407, 413, and 441 of Title 33 of the United States Code (Refuse Act). The complaint sought preliminary and permanent injunctive relief, enjoining and restraining the "discharge or deposit of any alkali, or any salt of nickel, cadmium or cobalt...directly or indirectly into Foundry Cove or the Hudson River" and ordered Marathon Battery Company and the other defendants to remove the "deposited salts, and any other refuse or debris deposited in Foundry Cove."

A Final Judgment was filed in 1972, which required Marathon Battery Company, Sonotone, Clevite, and Gould to remove contaminated sediments to a concentration of 900 milligrams per kilogram (mg/kg) from the outfall area adjacent to the discharge pipe, the channel leading to the main body of Foundry Cove, and a portion of Foundry Cove. Marathon Battery Company, Sonotone, Clevite, and Gould, participated in the limited cleanup of Foundry Cove.

In response to a report filed with the Court on the dredging by the defendants, the United States filed a Satisfaction of Judgment, stating that "the defendants...are deemed to have complied with the terms of the Final Judgment, as amended, with respect to the removal of the deposits of cadmium from Foundry Cove and are relieved from any further obligation with respect thereto."

The Army was not named as a co-defendant in the United States' suit. Marathon Battery Company, Sonotone, Clevite, and Gould alleged that the Army had participated in damaging Foundry Cove by engineering and approving the plant design and by consructing the plant.

Between November 1972 and July 1973, dredging was conducted. The dredged sediments were mixed with 0.5% limestone and were buried in an asphalt and clay-lined underground vault on the plant property. A fence was placed around the vault. The surface of the vault was to be maintained in perpetuity by the property owner and monitoring was to be conducted by the New York State Department of Environmental Conservation (NYSDEC).

Studies conducted from 1976 to 1980 by NYSDEC, the United States Environmental Protection Agency (EPA), and New York University indicated, however, the East Foundry Cove was still contaminated, much of it at concentrations greater than 900 mg/kg.

In 1981, this area was designated as a Superfund site. Subsequently, in September 1983, it was designated a state-lead Superfund site upon signing of a cooperative agreement between NYSDEC and EPA.

In 1983, in response to an informal complaint regarding possible employee illnesses associated with cadmium exposure, the Occupational Safety and Health Administration (OSHA) took air samples during routine and maintenance work in the warehouse. These data showed exposure levels of cadmium, lead, and nickel to be below OSHA's permissible exposure limits. Based upon these sample results, OSHA concluded that, although there was evidence of heavy metal-contaminated dust in the facility, the only potential exposure was to workers involved in maintenance operations. OSHA advised that these employees should wear respiratory equipment while performing dust-producing activities.

In 1984, in order to investigate the feasibility of remediating the Site, NYSDEC contracted with Acres International Corporation (Acres) of Buffalo, New York, to perform a Remedial Investigation/Feasibility Study (RI/FS). Area II sampling efforts in the summer of 1985 identified contamination in the dust inside the building at concentrations as high as 120,000 mg/kg and 130,000 mg/kg, respectively.

In August 1985, a draft RI/FS report was prepared by Acres. Because the FS contained insufficient information to evaluate effectively the effects of remedial alternatives under consideration, the USACE was tasked to expand upon the study by further evaluating the technically feasible means of remediating Foundry Cove and Constitution Marsh. The USACE completed this technical assistance in February 1986.

In March 1986, following a contractual dispute with its contractor, NYSDEC requested that EPA assume the lead responsibility for the project.

In April 1986, Ebasco Services, Incorporated (Ebasco) initiated a supplemental RI for Area I. In September 1986, a ROD was signed by EPA, calling for the remediation of East Foundry Cove Marsh and "no action" for Constitution Marsh.

An analysis of the sampling data from the former battery facility by the Agency for Toxic Substances and Disease Registry (ATSDR) in late June 1986 led to the recommendation that the facility be closed immediately to all personnel not in personal protective equipment, until the cadmium levels were below occupational standards and guidelines. On July 3, 1986, EPA advised OSHA of the levels of cadmium detected in the warehouse, referring the project for immediate action.

Because of the proximity of the local residences to the former battery facility, on July 9-10, 1986, the EPA Technical Assistance Team (TAT) collected twenty-two discrete soil surface samples from the yards of residences on Constitution Avenue and the Boulevard (Figure 4). TAT inspected the warehouse and took soil and air samples around the perimeter of the facility. Results from this investigation showed no detectable levels of cadmium in the air, and concentrations ranging to 600 mg/kg in the soil on the plant grounds.

In July 1986, OSHA performed an investigation of the warehouse. Air and wipe samples were collected. Results from the air sampling showed levels of cadmium in the employees' breathing zone to be below OSHA's occupational exposure criteria.

In February 1988, EPA conducted an investigation of the sprinkler system within the battery facility in response to notification by the Cold Spring fire department that the system was inoperable. EPA, concerned that a fire could result in a release of contaminated dust into the environment, inspected the facility and verified that the sprinkler system was inoperable.

EPA intends to proceed under CERCLA against the Potentially Responsible Parties (PRPs). Consequently, notice letters were sent to USACE, Marathon Battery Company, Gould, Sonotone, and Clevite, as well as Merchandise Dynamics, the current property owner.

Marathon Battery Company, Gould, and the USACE have cooperated in supplying information and meeting with the Agency to comment on the proposed remedial alternative.

COMMUNITY RELATIONS HISTORY

The governmental effort to ensure significant community involvement in Cold Spring has been extensive. A comprehensive public relations strategy was developed by EPA to keep concerned parties cognizant of CERCLA activities at the Site. The EPA has a public information repository in Cold Spring. The public is also kept informed through public meetings.

A public meeting was held on June 13, 1988 to discuss the preferred alternative for the Area II portion of the Site. A more detailed discussion of the outcome of this public meeting can be found in the Responsiveness Summary.

The Supplemental RI/FS and the Proposed Remedial Action Plan (PRAP) were released for public comment on May 27, 1988. After submittal of the PRAP to the public, a number of issues of concern were raised by NYSDEC and the public. In particular, EPA reassessed the No-Action alternative for the vault and the proposed cleanup level of 50 mg/kg for the on-site cadmium-contaminated soil.

The Responsiveness Summary addresses questions and concerns raised by interested parties during the public comment period.

SCOPE AND ROLE OF OPERABLE UNIT

As indicated previously, the Site has been divided into three areas, addressed as separate operable units. A ROD for the Area I portion was signed in September 1986, and the design is currently underway. This ROD deals with the second operable unit which encompasses the former battery plant, the dredge spoils vault, the surrounding grounds, and nearby residential yards.

SUMMARY OF SITE CHARACTERISTICS

The RI/FS was prepared by EPA's contractor, Ebasco in April 1988. Five different media were sampled during the RI: surface soils; subsurface soils; groundwater; and dust and concrete borings from the former battery plant. All media were found to be contaminated by the activities performed at the plant.

Soil Investigation

Sixty-six surface and subsurface soil samples were collected from the former battery plant grounds and analyzed for full hazardous substance list (HSL) compound concentrations. On-site soils were found to be contaminated with heavy metals, volatile organic compounds, base/neutral extractable compounds, and pesticides. Tables 1 and 2 list the concentrations of inorganic and organic compounds detected in soils Figure 5 shows the locations of the contaminated soil on the plant grounds. Table 3 summarizes average United States soil concentrations found at this site. All compounds that were found to exceed background level and criteria are noted.

Cadmium concentrations ranged from 0-34,700 mg/kg, with a mean of 685 mg/kg. Nickel was found in concentrations of 0-36,300 mg/kg, with a mean of 674 mg/kg, and cobalt was found at 0-1800 mg/kg, with a mean of 35.2 mg/kg*. In general, the concentration distribution patterns of these three metals are very similar. Levels of metal contamination decrease with distance from the former battery plant and with depth from ground surface. Metal contamination is limited to the upper 60-90 cm (2-3 feet) of site soils. The sources of this contamination are believed to be air emissions from former ventilation units and contaminated debris which was removed from the building and still litters the Site.

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* Soil metal concentrations reported in the RI include samples taken previous to the RI by NYSDEC's, contractor Acres. This

In summary, heavy metal-contaminated soils on the former battery plant grounds occur primarily in the area around the building or under debris from the demolition. Since no contaminant-specific promulgated applicable or relevant and appropriate federal and state requirements (ARARS) exist for heavy metals, other criteria were evaluated to determine the level of cleanup of contamination at the Site.

Hazard substance list (HSL) compounds were found in both surface and subsurface soils on the former battery plant grounds. The majority of compounds found were polycyclic aromatic hydrocarbons (PAHs) ranging in concentration from 0 to 9.2 mg/kg. Soil contamination by PAHs appears to be related to surface runoff from the asphalt parking lot.

Volatile organic compounds were also detected in the soil on the former battery plant grounds. Trichloroethylene was found at one location, 12-14 feet below ground level, at concentrations of 13 to 30 ug/kg. Trichloroethylene was detected at another location at 37 ug/kg, 35 to 37 feet below ground level in the saturated soil. Tetrachloroethylene was detected in soils at three locations, 12 to 14 feet below the ground surface, at a concentration of 15 ug/kg and in the surface (0-6") at 2.3 and 2.2 ug/kg. Other volatile organic compounds detected include toluene at 21,000 ug/kg, xylene at 410 ug/kg, ethylbenzene at 150 ug/kg and chloroform at 120 ug/kg.

Several pesticide and pesticide breakdown products were found in the soil samples. Chlordane was found in surface soil (0-6") at 8,900 ug/kg. 4,4'-DDT was found at concentrations of 6.4, 3.2, and 24 ug/kg, while its breakdown product DDE and Dieldrin were found at concentrations of 10 ug/kg and 3.1 ug/kg, respectively. Beta BHC was detected at 260 ug/kg, endosulfan sulfate was detected at a concentration of 12 ug/kg, and heptachlor epoxide was detected at 6.9 ug/kg.

In general, soil contamination is localized in areas near the former battery plant building and the parking lot.

Groundwater Contamination

During the RI, 17 groundwater samples were collected for HSL volatile organic contaminant analysis (Table 4). Nine of the groundwater samples indicated TCE contamination with concentrations ranging from 2 ug/1 to 100 ug/1. The most upgradient well had the highest TCE concentrations, ranging from 82 to 100 ug/1. 1,1-trichloroethane in this well ranges from 8 to 18 ug/1. The most downgradient well had a TCE concentration of 26 ug/1 and 1,1,1-trichloroethane at 5.5 ug/1. Wells located approximately at the mid-point between the upgradient and downgradient wells have TCE concentrations of 6, 8 and 65 ug/1, and 1,1,1-trichloroethane concentrations of 2, 0 and 9 ug/1. These five monitoring wells are situated in a line with groundwater flow direction (i.e., southeast; see site description). This may indicate a volatile organic contaminant plume present in the groundwater, with the contaminant source near the upgradient well. This assumption is supported by the TCE- and tetrachloroethane-contaminated soil samples collected at this monitoring well location. 1,2-dichloroethane was detected at concentrations of 15 ug/1 during the pump test. 1,2-dichloroethane was not detected in groundwater samples collected from the other monitoring wells.

