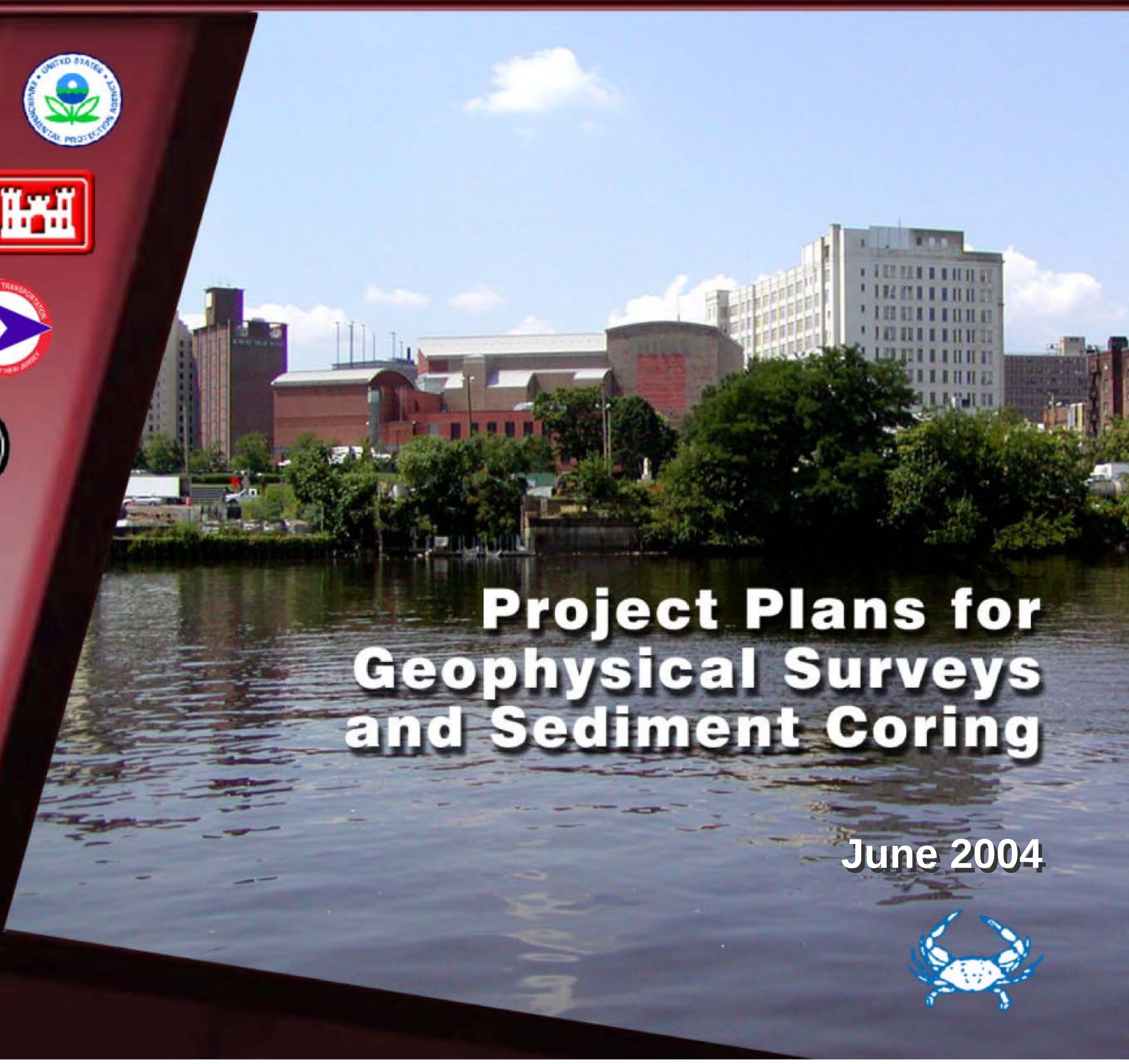
Lower Passaic River Restoration Project



Project Plans for Geophysical Surveys and Sediment Coring

June 2004

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FOR:

New Jersey Department of Transportation
Office of Maritime Resources

Contract No.
2001-NJMR02

GEOPHYSICAL SURVEYS AND SEDIMENT CORING WORK PLAN

ENVIRONMENTAL DREDGING AND SEDIMENT DECONTAMINATION TECHNOLOGY DEMONSTRATION PILOT STUDY
LOWER PASSAIC RIVER RESTORATION PROJECT

GEOPHYSICAL SURVEYS AND SEDIMENT CORING WORK PLAN
Environmental Dredging and Sediment Decontamination Technology Demonstration
Pilot Study
Lower Passaic River Restoration Project

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1.0 INTRODUCTION

1.1 INTRODUCTION AND PURPOSE

These Project Plans for Geophysical Surveys and Sediment Coring for the Lower Passaic River Restoration Project have been prepared by TAMS Consultants, Inc., *an Earth Tech Company* (TAMS/ET), Malcolm Pirnie, Inc. (MPI), and Aqua Survey, Inc. (ASI) for the New Jersey Department of Transportation – Office of Maritime Resources (NJDOT-OMR) as authorized under NJDOT Agreement No. 2001-NJMR02 Task Order #OMR-03-6. The purpose of this task, which is described in this work plan, is to conduct a Hydrographic Survey, Side Scan Sonar Survey, and Sediment Coring in order to perform a detailed characterization of the Pilot Study Area for the Environmental Dredging Demonstration and Sediment Decontamination Technology Demonstration – Treatability Study. This work is part of the Lower Passaic River Investigation and Feasibility Study, a joint effort of Federal and State Agencies to remediate and restore the Lower Passaic River Basin. The purpose of the overall Feasibility Study is to develop a comprehensive watershed-based plan for the remediation and restoration of the Lower Passaic River. During this pilot-scale demonstration project, approximately 5,000 cubic yards of contaminated sediment will be dredged from the Harrison Reach of the Passaic River. It is anticipated that this dredging will be performed in July 2005. During the spring and summer of 2004, the Institute of Marine and Coastal Sciences at Rutgers University and the Water Resources Division of the United States Geological Survey will collect data to support the hydrodynamic modeling for the Passaic River. After this data is evaluated, separate Project Plans that describe the sampling, monitoring, and other activities to be conducted during the dredging pilot study will be prepared by TAMS/ET and MPI. A Dredging Technology Review Report has been prepared by TAMS/ET and MPI (June 2004). Technical specifications for the dredging contractor will also be prepared by TAMS/ET and MPI.

The objective of the dredging demonstration project is to show that Passaic River sediments can be successfully dredged. Evaluating the success of dredging requires the collection of data to determine the resuspension production rate, the resuspension release rate, and the resuspension export rate and to perform a mass balance. In addition, equipment performance, dredging production rates, turbidity levels, and engineering controls will be evaluated. The objective of the sediment decontamination technology demonstration project is to show that Passaic River sediments, contaminated with dioxins, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals, pesticides, herbicides, and other contaminants can be successfully treated to meet applicable federal, State, and American Society for Testing and Materials (ASTM) standards for the appropriate beneficial use end product (e.g., cement, light weight aggregate, manufactured soil, glass, etc.). The decontamination project will collect data to perform a contaminant mass balance and determine the economic viability of the treatment process for commercial scale applications. The decontamination technology vendors will prepare separate work plans that describe these efforts.

The objective of the hydrographic survey described herein is to develop a bathymetric map of the Passaic River bed along a 1,000-foot stretch at the river centerline in the Harrison Reach between the Jackson Street Bridge and the New Jersey Turnpike Bridge (hereinafter referred to as the Pilot Study Survey Area). The objective of the side scan sonar survey is to characterize the texture of the sediments and to identify any debris in the Pilot Study Survey Area. The work area for these surveys encompasses the entire river bottom to the mean low water mark (MLW) along each shoreline. Based on the results from the hydrographic and side scan sonar surveys, TAMS/ET and MPI will select a one and one-half acres work area (hereinafter referred to as the potential Dredging Area) for the collection of sediment cores in conjunction with NJDOT-OMR, USEPA, and USACE. The goal of the sediment coring effort is to perform a representative chemical and geotechnical characterization of the sediments in the upper four feet of the Passaic River bed in the potential Dredging Area. This information will then be utilized to support the objectives of the combined dredging and sediment decontamination demonstration project.

The project plans for the geophysical surveys and sediment coring in this report explain the details of how the work will be performed and evaluated and include a Work Plan, a Quality Assurance Project Plan (QAPP), and a health and safety plan. These Project Plans are the second of several reports that will be prepared by TAMS/ET and MPI as part of this demonstration project.

In furtherance of the objectives of the Feasibility Study, this report provides a summary of conditions within the Passaic River that may affect implementation of the dredging pilot program. A brief history of the River's industrial past that has led to a highly contaminated estuarine ecosystem is also included.

A Feasibility Cost Sharing Agreement (FCSA) for the Feasibility Study was executed between the U.S. Army Corps of Engineers (USACE) and NJDOT-OMR. Funding for the tasks described in this Work Plan is being provided by NJDOT-OMR. These in-kind services represent NJDOT-OMR's contribution to the FCSA.

1.2 STUDY AREA

The Passaic River drains a 935 square mile watershed located in northern New Jersey and southern New York states (see Figure 1-1). The Lower Passaic River is considered to be the 17-mile tidally influenced portion of the river from the mouth of the confluence at Newark Bay up to the Dundee Dam. Due to historical contaminant releases, the Lower Passaic River sediments are contaminated with dioxins, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals, pesticides and other contaminants. The Harrison Reach of the river was selected as the location for the dredging pilot. The selection of this location was based on consideration of the following factors:

- In-river location: The preferred river configuration for the dredging demonstration is a reach without bends. Conducting dredging operations in a uniform reach will reduce the complexity of estimating and evaluating water quality impacts because of reduced lateral mixing.

- Contaminated sediment: The target dredging area must provide sufficient material to allow a reasonable assessment of both the selected dredging technology and the available decontamination systems. Targeted sediments should have moderately elevated contamination levels to evaluate decontamination technologies, though not levels that would create major handling problems or increase risk from sediment releases. Also, the targeted sediments should have geotechnical properties typical of those throughout the river.

- Access: Sufficient air and water draft must be available to enable access to the work area by the selected dredging equipment and the associated tugboats and barges/scows. In particular, it is expected that ten feet of water under low water conditions will be required for scows and towboats to gain access to the work area.

- River currents: High river velocities can impact dredging operations by making equipment anchoring and maneuvering difficult. Average velocities in the Study Area do not appear to pose a major problem for the pilot program.

In addition to generally conforming to the above requirements, the Harrison Reach has relatively light river traffic, thereby enabling any dredging work to proceed largely unimpeded. It is anticipated that the pilot scale dredging and decontamination program would result in removal and treatment of approximately 5,000 cubic yards of contaminated river sediments from the Harrison Reach. In a separate evaluation, mechanical dredging was selected as the most suitable technology for the pilot program (TAMS/ET and MPI, December 2003).

1.3 WORK PLAN ORGANIZATION

This Work Plan is organized as follows: Section 1 presents an Introduction; Section 2 presents the Site Conditions including a site history, site description and physical characteristics; Section 3 contains the Work Plan Rationale including the overall project objectives, and the general approach to the Work Plan; Section 4 contains the proposed Detailed Scope of Work; and Section 5 presents the Project Schedule. The following documents are attached to this Work Plan: a Quality Assurance Project Plan (QAPP); and Site-Specific Safety and Health Plans (SSHPs) for TAMS/ET, MPI, and ASI. In addition two appendices are attached which contain work plans provided by ASI.

2.0 SITE CONDITIONS

2.1 BACKGROUND

The Passaic River drains a 935 square mile watershed, located in northern New Jersey and southern New York states. Downstream of Dundee Dam (Garfield, NJ) the Lower Passaic River is a tidal estuary with a connection to New York Harbor via Newark Bay. All or portions of 117 municipalities in eight New Jersey counties, and 15 municipalities in two New York counties are located within the Passaic watershed (see Figure 1-1).

Lower Passaic River sediments are contaminated with a variety of hazardous and toxic substances including dioxin, PCBs, pesticides, total extractable petroleum hydrocarbons (TEPH), PAHs, and metals. As a result of the presence of these contaminants in River sediments, the New Jersey Department of Environmental Protection (NJDEP) has instituted a 'do not eat' advisory/prohibition for both fish and shellfish that inhabit the Passaic.

In 1994, Occidental Chemical Company (OCC) entered into an Administrative Order on Consent with the United States Environmental Protection Agency (USEPA). Chemical Land Holdings (CLH), on behalf of OCC, designed and executed a RI/FS work plan, which addressed the contaminated sediments of the Lower Passaic River in the vicinity of the former OCC facility in Newark, New Jersey. The RI/FS primarily focused on the six-mile reach of river extending upstream from the abandoned ConRail Railroad Bridge; that area has been designated the Passaic River Study Area (PRSA).

The contaminated sediments underlying the Lower Passaic River are of concern to various federal and state regulatory agencies because they can induce a number of negative consequences in the following areas:

- ecological health effects;
- human health effects; and
- economic impacts on navigational dredging and disposal costs.

As water quality, sediment quality and biological data from the RI/FS have become available, the scientific understanding of the Passaic River system has evolved and the potential importance of the inter-relationship of the 11 miles of the Lower Passaic River upstream of the PRSA and Hackensack River-Newark Bay system has become apparent. During the summer of 2001, the USACE NY District completed a reconnaissance survey of the Lower Passaic River as part of their Hudson-Raritan Estuary Restoration Initiative. The USACE, USEPA Region 2 and NJDOT-OMR completed a Lower Passaic River Remediation and Ecosystem Restoration Project Management Plan (PMP) in April 2003. A National Memorandum of Understanding (MOU) was signed in July 2002 between USEPA and USACE. A Memorandum of Agreement between all of the agencies is pending.

NJDOT-OMR, USEPA, and USACE recognizing the importance of the Lower Passaic River as an integral component of the Passaic - Hackensack - Newark Bay complex, have committed to better understand this system. The most significant potential benefit of addressing the environmental concerns facing the Lower Passaic River via a unified watershed approach is that the primary contaminants of concern can be addressed more effectively. Additionally, the joint effort will supplement the existing PRSA RI/FS database. It is expected that the data collected by the New York - New Jersey Harbor Estuary Programs (HEP) Contaminant Assessment Reduction Project (CARP), will also be added to the PRSA RI/FS database.

2.2 SITE CHARACTERISTICS

The Harrison Reach (Site) of the Lower Passaic River is the general study area for the pilot-scale dredging program being planned for 2005. Sediments within the Harrison Reach are among the most severely contaminated and several of the principal sources of contaminants to the river also are/were situated here. This reach has become a particular focal point for the pilot program since it provides an opportunity to handle and process the widest range of contaminated sediments and, therefore, the results obtained from the pilot program can be expected to have the broadest applicability to ultimate remediation of the river system.

The Harrison Reach extends approximately 2 miles from the NJ Turnpike Bridge to the Jackson Street Bridge (Figure 2-1) that connects Harrison with Newark. The Study Area is bordered to the north by the City of Harrison in Hudson County and to the south by the City of Newark in Essex County (see Figure 2-1). The Passaic River is aligned in a nearly true east-west direction in the central portion of the Harrison reach. Upstream and downstream of this central area the River exhibits a series of bends. To simplify evaluation and monitoring of dredging operations, the proposed demonstration project would preferably occur in the portion of the Harrison Reach that is aligned east-west.

According to the RI/FS Work Plan submitted to the USEPA in 1995 (USEPA, 1995), the Harrison reach also contains a total of six direct and three indirect CSO discharges into the Passaic River. Five of the direct CSOs are along the southern bank. The three indirect CSO discharges are located on Franks Creek, a small creek that enters the Reach from the northern bank approximately midway through the Site.

The USACE had historically designated a 300-foot wide navigation channel within the Harrison Reach with a Project Depth of 20 feet MLW. Based on a hydrographic survey conducted by USACE in 1989, water depths in the Reach ranged from 21.1 feet at mean low water (MLW) at the downstream end of the Reach to approximately 19.2 feet (MLW) at the upstream end. However, a more recent USACE channel condition report (2002) noted significant shoaling. According to the Work Plan for the RI/FS submitted to the USEPA in 1995, the only dredging event in the Harrison Reach within the period of interest (1940 to 1995) was performed in 1949 to the Project Depth of 20 feet. Sediment surface cross sections within the Pilot Study Survey Area are shown in Figures 2-2a through 2-2f. The figures are based on the USACE July 2002 bathymetric survey.

2.2.1 Downstream Accessibility

In order to access the Harrison Reach from the Newark Bay, there are a series of low and high bridges beneath which demonstration project equipment must navigate. Table 2-1 lists the possible bridges starting from the Garden State Parkway Bridge, across the Raritan River (near a potential decontamination demonstration site), to the New Jersey Turnpike Bridge within the Harrison reach. The photographs of the Jackson Street Bridge, New Jersey Turnpike (NJTP) Bridge, and the Point-No-Point Conrail Bridge are presented in Figure 2-3. Given that tugboats hauling barges laden with project sediments will generally require 25 feet of air draft, a number of the low bridges will be required to open to enable project equipment to pass. The bridge opening notification periods required by 33CFR Part 117 are also presented in Table 2-1.

2.2.2 Geologic Setting

The Site is situated within the Newark Basin portion of the Piedmont physiographic province. The province is located between the Atlantic Coastal Province and the Appalachian Province. The Newark Basin is underlain by sedimentary rocks (sandstones, shales, limy shales, and conglomerates), igneous rocks (basalt and diabase) and metamorphic rocks (schists and gneiss). These rocks are from the mid-Triassic to early Jurassic periods. Bedrock underlying the Site is the Passaic Formation (Olsen et al. 1984; Nichols 1968), which consists of interbedded redbrown sandstones and shales. Almost the entire Passaic River Basin, including the Site, was subjected to glacial erosion and deposition as a result of the last stage of the Wisconsin glaciation. Considerable quantities of stratified sand, silt, gravel and clay were deposited in a glacial lake covering the area. These glaciofluvial deposits overlie bedrock and underlie the meadowlands section of the Newark Basin.

2.2.3 Hydrology

The Passaic River is considered to have serious water quality problems (USACE 1987). The water quality is rated very poor in both the freshwater regime above the Dundee Dam, and below the dam in the saline tidal reaches which includes the Harrison Reach (USACE 1987). The Lower Passaic River, including the Site, is influenced by tidal flows for approximately 17 miles, extending from Dundee Dam downstream to the confluence with Newark Bay. The mean tidal range (difference in height between mean high water and mean low water) at the New Jersey Turnpike Bridge (approximately 1.5 miles upstream from Newark Bay) is 5.1 feet (NOAA 1972) with a mean tide level (midway between mean low water and mean high water) at elevation 2.5 feet (NOAA 1972). The mean spring tide range (average semi-diurnal range occurring during the full and new moon periods) is 6.1 feet. Saline water conditions exist throughout the Site. The cross-sectional average river velocity due to freshwater flow in the Site is approximately 1 foot per second and the typical maximum tidal velocity is approximately 3 feet per second.

Coastal storms are the dominant source of floods within the lower Passaic. The Flood Insurance Study for the Town of Harrison indicates an annual tide elevation of 5.7 feet National Geodetic Vertical Datum (NGVD). For a two-year recurrence interval, the predicted tide is 6.2 feet NGVD. Additional predicted tide elevations are 6.9 feet for a 5-year recurrence, 7.5 feet for a 10-year recurrence, 8.2 feet for a 20-year recurrence, 9.3 feet for a 50-year recurrence and 10.2 feet for a 100-year recurrence interval (tide elevations are referenced to NGVD). The maximum-recorded tide level on the Passaic River is 8.33 feet, measured at East Newark on September 12, 1960, and is equivalent to a flood with a 20-year recurrence interval. During the record flood of October 1903, the Passaic River crested between 9 and 10 feet in the vicinity of Harrison.

2.2.4 Shoreline Features

Both shorelines of the Study Area are almost completely developed, consisting of commercial and industrial properties. Figure 2-4 shows the northern shoreline just west of the NJTP Bridge. On the northern shoreline is gravel riprap and wooden or stone bulkheads bordering the train yard to the north of the Site. The southern shoreline also contains wooden bulkheads, bordering several chemical facilities (both active and inactive) to the south of the Site. The southern shore also contains an abandoned marina at Blanchard Street between the abandoned Commercial Solvents site and the Benjamin Moore facility. Photographs of the southern shoreline features from the NJTP Bridge to the Diamond Alkali Superfund site are presented in Figure 2-5.

2.2.5 Ecological Resources

According to the RI/FS Work Plan submitted to the USEPA in 1995, the expansion of industry and population surrounding the Site has resulted in a severe reduction in the availability of natural habitats for indigenous and migratory biota (Squires and Barclay 1990). Much of the city of Newark occupies land once dominated by salt marsh, which was filled with more than 21 million tons of material, including industrial and municipal wastes, dredged material, and railroad cinders (Zdepski 1992). The left shore of the Site, just upstream of the New Jersey Turnpike Bridge was once primarily marshlands (ERM 1992). Between 1873 and 1890, this area was extensively filled with 8 to 12 feet of mixed fill material from coal gasification facilities, eliminating the marsh habitat and introducing a wide variety of chemicals to the environment (ERM 1992). By the early 1900s, the majority of salt marshes were filled with solid waste, and pesticide application was routine in an effort to eliminate mosquito-breeding areas (Zdepski 1992; Rod et al. 1989). A decline in bird diversity in the area is attributed to the destruction of marshlands and other natural habitats as a result of encroachment of human development and industrial activities on nesting and breeding grounds (Burger et al. 1993).

Populations of fish and shellfish in the Site and surrounding area have been substantially reduced by over-harvesting, loss of habitat, and pollution (Mytelka et al. 1981; Esser 1982; Franz 1982). A significant commercial fishery has not operated in Newark Bay or the Passaic River, including the Study Area, since the early 1900s (McCormick and Quinn 1975). As early as the Civil War, sales of oysters and shad were affected by reports that the organisms were tainted with coal oil and "off flavors" (Earll 1887; Squires 1981). The Commission of Fisheries of New Jersey reported in 1885 that water-borne pollution was resulting in declining fish populations in the Passaic River (Esser 1982). After the turn of the century, conditions apparently deteriorated rapidly until 1926, when a survey conducted in the area by the US War Department found “fish life destroyed” (Hurley 1992).

Based on the results of monitoring and research undertaken since the mid-1970s, the State of New Jersey has taken a number of steps, in the form of consumption advisories, closures, and sales bans, to limit the exposure of the fish-eating public to toxic contaminants in the Passaic River Study Area. The initial measures prohibited the sale, and advised against the consumption, of several species of fish and eel based on the presence of PCB contamination in the seafood. The discovery of widespread dioxin contamination in the Newark Bay Complex led the State of New Jersey to issue a number of Administrative Orders in 1983 and 1984 that prohibited the sale or consumption of all fish, shellfish, and crustaceans from portions of the Passaic River, including the Passaic River Study Area. These State fish advisories and prohibitions are still in effect. Recent studies of the Lower Passaic River and Site report the presence of some fish and benthos known to be highly tolerant of reduced dissolved oxygen conditions, implying the presence of a stressed aquatic system (Festa and Toth 1976; Santoro et al. 1980; Princeton Aqua Science 1982). Depressed levels of dissolved oxygen have been known to be a chronic problem in Newark Bay and its tributaries since the early 1900s (McCormick et al. 1983). Investigations conducted prior to 1940 by the Interstate Sanitation Commission (ISC) indicated substantially decreased levels of dissolved oxygen (DO) throughout the region during the early part of the century (ISC 1939). A survey of benthic organisms conducted in the Site in 1981 indicated that the benthic macroinvertebrate community was limited to those species capable of surviving extremely poor water quality conditions (Princeton Aqua Science 1982).

Available studies of sediment and water quality indicate that pollution control measures and the reduction or control of other environmental stressors have produced a gradual improvement in the ecosystem over the past two decades. Description of the ecological resources in Passaic River by NOAA (Zich 1978, USFWS 1980, Papson et al. 1981, RPI 1985) indicates that species such as blueback herring, alewives, American shad, striped bass, bay anchovy, mummichog, striped killifish, and white perch spawn within the Passaic River. Alewife, shad and herring typically migrate upriver in the spring to spawn in less saline waters. Spawning in the Passaic occurs above the mouth of the Second River as well as in the Third and Saddle Rivers but not in the Second River. Fish spawning habitat on the Passaic River is limited to below Dundee Dam because of the absence of fish passage facilities. Furthermore, the description indicates that the tidal freshwater sections of the Passaic (from Dundee Dam to the mouth of the Second River) function as the principal nursery areas. Brackish water and marine species use the lower saline portions of the Passaic for adult and nursery habitat. Their distribution depends on the salt wedge. Resident euryhaline species include white perch, mummichog, and striped killifish, which spawn and develop within the estuary and are distributed throughout the system. Blue crabs use the lower brackish portion of the estuary as a nursery and adult habitat. The American eel uses the Passaic River and its tributaries for adult habitat. Recent surveys by TSI in 1999 through 2001 (TSI 2002, Passaic River and Newark Bay Estuary Data Presentation, May 29, 2002; PRSA Data Presentations Sept 26, 2002 CD) during the Ecological Sampling Plan two seasons field effort recorded the collection of twenty-four species of fish and crabs from the PRSA. These included estuarine, freshwater and marine species. Seven taxa of benthic invertebrates were also identified from the same stations. Approximately 30 bird species were also reported during the survey.

2.2.6 Wetlands and Floodplains

Almost all of the wetlands in the Lower Passaic River have been eliminated, with more than 7,500 acres developed since 1940 (USACE 1987).

2.2.7 Archaeological, Historic, and Cultural Resources

Within the Site, there are no known archaeological or historical resources that would impede the dredging pilot program.

2.2.8 Demographics and Land Use

The Lower Passaic has a long history of industrial activity. By the turn of the 20th century, Newark was the largest industrial-based city in the United States, with well established industries such as petroleum refining, shipping, tanneries, creosote wood preservers, metal recyclers, and manufacturing of materials such as rubber, rope, textiles, paints and dyes, pharmaceutical, raw chemicals, leather, and paper products (Meyers 1945; Cunningham 1954; Cunningham 1966a; Brydon 1974; Halle 1984; MacRae's 1986; Galishoff 1988). Land use along the lower Passaic River, extending south of the Dundee Dam and including the Site, is dominated by high-density commercial and industrial/commercial development.

2.2.9 Commercial Use

In 1998, the State petitioned the Coast Guard to allow for longer notice times to open five drawbridges upstream of the Study Area since there had been few requests to open them in previous years. After a comment period, the Coast Guard agreed to the petitions. The USACE water borne commerce survey of 2001 shows 2.2 million short tons moving along the river's lower reach down from over 5 million tons in 1991. It is likely that most of this activity is below the NJ Turnpike Bridge.

2.3 SITE HISTORY

During the past two centuries, the Site has been subject to multiple influences and changes due to natural hydrological, topographical, climatological and ecological conditions. However, of equal significance were changes due to rapidly expanding urban and industrial development in the region. Available information indicates that historical pollutant loadings throughout the 1900s have had a substantial impact on the ecological conditions of the Site, as well as the Newark Bay estuary (McCormick and Quinn 1975; Earll 1887; Mytelka et al. 1981; Esser 1982; Squires 1981; and Hurley 1992). Degradation of water quality in the lower Passaic River, including the Site, first became apparent during the Civil War (Brydon 1974; Cunningham 1966b). In 1873, coal tar residues suspended in the river water were noted (Brydon 1974). The deteriorating water quality of the lower Passaic River during this period forced many residents to dig their own wells; by 1885 however, a survey showed that seventy-five percent of groundwater wells also were polluted (Cunningham 1966b). Between 1884 and 1890, over 1,000 of Newark's more than 1,500 wells had been closed due to contamination (Galishoff 1988). In 1887, an inspector for the Passaic River declared that legal action would be required to mitigate pollution of the river from industrial waste practices (Brydon 1974).

The growing population of Newark during the first half of the twentieth century resulted in the generation of increasing volumes of human wastes, resulting in a characterization of the lower Passaic River as an open sewer (Suszkowski et al. 1990). Efforts to improve water quality and to reduce the spread of disease in the Passaic River led to the construction of a trunk sewer line system in 1924 (Brydon 1974). However, despite the development of sewage treatment plants, many industrial facilities located along the Passaic River were not connected to the Passaic Valley Sewerage Commission trunk line until the late 1950s (Brydon 1974).

During the 1980s and early 1990s, several investigations were conducted to evaluate the concentrations of various potential contaminants in sediments within the Site boundaries. These studies include investigations conducted as part of the remedial investigation work at the Diamond Alkali Superfund Site, investigations conducted on behalf of OCC in the early 1990s, and investigations conducted by various governmental agencies, including the National Oceanic and Atmospheric Administration (NOAA), US Fish and Wildlife Service (USFWS), and USEPA. These investigations indicated that sediments of the Passaic River Study Area contain elevated concentrations of numerous hazardous substances including, but not limited to, cadmium, copper, lead, mercury, nickel, zinc, bis (2-ethylhexyl) phthalate, polynuclear aromatic hydrocarbons, polychlorinated biphenyls (PCBs), 4,4'-dichlorodiphenyltrichloroethane (4,4'- DDT), diesel range organics (Total Extractable Petroleum Hydrocarbons), polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans, and chlorinated herbicides and phenols (Huntley, 1993; Bonnevie, 1993; Gillis, 1993; Wenning, 1993; Bonnevie, 1992; Bonnevie, 1994; Wenning, 1994).

The main contaminants of concern in site sediments are lead, mercury, 2,3,7,8-TCDD, PCBs, PAHS, and DDTs. The concentration ranges and average concentrations of these contaminants, as found in representative sediment samples, are provided in Table 2-2. Also included is the total organic carbon content (TOC) of the samples. The distribution of contaminants in the upper four feet of sediment is shown in Figures 2-7a to 2-7g.

3.0 WORK PLAN RATIONALE

3.1 OVERALL PROJECT OBJECTIVES

The overall objective of the Feasibility Study is to develop a comprehensive watershed-based plan for the remediation and restoration of the Lower Passaic River and its watershed. The table below summarizes the objectives of the pilot demonstration, and the metrics to be used to measure success of the demonstration.

Table 3-1. Pilot Demonstration Objectives

Objective	Metrics
Evaluate if Passaic River sediments can be successfully dredged without causing significant impact to the environment	• Resuspension production rate • Resuspension release rate • Resuspension export rate • Mass balance
Evaluate dredging equipment performance	• Dredging production rates • Turbidity levels • Engineering controls
Evaluate sediment decontamination technologies	• Comparison of treated dredged material to applicable federal, State and ASTM standards • Economic viability of technology

The objective of the hydrographic survey is to develop a bathymetric map of the Passaic River bed along a 1,000-foot stretch at the river centerline in the Harrison Reach between the Jackson Street Bridge and the New Jersey Turnpike Bridge (hereinafter referred to as the Pilot Study Survey Area). The objective of the side scan sonar survey is to characterize the texture of the sediments and to identify any debris in the Pilot Study Survey Area. The work area for these surveys encompasses the entire river bottom to the mean low water mark (MLW) along each shoreline. Based on the results from the hydrographic and side scan sonar surveys, TAMS/ET and MPI will select a one and one-half acres work area (hereinafter referred to as the potential Dredging Area) for the collection of sediment cores in conjunction with NJDOT-OMR, USEPA, and USACE. The goal of the sediment coring effort is to perform a representative chemical and geotechnical characterization of the sediments in the upper four feet of the Passaic River bed in the potential Dredging Area. This information will then be utilized to support the objectives of the combined dredging and sediment decontamination demonstration project.

3.2. Work Plan Approach

A detailed Scope of Work (Section 4.0) has been developed and will be strictly adhered to during the implementation. This work includes:

- Conduct a hydrographic survey to develop a bathymetric map of the Passaic River bed along a 1,000-ft stretch in the Harrison Reach between the Jackson Street Bridge and the New Jersey Turnpike Bridge. The work area for this survey shall encompass the entire river bottom to the mean low water mark (MLW) along each shoreline. This 1,000 ft bank-to-bank area is designated as the Pilot Study Survey Area.

- Conduct a side scan sonar survey to characterize the texture of the sediments and to identify any debris in the Pilot Study Survey Area. As part of the side scan sonar survey, sediment samples from the top 2 inches will be collected using a petite ponar dredge, to help interpret and ground truth the side scan sonar results. At a minimum a field geologist will classify all of the samples, while up to five samples may be sent for grain-size analysis.

- Use the results of the bathymetric and side scan sonar surveys to define the potential Dredging Area (a smaller area of about 225 ft (75 yd) by 300 ft (100 yd), approximately 1.5 acres) for sediment core collection. The survey drawings will illustrate the location and elevation of river-bottom contours at one-foot intervals referenced to the MLW.

- Collect 15 sediment cores within the work area. It is anticipated that 5,000 cubic yards of sediment from the upper 2 feet will be dredged over a period of 5 days in July 2005 and that dredging will be performed for 12 hours per day. Each sediment core represents a period of 4 hours of dredging, and can be related to the associated surface water quality monitoring data that will be collected during those 4 hours. Therefore, 3 cores will represent the associated surface water quality monitoring data that will be collected during one day of dredging, giving a total of 15 cores corresponding to the 5 days of dredging (see Figure 4-1). The sediment cores will be four feet deep. Each core will be divided into one-foot segments and the sediment samples from each one-foot segment will be analyzed for some combination of geotechnical parameters (including grain size distribution, bulk density, Atterberg limits, moisture content, percent solids, total organic carbon, and specific gravity) and chemical parameters (including dioxins, PCBs, PAHs, metals, herbicides, and pesticides). See Tables B-2 and B-3 of the QAPP for a comprehensive listing of the proposed analyses. Samples from the 0-1 ft and 1-2 ft intervals from each of the 15 cores will be used to characterize the sediment that will be dredged and represent any release that may occur during dredging. Samples from the 2-3 ft interval will be used to characterize the new surface that will be exposed after dredging is completed and will help to determine if there will be an increased risk from exposure to potentially higher contaminant concentrations. Samples from the 3-4 ft interval will be archived and analyzed in future if necessary.

- Collect equal amounts of sediment from the top two feet of each of the 15 areas within the potential dredging area. Homogenize these 15 samples to obtain 60-

gallons of sediment that will be used by one of the vendors for sediment decontamination bench tests. USEPA and NJDOT-OMR will conduct this activity using a USACE or USEPA boat.

- Interpret and evaluate the data and prepare summary reports that document the work performed during the geophysical surveys and the sediment core collection effort. Assemble the survey results and sediment analysis data for use as baseline conditions for the dredging work to be performed in 2005.

4.0 DETAILED SCOPE OF WORK

4.1 GEOPHYSICAL SURVEYS

A hydrographic survey and side scan sonar survey will be conducted in a section of the Lower Passaic River within the Harrison Reach using the RV Delaware, a 21-foot survey vessel. The vessel will be equipped with a real-time kinetic (RTK) system for positioning. Hypack survey management software will be used for survey control and ship track recording. An Innerspace Model 455 survey grade Fathometer will be used to collect the water depth data.

4.1.1 Hydrographic Survey

The hydrographic survey will encompass the entire river bottom to the mean low water (MLW) line along each shoreline. The survey work area will extend for 1000 feet along the river centerline from bank to bank. The survey will be conducted using 25-foot lanes and single beam or multi-beam acoustical survey techniques to acquire depth soundings. Horizontal position of the depth soundings will be obtained using differential global positioning (DGPS) methods with real time kinematic (RTK) correction applied to the data. The Survey will be conducted in horizontal datum NAD 83 and NJ State Plane feet and vertical datum NGVD 1929.

The survey drawings will show shoreline features in the vicinity of the Site that are available on NJDOT geo-referenced base maps. The geo-referenced shoreline features will be shown for 1000 feet along the riverbank. The features shown will be limited to the horizontal position of the furthest riverward project of bulkhead walls and piers and the horizontal position of the highest elevation of earthen/rip-rap slopes. The survey drawings will also show utility information in the vicinity of the work area, including inverts, sizes, types, location of utilities, shoreline outfall structures that are available from existing drawings, maps, and data, the location of all combined and sanitary sewer outfalls, if any, within the reach.

4.1.2 Side Scan Sonar Survey

A side scan survey will be conducted in the same 1000-foot section of the river where the hydrographic survey is done. This survey will be conducted using a Marine Sonic System running at 500-600 KHz frequency. RTK will be used for positioning and Hypack survey management software will be used for survey control and ship track recording. This survey will be conducted by running lines parallel to the shoreline. The survey will be conducted using 50-foot lane spacing. It is estimated that 5 to 7 track lines are required for 150% coverage.

A mosaic of the river bed in the study area will be created, accompanied by annotation of individual objects in a target file. All of the individual survey maps will be plotted on Mylar and presented on the same scale to enable them to be combined using overlays.

This will enable the data to be layered together forming a composite picture of the project area.

As part of the side scan sonar survey, sediment samples at approximately 30 locations will be collected from the top 2 inches with a petite-ponar dredge to help interpret and ground truth the side scan sonar results. At a minimum a field geologist will classify all of the samples, while up to five samples may be sent for grain-size analysis. The locations will be selected in the field, based on the side scan sonar images and the need to verify signal/sediment types

4.2 SEDIMENT CORING

A work area (the potential Dredging Area) about 100 yards long and 75 yards wide will be selected based on the results of the geophysical surveys for sediment core collection. This work area will be divided into 15 rectangular sampling grids with dimensions of 20 yards long by 25 yards wide. Sediment cores will be collected within each grid using core catchers (see Figure 4-1).

It is anticipated that 5,000 cubic yards of sediment from the upper 2 feet will be dredged over a period of 5 days in July 2005 and that dredging will be performed for 12 hours per day. Each sediment core represents a period of 4 hours of dredging, and can be related to the associated surface water quality monitoring data that will be collected during those 4 hours. Therefore, 3 cores will represent the associated surface water quality monitoring data that will be collected during one day of dredging, giving a total of 15 cores corresponding to the 5 days of dredging (see Figures 4-1 and 4-2). The sediment cores will be four feet deep. Each core will be divided into one-foot segments and the sediment samples from each one-foot segment will be analyzed for some combination of geotechnical parameters (including grain size distribution, bulk density, Atterberg limits, moisture content, percent solids, total organic carbon, and specific gravity) and chemical parameters (including dioxins, PCBs, PAHs, metals, herbicides, and pesticides). See Tables B-2 and B-3 of the QAPP for a comprehensive listing of the proposed analyses.

Each core will consist of at least four feet of sediment, and the core diameter will be 4 inches so as to provide sufficient material for the required chemical and geotechnical analyses. The samples will be extruded in the land-based staging/core processing area, located at the Newark Fire Training Academy property (Figure 2-6). Each core will be segmented into 1-foot intervals. Samples from the 0-1ft and 1-2 ft intervals from each of the 15 cores will be used to characterize the sediment that will be dredged and represent any release that may occur during dredging. Because historical data on contaminant concentrations suggested that concentrations are lognormally distributed, the mean concentration of the sediments in the top 2 ft should be estimated using a minimum variance unbiased estimator (MVUE) (e.g., Gilbert, 1987). The estimator of the mean for a lognormal distribution requires an estimate of the variance of the population. In general, 30 samples are required to estimate the variance of a lognormal distribution. The 30 samples in the top 2 ft interval will be used for this purpose.

Samples from the 2-3 ft interval will be used to characterize the new surface that will be exposed after dredging is completed and will help to determine if there will be an increased risk from exposure to potentially higher contaminant concentrations. Sediments in the 3-4 ft interval will be archived for potential analysis at a later date. Provisions will be made to extrude and segment the sediment from the coring tube while maintaining stratigraphic integrity. Horizontal position of the coring locations will be obtained using global positioning methods (GPS) accurate to 1 meter or less horizontally. The coordinates shall be reported in horizontal datum NAD 83 and NJ State Plane feet and national geodetic vertical datum (NGVD) 1929. The accuracy of the coring will be as follows:

- Depth of water: ± 0.5 feet
- Horizontal position: ± 3 feet
- Depth of sediment penetration: ± 2.5 cm
- Depth within the sediment core: ± 1 cm

The field sampling team will perform the following activities associated with each core: photo log, visual description of the physical characteristics, sample processing and homogenization, sample jarring, chain-of-custody and shipping documentation. Sediment samples will be analyzed to determine the representative chemical and geotechnical characterization of the sediments in the work area.

