Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision

Dzus Fastener Site
Operable Unit #2
West Islip, Suffolk County
Site Number 1-52-033

September 1997

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

DECLARATION STATEMENT - RECORD OF DECISION

Dzus Fastener Company Inactive Hazardous Waste Disposal Site
Operable Unit #2
West Islip, Suffolk County, New York
Site No. 1-52-033

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedial action for Operable Unit #2 of the Dzus Fastener Company inactive hazardous waste disposal site which was chosen in accordance with the New York State Environmental Conservation Law (ECL). The selected remedial program is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300).

This decision is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the Dzus Fastener Company Inactive Hazardous Waste Disposal 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 waste constituents 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.

Descriution of Selected Remedy

Based upon the results of the Remedial Investigation/Feasibility Study (RI/FS) for the Dzus Fastener Company site and the criteria identified for evaluation of alternatives, the NYSDEC has selected groundwater monitoring and dredging Lake Capri with off-site disposal of contaminated sediments. The components of the remedy are as follows:

- A long-term groundwater monitoring program to evaluate the effectiveness of the on-site remedy and to verify that the existing off-site groundwater plume does not adversely impact public health or the environment. Institutional Controls..
- Dredging, dewatering and off-site disposal of approximately 12,000 cubic yards of contaminated sediments from Lake Capri.

- Excavation and off-site disposal of approximately 100 cubic yards of sediment from Willetts Creek, corresponding to levels of cadmium exceeding ~~9 ppm~~ 10ppm.

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. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

_____ _____

Date

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

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SECTION 1: SITE LOCATION AND DESCRIPTION

The Dzus Fastener Company site is located at 425 Union Boulevard, West Islip, Suffolk County. The site comprises one acre and is located in a mixed residential, commercial, and industrial area. The site is triangular in shape and is bounded by Union Avenue to the south, Beach Street to the west, and the Long Island Railroad tracks to the north. Immediately to the east of the site is Willetts Creek, which drains into Lake Capri (see Figure 1). Lake Capri is an eight-acre man-made lake which drains into the tidal portion of Willetts Creek through a culvert located underneath Montauk Highway.

This site has been divided into two operable units. Contamination in on-site soils was addressed as Operable Unit 1 (O.U. 1), for which a Record of Decision was signed in March 1995. Operable Unit 2 (O.U. 2) addresses contamination in groundwater and in the sediments and surface waters of Willetts Creek and Lake Capri.

SECTION 2: SITE HISTORY:

2.1 : Operational/Disposal History

Since 1932, the Dzus Fastener Company has manufactured fasteners, small springs and other specialty devices. Until 1985, electroplating and metal cleansing wastes were discharged into a series of drywells and a leach field, thereby releasing contaminants (primarily cadmium, chromium, and cyanide) into the soil and groundwater. A discharge pipe was discovered along the northern boundary of the site, ending near Willetts Creek. From this, the DEC believes that wastewaters may have been discharged directly into the creek during past operations of the site.

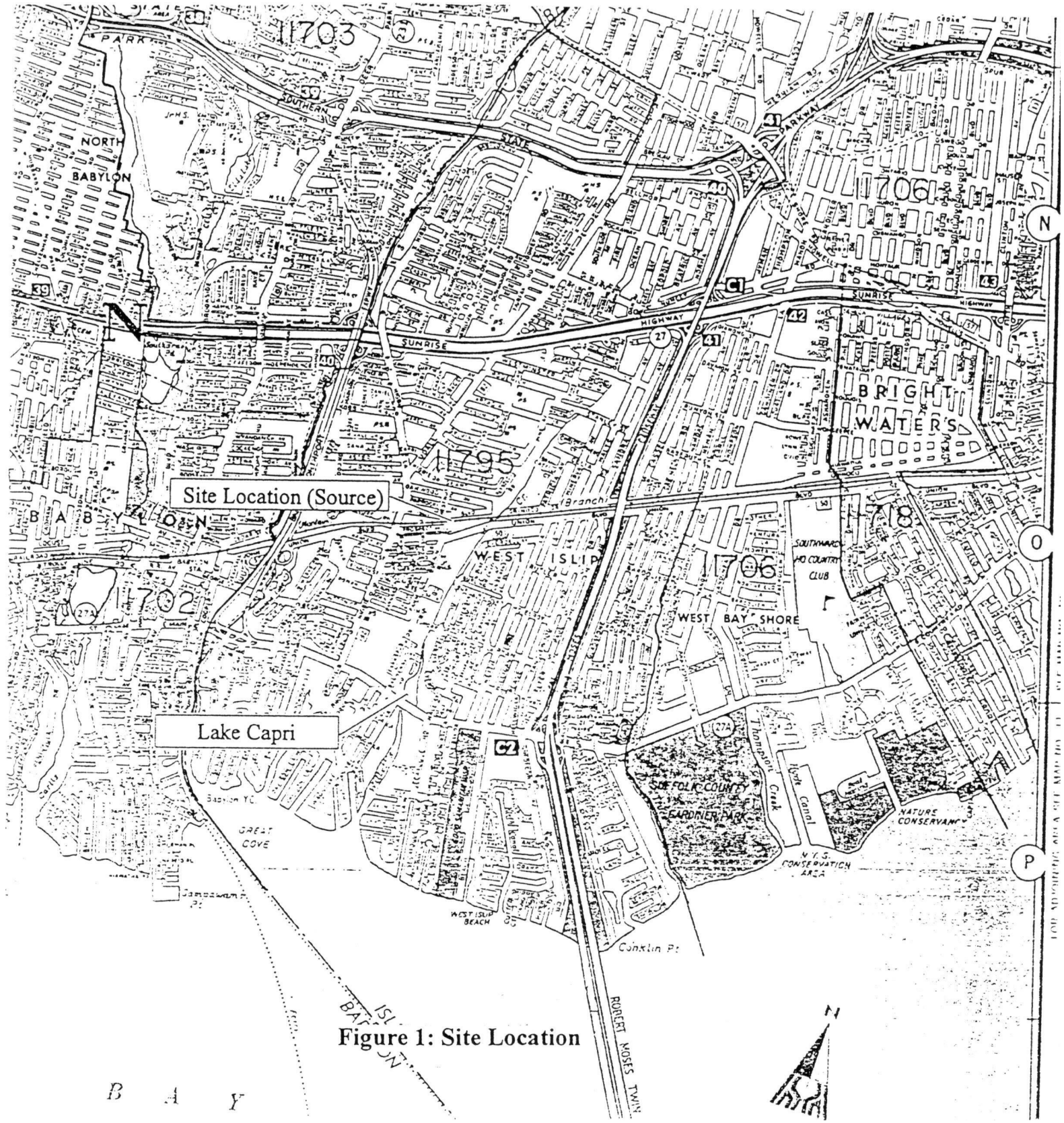
2.2: Remedial History

The Dzus Fastener Company site was added to the NYSDEC's Registry of Inactive Hazardous Waste Disposal Sites in New York State in 1982. In 1991, the site was classified as a Class 2 site; meaning that it poses a significant threat to human health or the environment.

In 1984, the NYSDEC conducted a Phase I investigation of the site. This consisted of a literature/file search, a review of disposal practices and a site reconnaissance.

A Phase II Investigation, funded by Dzus Fastener (Dzus) with oversight by the NYSDEC, was conducted in 1990. Soil samples were collected across the site, and fourteen groundwater monitoring wells were installed and sampled during the investigation, Elevated levels of cadmium, chromium, and cyanide were detected in groundwater both on-site and off-site. The source of this contamination was found to be the industrial leach field on the eastern portion of the site.

An Interim Remedial Measure (IRM), funded by Dzus, was conducted in 1991 with oversight by the NYSDEC. The purpose of this IRM was to remove the contaminated leach field. Approximately 1960 cubic yards of contaminated soil were excavated and disposed off site before the project was terminated due to a lack of funds. During this IRM, a 10-inch clay discharge pipe was discovered along the northern property boundary. A report on the IRM activities was prepared in June 1992.


Site Location (Source)
Lake Capri
Figure 1: Site Location

The NYSDEC began the Remedial Investigation/Feasibility Study in May 1992. This investigation was funded by the Environmental Quality Bond Act of 1986 (EQBA). The final RI/FS Report was prepared in October 1994 and an addendum to the RI/FS Report was completed in October 1995.

The Proposed Remedial Action Plan (PRAP) for Operable Unit 1 (O.U. 1) was issued by the NYSDEC in January 1995. The ROD for O.U. 1, which specified in-situ stabilization/solidification of cadmium-contaminated soils, was issued by the NYSDEC in March 1995, and treatment of site soils was completed in December 1996.

To provide a broader range of alternatives to address cadmium contamination in Lake Capri sediments, the NYSDEC prepared a Supplemental Feasibility Study, which was finalized in March 1997.

SECTION 3: CURRENT STATUS

The NYSDEC conducted a Remedial Investigation/Feasibility Study (RI/FS) at the Dzus site between May 1992 and March 1997. The purpose of these studies was to determine the nature and extent of contamination attributable to the site, and to develop and evaluate alternative remedies for addressing this contamination.

3.1: Summary of the Remedial Investigation

The Remedial Investigation (RI) was conducted in two phases between May 1992 and April 1994. Additional sampling was conducted through 1995. A description of the work conducted during the RI is presented below, and the results of this work are summarized in Section 3.1.2 of this document (Extent of Contamination).

- Area Well Inventory: An inventory of wells screened in the Upper Glacial Aquifer to the south of the site was conducted. **A** total of 18 wells were identified, none of which is used as a public or private water supply. It is believed that all residences, businesses, schools, etc. in these areas are served by the public water supply.

- Groundwater Quality Investigation: **A** total of 21 groundwater monitoring wells were installed during the RI. These and 11 pre-existing monitoring wells were sampled during the investigation and these samples were analyzed for Volatile Organic and Semivolatile Organic Compounds (VOCs and SVOCs), and Inorganics.

- Groundwater Flow Model: A computer model of groundwater flow was developed to model the future extent of the groundwater contamination migrating from the site. The MODFLOW and MT3D software packages were used to simulate the three-dimensional flow of groundwater and contaminant particles. The model was first calibrated to the known existing contaminant plume, and then used to simulate the migration of cadmium in 50, 100 and 200 years. A more detailed description of the computer model appears in the October 1995 RI/FS Addendum.

- Surface Water and Sediment Investigation: Surface water and sediment samples were collected from 35 locations on Willetts Creek and in Lake Capri. At 11 of these locations, samples were taken of both surface sediment and deeper sediments to determine the depth of cadmium contamination.

- Analysis of Fish and Shellfish Tissues: Fish specimens were collected from Lake Capri by electrofishing in March 1994. The fillets and carcasses of the fish were analyzed separately for cadmium. Specimens of blue crabs and hardshell clams were collected from the tidal portions of both Willetts Creek and Carlls River and analyzed for cadmium. The specimens collected from the Carlls River are considered to be the background control group for this study.

- Sampling of Residential Soils: Soil samples were collected from the yards of thirteen residences along Willetts Creek and Lake Capri. These samples were analyzed for cadmium and chromium.

The analytical data obtained during the RI were compared to applicable Standards, Criteria, and Guidance values (SCGs) in determining the need for remedial action goals for this operable unit. Groundwater, surface water, and drinking water SCGs identified for the Dzus Fastener Company site were based upon the NYSDEC Ambient Water Quality Standards and Guidance Values and Part V of the New York State Sanitary Code. Soil and sediment SCGs identified for the site were based on NYSDEC clean-up guidelines and health-based clean-up guidelines developed by the NYSDOH.