Building Contamination

During the RI, representative dust samples were taken from 19 locations of the building surfaces (i.e., walls, ceilings, floors, etc.) and from six locations on the stacked book surfaces (i.e., plastic covers, boxes, etc.) (Table 5).

Dust samples were analyzed for cadmium, cobalt and nickel. The concentrations of these metals in building dust are shown in Table 5. Cadmium concentrations in building dust ranged from 24-15,300 mg/kg with a mean of 5946 mg/kg. Cobalt concentrations ranged from 1.2-462 mg/kg, with a mean of 33.26 mg/kg, while nickel dust concentrations ranged from 36 to 21,500 mg/kg, with a mean of 6771 mg/kg*.

The estimated surface areas of the building and the stacked books are 239,000 ft^2 and 322,000 ft^2 respectively. Assuming that the thickness of the dust on the surfaces is 1/16 inch, the total dust volume from both the building surfaces and the stacked books surfaces is 110 yd^3.

Cadmium, cobalt and nickel analyses were performed on concrete borings. In seven samples, no cadmium was found in the concrete; cobalt concentrations ranged from 7.1 to 66 mg/kg, and nickel concentrations ranged from 20 to 200 mg/kg.

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* Building dust metal conentrations reported in the RI include samples taken previous to the RI by NYSDEC's contractor ACRES.

Integrity of the Spoils Vault

Approximately 5000 cubic yards of sediment were deposited in an underground vault located on the former battery plant grounds in 1972 (Figure 3). These sediments have a cadmium concentration ranging from 1000 mg/kg to 3000 mg/kg. Five monitoring wells were installed around the perimeter of the dredge spoils vault, and subsurface soils and groundwater were analyzed to determine whether the cadmium, cobalt and nickel contaminated sediments had leaked from the vault. The results of these analyses showed that contaminated sediments have not migrated from the vault (Table 4). None of the groundwater samples or subsurface soils collected from the vault wells produced any cadmium, cobalt, or nickel.

SUMMARY OF SITE RISKS

The following evaluation is consistent with EPA Superfund Public Health Evaluation Manual, dated October 1986.

The chemical parameters presented in Tables 1 and 2 which were found to exceed health and environmentally based values were candidate indicator parameters. Several compounds were eliminated based on low concentrations present in soil, limited available toxicity data for health risk assessment, or low potential for exposure.

Many base/neutral polycyclic aromatic hydrcarbons (PAHs) were detected in the surface soils of the former battery plant grounds. These PAHs were detected in 28 of the 66 soil samples collected during the investigation. The PAHs which were detected during the sampling effort are generally mid to high molecular weight PAHs, indicative of asphalt or coal tar. Benzo (a) Pyrene (B(a)P) was detected in 12 of 66 total soil samples, ranging from 0.096 to 6.5 mg/kg. These B(a)P concentrations fall within normal background concentrations. Based on previous studies, it has been shown that asphalt can contain between 1.0 and 69 mg/kg of total B(a)P, some of which can be transported to soils near roadways and parking lots. It appears that the levels of B(a)P and other PAHs found in the soils of the Marathon Battery Company site are indicative of normal background contamination not requiring remediation.

The pesticides detected in the soil samples included chlordane and breakdown products of 4-4' DDT, lindane and heptachlor. These pesticides and their breakdown products were detected in 11 of the 66 collected soil samples and generally ranged between 1.6 and 260 ug/kg, with chlordane being found in one sample at 8900 ug/kg near the fence lines. Since chlordane was only found in one soil sample, it is believed that it represents a localized spill unrelated to site operations and should not be considered site-specific contamination requiring remediation. In general, none of the pesticides detected in the soil samples were considered to be site-specific contamination requiring remediation and were not addressed in the public health evaluation.

The final indicator chemicals which were subjected to the health risk assessment are cadmium, nickel, chloroform, tricloroethylene, tetrachloroethylene, 1,1,1-trichloroethane, and 1,2-dichloroethane.

Based on environmental features and surroundings, along with possible activities and concerns of nearby residents, the following exposure pathways were initially considered to be of potential significance:

- o Ingestion of soil/dust
- o Ingestion of groundwater
- o Direct contact with soil/building dust
- o Inhalation of soil/building dust
- o Inhalation of fumes during a fire event
- o Volatilization of organics from groundwater during use
- o Contamination of groundwater by dredge spoils vault

Numerical estimates of risk were calculated for the seven indicator chemicals for each potential route of exposure, on the basis of Acceptable Chronic Intake values and Cancer Potency Factors (CPFs) and the human intakes estimated for each exposure scenario. Inhalation (USEPA, 1986) of cadmium-contaminated dust (soils) was identified as the pathway of greatest risk to nearby residents and persons entering the property. The inhalation model assumed that dusts were generated from the most highly contaminated soils on-site, that 60% of inhaled cadmium was absorbed into the lung, and that adults were exposed to an ambient dust level typical of rural air. The model utilized the EPA Cancer Potency Factor for cadmium of 6.1 mg/kg/d (Ebasco).

Using these assumptions, it was determined that inhalation of cadmium exceeded the 10^{-6} cancer risk level by factors of 98.0 and 271 for soils and former plant dusts, respectively. Ebasco determined that soil cadmium levels would have to be reduced to 56 ppm in order to achieve the 10^{-6} cancer risk level.

Although the groundwater is not currently used for drinking water or any other potable water use, the Village of Cold Spring has expressed interest in using this aquifer to supplement its fire hydrant supply. This fire hydrant water supply is connected to the municipal water supply, based on design drawings from the construction phase of the former battery plant. Therefore the potential exists, if the aquifer is used as a water source, residents may be exposed to contaminants.

It was assumed in the model that a person drinking water from the aquifer consumed 2 liters per day for a lifetime, with contaminant concentrations at the maximum level determined in the RI. This evaluation indicated that trichloroethylene, chloroform, tetrachloroethylene, 1,1,1-trichloroethane and 1,2 dichloroethane exceeded the 10^{-6} cancer risk by factors of 31.4, 254, 3.5, 3.9, and 3.7, respectively.

The risk assessment also indicated that by the direct soil/dust ingestion scenario, cadmium exceeded the maximum acceptable intake level by a factor of 18 for workers ingesting site soils, and by a factor of 48 for workers ingesting building dusts.

The Ebasco risk assessment determined that the cadmium-contaminated dust would not pose a significant health risk to firefighters or nearby residents in the event of a fire at the former battery plant.

The EPA subsequently requested that the Agency for Toxic Substances and Disease Registry (ATSDR) evaluate the health risk associated with ingestion of garden vegetables grown on cadmium-contaminated soils. ATSDR assumed that the dietary intake of high-and-low cadmium accumulating vegetables is, as reported in the FDA 1981-82 total diet study (Gartrell, 1986), that 50% of vegetables consumed are home-grown, and that accumulation of cadmium by vegetable classes is as reported in the literature (Davis, 1984, and Smilde, 1982). The maximum daily dietary intake of cadmium recommended by EPA is 70 ug/d. Using the above assumptions, ATSDR estimated that ingestion of vegetables grown in garden soils containing 20 mg/kg cadmium would produce a daily dietary cadmium intake of 41-53 ug/d, and ATSDR recommended a cadmium cleanup level for residential soils of 20 mg/kg.

Dermal absorption of on-site soil and dust was found to be an ineffective pathway since no compound exceeded the 10^{-6} cancer risk or acceptable intake rates. A cancer risk less than 10^{-6} was found for ingestion of groundwater, and also inhalation of fumes during a fire event.

Using the acceptable cadmium intake rate of 2.9×10^{-4} mg/kg/day, acceptable site specific soil and dust concentrations for the ingestion pathway are 3140 mg/kg. Based on a carcinogenic risk of 10^{-6} and compound-specific acceptable intakes, acceptable soil and dust concentrations for cadmium for the inhalation pathway are 56.3 mg/kg.

The model used for the ingestion of groundwater indicates that a significant risk would occur if groundwater were to be used as a drinking water supply.

Acceptable water concentrations calculated in the RI report are: trichloroethylene, 3 ug/1; chloroform, 0 ug/1; tetrachcloroethlene, 0 ug/1; 1,1,1-trichloroethane, 0 ug/1 and 1,2-dichloroethane, 0 ug/1. It is anticipated that the groundwater will take 3-10 years to reach these acceptable levels by means of natural attenuation.

A complete description of the analytical methods that were used in making these risk calculations are documented in the RI report and supplementary memorandum which are part of the Administrative Record.

DOCUMENTATION OF SIGNIFICANT CHANGES

Based on the requirements of CERCLA Section 117(b), EPA has determined that significant changes have been made to the selected remedy from the time it was proposed in the PRAP until final adoption of the remedy in the ROD.

Based upon further consideration of public comments and review of information regarding the design specification of the vault, it is EPA's judgment that Alternative V-3, which involves excavation of the sediments within the vault, followed by chemical fixation and off-site disposal, would provide a better balance of permanence than the "no-action" alternative. Although the technical data collected in the vicinity of the vault does not indicate that the integrity of the vault has been breached, the levels of uncertainty associated with the useful life of the vault lead EPA to conclude that Alternative V-3 would provide a higher degree of protection to human health and the environment. In addition, the proposed excavation of the vault would result in cost savings (by avoiding remobilization activities) if EPA has to excavate the vault at a future date.

In addition, the PRAP called for excavation of the cadmium-contaminated soils on the plant grounds to a level of 50 mg/kg. Since excavating the cadmium-contaminated soil on the plant grounds to a level of 50 mg/kg could potentially allow the migration of cadmium-contaminated soils to the adjacent residential yards (which will be remediated to 20 mg/kg), and since the incremental cost associated with remediating the plant ground soils to 20 mg/kg (approximately $500,000) is insignificant compared to the overall cost of the remedy for the Site, a remediation level of 20 mg/kg of cadmium for both the plant grounds and adjacent residential yards is recommended.

Also, the PRAP called for the repair of the damaged sprinkler system and heating sytem within the former battery facility to reduce the potential for release of cadmium-contaminated dust to the environment should a fire occur before decontamination is complete. As an alternative approach, decontamination of the interior building will be accelerated. The existing fire protection system will be evaluated and minor repairs will be made to render the system operational. The collected contaminated dust will be placed in secure containers pending final disposition.

DESCRIPTION OF ALTERNATIVES

Table 6 summarizes all remedial action technologies that were considered for remediation of Area II of the Site. This table presents the status of each technology with regard to further consideration during development of preliminary alternatives and brief explanations describing why technologies were eliminated. The technologies that were considered were then combined into preliminary remedial action alternatives. As a result of the initial screening process, a total of three ground-water, four dust/soil, and four dredge spoils vault remedies were developed for detailed comparative evaluation.