In addition, equal amounts of sediment from the top two feet within each of the 15 areas will be collected to obtain 60-gallons of sediment that will be used by one of the vendors for sediment decontamination bench tests. USEPA and NJDOT-OMR will conduct this activity using a USACE or USEPA boat.

4.3 MANAGEMENT OF INVESTIGATION DERIVED WASTE (IDW)

It is currently anticipated that four waste streams will be generated as a result of surveying activities. These are:

- Non-hazardous trash and debris (municipal solid waste);
- Spent sediment core tubes;
- Sediment cuttings from sampling; and,
- Water from sediments.

Non-hazardous trash and debris generated from investigation programs will be segregated and disposed as regular municipal solid waste.

Sediment that is not used for sample analysis will be collected in 5-gallon buckets that will be shipped to the decontamination vendors for their use in performing bench tests. Spent sediment core tubes shall be rinsed in the river and disposed of as ordinary trash.

4.4 DELIVERABLES

ASI will provide the following deliverables in both hardcopy and electronic format:

4.4.1 Geophysical Surveys

Two copies of the Survey drawing(s), showing both hydrographic information and the geo-referenced shoreline features, shall be submitted in plan view at scales of both 1" = 50' and 1"=100' on standard sized drawing sheets. The Survey drawings shall illustrate the location and elevation of river-bottom contours at one-foot intervals referenced to MLW. Contours shall be labeled at five-foot intervals in relationship to the MLW. The Survey drawings shall illustrate the location and description of shoreline features such as bulkhead walls, piers, and earthen/rip-rap slopes and shall also illustrate the NJ State plane coordinate grid at 250-foot intervals.

All drawing dimensions and elevations shall be shown in feet. The drawings shall identify the scale being used and shall illustrate the scale graphically. The convention that north is at the top of the drawing shall be followed. The drawings shall contain a graphic scale that relates MLW to Mean Lower Low Water (MLLW), to Mean Sea Level (MSL) 1929, to Mean High Water (MHW), and to Mean Higher High Water (MHHW).

Survey drawings shall be submitted in AutoCAD Release 14 or 2000 format on a CD-ROM. Surveyed features are to be drawn in model space at "model space" scale (1' = 1'). Each element of the survey, e.g. one-foot contours, shall be situated in 3-D space at their true x, y, and z datum coordinates. The data shall be positioned in NJ State Plane grid and NGVD 1929.

Hydrographic (depth soundings) and topographic (for the shoreline) data shall also be submitted in an ASCII text file on a CD-ROM. These data points shall be provided as Land Development Desktop (LDDT) standard point blocks, in ASCII, comma-delineated PENZD (Points, Easting, Northing, Elevation, Description) format with attributes properly valued.

A Metadata file for all geospatial data associated with the production of survey drawings shall be submitted on a CD-ROM. Geospatial data is considered information identifying the geographic location and characteristics of natural or constructed features. The metadata file shall be formatted to comply with the Federal Geographic Data Committee content standards for Digital Geospatial Metadata, version 1.0 or higher.

Survey drawings shall be submitted in AutoCAD Release 14 or 2000 format on a CD-ROM. Surveyed features are to be drawn in model space at "model space" scale (1' = 1'). Each element of the survey, e.g. one-foot contours, shall be situated in 3-D space at their true x, y, and z datum coordinates. The data shall be positioned in NJ State Plane grid and NGVD 1929.

For the side scan sonar, a mosaic of the Passaic River bed in the study area will be created, accompanied by annotation of individual objects in a target file. All of the individual maps will be plotted on Mylar and presented on the same scale to enable them to be combined using overlays. This will enable the data to be layered together forming a composite picture of the project area.

4.4.2 Sediment Coring

After completion of the coring effort, ASI will submit a summary report including a description of the field operation and the original and electronic field logs, including documentation of any unsuccessful attempts. The report will also contain a single data table with the following information:

- sample ID,
- date and time of collection,
- coordinates (northing, easting),
- water depth,
- sediment penetration depth,
- upper depth of segment, and
  lower depth of segment

The electronic information will be provided in MS Word and in Adobe Acrobat format.

TAMS/ET and MPI will provide the following deliverables in both hardcopy and electronic format.

TAMS/ET and MPI will interpret and evaluate the data and prepare summary reports that document the work performed during the geophysical surveys and the sediment core collection effort. TAMS/ET and MPI will utilize the bathymetric and side scan sonar maps prepared by ASI along with an evaluation of the existing site database to provide recommendations to NJDOT-OMR, USEPA, and USACE regarding the selection of the area for the sediment core collection. After the results of chemical and geotechnical analyses are available from the approved laboratory, TAMS/ET and MPI will interpret, evaluate, summarize, and tabulate the data collected during the sediment core collection effort and present the major findings to NJDOT-OMR, USEPA, and USACE. TAMS/ET and MPI will revise these summary reports to incorporate comments provided by NJDOT-OMR, USACE, EPA and other government agencies. TAMS/ET and MPI will prepare these reports in a format that will allow for easy incorporation into pertinent PMP documents.

5.0 PROJECT SCHEDULE

The proposed project schedule for this effort is summarized in Table 5-1.

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Table 2-1
Bridge Clearances and Notice Requirements

Bridge	Location	Type	Horizontal	Vertical Clearance (ft) (high water)	Notice Required	References
Garden State Parkway (Driscoll Bridge)	Raritan	Fixed	199	135	N/A	1
Rt 9 Edison Bridge	Raritan	Fixed	250	135	N/A	1
Victory Bridge	Raritan	Swing		Under Construction		1
Conrail	Raritan	Swing	125	8 ft	on signal	1,2
Outer Bridge Crossing	Arthurkill	Cantilever	675	143	N/A	1
Goethals Bridge	Arthurkill	Cantilever	672	135	N/A	3
Railroad Bridge to Bayway Barge Piers	Arthurkill	Lift	500	31 Down/ 135 Up	on signal	1,2
NJ Turnpike Extension	Newark Bay	Fixed	550	135	N/A	1
Conrail	Newark Bay	Lift	300	35 Down/135 Up	on signal	
Central Railroad of NJ	Passaic	Swing	100	25	Removed	1
Lincoln Hwy Bridge (Routes 1&9)	Passaic	Lift	300	40 Down/135 Up	4 hours	1,2
Pulaski Skyway	Passaic	Fixed	520	135	N/A	1
Point-No-Point Conrail (freight bridge)	Passaic	Swing	103	16	4 hours	1,2
NJ Turnpike	Passaic	Fixed	319	100	N/A	1
Jackson St Bridge	Passaic	Swing	75	15	4 hours	1,2
Northeast Corridor (Amtrak)	Passaic	Lift	200	24 Down/138 Up	4 hours	1,2

Note: There are also a number of overhead power cables ranging from 135 to 170 ft vertical clearance.

References:

(1) naviagtional charts 21st edition

(2) 33 CFR 117

(3) NJDEP

Table 2-2
Concentration Ranges and Averages for the Contaminants of Concern and Total Organic Carbon

	0-2 ft				2-5 ft				> 5 ft			
Parameter	n	Min (ug/kg)	Max (ug/kg)	Average (ug/kg)	n	Min (ug/kg)	Max (ug/kg)	Average (ug/kg)	n	Min (ug/kg)	Max (ug/kg)	Average (ug/kg)
Total Organic Carbon	224	644,000	409,000,000	71,671,350	164	238,000	563,370,000	77,562,504	118	691,100	271,890,000	76,608,008
Lead	264	0.30	17,900,000	375,504	163	1,000.00	1,230,000	438,245	99	3,100	2,490,000	596,420
Mercury	230	0.00017	28,500	4,433	161	10.00000	28,100	6,641	113	110	29,600	8,722
2,3,7,8-TCDD	231	0.00026	78	2	166	0.00019	5,300	54	115	0.0003	240	11
Total PCBs - Sum of Coplanar Congeners	226	0.03	1,970	176	166	0.04	1,960	334	115	0.0091	1,240	226
Total PCBs - Aroclors	222	54	12,500	1,679	157	97	47,700	4,149	110	368	11,300	3,736
Total PAHs	264	640	7,750,000	74,741	164	520	719,000	53,977	118	220	1,170,000	99,445
Total DDT	224	4.13	30,800	600	159	5.78	18,600,000	234,243	115	7	223,000	4,069

Table 5-1
Project Schedule for Geophysical Survey and Sediment Coring

Activity	**Date**
Submit Draft Project Plans	January 2, 2004
Receive Comments from Agencies	February, March, and May 2004
Submit Final Project Plans	June 2004
Initiate Geophysical survey Fieldwork	March 2004
Receive Geophysical Survey Documents	May 2004
Initiate Sediment Coring	July 2004
Submit Draft Study report	Fall, 2004

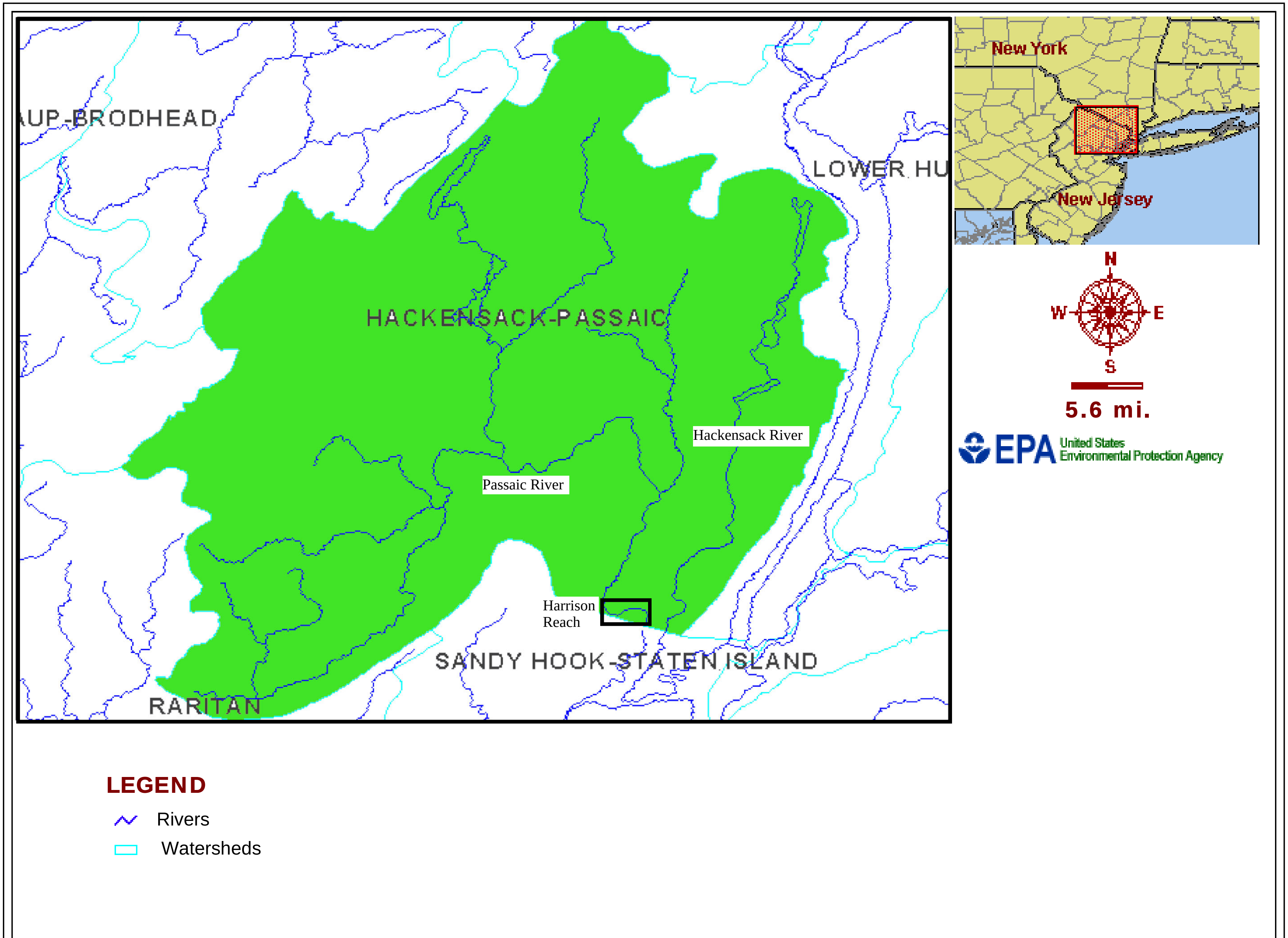
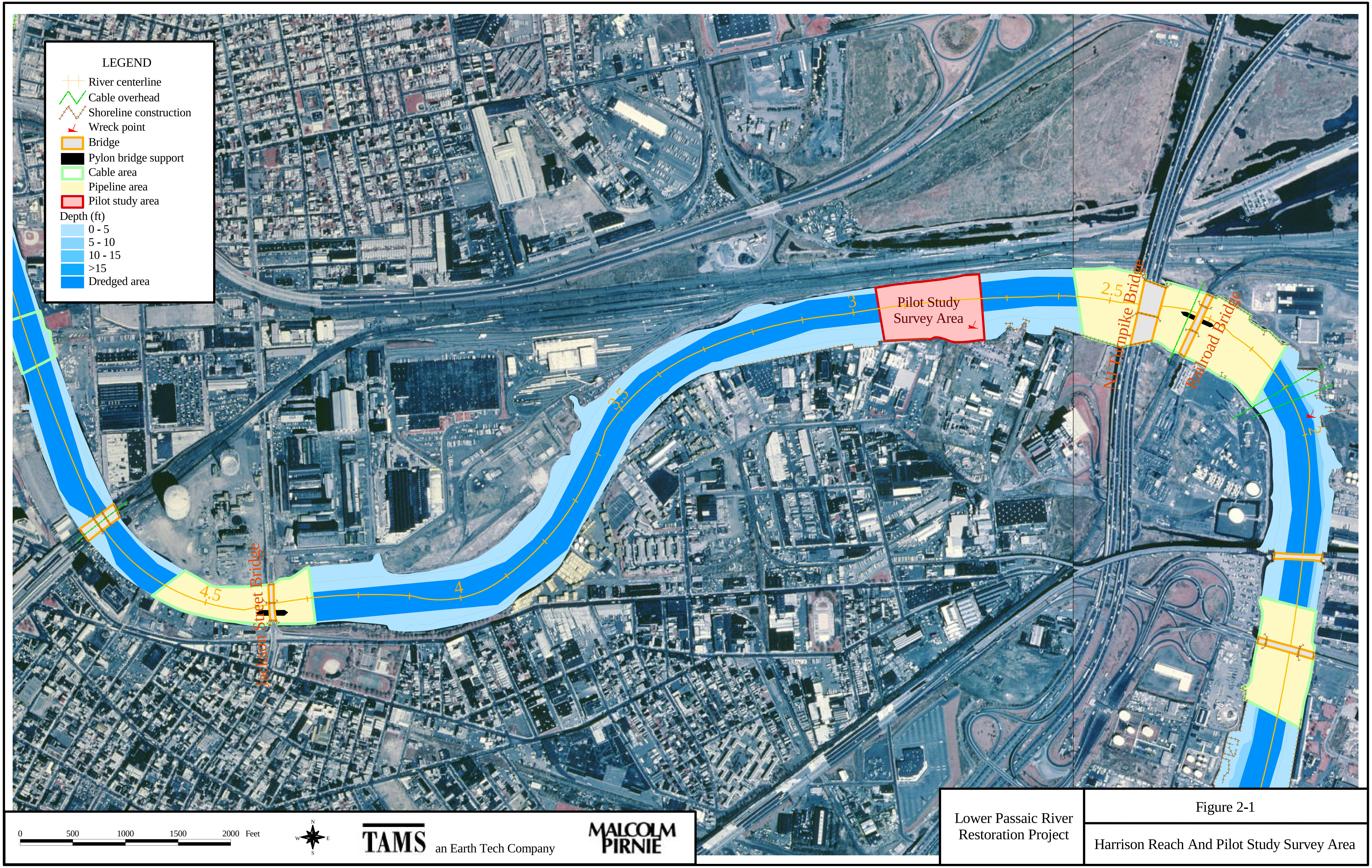


Figure 1-1
Hackensack - Passaic Watershed

Reference: USEPA Envriomapper at http://www.epa.gov/enviro/html/em/index.html



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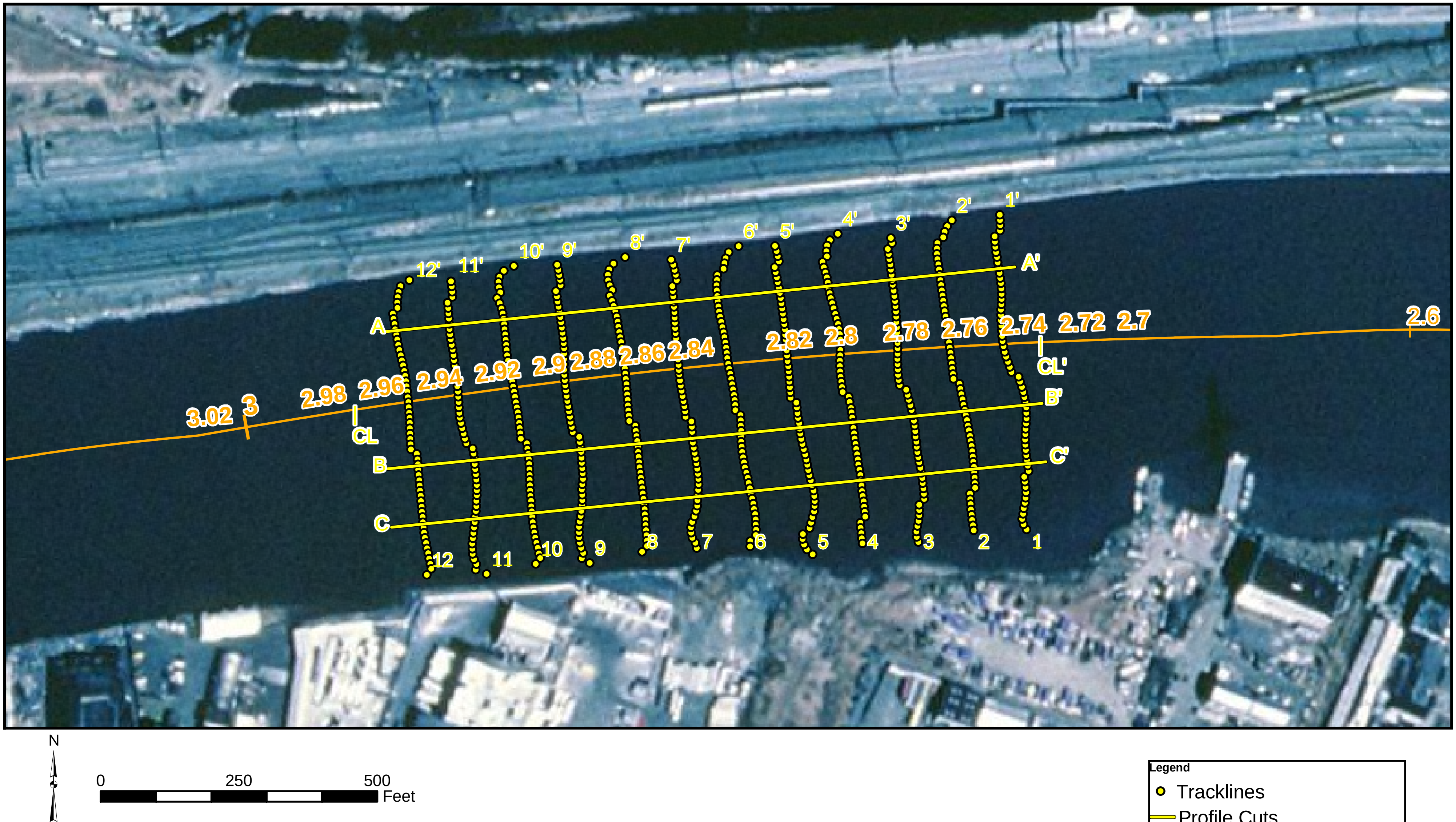
Lower Passaic River Restoration Project

Figure 2-1

Harrison Reach And Pilot Study Survey Area



Bathymetric data is based on USACE July 2002 Bathymetry.
Aerial imagery from NJDEP.

US Army Corps of Engineers

MALCOLM PIRNIE

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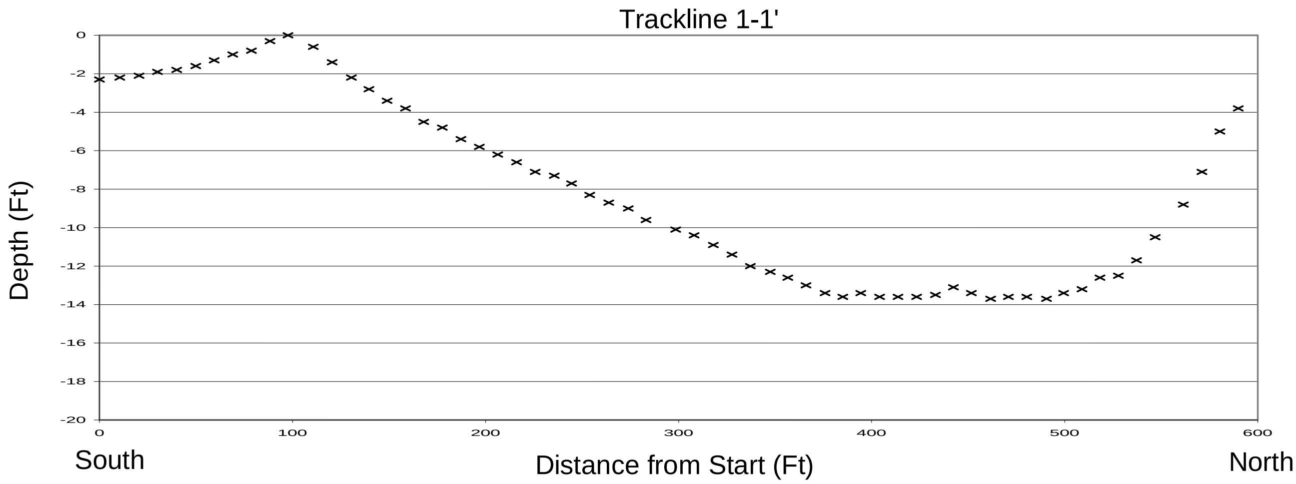
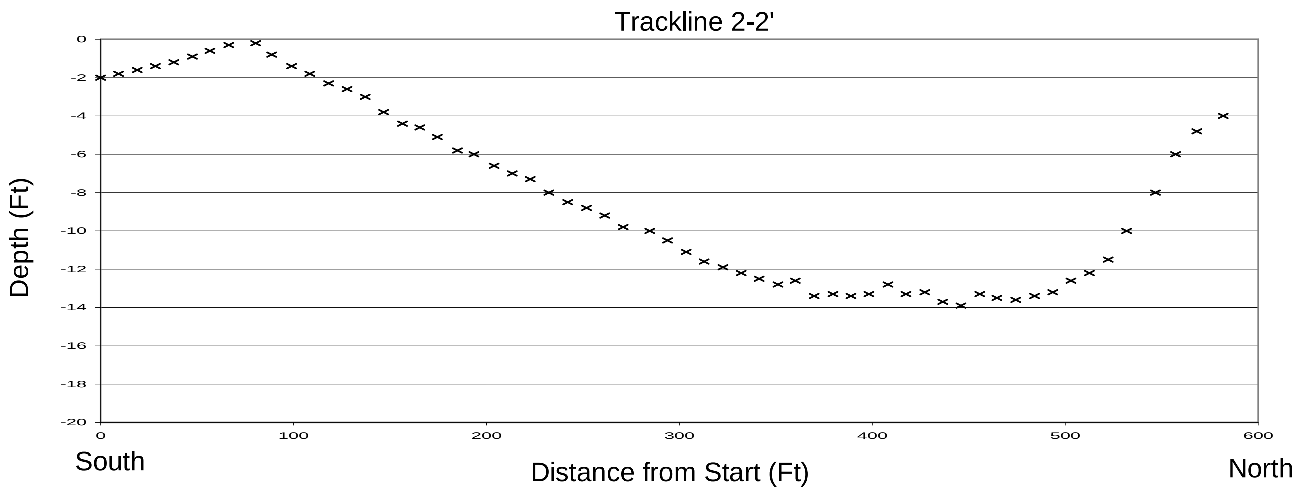
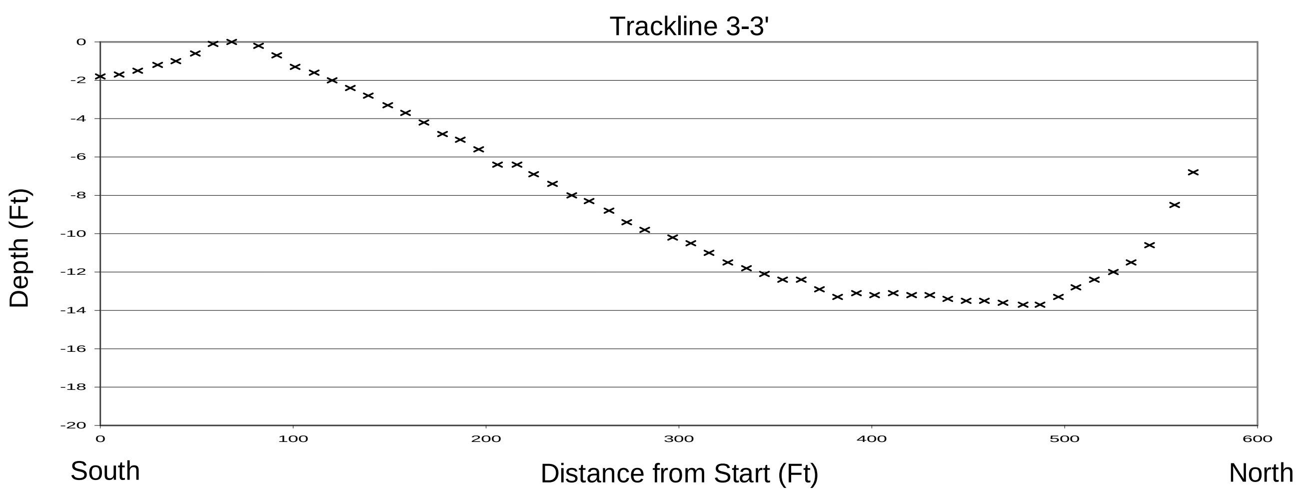
AN EARTH TECH COMPANY

FIGURE 2-2a. SEDIMENT SURFACE CROSS SECTION LOCATION MAP



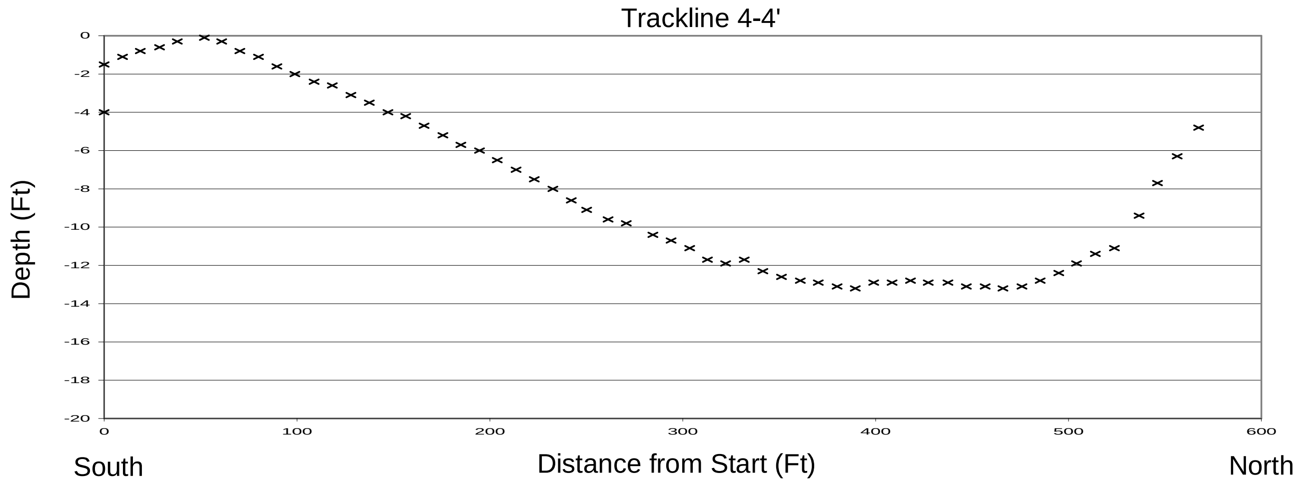


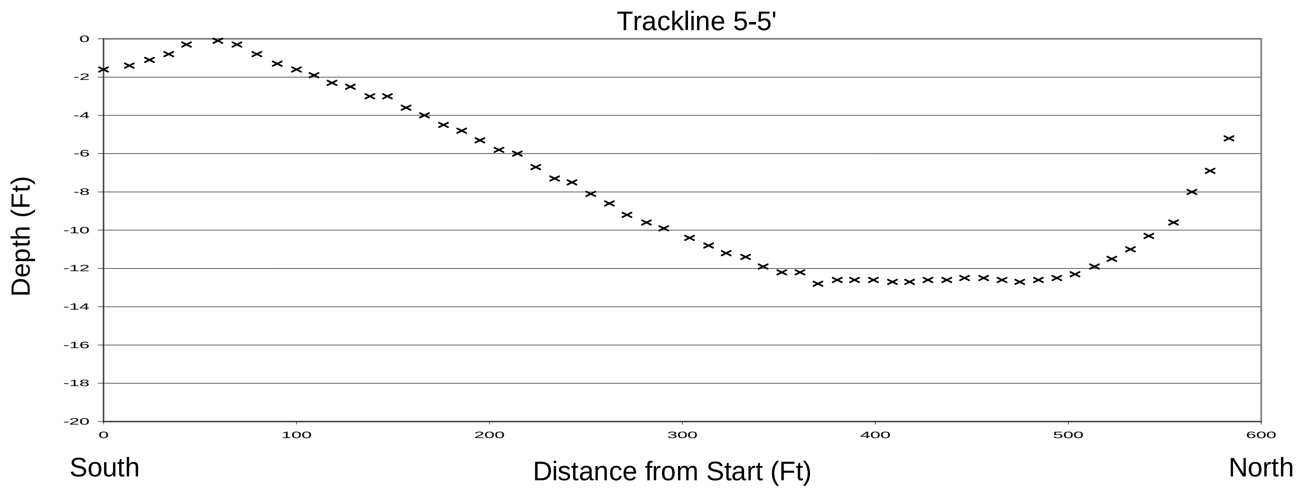


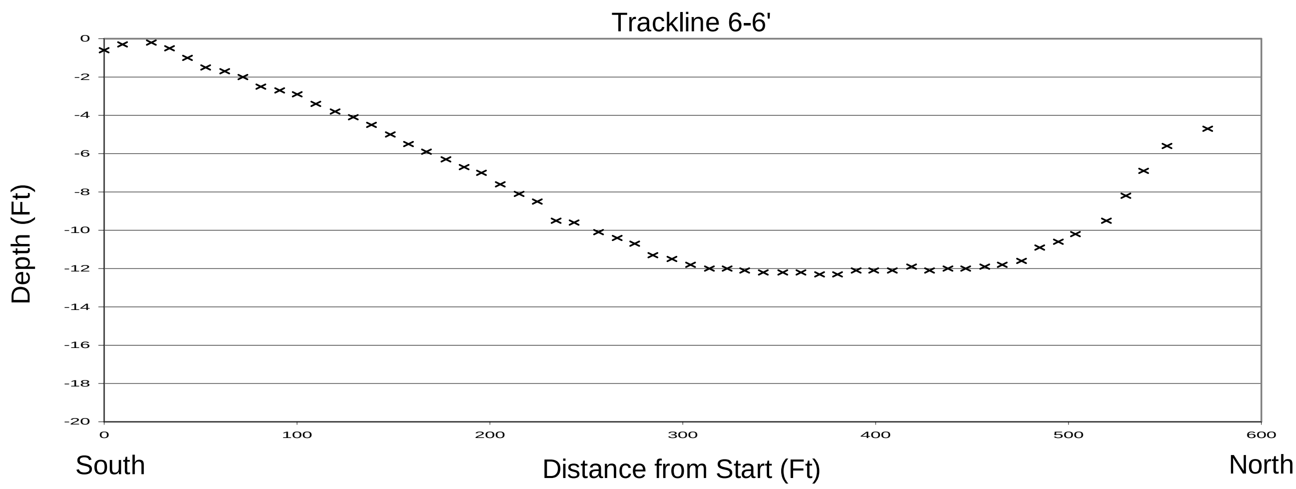
Data is based on July 2002 USACE Bathymetry.
"Distance from Start" refers to the distance of each sampling point from the southmost sampling point along the point-to-point route.

Scale:
Horizontal: 1" = 100'
Vertical: 1" = 10'

Figure 2-2b. Sediment Surface Cross Sections Tracklines 1-1' to 3-3'



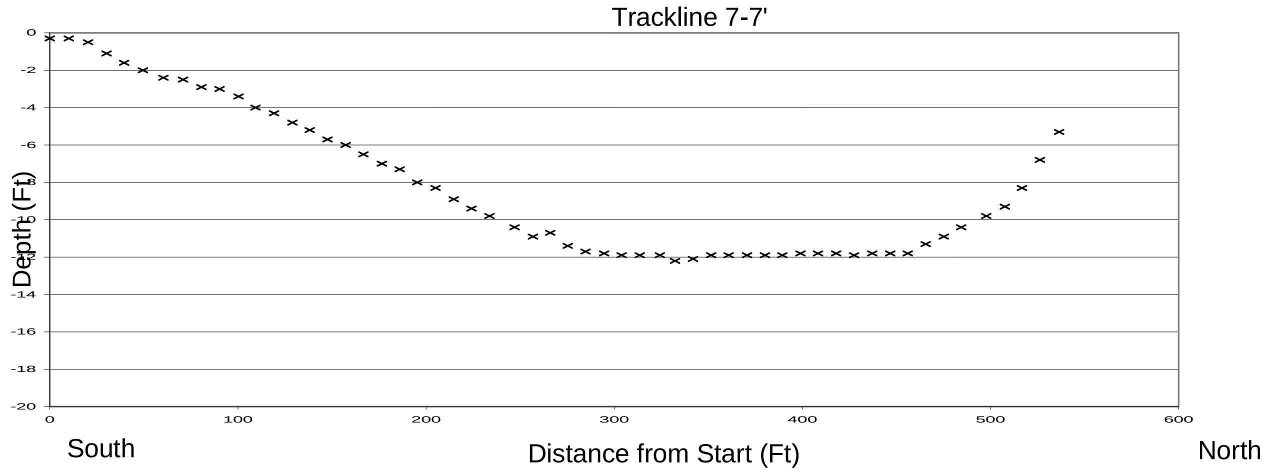


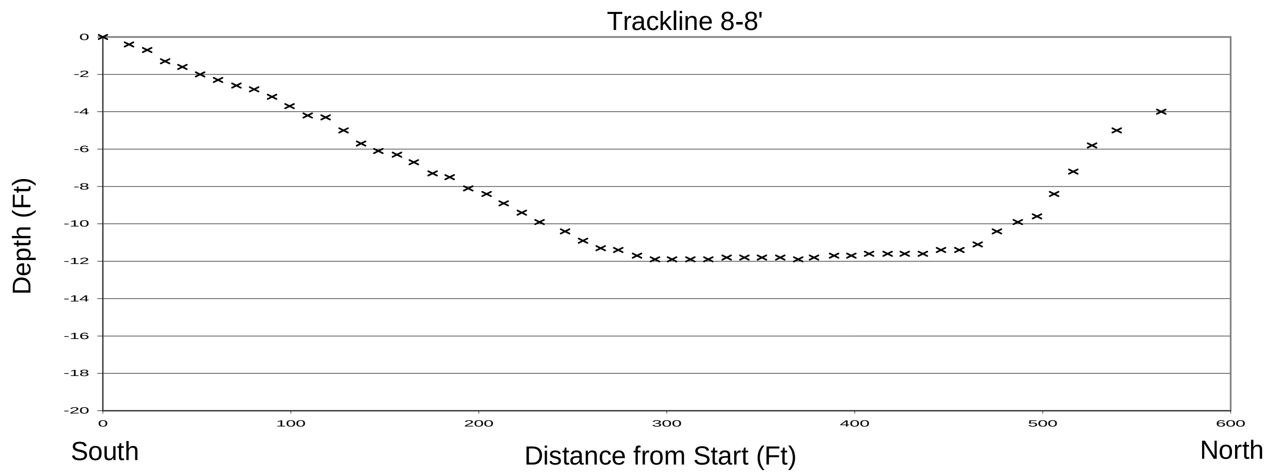


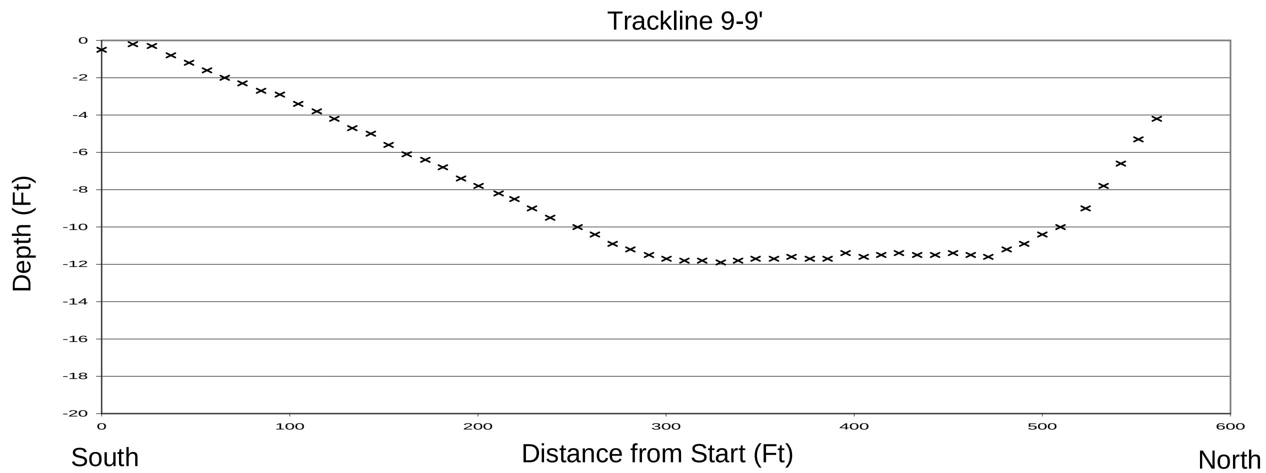
Data is based on July 2002 USACE Bathymetry.
"Distance from Start" refers to the distance of each sampling point from the southmost sampling point along the point-to-point route.