Guidance values for cadmium in sediments are established at two thresholds: the Lowest Effect Level (LEL) of 0.6 ppm and a Severe Effect Level (SEL) of 9.0 ppm. The LEL indicates a level that can be tolerated by the majority of benthic organisms, but which still causes toxicity to a few species. The SEL indicates the concentration at which pronounced disturbance of the sediment-dwelling community can be expected, Cadmium concentrations between the LEL and SEL (0.6 and 9.0 ppm) are considered to be contaminated, with moderate impacts to benthic life.

Chemical concentrations are reported in parts per billion (ppb) and parts per million (ppm). For comparison purposes, Table 1 lists SCGs for each medium.

3.1.1 Nature of Contamination

Based upon a comparison of the analytical results outlined above and the SCGs for this site, it has been determined that the following areas and media are contaminated above SCGs:

- Cadmium levels in groundwater exceed 10 ppb both on- and off-site.

- Surface water in Willetts Creek are contaminated with cadmium and cyanide at concentrations exceeding water quality standards.

- Sediments in Willetts Creek and Lake Capri are contaminated with cadmium above the guidance value of 0.6 ppm. Cadmium is bioaccumulating in the food chain as demonstrated by the cadmium contamination detected in the fish specimens.

3.1.2 Extent of Contamination

map

Groundwater

Cadmium concentrations in groundwater under the Dzus Fastener Company site ranged from non-detectable at the northern boundary to 1,430 ppb in the leach field area in the eastern corner of the site. Cadmium concentrations in off-site groundwater ranged from non-detectable at all locations south of the Junior High School to 755 ppb at **MW-13,** located at the shopping center across Union Blvd. from the site. The ambient groundwater standard for cadmium is **10** ppb. From this groundwater monitoring data, a plume of cadmium-contaminated groundwater was mapped, extending approximately 700 feet south from the site, to where it discharges into Willetts Creek.

In addition to cadmium, cyanide was detected on-site at concentrations ranging up to **2,490** ppb (the ambient groundwater standard is **100** ppb). Chromium was also detected in on-site and off-site wells at concentrations ranging up to **258** ppb (the groundwater standard is 50 ppb).

The groundwater flow model predicted the extent of the cadmium plume 50, 100 and 200 years after the source of contamination has been remediated. The model estimates that cadmium levels in excess of the groundwater standard (10 ppb) will extend no further than 1000 feet from the site **100** years in the future.

Sediments

Cadmium was detected in most of the Willetts Creek and Lake Capri sediment samples, as shown in Table 1 and Figure **2.** Figure **3** shows the sample detections and a contour plot of cadmium concentrations in the lake, averaged over the top **12**" of sediments.

Concentrations of cadmium in Willetts Creek sediments ranged from 0.82 to **79.8** ppm, with non-detectable levels at 6 locations.

In Lake Capri, cadmium was detected in the surface sediments at all sampling locations, at concentrations ranging from **1.4** to **347** ppm. Cadmium concentrations in deeper sediments were consistently lower than in surface sediments, ranging from non-detectable to **79** ppm. Due to sampling variability, the deeper sediment samples were not taken from a consistent depth; they range from **3**"**-6**" to **12**"**-24**".

Lead was detected in ***6*** samples from both Willetts Creek and Lake Capri at levels that exceed the sediment quality guideline. At all **6** locations, the sediment guideline for cadmium was also exceeded.

Surface Water

Cadmium was detected in surface water at two locations on Willetts Creek and at one location in Lake Capri. The highest cadmium concentration in Willetts Creek was **37.7** ppb at location **SED-3/SW-3** (see Figure **2),** which is significantly higher than the NYSDEC's surface water standard of **0.7** ppb. Cyanide was also detected at the SW-3 location at a concentration of **15** ppb. The surface water standard for cyanide is **5.2** ppb. The location of these detections closely matches the current extent of the groundwater

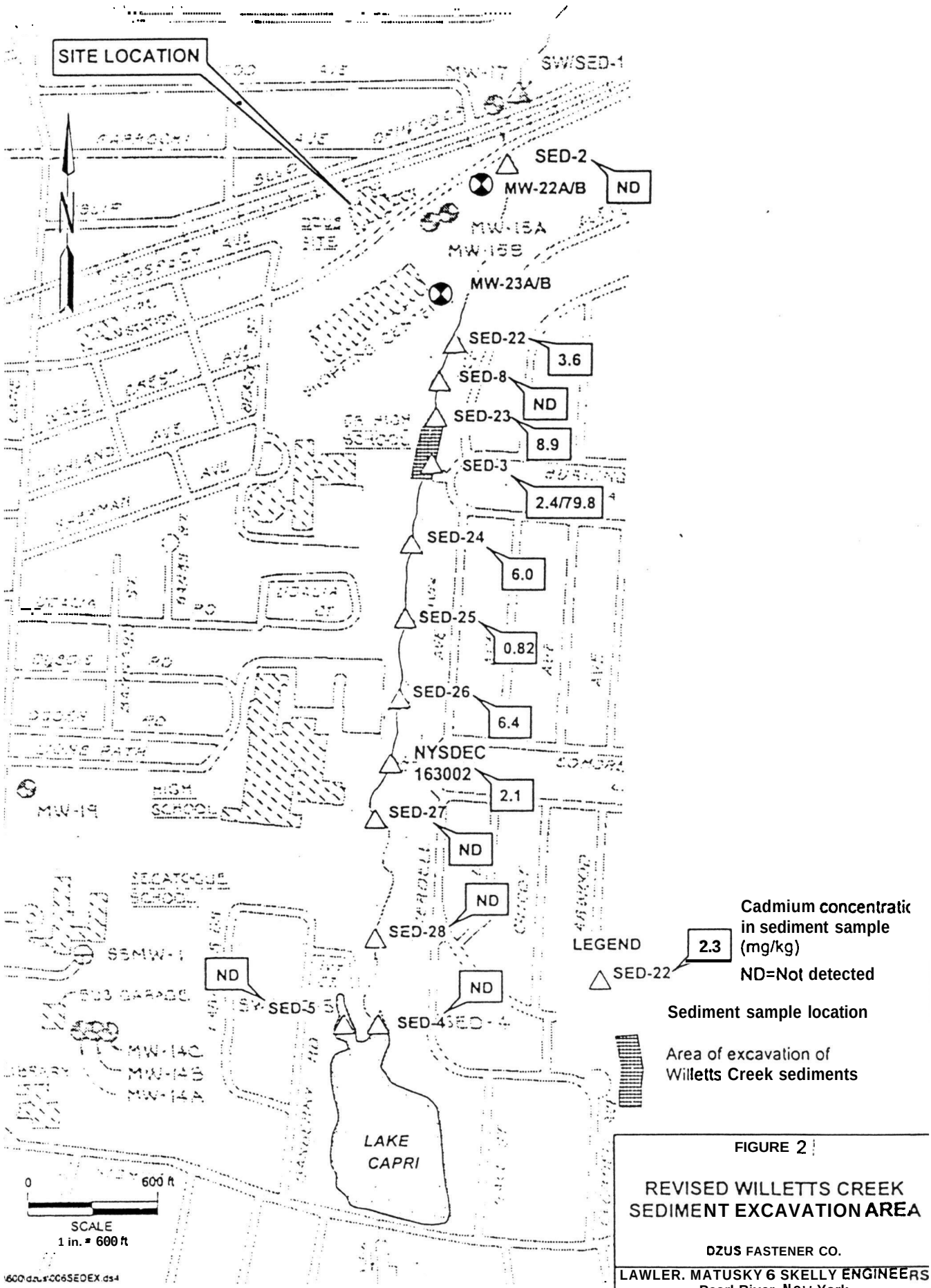
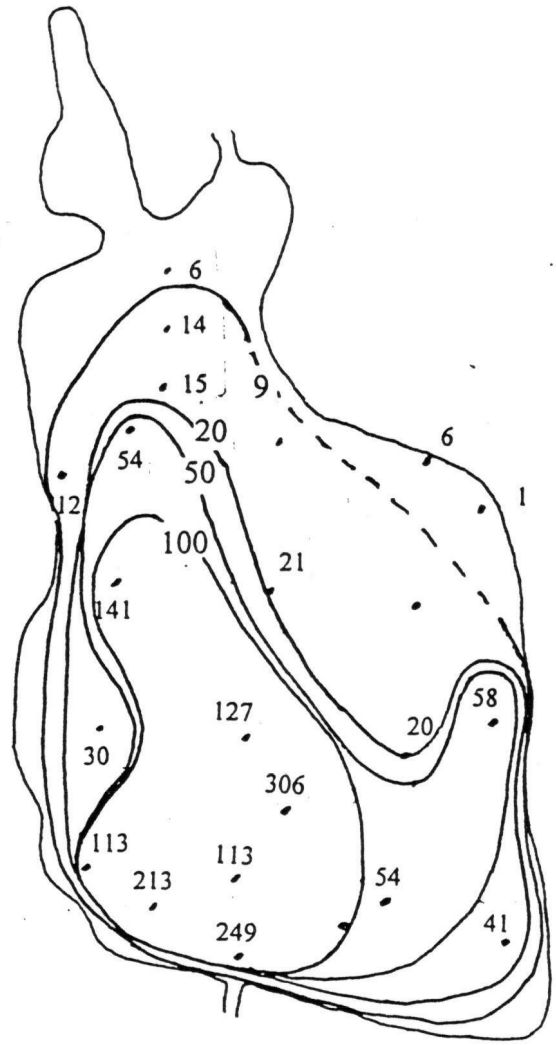


FIGURE 2

REVISED WILLETTS CREEK
SEDIMENT EXCAVATION AREA

DZUS FASTENER CO.

LAWLER. MATUSKY 6 SKELLY ENGINEERS
Pearl River, New York



Scale: 1" = 200' (approx)

C = 100 ppm Cd	V = 3,000 cu yds
C = 50 ppm Cd	V = 5,600 cu yds
C = 20 ppm Cd	V = 6,500 cu yds
C = 9 ppm Cd	V = 9,950 cu yds
C = 1 ppm Cd	V = 12,000 cu yds

Volume estimates based on 12" depth of excavation
Sediment concentrations averaged over top 12"

FIGURE 3.1 Sediment Concentration Isopleths and Estimated Volumes

contaminant plume, indicating that contaminated groundwater is discharging to this portion of Willetts Creek. Cadmium was detected in only one of ten surface water samples collected in Lake Capri at a concentration of **3.8** ppb.

Residential Surface Soils

Cadmium concentrations ranged from non-detectable levels to 1.7 ppm (the health-based clean-up guideline is 10 ppm) in samples collected from the yards of residences along Willetts Creek. Cadmium was also detected at **2.6** ppm in a sample taken adjacent to a picnic table at the Dzus Site. Chromium was detected at concentrations ranging from 5.2 to 20.2 ppm, compared to the DEC cleanup guideline of 50 ppm. These results are presented in Table 1.

Biota

The results of fish and shellfish analyses are summarized in Table 1. Carp were the most contaminated species with cadmium at concentrations up to 1.9 pprn in the fillet samples. While there are no established guidelines or standards for cadmium in fish, the NYSDOH has issued a health advisory against the consumption of fish from the lake. In crab and clam samples, cadmium was detected at a greater frequency in the specimens collected from Willetts Creek than in those of the control group collected in Carlls River. In the Willetts Creek crab specimens, cadmium was found more frequently and in higher concentrations in the hepatopancreas (liver/pancreas) than in the muscle tissue.