GROUNDWATER

Alternative GW-1: No Action (Natural Attenuation)

The "no-action" alternative for the groundwater underlying the former battery plant grounds consists of a long-term monitoring program. Sampling of the six existing monitoring wells on-site, and of additional wells which will be installed into the bedrock, monitoring will continue until health based levels are reached by natural attenuation. The information gathered will be used to determine whether the concentrations of the contaminants of concern (i.e., trichloroethylene, tetrachloroethylene, 1,1,1-trichloroethane, 1,2-dichloroethane and chloroform) have been lowered to acceptable levels). Institional controls would restrict development of the aquifer for potable and municipal water uses until State and Federal ARARs are reached. Because of the hydrology of the aquifer (highly transmissive), ARARs are expected to be achieved within three to ten years after removal of the volatile organic-contaminated soil.

Alternative GW-3: Pumping/Carbon Absorption/On-Site Discharge

This alternative consists of a pumping system involving four pumping wells to remove the volatile organic-contaminated groundwater. The contaminated groundwater would be pumped to a carbon adsorption system which would consist of two downflow fixed carbon beds in series. Organic contaminants would be removed to levels equal to or below the State and Federal ARARs specified for all drinking water supplies. The treated water would be discharged to East Foundry Cove at a location which would prevent resuspension or transport of sediments in the Cove.

Alternative GW-4: Pumping/Hydrogen Peroxide-Ultraviolet Oxidation/On-Site

This alternative consists of a pumping system involving four pumping wells to remove the volatile organic-contaminated groundwater. The contaminated groundwater would be treated by chemical oxidation with hydrogen peroxide (H_2O_2) and ultraviolet light. A schematic diagram of this system is shown in Figure 6. Groundwater is first mixed with a 50% H_2O_2 solution. It then enters an oxidation chamber where the H_2O_2 would be readily converted to hydroxyl radicals through the influence of UV light. High intensity UV light and the concentrated hydroxyl radicals synergistically promote rapid breakdown of organic molecules. Reduction of the volatile organics to levels equal to or below State and Federal ARARs for public drinking water supplies would be achieved.

CONTAMINATED SOIL AND BUILDING DUST

Alternative S-1: No Action

The "no-action" alternative for the cadmium-contaminated soil and the dust in the former battery plant consists of a long-term monitoring and an institutional control program. Institutional control would restrict public access to the plant grounds. Currently, there is an eight foot chain link security fence with 3-strand barbed wire enclosing the entire area. The total length of the fence is approximately 1,049 m (3,440 ft). As added protection, warning signs would be posted at the points of entry and at prominent locations on the fence every 60 m (200 ft).

A long-term monitoring program would be implemented in order to assess the migration of contaminants. Monitoring would include sampling and testing the groundwater and soil runoff every six months for 30 years. The groundwater sampling would be done using the existing monitoring wells. The monitoring program would also include an annual inspection of the facility to verify the condition of the fence, warning signs and the building.

Alternative S-2: Building Decontamination/Off-Site Disposal of Dust/Soil Capping

Decontamination procedures would be used to remove the heavy metal-contaminated dust on the inside surfaces of the building (e.g., walls, ceilings, floors, etc.) and on the surfaces of the stacked books. The collected dust (approximately 100 yd^3) would then be transported by truck to an off-site disposal facility. Soil from the plant grounds and nearby residential yards contaminated with cadmium at a concentration greater than 20 mg/kg would be compacted, graded and capped with macadam. The estimated total area needed to be capped is 53,300 ft^2.

Capping the cadmium-contaminated areas would also cap the volatile organic-contaminated soil.

A long-term monitoring and maintenance program would be implemented to monitor groundwater quality and to ensure the integrity of the cap.

Alternative S-3: Building Decontamination/Soil Excavation/ Fixation/Enhanced Volatilization/On-Site Disposal

In this remedial alternative, the building decontamination would be carried out in the same manner as that of Alternative S-2. However, the collected dust would be treated along with the metal-contaminated soil.

Approximately 5,500 yd^3 of metal-contaminated soil and 600 yd^3 of volatile organic-contaminated soil would be excavated.

The excavated metal-contaminated soil from nearby residential yards and the battery plant grounds and the dust from within the building would be transported to an on-site treatment facility. In the treatment unit, the contaminated soil and dust would be mixed with fixating materials (e.g., sodium silicates, Portland cement and/or other proprietary chemicals) and water, and allowed to cure for over 48 hours. After curing, the metal contaminants would be bound and/or physically encapsulated into the product material. Therefore, the contaminants in the original soil and dust would no longer leach out. The fixated material would not be hazardous as defined by RCRA and would be disposed of on-site in a pit located in the southwest section of the former battery plant grounds.

Because fixation would result in a volume increase, it is anticipated that the ground surface would either have to be regraded in a different configuration from what currently exists, or the fixated material would occupy a larger area of the Site.

The areas where volatile organics were detected contain heavy metal-contamination below the cadmium level of 20 mg/kg. The soil found in these areas would be excavated and subjected to the enhanced volatilization process, and then redeposited on-site.

Alternative S-4: Building Decontamination/Soil Excavation/ Fixation/Enhanced Volatilization/Off-Site Disposal

In this remedial alternative, approximately 110 yd^3 of dust would be removed from the inside surfaces of the building and from the surfaces of the stacked books. Approximately 5,500 yd^3 of cadmium-contaminated soil and 600 yd^3 of volatile organic-contaminated soil would be excavated.

The excavated cadmium-contaminated soil from nearby residential yards and the battery grounds and the dust from within the building would be transported to an on-site treatment facility. In the treatment unit, the contaminated soil and dust would be mixed with fixating materials (e.g., sodium silicates, Portland cement and/or other proprietary chemicals) and water, and allowed to cure for over 48 hours. After curing, the metal contaminants would be bound and/or physically encapsulated into the product material. The fixated material would not be hazardous as defined by RCRA, and would be disposed of in an off-site disposal facility. Clean fill would be brought in to restore the property to its orginial contour.

The areas where volatile organics were detected contain metal contaminants below the cadmium cleanup level of 20 mg/kg. The soil found in these areas would be excavated and subjected to the enhanced volatilization process, and then redeposited on-site.

SEDIMENTS IN THE VAULT

Alternative V-1: No Action

The "no-action" alternative for the sediments in the vault at the former battery plant site consists of a long-term monitoring and institutional control program. Institutional controls would restrict human access to the vault and prevent development of this portion of the Site. Currently, there is a chain link security fence enclosing the entire vault area. The total length of the fence is approximately 152 m (500 ft). As added protection, one warning sign would be posted at each side of the fence. A total of four warning signs would be needed. A long-term monitoring program would be implemented in order to assess the migration of contaminants, as well as to check the condition of the fence.

Alternative V-2: Sediment Excavation/Chemical Fixation/ On-Site Disposal

Under Alternative V-2, the 5,000 yd^3 of sediments within the vault would be excavated and transported to an on-site chemical fixation unit. In the treatment unit, the contaminated sediments would be mixed with fixating materials (e.g. sodium silicates, Portland cement and/or other proprietary chemicals) and water. After curing the mixture for 48 hours, the metal contaminants would be bound and/or physically encapsulated into the product material. Fixated material would not be hazardous as defined by RCRA.

The chemically fixated sediment would be disposed of in a disposal pit developed by enlarging the existing vault area. A larger disposal pit would be necessary because fixation would double the volume of the excavated sediments. The disposal pit would then be covered with top soil and seeded to establish a grass surface.

Alternative V-3: Sediment Excavation/Chemical Fixation/Off-Site Disposal

This alternative includes excavation of the 5,000 yd^3 of sediments in the vault, chemical fixation of the sediments on-site and off-site disposal of the treated sediments. Alternative V-3 is similar to Alternative V-2 in every aspect, except that the fixated sediments would be disposed of at an off-site disposal facility to be arranged for by NYSDEC.

Alternative V-6: Sediment Excavation/Off-Site Treatment and Disposal

In this remedial alternative, the 5,000 yd^3 of sediments in the vault would be excavated and transported to an off-site RCRA-permitted, hazardous waste treatment and disposal facility to be arranged for by NYSDEC.

After excavation, the vault would be filled with clean soil, covered with top soil, and seeded to establish a grass surface.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The above eleven alternatives were evaluated using evaluation criteria derived from the NCP and CERCLA Section 121, including CERCLA Section 121 (b)(1)(A-G). The criteria are as follows:

- Protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility or volume
- Short-term effectiveness
- Implementability
- Cost
- State acceptance
- Community acceptance

Each criterion will be briefly addressed in a comparative fashion for all the alternatives.

GROUNDWATER

Overall Protection of Human Health and the Environment

All of the groundwater alternatives are protective of human health and the environment since each alternative will attain the New York State and Federal ARARs for the groundwater at the conclusion of the remedial action. In addition, the groundwater alternatives will not pose a threat to Foundry Cove.

Compliance with ARARs

New York State and Federal ARARs will be attained at the conclusion of the remedial action for each of the groundwater alternatives. Under Alternatives GW-3 and GW-4, which are pump and treat options, the treated groundwater would be discharged to East Foundry Cove in accordance with New York State Pollutant Discharge Elimination System (SPDES) requirements.

Reduction of Toxicity, Mobility or Volume

The implementation of Alternative GW-3 or GW-4 would reduce the toxicity, mobility, or volume of contaminants in the groundwater by treatment. Alternative GW-1 would reduce the toxicity, mobility or volume of contaminants in the groundwater by natural attenuation.

Short-Term Effectiveness

Groundwater remediation is generally unattainable in the short-term. However, the aquifer is not presently being utilized as a potable water supply, so there is no short-term risk from the contaminated groundwater.

Short term risks from the drilling and installation of bedrock monitoring wells and/or construction and operation of the treatment processes will be mitigated through proper health and safety measures.

Long-Term Effectiveness and Permanence

Each of the groundwater alternatives is expected to attain State and Federal ARARs. The pump and treat options, GW-3 and GW-4, will attain the levels set by the ARARs within the same timeframe as Alternative GW-1, natural attenuation. Once cleanup goals are met, all three groundwater options will protect human health and the environment.

Implementability

All aspects of Alternative GW-1 would be implemented easily. There are no activities identified with this alternative which would require coordination with or approval by other agencies. Materials and services for implementation of Alternatives GW-3 and GW-4 are readily available from several vendors. These alternatives could be implemented easily. SPDES discharge limitations would be obtained from NYSDEC.

Cost

The costs associated with the groundwater alternatives are shown on Table 7.

State Acceptance

State acceptance of all three groundwater alternatives is favorable.

Community Acceptance

Since the local authorities wish to use the aquifer as a municipal water source, Alternative GW-1 may not be accepted by the public. Community acceptance of Alternatives GW-3 and GW-4 would probably be higher since these remedies actively treat the groundwater.

CONTAMINATED SOIL AND DUST

Overall Protection of Human Health and The Environment

Alternative S-1 provides minor protection to human health and the environment. The fencing would limit site access; however, future exposure to the contaminants would be possible. In addition, cadmium-contaminated soil may become entrained in storm water runoff and could be deposited in East Foundry Cove.

Alternative S-2 adequately protects public health with respect to the former battery facility, but fails to adequately protect the community in regard to the contamination on the battery plant grounds and in nearby residential yards.