Scale:
Horizontal: 1" = 100'
Vertical: 1" = 10'

Figure 2-2c. Sediment Surface Cross Sections Tracklines 4-4' to 6-6'



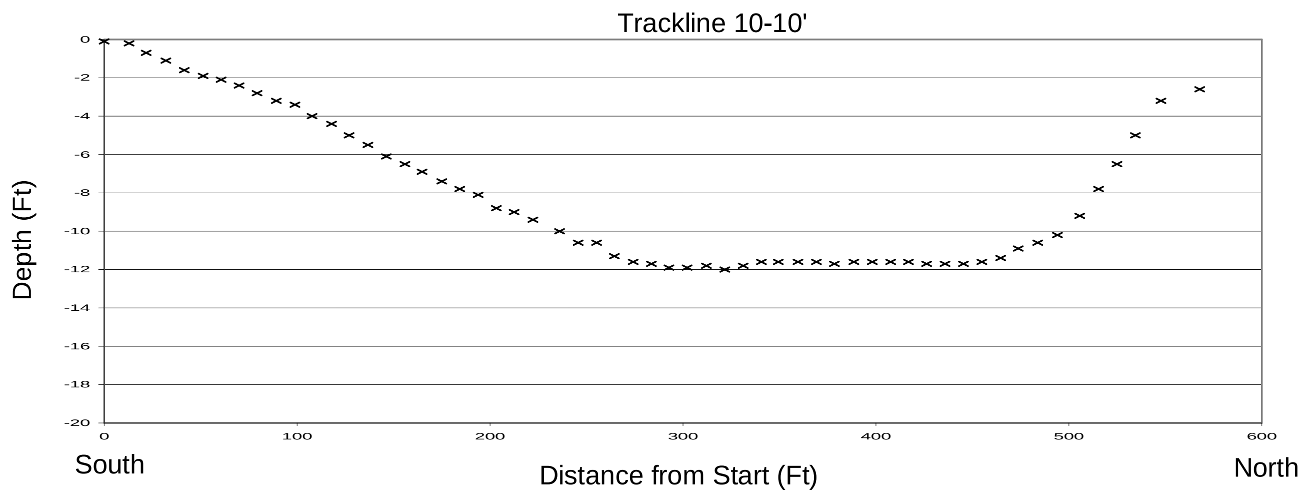


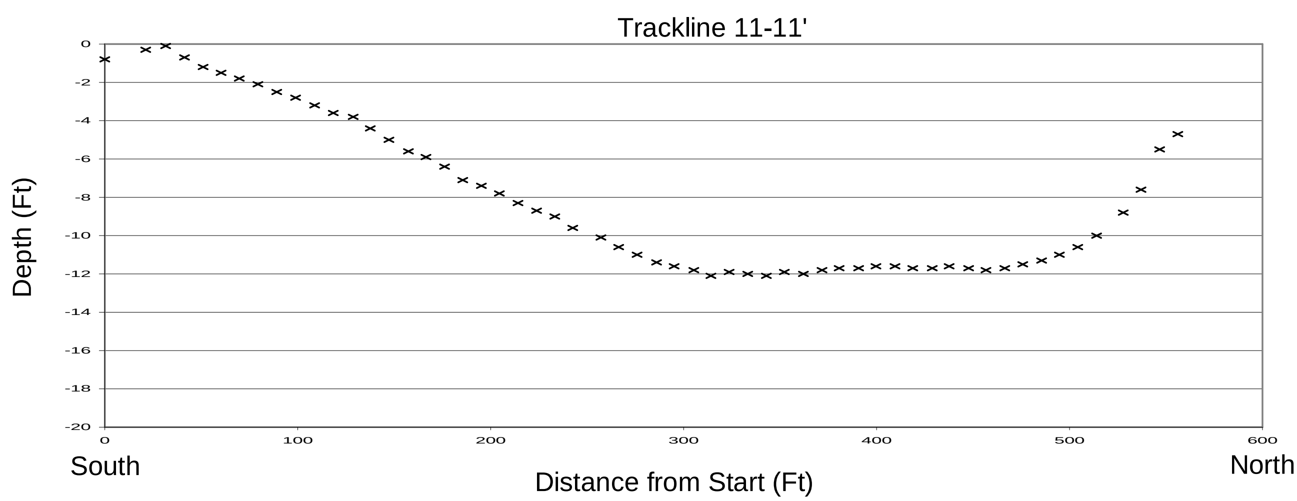


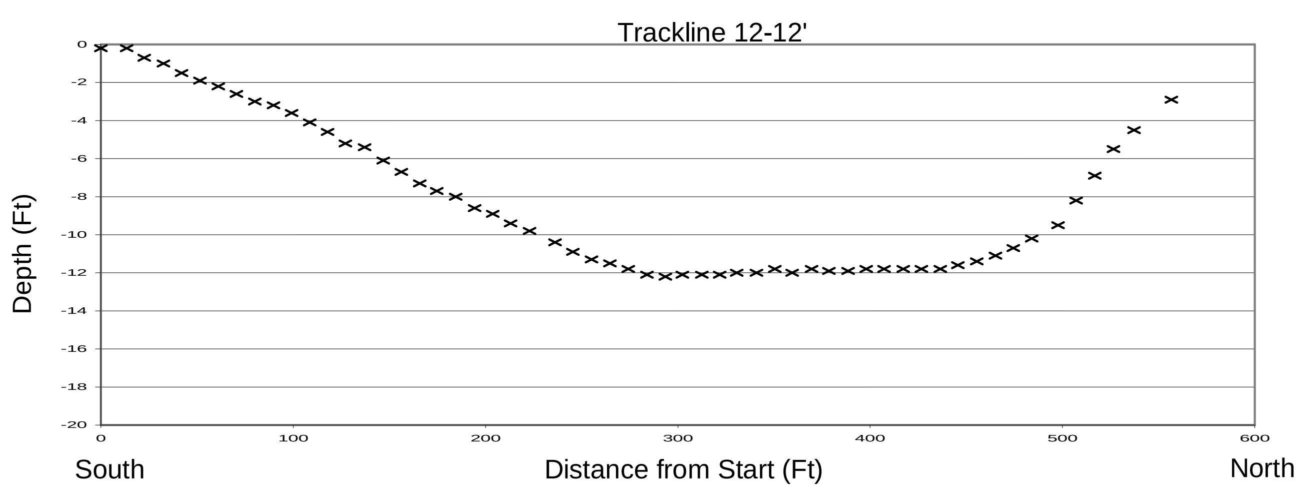
Data is based on July 2002 USACE Bathymetry.
"Distance from Start" refers to the distance of each sampling point from the southmost sampling point along the point-to-point route.

Scale:
Horizontal: 1" = 100'
Vertical: 1" = 10'

Figure 2-2d Sediment Surface Cross Sections Tracklines 7-7' to 9-9'



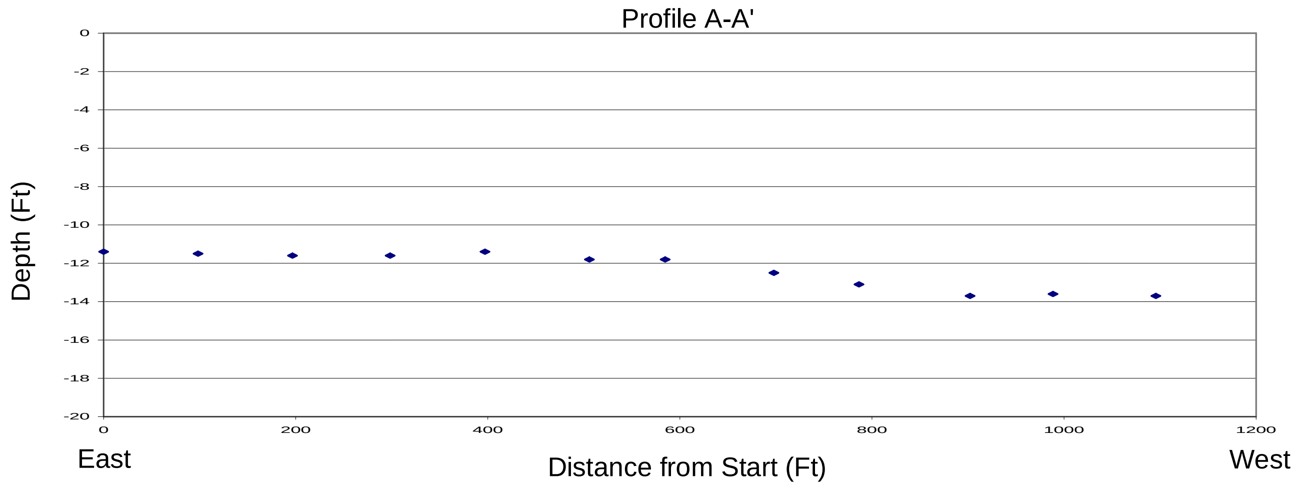


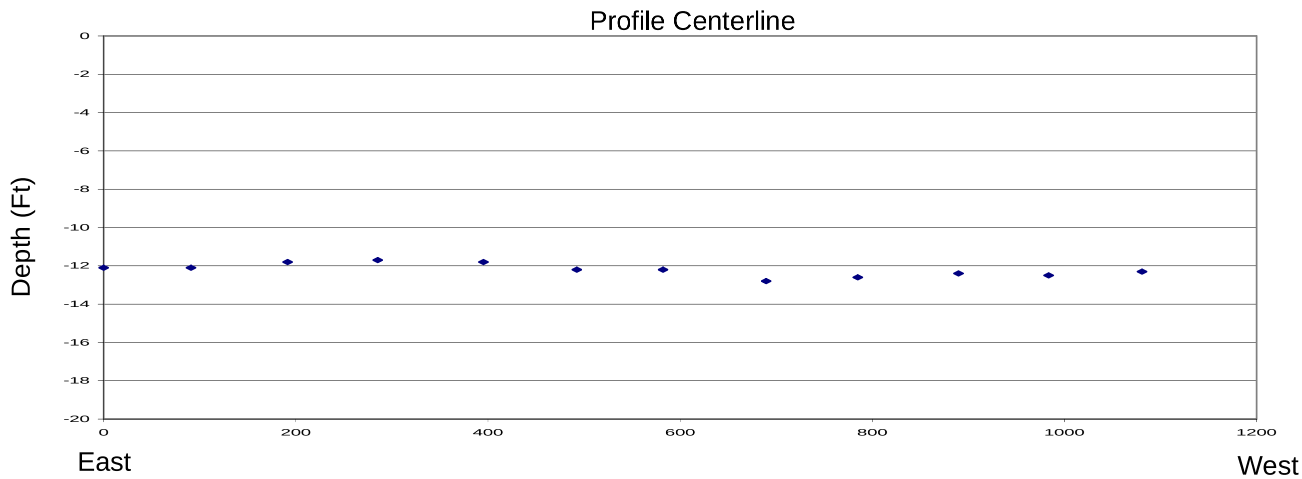


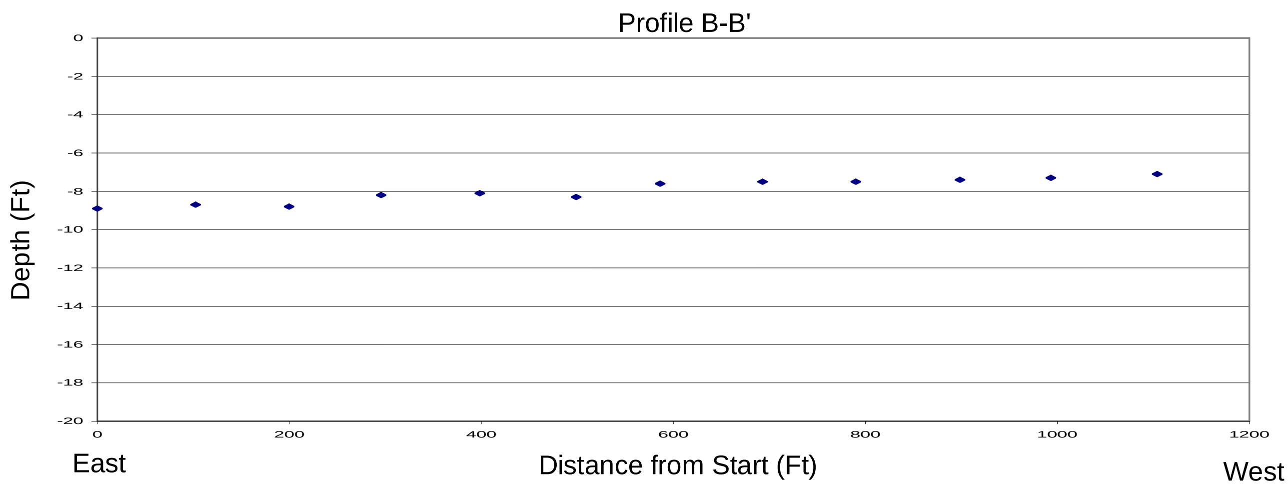
Data is based on July 2002 USACE Bathymetry.
"Distance from Start" refers to the distance of each sampling point from the southmost sampling point along the point-to-point route.

Scale:
Horizontal: 1" = 100'
Vertical: 1" = 10'

Figure 2-2e. Sediment Surface Cross Sections Tracklines 10-10' to 12-12'



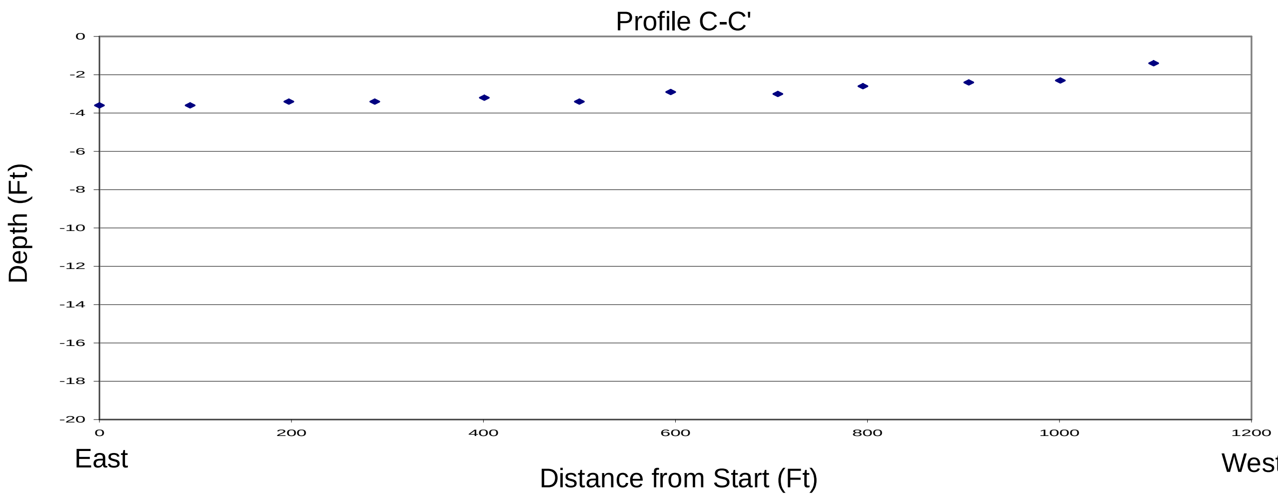




Data is based on July 2002 USACE Bathymetry.
"Distance from Start" refers to the distance of each sampling point from the southmost sampling point along the point-to-point route.

Scale:
Horizontal: 1" = 200'
Vertical: 1" = 10'

Figure 2-2f. Sediment Surface Cross Sections Profiles A-A' to C-C' Page 1 of 2



Data is based on July 2002 USACE Bathymetry.
"Distance from Start" refers to the distance of each sampling point from the southmost sampling point along the point-to-point route.

Scale:
Horizontal: 1" = 200'
Vertical: 1" = 10'

Figure 2-2f. Sediment Surface Cross Sections Profiles A-A' to C-C' Page 2 of 2

Figure 2-3
Photographs of the Bridges

Jackson Street Bridge

Jackson Street Bridge

Figure 2-3
Photographs of the Bridges

New Jersey Turnpike and Point-No-Point Conrail Bridges

Figure 2-4
Photographs of the Northern Shoreline Features

Northern Shoreline

Northern Shoreline

Figure 2-5
Photographs of the Southern Shoreline Features

Southern Shoreline and New Jersey Turnpike Bridge

Southern Shoreline

Figure 2-5
Photographs of the Southern Shoreline Features

Southern Shoreline and Blanchard Street Dock

Southern Shoreline

Figure 2-5
Photographs of the Southern Shoreline Features

Southern Shoreline

Southern Shoreline

Figure 2-5
Photographs of the Southern Shoreline Features

Southern Shoreline

Southern Shoreline

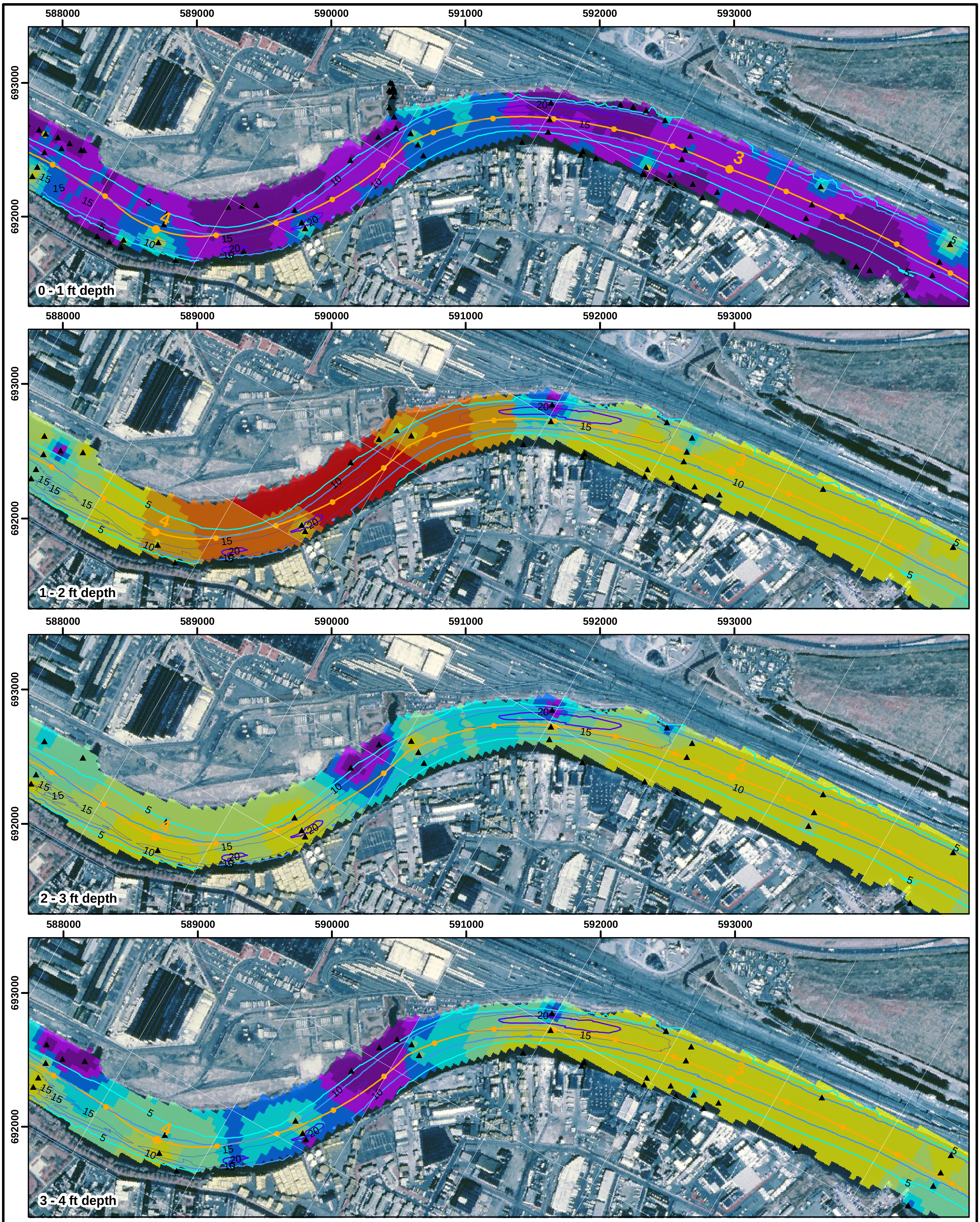
Figure 2-5
Photographs of the Southern Shoreline Features

Southern Shoreline and Diamond Alkali Superfund Site

Figure 2-6
Photographs of the Land Based Staging/Core Processing Area

Newark Fire Training Academy

Newark Fire Training Academy



N

0 400 800 1,600 2,400 Feet

1 inch equals 800 feet

Notes:
1. Sediment data from Terra Solutions, Inc. database Version 4.
2. Digital orthophotography acquired from the NJDEP.
3. Bathymetry - Contours based on 2002 survey by NY District Corps of Engineers.
4. Samples interpolated with inverse distance weighting.
5. Map Projection: New Jersey State Plane Feet NAD83.

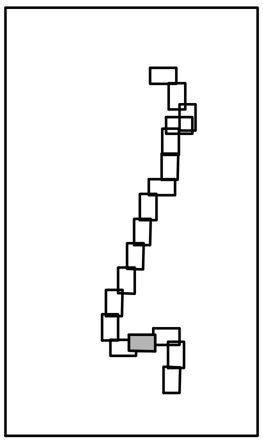
Legend

▲ Lead Sample Locations

Passaic River Centerline
- 1-Mile segment
- 1/10-Mile segment

Bathymetry (ft below MLW)
- 5
- 10
- 15
- 20
- 25
- 30

Lead (ug/Kg)
- 0 - 250,000
- 250,001 - 300,000
- 300,001 - 350,000
- 350,001 - 400,000
- 400,001 - 450,000
- 450,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 1,500,000
- 1,500,001 - 2,000,000
- 2,000,001 - 14,000,000



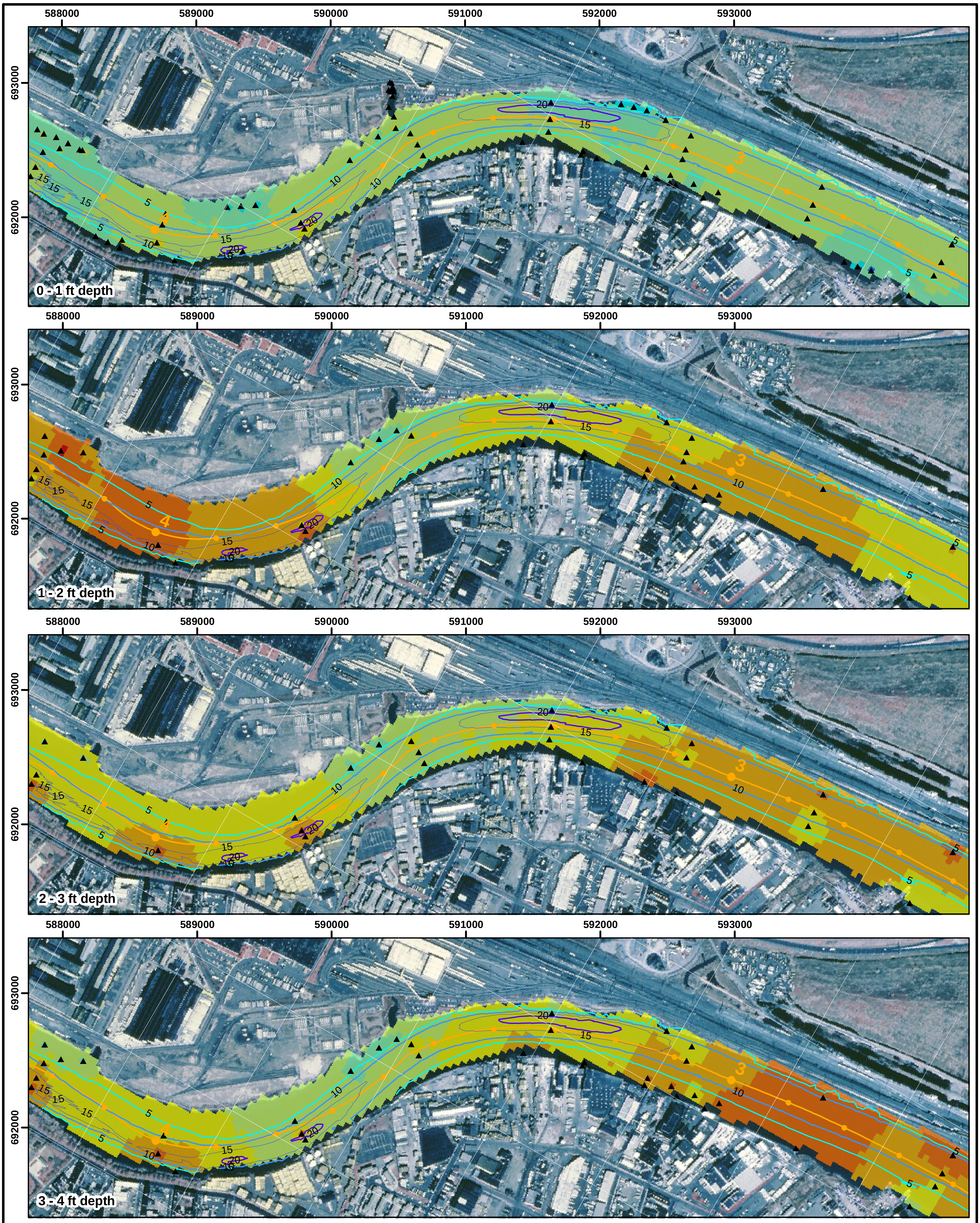
US Army Corps of Engineers

MALCOLM PIRNIE

TAMS AN EARTH TECH COMPANY

Map Document: (S:\Projects\0285924\Maps_3473003_TAMS\MapDocuments\HarrisonReach_Lead_SampleLocations_depth.mxd)
11/12/2003 -- 10:56:52 AM

FIGURE 2-7a
MILE 2.7 - 4.1: HARRISON REACH LEAD SEDIMENT DATA 0-4'



0 400 800 1,600 2,400 Feet

1 inch equals 800 feet

Notes:
1. Sediment data from Terra Solutions, Inc. database Version 4.
2. Digital orthophotography acquired from the NJDEP.
3. Bathymetry - Contours based on 2002 survey by NY District Corps of Engineers.
4. Samples interpolated with inverse distance weighting.
5. Map Projection: New Jersey State Plane Feet NAD83.

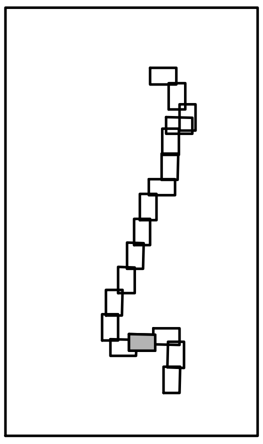
Legend

▲ Mercury Sample Locations

Passaic River Centerline
- 1-Mile segment
- 1/10-Mile segment

Bathymetry (ft below MLW)
- 5
- 10
- 15
- 20
- 25
- 30

Mercury (ug/Kg)
- 0 - 10
- 11 - 100
- 101 - 500
- 501 - 1,000
- 1,001 - 2,500
- 2,501 - 5,000
- 5,001 - 7,500
- 7,501 - 10,000
- 10,001 - 17,500
- 17,501 - 25,000



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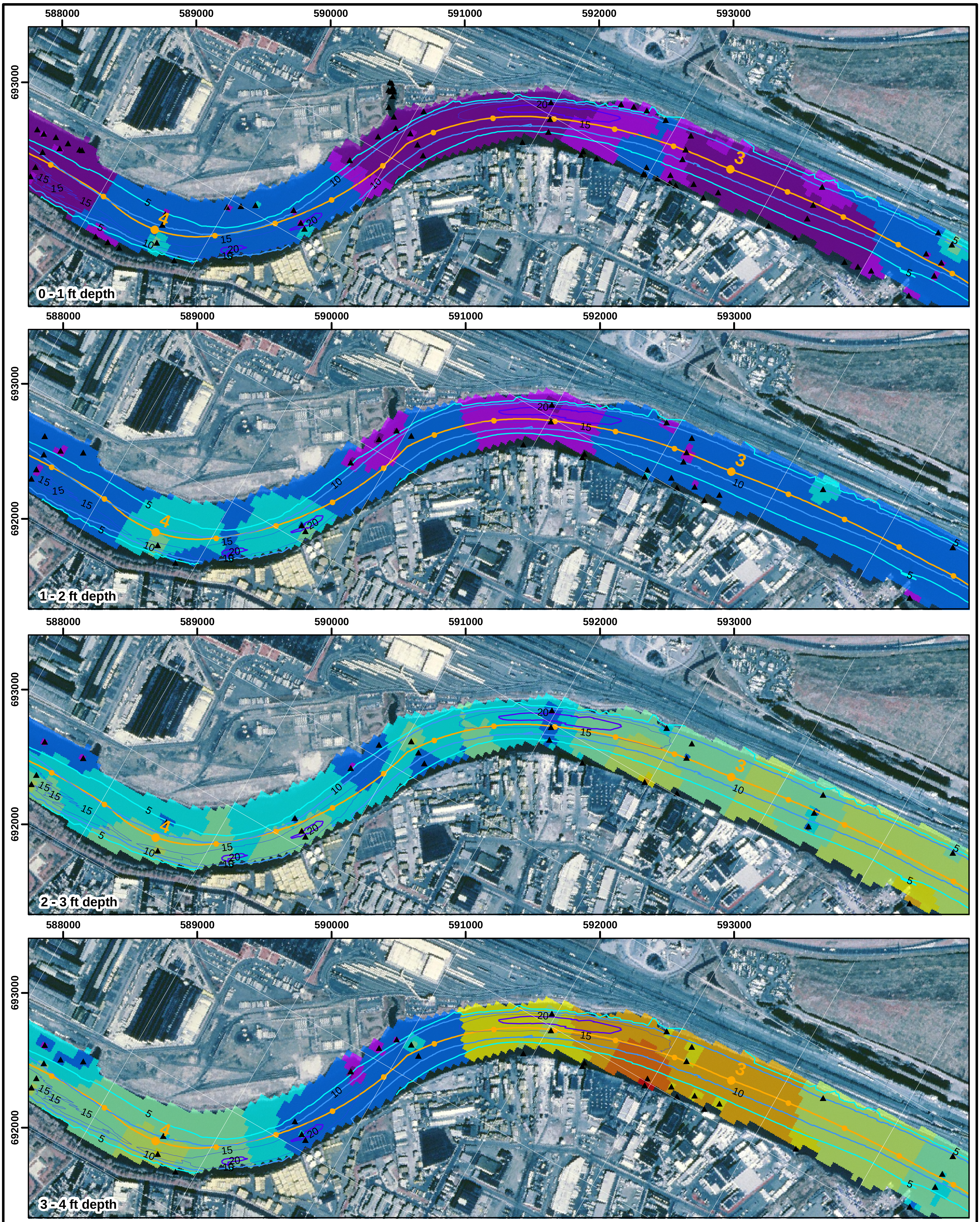
AN EARTH TECH COMPANY

Map Document: (S:\Projects\0285924\Maps_3473003_TAMS\MapDocuments\HarrisonReach_Mercury_SampleLocations_depth.mxd)
11/12/2003 -- 10:43:51 AM

FIGURE 2-7b
MILE 2.7 - 4.1: HARRISON REACH
MERCURY SEDIMENT DATA 0-4'



0 400 800 1,600 Feet

1 inch equals 800 feet

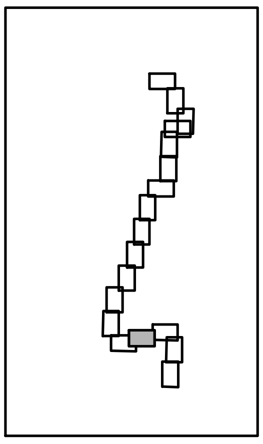
Legend

▲ Dioxin Sample Locations

Passaic River Centerline
- 1-Mile segment
- 1/10-Mile segment

Bathymetry (ft below MLW)
- 5
- 10
- 15
- 20
- 25
- 30

Dioxin (ug/Kg)
- 0.0 - 0.5
- 0.6 - 1
- 1.1 - 3
- 3.1 - 5
- 5.1 - 10
- 10.1 - 30
- 30.1 - 50
- 50.1 - 100
- 100.1 - 300
- 300.1 - 600



Notes:
1. Sediment data from Terra Solutions, Inc. database Version 4.
2. Digital orthophotography acquired from the NJDEP.
3. Bathymetry - Contours based on 2002 survey by NY District Corps of Engineers.
4. Samples interpolated with inverse distance weighting.
5. Map Projection: New Jersey State Plane Feet NAD83.

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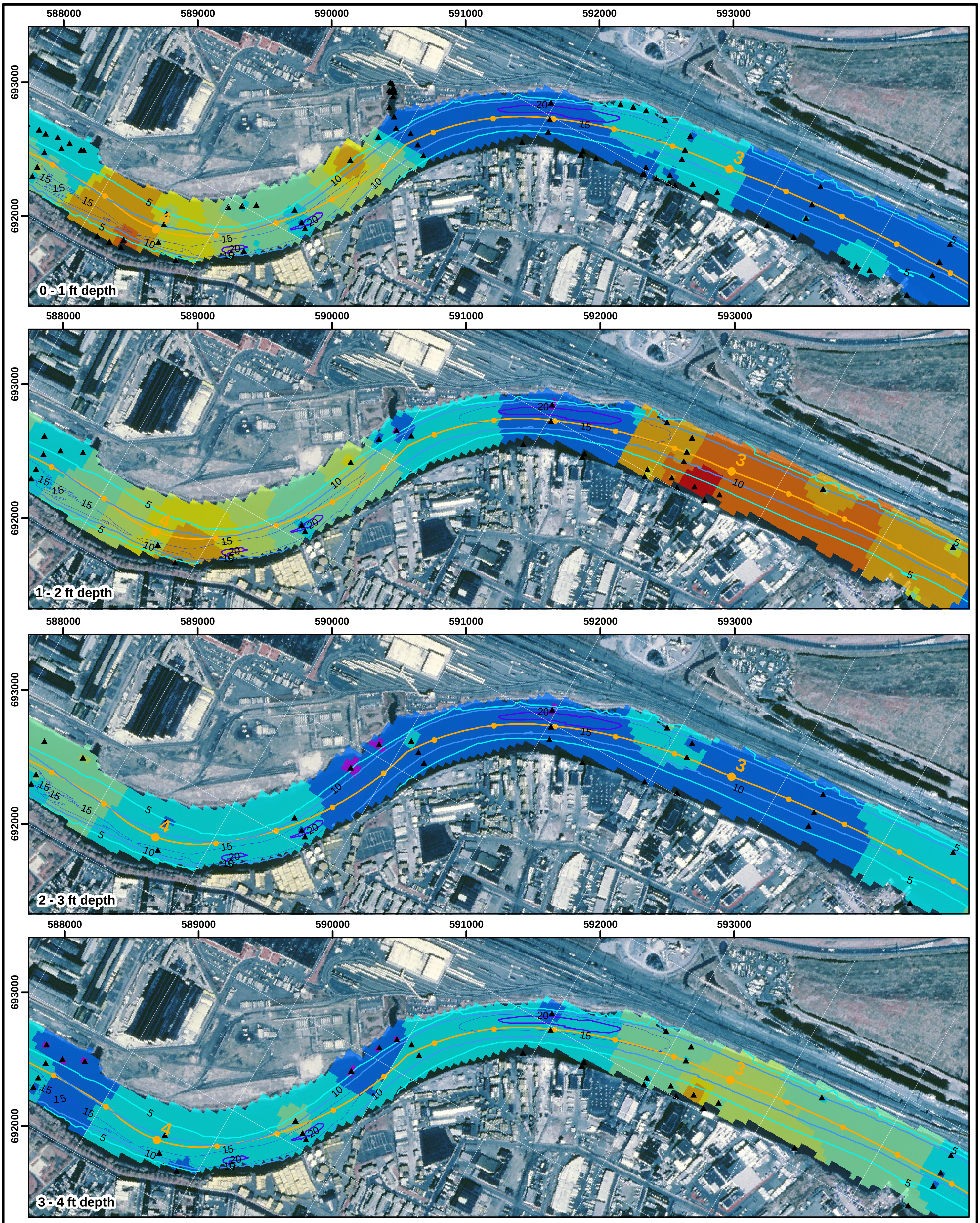
Map Document: (S:\Projects\0285924\Maps_3473003_TAMS\MapDocuments\HarrisonReach_Dioxin_SampleLocations_depth.mxd)
11/12/2003 -- 10:43:39 AM

FIGURE 2-7c
MILE 2.7 - 4.1: HARRISON REACH
2,3,7,8-TCDD SEDIMENT DATA 0-4'



N

0 400 800 1,600 2,400 Feet

1 inch equals 800 feet

Notes:
1. Sediment data from Terra Solutions, Inc. database Version 4.
2. Digital orthophotography acquired from the NJDEP.
3. Bathymetry - Contours based on 2002 survey by NY District Corps of Engineers.
4. Samples interpolated with inverse distance weighting.
5. Map Projection: New Jersey State Plane Feet NAD83.

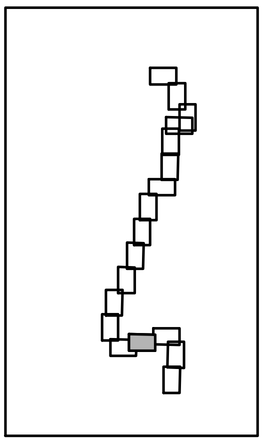
Legend

▲ Total PAH Sample Locations

Passaic River Centerline
- 1-Mile segment
- 1/10-Mile segment

Bathymetry (ft below MLW)
- 5
- 10
- 15
- 20
- 25
- 30

Total PAH (ug/Kg)
- 0 - 1,000
- 1,001 - 10,000
- 10,001 - 25,000
- 25,001 - 50,000
- 50,001 - 100,000
- 100,001 - 150,000
- 150,001 - 200,000
- 200,001 - 500,000
- 500,001 - 1,000,000
- 1,000,001 - 3,735,000



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TAMS
AN EARTH TECH COMPANY

Map Document: (S:\Projects\0285924\Maps_3473003_TAMS\MapDocuments\HarrisonReach_TotalPAH_SampleLocations_depth.mxd)
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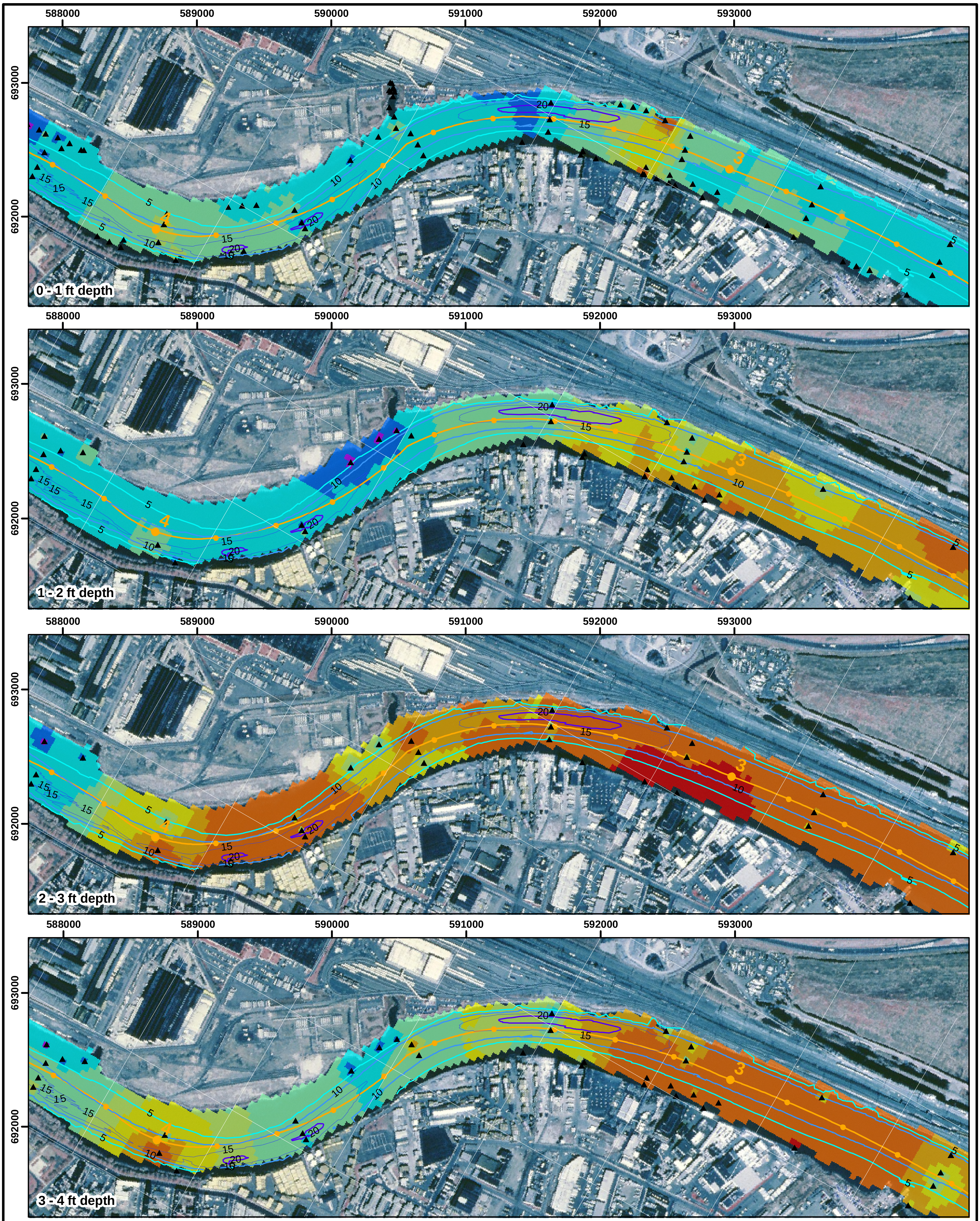
FIGURE 2-7d
MILE 2.7 - 4.1: HARRISON REACH
TOTAL PAHs SEDIMENT DATA 0-4'



N

0 400 800 1,600 2,400 Feet

1 inch equals 800 feet

Legend

▲ Total DDT Sample Locations

Passaic River Centerline

1-Mile segment

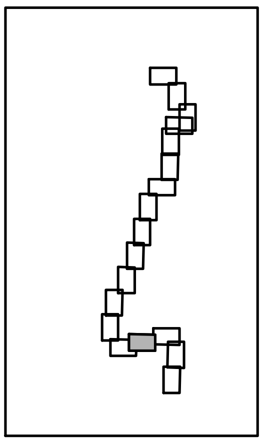
1/10-Mile segment

Bathymetry (ft below MLW)

- 5
- 10
- 15
- 20
- 25
- 30

Total DDT (ug/Kg)

- 0 - 10
- 11 - 50
- 51 - 100
- 101 - 200
- 201 - 400
- 401 - 600
- 601 - 800
- 801 - 1,000
- 1,001 - 5,000
- 5,001 - 16,500



Notes:
1. Sediment data from Terra Solutions, Inc. database Version 4.
2. Digital orthophotography acquired from the NJDEP.
3. Bathymetry - Contours based on 2002 survey by NY District Corps of Engineers.
4. Samples interpolated with inverse distance weighting.
5. Map Projection: New Jersey State Plane Feet NAD83.