Statewide, the NYSDOH has issued **an** advisory against eating the hepatopancreas of the blue crabs due to presence of PCBs and cadmium. In addition, the consumption of clams is prohibited due to the presence of coliform in these species.

3.2: Interim Remedial Measures

Interim Remedial Measures (IRMs) are conducted at sites when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

In 1991, the Dzus Fastener Company excavated and removed approximately 1960 cubic yards of contaminated soil and several leach field appurtenances from the on-site leach field (See Section 2.2).

3.3: Summary of Human Exposure Pathways

A baseline human health evaluation and risk assessment was conducted to identify potential exposure pathways to site-related contaminants and to assess the potential risks to human health associated with those pathways.

The potential human exposure pathways at the Dzus site and the associated contaminants are:

Exuosure Pathway	Chemical
Ingestion of chemicals in residential soils by adults	Cd, Cr
Ingestion of chemicals in residential soils by children	Cd, Cr
Ingestion of surface water in Willetts Creek	Cd, Zn, CN
Ingestion of chemicals in sediments in Willetts Creek	Cd, Zn, Ni
Dermal contact with chemicals in Willetts Creek	CN
Dermal contact with chemicals in the sediment of Lake Capri	Cd, Cr

NOTE: Cd = Cadmium, Cr = chromium, Zn = Zinc, Ni = Nickel CN = Cyanide

For noncarcinogenic effects associated with off-site exposure, it was assumed that adults may be exposed to site contaminants through the ingestion of contaminated soils from yards along Willetts Creek and Lake Capri. Children may potentially be exposed to site contaminants through the ingestion of surface water and sediments in Willetts Creek, dermal contact with contaminants in surface water while wading in Willetts Creek and Lake Capri, and ingestion of chemicals in residential soils.

To describe the potential for noncancer health effects to occur in an individual, the hazard index is used, which is expressed as **the** ratio of an estimated contaminant intake to the risk reference dose. **A** risk reference dose is the estimated daily intake of a chemical that is likely to exist without an appreciable risk of health effects. **A** ratio equal to or less than one is generally considered to be an acceptable level of risk.

The total noncancer risk to adults, including the fish ingestion pathway, is 0.376. The corresponding risk to children is 0.710. The largest contribution to these risks is from the ingestion of cadmium in fish, totalling 0.373 and 0.620 for adults and children, respectively. These results indicate that it is unlikely that the contaminants of concern at the Dzus Fastener site will result in adverse human health effects at the concentrations currently identified in the surface soils in residential yards, surface water, sediments or fish of Willetts Creek or Lake Capri.

Cancer risks were calculated using standard exposure estimates for site-specific levels of the contaminants of concern. Cancer risks are expressed as the probability of developing an additional case of cancer in the exposed population. For known or suspected carcinogens, the NYSDOH compares site-related cancer risks to the health risk goal of one additional cancer in one million (1×10^{-6}).

In the evaluation of on-site contamination (O.U.1), cancer risks were estimated based on the inhalation of airborne cadmium in soils by on-site workers and children trespassing on the site. These risks were calculated as 3.74×10^{-7} and 1.32×10^{8}, respectively. Because on-site contamination has now been remediated, off-site contaminant levels are much lower than those on-site, and inhalation of contaminated sediments is **an** unlikely exposure pathway, airborne exposure to cadmium was not evaluated for Operable Unit 2.

Carcinogenic health effects are not known to result from inhalation exposures to cyanide, zinc or chromium in its trivalent form. No evidence currently exists that cadmium and cyanide are carcinogenic by the ingestion pathway. Therefore, oral exposures to these contaminants are not expected to pose an increased risk of cancer to human populations. Dermal exposures to cyanide are also not expected to result in carcinogenic effects for children wading in Willetts Creek.

3.4: Summary of Environmental Exposure Pathways

Cadmium was detected in the sediments of Willetts Creek and Lake Capri at concenttations above those known to cause toxic effects to benthic organisms living on or in the sediments, At the detected concentrations, it is likely that benthic species richness and diversity are low, and that the lake is inhabited by a few tolerant species at low population levels.

Cadmium is entering the food chain as demonstrated by detections of this contaminant in fish specimens collected from Lake Capri. It is also likely that birds and mammals which consume plants and/or invertebrates from the lake are at risk from the uptake of cadmium from lake water and sediments. Impacts to fish at the detected concentrations include mortality, retarded growth and impaired reproduction. Migratory waterfowl which may be exposed to cadmium in aquatic plants and invertebrates may be at risk of kidney damage, infertility and reduced egg production. Waterfowl may also bioaccumulate cadmium in their tissues, which may pose a route of exposure to humans who hunt and consume them.

SECTION 4: ENFORCEMENT STATUS

The Potentially Responsible Parties (PRPs) in this action include:

- Dzus Fastener Company, Inc. (Dzus Fastener);
- Dzus International Limited (Dzus International); and
- Theodore Dzus. Sr.

The PRPs initially refused to sign a consent order with the NYSDEC to conduct an RI/FS at the site. As a result, the NYSDEC, using state funds, conducted the RI/FS. The funds required for remediating Operable Unit 2 of the site will also come from state funds provided by the Environmental Quality Bond Act of 1986.

Dzus Fastener and Dzus International later signed Orders on Consent, which became effective on December 13, 1993, agreeing to pay the State the following amounts towards the investigation and remediation of the site:

- Dzus Fastener: $1,100,000
- Dzus International: $400,000

A. Alternatives for Remediating Contaminated Groundwater

Alternative A1 - No Action

Under this alternative, no remediation would be conducted. The no action alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Capital Cost: $ 0
O&M Costs: $ 0/year
Present Worth: $ 0

Alternative A2 - Monitoring and Institutional Controls

A long-term monitoring program would be developed and implemented. An estimated 20 monitoring wells would be sampled periodically and analyzed for cadmium, chromium, and cyanide, which are the contaminants of concern in groundwater. This monitoring would be performed to verify the current expectation that contaminants in groundwater will not migrate significantly from their current extent. Existing institutional controls would be continued to ensure that no public or private water supply wells are installed in areas of contaminated groundwater.

Capital Cost: $ 0
O&M Costs: $ 21,950/year
Present Worth: $ 337,500

Alternative A3 - Pump and Treat Groundwater for Aquifer Restoration

This alternative was developed to evaluate the feasibility of pumping and treating groundwater to restore the aquifer to ambient water quality standards. Three groundwater extraction wells would be installed, a treatment plant would be constructed, and the system would be operated until groundwater quality standards are achieved in the aquifer. Groundwater would be treated via chemical oxidation (to remove cyanide) and precipitation (to remove cadmium and chromium) and would then be reinjected into the aquifer.

A long-term monitoring program would be developed to evaluate the performance of the pump and treat system. An estimated 20 monitoring wells would be sampled periodically and analyzed for cadmium, chromium, and cyanide.

Capital Cost: $ 3,793,000
O&M Costs: $ 201,700/year
Present Worth: $12,763,000

Alternative A4 - Pump and Treat Groundwater for Containment

This alternative was developed to evaluate the feasibility of pumping and treating groundwater to contain the contaminant plume and to prevent the discharge of contaminants to Willetts Creek. One groundwater

extraction well, located behind the Grand Union Shopping Center would be installed and operated under this alternative. Groundwater would be treated as described above and reinjected into the aquifer.

A long-term monitoring program would be developed to evaluate the performance of the pump and treat system. An estimated 20 monitoring wells would be sampled periodically and analyzed for cadmium, chromium, and cyanide.

Capital Cost: $ 1,428,000
O&M Costs: $ 58,350/year
Present Worth $ 4,528,500

B. Alternatives for Remediating Cadmium-Contaminated Sediments in Willetts Creek and Lake Capri.

Alternative B1 - No Action

Under this alternative, no remediation would be conducted. The no action alternative is evaluated as a procedural requirement and as a basis for comparison. It requires only continued monitoring of sediment, surface water and fish tissue, allowing 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.

Capital Cost: $0
O&M Costs: $1,500/year
Present Worth $23,055

Alternative B2 - Dredging Lake Capri with Off-site Disposal of the Sediments

The entire lake bottom to a depth of approximately one foot (approximately 12,000 cubic yards) would be dredged from Lake Capri under this alternative. These dredged sediments would be pumped as a slurry to a treatment unit for dewatering. A temporary treatment facility would be established at a nearby location, such as the back parking lot of the West Islip High School adjacent to Willetts Creek. The sediments would be dewatered using filter presses to produce a solid material for transport to a disposal facility. Water removed from the sediments would be treated and discharged into Willetts Creek in compliance with discharge permit requirements.

Also, approximately 100 cubic yards of sediment from Willetts Creek would be excavated mechanically and transported to a disposal facility. This corresponds to the higher levels of cadmium (greater than 9 ppm) found near locations **SED-3** and SED-23.

After dredging, lake vegetation would be allowed to naturally re-establish, and the lake would be restocked with fish. Monitoring would be performed as described for Alternative B1.

Capital Cost: $ 5,153,200
O&M Costs: $ 1,500/year
Present Worth $ 5,176,255

Alternative **B3** - Dredging the Southern Portion of Lake Capri with Off-site Disposal of the Sediments

Under this alternative, only the most contaminated Lake Capri sediments (approximately 4,000 cubic yards) would be dredged, treated and disposed **as** described above. This corresponds to a cleanup level of approximately 100 ppm cadmium. Also, approximately 100 cubic yards of sediment from Willetts Creek would be excavated mechanically and transported to a disposal facility. This corresponds to the higher levels of cadmium (greater than 9 ppm) found near locations SED-3 and SED-23.

Capital Cost: $ 1,896,700
O&M Costs: $ 1,500/year
Present Worth: $ 1,919,755

Alternative **B4 - Fill** in Lake Capri

Under this alternative, contaminated sediments would be treated by solidification and then buried under clean soil **as** the lake is filled in. A culvert would be installed under the lake bed to carry Willetts Creek water through the filled area. A barrier cap would be constructed in order to prevent humans, plants, or wildlife from coming into contact with the contaminated sediments.

Capital Cost: $ 2,693,600
O&M Costs: $ 1,500/year
Present Worth $ 2,716,655

Alternative **B5** - Consolidation of the Contaminated Sediments in **a** Containment Cell along the Shore of Lake Capri

For this alternative, a containment cell would be constructed along a portion of the shoreline, as shown in Figure **4.** Contaminated sediments outside the containment cell (approximately 10,000 cubic yards) would be hydraulically dredged and pumped into the cell for gravity settling. Water would be decanted from the cell or subcells, treated, and discharged in compliance with permitting requirements. The cell would comprise approximately 1.3 acres, and its exact location would be determined by the availability of permanent easements. As shown in Figure 5, the containment cell would be capped with a geomembrane and covered with backfill and vegetative cover to prevent humans, plants or wildlife from coming into contact with it.

Also, approximately 100 cubic yards of sediment from Willetts Creek would be excavated mechanically and transported to a disposal facility. This corresponds to the higher levels of cadmium (greater than 9 ppm) found near locations SED-3 and SED-23.

Capital Cost: $ 2,316,600
O&M Costs: $ 1,500/year
Present Worth $ 2,355,025

Alternative B6 - Consolidation of the Contaminated Sediments in a Containment Cell in the Middle of Lake Capri

A circular containment cell would be constructed in Lake Capri in the general location shown in Figure **4,** and having the cross section shown in Figure **5.** As described above, contaminated sediments would be dredged from the lake and pumped into the cell for gravity settling. The cell would comprise approximately 1.0 acre, and its location would be determined by the availability of easements. The dredged material would then be capped in a manner to prevent humans, plants, or wildlife from coming into contact with it.