Under Alternatives S-3 and S-4, the potential for exposure to the contaminated soil and dust via all pathways would decrease substantially. The cadmium-contaminated soil which would remain in the soil after remediation (concentrations less than 20 mg/kg) would be within health-based levels.

Compliance with ARARs

Based upon the land disposal restrictions (Land Ban) and in accordance with 40 C.F.R. Part 261, RCRA hazardous waste (i.e., listed or characteristic) which is excavated, treated and then redeposited in the same unit of contamination constitutes placement, and, therefore, the Land Ban requirements are potentially applicable or relevant and appropriate.

The cadmium-contaminated soils and dust are not RCRA listed wastes, although it is possible that they may be RCRA characteristic wastes. EP Toxicity tests will be performed to determine whether they are RCRA characteristic wastes.

Although the Land Ban requirements are not applicable in terms of a listed hazardous waste, they may be applicable if the waste is identified as RCRA characteristic hazardous waste. A RCRA characteristic hazadous waste is identified as a waste which exhibits the characteristics of either ignitability, corrosivity, reactivity or toxicity (using the extraction procedure (EP)).

Since RCRA Land Ban applies to waste which is excavated, treated and then redeposited in the same unit of contamination, the Land Ban requirements would be applicable or relevant and appropriate for all soils in Alternative S-3, and for the volatile organic-contaminated soil in Alternative S-4. This means that the alternatives involving fixation and enhanced volatilization would have to treat the soils to a level which satisfies the requirement for land disposal.

EPA is, presently undertaking a Land Ban rulemaking that will specifically apply to soil and debris. Until that rulemaking is completed, the CERCLA program will not consider Land Ban to be relevant and appropriate to soil and debris that does not contain RCRA restricted wastes.

The fixated soils in Alternative S-3 would occupy a larger portion of the Site than they presently occupy, so RCRA minimum requirements for design and operation would be relevant and appropriate.

While permits are not required for on-site remedial actions at Superfund sites, any on-site action must meet the substantive technical requirements of the permit process. Alternatives S-3 and S-4 would comply with all State and Federal requirements concerning potential air emissions (particulates and volatiles) during the excavation of the soil hot-spots. The chemical fixation treatment process (to treat the collected building dust and the excavated cadmium-contaminated soil) and the enhanced volatilization process (to treat the excavated volatile organic-contaminated soil) will satisfy the standards promulgated in 40 C.F.R. Part 264, Subpart X (Miscellaneous Treatment Units) and 40 C.F.R. Part 264, Subpart O (Incinerators), respectively. The requirements promulgated at 40 C.F.R. Part 264, Section 117; NYCRR Subpart 373.2 (post-closure care and use of property) are relevant and appropriate for all of the soil/dust options.

A location-specific ARAR, the National Historic Preservation Act (NHPA), would be complied with for all the soil/dust options. A determination of whether the alternatives would have any effect on cultural resources would be made during the design phase.

Reduction of Toxicity, Mobility, or Volume

Alternative S-4, which removes the contaminants from the Site above action levels, would significantly reduce the toxicity, mobility, or volume of the contaminants.

Short-Term Effectiveness

There are no short-term risks associated with Alternative S-1. Short-term risks to the community and workers during implementation of Alternatives S-2, S-3 and S-4 would include an increase in truck traffic, and possibly fugitive dust emissions, which would be mitigated through proper health and safety measures.

Long-Term Effectiveness and Permanence

Alternatives S-3 and S-4 would maintain reliable protection of human health and the environment once the remedial action is completed.

Implementability

All of the soil/dust options can be easily implemented.

Cost

The costs associated with the soil/dust options, listed on Table 7, are consistent with the NCP.

State Acceptance

Although the State is in agreement with the soil/dust proposed remedial action, it disagrees with the EPA recommended cadmium cleanup level of 20 mg/kg. The State believes that 20 mg/kg is unacceptable.

Community Acceptance

"No action" with respect to the soil/dust alternatives is clearly unacceptable to the community. The community will only accept alternatives which remove the cadmium-contaminated dust from inside the building and the cadmium-contaminanted soil from the battery plant grounds and adjacent residential yards.

VAULT ALTERNATIVES

Overall Protection of Human Health and Environment

Alternatives V-3 and V-6, which remove the vault and its contents from the Site, provide the highest degree of protection to human health and the environment. Alternative V-2, which fixates the contents of the vault and replaces them on-site, would also be protective of both human health and the environment, but to a lesser degree.

It is unknown at this time to what extent Alternative V-1 "no-action" is protective of human health and the environment.

Compliance with ARARs

As indicated above, based upon the land disposal restrictions under RCRA, waste which is excavated, treated and then redeposited in the same unit of contamination constitutes placement. Therefore, the Land Ban requirements would be applicable or relevant and appropriate for Alternative V-2. This means that the fixation process would have to treat the contaminated sediments to a level which satisfies the requirements for land disposal. As discussd above, until the EPA rulemaking is completed, the CERCLA program will not consider Land Ban to be relevant and appropriate to soil and debris that does not contain RCRA restricted wastes.

While permits are not required for on-site remedial actions at Superfund sites, any on-site action must meet the substantive technical requirements of the permit process. Alternatives V-2, V-3 and V-6 would meet all Federal and State requirements concerning potential emissions of particulates to the air during excavation of the vault.

The chemical fixation treatment process, used to treat the sediments in the vault, under Alternative V-3, would satisfy the standards promulgated at 40 C.F.R. Part 264, Subpart X (Miscellaneous Treatment Units).

The requirements promulgated at 40 C.F.R. Part 264, Section 117, 6 NYCRR Subpart 373.2 (post-closure care and use of property) are relevant and appropriate for all of the vault options.

Long-Term Effectiveness and Permanence

Alternative V-3 which calls for the excavation of the vault offers the highest degree of on-site long-term permanence. Removal of the vault in conjunction with the overall cleanup of the Site would allow the Site to be used for a variety of purposes without endangering human health. Leaving the vault in place is the least protective remedy. The long-term reliability of the V-1 option is in question because the useful life of the vault is uncertain.

Reduction of Toxicity, Mobility or Volume

Alternatives V-3 and V-6 will significantly reduce the mobility, toxicity or volume of the contaminants on-site because the vault sediments are removed and are rendered immobile by fixation.

Short-Term Effectiveness

There would be no short-term risks associated with implementing Alternative V-1. The only short-term risks associated with Alternatives V-2, V-3 and V-6 would be the exposure of on-site workers and nearby residents to cadmium-contaminated dust during excavation of the vault, and the risks caused by increased truck traffic along Main Street and Kemble Avenue. These risks would be managed by dust control techniques during excavation, and through proper health and safety measures.

Implementability

All aspects of Alternative V-3 are easily implemented.

Cost

The estimated present worth of removal of the vault is $3,500,000. Although Alternative V-1 is less expensive than Alternative V-3, Alternative V-1 would not provide the most cost-effective remedy to protect human health and the environment. In addition, the proposed excavation of the vault would result in cost savings (by avoiding remobilization activities) if EPA has to excavate the vault at a future date.

State Acceptance

After the public meeting the State conducted a thorough analysis of the RI/FS and public comments and concluded that the vault should be removed from the Site.

Community Acceptance

In written and oral comments to the Agency, the community has expressed its extreme concern related to leaving the vault in place. Recognizing that the vault has not contaminated the groundwater, the community nonetheless is concerned that the vault should be removed because it is a continuing threat to their community.

DESCRIPTION OF THE SELECTED REMEDY

The major components of the selected remedy can be summarized as follows:

- Decontamination of the inside surfaces and contents of the former battery facility to remove the heavy metal-contaminated dust.
- Excavation of the cadmium-contaminated soil to a level of 20 mg/kg on the battery plant grounds and the residential yards impacted by the Site.
- Excavation of the on-site dredge spoils vault.
- Fixation of the excavated soil, dust and vault sediments.
- Off-site disposal of the cadmium-contaminated soils, sediments, and dust at a facility to be arranged for by NYSDEC.
- Excavation of the volatile organic-contaminated soil hotspots followed by enhanced volatilization and replacement of the clean residuals on-site.
- Backfilling of the excavated areas with clean fill.
- Institutional controls to restrict development of the aquifer for potable or municipal use, until State or Federal applicable or relevant and appropriate requirements are reached.
- Long-term monitoring of the groundwater underlying the Site.
- Evaluation and performance of minor repairs, if needed, to the inoperable sprinkler and heating systems inside the former battery facility.

STATUTORY DETERMINATION

Section 121 of CERCLA requires that EPA select a remedy which is protective of human health and the environment, attains ARARs, is cost effective, and utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

Based upon the analysis presented in the Comparative Analysis of Alternatives and Selected Remedy sections, the following conclusions were reached regarding the groundwater, soil/dust and vault alternatives.

Attainment of ARARs

The selected remedy will attain all ARARs. Contaminated soils and debris are not RCRA listed wastes based on available information. In addition, these wastes are not expected to be characteristic. Hazardous substances with high concentrations of contaminants will be treated to levels that will not fail hazardous characteristic tests. Similarly, soils with low concentrations of hazardous substances are not expected to be characteristic wastes.

RCRA requirements in 40 C.F.R. Part 264 Subpart G - Closure and Post-Closure and the New York State equivalent at 6 NYCRR Subpart 373.2, are relevant and appropriate for the treated soil which will be redeposited on the Site after treatment by the enhanced volatilization process. The cleanup levels for the soils are consistent with an alternative clean closure which is protective for all routes of exposure and will not require long-term management or engineering controls.

RCRA general treatment and storage standards for units are relevant and appropriate for treatment conducted on-site as are the requirements at 40 C.F.R. Part 264 Subpart O - Incinerators; 6 NYCRR 373-2.15 et seq., for the enhanced volatilization process.

Although it is not anticipated that hazardous waste will be transported off-site, if it is, the requirements at 40 C.F.R. Part 262, 6 NYCRR Part 372, relating to generators, transporters and manifesting would be met.

At this time, EPA is undertaking a RCRA land disposal rulemaking (Land Ban) that will specifically apply to soil and debris. Until that rulemaking is completed, the CERCLA program will not consider the Land Ban to be relevant and appropriate to soil and debris that does not contain RCRA restricted wastes.

The selected response action meets the ARARs for the groundwater portion of the remedy. At the conclusion of the remedial action, EPA Maximum Contaminant Levels (MCLs) will be met through the natural attenuation process. In addition, the remedy attains RCRA Ground Water corrective Action requirements by meeting the requirements of a health based Alternate Concentration Limit (ACL).

Lastly, 6 NYCRR Part 211: General Prohibitions, 6 NYCRR Part 212: Process and Exhaust and/or Ventilation Systems, and 6 NYCRR Part 257: Air Quality Standards are applicable.

Utilization of Permanent Solutions and Alternative Treatment Tehnologies or Resource Recovery Technologies to the Maximum Extent Practicable (MEP)

GROUNDWATER

The excavation and treatment of soils contaminated with volatile organics will remove the source of contaminants to the groundwater.