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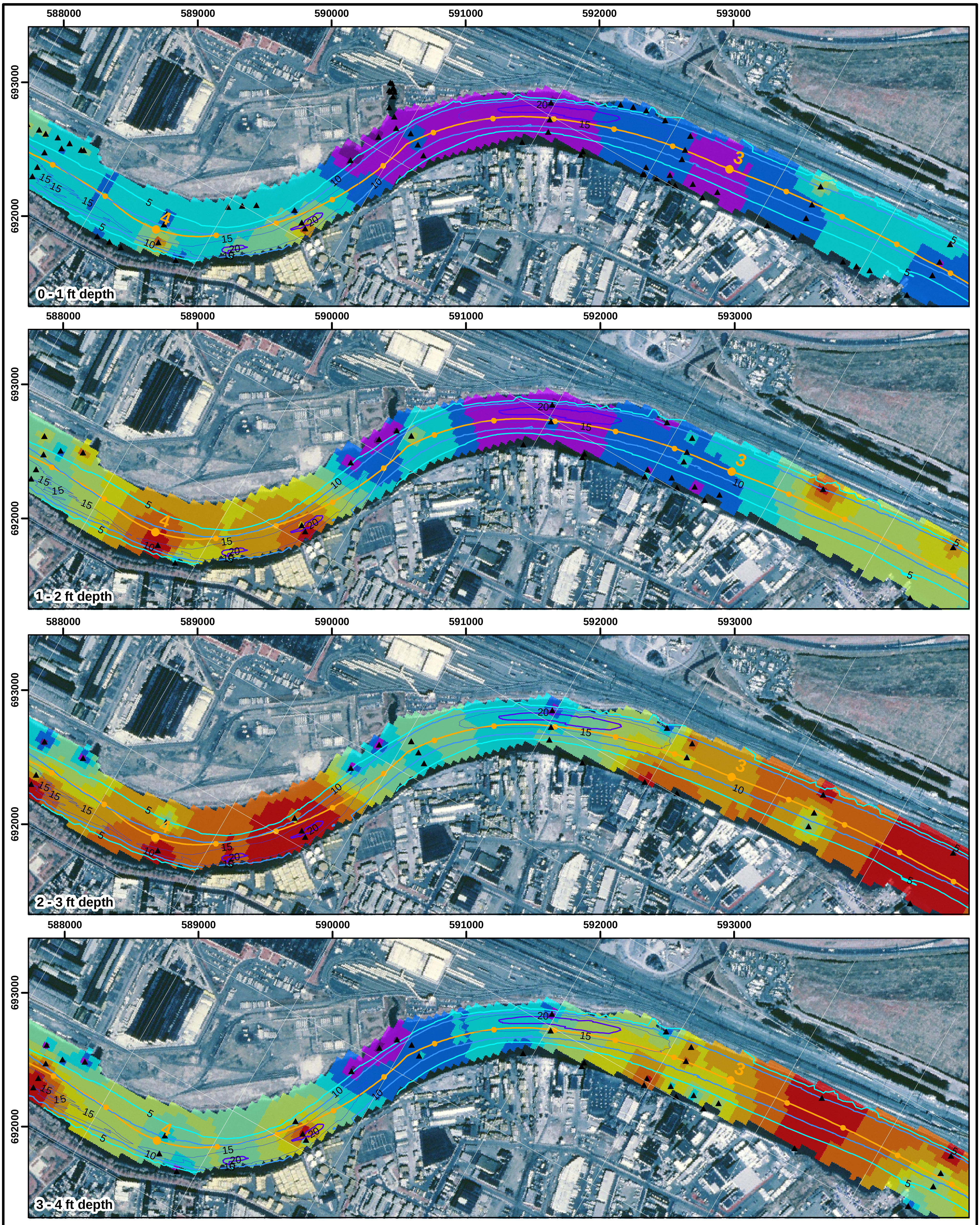
TAMS
AN EARTH TECH COMPANY

Map Document: (S:\Projects\0285924\Maps_3473003_TAMS\MapDocuments\HarrisonReach_TotalDDT_SampleLocations_depth.mxd)
11/12/2003 -- 11:15:02 AM

FIGURE 2-7e
MILE 2.7 - 4.1: HARRISON REACH
TOTAL DDT SEDIMENT DATA 0-4'



N

0 400 800 1,600 2,400 Feet

1 inch equals 800 feet

Legend

▲ Total PCB (Congener) Sample Locations

Passaic River Centerline

1-Mile segment

1/10-Mile segment

Bathymetry (ft below MLW)

- 5
- 10
- 15
- 20
- 25
- 30

Total PCB (ug/Kg)

- 0 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- 201 - 250
- 251 - 300
- 301 - 350
- 351 - 400
- 401 - 500
- 501 - 3,500

Notes:
1. Sediment data from Terra Solutions, Inc. database Version 4.
2. Digital orthophotography acquired from the NJDEP.
3. Bathymetry - Contours based on 2002 survey by NY District Corps of Engineers.
4. Samples interpolated with inverse distance weighting.
5. Map Projection: New Jersey State Plane Feet NAD83.

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TAMS

Map Document: (S:\Projects\0285924\Maps_3473003_TAMS\MapDocuments\HarrisonReach_TotalPCB_SampleLocations_depth.mxd)
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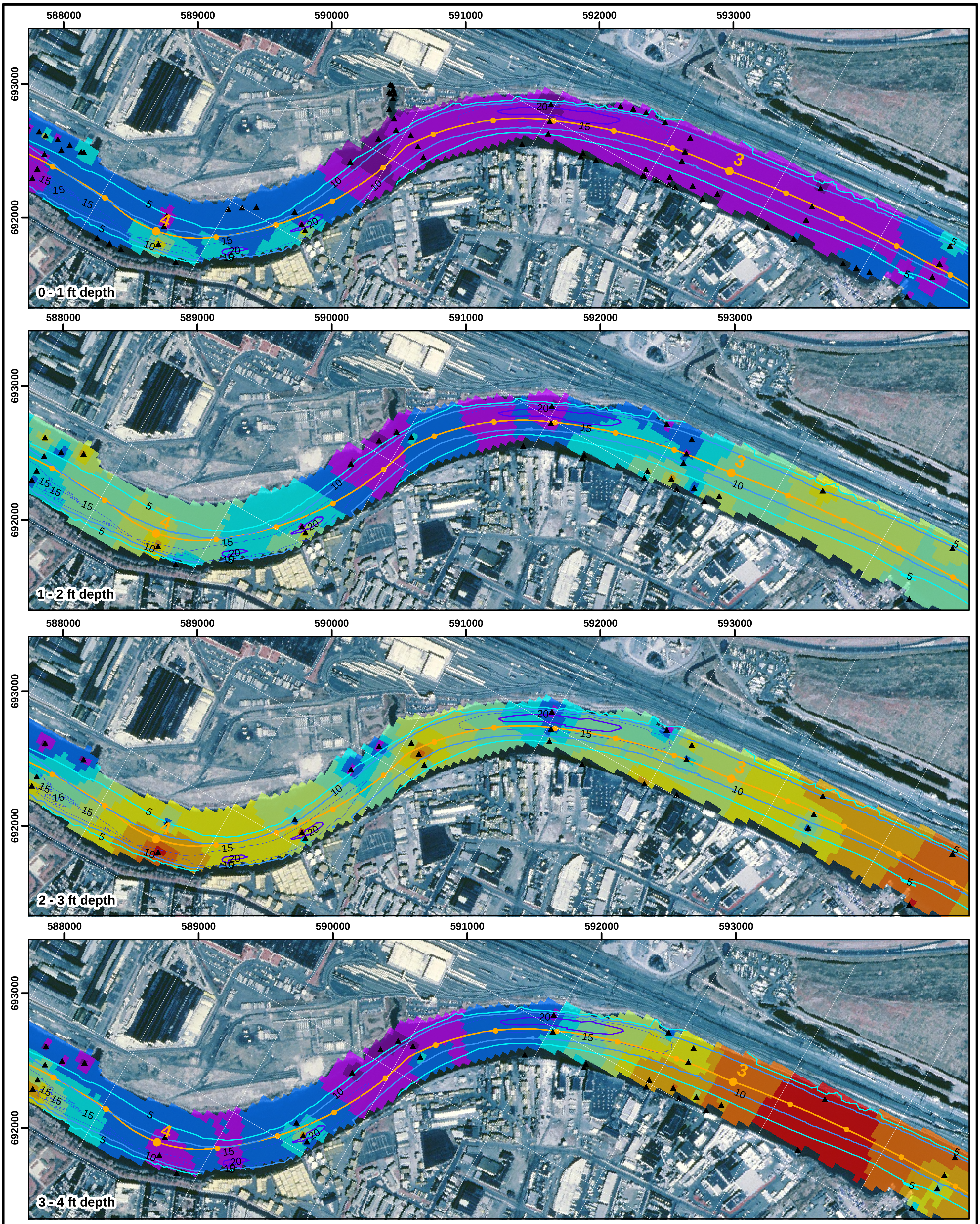
FIGURE 2-7f
MILE 2.7 - 4.1: HARRISON REACH
TOTAL PCB (Coplanar Congeners) SEDIMENT DATA 0-4'



N

0 400 800 1,600 2,400 Feet

1 inch equals 800 feet

Legend

▲ Total PCB (Aroclors) Sample Locations

Passaic River Centerline
- 1-Mile segment
- 1/10-Mile segment

Bathymetry (ft below MLW)
- 5
- 10
- 15
- 20
- 25
- 30

Total PCB (ug/Kg)
- 0 - 500
- 501 - 1,000
- 1,001 - 1,500
- 1,501 - 2,000
- 2,001 - 2,500
- 2,501 - 3,000
- 3,001 - 4,000
- 4,001 - 6,000
- 6,001 - 10,000
- 10,001 - 36,000

Notes:
1. Sediment data from Terra Solutions, Inc. database Version 4.
2. Digital orthophotography acquired from the NJDEP.
3. Bathymetry - Contours based on 2002 survey by NY District Corps of Engineers.
4. Samples interpolated with inverse distance weighting.
5. Map Projection: New Jersey State Plane Feet NAD83.

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Map Document: (S:\Projects\0285924\Maps_3473003_TAMS\MapDocuments\HarrisonReach_TotalPCB_SampleLocations_depth.mxd)
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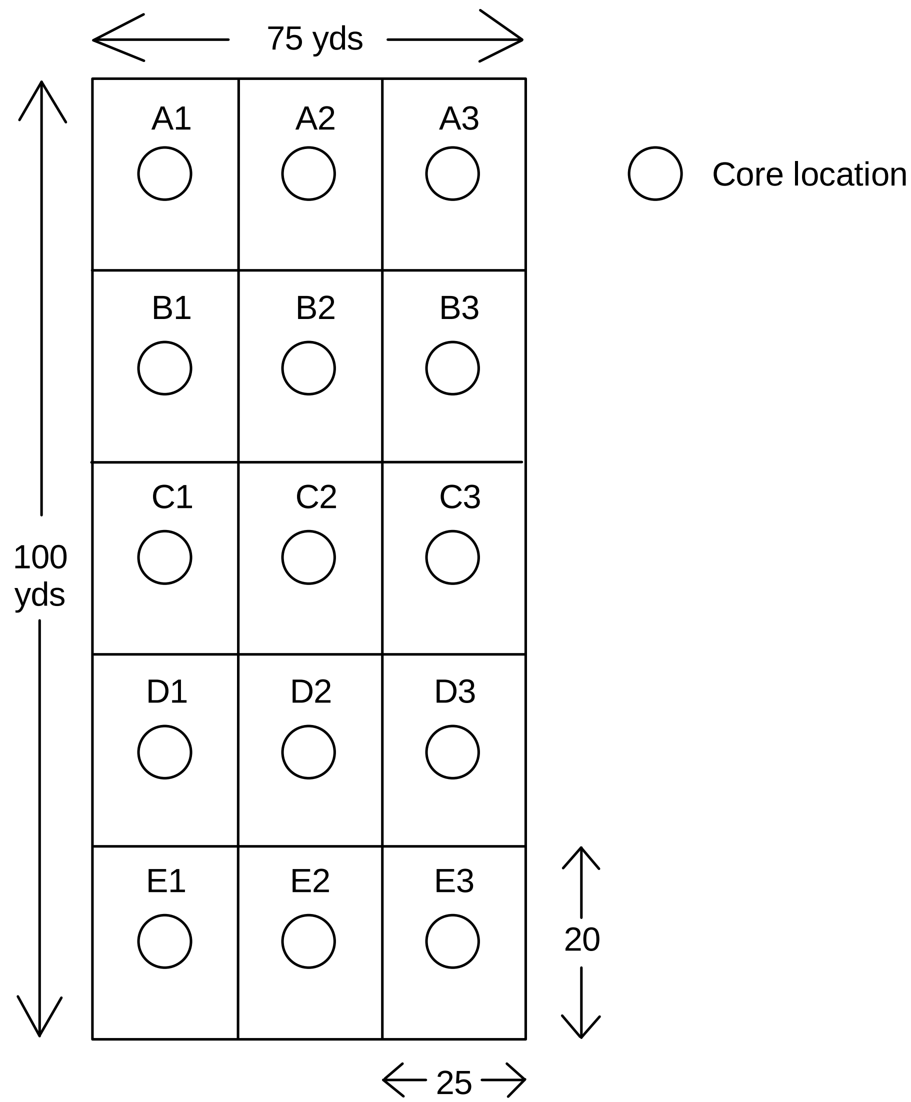
FIGURE 2-7g
MILE 2.7 - 4.1: HARRISON REACH
TOTAL PCB (Aroclors) SEDIMENT DATA 0-4'

Sediment Coring Grid



Core Nomenclature

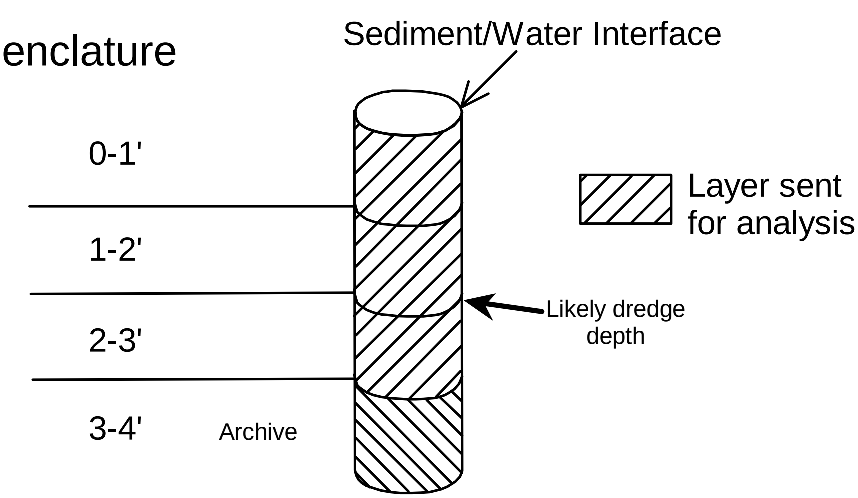


Figure 4-1. Sediment Coring Grid

LEGEND

- Sediment coring grid
- River centerline
- Shoreline construction
- Wreck point
- Pilot study survey area

TAMS, an Earth Tech Company

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Lower Passaic River Restoration Project

Figure 4-2

Potential Dredging Area and Sediment Coring Locations

REVISED

GEOPHYSICAL SURVEYS AND SEDIMENT CORING QUALITY ASSURANCE PROJECT PLAN

ENVIRONMENTAL DREDGING AND SEDIMENT DECONTAMINATION TECHNOLOGY DEMONSTRATION PILOT STUDY
LOWER PASSAIC RIVER RESTORATION PROJECT

JULY 12, 2004
(Revision 2)

A. PROJECT MANAGEMENT

A1. TITLE PAGE AND APPROVALS

QUALITY ASSURANCE PROJECT PLAN FOR GEOPHYSICAL SURVEYS AND SEDIMENT CORING.

LISA BARON PROJECT MANAGER NJDOT OFFICE OF MARITIME RESOURCES	DATE
MAHEYAR BILIMORIA, PHD PROJECT MANAGER TAMS/ EARTHTECH, INC.	DATE
ALLEN BURTON QA PROGRAM MANAGER TAMS/EARTHTECH,INC.	DATE

Lower Passaic River
Environmental Dredging and Sediment Decontamination Technology
Demonstration Pilot Study
Quality Assurance Project Plan
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APPENDICES

A3 Distribution List

Name	Agency or Company
Lisa Baron	NJDOT-OMR
Alice Yeh	EPA Region 2
Eric Stern	EPA Region 2
Thomas Shea	USACE-NYD
Mike Thiagaram	TAMS/ET
Maheyar Bilimoria	TAMS/ET
Ed Garvey	TAMS/ET
Allen Burton	TAMS/ET
John Szeligowski	TAMS/ET
Scott Thompson	MPI
James Todd	ASI
Project File 72207	TAMS/ET

A4 Project/Task Organization

An organization chart with the anticipated personnel is provided in Figure A-1.

A4.1 Project Management

Project Manager – Maheyar R. Bilimoria (TAMS/ET)

Responsibilities and duties of the Project Manager include the following:

- define project objectives and establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task;
- review and analyze overall task performance with respect to planned requirements and authorizations;
- approve reports prior to their submission to NJDOT-OMR, USEPA Region 2, and USACE; and
- represent TAMS/ET and the project team at public meetings.

Technical Advisor (Resuspension) – Edward Garvey (TAMS/ET)

Responsibilities and duties of the Technical Advisor include the following:

- Assist Project Manager in defining technical project objectives related to Sediment Resuspension and recommend procedures to address the specific technical needs of the project;
- review reports prior to their submission to NJDOT-OMR, USEPA Region 2, and USACE; and
- support the TAMS/ET Project Manager at public meetings as required.

Technical Advisor (Dredging) – John Szeligowski (TAMS/ET)

Responsibilities and duties of the Technical Advisor include the following:

- Assist Project Manager in defining technical project objectives related to Sediment Dredging and recommend procedures to address the specific technical needs of the project;
- review reports prior to their submission to NJDOT-OMR, USEPA Region 2, and USACE; and
- support the TAMS/ET Project Manager at public meetings as required.

Subcontractor Project Manager – Scott Thompson (MPI)

The MPI Project Manager is directly responsible for activities performed by MPI personnel associated with the project. Other responsibilities include:

- Provide overall direction and management of MPI activities as defined in the QAPP;
- provide QA management of all aspects of the project within the responsibility of MPI;
- final review of all documents prepared by MPI.

Subcontractor Project Manager – James Nickels (ASI)

The ASI Project Manager is directly responsible for activities performed by ASI personnel associated with the project. Other responsibilities include:

- Provide overall direction and management of ASI activities as defined in the Geophysical Surveys Work Plan (Appendix A)
- provide QA management of all aspects of the project within the responsibility of ASI;
- final review of all documents prepared by ASI; including ASI's work plan, SSHP, and coring SOPs.

QA Program Manager – Allen Burton (TAMS/ET)

The QA Program Manager will oversee the quality assurance aspects of the project. Specific responsibilities include:

- Preparation of the QAPP;
- review data quality objectives, set assessment criteria and conduct assessments to determine compliance;
- Identification of appropriate analytical methodologies to generate the data to achieve the data quality objectives (DQOs);
- Establish the documentation, tracking, and sample shipping requirements for the various commercial and USEPA laboratories (DESA and CLP) receiving samples, and (in association with the site sample coordinator) verify that the field team is adequately trained and familiar with these requirements;
- oversight of data verification and validation (as the current scope calls for USEPA to be responsible for the data validation, this task will consist mostly of tracking and compiling the validation performed by USEPA's staff or contractor);
- coordinate analytical laboratory schedules;
- maintain the QAPP.

Field Team Leader – Muhammad Akbar (TAMS/ET)

Field activities on the boat and on shore will be managed by the Overall Field Team Leader. Responsibilities include:

- manage field staff;
- supervise Site Coordinator and Sample Collection Coordinator;
- coordinate sample collection and field sample processing schedules;
- coordinate and manage the coring subcontractors;
- monitor program progress relative to schedule and determine corrective actions necessary to maintain schedule;
- review/approve the type of field equipment used and verify that procedures are followed to achieve the DQOs;
- review field notebooks/logs with respect to completeness, consistency, and accuracy; and

- prepare routine progress reports, including a summary of field activities and field audit results.

<u>Site Coordinator and Sample Collection Coordinator – Celeste Foster (TAMS/ET)</u>

The Site Coordinator are responsible for day-to-day supervision of site activities. Specific responsibilities include:

- Primary contact with Agency oversight team;
- oversee field laboratory activities, including field data log in, TR/COC generation (including Forms II Lite-generated documentation), core segmentation, sample labeling, cooler packing;
- coordinate sample collection and field laboratory schedules; and
- report deviations from protocol to the Field Team Leader.

<u>Site Health and Safety Manager – F. Christopher Purkiss (TAMS/ET)</u>

The Site Health and Safety Manager is responsible for establishing and monitoring compliance with the Site Safety and Health Plan (SSHP) and OSHA standards (29 CFR 1910.120) for the overall field project (both ship- and shore-based). Specific responsibilities include:

- Establish and monitor compliance with SSHP procedures during performance of field work activities;
- Conduct daily health and safety/subcontractor coordination meetings;
- report deviations from SSHP to Project Manager

<u>Site Health and Safety Coordinator (Shore-based) – Daria Navon (MPI)</u>

The Site Health and Safety Coordinator is responsible for compliance with the SSHP and OSHA standards (29 CFR 1910.120) regarding Health and Safety concerns for the project team on the land based staging/core processing area. Specific responsibilities include:

- Maintain compliance with the SSHP procedures during performance of field work activities;
- Jointly conduct daily health and safety/subcontractor coordination meetings;
- report any deviations from SSHP to Site Coordinator

<u>Site Health and Safety Coordinator (Ship-based) – Mark Padover (ASI)</u>

The Site Health and Safety Coordinator is responsible for compliance with the SSHP and OSHA standards (29 CFR 1910.120) regarding Health and Safety concerns for project team on the water and in the R/V Delaware or other ASI vessel. Specific responsibilities include:

- Maintain compliance with SSHP procedures during performance of field work activities;
- Jointly conduct daily health and safety/subcontractor coordination meetings; report deviations from SSHP to Site Coordinator

A4.2 Project Execution

Geophysical Surveys
TAMS Consultants Inc.
Aqua Survey, Inc.

TAMS/ET will provide oversight to ASI staff conducting bathymetric surveys and side-scan sonar (SSS) surveys. ASI responsibilities include:

- Conduct measurements of water depth at the project site in the Harrison Reach of the Lower Passaic River
- Conduct side-scan sonar survey at the project site in the Harrison Reach of the Lower Passaic River
- Conduct tests of acoustic and electromagnetic surveying equipment according to the manufacturers' guidelines
- Maintain field logs; and
- Perform a daily check of the Global Positioning System (GPS) by checking a point with known coordinates.

Sediment Core Collection
Aqua Survey, Inc.

The field personnel conducting sediment core collection have the following responsibilities:

- Collect core samples at pre-determined sites and maintain field logs;
- Perform a daily check of the Global Positioning System (GPS) by checking a point with known coordinates; and
- Deliver field logs and sediment cores to land based staging/core processing area throughout each of three days in the field.

Sediment Core Processing (Land-Based Processing Area)
TAMS Consultants Inc.
Malcolm Pirnie Inc.

TAMS/ET and MPI will process the sediment cores (with limited assistance from ASI, if necessary). Specific responsibilities of the personnel processing cores include:

- enter field notes into electronic database;
- section sediment cores;
- homogenize core sections;
- place samples of homogenized sediment in sample containers;
- prepare sample containers for shipping; and
- maintain chain of custody documentation.

Project QA/QC Officer

The Project QA/QC officer has the following responsibilities:

- Receipt of data packages from laboratories;
- review laboratory data packages;
- coordinate field QA/QC activities with Field Team Leader;
- review field reports;
- review audit reports;
- prepare interim Quality Assurance Reviews; and
- prepare final Quality Assurance Reviews.

Analytical Measurements on Sediment Samples

To the extent feasible, analytical work for this project will be arranged through the USEPA Contract Laboratory Program (CLP); or through other USEPA-coordinated laboratories (e.g., the DESA laboratory in Edison, NJ). Some of the more specialized, non-routine analyses will need to be subcontracted outside of the USEPA/CLP system. These analyses include herbicides and ASTM method analyses being conducted for assessment of specific technologies.

The specific analyses that the analytical laboratories will perform are identified in Section B4. In general, it is anticipated that the analytical laboratories utilized will include the following (note that it is likely that three different CLP laboratories will be used):

- CLP – Inorganic analyses laboratory. Metals analyses (CLP SOW ILM05.3)
- CLP – Organic analyses laboratory (routine analyses). VOCs, SVOCs, and pesticides/PCBs (CLP SOW OLM04.3)
- CLP – High resolution analyses. Dioxins/Furans (CLP DLM01.4) and PCB congeners (USEPA Method 1668A)
- USEPA Region 2 DESA Laboratory. Total organic carbon (TOC; Lloyd Kahn method, 1988) and grain size analyses (ASTM D422 and D1140)
- Commercial laboratory (Severn Trent Laboratories [STL]-Burlington, Vt). Herbicides (2,4-D and 2,4,5-T by SW-846 Method 8151) and other vendor-requested and miscellaneous methods (ASTM and Standard Methods).

Responsibilities and duties of the analytical laboratories include the following:

- Perform the specified analytical procedures;
- report the data to TAMS/ET (contract-required USEPA contact for CLP laboratories) and the database manager (MPI) in the required format and within required turnaround times; and
- Conformance with the protocols in the QAPP and specified analytical method, and contact the QA Program Manager prior to any protocol deviations.

Coordination of Analytical Laboratories
TAMS Consultants Inc. (for commercial analyses [STL])
USEPA Region 2 (for CLP or other USEPA-arranged analyses)

Responsibilities include:

- Coordination with the analytical laboratories;
- Monitor the progress of the analytical work, including preliminary, electronic, and hard copy final deliverables;
- resolve laboratory questions/concerns regarding analytical or deliverable requirements.

Data Production and Database Development and Maintenance
TAMS Consultants Inc.
Malcolm Pirnie Inc.

TAMS/ET will provide oversight of the production of data tables and maps that will be prepared by MPI resulting from this field effort. MPI is the Database Manager for the overall Lower Passaic River Restoration Project. Responsibilities include:

- Electronic QA checks on data packages;
- electronic data verification;
- population of the project database;
- QA checks on database; and
- distribution of database.

Data Quality Review and Validation

Validation of CLP and other analyses performed by or through USEPA will be performed by the Environmental Services Assistance Team (ESAT) (USEPA Region 2), Edison NJ. USEPA Region 2 SOPs will be utilized for data validation (see further discussion in Section D.2 of this QAPP), regardless of whether the chemical analytical data analysis is performed by a CLP laboratory or a subcontract laboratory. There is no Region 2 SOP currently available for validation of PCB congener data (USEPA Method 1668A); other available agency guidelines will be used for validation of those data (see D.2). USEPA Region 2 will be requested to perform the validation of the STL-generated herbicide data.

Analyses performed by the Region 2 DESA laboratory are validated internally and do not require third-party validation.

Based on the data quality objectives, full validation is not necessary for the ASTM-type analyses; rather, a less rigorous data quality review will be conducted for these analyses. Such review will include verification that the samples were analyzed by the requested method, and the important protocols specified by the method were followed (to the extent that the required deliverables allow such review). An individual familiar with the site and the method will also check that the reported results are reasonable, and method-required QC is within acceptable limits.

Responsibilities include:

- Validate data on a timely basis to facilitate incorporation of qualifiers into the database.
- Identification of any data which have limited usability or which are unusable for their intended purpose.

A5 Problem Statement and Background

The Passaic River drains a 935 square mile watershed, located in northern New Jersey and southern New York states. Downstream of Dundee Dam (Garfield, NJ) the Lower Passaic River is a tidal estuary with a connection to New York Harbor via Newark Bay. All or portions of 117 municipalities in eight New Jersey counties, and 15 municipalities in two New York counties are located within the Passaic watershed (see Figure A-2).

Lower Passaic River sediments are contaminated with a variety of hazardous and toxic substances including dioxins/furans, PCBs, pesticides, petroleum hydrocarbon, polynuclear aromatic hydrocarbons (PAHs), and metals. As a result of the presence of these contaminants in River sediments, the New Jersey Department of Environmental Protection (NJDEP) has instituted a ‘do not eat’ advisory/prohibition for both fish and shellfish that inhabit the Passaic.

In 1994, Occidental Chemical Company (OCC) entered into an Administrative Order on Consent with the United States Environmental Protection Agency (USEPA). Chemical Land Holdings (CLH), on behalf of OCC, designed and executed a RI/FS work plan, which addressed the contaminated sediments of the Lower Passaic River in the vicinity of the former OCC facility in Newark, New Jersey. The RI/FS primarily focused on the six-mile reach of river extending upstream from the abandoned ConRail Railroad Bridge; that area has been designated the Passaic River Study Area (PRSA).

The contaminated sediments underlying the Lower Passaic River are of concern to various federal and state regulatory agencies because they can induce a number of negative consequences in the following areas:

- ecological health effects;
- human health effects; and
- economic impacts on navigational dredging disposal costs.

As water quality, sediment quality and biological data from the RI/FS have become available, the scientific understanding of the Passaic River system has evolved and the potential importance of the inter-relationship of the 11 miles of the Lower Passaic River upstream of the PRSA and Hackensack River-Newark Bay system has become apparent. During the summer of 2001, the USACE NY District completed a reconnaissance survey of the Lower Passaic River as part of their Hudson-Raritan Estuary Restoration Initiative. A national Memorandum of Understanding between USEPA and USACE was signed in July, 2002.

NJDOT, USEPA and USACE, recognizing the importance of the Lower Passaic River as an integral component of the Passaic - Hackensack - Newark Bay complex, has committed to better understand this system. USACE, USEPA Region 2, and NJDOT-OMR completed a Lower Passaic River Remediation and Ecosystem Restoration Project Management Plan (PMP) in April, 2003. The most significant potential benefit of addressing the environmental concerns facing the Lower Passaic River via a unified watershed approach is that the primary contaminants of concern can be addressed more effectively. Additionally, the joint effort will supplement the existing PRSA RI/FS database (which includes data compiled by USEPA and Tierra) to which the data collected via the New York - New Jersey Harbor Estuary Programs (HEP) Contaminant Assessment Reduction Project (CARP) will be subsequently added.

These Project Plans for Geophysical Surveys and Sediment Coring for the Lower Passaic River Restoration Project have been prepared by TAMS Consultants, Inc., an Earth Tech Company (TAMS/ET), and Malcolm Pirnie Inc. (MPI) for the New Jersey Department of Transportation – Office of Maritime Resources as authorized under NJDOT Agreement No. 2001-NJMR02 Task Order #OMR-03-6. The purpose of this task is to conduct a Hydrographic Survey, Side Scan Sonar Survey, and Sediment Coring in order to perform a detailed characterization of the Pilot Study Area for the Environmental Dredging Demonstration and Sediment Decontamination Technology Demonstration – Treatability Study.

It is important to note that this QAPP and the associated work plan cover only the initial sediment coring program and hydrographic survey, planned for spring/summer 2004. This work is part of the Lower Passaic River Investigation and Feasibility Study, a joint effort of Federal and State Agencies to remediate and restore the Lower Passaic River Basin. The purpose of the overall Feasibility Study is to develop a comprehensive watershed-based plan for the remediation and restoration of the Lower Passaic River. Separate plans will be developed and submitted later for the pilot-scale demonstration project (currently planned for 2005), in which approximately 5,000 cubic yards of contaminated sediment will be dredged from the Harrison Reach (see Figure A-3) of the Passaic River.

The implementation of two geophysical surveys (hydrographic and side-scan sonar) and a sediment coring program is covered in these plans. The objective of the hydrographic survey is to develop a bathymetric map of the Passaic River bed along a 1,000-foot stretch in the Harrison Reach between the Jackson Street bridge and the New Jersey Turnpike bridge (hereinafter referred to as the Pilot Study Survey Area). The objective of the side scan sonar survey is to characterize the texture of the sediments and to identify any debris in the Pilot Study Survey Area. The work area for these surveys encompasses the entire river bottom to the mean low water mark (MLW) along each shoreline (see Figure A-3). Based on the result of the hydrographic and side scan sonar surveys, TAMS/ET and MPI will select a 1.5-acre work area (referred to as the potential Dredging Area) for the collection of sediment cores in conjunction with NJDOT-OMR, USEPA, and USACE. The goal of the sediment coring effort is to perform a representative chemical and geotechnical characterization of the sediments in the upper three to four feet of the Passaic River bed in the potential Dredging Area. This information will then be utilized to support the objectives of the combined dredging and sediment decontamination demonstration project.

The project plans for the geophysical surveys (hydrographic and side-scan sonar) and sediment coring in this report explain the details of how the work will be performed and evaluated and include a work plan, a quality assurance project plan which addresses field sampling procedures (i.e., this document), and a health and safety plan. This report is the second of several reports that will be prepared by TAMS/ET and MPI as part of this demonstration project.

Subsequent to the completion of the sediment coring and hydrographic surveys (covered by these plans), a dredging demonstration project (not within the scope of this QAPP or associated work plan) will be conducted to show that Passaic River sediments can be successfully dredged and to collect data on the resuspension production rate, the resuspension release rate, and the resuspension export rate and perform a mass balance. In addition, equipment performance, dredging production rates, turbidity levels, and engineering controls will be evaluated. The work plans for the dredging demonstration project, including the necessary sampling and analytical data, will be developed later as a separate document.

The objective of the sediment decontamination demonstration project is to show that Passaic River sediments, contaminated with dioxins, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals, pesticides, herbicides, and other contaminants can be successfully treated to meet applicable New Jersey Department of Environmental Protection (NJDEP) criteria, collect data to perform a mass balance and determine the economic viability of the treatment process. Although final treatment criteria have not been established, the likely most stringent criteria to be met are the New Jersey Residential Direct Contact Soil Criteria. The analytical methodologies selected will have sufficient sensitivity to meet these criteria for the analytes of interest in the sediment coring program; the data generated from the bench scale vendor testing (i.e., on the 60 gallon treatability study composite collected as part of this sediment coring program) will be utilized in the development of the work plans for the larger-scale sediment decontamination demonstration project, tentatively scheduled for 2005. Plans and data requirements for the sediment decontamination demonstration project will be generated by each decontamination vendor participating in the project.

A6 Project/Task Description

A6.1 Description of Work to be Performed

The scope of work for this project includes:

- Conduct a hydrographic survey to develop a bathymetric map of the Passaic River bed along a 1,000-ft stretch in the Harrison Reach between the Jackson Street Bridge and the New Jersey Turnpike Bridge. The work area for this survey will encompass the entire river bottom to the mean low water mark (MLW) along each shoreline. This 1,000-ft bank-to-bank area is designated as the Pilot Study Survey Area (PSSA; refer to Figure A-3).

- Conduct a side scan sonar survey to characterize the texture of the sediments and to identify any debris in the PSSA (refer to Figure A-3). As part of the side scan sonar survey, sediment samples from the top 6 inches will be collected using a petite ponar for ground-truthing to help characterize the side scan sonar results. A field geologist will classify the samples, and five samples will be sent for grain-size analysis.

- Evaluate the results of the bathymetric and side scan sonar surveys to define the potential Dredging Area (a smaller area of about 225 ft [75 yd] by 300 ft [100 yd], approximately 1.5 acres; see Figure A-4) for sediment core collection. The survey drawings will illustrate the location and elevation of river-bottom contours at one-foot intervals referenced to the MLW.

- Collect sediment cores from each of the 15 cells (i.e., A1 through E5 as shown on Figure A-4) within the potential Dredging Area. Each core will be divided into four one-foot segments. The sediment samples from the upper three one-foot segments (i.e., 0-1 ft; 1-2 ft, and 2-3 ft) will be analyzed for some combination of geotechnical parameters (including grain size distribution, bulk density, Atterberg limits, moisture content, percent solids, total organic carbon and specific gravity) and chemical parameters (including dioxins, PCBs, PAHs, metals, pesticides, and herbicides). The fourth sample (3-4 ft) will be archived at the laboratory for possible future analysis. The details of the analytical program are discussed in Section B4.

- Generate 10 sediment composites from the coring program described above for chemical analysis. These ten samples will be generated from the top two intervals (0-1 ft and 1-2 ft) across each row (e.g., composites of cells A1, A2, and A3; as shown on figure A-4). For PCBs only (congeners and aroclors), composites will also be generated from the 2-3 ft interval of each row; so five additional samples (15 total) will be generated for congener and aroclor analysis.

- Collect equal amounts of sediment from the top two feet of each of the 15 cells within the potential Dredging Area. Homogenize these 15 samples to obtain a 60-gallon sediment composite sample that will be used by the vendors for bench scale tests. One sediment composite sample for analysis will be generated from this treatability study composite.

- Interpret and evaluate the data and prepare summary reports that document the work performed during the geophysical surveys and the sediment core collection effort. Assemble the survey results and sediment analysis data for use as baseline conditions for the dredging work to be performed.