Also, approximately 100 cubic yards of sediment from Willetts Creek would be excavated mechanically and transported to a disposal facility. This corresponds to the higher levels of cadmium (greater than **9** ppm) found near locations **SED-3** and **SED-23.**

Capital Cost: $ **1,418,476**
O&M Costs: $ 1,500/year
Present Worth $ **1,456,901**

Alternative B7 - Dredging with Combined Off-Site Disposal and Underwater Capping

This alternative involves dredging and removing the most contaminated portion of the lake sediments, and consolidating the remaining low-level sediments in an underwater containment cell. Figure **6** shows the conceptual cross section of this containment cell. Approximately **6,500** cubic yards of contaminated sediments would be dredged from the lake, dewatered as described in Alternatives B2 and **B3,** and disposed in an off-site landfill. This volume of sediments corresponds to an estimated depth of 1 foot and a minimum level of approximately 20 ppm of cadmium. Based on current sampling data, this would result in the removal of **92.4%** of the mass of cadmium from the lake. Also, approximately 100 cubic yards of sediment from Willetts Creek would be excavated mechanically and transported to a disposal facility. This corresponds to the higher levels of cadmium (greater than **9** ppm) found near locations **SED-3** and **SED-23.**

After the most contaminated sediments are dredged and removed, additional uncontaminated sediments would be excavated to create a cavity for the placement of sediments containing lower levels of cadmium. These over-excavated sediments, which would be free of contaminants, would be stockpiled on shore for use as the final cover over the disposal cell. The underwater disposal cell would contain approximately 5,500 cubic yards of sediments, with an estimated average concentration of **10** ppm cadmium.

Capital Cost: $ **3,859,567**
O&M Costs: $ 1,500/year
Present Worth $ **3,882,622**

Section **6.2:** Evaluation of the Remedial Alternatives

The criteria used to compare and contrast the potential remedial alternative are defined in **6** NYCRR Part **375.** For each of the criteria, a brief description is provided, followed by an evaluation of the alternatives against that criterion.

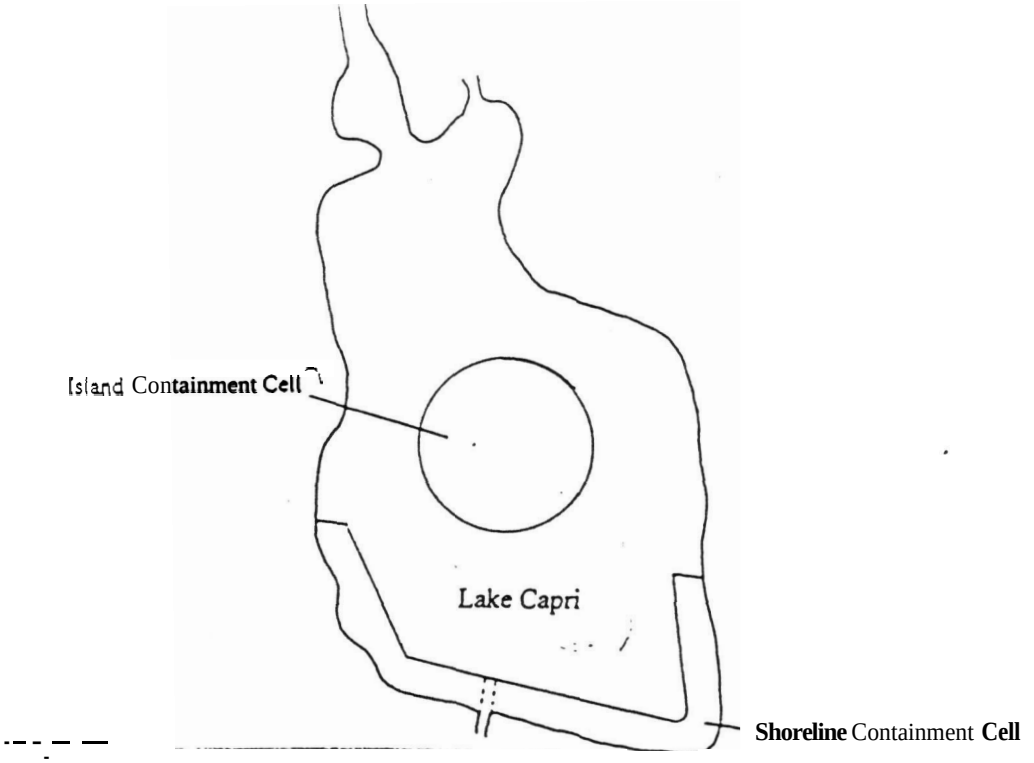


FIGURE 4: Location of Shoreline and Island Containment Cells (Alternatives B5 and B6)

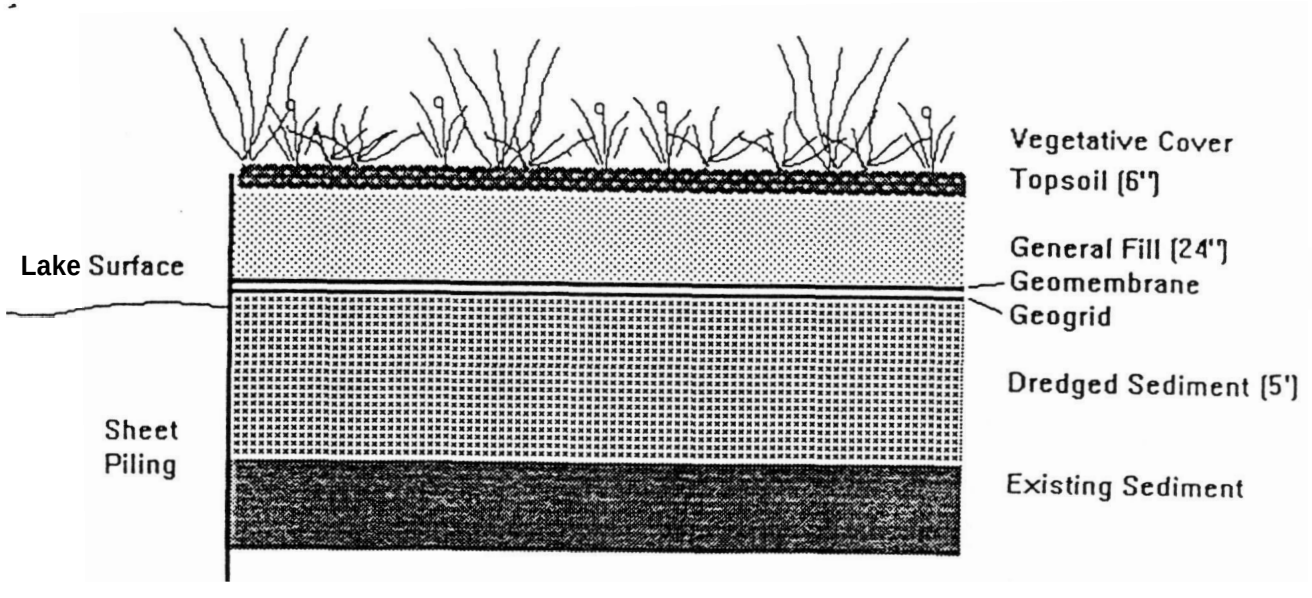


FIGURE *5:* Cross Section of Shoreline and Island Containment Cells (Alternatives B5 and B6)

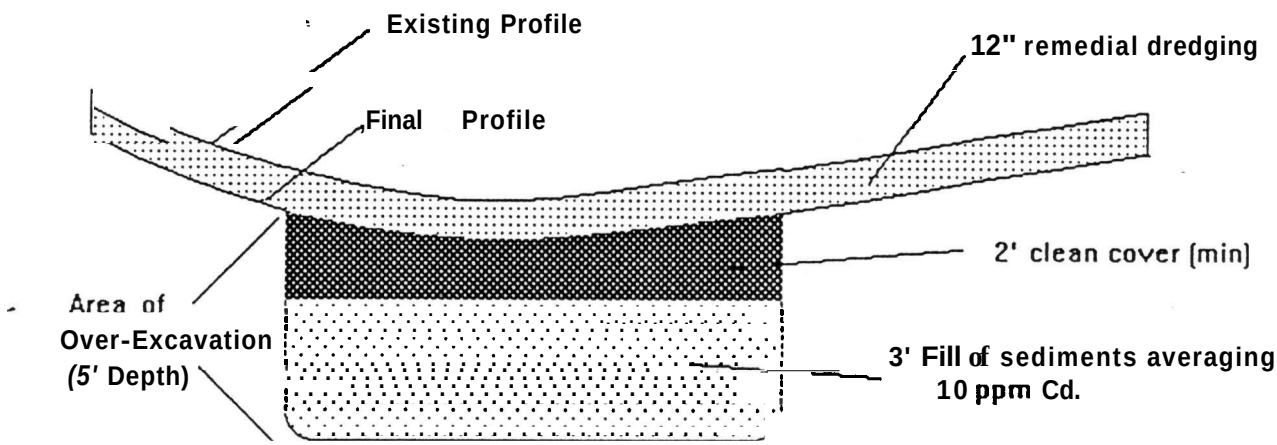


Figure 6: Conceptual Cross-Section of Underwater Containment Cell (Alternative B7)

Threshold Criteria - The first two criteria must be satisfied in order for an alternative to be eligible for selection.

1. Protection of Human Health and the Environment - This criterion is an overall and final evaluation of the health and environmental impacts to assess whether each alternative is protective. This evaluation is based upon a composite of factors assessed under other criteria, especially shortllong term effectiveness and compliance with Standards, Criteria, and Guidance values (SCGs).

All of the groundwater alternatives would be protective of human health because no public exposure *to* contaminated groundwater presently exists or is expected to occur. Alternatives A3 and A4 would provide more certain environmental protection than Alternatives A1 and A2 because groundwater would be actively removed and treated. The main environmental threat from contaminated groundwater is the release of contaminants to surface water (Willetts Creek). Surface water standards for cadmium and cyanide are presently exceeded in the upper reaches of Willetts Creek (locations SW-3 and SW-24 on Figure **2).** The groundwater model indicates that these exceedances are likely to continue under Alternatives A1 and A2. However, based on current conditions, the NYSDEC believes that groundwater contamination will not cause widespread surface water quality impacts to Willetts Creek if no remedial action is undertaken. Alternative A2 would confirm this expectation through monitoring.

Alternative B2 (Full Dredging & Off-site Disposal) provides the greatest degreee of environmental protection because all sediments containing excessive levels of cadmium would be removed from the ecosystem. Alternative B7 (Dredging and Underwater Capping) would provide the next best level of protection because more than 90% of the cadmium would be removed from the lake, and the remainder would be isolated by the underwater cap.

Alternatives **B5** and **B6** would be somewhat less protective of the environment because all cadmium-contaminated sediments, including those with high levels, would be managed in containment cells in or along the lake. The risk of release to the environment is greater for these alternatives than for the underwater capping alternative. Alternative B3 (Partial Dredging) would provide a lesser degree of protection because moderate to high levels of cadmium (up to 100 ppm) would remain exposed to the environment. Alternative B4 (Filling the Lake) would provide protection from cadmium contamination, but the environment as a whole would be severely degraded. Alternative B1 (No Action) would provide the least degree of environmental proteciton.