Due to the hydraulic conditions of the aquifer, the contaminant plume in the groundwater would disperse and migrate at a rapid rate. Therefore, it is expected that State and Federal standards will be achieved through natural attenuation (Alternative GW-1) within three to ten years after the removal of the source contamination. This time-frame is comparable to the time period required for active remediation (Alternatives GW-3 and GW-4). Consequently, the selection of Alternative GW-1 was deemed to be the most appropriate solution for groundwater remediation.

SOILS AND BUILDING DUST

The selected remedy, Alternative S-4, (Building Decontamination) Soil Excavation/Fixation/Enhanced Volatilization/Off-Site Disposal) satisfies the statutory preference for treatment as a principal element. More significantly, the soil will be cleaned to a level that is protective of public health and the environment and provides a permanent solution through the selected alternative.

VAULT

The selected alternative, Alternative V-3 (sediment excavation/ chemical fixation/off-site disposal), would comply with applicable or relevant and appropriate standards. It meets the statutory preference for treatment to the maximum extent practicable. In addition, Alternative V-3 provides the most permanent remedy for the Site.

Preference for Treatment as a Principal Element

The remedy selected, satisfies the statutory preference for treatment as a principal element and addresses, to health-based levels, the principal threats posed by this operable unit of the Site.

OPERATION AND MAINTENANCE (O&M)

O&M are those costs required to operate and maintain the remedial action throughout its lifetime. These activities ensure the lifetime effectiveness of the remedial alternatives selected.

O&M requirements (primarily groundwater monitoring) are eligible for Superfund monies for a period of up to one year to assure that human health and the environment are being protected. In subsequent years, any additional O&M costs would be paid for with State funds.

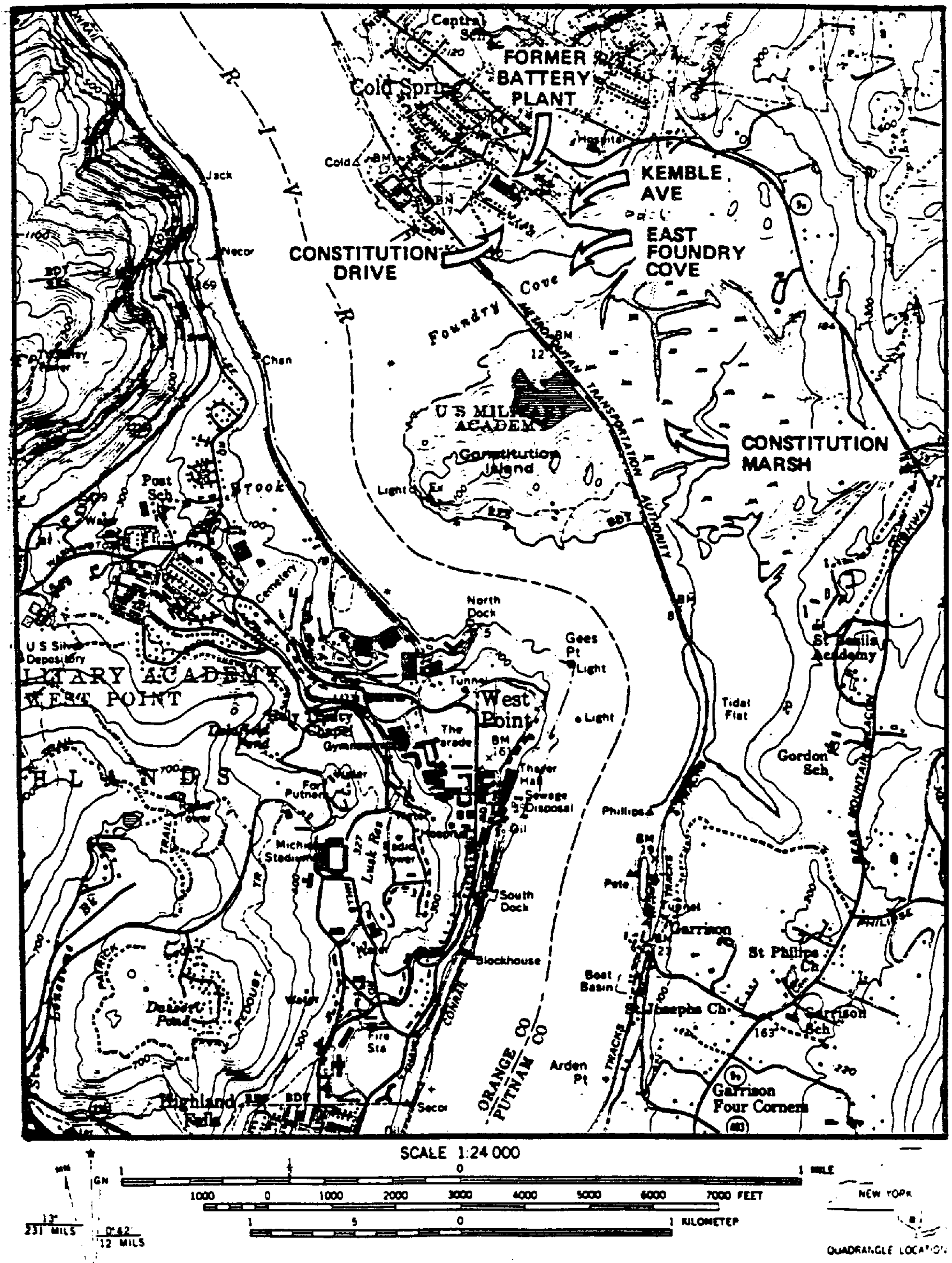
As part of the remedial action, a long-term groundwater sampling program is included to monitor changes in the nature and extent of contamination at the Site and to determine the effectiveness of the remedy. Also, as part of the monitoring program, several monitoring wells screened in bedrock will be installed on-site.

One hundred percent (100%) of the remedial design will be funded by EPA. Cost sharing for construction of the remedy is 90% Federal and 10% State.

FUTURE ACTIONS

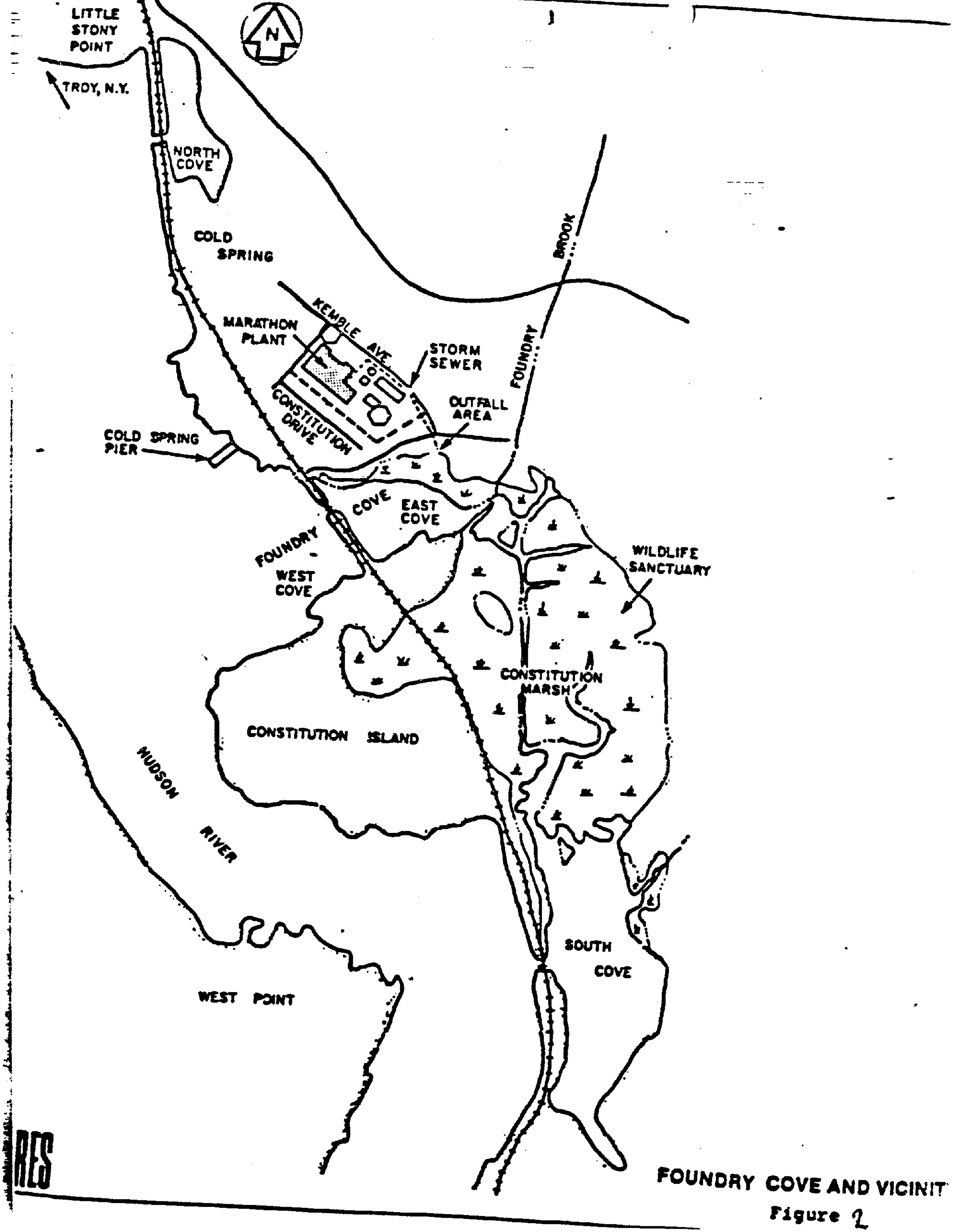
This ROD addresses the source of contamination by remediation of the on-site and off-site contaminated soils and the building dust. The remedy addresses the principal threats posed by Area II of the Site by removing and treating the contaminated soils and by natural attenuation of the groundwater contamination. As part of the remedial design, additional samples will be collected to determine the areal extent of the off-site contaminated soil requiring excavation and treatment. Further sampling and monitoring of the groundwater is planned.