A6.2 Schedule

The proposed study schedule is provided as Table A-1.

A7 Quality Objectives and Criteria

A7.1 Data Quality Objectives

The design and implementation of the Treatability Study requires the collection of the following information about conditions in the Harrison Reach of the Passaic River during this support task:

- the river hydrography in the Pilot Study Survey Area (PSSA) (1000-ft segment, bank-to-bank);
- the locations of obstacles to operation of dredging equipment in the PSSA;
- based on the review of the hydrography and presence of obstacles, identify horizontal and vertical boundaries for the potential Dredging Area (75 yd by 100 yd by 2 ft) for the Treatability Study;
- the geotechnical properties of the sediment in the potential Dredging Area that affect the choice of dredging equipment, dredging rate, and the transport, processing and treatment of dredged sediments;
- the geotechnical properties of the sediment in the potential Dredging Area that affect the resuspension production rate, the resuspension release rate, and the resuspension export rate;
- the concentration of contaminants in the potential Dredging Area that affect the resuspension production rate, the resuspension release rate, and the resuspension export rate;
- the concentration of contaminants in the potential Dredging Area that affect the transport, processing and treatment of dredged sediments;
- the geotechnical properties of sub-bottom sediments that would be uncovered by the dredging (i.e., the 2-3 ft interval); and
- the concentration of contaminants in sub-bottom sediments that would be uncovered by the dredging.

The field and analytical work described in this QAPP is designed to generate sufficient data of adequate quality to achieve these DQOs.

A7.2 PARCC and Sensitivity - Definitions and Equations

Data quality and quantity are measured by comparison of resulting data with established acceptable limits for data precision, accuracy, representativeness, comparability and completeness (PARCC) and sensitivity. Data outside PARCC/sensitivity QA objectives will be evaluated, according to Section B5 and the Quantitative Data Quality Objectives of this document, and the criteria contained in the specified analytical methods, to determine what, if any, aspects of the data can be defensibly used to meet the project objectives.

Data from previous sediment investigations in the Harrison Reach of the Passaic River, available on the PREmis database, were reviewed in order to evaluate the appropriate criteria for the data to be generated in the sediment coring program.

A7.2.1 Precision

Precision measures the reproducibility of data or measurements under specific conditions. Precision is a quantitative measure of the variability of a group of data compared to their average value. Duplicate precision is stated in terms of relative percent difference (RPD). Measurement of precision is dependent upon sampling technique and analytical method. Field duplicate and laboratory duplicate samples will be used to measure precision for project samples. Both sampling and analysis will be as consistent as possible. For a pair of measurements, RPD (or absolute difference; see Section B5.1) will be used, as presented below:

$$RPD(\%) = \frac{|D_1 - D_2|}{\left[\frac{(D_1 + D_2)}{2}\right]} \times 100$$

Where:

D_1 and D_2 = the two replicate values.

The upper limit for precision in sediment duplicates is 100 percent RPD (in accordance with USEPA Region 2 data validation criteria for inorganics) for analytes present at five times the sample quantitation limit. More detail on the implementation and evaluation of the precision criteria is presented in Section B5.1

A7.2.2 Accuracy

Accuracy measures the bias in a measurement system that may result from sampling or analytical error. Sources of error that may contribute to poor accuracy are laboratory error, sampling inconsistency, field or laboratory contamination, sample handling, and matrix interference.

Equipment blanks, as well as matrix spike QC samples and Laboratory Control Samples (LCSs), will be used to measure accuracy for project samples.

Matrix spike analysis is not required for the geotechnical methods nor for the vendor-requested parameters. Accuracy is calculated using the equation below:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

Where:

%R = % recovery
SSR = spike sample result
SR = sample result
SA = amount of spike added to sample

Accuracy goals are method, analysis, and laboratory-specific. Accuracy is assessed quantitatively. Accuracy criteria for CLP methods are specified in the applicable CLP statement of work (SOW). For methods, analytes, or samples which do not have criteria specified in the CLP SOW, a default goal of 70 to 130 percent recovery is established unless the laboratory has developed its own recovery criteria.

A7.2.3 Representativeness

Representativeness expresses the degree to which sample data represent the characteristics of the media or matrix from which they are collected. Samples that are considered representative are properly collected to accurately characterize the nature and extent of contamination at a general sample location. Representativeness also requires that a sufficient number of data points (samples and analyses) be obtained so that the variability of the matrix being sampled can be ascertained to the extent required by the project objectives. Representativeness will be achieved by using standardized collection methods (e.g., sampling, handling, and preserving) and laboratory analytical methods. Representativeness is assessed qualitatively.

A7.2.4 Comparability

Comparability expresses the confidence with which one data set can be compared with another data set from a different phase or from a different program. To achieve this, analytical methodologies used in this program are consistent with those used in previous investigations of the lower Passaic River (e.g., PCBs as aroclors). Where newer or more sophisticated methods are proposed (e.g., PCB congeners by USEPA method 1668A), the analyses are paired with analyses performed by the previous methodology so the comparability of the methods can be determined. Comparability is assessed qualitatively. For this program, the comparability of these two methods is being directly compared by analysis of 16 split samples by both methods (i.e., all the samples analyzed for PCB congeners are also being analyzed for PCBs as aroclors).

Water quality data has been generated for the Contaminant Assessment and Reduction Project (CARP) utilizing high-volume samples and sophisticated, highly sensitive analytical methodologies (e.g., HRGC/LRMS for PAH compounds). Review of the available sediment data, however, indicates that more conventional methods (e.g., standard GC/MS methods for PAHs) have adequate sensitivity to detect the anticipated concentrations of contaminants in samples collected from the project area, and as such will be comparable to the previously-generated sediment data.

A7.2.5 Completeness

Completeness is defined as the percentage of data that is judged to be valid to achieve the objectives of the investigation compared to the total amount of data. Deficiencies in the data may be due to sampling techniques, poor accuracy, precision, or laboratory error. While the deficiencies may affect certain aspects of the data, usable data may still be extracted from applicable samples. An evaluation of completeness necessarily involves an evaluation of the impact of missing data on the ability of the project to achieve its goals. The goal for completeness is 95 percent. The equation used for analytical completeness is presented below:

$$C(\%) = \frac{D \times 100}{P \times n}$$

Where:

- C = Completeness
- D = number of usable data points (includes both detections and non-detected results). Usable data are those with no qualifier; or with the U, J, or UJ qualifiers. (The ‘D’ flag, indicating a result from a dilution, is not considered a data quality qualifier; D-flagged data are also fully usable.)
- P = number of analytical parameters per sample requested for analysis (e.g., seven for PCB aroclors by the CLP SOW [as there are seven different aroclors which are reported by that method])
- n = number of samples requested for analysis

A7.2.6 Sensitivity

Sensitivity is defined as the ability to achieve the project-required reporting (quantitation) limits. Analytical methodologies are selected so that the target analytes will be detectable at the expected concentrations (based on review of historical sediment data for the Harrison Reach of the Passaic River) or at the concentrations of concern (e.g., regulatory thresholds). For a given analytical method, quantitation limits may be adversely affected by matrix interferences, such as those caused by high concentrations of non-target analytes (e.g., sulfur or high molecular weight organics), or trace impurities in analytical reagents concentrated to detectable amounts in the analytical process. To control interferences, the laboratory will perform sample and extract cleanups (e.g., to remove sulfur) and laboratory, only pesticide grade or better solvents will be used, and method blanks must be demonstrated to be free of contamination prior to analysis. (For a few common volatile and semivolatile laboratory contaminants, detectable concentrations of up to five times the sample reporting may be tolerated.)

In general, the methods selected for the sediment coring project have been selected so that the target analytes will be reported at detectable concentrations in about 90 percent of the samples (based on review of historical data from the 0 – 3 ft interval in the Harrison Reach). Review of the database indicates that herbicides have been detected infrequently (3 percent or less of the sediment samples in the Harrison Reach); the laboratory reporting limits for the target herbicides are similar to or lower than the values at which the historic non-detect data have been reported.

GC/MS methods allow the laboratory to screen samples prior to analysis, so that excessive levels of contaminants due not cause subsequent contamination problems in the laboratory (e.g., due to carryover, memory/ghost effects, and the like); if warranted by the screening, the initial analysis may be performed at a dilution (or use a smaller sample size), resulting in higher reporting limits for that sample. If a subsequent analysis is performed (due to one or more target analytes exceeding the calibration range), the laboratory will re-analyze the sample at an appropriate dilution factor, and report both results (diluted and undiluted) in the data package. Documentation of the screening performed to dilute the sample prior to the initial analysis shall also be provided by the laboratory and noted in the case narrative.

A8 Special Training/Certification

Field personnel will adhere to the procedures specified in the site-specific safety and health plan (SSHP), including having met the following requirements prior to the commencement of sampling:

A training course of at least 40 hours that meets the requirements specified in 29 CFR Part 1910.120(e) on safety and health at hazardous waste operations; and a refresher course of at least 8 hours that meets the requirements of 29 CFR Part 1910.120(e) on safety and health at hazardous waste operations within the last 12 months.

The Site Health and Safety Coordinator will be responsible for verifying that field personnel for each participating organization have current health and safety training prior to commencement of field sample collection activities (including the geophysical survey personnel). The health and safety training records will be maintained as discussed in the SSHP. As noted in the SSHP, personnel responsible for boat operations will have the required licenses and certifications.

No other specialized training is anticipated for this project. Field personnel performing sample collection and measurement activities will be properly trained in equipment use and procedures necessary for each task prior to entering the field. Each contractor/consultant will employ their internal processes/procedures for establishing that personnel are adequately experienced in the duties they are expected to carry out and are receiving any needed training. Training courses or workshops on specific equipment, techniques or procedures shall all be documented. The requirements of this QAPP will be reviewed by management and field personnel of each participating organization to ensure that persons with appropriate credential and experience are assigned to the tasks to be performed. It will be the responsibility of the Field Team Leader to verify that field personnel understand and comply with the applicable QAPP requirements for their individual tasks.

Personnel who are responsible for performing laboratory analyses will be properly trained by the laboratory director or designee to conduct the various laboratory analyses described in this QAPP. The laboratory(ies) participating in this project will have training programs that are equivalent to those requirements in the National Environmental Laboratory Accreditation Conference (NELAC/NELAP) standards, Section 5.0 Quality Systems, or other accreditation acceptable to USACE. The laboratory(ies) will have sufficient personnel with the necessary education, training, technical knowledge and experience for their assigned functions. Data verification and validation not performed by USEPA will be under the direction of the QA Program Manager who is experienced with the production, reporting, verification and validation of analytical data.

A9 Documentation and Records

This QAPP will be distributed to each of the agencies and contractors responsible in the collection, generation and interpretation of field and analytical data. The QA Program Manager will be responsible for verifying that necessary changes occur to keep the QAPP up to date with actual practices. The QA Program Manager will ensure that a distribution list of QAPP recipient organizations or individuals is maintained such that revisions and updates can be distributed. The document control format used in this QAPP will identify the QAPP revision number and revision date. A QAPP revision history will be maintained that identifies each revision and a summary of the revision. This revision history will be incorporated into this section of the QAPP in any subsequent issues of the revised or updated QAPP.

- Revision 0, January 2, 2004. This is the initial document submitted to NJDOT, USEPA and USACE for review and comment.
- Revision 1, June 2004. Revised document, edited to reflect February 2003 meeting and written comments from NJDOT-OMR, NOAA, and USEPA; subsequent clarifications of scope and responsibilities within the project team; and a final issue resolution meeting on May 28, 2004.

Analytical data for this project will be reported in both an Electronic Data Deliverable (EDD) and analytical data package. The EDD will be generated by the participating laboratories and will be used by the MPI (responsible for data management) to facilitate loading the analytical data into the project database.

Appropriate records will be maintained to provide adequate documentation of the entire data generation process, including field sampling and laboratory analysis. Field sampling records will include maintaining field logs and sample chain of custody documentation (see discussion in Section B of this QAPP).

The final evidence file will be the central repository for documents that constitute evidence relevant to sampling and analysis activities as described in this QAPP and the FSP. TAMS/ET and MPI and the various consultants/contractors are custodians of and will maintain the contents of the evidence files for the sediment sampling and analysis program, including all relevant records, correspondence, reports, logs, data, field records, pictures, subcontractor reports, analytical data, and data reviews.

The final evidence file will include, as applicable, the following:

- field records;
- field data and data deliverables;
- photographs;
- drawings;
- coring logs;
- laboratory data deliverables;
- data validation reports;
- field and laboratory audit reports,
- progress reports, QA reports; and
- custody documentation.

B. DATA ACQUISITION

B1 Sampling Process Design

The SSAP consists of two principle data acquisition tasks: the geophysical surveys, and the sediment coring (sampling and analysis) characterization. The experimental design for each of these components is provided in the sub-sections below.

B1.1 Geophysical Surveys

The geophysical surveys to be performed by the subcontractor (ASI) include a hydrographic survey and a side-scan sonar survey. These geophysical surveys will be conducted in a section of the Lower Passaic River within the Harrison Reach using the RV Delaware, a 21-foot survey vessel. The vessel will be equipped with a real-time kinetic (RTK) system for positioning. Hypack survey management software or equivalent will be used for survey control and ship track recording. An Innerspace Model 455 survey grade fathometer or equivalent will be used to collect the water depth data. The ASI geophysical survey workplan, including equipment specifications, are provided as Appendix A.

Geophysical data will be digitally acquired using geophysical survey equipment positioned on the survey vessel in a manner that minimizes potential interference, or cross-talk, between the various types of equipment. Positioning of this equipment will be optimized in the field during the field mobilization phase of the geophysical investigation. In addition to being equipped with RTK Differential Global Positioning System (DGPS) navigation equipment, the geophysical survey vessel will be equipped with a digital compass to continuously record the orientation of the various geophysical sensors used (e.g., side-scan sonar fish). Depth of each sensor below the water surface and above the river bottom will also be digitally recorded continuously throughout each survey. Each geophysical sensor will be towed over river bottom sediments at a constant rate of between 1.5 and 2.0 knots. This requirement becomes particularly important in periods of high tidal flow where geophysical survey lines will be run against the current whenever possible.

It is anticipated that the following equipment (or equivalent) will be required (at a minimum) for the performance of the geophysical investigation.

- RTK DGPS, or equivalent
- Shallow draft survey vessels, Zodiacs and /or John Boats
- Survey Depth Sounder (200 kHz)
- Single frequency (600 kHz) side-scan sonar
- Underwater camera system.
- Sediment sampling/coring equipment.

During the geophysical surveys, the vendor's equipment is capable of establishing the horizontal location to a precision of ±1 cm and vertical position to a precision of ±2 cm, easily meeting the project objectives (e.g., vertical position to within ± 3 ft [1 m]).

B1.1.1 Hydrographic Survey

The hydrographic survey will encompass the entire river bottom to the mean low water (MLW) line along each shoreline. The survey work area will extend for 1000 feet from bank to bank; i.e., the PSSA. The survey will be conducted using 25-foot lanes and single beam or multi-beam acoustical survey techniques to acquire depth soundings. Horizontal position of the depth soundings will be obtained using DGPS methods with RTK correction applied to the data. The survey will be conducted in horizontal datum NAD 83 and NJ State Plane feet and vertical datum NGVD 1929.

The survey drawings will show shoreline features in the vicinity of the site that are available on NJDOT geo-referenced base maps. The geo-referenced shoreline features will be shown for 1000 feet along the riverbank. The features shown will be limited to the horizontal position of the furthest riverward project of bulkhead walls and piers and the horizontal position of the highest elevation of earthen/rip-rap slopes. The survey drawings will also show utility information in the vicinity of the work area, including inverts, sizes, types, location of utilities, shoreline outfall structures that are available from existing drawings, maps, and data, the location of all combined and sanitary sewer outfalls, if any, within the reach.

The hydrographic profiling will consist of a topographic survey of the entire river bottom for the 1000-foot study area (PSSA) with a footprint area that will extend up to the MLW line along each shoreline. The survey will be conducted along a series of lines that are parallel to the shoreline with each survey line spaced at intervals of 25 feet.

The vertical control for the survey will be established in the study area using a United States Geological Survey (USGS) benchmark as a reference point. The elevation for the benchmark will be based on the National Geodetic Vertical Datum of 1929 (NGVD 29). This benchmark elevation will be transferred using a surveyors level to a tide gauge, which will be established within the study area with accuracy equivalent to a first order survey (±2 cm).

Horizontal control for the vessel and equipment will be maintained with a real-time kinematic global positioning system (RTK DGPS) which can record position data in the following horizontal coordinate systems: 1983 North American Datum (NAD83) and New Jersey State Plane NAD83. The global positioning system consists of a dual frequency GPS receiver with the base station instrument set over the vertical control point (i.e., USGS benchmark) and the second instrument antennae on top of the fathometer to eliminate potential horizontal positioning offset errors. The typical specifications for a GPS system that provides acceptable horizontal and vertical control are provided in Table B-1.

The water depth or bathymetric survey will be conducted concurrently with the horizontal and vertical measurements to assist in the development of a topographic map of the bottom of the river. The water depth will be measured by a 200 kHz Survey Depth Sounder or fathometer that uses single beam survey technology, or equivalent. The sounder will be calibrated at the beginning and end of each day to compensate for variations in speed of sound in water and transducer mounting depth. The typical specifications for a depth sounding system that provides such accuracy are provided in Table B-1. Relevant observations and changes in operational procedures will be noted in the field log.

The horizontal, vertical, and water depth data will be transferred to a computer during the survey activities and analyzed using the computer program Hypack Max, or equivalent. The computer program displays geo-referenced base map and updates the drawing in real-time showing survey lines, vessel horizontal and vertical positioning, and water depth. The program will also be used to develop the complete topography of the pilot study area.

The accuracy of the horizontal and vertical measurements for the hydrographic survey are presented in Table B-1: Geophysical Survey Measurement Quality Objectives.

B.1.1.2 Side Scan Sonar Survey

A side-scan survey will be conducted in the same 1000-foot section of the river where the hydrographic survey is done. This survey will be conducted using a Marine Sonic System running at 500-600 KHz frequency. RTK will be used for positioning and Hypack survey management software will be used for survey control and ship track recording. This survey will be conducted by running lines parallel to the shoreline. It is estimated that five to seven track lines are required for 150 percent coverage. Relevant observations and changes in operational procedures will be noted in the field log.

Both electronic and hard copy mosaics of the river bed in the study area will be created, accompanied by annotation of individual objects in a target file. The individual survey maps will be plotted on Mylar and presented on the same scale so they may be combined using overlays. This will enable the data to be layered together forming a composite picture of the project area.

Side-scan sonar will be used to locate large and small underwater objects (*i.e.,* debris, rocks, etc.) as well as display the biological condition on the bottom of the river. The side-scan sonar does not penetrate into the sediment layers but based on the reflective characteristics of the river bottom, it can yield a general indication as to whether the surface sediments are hard (*i.e.,* rock) or soft (*i.e.,* silts and sands). The system provides a near photographic sonic image of the bottom of the river regardless of underwater visibility. For this project, the sonar will consist of a single high-frequency 600-kHz submerged system that is towed behind the vessel that will scan up to 160 feet on each side of the equipment. Side-scan sonar data will be collected along the same survey lines as described for the hydrographic survey (i.e., 1000-feet long lines parallel to the direction of the river with each survey line spaced 25-feet apart). The relatively close spacing of the survey lines will provide good overlap of the data and improve interpretation of river bottom features. The sonar unit will be interfaced with the GPS receiver to allow target locations (i.e., the locations of underwater objects and features) to be accurately determined.

The acquisition of side-scan sonar data will be used in conjunction with the hydrographic survey to refine the river bottom topography and morphology. The data can also be used to provide some limited information on the physical characteristics of the surface sediments (e.g., hard versus soft).

The side-scan sonar data will be processed in one of several ways depending on the results. Essentially, there are two main means of processing. The first uses the absolute reflectivity of the river bottom (*i.e.,* the acoustic signal strength) to create an image of the river bottom. In this instance, highly reflective (bright) areas are typically coarser grained sediments. Low reflectivity areas represent fine-grained sediments. The second means of image processing involves the calculation of a local image mean and the presentation of the deviation from in the mean. In these images, sharp boundaries are enhanced and objects on the river bottom are more easily identified. The decision for the type of image processing to be used will be made after the side-scan sonar data are obtained and the quality of the images can be examined.

B.1.1.3 Ground Truth Data Collection

Sediment samples will be collected to aid in interpreting the side-scan sonar data. Grab samples are collected using a petite ponar dredge or similar device. The retrieved sediment samples (typically the top 2 to 6 inches of material; depending on the depth to which the ponar penetrates) will be visually classified in the field for sediment texture, appearance (record in the field notes whether or not there is a visible sheen or staining), odor, and physical properties (e.g., color, particle size, stratigraphy breaks), according to Burmeister classification system. The sediment samples will then be containerized for disposal. Locations will be selected in the field based on the images and the need to verify the signal and sediment types. Up to 30 locations will be sampled, conditions permitting; all samples will be field classified.

The following procedure will be used for collecting and classifying the sediment samples:

- The sampling location will be located using the GPS equipment and the coordinates recorded in the field note book.
- The petite ponar dredge will be dropped and retrieved.
- Each sediment grab will be classified using the Burmeister sediment classification. The sediment will be removed from the dredge and transferred to a stainless steel pan to aid in visual-manual evaluation.
- The field geologist will select up to five of the sediment samples for laboratory grain size analysis. The selected sediment samples will be jarred and analyzed for grain size.

- Sediment cuttings will be containerized in a 5-gallon bucket for disposal.
- The petite ponar dredge will be rinsed thoroughly in river water in preparation for the next sampling location.

B1.2 Sediment Coring

A work area (i.e., the potential Dredge Area) of about 300 ft (100 yd) long and 225 ft (75 yd) wide will be selected for sediment coring, based on the results of the geophysical survey for sediment core collection. This potential Dredge Area will be divided into 15 rectangular sampling grid cells with dimensions of 20 yards (60 feet) long by 25 yards (75 feet) wide. A single sediment core location will be occupied within each grid cell (see Figures A-4 and B-1).

At each coring location, a single, primary core will be obtained. Each core will consist of at least four feet of sediment, and the core diameter will be 4 inches to provide sufficient material for subsequent chemical and geotechnical analyses. If it proves difficult to obtain the desired core penetration and recovery, the core diameter may be adjusted. If a narrower tube is needed for good recovery, a second core may be obtained from the same location so as to provide sufficient material for all analyses. In these instances, all chemical analyses are to be obtained from one core while the geotechnical analysis material may be obtained from the second core. Due to the anticipated non-cohesive nature of the sediments, it is likely that core catchers, steel cones or shoes will be necessary in order to obtain cores of adequate recovery. If core catchers are required, the type of core catcher that offers the lightest resistance should be used. In the event that a given core location is unsuccessful (recovery is less than 60 percent or gaps are found within the sediment core that are greater than 2 inches long), the location should be abandoned and a new location occupied with the same cell grid. At least three attempts will be made to collect a core. The decision to abandon a grid cell entirely due to poor core recovery is left to the field team leader.

A determination of bulk density will be made on the intact core when it is brought to the on-shore processing area. After decanting the overlying water, the length of sediment recovered, the length of the core tube and the weight of the core will be measured. An average weight of the core tube per inch and the core caps will be subtracted from the total weight of the core to estimate average bulk density. After the bulk density is measured, each core will be segmented into 1-foot intervals. Provisions will be made to extrude and segment the sediment from the coring tube while maintaining stratigraphic integrity. The upper two segments (0-1 ft and 1-2 ft intervals) represent the anticipated pilot study dredging thickness. The next layer (2-3 foot interval) represents the potentially exposed material after dredging. The fourth segment (3-4 foot interval) will be archived (frozen) for possible later use, primarily in case a deeper dredge depth (i.e., 3 feet) is selected.

Horizontal position of the coring locations will be obtained using global positioning methods (GPS) accurate to 1 meter or less horizontally. (The capability of the digital GPS system used approaches ±1 cm.) The coordinates will be reported in horizontal datum

NAD 83 and NJ State Plane feet and vertical datum NGVD 1929. The accuracy of the coring will be as follows:

- Depth of water: ± 0.5 feet
- Horizontal position: ± 1 3 ft (1 m), although the ASI equipment has the capability of 1 cm resolution
- Depth of sediment penetration: ± 2.5 cm
- Depth within the sediment core: ± 1 cm

The field sampling team will perform the following activities associated with each core: photo log, visual description, sample processing and homogenization, sample jarring, chain-of-custody and shipping documentation. Sediment samples will be analyzed to determine the representative chemical and geotechnical characterization of the sediments in the work area. The sediment samples from each segment in the top three feet of the core will be analyzed for some combination of dioxins/furans, PCBs, PAHs, volatile organic compounds, metals, pesticides, and herbicides. Each sample will also be analyzed for some combination of geotechnical parameters including grain size distribution (including fine-grained materials), bulk density, Atterberg limits, moisture content, solids content, total organic carbon, and specific gravity. The sediment bulk density for each core will be estimated by weighing each core after removing the overlying water. The calculation for bulk density uses the following formula:

$$\rho_{\text{bulk}} = \frac{W_{\text{sediment}}}{A_{\text{tube}} * L_{\text{sediment}}} = \frac{W_{\text{sediment\&tube}} - W_{\text{tube}}}{A_{\text{tube}} * L_{\text{sediment}}}$$

where:	ρ_{bulk}	=	wet bulk density in g/cm^3
	W_{sediment}	=	weight of sediment in the tube
	$W_{\text{sediment\&tube}}$	=	weight of sediment and tube
	W_{tube}	=	weight of the empty coring tube
		=	length of tube * weight of tube per unit length
	A_{tube}	=	inner cross sectional area of the coring tube
	L_{sediment}	=	length or thickness of sediment in the tube (Note that this is probably not the length of the coring tube itself.)

B1.2.1 Sediment Characterization

The sediment core collection program was designed to collect the information necessary to characterize the extent of sediment contamination in the potential Dredge Area (i.e., estimate the mean concentration of PCBs, dioxins and other contaminants). A subset of the samples collected under this program will be subject to additional testing to provide supporting information needed for other aspects of the remedial design (e.g., equipment types, sediment handling facilities, etc.). This additional testing includes geotechnical characterization and sub-bottom characterization. The sediment sampling program is planned for spring/summer 2004.

B1.2.1.1 Chemical Analysis of Sediments

The procedures for collecting, handling and segmenting the sediment cores are provided in Section B2.4. A homogenized sediment sample from each core segment will be analyzed for parameters listed in Table B-2. (Samples for VOC analysis will be grab samples and not homogenized.) In addition to chemical analyses, grain size, bulk density and moisture content will be determined for each core segment.

Volume requirements are sufficient from the 4-inch diameter core to provide the necessary sample volume to conduct the analyses. Container requirements are summarized in Table B-2.

Additionally, a total of 11 samples (five 0-1 ft interval composites, five 1-2 ft interval composites, and one composite from the 60-gallon bench scale treatability study composite) will be analyzed for a limited suite of parameters requested by technology vendors, as shown on Tables B-2 and B-3.

In addition, equal amounts of sediment from the top two feet within each of the 15 areas will be collected to obtain 60 approximately gallons of sediment that will be used by one of the vendors for sediment decontamination bench tests. USEPA and NJDOT-OMR will conduct this activity using a USACE or USEPA boat. The material for this sample will be collected during the execution of the sediment coring program. The vendor-requested sample material will be shipped to the vendors within one day of the completion of the sediment coring program.

B1.2.1.2 Geotechnical Characterization

Sediment samples collected during the sediment characterization program will be analyzed for geotechnical parameters to characterize the physical properties of the sediment. Consistent with the U.S. Army Corps of Engineers (USACE) guidance, the results of these analyses will be used to assess the overall dredge-ability of the sediment, including selecting dredging equipment, developing estimates of dredge production rates, and assisting in the design of the sediment transport, processing and disposal aspects of the project (USACE 1983, USACE 1986).

Once the sediment samples for geotechnical testing are obtained, each sample will be subjected to analysis for the following parameters:

Parameter	**Method**
Grain Size (sieve and hydrometer as appropriate)	ASTM D422 and D1140
Moisture Content	ASTM D2216
Atterberg Limits (Liquid and Plastic Limits)	ASTM D4318
Specific Gravity	ASTM D854-01
Bulk Density	ASTM D4531

B1.2.2 Investigation-Derived Waste Disposal

Due to the large volume of sediment required for analysis, and generation of additional volume for treatability study analysis, it is not anticipated that much, if any, excess sediment will be obtained as part of this sediment coring program. Any such material that is generated will be added to the 60 gallons of sediment submitted to treatability study vendors.

Other investigation-derived waste materials (e.g., personnel protective gear; used core tube sections, etc.) will be rinsed so that it is visually clean (no significant sediment residue) and then disposed as ordinary (non-hazardous) trash.

B2 Sampling Methods

B2.1 Geophysical Surveys

Procedures for the geophysical surveys (hydrographic and side-scan sonar surveys) procedures will follow the procedures outlined above (Section B1.1). Sediment sample collection for the purposes of ground-truthing the side-scan sonar data interpretation will entail the use of petite-ponar dredge samples to allow for visual sediment texture classification of the top 2 to 6 inches of sediment. These materials will be field classified by a geologist or a similar appropriately-trained staff member. Given the short duration of this effort, it is expected that the classifications will all be performed by the same staff member for internal consistency

Five of these samples will also be sent for off-site laboratory grain-size distribution analysis to further support the side-scan sonar interpretation.

B2.2 Sediment Characterization

The collection and processing of sediment samples collected as part of the sediment characterization will follow the standard operating methods. Vessels utilized for this program will be equipped with real-time kinematic (RTK) differential global positioning systems (DGPS) capable of ±1 cm horizontal accuracy, which is more than adequate for the requirements of the sediment coring program. Adequate shore-based control points to operate this system will be established. This positioning system will provide data to onboard GPS receivers that will guide vessels to pre-programmed coordinates for each core sample location. Once in position, vessels will be held in position with spuds or anchors, and sample collection will commence.

B2.2.1 Sediment Characterization Core Collection and Processing

Sediment cores will be collected by a vibrating coring device (e.g., vibra-coring). Because the sediment are likely to be not cohesive, it may be difficult to collect 4-ft of sediment without either coring several feet deeper or using a core catcher, steel cone, shoe or other device. Use of core catchers or similar equipment is likely to entrain sediment; to minimize entrainment and cross-contamination, core catchers with lightest resistance should be used.

The procedure for vibratory coring is described below.

1. The boat or sampling platform will be positioned and stabilized over the sampling location to the extent possible. Confirm location by examining the site map, bathymetry survey, and landmarks. Record the location, sample number, water depth, stage of the tide, time and the weather conditions. The locations will be recorded at the time of sampling to an anticipated accuracy of about $\pm$ 1 cm using RTK DGPS. The DGPS antenna should be mounted as close as practicable to the vibracore deployment to identify the core location as accurately as possible.

2. Don personal protective equipment as per SSHP.

3. Clean the core barrel with the washdown pump, pressure washer or steam cleaner as needed. Because of the direct contact with sample material, the core nose catcher assembly should be carefully washed with soap (Alconox) and water to remove any debris. See Section B2.2.3 for more details.

4. Mount a clean, decontaminated clear plastic coring tube liner within the vibratory coring apparatus. The core liner and core catcher, etc. are assembled and attached to the vibracorer head as per manufacturers' directions. Be certain that when using rigid liner that the core tube seats in the vibracorer head. Confirm that the check valve has a tight seal and no debris is present. Attach the apparatus to the end of a rope or cable to enable it to be lowered to the river bottom.

4. Deploy the vibracoring device. Marks may be placed on the power cable or the lift cable to track the vibracorer's progress, or use a video or paper depth recorder to track the vibracorer's head.

5. When the nose has reached bottom, turn on the vibracore unit and note the start time.

6. The core is complete when desired depth is reached or when point of refusal is encountered. The point of refusal is defined as the depth at which no additional penetration can be obtained in a one-minute period.

7. Vibracorer is turned off.

8. The vibracorer is then extracted slowly from the bottom by the lift cables. If the corer refuses to come free, the unit is again vibrated until it is extractable. The apparatus must be maintained in a vertical position.

9. As the unit is brought up out of the water, penetration depth is confirmed by visually inspecting the core tube for a mud line. This procedure helps to verify

that the corer did penetrate into the sediment vertically. Before the bottom of the tube breaks the water surface, place a cap over the bottom to prevent the loss of material from the corer. The vibracorer and core barrel are then hosed down with site water prior to bringing the unit on board.

10. Remove the core liner from the coring apparatus following the manufacturer's instructions. This must be done while maintaining the core in a vertical position.

11. Determine the length of tube above the sediment-water interface by inserting a decontaminated yardstick into the top of the core and lightly resting it on the sediment surface.

12. Inspect the core for gaps in the sediment.

13. Calculate the percent recovery.

14. Place a cap over the top.

15. Assess the core. Cores having gaps of more than two inches are not acceptable. (The tolerance for core breaks will be partially a function of field conditions. Specifically, to obtain the desired number of cores in the allotted field sampling period, it may be necessary to accept larger core breaks than desired so as to obtain a core sample rather than abandon a sampling location.) Inspect the tube to determine if sufficient material was collected, at least 36 inches is needed, but 48 to 54 inches is preferable. Minimum recovery for an acceptable core is 60 percent whether or not a core catcher or similar device is used. In the event that the core length or recovery is not sufficient or there are gaps in the sediment greater than 2 inches, tape the cap ends with electrical tape and place the core on ice. If the sediment core is deemed unusable, discard the sediment into a 5-gallon lined bucket, rinse the lining thoroughly and collect a new. Move the sampler to a nearby location (approximately 3 to 5 feet from the initial sample) and collect a new core (starting with step 1, above). The second attempt should be at least 10 inches deeper than the first. Repeat a third time if the second attempt is not successful. The Field Team Leader or designee will decide which core to use for sampling or if no core will be collected for the grid location.

16. Tape the end caps in place using electrical tape and store the core vertically on ice.

B2.2.2 Core Slicing and Analytical Sample Generation

The below procedures will apply once a sediment core has been obtained. The process is shown schematically in Figure B-1.

1. The cores are obtained from the boat and brought to the sample handling facility. The cores must be maintained vertically during transport and handling. The core

must be allowed to settle, and water decanted prior to measuring and splitting (slicing).

2. Inspect the core and describe the stratigraphy.

3. When ready to begin slicing the core, remove the top cap on the core tube and gently siphon off the water overlying the sediments, taking care to minimize the loss of sediment.

4. Measure the length of the core tube and the length of mud in the tube, being sure to note any separations. Weigh the entire core. Record all measurements.

5. Cut the core tube into 1-foot lengths, beginning at the top. Record the exact lengths cut. Use a steel plate if necessary (to prevent loose, non-cohesive material from spilling out) to slide between the segments once the coring tube is cut.

6. Place the core segment within the cut tube in a stainless steel bowl and weighed prior to removing the sediment from the tube in order to estimate the bulk density of the segment.

7. Transfer the sediment material in the first core segment (i.e., the 0 - 1 ft interval) to a decontaminated stainless steel bowl. A brief description of the physical characteristics of each core segment will be recorded in the field notes. These characteristics will include the general soil type (fine sand, coarse sand, gravel, silt, clay, and organic/other matter such as debris), presence of observable biota, odor, and color. Sediment texture will be identified using the Burmeister classification system. Each core segment will be examined visually to identify changes in sediment characteristics as it is extruded from the core tubing. If changes in stratigraphy are observed within a core segment, then the nature and approximate length of the various layers will be noted in the field notes.

8. Remove a representative sample for VOC analysis (three EnCore samplers are required for each VOC sample). Homogenize the remaining material and subsample for additional analyses as scheduled for the location.

9. Repeat step 7 for the 1 - 2 ft and 2 - 3 ft core segments.

10. For the 3 - 4 ft interval, follow step 7 but the sample aliquots are to be archived for possible later use. (Archive samples will be shipped to the analytical laboratories, with instructions that the sample be archived [frozen] pending instruction from the client.)

The bottom two inches in each core will not be used for any purpose due to coring-induced mixing that frequently occurs in this layer.

B2.2.3 Decontamination Procedures

Decontamination of field equipment and its subsequent use will be documented in a field notebook. If visual signs such as discoloration indicate that decontamination was inadequate, the equipment will be decontaminated again. If the situation persists, the equipment will be taken out of service. Decontaminated sampling equipment will be wrapped in aluminum foil or otherwise protected to maintain its cleanliness when not in use.

Field decontamination of spatulas, mixing bowls, and other stainless steel apparatus used to collect samples for chemical analysis will consist of a detergent (alconox) wash followed by rinsing with potable (tap) water, an acetone rinse, and distilled deionized analyte free water rinse. After decontamination, stainless steel apparatus and utensils will be allowed to air dry. If the equipment will not be re-used immediately, it will be wrapped and stored in aluminum foil or otherwise protected to maintain its cleanliness prior to subsequent re-use. The exterior metal of the vibratory coring apparatus which holds the core liner but does not contact the sample will be decontaminated by rinsing with water followed by a visual inspection to verify that it is free of sediment and mud. If the metal tip of the coring apparatus advances through the sediment ahead of the core liner (so that the metal tip of the apparatus contacts the sediments which will be sampled), then that part of the coring apparatus will be decontaminated with alconox and water. Solvents and acids will not be utilized for equipment decontamination.

Decontamination of plastic apparatus for sediment collection (e.g., core tube liners) will consist of washing with alconox, followed by immersion in river water to remove the detergent. A final tap water or distilled water rinse will be performed after the river water rinse. Plastic equipment will be visually inspected for cleanliness prior to use.

Only new core liners will be used for this project (i.e., the core liners will not have been used at other sites). Prior to initial use in the field, decontamination of all apparatus for sediment sample collection will consist of washing with alconox and tap water.

As it is likely that adequate sample recovery cannot be obtained without the use of core catchers or similar equipment, the following conditions will apply.

- Only new, metal (preferably steel) core catchers will be used.
- Core catchers will be decontaminated by detergent (alconox), and tap water or distilled/deionized water rinse.
- Core catchers may be re-used following field decontamination following the procedure outlined immediately above.

If a location is resampled due to insufficient core length or poor recovery, sampling equipment will require limited decontamination between attempts, consisting of rinsing with Passaic River water and a visual inspection to verify that the equipment is free of mud.

B3 Sample Handling and Custody Requirements

B3.1 Field Activities Sample Custody

As described in Section B2.2, upon collection of an acceptable sediment core, the core will be capped, sealed and labeled. The capped cores will be maintained in a vertical position aboard the sampling vessel, at all times, until they are submitted to the field processing facility and cut into segments. Core sample processing will follow the procedure described above, in Section B2.2.2.

The primary objective of sample custody procedures is to create an accurate written record which can be used to trace the possession and handling of samples from the moment of their collection, through analysis, until their final disposition.

A sample (or sample container) will be considered under custody if:

- It is in the Field Team Leader's (or a designee's) possession,
- It is in the Field Team Leader's (or a designee's) view, after being in the Field Team Leader's (or a designee's) possession,
- It was in the Field Team Leader's (or a designee's) possession and the Field Team Leader (or a designee's) locked it up, or
- It is placed in a designated secure area by the individual who is maintaining custody.

A field log (Figure B-2) will be used to document custody of the sediment cores from the time of collected until the cores are delivered to the field sample processing facility. The field log is used to track custody until the core is segmented and extruded, and the sediment is placed in bottles and the analytical samples are created. Custody of the sediment cores will be transferred by the core collection personnel to the processing facility personnel by a release and acceptance signature as indicated on the field log (Figure B-2). The field log transfer of the sediment cores will terminate with the transfer of the sediment cores to the processing laboratory where sample custody will begin, including initiation (preparation) of the formal chain-of-custody forms (Figure B-3) (Combined traffic report/chain of custody [TR/COC] forms are used for samples submitted to the CLP laboratory; see B3.1.1, below.) A copy of the field log forms will be maintained on file at the sediment sample processing laboratory. Custody for samples collected from sediment sample core processing will be maintained by the field personnel collecting the samples. The field personnel are responsible for documenting each sample transfer and maintaining custody of samples until they are shipped or delivered by courier to the laboratory or archived or disposed.