2. Compliance with New York State Standards. Criteria. and Guidance values (SCGs) - Under this criterion, the issue of whether a remedy will meet all of the Federal or State environmental laws and regulations is addressed. If these laws and regulations will not be met, then grounds for invoking a waiver must be provided.

In time, groundwater standards would be met under all four groundwater alternatives under consideration. These standards would be achieved more quickly under Alternatives A3 and A4 because groundwater would be actively pumped and treated. Alternatives A1 and A2 rely on natural attenuation and dilution processes to achieve standards, which are expected to require a very long period of time. However, during this time, no unacceptable public exposure to site contaminants is expected to occur.

As discussed in Section 3.1, guidance values for cadmium in sediments are established at two thresholds: the Lowest Effect Level (LEL) of 0.6 ppm and a Severe Effect Level (SEL) of 9.0 ppm. In addition, the NYSDEC provides guidance on recommended management practices for dredging and disposing of contaminated sediments.

With respect to the sediment guidance values, Alternatives B2 and B7 would provide the best compliance. The Severe Effects Level (SEL) would be achieved and the Lowest Effects Level (LEL) would be approached. Alternatives B5 and B6 would remediate sediments to levels that meet the guidance values for cadmium, but the level of cadmium disposed in the containment cells would exceed that recommended as a best management practice. Alternative B3 would not meet the guidance values because sediments left undredged would exceed the SEL for cadmium. Alternative B4 would result in compliance with sediment guidance values because the lake would no longer contain sediments. However; filling in the lake would violate other promulgated criteria such as the state Freshwater Wetlands Act and Section 404 of the federal Clean Water Act. Alternative B1 would not comply with guidance values for sediment contamination, but would not violate any action-specific criteria because no action would be taken.

Primary Balancing Criteria - The next five "primary balancing criteria" are used to compare and contrast the positive and negative aspects of the various alternatives.

3. Short-term Effectiveness - Under this criterion, the potential short-term impacts of the remedial action upon the community, the workers, and the environment are evaluated. The period of time required to achieve the remedial objectives is estimated and compared/contrasted with the other alternatives.

There are no short-term impacts associated with Alternatives A1 and A2 because no action would be taken. There would be some short-term impacts to the community under Alternatives A3 and A4 as wells, piping systems and treatment facilities are installed. These activities should take one to three months to complete, during which no exposure to contaminants is expected.

There are no short-term impacts associated with the implementation of Alternative B1. There are significant short-term impacts associated with the implementation of the remaining sediment alternatives (B2 - B7). It is estimated that it would take three to four months to implement Alternatives B5 and B6, and an additional month to implement Alternative B7. During that time, there would be significant aesthetic and environmental impacts to Lake Capri and the surrounding community. These impacts would include temporary destruction of the sediment habitat, elimination of resident fish, increased truck traffic, construction activities on properties adjoining the lake and increased noise during construction periods.

Dredging operations on the lake would only occur during working hours. Access to the lake would be restricted, particularly in the designated containment and water treatment areas, and in areas of active dredging. Dewatering processes and treatment equipment would be operated for 24 hours per day during the hydraulic dredging phase. A temporary structure would enclose this equipment to minimize the noise. Temporary access roads may be required along all or part of the shoreline, which would require temporary easements, followed by restoration. Alternatives B5, B6 and, possibly, B7, which require sheet pile containment, would create additional noise as the piles are driven.

Short-term environmental impacts of dredging include the disturbance of the sediment habitat and the suspension of cadmium-contaminated material. Some desorbtion of cadmium from the solid to the dissolved phase could also occur, resulting in increased water column concentrations. These impacts would be minimized by careful

monitoring and contingency planning. Temporary silt curtain containment may be required in areas of active dredging to control the migration of suspended particles.

4. Long-term Effectiveness and Permanence - If wastes or residuals will remain **at** the site after the selected remedy has been implemented, then the following items are evaluated: 1) the magnitude and nature of the risk posed by the remaining wastes; 2) the adequacy of the controls intended to limit the risks posed by the remaining wastes; and 3) the reliability of these controls.

Alternatives A3 and A4 would provide more certain long term effectiveness as groundwater contaminants would be actively removed from the aquifer. Alternatives A1 and A2 rely on natural processes to limit the migration of contaminants now that the source has been removed. In Alternative A2, the plume would be monitored periodically to confirm the NYSDEC's expectation of little future contaminant migration and human health or environmental impacts.

Alternative B2 would provide the greatest degreee of long-term effectiveness because all sediments containing excessive levels of cadmium would be removed from the ecosystem. This alternative would provide a permanent solution to cadmium contamination in the lake. Alternative B4 would also provide Iong term protection from cadmium contamination. Alternative B7 would provide the next best level of protection and permanence because more than 90% of the cadmium would be removed from the lake and the remainder would be isolated by the underwater cap. The capped area would require monitoring and possibly maintenance to ensure that low level contaminants are not transported from the capped area back into the environment.

Alternatives B5 and B6 would provide somewhat less long-term effectiveness because all cadmium-contaminated sediments, including those with high levels, would be managed in containment cells in or along the lake. The risk of release to the environment, and the degree of long-term operation and maintenance, is greater for these alternatives than for the underwater capping alternative.

Alternative B3 (Partial Dredging) would provide a lesser degree of long-term effectiveness because moderate to high levels of cadmium would remain exposed to the environment. Alternative B1 (No Action) would provide no long term effectiveness or permanence.

5. Reduction of Toxicitv. Mobilitv. and Volume - Preference is given to alternatives that permanently, and by treatment, reduce the toxicity, mobility, or volume of the wastes at the site. This includes assessing the fate of the residues generated from treating the wastes at the site.

The volume and mobility of the contaminants in the aquifer would be reduced if Alternatives A3 and A4 are implemented. The magnitude of these reductions would be greater under Alternative A3 than A4 due to the higher rate of pumping. Alternatives A1 and A2 provide no reduction in the toxicity, mobility, or volume of the contamination in the aquifer.

Alternative B2 would provide the greatest reduction in the volume and mobility of cadmium because all contaminated sediments would be dewatered and disposed off site.

The mobility of cadmium would be reduced to a lesser degree under Alternative B7, but more than 90% of the cadmium would be removed from the lake and disposed off-site. The volume of this material would be significantly reduced by the mechanical dewatering process. The mobility of the remaining contaminated sediments

would be reduced by the cap over the underwater containment cell, which would prevent migration of cadmium in the solid phase.

The mobility of cadmium in Lake Capri sediments would be reduced to a lesser degree by the containment cells in Alternatives B5 and B6, and by the fill in Alternative B4. The volume of contaminated sediments would be reduced slightly by gravity dewatering and consolidation in the containment cell.

6. Implementability - Under this criterion, the technical and administrative feasibility of implementing each alternative is evaluated. Technically, this includes the difficulties associated with the construction and operation of the alternative and the ability to effectively monitor the effectiveness of the remedy. Administratively, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining special permits, rights-of-way for construction, etc.

Alternative A1 would be the easiest groundwater alternative to implement since there would be no difficult technical or administrative tasks associated with this alternative. Alternative A2 would also be easy to implement because only an institutional action is required. Alternatives A3 and A4 would be more difficult to implement because pumping, piping and treatment systems would have to be designed and constructed.

Alternative B1 would be the easiest sediment alternative to implement since it requires only institutional action and continued monitoring. The remaining alternatives involve well-established technologies for dredging and dewatering contaminated sediments, and for treating contaminated water for discharge. However; site-specific conditions pose several technical challenges that impact Alternatives B2 through B7 to varying degrees.

For all dredging alternatives, access to Lake Capri would be required for the dredge and supporting equipment. The level of the lake may have to be lowered to provide better access for shore-based mechanical dredges. This should be easily done by means of the outlet culvert along the Montauk Highway. Alternative B3 would be easier to implement because it generally involves dredging in the deepest part of the lake. Alternatives B2, B3 and B7 would require access for sediment dewatering and water treatment facilities at a nearby location.

Alternatives B5 and B6 would be somewhat more difficult to implement because, in addition to the difficulties associated with dredging, they require installation of sheet pile containment structures in or along the lake. These would be difficult to install from the shallow draft barges which would be necessary in this lake. The shoreline cell (Alternative B5) would be easier to construct because access would be available from the shoreline. The containment island (Alternative B6) would be more difficult because the piles would have to be transported to and installed in the middle of the lake. These alternatives would not require a sediment dewatering process, and access to a nearby property may not be required. However, water decanted from the containment cells would require treatment prior to discharge to Willetts Creek, and so construction of a treatment facility would be necessary in the work area.

Alternative B7 would be the most difficult to implement because it requires both hydraulic and mechanical dredging, as well as the removal, dewatering and temporary stockpiling of clean cover material. Alternative B4 has uncertain implementability due to the unknown rate of groundwater recharge into the lake.

With respect to administrative implementability, it is likely that permits and approvals could be obtained for all alternatives except Alternative B4 (Filling in the Lake). Filling in Lake Capri is likely a violation of the state Freshwater Wetlands Act and the federal Clean Water Act and is not implementable. All three containment

alternatives (Alternatives **B5, B6** and **B7)** may also be difficult to implement administratively. The lake is privately owned by at least 20 homeowners, and permanent easements would be required to construct any on-site containment cell. A shoreline containment cell located along the Montauk Highway would impact at least 3 properties, filling nearly all the lake contained in them. The island containment cell would require a greater number of easements, but would involve filling a much smaller fraction of each property. Past discussions with property owners suggest that permanent easements would be very difficult to obtain.

7. Cost - Under this criterion, capital and operational **and** maintenance costs are estimated for the alternatives and compared on a present worth basis. Although cost is the last criterion evaluated; where two or more alternatives have met the requirements of the other criteria, lower cost can be used as the basis for final selection.

A summary of the costs for each alternative are presented in Table **2.**

Modifying Criterion - This final criterion is taken into account after evaluating those above. It is focused upon after public comments on this Proposed Remedial Action Plan (PRAP) have been received.

8. Community Acceatance - Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan have been evaluated. No written comments were received during the comment period. The "Responsiveness Summary" included as Appendix A presents comments and questions received from the public during the August **6, 1997** public meeting and the Department's response to them. The **69** attendees of the public meeting were asked to raise their hands if they supported the proposed remedy and the response was strongly favorable. As a result, the NYSDEC did not modify the remedy as a result of public comment.

SECTION 7: SUMMARY OF THE SELECTED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section **6,** the NYSDEC is selecting the following remedy:

- A long-term groundwater monitoring program to evaluate the effectiveness of the on-site remedy and to verify that the existing groundwater plume does not impact public health or the environment (Alternative A2). Institutional controls...
- Dredging, dewatering and off-site disposal of contaminated sediments from Lake Capri (Alternative B2).
- Excavation and off-site disposal of approximately 100 cubic yards of sediment from Willetts Creek, corresponding to levels of cadmium exceeding 9 ppm near locations SED-3 and SED-23.

Monitoring groundwater will verify the expectation that the contaminant plume will not migrate significantly beyond its current extent. It should be noted that exceedances of cadmium and cyanide standards are likely to continue in the upper reaches of Willetts Creek. However, concentrations of these contaminants will continue to be diluted by clean groundwater in southern sections of the creek, and ambient water quality standards are expected to be met as the creek enters Lake Capri. Because the basis for these standards is fish propagation, the impact of these exceedances is to the environment, not to public health. Because a portion of upper Willetts Creek is an intermittent stream, and the remainder is not a valuable habitat for fish propagation, the environmental impact of continued

exceedances will be minor. Surface water and sediments in Willetts Creek and Lake Capri will be monitored to verify this expectation.