MARATHON BATTERY SITE
SITE LOCATION MAP



SOURCE: USGS WEST POINT QUADRANGLE

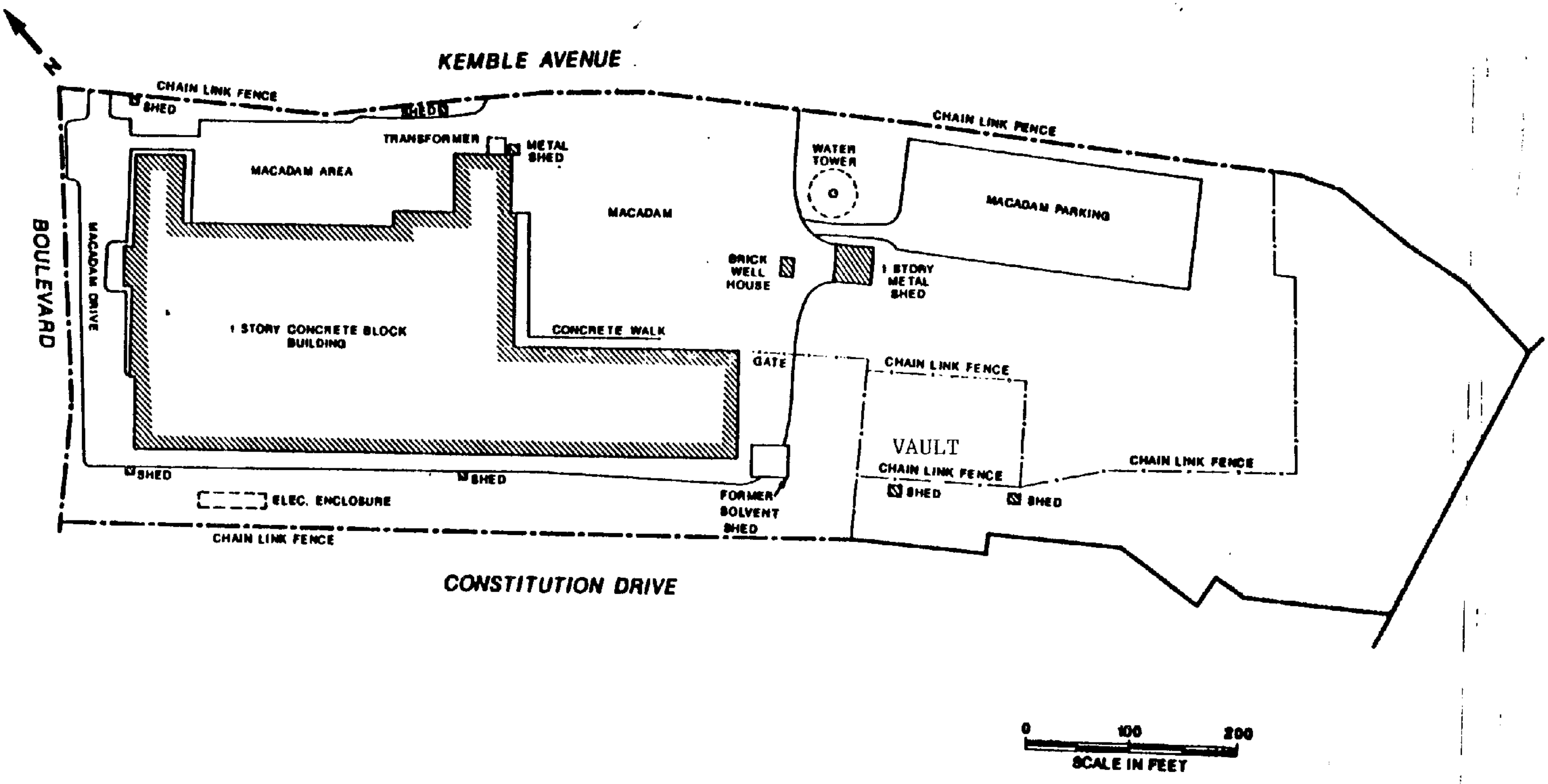
EBASCO



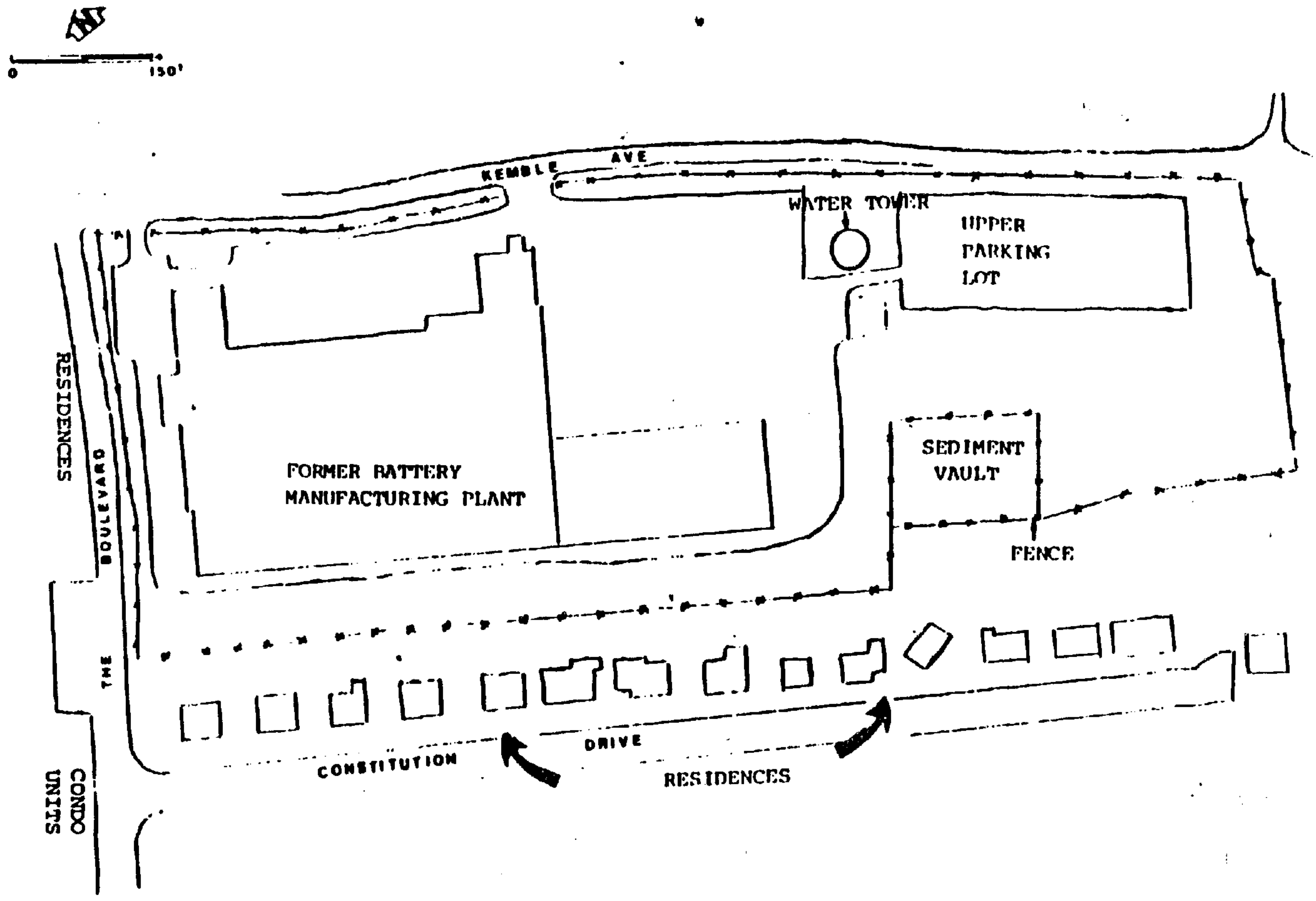
FOUNDRY COVE AND VICINIT

Figure 2

FIGURE 3
FORMER BATTERY PLANT GROUNDS



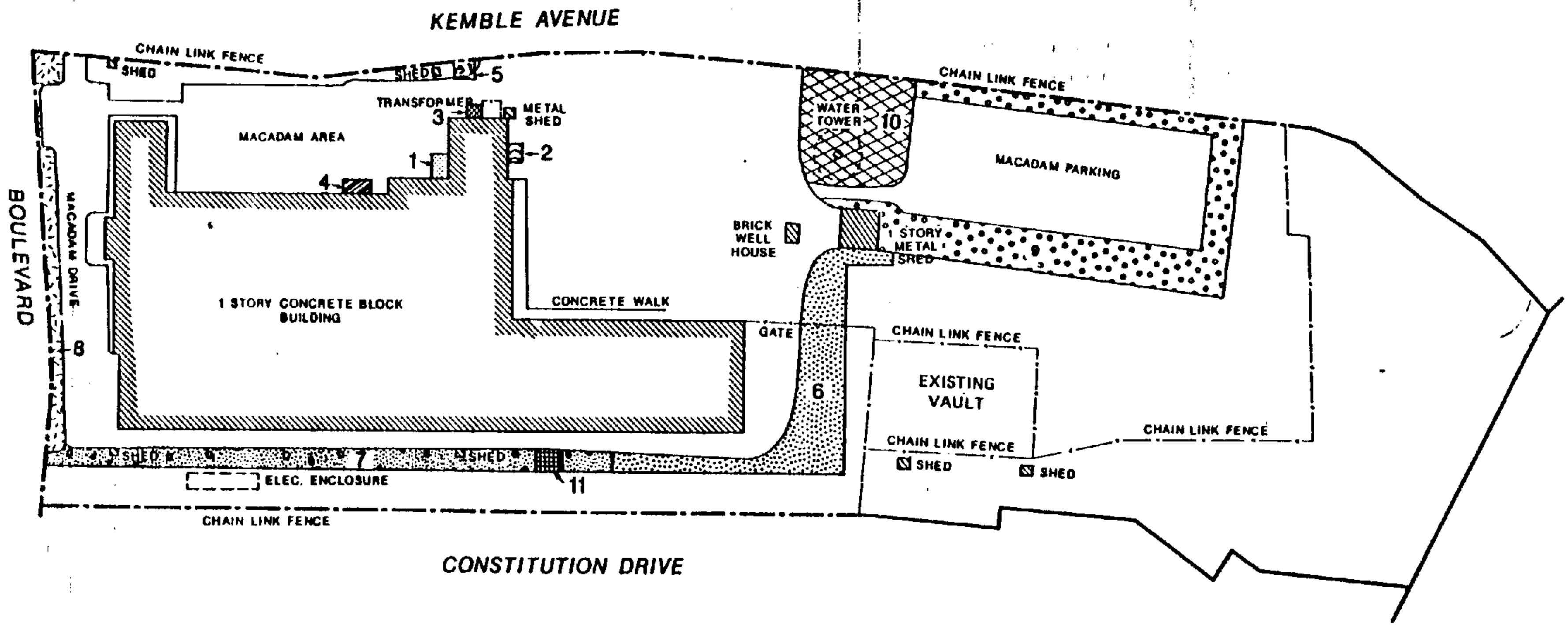
EBASCO



WESTON SPILL PREVENTION & EMERGENCY RESPONSE DIVISION	EPA PM E. DOMINACH	FIG 4
In association with ICF Inc. Jacobs Engineering Inc. & Tetra Tech Inc.	TAT PM E. BIRCKHEAD	MARATHON BATTERY SITE PLAN

FIGURE 5

AREA OF METAL AND ORGANIC CONTAMINATED SOIL



NOTE: THE EXISTING LOCATIONS OF THE CONTAMINANT ARE INDICATED BY THE DOTTED OR SHADED AREA.