The necessary sample containers will be shipped or delivered by laboratory courier to TAMS/ET and MPI personnel (the specific arrangements will be established after the laboratories have been selected). If sample containers are not provided by the analytical laboratories, sample containers which have been decontaminated in accordance with EPA specification may be purchased from commercial vendors. Certificates of analysis documenting the bottle cleanliness will be provided by the vendor and retained as part of project records. Sample container and preservation requirements are presented in Table B-2. The laboratory(ies) or bottle vendor will deliver containers at a frequency and location determined by the project team. Sample containers needed for a specific sampling task will then be relinquished to the sampling team after verifying the integrity of the containers and confirming that the proper bottles have been assigned for the task to be conducted.

After a given sample has been prepared, a self-adhesive, waterproof label will be affixed to each container. At a minimum, the sample label will contain:

- Field sample identification number (including core number and depth interval; however, in accordance with USEPA/CLP protocol, the site name is not to appear on any documentation sent to CLP laboratories),
- Date and time collected,
- Custodian’s initials, and
- Analyses required

Immediately after sample preparation and labeling, each sample container designated for analysis will be sealed into a plastic bag and placed into an insulated cooler with “wet ice” or icepacks (for samples requiring temperature preservation) and appropriate packing materials for shipment to the laboratory.

A field Chain-of-Custody record (combined traffic report/chain of custody for CLP laboratory shipments) will accompany the samples to their destination. These record forms will be sealed in a plastic bag to protect them against moisture. The temperature of a temperature bottle blank will be monitored to verify that samples requiring temperature preservation are within $4° \pm 2°$ Celsius (C), as required, prior to leaving the site. Temperature blanks consist of bottles filled with distilled or tap water. The shipping coolers will then be sealed utilizing custody seals that will be initialed by the field personnel. Sample coolers will be delivered to the analytical laboratory by either direct courier or overnight delivery courier (e.g., FedEx) at the end of each day’s sample processing activities.

B3.1.1 Shipping Documentation – CLP Laboratories

It is anticipated that samples will be shipped to three different CLP laboratories: one for routine organics analysis (VOCs; SVOCs; and pesticides/aroclors); one for metals; and one for non-routine high resolution GC/MS (CDDs/CDFs and PCB congeners).

Required documentation includes the following:

- Custody seals – one on each bottle (except not place on EnCore samples for VOC analysis; for VOC samples seal is placed on bag containing the EnCore samples). Provided by the sampling organization. Signed (or initialed) and dated by sampler.

- Labels – one on each bottle. Provided by the sampling organization, generated by EPA Forms II Lite software. Includes the CLP Sample Number and the SMO-assigned Case Number (along with other information as described previously).
- Traffic Report/Chain of custody (TR/COC). One per cooler. Generated by Forms II Lite software.
- Custody Seals – two; on outside of cooler. Provided by sampling organization.

Note that USEPA Region 2 does not require the use of sample tags; and therefore sample tags will not be used. Also, CLP protocol specifies that the site name not appear on any of the documentation provided to the CLP laboratories.

Sampling personnel will report shipments to CLP laboratories to the EPA-designated RSCC/SMO contact by 8:00 a.m. of the day after the samples are shipped; and the TR/COC forms are exported electronically within five days.

B3.1.2 Shipping Documentation – USEPA Region 2 DESA Laboratory

Shipping documentation will be the same as for the CLP Laboratories; except that RSCC/SMO reporting is not required..

B3.1.3 Shipping Documentation – Commercial Laboratory (STL – Vt)

For samples shipped to the commercial laboratory, the documentation is as follows:

- Labels – one on each bottle. Provided by the analytical laboratory.
- Chain of custody form. One per cooler/shipping container. Provided by the analytical laboratory.
- Custody Seals – two per cooler/shipping container; on outside of cooler. Provided by laboratory or sampling organization.

A single commercial laboratory (STL-Vt) will be used. Some analyses (metal oxides by ASTM methods) will be subcontracted by STL to another laboratory; shipping, custody and documentation for those transfers will be performed by STL.

B3.2 Laboratory Receipt and Custody

Once samples are received at the laboratory, the field Chain-of-Custody form (an example of which is provided as Figure B-3; TR/COC used for CLP shipments) is completed and signed by the individual Laboratory Sample Custodian. The Laboratory Sample Custodian will check the sample bottle labels against the corresponding information listed on the field Chain-of-Custody records and note any discrepancies. Additionally, the laboratory sample receipt personnel will note any damaged or missing sample containers. This information will be recorded on the field Chain-of-Custody record or in a separate logbook. The temperature of the temperature bottle blank included in each cooler of samples requiring temperature preservation will also be recorded at the time of sample receipt by the laboratory personnel. This temperature will also be measured on the field Chain-of-Custody record or in a separate logbook. Any discrepancies in sample identifications, sample analysis information, any indication that samples are missing upon receipt at the laboratory, or any indication that samples not received at the correct pH or temperature (4° ± 2° C) will be communicated to the QA Program Manager and Field Team Leader within 24 hours of sample receipt so that appropriate corrective action can be determined and implemented. For samples sent to CLP laboratories, the SOW requires that the laboratory contact the EPA SMO if the shipment temperature exceeds 10° C.

After the sample receipt information is checked and recorded, sample analysis information will be entered into the individual Laboratory Information Management System (LIMS) (or equivalent). Each sample will be provided a unique laboratory identification number and the analysis tests requested on the Chain-of-Custody records entered into the LIMS. After the required information has been entered into the LIMS, the Laboratory Sample Custodian will initiate an internal laboratory Chain-of-Custody. The internal Chain-of-Custody will document the transfer of samples from the storage location to the analyst for analysis and subsequently through final disposition at the laboratory. At a minimum, the internal Chain-of-Custody will include client identification, laboratory sample number, sample matrix, signatures for relinquishing and receiving samples or samples, and reasons for the change in custody.

Samples for the various analyses to be performed will be contained in separate jars (Table B-2). However, this scheme is subject to change based on the number of different laboratories that will be used; the parameters analyzed by each laboratory; and the preferences of each laboratory performing the analyses.

All completed field and laboratory Chain-of-Custody records will be provided in the laboratory analysis data package as part of the required deliverable report.

Samples will be stored in secure, limited access areas in an environment that maintains any required temperature preservation noted in Table B-2. Samples for most analyses are required to be refrigerated at a temperature of 4° ± 2° C. However, samples for PCB congener and PCDD/PCDF analysis may be frozen at the laboratory and maintained at -10° C; the holding time clock stops during the time that these samples (or extracts) are frozen. The temperature of the refrigerators or freezers used to store samples will be monitored by the project laboratories according to their internal standard operating procedures. Samples that do not require temperature preservation (some geotechnical parameters) may be stored at room temperature. Disposal of unused raw sample volumes, sample extracts, etc., will be in accordance with each laboratory's waste management procedures.

B3.3 Extract and Sample Archive Procedures

Sample extracts will be held (frozen at <-10°C) at the laboratory until the final data reports have been validated and approved. In addition, core segments from intervals not initially designated for PCB congener and PCDD/PCDF analysis will be archived for possible subsequent analysis at a later date (after review of the initially-generated data).

Subsequent analysis of the archived samples may be necessary if, for example, there are problems with the quality of the data obtained from the initial analysis, or if data gaps relating to the above goal are identified, or if additional data are needed to characterize sediments for disposal.

Archived samples will be stored frozen in a clean and controlled manner at a temperature of <-10°C. Daily temperature measurements will be taken and recorded at the storage location using a NIST-calibrated thermometer to document proper temperature preservation. A label identical to that placed on the original sample will be used to identify the archive sample.

B4 Analytical Procedures

The Passaic River Sediment Coring Sampling and Analysis Program will involve the analysis of sediment samples for chemical constituents and geotechnical characterization. The justification and rationale for the selected analyses are presented in Section A7. The specific methods to be used are shown on Tables B-2 and B-3.

The following laboratories will provide analytical services for the SSAP (see also table B-2):

USEPA Region 2 Division of Environmental Science and Assessment (DESA) Laboratory – Total Organic Carbon and grain size data.

USEPA Contract Laboratory Program Laboratories will perform the bulk of the chemical analyses (except herbicide analyses).

Commercial laboratories (contracted by TAMS/ET under NJDOT-OMR contract) will perform the herbicide analyses and vendor-requested and geotechnical analyses (except grain size).

B4.1 Chemical Analysis Procedures

The chemical analyses to be performed collectively for sediment samples include PCBs (as aroclors and PCB congeners); TCL volatile organic compounds, TCL semivolatile organic compounds (base-neutral fraction; polynuclear aromatic hydrocarbon [PAH] compounds only), TCL pesticides, herbicides, and target analyte list (TAL) metals; polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans (PCDDs/PCDFs or dioxins/dibenzofurans), total organic carbon (TOC), specific gravity; bulk density; grain size; and moisture content.

The 16 samples to be analyzed for PCB congeners and PCDD/PCDFs will be a complete vertical profile (i.e., the 0-1, 1-2, and 2-3 foot interval composites generated from of the five row [A, B, C, D, and E]; see figure A-4 – these are the same composites as generated for the vendor-requested analyses, with the addition of the five composites from the 2 – 3 ft interval [the vendor composites are only from the 0-1 and 1- 2 ft intervals]), plus one composite of the 60 gallons of material submitted for vendor treatability studies. To associate the PCB aroclor data with the congener data, splits of all the samples analyzed for congeners will also be analyzed for aroclors.

The procedures that will be used to for the analysis of the sediment samples are summarized below:

- Extraction and analytical procedure for pesticides and PCBs as aroclors – CLP OLM04.3, Exhibit D, Analytical Methods for Pesticides/Aroclors
- Determination of PCB Congeners in Sediment by Gas Chromatography/Mass Spectrometry by EPA Method 1668A, to be used for PCB congener analysis
- Total Organic Carbon by Lloyd Kahn (USEPA Region 2; 1988)
- Volatile Organics Compounds analysis – CLP OLM04.3, Exhibit D, Analytical Methods for Volatiles
- Semivolatile Organics Analysis (PAH compounds; base-neutral fraction only) – CLP OLM04.3, Exhibit D, Analytical Methods for Semivolatiles
- Herbicides Analysis (2,4-D and 2,4,5-T only) – STL SOPs for Extraction by SW-846 Method 3550 (ultrasonic) and analysis SW-846 Method 8151A
- Metals Analysis – CLP SOW ILM05.3 (ICP-AES for soil)
- PCDD/PCDF Analysis of sediment/solids – CLP SOW DLM01.4 for Analysis of Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs)
- Bulk Density (ASTM D4531)
- Specific Gravity by ASTM method D854
- Grain size analysis by ASTM methods D422 and D1140, sieve and hydrometer analysis
- Water Content (ASTM D2216)

B4.2 Vendor-Requested (Technology Evaluation) Analysis Procedures

Several vendors participating in the sediment decontamination study have requested that specific analyses be performed. These analyses will be performed on a limited subset of the samples collected (about 11 analyses for each method). Based on vendor requests, these samples will be analyzed for pH (SW-846 9045C); Atterberg Limits (liquid and plastic limit; ASTM D4318), metal oxides (ASTM D4503; ASTM D4326; and/or ASTM D3682); and Solids (Standard Method 2540G).

These 11 samples will consist of one composite of the bulk material (60 gallon treatability study sample), and 10 composites from the sediment cores. The 10 sediment core composites will be five each from the 0-1 and 1-2 ft intervals; and each will be a composite of three locations making up a single row (e.g., the 0-1 ft sample from cells A1, A2, and B2 will be one of the 10 composites).

B5 Quality Control Requirements

Data Quality Objectives (DQOs) are quantitative and qualitative statements specifying the quality of the environmental data required to support the decision-making process. The intended use of data, analytical measurements and the availability of resources are an integral part in development of the DQOs. DQOs define the total uncertainty in the data that is acceptable for each specific activity during the sampling events. This uncertainty includes both sampling error and analytical instrument error. Ideally, the prospect of zero uncertainty is the intent; however, the variables associated with the collection process (field and laboratory) inherently contribute to the uncertainty of the data. The overall quality assurance objective is to keep the total uncertainty within an acceptable range that will not hinder the intended use of the data. In order to achieve this objective, specific data quality requirements such as detection limits, criteria for accuracy and precision, sample representativeness, data comparability, and data completeness will be specified. The objectives and requirements for this project have been established to provide a high degree of confidence in the data obtained.

B5.1 Field QA/QC Samples

QA/QC samples will be collected in the field to allow evaluation of data quality. Field QA/QC samples include equipment blanks, duplicate samples, matrix spike samples and matrix spike duplicate samples. The types and frequency of QA/QC samples to be collected for each parameter are described below, and illustrated on Table B-3. QA/QC samples prepared in the laboratory include method blanks, laboratory control spikes, and temperature blanks. Field quality control checks used during this investigation are discussed below.

Equipment Blanks

The purpose of analyzing equipment blanks (rinsate blanks) is to demonstrate that sampling procedures do not result in contamination of the environmental samples and to evaluate the effectiveness of the decontamination of field equipment performed by field personnel. Equipment blanks will be prepared by processing a sample of laboratory grade analyte-free water in the same manner that environmental samples including placement in new core sample tubing, removal, mixing, and placing in containers. Equipment blanks will be collected at a frequency of one per each group of 20 coring locations (as specified in NJDEP, 1997) for each analytical parameter.

Field blank contamination will be addressed during data quality review. Actions (data qualification) for field blank contamination will be similar to that discussed under method blanks, below (Section B5.2).

Field Duplicates

The purpose of analyzing field duplicates is to demonstrate the precision of sampling and analytical processes. Field duplicates will be prepared in the field laboratory at the rate of five percent of the total number of environmental samples (i.e., one duplicate for each group of 20 [or fewer] field samples) and will consist of two aliquots from the same segment of a sediment core (after homogenization). Meaningful analysis of a duplicate sample requires that detectable concentrations of the analytes are present in samples. The relative percent difference (RPD) of the two measurements on the sample is calculated by the following equation:

$$RPD(\%) = \frac{|D_1 - D_2|}{\left[\frac{(D_1 + D_2)}{2}\right]} \times 100$$

Where: D_1 = the measured value for the initial field sample

D_2 = the measured value for the field duplicate sample

Note: Precision in not calculable if the analyte is not detected in one or both analyses. In this case, precision is assessed qualitatively, not quantitatively. If the detected concentration in one or both analyses is less than five times the sample-specific reporting limit, precision is assessed based on the absolute difference (D) between the two results, not the RPD.

If the RPD (or D) of sediment field duplicate results is greater than the QC acceptance criteria, the environmental results for the field duplicate pair will be qualified as estimated. The USEPA Region 2 field duplicate precision criteria for metals will be utilized for all analytes (i.e., RPD of < 100 percent for non-aqueous samples; or D less than two times the reporting limit, as applicable).

Matrix Spikes and Matrix Spike Duplicates

The purpose of analyzing matrix spikes (MS) and matrix spike duplicates (MSDs) is to assess analytical accuracy and recovery of analytes of interest in a particular sample matrix. Laboratory duplicates (LDs) are typically substituted for MSDs for inorganic and wet chemistry analyses. Matrix spike and matrix spike duplicate samples are not required for geotechnical analyses and vendor-requested analytical parameters.

MSs/MSDs/LDs will be analyzed at the rate of one pair per sample batch (up to 20 samples) for chemical analyses, except as noted below.

1. Chlorinated Dibenzo-p-Dioxins/Chlorinated Dibenzofurans – MS and MSD not required based on CLP SOW DLM01.4 (an LCS is required for each SDG).
2. TOC: Laboratory quadruplicate required.
3. Bulk Density and Moisture Content: Laboratory duplicate required.

Each MS/MSD will consist of an aliquot of laboratory-fortified environmental sample. Preferably a sample of low contaminant concentration should be used so that the spike level is of sufficient concentration over the contaminant concentration of the chosen sample. Spike concentrations are given in the analytical SOPs. The MS and MSD are extracted and analyzed following procedures used for actual sample analysis. The percent recovery of the MS/MSD is calculated by the following equation:

$$\%REC = (A-B)/T \times 100\%$$

Where: A = concentration of analyte in the spike sample aliquot
B = background concentration of compound or analyte in the unspiked sample aliquot
T = known true value of the spike concentration

Matrix spike recovery information is used to assess the long-term accuracy of a method. If the percent recovery or the precision between the MS and MSD is outside the limits, all calculations should be checked and the data may be qualified in accordance with the applicable data validation protocol (see Section D2.1.2). Absent laboratory-specific precision and recovery criteria (generated by the laboratory as specified in SW-846 Method 8000, Section 8.0), the spiking compounds, and recovery and precision criteria specified in the current CLP statement of work (OLM04.2/4.3) in Forms 3B, 3D, and 3F shall be applicable.

The CLP method for pesticides/aroclors does not include an aroclor spike (only pesticide compounds). For PCBs as aroclors, an aroclor spike will be requested through the CLP methods flexibility clause. The requested spike compounds will be aroclors 1016 and 1260, with recovery limits of 29 to 135 percent and precision (RPD) goals of 15 percent for aroclor 1016 and 20 percent for aroclor 1260.

Performance Evaluation (PE) Samples

Submission of PE samples is not currently planned. If PE samples are analyzed, an addendum to the QAPP will be issued to address the analysis and evaluation PE sample results. PE samples, if utilized, may include standard reference materials (SRMs) certified by NIST.

B5.2 Laboratory QA/QC Procedures

Method Blanks

The purpose of analyzing method blanks is to demonstrate that the analytical procedures do not result in sample contamination from the laboratory solvents, reagents, or glassware used in processing the samples. Method blanks will be prepared and analyzed by the contract laboratory at a rate of at least one per analytical batch. Method blanks will consist of laboratory-prepared blank water processed along with the batch of environmental samples including all manipulations performed on actual samples. The method blank should be prepared and analyzed before analysis of the associated environmental samples. Method blank concentrations should be below the reporting limit for each target analyte. (There are exceptions for a few volatile and semivolatile organics, which may be tolerated at concentrations up to five times the reporting limit.) If the analyte concentrations in a method blank exceed the criteria, the source of contamination should be corrected, and the associated samples should be reanalyzed. If reanalysis is not possible, the laboratory will flag the associated data (B qualifier) and note the deviation in the case narrative.

Sample data will not be corrected or adjusted for blank contamination. Blank contamination will be addressed during data validation; and the data validator will determine whether the data should be accepted (typically in cases where the sample concentration is at least five times higher than the blank concentration; the B-flag is then removed by the validator) or negated (the reported concentration is flagged 'U' and the B-flag is removed; typically where the sample concentration is less than five times the blank concentration).

Laboratory Control Samples

The purpose of analyzing laboratory control samples is to demonstrate the accuracy of the analytical method. Laboratory control samples (LCSs) will be analyzed at the rate of one per sample batch (up to 20 samples). Laboratory control spikes consist of laboratory-fortified (spiked) method blanks. The LCS is spiked with the same analytes at the same concentrations as the MS. When the MS results indicate a potential sample matrix-related problem, the LCS results are used to confirm that the laboratory can perform the analysis in a clean matrix. In general, criteria for LCS analyses will be equal to or more stringent than those established for the corresponding MS. Each laboratory should develop its own recovery criteria; absent laboratory-generated criteria, an initial default recovery goal of 70 to 130 percent may be utilized. For aroclors, the LCS recovery criteria are 50 to 120 percent for aroclor 1016 and 50 to 150 percent for aroclor 1260. For CDDs/CDFs, all 17 target isomers are present in the LCS and the (analyte-specific) recovery criteria range from 63 to 170 percent (see DLM01.4 Exhibit D, Table 6 for analyte-specific limits). If the LCS recovery not within method-specified criteria, the analytical process is not being performed adequately, and the appropriate corrective action must be undertaken (e.g., re-extraction and reanalysis of associated samples). If reanalysis is not possible, the associated sample results should be qualified as low or high biased. The percent recovery of the LCS is calculated by the following equation:

$$\%REC = (A)/T \times 100\%$$

Where: A = concentration of analyte in the spike sample aliquot
T = known true value of the spike concentration

Temperature Blanks

The purpose of preparing temperature blanks and sending the temperature blanks in the sample coolers on location is to enable the laboratory to monitor the temperature of the coolers (and samples) upon receipt at the laboratory. A temperature blank will be provided in each cooler sent from the laboratory to the field.

If the temperature of the cooler upon receipt exceeds 6° C (10º C for CLP laboratories), the laboratory will immediately contact the client (SMO for CLP) for instructions as to how to proceed (e.g., discard the sample; or analyze as planned and note deviation in the case narrative).

B6 Equipment/Instrumentation Testing, Inspection, and Maintenance

B6.1 Field Equipment

Equipment failure will be minimized by inspecting all field equipment to ascertain that it is operational and by performing appropriate preventive maintenance activities. Field sampling equipment and associated support equipment will be inspected prior to collecting each sample and any necessary repairs will be made prior to decontaminating and reusing the equipment. Routine daily maintenance procedures of field equipment to be conducted in the field will include:

- Removal of surface dirt and debris from exposed surfaces of the sampling equipment and measurement systems,
- Storage of equipment away from the elements,
- Daily inspections of sampling equipment and measurement systems for possible problems (e.g., damage or weak batteries),
- Check instrument calibrations as described in Section B7 of the QAPP, and
- Charging battery packs for equipment when not in use.

Field equipment maintenance will be documented in the applicable field logs. Specific equipment that will be inspected/tested includes:

- The Global Positioning System on the sampling vessel and the geophysical testing equipment will be maintained in accordance with the manufacturer’s recommendations.

- Instrumentation used to collect geophysical data will be maintained in accordance with the manufacturer's recommendations.
- Vibracoring equipment will be inspected daily to verify that it is in proper working condition and maintained in accordance with manufacturer's recommendations.
- Sampling vessels will be inspected daily and maintained in good working order.

Spare parts and supplies will be stored in the field or processing laboratory facility to minimize downtime. These items include, but are not limited to, the following:

- Appropriately-sized batteries,
- Extra sample containers and preservatives,
- Extra sample coolers, packing material, and ice,
- Sufficient supply of decontamination materials (alconox, distilled/deionized water)
- Tubing cutters
- Broad taping knives
- Distilled water
- Additional supply of health and safety equipment (e.g., respirator cartridges, boots, gloves, Tyvek, etc.),
- Core tubing cut in appropriate lengths will be available on site in sufficient quantity to supply field personnel for several days, and
- Additional equipment, as necessary, for the field tasks.

B6.2 Laboratory Instrumentation

The primary goals of the project laboratory's preventive maintenance programs will be to prevent instrument and equipment failure as much as possible and to minimize instrument down time when failure occurs. The laboratory(ies) will maintain an inventory of replacement parts needed for preventive maintenance and spare parts that routinely need replacement (e.g., septa, gauges, sources, detectors, etc.). Implementation and documentation of the preventative maintenance program will be primarily the responsibility of the technical group using the instrumentation according to the individual laboratory preventative maintenance policies in its Laboratory Quality Manual. If an instrument fails, the problem will be diagnosed as quickly as possible, and either replacement parts will be ordered or a service call will be placed to the manufacturer. If instrument failure impedes sample analysis, the QA Program Manger will be notified promptly so that appropriate corrective action and sample capacity management can occur. Preventive maintenance and maintenance performed as corrective action will be documented by the group leader, analyst, or contracted service representative who performed the procedure and the documentation will be maintained at the individual laboratory.

B7 Calibration Procedures and Frequency

B7.1 Field Instruments and Calibration

It is expected that field measurements and equipment will include, but may not be limited to, GPS readings, geophysical testing, and vibracore sediment core collection. The GPS on the sampling vessel will have a daily check on a point with known coordinates. Geophysical testing equipment will be calibrated and maintained in accordance with the manufacturer's recommendations. The operation of vibracoring equipment will be measured against criteria provided by the manufacturer. If these criteria are not met, appropriate adjustments/modifications will be made.

Field measurements obtained during field data collection will be collected with properly calibrated instruments. Field personnel will follow the procedures described by the manufacturer's recommendation and as described below.

In general, field instruments will be calibrated prior to use and the instrument calibration checked after the final use on each day. Personnel performing instrument calibrations shall be trained in its proper operation and calibration. Equipment will be maintained and repaired in accordance with manufacturer's specifications (Section B6). In addition, prior to use, each major piece of equipment will be cleaned, decontaminated, checked for damage, and repaired, if needed. Field calibration activities will be noted in a field log notebook that will include, at a minimum, the following:

- Entries to the instrument logbooks will be made at least once daily whenever the instrument is in use.
- Calibration records will include:
    - Calibrator's name,
    - Instrument name/model,
    - Date/time of calibration,
    - calibration standard(s) used and source,
    - Temperature (if it influences the measurement),
    - Results of calibration (raw data and summary), and
    - Corrective actions taken.

B7.2 Laboratory Analytical Instrumentation and Calibrations

Calibration of laboratory analytical instrumentation is required for the generation of appropriate data to meet project data quality objectives. Detailed calibration procedures, calibration frequency and acceptance criteria are specified in the analytical method SOPs. Each laboratory contracted for this project will be responsible for the proper calibration and maintenance of laboratory analytical equipment. Calibration activities performed will be documented in the analytical data package (see Section A9) and will be available for review during external laboratory audits.

In general, reference standards used will bracket the expected concentration of the samples. At a minimum, this generally will require the use of three to five different standard concentration levels that are used to demonstrate the instrument's linear range in quantitation. Calibration of an instrument must be performed prior to the analysis of any sample and then at periodic intervals (continuing calibration) during the sample analyses to verify that the instrument is still calibrated. Sample concentrations are often outside the instruments linear range and, therefore, need to be diluted and reanalyzed. The specific analytical methods also provide the calibration acceptance criteria and corrective actions to be employed if the acceptance criteria are not met (e.g., recalibration).

B7.3 Standard and Standards Records

Standards used by laboratories are described in the laboratory analytical methods. Laboratory standards will not be used if there are indications of physical deterioration (such as discoloration), or if the shelf life of the standard (as established by the manufacturer) is exceeded. Appropriate records of laboratory standards will be maintained in the laboratory, including the following:

- name and source,
- date received,
- lot number or manufacturer's tracking number,
- stock and initial concentration calculations, and
- storage requirements and storage location.

B8 Inspection/Acceptance Requirements of Supplies and Consumables

Only supplies and consumables that are of adequate quality to sustain confidence in the sample collection, processing, and laboratory analyses will be used for this project. Where no independent assurance of the quality of outside supplies is available (including materials provided by third parties; for example, sediment coring tubes provided by the coring contractor), procedures to verify that the quality of the purchased materials are consistent with the overall project technical and quality criteria will be established. Purchased supplies and consumables will not be used until they have been inspected, calibrated or otherwise verified to verify compliance with any specifications relevant to all calibrations or tests being performed for the project. Records of supplies and consumables used for the project will be maintained.

B8.1 Inspection and Acceptance Testing of Supplies and Consumables

Inspections or acceptance testing will be documented, including the procedures to be followed (including acceptance criteria and testing method), the individuals responsible, frequency of evaluation, and handling and storage conditions. The established procedures must enable project personnel to verify, prior to use, that critical supplies and consumables meet relevant project quality objectives. Supplies and consumables used during sample collection and processing will be inspected on an as-received basis. In the analytical laboratories, each analyst verifying the quality of reagents/standards must be qualified to perform the associated instrumental analysis so that they can calibrate the instrument, use the data system to establish sequences, perform calculations, and interpret the data.

B8.2 Documentation and Tracking of Supplies and Consumables

Records for purchases and receipt of supplies and consumables for sample collection and processing activities will be maintained in the field processing facility. Return of damaged or inappropriate materials to the suppliers will also be documented.

Documented procedures shall exist at each project laboratory for the purchase, receipt, handling/storage, and tracking of supplies and consumables used for the technical operations. The established procedures must enable project personnel to confirm that supplies and consumables that have not been tested, have expired, or do not meet acceptance criteria are not used for the project. Laboratory personnel performing reagent/standard preparation must have demonstrated proficiency that they understand the dilutions, preparations, and documentation required after training with a qualified person.

Each project laboratory will retain records for standards, reagents and media including the manufacturer/vendor, the manufacturer's Certificate of Analysis or purity (if supplied), the date of receipt, recommended storage conditions, and an expiration date after which the material may not be used unless its reliability is verified by the laboratory. The original containers (such as provided by the manufacturer or vendor) will be labeled with a unique identifier that links the containers to the aforementioned records, the date opened, and the expiration/reevaluation date.

Records of reagent and standard preparation will be maintained by the laboratory. These records indicate traceability to the purchased stocks or neat compounds, reference to the method of preparation, date of preparation, expiration date, and preparer's initials. Containers of prepared reagents and standards must bear a unique identifier and expiration/ reevaluation date and be linked to the aforementioned records. Labels that indicate the following information are to be used for reagents and standards:

- Unique Identifier (notebook reference indicating where the reagent preparation is documented),
- Name of the material,
- Concentration,
- Date prepared,
- Storage Conditions, and
- Expiration/reevaluation date.

B9 Data Acquisition Requirements (Non-Direct Measurements)

Data such as river flow rate may be provided by others (e.g., USGS). Verifying the quality of data from outside sources is the responsibility of the data user.

Historical data were utilized as part of the criteria for the selection of the study area for this project. As the historical data was used only in a general manner (identifying approximate levels of contamination), no detailed data quality review was necessary or appropriate.

B10 Data Management

The following subsections present an overview of the project information management system. This includes the field sample data collection process, the required specifications of the data deliverables, and the storage, review, and retrieval of analytical data.

To support the storage, evaluation, and retrieval of analytical results, commercially available software such as Fox Pro, a relational database management system, will be used to organize the data.

B10.1 Purpose/Background

Analytical laboratories will provide preliminary electronic data files in Excel-compatible spreadsheet form and final data also as a tab-delimited file.

B10.2 Data Recording

As discussed above, the field sample data collection will be done using field books and sample logs (Figure B-2).

B10.3 Data Validation

The data validation process is described in Section D2.1 of this QAPP.

The criteria for data verification are as described in the data validation SOPs in this QAPP and the evaluation process described in Section D.2.1.; specific procedures for validation (i.e., validation SOPs)are listed in Section D.2.1.2.

In general, the actions identified below will be taken when data quality indicators do not meet method or project criteria. However, the list below is general; the specific data validation documents cited in Section D of this QAPP take precedence over the summary below.

- Samples analyzed outside of holding time criteria will be qualified as estimated (for minor exceedances) or rejected (in the event of gross exceedance).
- Samples with surrogate recoveries greater than or less than the control limits will have all values greater than the sample reporting limit qualified as estimated.
- Samples with surrogate recoveries below the control limits but greater than or equal to 10 percent will have all non-detected values qualified as estimated.

- Samples with surrogate recoveries less than 10 percent will have non-detected results rejected.
- Samples for organic analysis with MS recoveries or relative percent differences (RPDs) outside of control limits will have the specific out-of-criteria compound result(s) in the associated unspiked sample qualified. Qualification for matrix spike analyses follows the QC rules used for surrogates using the associated QC Limit.
- LCS samples with recoveries outside of criteria will have all samples in the same preparation batch qualified following the same rules as for surrogates using the associated QC Limit.
- Inorganic spike samples with recoveries outside of criteria will have all samples of the same matrix on the Chain-of-Custody qualified following the same rules as for surrogates using the associated QC Limit.
- Laboratory duplicates with inorganic analytes not meeting the method-specified RPD criteria will have the analyte values greater than the sample reporting limit qualified as estimated in all similar matrix samples in the same lab preparation batch.
- Field duplicate analytes with out-of-criteria RPDs will have the analyte values greater than the sample reporting limit estimated in only the field duplicate and its associated sample. Although the precision goal is RPD less than or equal to 50 percent, only sediment data with RPDs greater than 100 percent requires qualification.
- Chemical analytical data from samples with less than 50 percent solids (as measured by the analytical laboratory performing the analysis) will be qualified as estimated, in accordance with USEPA Region 2 SOPs.

C. ASSESSMENT AND OVERSIGHT

C1 Assessments and Response Actions

Performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the FSP and QAPP. The audits of field and laboratory activities include two independent parts: internal and external audits.

C1.1 Field System Audits

C1.1.1 Internal Field System Audits Responsibilities and Frequency

Internal field system audits are those conducted by the organization conducting the work (i.e., TAMS/ET and MPI). Due to the limited scope and short duration (about two or three days) of the sediment coring project, no formal internal audits of field activities including sampling and field measurements will be conducted. However, it is the responsibility of the field team leader (or designee) to perform the work in accordance with the requirements of the project; as such, the monitoring of the following items will be conducted during the execution of the sediment coring program:

- Completeness and accuracy of sample Chain-of-Custody forms including documentation of times, dates, transaction descriptions, and signatures,
- Completeness and accuracy of sample identification labels including notation of time, date, location, type of sample, person collecting sample, preservation method used, and type of testing required,
- Completeness and accuracy of field notebooks or records including documentation of times, dates, subcontractor names, sampling method used, sampling locations, number of samples taken, name of person collecting samples, types of samples, results of field measurements, soil logs, and any problems encountered during sampling,
- Adherence to health and safety guidelines outlined in the Site Safety and Health Plan (SSHP), including wearing of proper personal protective equipment (PPE) and adherence with established safety protocols for working on boats and near water,
- Adherence to decontamination procedures outlined in Section B2.7 of this QAPP including proper decontamination of sediment core sampling and processing equipment, and
- Adherence to sample collection, preparation, preservation, and storage procedures.

C1.1.2 External On-Site Field System Audits

External field audits are those conducted by organizations not affiliated with those performing the work. Such audits will be conducted at the discretion of the client and the frequency and procedures for external audits are identified by the client and are not established in this QAPP.

C1.2 Laboratory System Audits

As with field operations, laboratory systems audits may be internal or external.

C1.2.1 Internal Laboratory System Audits

Due to the limited scope and duration of the sediment coring (sampling and analysis) program, TAMS/ET and MPI will not perform project-specific laboratory systems audits. However, each individual laboratory QA Manager performing analytical testing services for this project will perform periodic internal systems audits to evaluate laboratory operations and quality control procedures in accordance with their individual Laboratory Quality Manual. These audits are intended to serve two purposes: to verify that the laboratories are complying with the procedures defined in laboratory manuals and contracts; and to determine any sample flow or analytical problems. Internal audits performed by the participating laboratories preceding or during the time the Passaic River sediment sample analyses are being performed may be requested by QA Program Manager as necessary to review associated QA/QC issues relevant to this project.

Laboratory services acquired through the USEPA Contract Laboratory Program will be audited in accordance with the requirements of the applicable CLP statement of work and contract requirements.

C1.2.2 External Laboratory System Audits – Responsibilities and Frequency

Independent assessment of the laboratory operations will be through the audits conducted by accrediting agencies. As such, it is important that laboratories selected for this project by accredited by recognized agencies or organizations; and where possible, be certified or validated for the specific parameters being analyzed. Principle accrediting organizations for this project include USACE, NJDEP, NYSDEC/NYSDOH, and NELAC.

Laboratories in the USEPA CLP are subject to audit by USEPA as part of their participation in the CLP. (The CLP, however, is a contracting, not an accrediting, program.)

Some of the analyses being performed for this project are not sufficiently used to have method-specific certification available (e.g., USEPA Method 1668A for PCB congeners; however, NYSDOH does grant certification for this method for aroclors). Laboratories selected for these methods will have undergone reviews of their laboratory operations in general; and client references or other third-party evaluations will be used to confirm the competence of the laboratory for the specific method.

C1.3 Corrective Action

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or poor QC performance that can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation, and data assessment. Corrective actions proposed and implemented will be documented in the regular quality assurance reports to management (Section C2). Corrective action will only be implemented after approval by the Project Manager or his designee. If immediate corrective action is required, approvals secured by telephone from the Project Manager will be documented (e.g., in a memorandum).

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the Project Manager, who in turn will assess whether the non-conformance is of sufficient significance to warrant immediate notification of the client.

Any nonconformance with the established QC procedures in the QAPP or FSP will be identified and corrected in accordance with the QAPP. The Project Manager, or his designee, will issue a nonconformance report for each nonconformance condition.

C1.3.1 Field Corrective Action – Sediment Coring Program

Corrective action in the field may be initiated when the sample network or rationale is changed (e.g., changes to sample quantities or sampling locations from those specified in the QAPP), or when sampling or field analytical procedures require modification due to unexpected conditions. In general, the field team may identify the need for corrective action. The field staff, in consultation with the Project Manager, will recommend a corrective action. The Project Manager will approve the corrective measure that will be implemented by the field team. It will be the responsibility of the Field Team Leader to verify that the corrective action has been implemented.

If the corrective action will supplement the existing sampling plan (e.g., additional sediment samples) using existing and approved procedures in the QAPP, corrective action approved by the Field Team Leader will be documented. If corrective actions resulting in fewer samples (or analytical fractions), alternate locations, etc., compromise the achievement of quality assurance objectives, it will be necessary that all levels of project management, including Project Manager and the client, concur with the proposed action.

C1.3.2 Field Corrective Action – Geophysical Investigation

Typical Measurement Quality Objectives (MQOs) necessary to fulfill Geophysical Data Quality Objectives GDQOs are summarized in Table B-1. MQOs presented in the table assume that the equipment gain, system linearity, source level, receiver level, and source wavelet are precisely known to within a predetermined range for all acoustic geophysical survey equipment. These MQOs also assume that these equipment parameters will be optimized during the mobilization phase of the program.

All digitally recorded geophysical data will be reviewed within 48 hours of acquisition and deviations from acceptable MQO criteria presented in Table B-1 will be addressed as required.

Project controls and systematic procedures that will be instituted by the geophysical survey crew during the geophysical investigation to provide that geophysical data collected will be of a sufficient quality to fulfill the GDQOs include, but may not be limited to:

- Survey speed consistency checks – Constant checks of vessel speed will be conducted at approximate 15-minute intervals to verify that the survey vessel(s) maintain a constant speed of between 1.5 and 2.0 knots while digitally recording geophysical data.
- Daily acquisition of repeat navigational / geophysical data along a representative portion of one geophysical survey line. Not less than four hours will be allowed to elapse between the original and repeat survey line measurements.
- Sensor position corrections (vertical, sensor layback and offsets, vessel draft and attitude).
- Geophysical equipment confidence checks (using river bottom targets of known location and depth to verify proper system tuning and operation of each sonar channel at outer limit of the range scale being used).
- Contact correlation (between successive side-scan sonar coverages).
- Review of physical properties analytical results and correlation with geophysical data recorded in the area.
- Daily inspection and calibration of hydrographic and side-scan sonar profiles collected.

In order to obtain these measurement parameters with accuracy, calibrated geophysical survey equipment will be used along with documented logging procedures of all survey equipment status such as gains, filter settings, linearity, etc.

Special QA acquisition equipment and calibration hydrophones will also be supplied to perform the field calibrations outlined in the plan that are necessary to obtain the desired acquisition accuracy along with detail instructions for the recording of data logs for gain, system operation (power or pulse lengths), and inline filters settings.

Typical sources of error that may affect MQO standards and must be avoided include, but are not limited to, the following:

- Vessel Position – minimum permissible deviation from the survey line will be determined prior to geophysical data acquisition and must not be exceeded. This deviation is normally within the beam pattern of the geophysical systems. Failure to maintain the minimum deviation from the survey line will necessitate the reacquisition of geophysical data along the survey line(s) in question.

- Data Clipping – Setting of receiver gains too high results in the clipping of digitally recorded geophysical data, thereby resulting in the incorrect measurement of signal amplitudes and compromising the integrity of the results of the analyses of the data recorded. Random single ping clipping is acceptable for acoustic data, however, severe clipping warrants the reacquisition of geophysical data along the survey line(s) in question.
- Field Notes / Log Header Information – Failure to properly record time, gain settings, or navigation logging will necessitate the reacquisition of geophysical data along the survey line(s) in question.
- Standards – Failure to meet the standards outlined in Table B-1 will necessitate the reacquisition of geophysical data along the survey line(s) in question.