Dredging-and off-site disposal of cadmium-contaminated sediments (Alternative B2) provides the greatest degree of environmental protection and compliance with SCGs. Although Alternative B2 is significantly more expensive than Alternative B7, which also provides a high degree of environmental protection, the construction of an underwater containment cell under Alternative B7 would be much more difficult to implement technically and administratively. As a result, the estimated costs of Alternative B7 are less certain. In addition, all of the containment alternatives would require maintenance for an indefinite period to maintain their integrity. This would not be necessary for the off-site disposal alternative. Because Alternative B2 provides the best level of environmental protection with a high degree of certainty for technical and administrative success, it is the selected alternative for remediating the sediments of Lake Capri.

SECTION 8: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation 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:

- A Citizen Participation Plan was developed and a repository for site-related documents was established.
- A public contact list was established which included nearby property owners, local political officials, local media and other interested parties.
- Public informational meetings were held in September 1992, June 1993, December 1993, and June 1994 to discuss this project and answer questions posed by the public.
- A questionnaire was distributed to residents living along Willetts Creek and Lake Capri in January 1994.
- A public meeting was held on February 6, 1995 regarding the State's proposed remedy for Operable Unit 1 (on-site source remedy).
- In October 1996, an availability session'was held with residents of the lake and elected officials to discuss the alternatives under consideration at that time, and to evaluate the feasibility of constructing on-site containment cells in the lake.
- In August 1997 a fact sheet was mailed to the public contact list and a public meeting was held to present the Proposed Remedial Action Plan for Operable Unit #2. A 30-day public comment period was established for the receipt of written comments.
- In September 1997 a Responsiveness Summary was prepared to address the comments and questions received during the public comment period for the PRAP. This was sent to the meeting attendees and placed in the document repositories.

Table 1
Nature and Extent of Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of SCG EXCEEDANCE	SCG (ppb)
Groundwater	Volatile Organic Compounds (VOCs)	1,1,1-Trichloroethane	N D - 5	I of 15	5.0
		1,1-Dichloroethane	N D - 5	1 of 15	5.0
	Semivolatile Organics (SVOCs)	1,4 -Dichlorobenzene	N D - 6	1 of 15	4.7
		1,2-Dichlorobenzene	ND - 24	1 of 15	4.7
	Metals	Cadmium	ND - 1,430	18 of 48	5
		Chromium	ND -258	1 of 43	50
		Cyanide	ND - 2,490	7 of 48	100
		Iron	ND - 54,000	33 of 38	300
		Manganese	33 - 5,420	25 of 38	300
		Sodium	3,220 - 92,300	8 of 38	20,000
Residential Surface-Soils	Metals	Cadmium	ND - 1.7	0 of 15	10 ppm
		Chromium	5.2 - 20.2	0 of 15	50
Sediments	Metals	Cadmium	ND - 347	23 of39	0.6 - 9.0 ppm
		Lead	ND - 610	6 of 18	110
Surface Water	Metals	Cadmium	ND-37.7	9 of 22	0.7
		Cyanide	N D - 15	5 of 11	5.2
Biota	Metals	Cadmium	ND - 1.9	N/A	None

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost	Annual O&M	Total Present Worth
Groundwater Alternatives			
A1 - No Action	$0	$0	$0
A2 - Monitoring and Institutional Controls	$ 0	$ 21,950	$337,500
A3 - Pump & Treat for Groundwater Remediation	$3,793,000	$201,700	$ 12,763,000
A4 - Pump & Treat for Groundwater Containment	$ 1,428,000	$ 58,350	$4,528,500
Sediment Alternatives			
B1 - No Action	$0	$0	$0
B2 - Dredging with Off-Site Disposal	$ 5,153,200	$1,500	$5,176,255
B3 - Partial Dredging with Off-Site Disposal	$1,896,700	$1,500	$1,919,755
B4 - Fill in Lake Capri	$2,693,600	$1,500	$2,716,655
B5 - Dredging with Shoreline Containment Cell	$2,316,600	$1,500	$2,355,025
B6 - Dredging with Island Containment Cell	$ 1,418,476	$1,500	$1,456,901
B7 - Dredging with Combined Off-Site Disposal and Underwater Containment	$3,859,567	$1,500	$3,882,622

APPENDIX A:
RESPONSIVENESS SUMMARY

No written comments were received during the public comment period. The following are the questions and comments that were verbally raised during the August 6, 1997 public meeting. Most of these were answered during the meeting.

The following questions relate to the proposed remedy:

Question/Comment: How much of Willetts Creek will be dredged?

Response: The selected remedy will dredge sediments from Willetts Creek where the cadmium concentration exceeds the Severe Effect Level of 9.0 ppm. This corresponds to a current estimate of 100 cubic yards of sediments. However, because contaminated sediments may have moved since the last samples were taken in 1995, samples will be taken during the design phase to determine the exact volume of sediments to be removed from Willetts Creek.

Question/Comment: What is the time frame for dredging the lake and stream?

Response: The DEC expects that design of the remedy will require one year, and construction of the remedy will require six months. Of the six month construction duration, an estimated three months would be for the dredging process, and the remainder would be for mobilization and demobilization activities.

Question/Comment: Why was phytoextraction not considered as one of the final alternatives?

Response: Phytoextraction, the use of plants to extract contaminants from soil and sediments, was rejected because of its unknown effectiveness. The DEC researched this technology during the Supplemental Feasibility Study, but could not find any documented evidence that it could completely remove cadmium from sediments in a reasonable amount of time. Also, to implement this technology would have meant completely vegetating the lake with reed grass (*phragmites*) for several growing seasons, which the DEC anticipated would not be acceptable to the community.

Question/Comment: Are funds currently allocated to perform the dredging? What is the procedure and time frame for ensuring such funds are available?

Response: Funds are not currently allocated for the construction phase of the project. The DEC's standard procedure is to encumber funds for construction when the design of the remedy is complete and a detailed engineer's estimate is available before the project is bid. The DEC expects this to occur in early fall of 1998.

Question/Comment: Why did the DEC change the recommended alternative to full dredging and off-site disposal since previous public meetings?

Response: At prior meetings, the DEC presented the two containment cell alternatives to the community to evaluate the administrative feasibility of obtaining easements to construct them. In addition to the community's resistance to the on-site containment of contaminated sediments, off-site disposal is consistent with remedies proposed and selected elsewhere in the state. The DEC also determined that off-site disposal provided the highest degree of environmental protection and permanence, and required the least amount of long term monitoring and maintenance to be effective. On balance, these factors outweighed the higher cost.

Question/Comment: How long after the public meeting will a final decision be made?

Response: Provided that no strong opposition is received during the comment period, a Record of Decision should be finalized by the end of September, 1997.

Question/Comment: Explain the difference between the Severe Effects Level (SEL) and the Lowest Effects Level (LEL) as sediment guidance values.

Response: Guidance values for cadmium in sediments are established at two thresholds: the Lowest Effect Level (LEL) of 0.6 ppm and a Severe Effect Level (SEL) of 9.0 ppm. The LEL indicates a level that can be tolerated by the majority of sediment-dwelling organisms, but which still causes toxicity to a few species. This affects the population distribution of sediment species, with corresponding effects up the food chain. The SEL indicates the concentration at which a pronounced disturbance of the sediment-dwelling community can be expected as a result of toxicity to most benthic organisms.

Question/Comment: For how long will the fish advisory be necessary?

Response: After the lake is dredged and re-stocked, the DEC and DOH expect that the fish advisory could be discontinued. Periodic sampling of fish and sediments will confirm whether this is appropriate.

Question/Comment: The DEC should do more to prevent children from accessing Lake Capri and fishing there. The lakeshore should be posted to ensure that people are aware of the fishing advisory.

Response: The State Department of Environmental Conservation (DEC) and Department of Health (DOH) will evaluate what additional measures can be taken to ensure that people are aware of the fishing advisory. Such measures may include posting a notice of the fish advisory on posts inside the fence along the Montauk Highway, where most of the trespass occurs. With a chain link fence in place along the highway, there are few additional measures that the DEC or DOH could take to physically restrict access to the lake. Maintenance of the fence is the responsibility of the Town of

Islip, which has provided timely repairs of recent breaks in the fence. The DEC and DOH will continue to ensure that the Town is notified immediately of future damage if it should occur.

The following comments relate to dredging Lake Capri:

Question/Comment: Will dredging activities affect lower Willetts Creek? Could suspended contaminants pass over the spillway and enter the tidal portion?

Response: During dredging activities, the DEC will minimize the transport of both suspended and dissolved contaminants from the work area. Silt curtains will be used in both the immediate area of dredging, and also at the lake outlet into lower Willetts Creek. Past dredging experience in slow flowing rivers and lakes indicates that silt curtains are very effective in controlling contaminant migration. During construction, the DEC will establish action levels for suspended solids (turbidity) and dissolved cadmium levels in both the work zone and at the lake outlet. Any exceedance of these action levels will cause work to be suspended and modified as necessary to achieve compliance.

Question/Comment: 'What is the expected effectiveness of dredging in terms of the percentage of cadmium removed from the lake bottom? How will debris in the lake be handled during dredging?

Response: It is difficult to predict the overall effectiveness of dredging in terms of the percentage of contaminants removed. The performance of hydraulic dredge equipment is affected by the composition of the sediment, particularly the presence of cobbles, boulders and debris. Based on the limited sampling conducted to date, it appears that the sediment does not contain a significant amount of this large material, and the DEC believes that the dredge performance will be excellent.

Subsurface debris such as logs, stumps, tires, concrete blocks, etc. will be identified and located by a surface reconnaissance and, if necessary, a diver survey. These will be removed mechanically as one of the first stages of construction.

Question/Comment: Will the widening of the Montauk Highway pose a problem with implementing the proposed remedy?

Response: During the public meeting, Senator Johnson's representative stated that the widening of the Montauk Highway will be done within the existing curb-to-curb right-of-way. As a result, this should not affect implementation of the remedy.

Question/Comment: When will the lake sediments be sampled to confirm the effectiveness of dredging? Will the lake be re-dredged if these samples indicate continued contamination?

Response: The DEC expects that Lake Capri will be dredged in distinct working areas of perhaps 1 acre each. These working areas would be enclosed by silt curtains to minimize the transport of suspended sediments to other areas of the lake. After dredging is complete in each working area,

lake sediments would be immediately sampled (confirmation sampling) so that additional dredging could be done before work moves on into the next dredging area.

In addition to construction-phase confirmation sampling, sediments would be sampled periodically (long-term monitoring) to ensure that they remain clean. The first such sampling would occur within one year of completion of construction, along with sampling of surface water, groundwater and fish, as part of the monitoring program for the remedy as a whole. The frequency of this long-term monitoring may be adjusted based on the initial results.

If long-term monitoring finds that sediments become recontaminated, the DEC will first determine the source of contamination and then potentially re-evaluate the site remedy. Re-dredging the lake, along with additional source controls are potential options for addressing this situation.

Question/Comment: What type of easements will be necessary to perform the project? Are easements necessary from all affected property owners on Lake Capri? What happens if some homeowners refuse to grant access to the lake for dredging?