EBASCO

TABLE 1

METAL CONCENTRATIONS IN CONTAMINATED SOILS

Location	Sample Depth cm (in)	No. of Samples	Concentrations (mg/kg)					
			Cd		Co		Ni	
			Range	Mean	Range	Mean	Range	Mean
1	0-15.2 (0-6)	1	–	5580	–	127	–	2040
	15.2-30.5 (6-12)	1	–	178	–	ND	–	164
	30.5-45.7 (12-18)	1	–	306	–	ND	–	211
2	0-15.2 (0-6)	1	–	989	–	27	–	61
	15.2-30.5 (6-12)	1	–	495	–	9.2	–	101
	30.5-45.7 (12-18)	1	–	1140	–	13	–	80
3	0-15.2 (0-6)	1	–	1800	–	73	–	1650
4	0-15.2 (0-6)	1	–	114	–	38	–	1030
5	0-15.2 (0-6)	1	–	312	–	13	–	277
6	0-15.2 (0-6)	5	126-414	217	18-22	20	118-325	227
	15.2-30.5 (6-12)	2	62-98	80	–	13	93-168	131
	30.5-45.7 (12-18)	1	–	13	–	14	–	39
7	0-15.2 (0-6)	3	11-171	74	–	9.2	4-235	110
	15.2-30.5 (6-12)	2	6-37	22	8.9-161	85	26-59	43
	30.5-45.7 (12-18)	1	–	8.8	–	15	–	39
8	0-15.2 (0-6)	5	23-43	34	5-9	7	40-93	67
	15.2-30.5 (6-12)	2	139-379	259	12-18	15	68-204	166
9	0-15.2 (0-6)	4	247-1360	817	12-43	30	87-953	538
	15.2-30.5 (6-12)	2	139-379	259	12-18	15	68-204	166
10	0-15.2 (0-6)	7	12-435	96	10-16	13	38-236	87

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* For locations, see Figure 5-7

Marathon Battery

TABLE 2

VOLATILE ORGANIC - CONTAMINATED SOIL CONCENTRATION AND EXTENT

A. CONCENTRATION

LOCATION*	Sampling Depth M (ft)	Number of Samples	Organic Contaminant	TCE Concentration (mg/kg) Range	TCE Concentration (mg/kg) Mean
11	3.7-4.3 (12-14)	2	TCE	13-30	22
	10.7-11.3 (35-37)	1	TCE	--	37
12	15.2-159 (50-52)	1	Chloroform	-	120

B. EXTENT**

LOCATION*	Area M^2 (ft^2)	Depth m (ft)	Volume m^3 (yd^3)
11	150 (1600) 150 (1600)	3.1 (10) 3.1 (10)	460 (600) 460 (600)
12	150 (1600)	3.1 (10)	460 (600)

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* For locations, see Figure 5-7.
** Defined based on a remediation level of 5 ug/kg.

TABLE 2 con't

SAMPLING RESULTS
MARATHON BATTERY
COLD SPRINGS
NEW YORK
Residential Yards

SAMPLE ID	DATE SAMPLED	DATE SENT TO LAB	DATE RESULTS RECEIVED	CADMIUM (PPM)	COBALT (PPM)	LEAD (PPM)	NICKEL (PPM)	ZINC (PPM)	LOCATION	COMMENTS
008726	07/09/86	07/14/86	07/29/86	27.70	9.00	197.60	61.90	331.00	NE CORNER MOVING WEST	SOIL #1
008727	07/09/86	07/14/86	07/29/86	41.50	5.00	40.40	58.80	55.10	NORTH FENCE MOVING WEST	SOIL #2
008728	07/09/86	07/14/86	07/29/86	42.80	8.00	39.60	81.40	62.80	NORTH FENCE MOVING WEST	SOIL #3
008729	07/09/86	07/14/86	07/29/86	22.80	6.00	41.70	40.10	64.00	NORTHWEST CORNER	SOIL #4
008730	07/09/86	07/14/86	07/29/86	283.90	11.00	53.20	293.40	104.30	50 FEET FROM N & S BUILD	SOIL #5
008567	07/09/86	07/14/86	07/29/86	438.20	23.00	29.00	721.00	72.40	SOUTHERN PERM GOING WEST	SOIL #6
008568	07/09/86	07/14/86	07/29/86	532.20	17.00	26.80	547.70	105.30	SOUTHERN PERM GOING WEST	SOIL #7
008564	07/09/86	07/14/86	07/29/86	27.10	11.00	42.50	74.50	118.00	WEST FENCE BY RESIDENTS	SOIL #8
008731	07/10/86	07/14/86	07/29/86	10.90	10.00	44.10	29.10	666.00	NE CORNER MOVING SOUTH	SOIL #9
008732	07/10/86	07/14/86	07/29/86	7.30	9.00	36.80	26.20	138.70	EAST PERM MOVING SOUTH	SOIL #10
008733	07/10/86	07/14/86	07/29/86	8.30	9.00	38.00	26.70	168.00	EAST PERM MOVING SOUTH	DUPE TO 10
008736	07/10/86	07/14/86	07/29/86	14.40	8.00	72.10	34.90	110.90	EAST PERM MOVING SOUTH	SOIL #11
008737	07/10/86	07/14/86	07/29/86	22.80	5.00	50.40	32.40	135.60	EAST PERM MOVING SOUTH	SOIL #12
008738	07/10/86	07/14/86	07/29/86	60.60	2.00	41.10	60.30	94.60	EAST PERM MOVING SOUTH	SOIL #13
008739	07/10/86	07/14/86	07/29/86	38.10	9.00	55.40	59.10	90.90	SOUTHEAST PERM BY W T	SOIL #14
008570	07/10/86	07/14/86	07/29/86	3.10	7.00	23.10	18.30	66.20	SE GATE DRIVE DISCRETE	SOIL #15

TABLE 2 con't

SAMPLING RESULTS
MARATHON BATTERY
COLD SPRINGS
NEW YORK
Residential Yards

SAMPLE ID	DATE SAMPLED	DATE SENT TO LAB	DATE RESULTS RECEIVED	CADMIUM (PPM)	COBALT (PPM)	LEAD (PPM)	NICKEL (PPM)	ZINC (PPM)	LOCATION	COMMENTS
008735	07/10/86	07/14/86	07/29/86	17.30	12.00	28.80	24.00	76.90	LOW AREA NEAR SE GATE	SOIL #16
008734	07/10/86	07/14/86	07/29/86	18.10	5.30	32.20	29.30	93.90	LOW AREA NEAR SE GATE	DUPE TO 16
008569	07/10/86	07/14/86	07/29/86	435.00	16.00	255.60	235.60	213.00	BY WATER TOWER	SOIL #17
008572	07/10/86	07/14/86	07/29/86	324.20	13.00	119.40	274.20	110.80	STORM DRAIN N OF SE GATE	SOIL #18
008571	07/10/86	07/14/86	07/29/86	613.10	50.00	110.80	277.60	244.00	LOW AREA W SIDE OF BDG	SOIL #19
008740	07/10/86	07/14/86	07/29/86	0.30	1.00	2.50	2.00	1.30	TRIP BLANK	SOIL #20
5487	07/10/86	07/14/86	08/06/86	0.30	0.10	0.25	0.20	2.20	LOW AREA BY SE GATE	AIR #1
5485	07/10/86	07/14/86	08/06/86	0.30	0.10	0.25	0.20	0.30	SOUTHERN BACK PARK LOT	AIR #2
5489	07/10/86	07/14/86	08/06/86	0.30	0.10	0.25	0.20	0.30	N W SIDE OF BUILDING	AIR #3
5486	07/10/86	07/14/86	08/06/86	0.30	0.10	0.25	0.20	0.30	NORTHEAST ENTRANCE	AIR #4
NA	07/10/86	07/14/86	08/06/86	0.30	0.10	0.25	0.20	0.30	TRIP BLANK	AIR #5

TABLE 3

AVERAGE U.S. SOIL CONCENTRATIONS FOR CONTAMINANTS FOUND AT THE MARATHON BATTERY COMPANY SITE

Parameter	Concentrations
Cadmium	0.01-3.5 mg/kg(1)
Nickel	11.1-86.5 mg/kg(1)
Cobalt	1.0-6.0 mg/kg(2)
Benzo(a)Pyrene	0.04 to 1.3 mg/kg (rural areas)
Tetrachloroethylene	<0.005 mg/kg
Chloroform	Not Known
Trichloroethylene	Not Known
1,1,1-Trichloroethane	Not Known
1,2-dichloroethane	Not Known

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(1) Toth, S., Unpublished New Jersey Soils Data, Cook College, Rutgers University 1970's (from NJDEP files)

(2) Field Studies Branch, Exposure Evaluation Division, U.S. EPA, Memo to Junio Morales-Sanchez, Director, Region II Enforcement

TABLE 4

INORGANIC CONTAMINATION IN GROUNDWATER(1)

Compound/Well	3S	2S	7SA	6S	6I	4I	4I Not Filtered	5S	5I	V1	V2	V3	V4	V5
INORGANICS														
Aluminum	174	106	-	-	-	-	16400	-	28	-	-	-	-	-
Antimony	-(2)	-	-	-	-	-	-	-	73	-	-	-	-	-
Arsenic	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	34	-	-	23	-	-	129	-	-	23	-	35	-	-
Baryllium	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	-	-	-	-	-	-	-	6.0	-	-	-	-	-	-
Calcium	79700	41900	39300	84200	17800	62700	7560	7420	6200	88400	70700	46300	70400	633
Chromium	18'	-	-	-	-	-	25	-	-	-	-	-	-	-
Cobalt	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	-	-	-	-	-	-	79	12	-	-	-	-	-	-
Iron	62	229	-	-	-	-	39800	67	-	-	-	81	-	-
Lead	-	-	-	-	-	-	24	-	-	-	-	-	-	-
Magnesium	3939	1400	8220	18400	19700	17300	25600	23300	23300	19400	20600	9680	21300	142
Manganese	209	322	77	21	47	108	2000	35	112	27	188	-	16	8.0
Mercury	-	-	-	-	0.26 J(3)	-	-	-	-	-	-	0.18 J	-	-
Nickel	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	1740	1990	1850	1540	-	1820	4420	2700	2250	1660	2190	1840	1500	
Selenium	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	-	-	-	-	-	-	-	-	-	-	-	-	-	129
Sodium	16000	11400	53700	13100	-	14600	15100	18600	9660	13300	16500	26000	13700	145
Thallium	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	-	-	-	-	-	-	15	-	-	-	-	-	-	-
Zinc	58	20	-	35	-	-	120	-	-	-	14	93	-	-

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(1) Concentration in ug/l.
(2) - = Not Detected.
(3) J = Estimated Concentration.