C1.3.3 Laboratory Corrective Action

Corrective action in the laboratory may occur prior to, during, and after initial analyses. The published methods and/or laboratory SOPs specify the majority of the conditions during or after analysis that automatically trigger corrective action or optional procedures. These conditions may include dilution of samples, additional sample extract cleanup, or automatic reinjection/reanalysis when certain QC criteria are not met. Furthermore, a number of conditions, such as broken or leaking sample containers, insufficient sample volume, multiple phases, low/high pH readings, and potentially high concentration samples, may be identified during sample log-in or just prior to analysis. Following consultation with laboratory analysts, it may be necessary for the laboratory QA Officer to approve the implementation of corrective action.

A member of the laboratory technical staff will identify the need for corrective action. The laboratory QA Officer, in consultation with members of the technical staff, will approve the required corrective action to be implemented by designated members of the laboratory technical staff. The laboratory QA Officer is responsible for the implementation and documentation of the corrective action. If the nonconformance causes project objectives not to be achieved, it will be necessary to inform the QA Program Manager who must concur with the corrective action.

Corrective actions that are performed prior to release of the data from the laboratory will be documented in a laboratory corrective action log and in the narrative data report that will be included in the laboratory data deliverable package. If corrective action does not rectify the situation, the laboratory will contact the QA Program Manager prior to release of the data.

C1.3.4 Corrective Action During Data Validation and Data Assessment

The need for corrective action may be identified during the data verification, data validation or data assessment process. Potential types of corrective action may include resampling by the field team (although this is unlikely to be feasible due to the limited scope and duration of this project) or reinjection/reanalysis of samples by the laboratory.

As previously stated in Section A7.3.5, the percent completeness will be used to determine whether the data quality meets the objectives for the project. If the completeness objectives are not met for individual parameters, the QA Program Manager will review the reasons for the incomplete data with the Project Manager. Depending on the reasons for the incomplete data (e.g., holding time exceeded), and the effect of the incomplete data on the accomplishment of the project objectives, additional samples may be collected and analyzed. An evaluation will also be conducted if a sample does not generate data for a parameter category (e.g., PCB congeners, TAL metals). Such a data gap could result from sample container breakage or sample loss during analysis. If it is determined that the missing results are critical to accomplishing the work plan objectives, additional sampling may be conducted to obtain the missing data. The Project Manager and the client will be responsible for approving the implementation of corrective action, including resampling, during data assessment. The QA Program Manager will document corrective actions of this type.

C2 Reports to Management

Periodic progress reports will be submitted to the client, and will include a summary of quality assurance and quality control activities that occurred during the reporting period. The QA portion of the monthly progress reports will be the responsibility of the QA Program Manager and will provide a status report on the accuracy, precision, and completeness of the data as well as the results of the performance and system audits, and corrective action needed or taken during the project.

C2.1 Contents of the QA Section of the Monthly Reports

The QA section of the monthly progress reports will contain results of field and laboratory audits performed during the reporting period, information generated during the reporting period reflecting on the achievement of specific DQOs (including data validation and assessment results), and a summary of corrective action that was implemented and the corrective action's immediate results on the project. The status of analytical, data verification and data validation tasks will be summarized for the project with respect to the project schedule. In addition, whenever necessary, updates on training provided, changes in key personnel, and anticipated problems in the field or laboratory for the coming reporting period that could bear on data quality along with proposed solutions will be reported. Progress reports will be prepared in written, final form by the Project Manager or his designee. To the extent possible, the monthly reports will include an assessment of the project will also be performed on the basis of available QC data and overall results in relation to the planned objectives.

C2.2 Frequency of QA Reports

The QA summary will be prepared as part of the monthly progress report required and will be delivered to recipients by the 15th day of every month. The reports will continue until the project has been completed.

In the event of an emergency, or in case it is essential to implement corrective action immediately, QA reports can be made by telephone to the appropriate individuals, as identified in the Corrective Action sections of this QAPP. These events and their resolution will be addressed thoroughly in the next issue of the monthly progress report.

C2.3 Individual Receiving/Reviewing QA Reports

Those individuals and organizations identified in the distribution list (Section A.3 of this QAPP) will receive copies of the monthly report containing the summary of QA activities. Additional project team members will receive the monthly progress report on a ‘need-to-know’ base as determined by the Project Manager.

D. DATA VALIDATION AND USABILITY

The QA procedures that will occur after data collection are described in this section.

D1 Data Review, Assessment, and Validation

The field, laboratory, and data management activities described in this QAPP will be reviewed to assess whether these activities were performed in a manner that is appropriate for accomplishing the project objectives. This assessment will include electronic data assessment, followed by data validation. Assessment of the data is performed to determine whether the data have been generated in accordance with the specified procedures as established in analytical SOPs and the QAPP. Data validation involves identifying the technical usability of the data for making decisions pertaining to satisfying the project objectives identified in Section A7.

D1.1 Review of Sampling Design

The project manager or designee will review the collected samples to verify conformance with to the sampling design specifications in Section B1 of the QAPP. Samples that deviate from the sampling design and the impact to project objectives, if any, will be discussed in the final report prepared at the end of this sediment coring program.

D1.2 Review of Sample Collection Procedures

The sample collection procedures employed by the sampling personnel be reviewed to confirm that the samples are collected in accordance with the procedures identified in Section B2 of this QAPP. This review will note unacceptable departures, if any, from sample collection procedures in the QAPP and identify sample data (analytical or field) that should be excluded from incorporation into the project database or data evaluation process. In addition, the Field Team Leader or his designee will review project logbooks or records at the conclusion of sampling activities.

As this project is of short duration (approximately two or three days), no formal field audit will be performed during sample collection.

The evaluation (data review) of equipment blanks and other field QC samples will provide definitive indications of the data quality. If a problem arises, it should be able to be isolated via the complete sample tracking and documentation procedures that will be performed. If such a problem does arise, corrective action can be instituted and documented. If data are compromised due to a problem, appropriate data qualifications will be used to identify the data. The labeling and identification of samples will also be reviewed to confirm that samples properly represent the location they were intended to represent.

D1.3 Review of Sample Handling

The handling, preservation and storage of samples collected during the sampling program will be monitored on an on-going basis. Additionally, the project laboratories will document sample receipt including proper containers and preservation at the time samples are logged into their individual laboratory. The sample receipt records (a required data package deliverable) as well as Traffic Report/Chain-of-Custody documentation will be routinely assessed by the data validators during data validation. Sample handling, storage, or preservation problems identified during data validation will result in appropriate qualification of data to warn the data user to data quality deficiencies or potential mis-identification of samples.

D1.4 Review of Analytical Procedures

The use of the proper analytical procedures described in Section B4 of the QAPP will be reviewed primarily through the data verification and data validation methods discussed in Section D2 of this QAPP. Qualification of data that does not conform to criteria is also discussed in Section D2 of this QAPP. Confirmation that samples were analyzed for the proper analyses will be performed to determine if samples submitted for analysis actually had the analyses performed. If analyses that were identified to be performed were not actually performed (e.g., due to loss of sample or improper log in at the laboratory) then a determination should have been made at the time the missing data was discovered and appropriate corrective action documented. The project manager will review the impact of incomplete analyses and identify impacts to the project objectives, if any, in the final project report.

D1.5 Review of Quality Control

The review of quality control checks described in Section B5 of the QAPP will be reviewed primarily through the data verification and data validation methods discussed in Section D2 of this QAPP. Qualification of data that does not conform to criteria is also discussed in Section D2 of this QAPP.

D1.6 Review of Calibration

The review of calibration of instruments and equipment described in Section B7 of the QAPP will be reviewed primarily through the data verification and data validation methods discussed in Section D2 of this QAPP. Qualification of data that does not conform to criteria is also discussed in Section D2 of this QAPP. The Field Team Leader will review records of field equipment calibration and identify any impacts to non-analytical data that may exist.

D1.7 Data Reduction and Processing

Data generated through field activities or by laboratory operations will be reduced and reviewed or validated prior to reporting. The field contractor or laboratory shall not disseminate data until it has been subjected to these reduction and internal validation procedures that are summarized in subsections below.

D1.7.1 Data Reduction

Data reduction involves the process of generating qualitative and quantitative sample information through observations, field procedures, analytical measurements, and calculations.

Data reduction occurs with:

- The QAPP through sample locations and naming conventions;
- The field sampling process through use of field logs and field measurements;
- Communications with the laboratory in sample analysis requests;
- Field operations with collection, preservation, and Chain-of-Custody documentation;
- Laboratory operations with sample receipt and handling, sample preparation and analysis, collation of raw data, and generation of laboratory results; and
- Post-laboratory operations with collation of analytical results in a format suitable for documents such as reports and maps.

Data reduction steps include field operations, laboratory operations, and report preparation operations.

Specific QC measures developed to maintain accuracy throughout the data reduction process are described throughout this QAPP.

D1.7.1.1 Field Data Reduction Procedures

<u>Sediment Sampling</u>

Field data will be recorded manually on a field log sheet at the time of core collection. These data will include:

- date,
- time,
- sample identification,
- horizontal coordinates (northing, easting),
- water depth,
- depth of core tube penetration,
- approximate length of recovered sediment,
- field observations (probing results), and
- any additional information field database.

If errors are made on the field logs, results will be legibly crossed out, initialed and dated by the field member, and corrected in a space adjacent to the original (erroneous) entry. The field logs will be reviewed at the end of each day.

Geophysical Surveys

Data acquired during the geophysical surveys will be generated by specialized instrumentation and stored electronically on a real-time basis in on-board computers. Proper calibration of instrumentation (Section B7) will facilitate the collection of accurate data. The electronic files will be backed up daily to minimize the potential for the loss of a significant amount of data. The geophysical survey contractor will be responsible for processing and interpreting the geophysical data upon completion of the field survey.

D1.7.1.2 Laboratory Data Reduction Procedures

Laboratory data reduction procedures will be followed according to the following protocol. Raw analytical data will be recorded in the individual laboratory's Laboratory Information Management System (LIMS) (or equivalent) and tabular summary tables will be generated. Other pertinent information, such as the sample identification number, the analytical method used, the name of the analyst, the date of analysis, and matrix sampled will also be recorded in LIMS. At a minimum, reagent concentrations, instrument settings, and raw data will be retained by hard copy and laboratory notebooks, which is signed and dated by the analyst. The laboratory will maintain (file) copies of instrument printouts (such as gas chromatograms). Periodic review of raw data and of the computerized records by the laboratory personnel will occur prior to final data reporting according to each laboratory's Laboratory Quality Manual.

For this project, the equations that will be employed in reducing data are presented in the laboratory SOPs. (In addition, several of these equations, expressing analytical accuracy and precision have been presented in Sections A7.3 and B5 of this QAPP.) The laboratory technical staff will check calculations prior to the release of the data. Errors will be noted, and corrections will be made. The original notations will be crossed out legibly. Analytical results for sediment samples will be calculated and reported on a dry-weight basis.

Quality control data (e.g., laboratory duplicate results, surrogate recoveries, matrix spike recoveries, and matrix spike duplicate recoveries) will be compared to the acceptance criteria.

Data considered to be acceptable will be entered into the laboratory computer system. Data summaries will be sent to the laboratory Quality Assurance Officer for review. Unacceptable data shall be appropriately qualified in the project report. The laboratory will prepare case narratives which will include information concerning data that was outside acceptance limits and any other anomalous conditions encountered during sample analysis. After the laboratory Quality Assurance Officer approves these data, the data are considered ready for release to the Passaic River project team.

D1.7.2 Identification and Treatment of Outliers

Outliers are unusually large or unusually small values in a population of observations. Outliers may be the result of a variety of circumstances (field or laboratory related), including any of the following:

- Sampling artifact,
- Sample integrity problem,
- Sample identification incorrectly transcribed in the field or laboratory,
- Unique conditions,
- Faulty or defective instruments,
- Inaccurate reading of meters,
- Errors in recording of data,
- Calculation errors, or
- Analytical errors.

Procedures for the identification of outliers will be followed at the data reduction stage. Outliers in laboratory data can arise from errors in analysis or from site-specific conditions that are out of the control of the laboratory. Errors in the laboratory are most often detected in the data review and validation process. In the event that quality control processes detect a suspected outlier not identified during data verification or validation, the suspect data will be subjected to appropriate statistically outlier testing. Outliers will be reported, but may not be used for evaluation purposes.

The QA Program Manager will identify outliers at the data reduction stage. When any particular value is suspected to be an outlier, the following steps will be taken:

- Other data from the same sample will be checked to see if they are also anomalous.
- The QA Program Manager will seek input from any individuals involved in generating the anomalous value as to possible causes. This will include questioning the field crew and the analyst(s).
- Field crew - If samplers demonstrate standard competency in the sampling procedure used at the time the sample with the anomalous value was obtained, then sampling errors will be dismissed as a possible cause of the outlier.
- Analyst(s) - The analyst(s) will be asked to examine his/her notes and calculations and, if possible, to rerun the sample for the specific parameter in question.

Results of any samples re-extracted or re-analyzed outside holding time will be used for comparative purposes. Rejection of any suspect data or outlier will only be done by the Project Manager in conjunction with the QA Program Manager. Data may be rejected as an unacceptable outlier if:

- A problem with equipment or an incorrect procedure used during the sampling event is identified, or
- The rerun by the analyst generates a value that significantly differs from the value being examined.

D1.7.3 Data Processing

Data will be processed from verified or validated data for use in making final decisions. It is expected that summary tables, maps and charts of verified and validated data will be prepared by various project team members. Data that is processed will be checked by an individual knowledgeable about the data type being compiled who will perform a reasonable (minimum of 10 percent) check of the final tabulated information to verify that transcription errors have not occurred.

Further checks of the tabulated data will occur if problems are encountered or if a systematic problem is detected in the process. Systematic problems will be identified and corrected prior to processing the data again.

D2 Data Assessment and Validation Methods

Data assessment verification and data validation are conducted after samples have been collected and laboratory analytical data has been reported. Data assessment for CLP is performed by USEPA contractor personnel (SMO). Validation provides an understanding of the data quality at the completion of the sediment coring program. If correctable data quality issues are discovered, the findings must be immediately provided so that appropriate corrective action can be taken to correct or prevent the problem from recurring. The data validation occurs after the formal laboratory reports are submitted. Any issues identified during EPA data verification or data user review of preliminary results will be communicated to the USEPA Region 2 data validation coordinator.

Analytical results from commercial laboratories will also be provided in a full data package (refer to QAPP Section A9) in a scanned electronic media (e.g., as a portable document file [pdf]). Data from CLP laboratories will be provided in contract-required formats. Electronic deliverables will be requested from the USEPA Region 2 DESA laboratory.

Data assessment is performed on all CLP analytical data (i.e., VOCs; SVOCs/PAHs; pesticides/PCBs; and TAL metals using EPA's Data Assessment Tool (DAT). The DAT incorporates Contract Compliance Screening (CCS), Computer Assisted Data Review and Evaluation (CADRE), and Data Assessment Rapid Transmittal (DART). It provides data in electronic formats that can be uploaded into databases and provides a complete CLP data assessment package. The DAT process is described in greater detail in Section D2.2.2, below.

This data assessment process will provide an understanding of the data quality based on those QC indicators that have the most influence on qualification of data. The DAT process will be conducted upon receipt of the data so that quality of the data can be determined soon after the laboratory reports it (within 24 to 48 hours of receipt). DAT does not address data usability, qualification based upon professional judgment, suitability of data for its intended use, or compliance with the site-specific QAPP.

Full data validation will be performed by USEPA Region 2 staff or contractors on all analytical data generated through the CLP program. Data generated by the USEPA Region 2 DESA laboratory is reviewed internally and is considered 'EPA-validated' on submission.

D2.1 Data Validation

Data validation is the process of verifying that qualitative and quantitative information generated relative to a given sample is complete and accurate. Data validation procedures will be performed for both field and laboratory operations as described below.

D2.1.1 Procedures Used to Evaluate Field Data

Procedures to evaluate field data for this program primarily include reviewing field logbooks to check for transcription errors by the field team. These procedures are performed to verify that field measurements and various quality control analyses were properly performed and documented. The field data documented includes data generated during measurement of field parameters, observations, results of any quality control sample analyses, and field instrument calibrations. This task will be the responsibility of the Field Team Leader or designee, who will otherwise not participate in making any of the field measurements or in adding notes, data, or other information to the logbook or record form.

D2.1.2 Procedures to Validate Laboratory Data

For the laboratory chemical analytical data, validation will be performed on the analytical results in accordance with the following frequencies:

- TOC by USEPA Region 2 (Lloyd Kahn) Method
    - Validated internally by the USEPA DESA laboratory, and considered EPA-validated as submitted. No further EPA or third-party validation will be performed.
- Dioxins/Furans by CLP SOW DLM01.4
    - Validation of all of the data (expected to be one SDG) to provide confirmation that the analyses were performed according to the requirements in the QAPP.
- TAL Metals by CLP ILM05.3
    - Validation of all TAL metals data to confirm that the analyses were performed in accordance to the requirements in the QAPP.
- TCL Volatiles by CLP OLM04.3, Part D-Volatiles
    - Validation of TCL volatiles data will be performed in order to provide confirmation that the analyses were performed according to the requirements in the QAPP.
- TCL Semivolatiles CLP OLM04.3, Part D - Semivolatiles (base neutral fraction; only PAH compounds reported)

  - o Validation of TCL semivolatiles data will be performed in order to provide confirmation that the analyses were performed in accordance with the requirements in the QAPP.
- TCL Pesticides CLP OLM04.3, Part D – Pesticides/Aroclors
  - o Validation of pesticides data from will occur in order to provide confirmation that the analyses were performed in accordance to the requirements in the QAPP.
- PCBs (Aroclors) CLP OLM04.3, Part D – Pesticides/Aroclors
  - o Validation of all (100 percent) of the PCB Aroclor will occur in order to provide confirmation that the analyses were performed in accordance to the requirements in the QAPP.
- Herbicides SW-846 Method 8151A (2,4-D and 2,4,5-T)
  - o Validation of herbicides data (generated by a commercial laboratory) will occur in order to provide confirmation that the analyses were performed in accordance to the requirements in the QAPP; and to verify that the proper herbicide analytes have been reported.
- PCBs (congeners) USEPA Method 1668A
  - o Validation of all (100 percent) of the PCB congener will occur in order to provide confirmation that the analyses were performed in accordance to the requirements in the QAPP, and that congener reporting (including identification and quantitation of coeluting congeners) is performed in accordance with the requirement of the FSP and QAPP.

Independent validation of vendor-requested parameters (e.g., ASTM method data and the like) will not be performed.

The data validation strategy is based upon the fact that 100 percent verification and validation of chemical analytical data (VOCs, SVOCs, pesticides/PCBs, herbicides, dioxins/furans, PCB congeners, and TAL metals) will occur.

Qualification of data resulting from the verification or validation processes will be reflected by assigning the appropriate qualifier code to the sample result in the project database.

The validation of the laboratory data will be performed with guidance from the USEPA Region II Standard Operating Procedures for the Validation of Organic and Inorganic Data (various SOPs and issue dates), supplemented as necessary by the USEPA National Functional Guidelines. These documents provide the criteria by which data are accepted, accepted with qualification, or rejected are listed below. Specific documents applicable to this project include:

- Organic data generated through the CLP program (volatiles, semivolatiles, and pesticides/PCBs) will be validated using SOP HW-6, Revision 11 (June 1996).
- Validation of metals data generated through the CLP program will be by SOP HW-2, Revision 11, January 1992: Evaluation of Metals Data for the CLP Program.

- Validation of chlorinated dioxin/furan data generated by DLM01.4 will utilize USEPA Analytical Operations/Data Quality Center (AOC) National Functional Guidelines for Chlorinated Dioxin/Furan Review (August 2002). This may be supplemented as necessary with guidance from HW-25, Revision 2, September 1999: Validating Tetra - through Octa - chlorinated Dioxins and Furans by Isotope Dilution (HRGC/HRMS) by Method 1613, Revision A
- HW-17, Revision 1.3, November 1994: Validating Chlorinated Herbicides by Gas Chromatography Validation of Herbicide Data Generated by SW-846 Method 8151A
- Validation of PCB Congener Data Generated by USEPA Method 1668A. There is no current USEPA Region 2 SOP for validation of this method. The USEPA Region 1 SOP (Standard Operating Procedure for Toxic PCB Congeners and Total Homologue Data Validation, Revision 2, August 2001) will be used as the starting point for validation of these data. In addition, the validation process will utilize applicable portions of criteria from methods with some similarity (for guidance on how to qualify the data) in conjunction with the published method and the laboratory's analytical SOP (for guidance on the method-specific criteria which should be achieved).

- Validation of TOC Data Generated by the USEPA Region Lloyd Kahn method (July 1988). These data will be generated by the Region 2 EPA DESA laboratory and are considered 'EPA-validated' when submitted by the laboratory.

The validation SOPs and guideline above will be supplemented, as appropriate, by the following guidance:

- USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (October 1999), and
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (July 2002).

These data validation SOPs provide the specific criteria used to validate the data for each analytical parameter for the project. Full validation will include an evaluation of documented QA/QC measures through a review of tabulated QC summary forms and raw instrument data.

Except as noted above, USEPA Region 2 staff or contractors will be responsible for data validation. All data analyzed through the CLP contracting system will be subject to full validation by USEPA.

Based upon the quality assurance review of the analytical data, specific codes (data qualifiers or 'flags') will be placed next to results in the database to provide and indication of the quantitative and qualitative reliability of the results. These defined qualifier codes will serve as an indication of qualitative and quantitative reliability. The data qualifier codes and definitions will be as follows:

U - The compound/analyte was analyzed for, but was not detected above the reported sample quantitation/detection limit. This applies to both samples in which the sample was reported as not detected by the laboratory, as well as compound/analytes which are considered "not detected" since it was detected in a blank at a similar level, as determined during the data quality review/data validation process.

J - Quantitation is approximate (estimated) due to limitations identified during the quality assurance review (data validation). This qualifier is applied to all data which were reported as detected at a concentration outside the limits of the calibrated range of the analysis, as well as for other reasons (minor deviations from QA/QC criteria) as determined during the data quality review/data validation process).

N - The analysis indicates that there is presumptive evidence to make a "tentative identification" of this compound/analyte. This flag is applicable only to organic analyses and is applied by the laboratory when an analyte does not meet all of the specified criteria for confident identification of the analyte, but is believed to be present based on the analyst's judgment.

R - Unusable (rejected) result – compound/analyte may or may not be present in this sample.

UJ - This compound/analyte was not detected, but the quantitation/detection limit is uncertain due to QA/QC issues identified during the quality assurance review.

EMPC – (dioxin analyses only). Estimated Maximum Possible Concentration; chromatographic peaks are present in the expected retention time window, but, the peaks do not meet all of the conditions required for a positive identification. The reported result represents the estimated maximum possible concentration if the PCDD or PCDF was present.

Additional qualifiers may be present on data generated by the USEPA Region 2 DESA laboratory; such qualifiers will be defined in the DESA laboratory deliverable.

D2.2 Procedures for Data Assessment (CLP)

Data assessment will be performed on all laboratory chemical analytical data generated through the CLP program. The five steps of the automated data assessment process, using the DAT process are:

1. Contracted laboratories provide analytical data electronically.
2. The electronic data is processed through CCS Initial Assessment (IA) checks to determine if the data is complete and in the proper format.
3. Laboratory electronic files that pass CCS IA are processed using the EPA mainframe to generate customized electronic spreadsheets and database files

(DBFs). The spreadsheet information is based on the laboratory qualified data. The results are forwarded to Regions via the DART system, an Internet-based email system.

4. Files that pass CCS IA are loaded and processed through the CLP's data review and evaluation system.
5. The assessment results are processed using the EPA mainframe to generate customized electronic files and spreadsheets. Results from the assessment process are generated in soft copy. All files, spreadsheets/DBFs, and reports are electronically transmitted to clients via the CLP's DART.

D2.2.1 CADRE

The Computer-Aided Data Review and Evaluation (CADRE) system examines Quality Control (QC) data for all analytical results and evaluates them against data review criteria which are appropriate for the corresponding analytical method/procedure and the intended use of the results. The CADRE system has predefined CLP method information and data review/QC criteria. However, it can be customized to support variations on the analytical techniques employed by the CLP and to review data according to project-specific QC criteria. CADRE uses both Regional and National Functional Guidelines to review and evaluate analytical data.

D2.2.2 CCS

The Contract Compliance Screening (CCS) system is a data assessment tool used to determine whether a laboratory has complied with all CLP Statement of Work (SOW) terms and conditions included in its contract. CCS results provide statistical and detailed reports (i.e., error messages and structural defects) on the administrative and technical defects and contributes to payment determination for the analytical services provided by a laboratory.

D.2.2.3DART

The Data Assessment Rapid Transmittal (DART) system is an automated email system designed to distribute specified reports to specific data recipients. DART is utilized to distribute CCS and CADRE reports to specified EPA Regional contacts. In addition, the DART distribution system delivers laboratory analytical data, in spreadsheet or database format.

D2.3 Data Evaluation and Summary Report

In accordance with the established scope of work (Task 4.4), TAMS/ET and MPI will interpret and evaluate the data and prepare summary reports that document the work performed during the geophysical surveys and the sediment core collection effort. TAMS/ET and MPI will utilize the bathymetric and side scan sonar maps prepared by ASI along with an evaluation of the existing database to provide recommendations to

NJDOT-OMR, USEPA, and USACE regarding the selection of the area for the sediment core collection. After the chemical and geotechnical laboratory data are available, TAMS/ET and MPI will interpret, evaluate, summarize, and tabulate the data collected during the sediment core collection effort and present the major findings to NJDOT-OMR, USEPA, and USACE. TAMS/ET and MPI will revise these summary reports to incorporate comments provided by NJDOT-OMR, USACE, EPA and other government agencies. TAMS/ET and MPI will prepare these reports in a format that will allow for easy incorporation into pertinent PMP documents. It should be noted that the current scope of work does not cover the preparation of a USACE-type Quality Control Summary Report.

D3 Reconciliation with Data Quality Objectives

The QA Program Manager in conjunction with the Project Manager will determine whether field and analytical data or data sets meet the requirements necessary for decision-making. The results of measurements will be compared to the DQO requirements set forth in this QAPP. As data are evaluated, anomalies in the data or data gaps may become apparent to the data users. Data that do not meet the DQOs will be identified and appropriately noted in the project database so the data users are aware of any limitations or concerns with the usability of the data.

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Table A-1
Project Schedule for Geophysical Survey and Sediment Coring

Activity	Date
Submit Draft Project Plans	January 2, 2004
Receive Comments from Agencies	February, March, and May 2004
Submit Final Project Plans	June 2004
Initiate Geophysical survey Fieldwork	March 2004
Receive Geophysical Survey Documents	May 2004
Initiate Sediment Coring	July 2004
Submit Draft Study report	Fall, 2004

Table B-1: Geophysical Survey Measurement Quality Objectives

Parameter	Acceptable Criteria	Unit of Measure	Validation Frequency	Corrective Action
Source level	+/- 2.5%	decibel	Beginning and end of each survey line	Re-survey if out of compliance
Amplifier Gain	+/- 1.0%	decibel	Same as above	Same as above
Receiver Gain	+/- 2.5%	decibel	Same as above	Same as above
Receiver Signal/Noise	Greater than 5	ratio	Continuous	Re-survey if not immediately corrected
Navigation (Horizontal)	+/- 1.75	feet	Continuous	Re-survey if not immediately corrected
Navigation (Vertical)	+/- 0.5	feet	Continuous	Re-survey if not immediately corrected

TABLE B-2
Passaic River Sediment Coring Quality Assurance Project Plan
SAMPLE BOTTLE, VOLUME, PRESERVATION, AND HOLDING TIME SUMMARY

MATRIX/ANALYSIS									
Sediment Samples		Sample Bottles (1)			Minimum	Preservation	Holding Time (3, 4)		
from Cores	Analytical Method	Mat'l	Size	Qty	Vol Rqd	(2)	Extraction	Analysis	Comment
Volatile Organics	OLM04.3, Part D-VOA	Encore	5 gm	3	3 x 5 g	None	N/A	48 hours	Analysis of Encore samplers must begin within 48 hours
Semivolatile Organics	SW-846 8270	Glass	8 oz	1	10 - 30 g	None	14 days	40 days	Extraction must be completed within 14 days
PCBs - Aroclors	SW-846 3550/8082	Glass	8 oz	1	2 - 30 g	None	14 days	40 days	Extraction must be completed within 14 days
Pesticides/Aroclors	OLM04.3, Part D-Pest	Glass	8 oz	(Note 8)	2 - 30 g	None	14 days	40 days	Extraction must be completed within 14 days
Herbicides	SW-846 3550/8151	Glass	8 oz	1	30 - 50 g	None	7 days (5)	40 days	Extraction must be completed within 7 days
PCBs- Congeners	EPA 1668A	Glass	8 oz	1	30 g	None	7 days (4)	40 days (4)	No holding times specified in method; default times applied.
PCDD/PCDFs	USEPA 1613B or 8290	Glass	8 oz	1	10 g	None	7 days (4)	40 days (4)	Holding times as listed in method for water samples.
Total Organic Carbon	EPA Region 2 (L Kahn)	Glass	8 oz	1	10 g	None	N/A	28 Days	
TAL metals (no CN)	ILM05.3	Plastic	8 oz	1	10 g	None	NA	180 days	Mercury holding time is 28 days
Grain Size (Sieve/Hydrometer)	ASTM D422/1140	P/G	Varies (7)	(Note 7)	(note 7)	None	NA	NA	100 g typical for fraction less than 75 um
Moisture Content of Soil and Rock	ASTM D2216	P/G	NS	1	20 g	None	NA	30 Days (6)	Sample volume assumes particle size below 2 mm
Bulk Density of Peat	ASTM D 4531 [9]	P/G	NS	1	100 g	None	NA	30 Days (6)	100 g minimum for method-specific matrix (i.e., peat)
Atterberg (liquid/plastic) Limits	ASTM D 4318	P/G	NS	1	150 - 200 g	None	NA	NA	Sample should be less than 425 um fraction
Specific Gravity	ASTM D 854	P/G	N/A	N/A	20 g	None	N/A	NA	Sample volume assumes particle size below 2 mm
Treatability Study / Vendor-Requested Analyses (60-gallon bulk sample)									
Dissolution of Solid Waste by Lithium Metaborate Fusion	ASTM D 4503	P/G	NS	1	NS	None	N/A	N/A	Referred to as 'total oxide analysis' by vendor. Generates extract suitable for metals analysis by ICP or AAS.
pH	SW-846 9045	P/G	NS	1	10 g	None	N/A	Immediate	pH should be measured as soon as practicable.
Percent Solids	SM 2540G	P/G	4 oz	1	10 g	None	N/A	N/A	SM 2540G requested by vendor
Major and Minor Elements in Coal and Coke by XRF or AAS	ASTM D 4326 (XRF) or ASTM D3682 (AAS)	P/G	NS	1	10 g	None	N/A	N/A	Referred to as 'major metal oxides' by vendor. Less than 1 g required for each determination, based on ash matrix

(1) Bottles shown for CLP SOW analyses as specified in USEPA, 2004. Others are typical and specific sizes and sample groupings may vary depending on laboratory-specific requirements.
(2) All samples for chemical analysis should be held at 4 degrees C in addition to any chemical preservation required.
(3) Holding time for calculated from day of collection.
(4) Samples and extracts may be held frozen (at -10 degrees C) for up to one year. Holding time clock is stopped while samples are frozen.
(5) 7-day extraction limit based on USEPA Region 2 Data Validation SOP requirement (SOP No.23, Revision 0, April 1995)
(6) No holding time specified in method. Time shown is default recommendation to minimize sample alteration.
(7) Necessary volume contingent upon fineness of material. Fine grained materials as expected in Passaic require smaller sample volumes; see method 422 (Appendix A) for specifics.
(8) Sample for pesticide analysis is taken from same 8-oz jar submitted for PCB analysis
(9) Bulk Density may be performed in field. See QAPP Section B.1.2.
SM = Standard Methods for the examination of Water and Wastewater
XRF = X-ray Fluorescence
AAS = Atomic Absorption Sprectroscopy
P/G = plastic or glass
NS = not specified in method. Appropriate bottles to be determined and provided by laboratory.

TABLE B.3
Quality Assurance Project Plan
Passaic River Sediment Coring QA Sample and Analysis Summary

Sediment Characterization				ESTIMATED SAMPLE QUANTITY					
Parameter	Laboratory	Analytical Method [1]	Reporting Limit Goal (mg/kg unless noted otherwise) [2]	Field Sample Quantity	Matrix Spike (MS)	MS Duplicate or Matrix Duplicate	Field Duplicate	Equipment Blank	Total Analytical Samples
Volatile Organics	CLP	OLM04.3, Part D-VOA (EnCore)	10 ug/kg	46	3	3	3	0	55
Semivolatile Organics	EPA 2 (DESA)	OLM04.3, Part D-SVOA	0.33 (individual)	46	3	3	3	3	58
PCBs - Aroclors	STL (Vt or Tn)	SW-846 3550/8082	33 ug/kg (67 ug/kg for 1221)	16	1	1	1	1	20
Pesticides/Aroclors	CLP	OLM04.3, Part D-Pest	varies (1.7 to 170 ug/kg)	46	3	3	3	3	58
Herbicides (2,4-D and 2,4,5-T only)	STL-Vt	SW-846 3550/8151	2,4D = 0.14; 2,4,5T = .018	46	3	3	3	3	58
PCBs - Congeners (Full suite [209])	STL-Tn	EPA 1668A	varies; 5 to 100 ng/kg	16	1	1	1	3	22
PCDD/PCDFs	STL-Tn	USEPA 8290 or 1613B	varies; 1 to 10 ng/kg	16	1	1	1	3	22
Total Organic Carbon	EPA 2 (DESA)	EPA Region 2 (L Kahn)	1000	46	0	0	3 [4]	0	46
TAL Metals (no cyanide)	EPA 2 (DESA)	ILM05.3	varies (Pb = 1 mg/kg; Hg = 0.1)	46	3	3	3	3	58
Grain Size Distribution (Sieve/Hydrometer)	EPA 2 (DESA)	ASTM D422/1140	NA	46	NA	NA	0	NA	46
Moisture Content of Soil and Rock	STL-Vt	ASTM D2216	NA	46	NA	NA	0	NA	46
Bulk Density of Peat	STL-Vt	ASTM D 4531[5]	NA	46	NA	NA	0	NA	46
Atterberg (liquid/plastic) Limits	STL-Vt	ASTM D 4318	NA	46	NA	NA	0	NA	46
Specific Gravity	STL-Vt	ASTM D 854	NA	46	NA	NA	0	NA	46
Treatability Study / Vendor-Requested Analyses (60-gallon bulk sample)									
Dissolution of Solid Waste by Lithium Metaborate Fusion (Total Oxide Analysis)	STL -Vt (sub to RJ Lee)	ASTM D 4503	NA	11	NA	NA	0	NA	11
pH	STL -Vt	SW-846 9045	NA	11	NA	NA	0	NA	11
Major and Minor Elements in Coal and Coke by XRF or AAS (Major Metal Oxides)	STL -Vt (sub to RJ Lee)	ASTM D 4326 (XRF) or ASTM D3682 (AAS)	NA	11	NA	NA	0	NA	11
Geophysical Ground Truth Sampling [3]									
Grain Size Distribution (Sieve/Hydrometer)	USACE/USGS	ASTM D422/1140/Laser	NA	5	NA	NA	2	NA	7

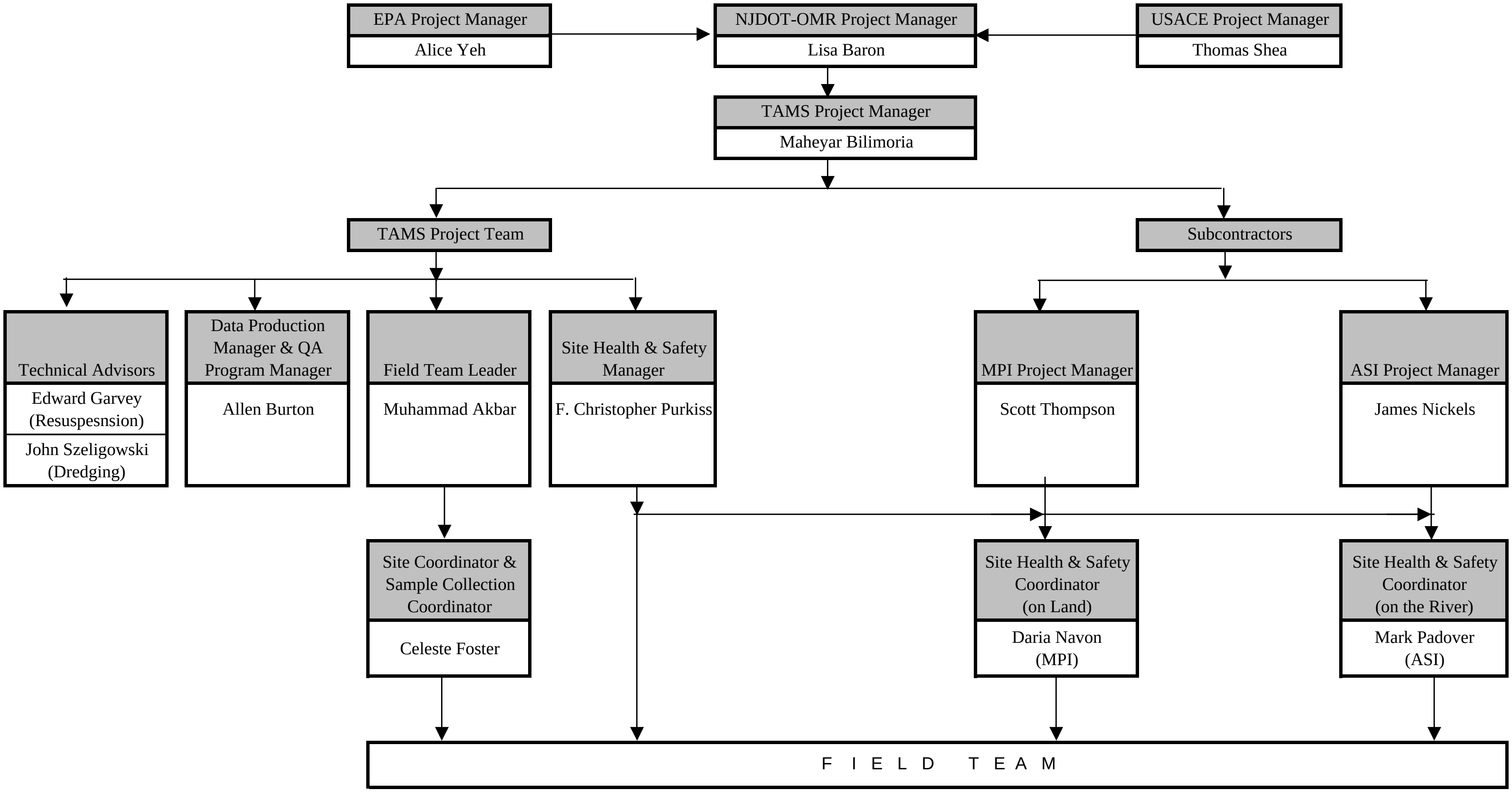
NOTES

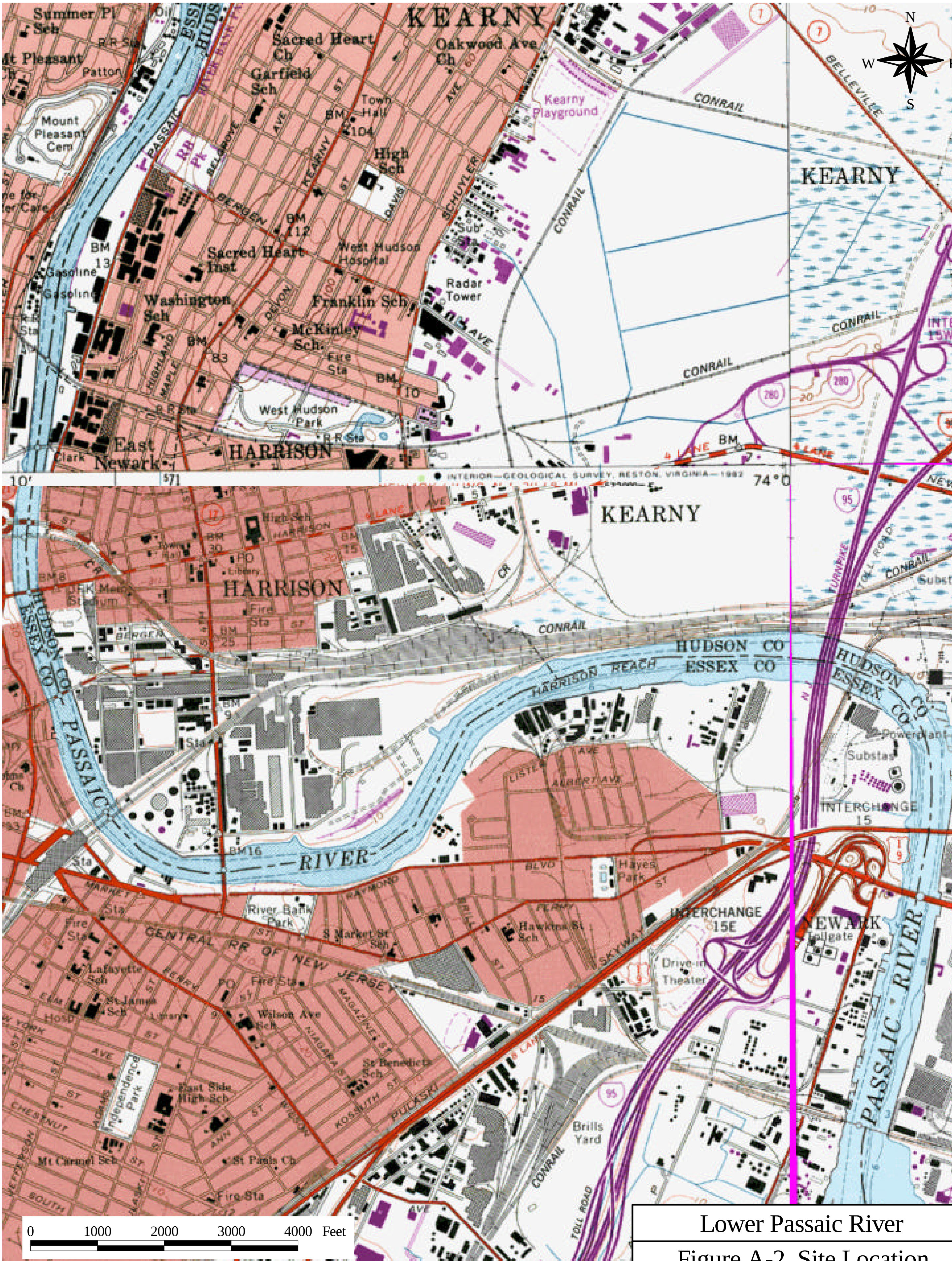
1 Analytical methods shown are expected to achieve required sensitivity. Other comparable methods may be used, subject to client approval.
2 Reporting limits goals based on method capabilities or estimated sensitivity necessary to detect the specified analyte in most (80 percent or more) of samples. Actual reporting limits may be higher due to matrix effects including moisture content and high contaminant concentrations.
3 Performed on a limited number of samples obtained during the geophysical survery; these samples are separate from those collected uring the sediment coring program. Samples submitted April, 2004
4 TOC replicate is analyzed in quadruplicate.
5 Bulk Density may be determined in field (by accurately weighing 12-inch core sections) to more accurately determine in situ density.