Response: The DEC will require temporary construction-phase easements to all the sediments and shoreline of Lake Capri and to the area of Willetts Creek that will be dredged. If design-phase sampling indicates that sediments on certain properties do not exceed the action level, then easements to those properties will not be required. The easements will require the DEC's contractors to restore any land or bulkheads that are damaged during construction. If some homeowners refuse to grant access to the lake sediments, the DEC will first determine the cause of their concerns and negotiate the terms of the easement to address such concerns. If easements still cannot be obtained, the DEC will consider several options, including not dredging that portion of the lake (depending on its location and contaminant levels), and using the authority under the Environmental Conservation Law Article 27 to obtain site access.

Question/Comment: How will the dredge and barge be brought to the lake?

Response: The dredge and barge will likely be brought to the lake on a flat-bed trailer. Access to a location along the lake will be necessary to off-load this equipment into the lake. During the negotiation of temporary easements, the DEC will discuss the possibility of obtaining this type of access with property owners along the lake.

Question/Comment: Is the DEC currently negotiating with the school district for access to any property for the temporary treatment system?

Response: No, the DEC is not currently negotiating with the West Islip School District. The school district had granted permission for use of part of the high school parking lot for a pilot dredging project that was never implemented. As a result, the high school property is regarded as a potential location for the treatment facility. The DEC will begin discussions with the West Islip School District when design of the remedy begins in early 1998.

Question/Comment: The lake is a valuable habitat for migrating waterfowl because it doesn't ice over in the winter. Dredging should not be performed during the winter because it would displace ducks and geese.

Response: The **DEC** agrees that the lake is valuable waterfowl habitat. Dredging will be scheduled for the summer months for many reasons, including the impacts to migrating waterfowl.

Question/Comment: What will be the odor and noise impacts during construction?

Response: Generally, dredged sediments can cause odors when sulfur-bearing compounds, especially hydrogen sulfide, are released into the air when the sediments are pumped to the surface. The odor potential depends on the total amount of sulfide in the sediments, and on the general chemistry of the sediments (pH, organic content, oxidation/reduction potential). These factors are presently unknown, but they will be determined during the sampling to be conducted during design of the remedy. The hydraulic dredge system is essentially enclosed until the sediments reach the treatment plant, so the potential for odors is greater at the treatment location than at the dredging location. If necessary, the sediment chemistry can be adjusted at the treatment facility, for example by adding lime, to remove the hydrogen sulfide and minimize odors.

Typically, the hydraulic dredge would operate 8-10 hours per day and create the noise equivalent of a small powerboat at low speed. Operations at the treatment facility would operate 24 hours per day, and would have a greater potential for noise. Noise mitigation will be addressed during design, including the feasibility of enclosing noise-generating equipment.

Question/Comment: Will reverse osmosis be used for removing cadmium from water pressed from the sediments?

Response: Probably not. The October 1995 RI/FS Report Addendum included a bench-scale treatability study that indicated that pH adjustment and sand filtration could effectively treat the sediment filtrate to meet effluent discharge standards. However, additional testing will be performed during design to confirm these results. Because reverse osmosis is a more expensive process, it would only be used if filtration was found to be ineffective.

The following comments relate to potential human health impacts from the site:

Question/Comment: There is a high rate of breast cancer in this area of Long Island. Cancer rates in West Islip have been mapped and they are very high. Could cadmium contamination from this site be the cause?

Response: By law, all cases of cancer are reported to the New York State Department of Health. A cancer incidence study was completed in July 1996 for several census tracts in the area surrounding the Dzus Fastener Company site in the Town of Islip, Suffolk County. This study

compared the observed number of cancers to what would be expected overall and broken down by cancer type. A statistically significant deficit was found among females for breast cancer (86 cases observed; 108 cases expected).

Age-adjusted breast cancer incidence rates for community groups were calculated in the *Small **Area Analysis of Breast Cancer Incidence Rates,** 1978-1987.* The rate for West Islip during this time period was 85.77, compared to the range from 60.77 to 134.64 per 100,000 for other areas of Suffolk County.

An extensive literature search found only one recent study that specifically examined cadmium exposure and breast cancer. The results neither prove nor disprove the role of cadmium in breast cancer initiation, promotion, or progression.

Question/Comment: A correlation has been found between cadmium exposure and prostate cancer, as reported by Dr. Jules Elias at SUNY Stony Brook. **A** recent study linked cadmium exposure to breast cancer. A study reported on the World Wide Web indicated that cadmium is assimilated though the skin. Additional studies are necessary to determine the cancer potential and exposure routes for cadmium.

Response: Cadmium and cadmium compounds have been classified as carcinogenic to humans by the International Agency for Research on Cancer (IARC). Evidence for carcinogenicity in humans comes from studies of workers exposed to cadmium mostly through inhalation of dust and fumes. These studies showed consistent associations between cadmium exposure and lung cancer, and less consistent evidence of associations with prostate cancer. There have been no reported studies of cancer incidence among humans who had ingested cadmium in their food or water, which would have been the route of exposure most likely to occur in persons with recreational contact with cadmium discharged into waterways. Studies of laboratory animals given high levels of cadmium compounds in their food or drinking water for their lifetimes provide only limited evidence of associations with cancers, specifically leukemias and cancers of the testes and prostate. None of the specific sites that have been associated with cadmium exposure in humans or animals were elevated in the July 1996 cancer incidence study.

The NYSDOH found little data on the dermal absorption of cadmium, and so reliance was placed on the Toxicological Profile for Cadmium prepared by the Agency for Toxic Substances and Disease Registry (ATSDR, 1993) for the following information. Cadmium is absorbed through the skin of animals, but it is likely that the rate of absorption into the body is slow and only a small percentage of the dose applied to the skin is absorbed. For example, one study showed that the total amount of cadmium found in the liver and kidney of mice and rabbits was only 0.2% and 0.8%, respectively, of the dose applied to the **skin** over the course of 1-5 weeks. Because most of absorbed cadmium accumulates in these 2 organs, these results suggest that dermal absorption is low. They also suggest that dermal absorption may be a concern only in situations where the potential for dermal exposure is considerably greater than from inhalation or oral exposures. Thus, skin contact is probably not a significant route of absorption for most people.

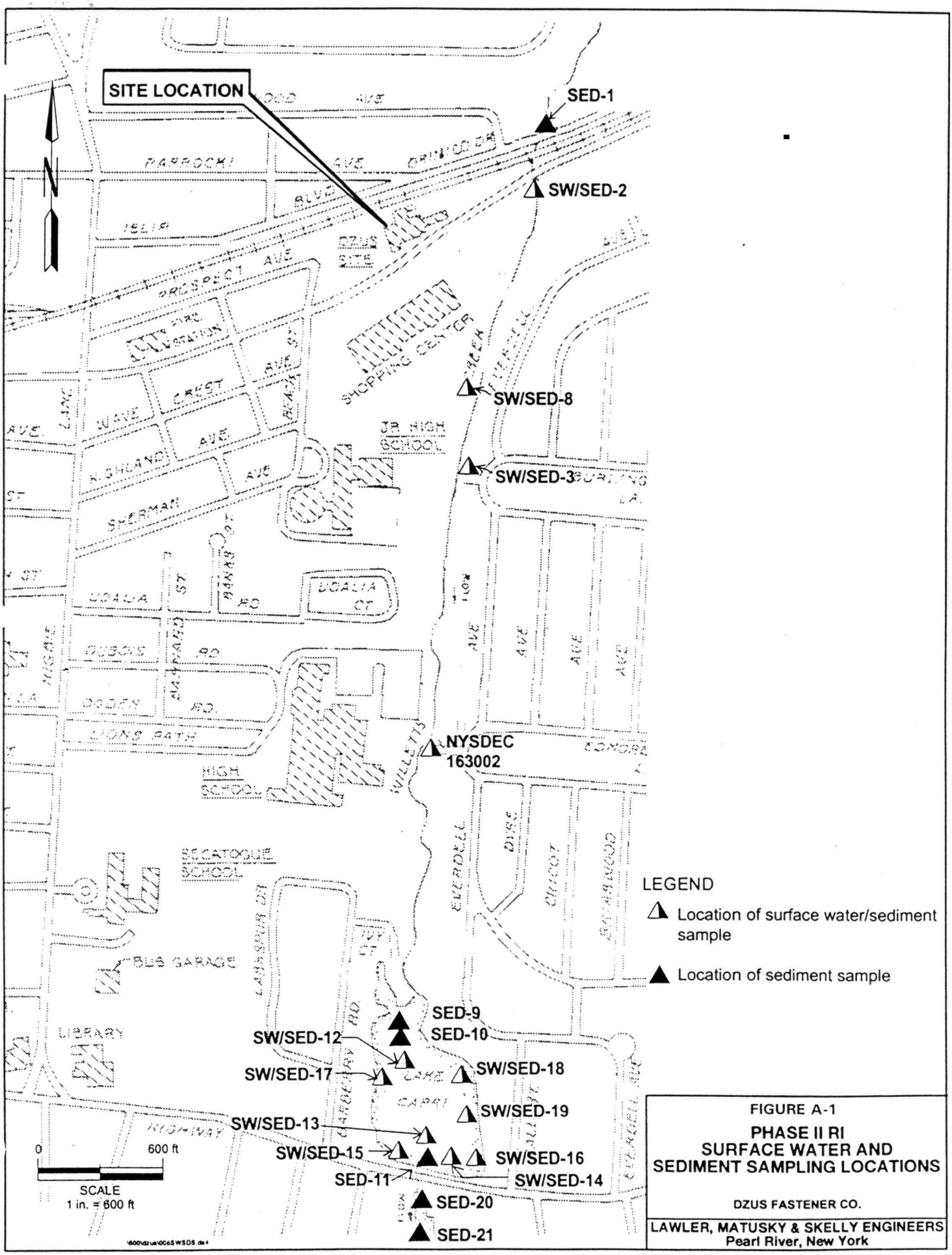
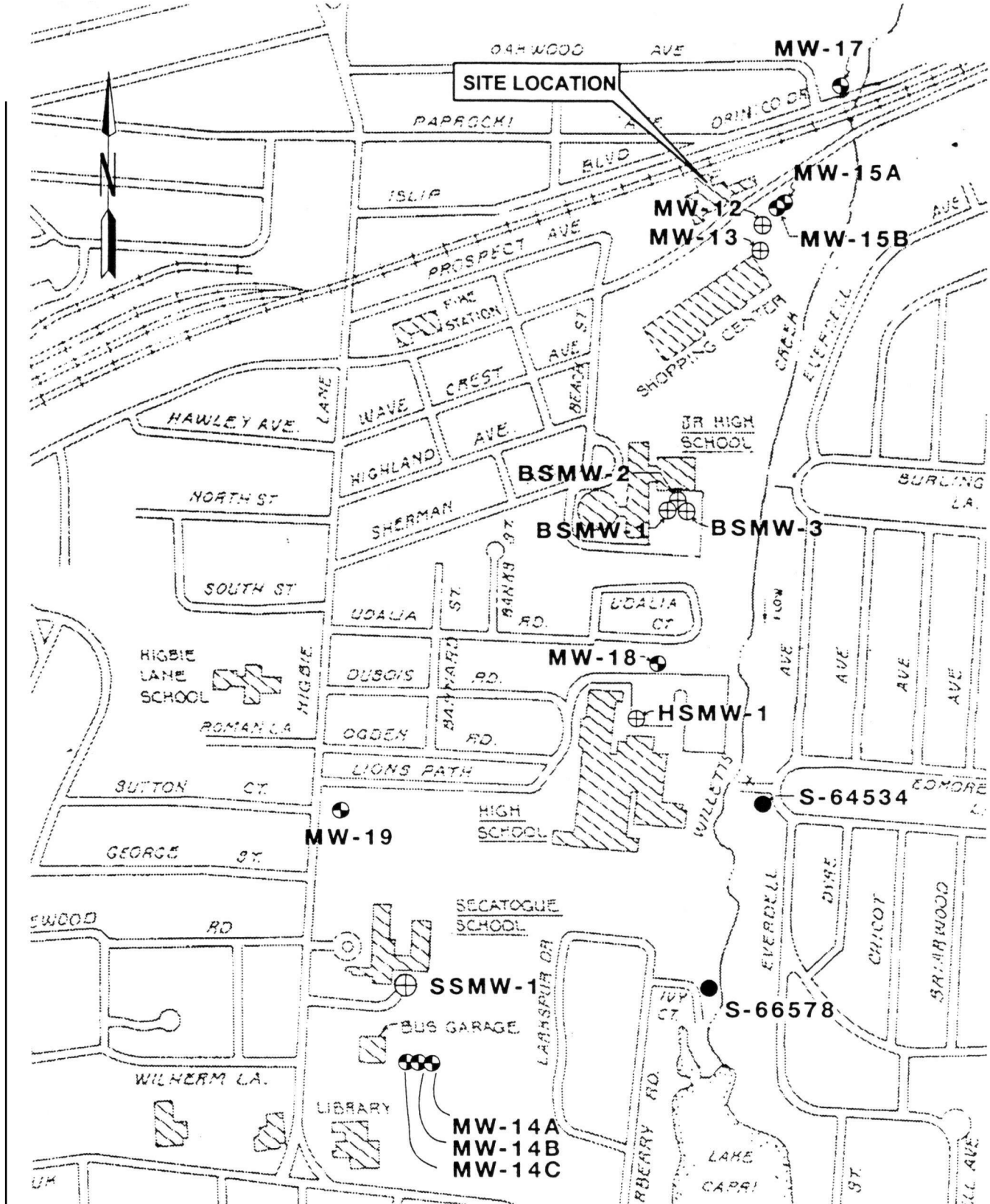