TABLE 4 con't

ORGANIC CHEMICAL CONTAMINATION IN GROUNDWATER COMPARISON OF FIRST AND SECOND ROUNDS OF GROUNDWATER SAMPLES

Well Number	Compounds Identified First Round Samples	 Second Round Samples
3 S	ND	Trichloroethylene 2 ug/l J
MB-1 (NYSDEC)	(Not Sampled)	Trichloroethylene 2 ug/l J
2 S	ND	Trichloroethylene 4 ug/l J
7 SA	Trichloroethylene 100 ug/l Chloroform 11 ug/l 1,1,1-Trichloroethene 18 ug/l	Chloroform 11 ug/l 1,1,1-trichloroethane 8 ug/l Trichloroethylene 82 ug/l
6 I	ND	ND
6 S	ND	1,1,1-Trichloroethane 2 ug/l J Trichloroethene 6 ug/l
MB-3 (NYSDEC)	(Not Sampled)	1,1,1-Trichloroethane 9 ug/l Trichloroethylene 65 ug/l
4 I	ND	ND
4 D	ND	ND
5 S	ND	Chloroform 1 ug/l J 1,1,1-Trichloroethane 1 ug/l J
5 I	ND	ND
MB 4 (NYSDEC)	(Not Sampled)	ND
V 1	Trichloroethylene 8 ug/l	Chloroform 19 ug/l Bromochloromethane 1 ug/l J
V 2	Fluorathene 3 ug/l Pyrene	ND
V 3	1,1,1-Trichloroethane 5.5 ug/l Trichloroethylene 26 ug/l Tetrachloroethane 2.4 ug/l	ND
V 4	ND	ND
V 5	ND	ND
Trip Blank		Totl Xylenes 1 ug/l J

ND = Not Detected.
J = Estimated Concentration.

TABLE 5

CADMIUM, COBALT AND NICKEL CONTAMINATION IN CONCRETE CORES AND WIPE SAMPLES (mg/kg)

Sample	Cadmium	Cobalt	Nickel
Concrete Cores			
1	-	66	32
2	-	8.0	20
3	-	8.4	27
4	-	7.5	27
5	-	18	200
6	-	7.4	21
7	-	7.1	21
Wipe Samples			
8	182	4.8	156
9	625	16	535
10	925	19	580
11	31	3.6	128
12	253	5.8	193
13	510	12	390
14	955	25	920
15	4830	153	5310
16	78	8.8	412
17	128	3.7	150
18	15300	462	21500
19	88	1.2	36
20	341	8.8	204
21	24	1.9	61
22	565	20	555
23	136	9.1	198
24	102	34	103
25	366	15	540
26	125	7.5	222
27	835	23	855
28	950	30	1140
29	735	20	645
30	72	2.0	60
31	72	1.8	64
32	263	7.2	240
Blank	0.25	0.60	0.65

TABLE 5 con't

METAL CONCENTRATIONS IN BUILDING DUST(1)

A. Dust from Building Surfaces (Walls, Ceilings, Floors, etc.)

Contaminant	Concentration, mg/kg		
	Range	Average	Median
Cadmium	24 - 15,300	1462	510
Cobalt	1.9 - 462	45	15
Nickel	61 - 21,500	1821	535

B. Dust from Stacked Book Surfaces (Plastic Covers, Boxes, etc.)

Contaminant	Concentration, mg/kg		
	Range	Average	Median
Cadmium	72 - 253	129	102
Cobalt	1.2 - 34	9	3.7
Nickel	60 - 193	108	103

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(1) Results from Ebasco Sampling

TABLE 5 con't

RESULTS OF ANALYSIS OF WIPE SAMPLES RECEIVED 6 AUGUST 1985

Page 2 of 2

Parameter	Unit	A-36* Plant Area	174* Plant Area	3426* Plant Area
Cadmium	mg/filter	8.5	65	6.5
Cobalt	mg/filter	0.45	<0.01	0.15
Lead	mg/filter	1.5	0.23	7.5
Nickel	mg/filter	13	78	8.9
Zinc	mg/filter	0.96	0.84	0.40
EA Laboratory Number		7120	7121	7122

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* Area wiped: 100 cm^2.

TABLE 5 con't

RESULTS OF ANALYSIS OF DUST SAMPLES RECEIVED 6 AUGUST 1985

Parameter	Unit	Discrete Rafter Area of #6	Discrete Floor	Discrete Dust Box Top Palates
Cadmium	mg/kg	120,000	2,000	16,000
Cobalt	mg/kg	<4	36	<2
Lead	mg/kg	530	260	1400
Nickel	mg/kg	130,000	2,400	22,000
Zinc	mg/kg	1,200	580	2,500
EA Laboratory Number		7123	7124	7125

TABLE 6

SUMMARY OF REMEDIAL TECHNOLOGY SCREENING GROUNDWATER

Remedial Technologies	Further Evaluation	Eliminated
No Action	X	
Containment		
Capping		
o Clay Cap		X
o Asphalt Cap	X	
o Concrete Cap		X
o Synthetic Membranes		X
Subsurface Barriers		
o Sheet piling		X
o Slurry Walls	X	
o Grout Curtains		X
Treatment and Disposal Pumping		
o Suction Wells		X
o Deep Wells	X	
o Well Point Systems		X
On-Site Treatment		
o Biological Treatment		X
o Air Stripping	X	
o Steam Stripping		X
o H_2O_2 - UV Oxidation	X	
o Carbon Adsorption	X	
o Centrifugation		X
o Chemical Oxidation/Reduction	X	
o Distillation		X
o Evaporation		X
o Filtration	X	
o Reverse Osmosis	X	
Off-Site Treatment		
o Publicly Owned Treatment Works (POTW)	X	

TABLE 6 Con't

SUMMARY OF REMEDIAL TECHNOLOGY SCREENING
SOIL

Remedial Technologies	Further Evaluation	Eliminated
No Action	X	
Containment		
Capping		
o Clay Cap		X
o Asphalt Cap	X	
o Concrete Cap		X
o Synthetic Membranes		X
o Multimedia Cap	X	
Removal		
o Excavation	X	
On-Site or Off-Site Treatment		
Physical Treatment		
o Solid Separation	X	
Chemical Treatment		
o Acid Extraction		X
o Fixation	X	
Thermal Treatment		
o Incineration		X
o Roasting		X
o Enhanced Volatilization	X	
o Thermoplastic Solidification		X
In Situ Treatment		
Biological		
o Biodegradation		X
Chemical		
o Soil Flushing		X

TABLE 6 Con't

SUMMARY OF REMEDIAL TECHNOLOGY SCREENING SOIL

Remedial Technologies	Further Evaluation	Eliminated
Thermal		
o Vitrification	X	
Disposal		
Disposal as Hazardous Waste		
o Construct On-Site RCRA Landfill	X	
o Construct Off-Site RCRA Landfill		X
o Existing RCRA Landfill	X	
Disposed as Non-Hazardous Waste		
o Construct On-Site Landfill	X	
o Construct Off-Site Landfill		X
o Existing Local Landfill	X	
Transportation		
o Truck	X	
o Train		X
o Barge		X

TABLE 6 Con't

SUMMARY OF REMEDIAL TECHNOLOGY SCREENING
SEDIMENT IN THE VAULT

Remedial Technologies	Further Evaluation	Eliminated
No Action	X	
Containment		
Capping		
o Clay Cap		X
o Asphalt Cap	X	
o Concrete Cap		X
o Synthetic Membranes		X
Subsurface Barriers		
o Sheet Piling		X
o Slurry Walls	X	
o Grout Curtains		X
Removal		
o Excavation	X	
On-Site or Off-Site Treatment		
Physical Treatment		
o Solids Separation	X	
Chemical Treatment		
o Acid Extraction		X
o Fixation	X	
Thermal Treatment		
o Incineration		X
o Roasting		X
o Thermoplastic Solidification		X
In-Situ Treatment		
Biological		
o Biodegradation		X
Chemical		
o Soil Flushing		X
o Solification/Fixation	X	

TABLE 6 Con't

SUMMARY OF REMEDIAL TECHNOLOGY SCREENING SEDIMENT IN THE VAULT

Remedial Technologies	Further Evaluation	Eliminated
Thermal		
o Vitrification	X	
Disposal		
Disposal as Hazardous Waste		
o Construct On-Site RCRA Landfill	X	
o Construct Off-Site RCRA Landfill		X
o Existing RCRA Landfill	X	
Disposed as Non-Hazardous Waste		
o Construct On-Site Landfill	X	
o Construct Off-Site Landfill		X
o Existing Local Landfill	X	
Transportation		
o Truck	X	
o Train		X
o Barge		X

Table 7
Summary of costs

Alternative	CAPITAL ($1,000)	ANNUAL O&M COST ($1,000/YR)	PRESENT WORTH ($1,000)
1) GW-1 No Action	0	17 (1-30 yr)	260
2) GW-3 Pumping/Carbon Adsorption/ On-Site Discharge	1,520	700 (1 yr) 677 (2 yr)	2,800
3) GW-4 Pumping/H202- UV Oxidation/On-Site Discharge	1,600	861 (1 yr) 838 (2 yr)	3,380
4) S-1 No Action	14	21 (1-30 yr)	340
5) S-2 Building Decontamination/ Off-Site Disposal/Soil Capping	1,100	20 (1-30 yr)	1,400
6) S-3 Building Decontamination/ Fixation/Enhanced Volatilization On-Site Disposal	3,600	368 (1 yr) 16 (2-30 yr)	4,180
7) S-4 Building Decontamination/Fixation Enhance Volatilization Off-Site Disposal	4,900	380 (1 yr)	5,270
8) V-1 No Action	230	15 (1-30 yr)	230
9) V-2 Sediment Excavation/Fixation/On-Site Disposal	2,930	393 (1 yr) 15 (2-30 yr)	3,520
10) V-3 Sediment Excavation Fixation/ Off-Site Disposal	3,500	378 (1yr)	4,480
11) V-6 Sediment Excavation/Off-Site Treatment & Disposal	3,930	0.2	3,930

TABLE 8

DETECTED CONCENTRATIONS OF INDICATOR CONSTITUENTS IN SOIL DUST AND GROUNDWATER, WATER QUALITY CRITERIA, AND CANCER POTENCY SLOPES

Parameter	Soil (mg/kg)	Water (ug/l)	Dust (mg/kg)	Ambient Water Quality Criteria (ug/l) For the Protection of Human Health		NYSDEC (6)	USEPA Cancer Potency Slope (mg/kd/day^{-1})	
				USEPA	NYSDEC (5)		Oral	Inhalation
Cadmium	ND(2) - 5580	ND-6.0	31-15300	10.0	10.0	—	—	6.1
Nickel	ND - 2040	ND	60-21500	15.4	—	—	—	—
Trichloroethylene	ND - 0.03	ND - 100	NA(3)	5.0	10.0	5.0	0.011	0.0043
Chloroform	ND - 0.12	ND - 11.0	NA	100	100	100(7)	0.081	0.081
1,1,1-Trichloroethane	ND	ND - 2.4	NA	200	—	5.0	0.0573(4)	—
Tetrachloroethylene	ND - 0.015	ND - 2.4	NA	0(1)	—	5.0	0.051	0.0017
1,2-dichloroethane	ND	ND - 15.0	NA	5.0	—	5.0	0.91	0.91

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(1) MCLG
(2) ND = Not Detected
(3) NA = Not Analyzed
(4) Based on cancer potency of 1,1,2-trichloroethylene
(5) New York State Water Quality Regulations March 1986
(6) New York State MCl's for Public Water Supply systems - proposed 1988
(7) New York State MCl's for Public Water Supply Systems - proposed: Based on total halogenated methanes criteria