FIGURE A-1

PHASE II RI
SURFACE WATER AND
SEDIMENT SAMPLING LOCATIONS

DZUS FASTENER CO.

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York



LEGEND

- Location of Phase I RI groundwater monitoring well
- Location of existing groundwater monitoring well
- Location of existing Suffolk County well

0 600 ft

SCALE

1 in. = 600 ft

002OFF SW ds4

FIGURE A-2

OFF-SITE PHASE I RI MONITORING WELL LOCATIONS

DZUS FASTENER CO.

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

Two sediment samples were taken from lower Willetts Creek in March 1994 and analyzed for cadmium and chromium. At SED-20, located 20 feet south of the Montauk Highway, cadmium and chromium concentrations were 4.2 ppm and 5.9 ppm, respectively. At SED-21, located 250 feet south of the Montauk Highway, cadmium and chromium concentrations were 2.5 ppm and 6.4 ppm, respectively. As explained above, the Lowest Effect Level (LEL) for cadmium is 0.6 ppm and the Severe Effects Level (SEL) is 9.0. For chromium the LEL is 26 ppm and the SEL is 110 ppm.

No surface water or groundwater samples were taken south of the Montauk Highway during this study. Groundwater samples taken from the southernmost monitoring wells, MW-14, located south of the Secatogue School property behind the school bus garage, and MW-18, located near the northeast comer of the West Islip High School, did not contain any contamination above drinking water standards. From a total of 12 samples taken at these two locations, only one contained a detectable level of cadmium, and two contained detectable levels of chromium, all below their water quality standards. Because there is little or no contamination at these locations, the DEC believes there is no reason to expect contamination south of the Montauk Highway.

Question/Comment: In the tidal portion of Willetts Creek is a 600' by 100' sandbar that is exposed at low tide. This material is deposited as Willetts Creek slows down and widens into the Great South Bay. Contaminated material may have been deposited there and it should be sampled.

Response: The DEC agrees that this deposit should be sampled for possible contamination. This will be done during the design phase, along with the sampling of Lake Capri.

Question/Comment: There are 3 east-west canals in the tidal portion of Willetts Creek where contaminated material may also have accumulated. The recent lack of barnacles on bulkheads and docks may indicate contamination, and these should be sampled.

Response: The DEC agrees that these deposits should be sampled for possible contamination. This will be done during the design phase, along with the sampling of Lake Capri.

Question/Comment: What sampling was performed north of the LIRR tracks and what were the results? A real estate purchase in this area was reportedly canceled due to environmental concerns.

Response: Sediment samples were taken from a single location (SED-1) north of the LIRR tracks in October 1992 and September 1993. During both sampling events, the creek was dry, and so a surface water sample could not be obtained. The sediment results and corresponding guidelines for the contaminants of concern are summarized below:

	SED-1 (10/92)	SED-1 (9/93)	LEL	SEL
Cadmium	6.9 ppm	ND	0.6	9
Chromium	35.3	12.1	26	110
Lead	821	149	31	110

The high levels of lead in these samples may be due to past fuel-related emissions along the railroad tracks and Union Blvd. The DEC does not believe these are related to the Dzus site. Groundwater samples north of the LIRR tracks are discussed below.

Question/Comment: A resident has observed personnel sampling from a stickup pipe located on Town property on Orinico Drive. What was sampled and what were the results?

Response: Monitoring well MW-17 is located along Orinico Drive between Oakwood Avenue and Willetts Creek. This well was installed upgradient of the Dzus site to evaluate background groundwater conditions. This well was sampled in November 1992 and September 1993 and the results are summarized below. The DEC is unaware of any sampling activities at this location after 1993.

Contaminant in MW-17	November 1992	September 1993	Groundwater Standard
Cadmium	5.4 ppb	ND	10 ppb
Chromium	15.9	ND	50
Lead	20.2	8.5 ppb	25
Cyanide	ND	ND	100
Volatile Organics	ND	Not Analyzed	5 (most VOCs)
Semivolatile Organics	ND	Not Analyzed	Varies by chemical

Question/Comment: What were the results of surface water and sediment samples taken north or the railroad tracks (Sed/SW-1 and Sed/SW-2)?

Response: See the response above for results of SED-1 sampling. Sample station SW-2 is located south of the railroad tracks and Union Boulevard, contrary to the location given by the DEC during the public meeting. As shown below and in Figure 2 of the ROD, cadmium was not detected in the

sediment sample taken from this location.

	SED-2 (10/92)	SED-2 (9/93)	LEL	SEL	SW-2 (10/92)	SW-2 (9/93)
Cadmium	ND	ND	0.6	9	ND	ND
Chromium	ND	9.4	26	110	ND	31.6
Lead	12.9	**39.6**	31	110	6.6	161

Question/Comment: Could flooding cause contaminants to migrate northward? The DEC should sample north of the railroad tracks to determine whether this is a concern.

Response: It is unlikely that flooding could cause sediment contaminants to migrate northward. To move sediments, the force of water must be sufficient to scour them from their present location and then transport them upstream. The likelihood of such a high energy event in the Willetts Creek environment is remote. The SED-1 sample results presented above indicate that northward migration of cadmium has not occurred.

Question/Comment: Did the DEC sample Pine Lake? There is an algae bloom on the lake and no ducks are present.

Response: The DEC did not sample Pine Lake as part of this study. Algae blooms are typically caused by a lack of oxygen, which favors the growth of algae over competing plant species. This effect is generally caused by a lack of fresh, oxygenated water entering a pond or lake, and not to chemical contamination.

Question/Comment: Prior to 1985 residences on Barnhard Street and Sherman Lane had private wells. What exposure may have occurred before public water was provided?

Response: Based on the sampling results from monitoring wells in the area:

- BSMW-I, located in the parking lot behind the Junior High School;
- MW-18, located near the northeast comer of the West Islip High School; and
- MW-19, located near the intersection of Lions Path and Higbie Lane,

it appears that no exposure to site-related contaminants would have occurred in private wells in the area. At the above locations, cadmium, chromium and cyanide were not detected in any samples. The plume of contaminants lies further to the east, between the Junior High School and Willetts Creek.

Question/Comment: Were any of the solvents used in the plating operation found in groundwater

samples? Where and in what concentrations were they found?

Response: In the off-site monitoring wells, volatile organic contaminants were found in only one well, MW-14B, at very low concentrations. At this location, behind the school district bus garage, the following contaminants were found:

- 1,1-Dichloroethane 5 ppb
- 1,1,1-Trichloroethane 3 ppb
- Trichloroethylene 3 ppb

The water quality standard for all three contaminants is 5 ppb, so the standard was not exceeded. Because this location is 3500 feet away from the site, is not directly downgradient, and because no monitoring wells between the site and MW-14 contained these contaminants, the DEC believes that these detections are not related to the Dzus site.

Question/Comment: When were the most recent soil, sediment and groundwater samples taken?

Response: Groundwater samples were taken from four off-site monitoring wells in August 1995. Prior to that, samples were taken from more wells in September 1993. Sediment and surface water samples were taken from Willetts Creek and Lake Capri in August 1995. Soil samples were taken from residential properties in April 1994.

The following questions relate to water flows into the lake:

Question/Comment: Is the lake recharging groundwater and introducing contaminants to the subsurface? A resident received a letter from the DEC stating that Lake Capri is a "Watershed Lake". What does this mean?

Response: Water level measurements and regional geologic studies indicate that Lake Capri is a spring fed lake, so groundwater is discharging into the lake, not the reverse. It is difficult to explain the reference to a "Watershed Lake" without examining the letter in question. Willetts Creek and Lake Capri are part of the Long Island Sound/Atlantic Ocean drainage basin, or watershed. Funding for clean water projects under the Environmental Quality Bond Act of 1996 is allocated by watershed, which may explain the letter's reference. However, this project will be funded by the 1986 EQBA, which does not assign funds on a watershed basis.

Question/Comment: Is surface water delivering contaminants into Lake Capri?

Response: The presence of cadmium in the surface water of upper Willetts Creek indicates that it is a source for contaminants to enter Lake Capri. However, of the ten surface water samples taken from Lake Capri only one had a detectable level of cadmium. Also, samples taken from Willetts Creek just north of the lake contained lower contaminant concentrations than those taken from the

upper reaches. This indicates that the loading of contaminants from Willetts Creek into Lake Capri is small, and the impact is diluted by the flow of clean groundwater into lower Willetts Creek and Lake Capri.

Question/Comment: Is the proper flow of water into the lake necessary for the lake's recovery? The volume of water pumped by the West Islip School District is insufficient to maintain proper flow in Willetts Creek and Lake Capri. The school's discharge pipe should be enlarged to ensure sufficient flow.

Response: Yes, the proper supply of water into the lake, via both groundwater and surface flow is important for the environmental health of the lake. Primarily, these flows provide oxygen, which is necessary for the survival of fish species and to prevent algae blooms. The DEC will investigate the impact of the school's pumping system and determine the feasibility of correcting any problems associated with it.

Miscellaneous Questions:

Question/Comment: Cadmium fungicides may have been used in the past on residential properties. Could this be the cause of present contamination?

Response: Without information as to where and when cadmium fungicides were used in the area, it is difficult to determine their present impact. The documented presence of high levels of cadmium at the Dzus site and well-established migration pathways through groundwater, surface water and into Lake Capri indicate that the site is the cause of this contamination.