LABORATORIES

STL-Vt = Severn Trent Laboratories (STL), Colchester, Vermont facility
STL-Tn = STL, Knoxville, Tennessee facility
EPA 2- DESA = USEPA Region 2 Division of Environmental Science and Assessment Laboratory, Edison, NJ
CLP = Contract Laboratory Program Laboratory. Laboratory is assigned from by USEPA from pool of USEPA CLP Labs.

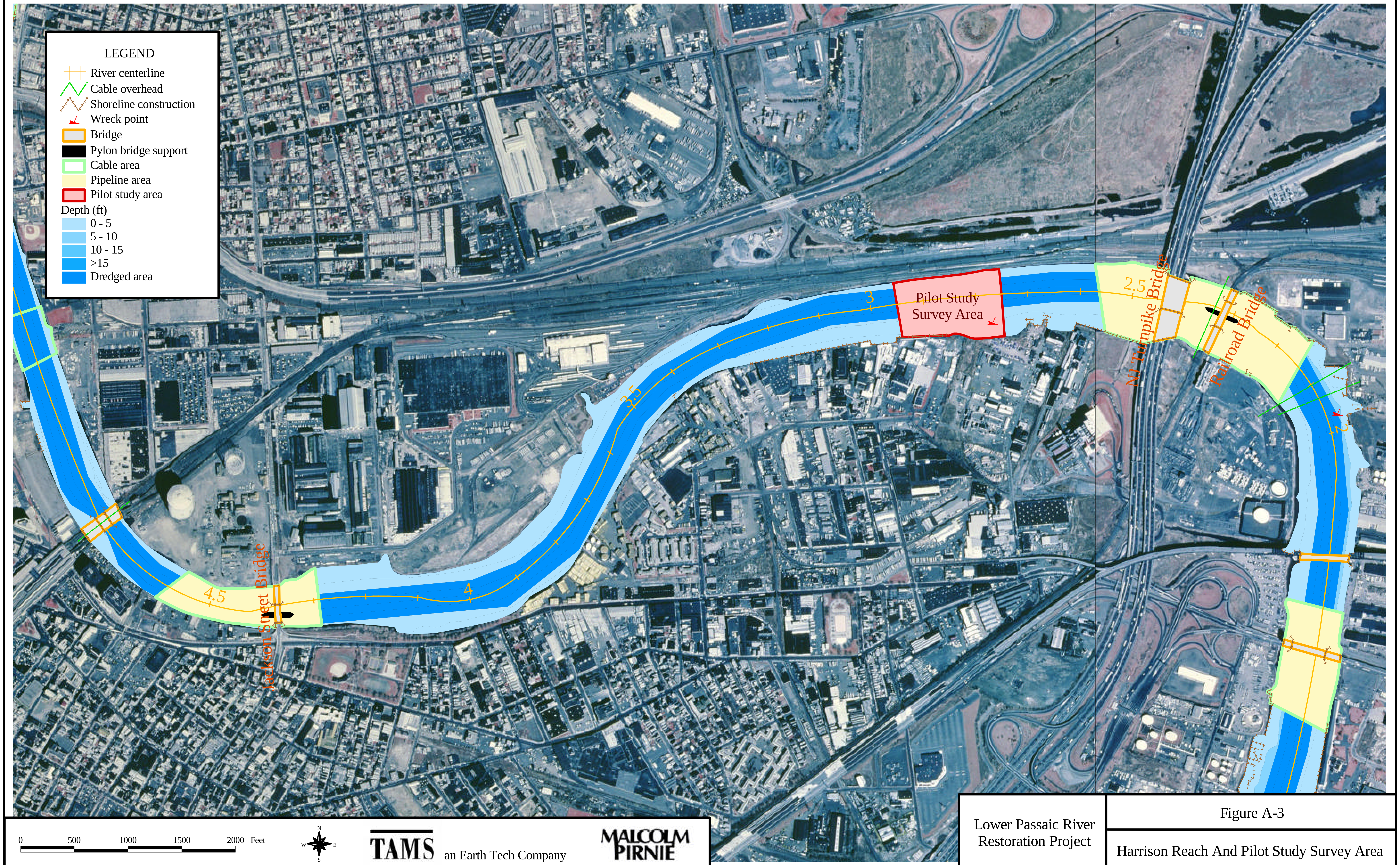
Figure A-1
Organization Chart





Lower Passaic River

Figure A-2. Site Location



Lower Passaic River Restoration Project

Figure A-3

Harrison Reach And Pilot Study Survey Area

TAMS, an Earth Tech Company

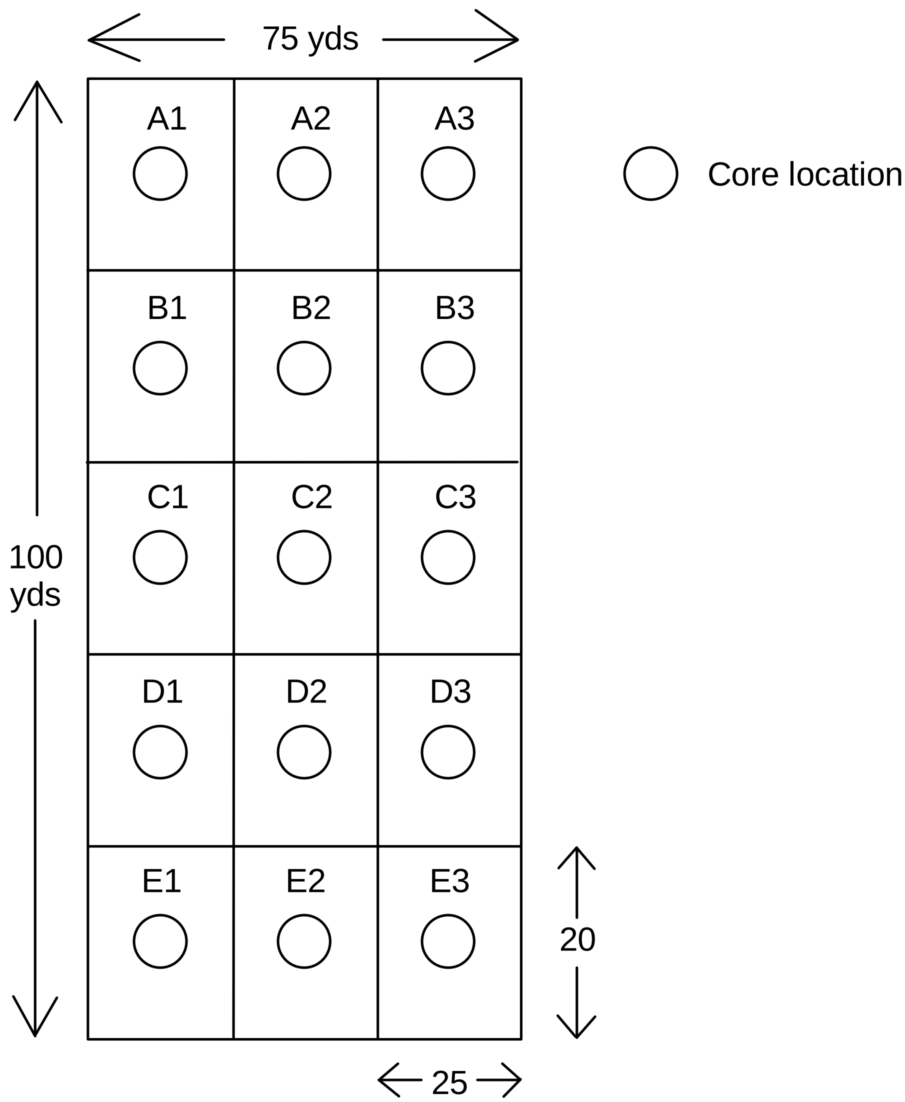
MALCOLM PIRNIE

Lower Passaic River Restoration Project

Figure A-4

Potential Dredging Area and Sediment Coring Locations

Sediment Coring Grid



Core Nomenclature

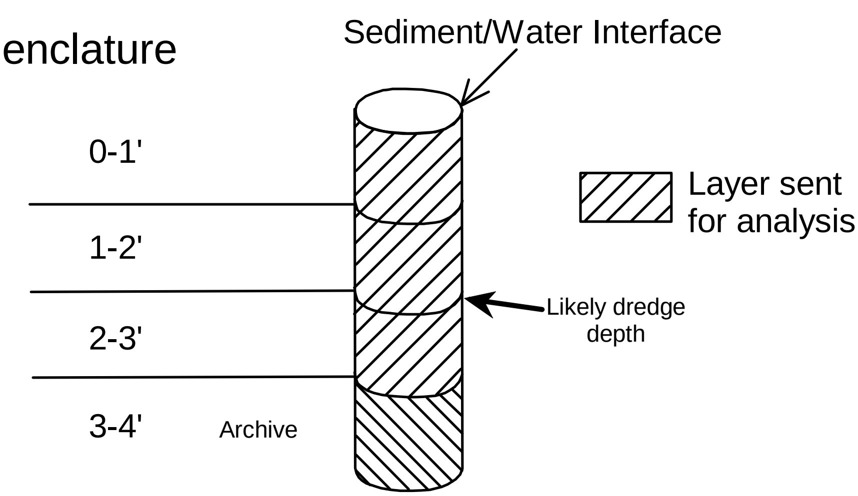


Figure B-1. Sediment Coring Grid

PASSAIC RIVER SEDIMENT SAMPLING AND ANALYSIS PROGRAM

Coring Field Log

Relinquished by:____________________ Date: ________ Time: ________ Sampler:______________________________

Received by:____________________ Date: ________ Time: ________ Weather:

Core I.D.	Date	Time	Northing	Easting	Water Depth (ft)	Probing Depth (in)	Sediment Type	Sediment Description	Sample Type **	Core Recovered	Tube Material *	Penetration (in)	Recovery (in)
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			

* Tube Material: A = Aluminum, L = Lexan   ** Sediment Type: C = Core, G = Grab

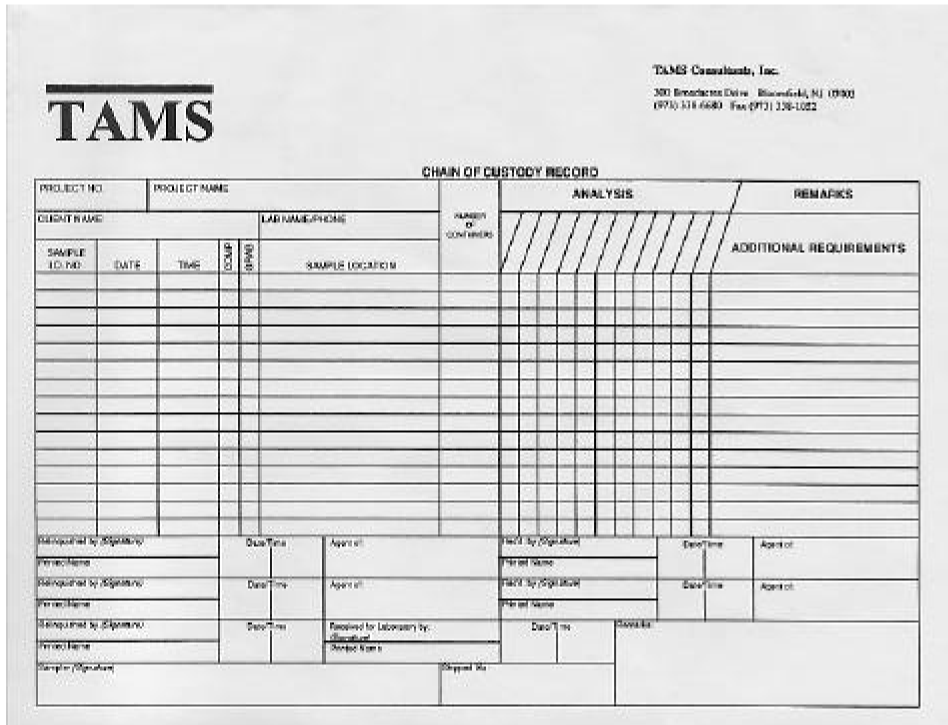
FIGURE B-2:
EXAMPLE FIELD LOG FORM

SCALE: NONE

EARTH TECH

PASSAIC RIVER SEDIMENT SAMPLING AND ANALYSIS PROGRAM

Chain of Custody Form



TAMS

TAMS Consultants, Inc.

CHAIN OF CUSTODY RECORD

PROJECT NO. | PROJECT NAME

CLIENT NAME | LAB NAME/PHONE

NUMBER OF CONTAINERS

ANALYSIS

REMARKS

ADDITIONAL REQUIREMENTS

SAMPLE I.D. NO. | DATE | TIME | COMP | GRAB | SAMPLE LOCATION

Relinquished by (Signature) | Date/Time | Agent of | Rec'd by (Signature) | Date/Time | Agent of

Printed Name | Printed Name

Relinquished by (Signature) | Date/Time | Agent of | Rec'd by (Signature) | Date/Time | Agent of

Printed Name | Printed Name

Relinquished by (Signature) | Date/Time | Received for Laboratory by: (Signature) | Date/Time | Remarks

Printed Name | Printed Name

Sampler (Signature) | Shipped Via

FIGURE B-3: EXAMPLE CHAIN OF CUSTODY FORM	SCALE: NONE	EARTH TECH

GEOPHYSICAL SURVEYS AND SEDIMENT CORING

SITE SAFETY AND HEALTH PLAN

Environmental Dredging and Sediment
Decontamination Technology Demonstration
Pilot Study

Lower Passaic River Restoration Project

Prepared for

New Jersey Department of Transportation -OMR

Prepared by

TAMS Consultants, Inc., *an Earth Tech company*
300 Broadacres Drive
Bloomfield, New Jersey 07003

June 2004

GEOPHYSICAL SURVEY AND SEDIMENT CORING
SITE SAFETY AND HEALTH PLAN
Dredging and Decontamination Pilot Study
Lower Passaic River Restoration Project

List of Tables

List of Attachments

1.0 INTRODUCTION

1.1 SCOPE

This Site Specific Safety and Health Plan (SSHP) has been developed to address overall health and safety requirements for TAMS conducting investigations in conjunction with a pilot-scale dredging and sediment decontamination technology demonstration. This SSHP has been prepared in accordance with the Occupational Safety and Health Administration's (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard 29 CFR 1910.120. The activities covered under this SSHP are:

- Sediment Coring
- Geophysical Surveys (Hydrographic and side-scan sonar)

This SSHP describes in detail the requirements and procedures for TAMS employee protection for the various investigation activities to be conducted at this site. TAMS, an Earth Tech Company (TAMS), is the prime consultant for the task, and has developed a separate SSHP included in the work plan. The subcontractor, Malcolm Pirnie, Inc. (MPI), is required to develop a SSHP addendum for their employees. The subcontractor, Aqua Surveys, Inc. (ASI), is also required to develop a SSHP addendum that will contain a hazard evaluation and methods to control hazards that may be encountered in their tasks. This (TAMS) SSHP contains the listing of chemicals of concern that shall be referenced during the fieldwork. This SSHP also contains the minimum requirements for work performed on the river, during the transport of samples on the shuttle vessel, and at the land-based sample management area. Addenda prepared by MPI and ASI will be appended to this SSHP and will be consistent with the provisions and restrictions outlined herein. Where MPI or ASI corporate H&S require more stringent H&S methods their plans will apply to their personnel. This SSHP and appended subcontractor safety documents will be submitted to the NJDOT-OMR prior to commencement of any field activities.

Included in this SSHP are safety and emergency response procedures for preventing accidents and protecting personnel from occupational injuries and illnesses during the site activities. Also included in this SSHP are the assignments of responsibilities, minimum personal protective equipment requirements, standard operating procedures for safety, accident investigation and reporting requirements, and emergency response procedures. The content of this document is based upon historical information and the assessment of the potential physical and chemical hazards associated with the site. A copy of this SSHP will be available on site during site investigations. Compliance with this SSHP is required of project personnel and visitors. Similarities between the TAMS and MPI SSHP's are deliberate so that there is general consistency between the plans.

1.2 REGULATORY REQUIREMENTS AND GUIDELINES

The procedures outlined in this SSHP comply with the OSHA requirements contained in 29 CFR 1910 including the final rule contained in 29 CFR 1910.120. The procedures are also consistent with the guidance contained in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, which has been prepared jointly by the United States Environmental Protection Agency (USEPA), Occupational Safety and Health Administration (OSHA), National Institute for Occupational Safety and Health (NIOSH), and the United States Coast Guard (USCG), the United States Army Corps of Engineers' (USACE) Safety and Health Requirements Manual EM385-1-1, and the USEPA's Standard Operating Safety Guidelines.

2.0 SITE BACKGROUND AND SETTING

The Harrison Reach of the Passaic River is the general Study Area for the pilot-scale dredging program being developed pursuant to OMR Task 1. Sediments within the Harrison Reach are among the most severely contaminated and several of the principal sources of contaminants to the river also are/were situated here. This reach has become a particular focal point for the pilot program since it provides an opportunity to handle and process the widest range of contaminated sediments and, therefore, the results obtained from the pilot program can be expected to have the broadest applicability to ultimate remediation of the river system.

2.1 SITE LOCATION

The Harrison Reach extends approximately 2 miles from the NJ Turnpike Bridge to the Jackson Street Bridge that connects Harrison with Newark. The Study Area is bordered to the north by the City of Harrison in Hudson County and to the south by the City of Newark in Essex County. The Passaic River is aligned in a nearly true east-west direction in the central portion of the Harrison reach. Upstream and downstream of this central area the River exhibits a series of bends. To simplify evaluation and monitoring of dredging operations, the proposed demonstration project would preferably occur in the portion of the Harrison Reach that is aligned east-west.

The USACE had historically designated a 300-foot wide navigation channel within the Harrison Reach with a Project Depth of 20 feet MLW. Based on a hydrographic survey conducted by USACE in 1989, water depths in the Reach ranged from 21.1 feet at mean low water (MLW) at the downstream end of the Reach to approximately 19.2 feet (MLW) at the upstream end. However, a more recent USACE channel condition report (2002) noted significant shoaling. According to the Work Plan for the RI/FS submitted to the USEPA in 1995, the only dredging event in the Harrison Reach within the period of interest (1940 to present) was performed in 1949 to the Project Depth of 20 feet.

2.2 NATURE OF CONTAMINATION

During the 1980s and early 1990s, several investigations were conducted to evaluate the concentrations of various potential contaminants in sediments within the Study Area boundaries. These studies include investigations conducted as part of the remedial investigation work at the Diamond Alkali Superfund Site, investigations conducted on behalf of OCC in the early 1990s, and investigations conducted by various governmental agencies, including the National Oceanic and Atmospheric Administration (NOAA), US Fish and Wildlife Service (USFWS), and EPA. These investigations indicated that sediments of the Passaic River Study Area contain elevated concentrations of numerous hazardous substances including, but not limited to, cadmium, copper, lead, mercury, nickel, zinc, bis (2-ethylhexyl) phthalate, polynucleararomatic hydrocarbons, polychlorinated biphenyls (PCBs), 4,4'-dichlorodiphenyltrichloroethane (4,4'- DDT), diesel range organics (Total Extractable Petroleum Hydrocarbons), polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans, and chlorinated herbicides and phenols.

2.3 SITE ACCESS

In order to access the Harrison Reach from the Newark Bay, there are a series of low and high bridges beneath which demonstration project equipment must navigate, starting from the Garden State Parkway Bridge across the Raritan River to the New Jersey Turnpike Bridge within the Harrison reach. Given that towboats hauling barges laden with project equipment will generally require 25 feet of air draft, a number of the low bridges will be required to open to enable project equipment to pass.

It is anticipated that the project land-based staging area will be established at a Fire Training Facility located on the east bank for the Harrison Reach. This location will serve as the sample management area and command post. Personnel vehicles will be parked here and the project shuttle boat will deliver the sediment cores to land-based sample management/processing personnel at this location. The address of the facility is 34 Jersey St., Newark, NJ, 07105.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

3.1 ORGANIZATION AND RESPONSIBILITIES OF SAFETY PERSONNEL

Project Manager (PM)

The PM, Maheyar R. Bilimoria, has the final responsibility for the quality of the work performed under the contract and will be the primary point of contact with the NJDOT-OMR senior management. He is primarily responsible for the development and implementation of the investigation and for the health and safety of TAMS personnel assigned to the field investigation.

Corporate Health and Safety Administrator (HSA)

The Corporate HSA, F. Christopher Purkiss, is responsible for the development and implementation of TAMS' health and safety program. The HSA functions as a liaison with the USACE, OSHA, and other agencies on health and safety issues. The HSA will have the final say on any changes to this SSHP.

Site Safety Officer (SSO)

The SSO (TBD) will be knowledgeable in safety and worker protection techniques as they relate to the project. Primary responsibilities of this individual include daily inspections of work locations to ensure compliance with this SSHP, correcting deficiencies noticed in the field and implementing procedures to prevent the same deficiency from reoccurring, conducting routine hazard analyses of the tasks being performed to ensure current practice is adequate, conducting hazard analyses on new or modified tasks, and assisting the PM with problems relating to worksite safety. This person shall be in regular communication with the HSA.

The SSO will report directly to the HSA and brief him on unsafe work practices as they are observed. This individual will oversee exposure monitoring conducted throughout this project and has the authority to stop work or upgrade PPE requirements based on this data.

This individual is responsible for the development and set-up of emergency procedures and personal decontamination procedures. Resolution of on-site health and safety problems will be coordinated through the PM with the assistance from the HSA.

The SSO will be present on site and will conduct pertinent health and safety training for employees working on the site, including the site orientation training, morning safety meetings, and training on controls put in place to address unsafe work practices noticed in the field.

The SSO is responsible for maintaining training, medical surveillance, and any other health and safety related documentation generated during the course of this project.

The SSO is responsible for ordering, maintaining, and issuing PPE to TAMS personnel on the site.

TAMS Field Personnel

Field personnel are required to become very familiar with the requirements set forth in this SSHP, follow the health and safety procedures and guidelines outlined in this SSHP, and use PPE properly to protect themselves and their co-workers. Field personnel are encouraged to contribute any suggestions and assist in discovering or correcting unsafe work conditions.

Subcontractors

The subcontractors, MPI and ASI, may designate one or more safety and health coordinators to the site during any site activities involving that subcontractor. This individual will develop a SSHP Addendum addressing the hazards associated with the subcontractor's project tasks and act as a liaison between the TAMS SSO and subcontractor.

Subcontractor Personnel

Subcontractors whose work will be performed on-site, or who otherwise could be exposed to health and safety hazards, will be advised of known hazards through distribution of site information obtained by TAMS and this SSHP. They will be solely responsible for the health and safety of their employees and will comply with all applicable health, safety, and environmental regulations. Subcontractors are responsible for the following:

- Providing their own PPE.
- Training their employees in accordance with applicable State, Federal and local laws and regulations.
- Providing medical surveillance and obtaining medical approvals for their employees.
- Ensuring their employees are advised of and meet the minimum requirements of this SSHP and any other additional measures required by their site activities.
- Comply with their corporate H&S requirements.

Subcontractors will ensure that their personnel are familiar with the proper use of protective equipment in order to protect themselves and those around them from injury and to prevent damage to materials, equipment, and facilities. Subcontractor personnel will contribute any suggestions and assist in discovering or correcting unsafe work conditions. Subcontractor personnel will notify the MPI SSHO and TAMS SSO of any suggestions to the plan or unsafe conditions. TAMS will document their subcontractors' compliance with the requirements of this SSHP.

Prior to commencing the hydrographic survey, and then the sediment coring fieldwork, ASI will notify all personnel on the boats of the dangers of their work activities. They will instruct all boat personnel as to where to stand during the movement of equipment so that the work may proceed safely, and efficiently. ASI requests shall be followed, unless it is noted that to do so will present a greater danger to boat observers. Any such conflicts shall be resolved with the SSO before proceeding with the work. ASI shall also establish standard embarking and disembarking procedures for both the sediment coring vessel and the shuttle vessel.

4.0 SAFETY AND HEALTH RISK ANALYSIS

4.1 PROJECT TASKS

Listed below are the proposed tasks that TAMS, Malcolm Pirnie (MPI), and ASI will be involved with and a description of the work they will be performing. This information is used as the basis for the task hazard analysis defined in Section 4.2.

4.1.1 Geophysical Survey

- TAMS and MPI personnel accompany ASI on a small (18 foot) vessel to oversight collection of geophysical data (i.e. river-bottom hydrographic survey and side-scan sonar) and collect field notes.

- TAMS and MPI personnel accompany ASI on a small vessel to collect sediment samples for physical properties analysis to "calibrate" the findings of the side-scan sonar, etc. (TAMS tasks: record field notes, accept custody of retrieved sediment sample, place in sample jar while aboard vessel and store in cooler with ice.)

- Additional sample management at field staging area.

4.1.2 Sediment Coring Programs

- TAMS and MPI personnel accompany ASI on a 26 foot vessel to oversee sediment core retrieval (TAMS tasks: record field notes, accept custody of retrieved sediment core, label exterior of core tube and place in container with ice.)

- TAMS or MPI personnel will accompany collected cores while being transported on ASI small shuttle vessel to off-loading points.

- TAMS and MPI personnel oversee off-loading of retrieved cores at the field staging area.

- TAMS and MPI personnel to process samples at processing center (field support facility).

    - Cut core tubes into sub-samples, each approximately one foot long
    - Transfer sediment into bowls and homogenize manually
    - Monitor breathing zone personnel exposure with PID and mercury vapor analyzer.
    - Transfer homogenized sample into laboratory jars
    - Decontaminate non-dedicated sampling tools using solvents (if necessary)

- Manage excess sample material, discarded core tubes, discarded PPE, and spent decontamination fluids
- Perform housekeeping of sample processing area to maintain clean and dust free environment.

4.2 TASK HAZARD ANALYSIS

Table 4-1 evaluates the safety and health hazards known to be associated with the planned activities for TAMS personnel at the various locations on the Passaic River. Table 4-1 develops each task or step, describes the potential safety hazards associated with the task, and recommends various site controls, personal protective equipment, and operating procedures to control the hazards.

Fieldwork for this task is scheduled to take place during January and February 2004. Therefore, heat stress is not a concern.

4.3 GENERAL PHYSICAL/BIOLOGICAL HAZARDS

Anticipated physical/biological hazards include:

- Cold Stress (low ambient temperature)
- Noise
- Slips, Trips, and Falls
- Equipment Operation
- Storms
- Falling Objects
- Biological Hazards
- Drowning/Man Overboard

4.3.1 Cold Stress

Exposure monitoring for cold stress is described in Section 6.2. Coordination of the transport of personnel exhibiting the signs of cold stress shall be performed ASAP.

4.3.2 Noise

Noise exposure monitoring is covered in Section 6.3. Earplug or earmuff type noise attenuators shall be used during any activity where equipment noise requires shouting between personnel located 2 to 3 feet apart.

4.3.3 Slips, Trips, and fall

Ground irregularities due to topography, snow and ice, or protruding materials equipment, or electrical cords may pose slip, trip, and fall hazards to employees who will be working from the banks of the Passaic River or on the boats. Wet, snowy or icy surfaces, and limited room to move around on the vessels also pose this type of hazard to employees. Waves from passing vessels are to be observed so that appropriate actions may be taken, if necessary. Field personnel will be briefed by the SSO at the beginning of each day during the morning safety meeting on the location and type of obvious hazards in the various work areas and snowy or icy conditions. Site workers are to take care in areas where ground irregularities and slick surfaces exist. Boat decks will be maintained in an orderly manner. Ice and snow will be removed from the working and walking deck areas of the boat prior to launching or if such conditions occur during the day. The safety of continuing work will be assessed by the SSO in consultation with the site personnel. Shuttle vessels shall be at the ready in the event that the sample vessels require assistance.

4.3.4 Equipment Operation

To prevent entrainment in moving machinery, site personnel will maintain a safe distance from heavy machinery. More importantly, personnel will keep a safe distance from the winch, the swing radius of the davit, and as heavy equipment is being moved, such as the vibracore, while on the sampling boats. It is mandatory that subcontractors who will be operating the boats safely position a spotter to guide the operator when passing near overhead hazards, and to warn others personnel of the equipment hazards.

4.3.5 Storms

Thunderstorms may pose an electrocution hazard. During thunderstorms, heavy equipment will be shut down, sampling activities will be terminated and all personnel on-site will take refuge on-shore. All personnel aboard boats are to head back to the staging area immediately in the threat of a thunderstorm. Each boat will be equipped with a marine radio that will be used to monitor impending storm conditions. If available, a storm warning radio or lightening detector shall be used. River activity shall cease 15 minutes prior to a storm and 15 minutes after the last observed lightening or storm warning notification.

4.3.6 Falling Objects

Caution shall be used when passing beneath bridges. Falling concrete, debris and objects thrown from vehicles may exist. Boats shall not linger beneath bridges. Eyewear shall be used if skyward observations are required beneath bridges. If there is a danger of falling objects at any location, the SSO shall assess the need to work at that location.

4.4 CHEMICAL HAZARDS

A variety of industrial sources are believed to have contributed to contamination of the sediment in the Passaic River. Sampling results indicate that there are chemicals present at various depths and locations within the Site.

The chemicals of concern (COCs) with respect to personnel safety at the Site include polychlorinated dibenzodioxins, polychlorinated dibenzofurans (PCDDs/PCDFs), polychlorinated biphenyls (PCBs), aromatic hydrocarbons, phenols, pesticides, chlorinated organic compounds, polynuclear aromatic hydrocarbons (PAHs), phthalates, and metals. Some of the COCs are known or suspected human carcinogens. Two tables from the 1995 Remedial Investigation Work Plan have been included in Attachment B. Table 4-1 presents the maximum concentrations of COCs based on review of historical analytical data. Table 6-1 lists the PEL-TWA (Permissible Exposure Limit - Time Weighted Average) and the TLV-TWA (Threshold Limit Value -Time Weighted Average) for most of the compounds listed in Table 4-1 (Current OSHA PELs for some of these constituents may be less stringent, however the more stringent 1995 limits shall be used). These limits are defined as the concentration of a chemical in air to which most workers can be repeatedly exposed, day after day, for a normal 8-hour workday and a 40-hour workweek, without adverse effect. Exposure limits have not been established for all the compounds listed in Table 6-1. If presented, the exposure limits were obtained from the 1994 "Guide to Occupational Exposure Values" compiled by the American Conference of Governmental Industrial Hygienists (ACGIH). Acute or chronic symptoms of exposure to the COCs are not included in Table 6-1 due to the number of COCs listed. However, common symptoms of exposure to COCs are eye, nose and throat irritation, headache, nausea, dizziness, blurred vision, cramps, and skin rashes. Whenever any of these symptoms are experienced, fieldwork should stop immediately and affected personnel should seek medical attention. Work will begin only after the SSO evaluates the situation and gives approval for commencing work. Common routes of entry are inhalation, ingestion and dermal contact. Skin contact with sediments is the primary route of exposure for site personnel. Therefore, proper use of PPE and replacement of compromised PPE will be of primary concern to personnel handling sediment samples or other potentially contaminated surfaces. Proper housekeeping is necessary to prevent the generation of dusts, which will increase contaminant exposure potential through the respiratory pathway. Therefore, sediment will be cleaned up from the sample processing area after each sample is processed.

Exposure Routes

The primary exposure pathways of concern for these constituents are inhalation and skin absorption.

<u>Inhalation of Contaminated Dust</u>
PCDDs/PCDFs, pesticides, hexachlorobenzene, metals, and PCBs are may be contained within the sediments collected from the river and become airborne in the breathing zone only as a result of dust-generating activities. Dust suppression techniques (i.e., water misting/washing and wiping up of the sample management counter and the floor of the sample processing area, ventilation, and washing sediments off the boat) shall be used to reduce airborne exposures.

<u>Inhalation of Volatile Contaminants</u>
There is the potential that aromatic hydrocarbons, phenols, and chlorinated organic compounds, may volatilize from the sampling media. There is a possibility that personnel may be exposed to volatile organic contaminants (VOCs) during activities, which require

contact with the river sediments. Volatilization is expected to increase with increasing ambient temperatures. Disturbance of the sediments such as will be required during sample processing may also result in increased air concentrations. Mercury vapor will be monitored as a precaution.

Ingestion

Personnel may be exposed to accidental ingestion of contaminants by hand to mouth contact after contact with contaminated materials. Ingestion of constituents of concern will be controlled by specific work practices, such as refraining from touching hand to mouth while on the work site, through the use of PPE (e.g., nitrile gloves) and by employing appropriate personal hand washing and other decontamination procedures.

Skin and Eye Contact

Skin and eye contact with some of the constituents at the site may cause skin or mucous membrane irritation. Many of those constituents can be absorbed into the bloodstream through the skin or eyes. Skin contact will be minimized through the use of Tyvek coveralls, nitrile gloves, and booties (where necessary). Where the potential for spash of sediments or liquid into the eyes is present appropriate eyewear shall be worn.

5.0 HEALTH & SAFETY TRAINING

5.1 GENERAL REQUIREMENTS

Personnel involved with the site investigation and sampling tasks are required to have completed the 40-hour hazardous materials health and safety training specified in 29 CFR 1910.120(e)(3)(i). This training, designed to orient personnel potentially exposed to hazardous substances, health hazards, or safety hazards includes the following:

- Safety and health risk analysis
- Use of Personal Protective Equipment
- Work practices by which an employee can minimize risk
- Safe use of engineering controls and equipment
- Medical Surveillance requirements
- How to recognize hazards and signs that indicate overexposure
- Procedures for environmental monitoring, site control, and decontamination
- Emergency Response Plans

Personnel will have proof of attendance at an annual 8-hour health and safety refresher course if their 40-hour course was completed more than a year prior to the start of field activities. In addition, a minimum of one field person with current CPR/First Aid Training will be present on-site during all field activities.

5.2 SPECIALIZED TRAINING

TAMS, subcontractor, and other field personnel are to be knowledgeable in the particular hazards that may be encountered during this project and be familiar with safe operating procedures (See Section 10). This will be accomplished through regular safety meetings during the program as discussed below.

Independent field personnel must have a minimum of three days of actual field experience under a skilled supervisor and be familiar with emergency response procedures outlined in Section 12 of this HASP. The SSO and supervisory personnel will have additional training, including CPR/First Aid and the 8-hour Supervisor Course for hazardous materials. Subcontractors will be responsible for ensuring their employees have received specialized training for their specific job functions and responsibilities.

5.2.1 Captain's Qualifications

Each captain must have proof of attendance at a Safe Boating Course offered by either the USPS or the U.S. Coast Guard and be certified in CPR and First Aid. All U.S. Coast Guard captain requirements for the hydrologic survey, sediment coring operations, and shuttle operations must be met. ASI will certify that they are so qualified, trained and licensed.

5.2.2 Morning Safety Meetings

The SSO will conduct a morning health and safety briefing. Issues uncovered and lessons learned from the previous day's activities or the interpretation of newly available environmental monitoring data are examples of topics that might be covered during these briefings. An outline report of meetings giving the date, time, attendees, subjects discussed, and instructor will be maintained. Visitors, including NJDOT-OMR and consultant personnel conducting a routine visit, will be properly oriented to existing site conditions, planned activities, levels of protection, and other procedures outlined in this SSHP.

5.3 HAZARD COMMUNICATION

Personnel will have attended hazard communication training that was established to meet the requirements of 29 CFR 1910.1200. Field activities shall be implemented in accordance with that program, as described below. Employees will be trained in accordance with subsection (h) of the above referenced standard.

The multi-employer section of the standard, 29 CFR 1910.1200(e)(2), requires TAMS to make our subcontractors aware of the hazardous substances we store and use on-site and requires subcontractors to inform TAMS personnel of the hazardous substances they store or use on site.

Material Safety Data Sheets (MSDSs) for hazardous chemicals introduced to the Site by TAMS and others will be kept in a labeled binder on-site as these materials arrive, for reference and review by on-site personnel.

Labels on containers used by TAMS are as originally received (not to be defaced) and are to contain the following information:

(1) The identity of the hazardous chemical(s);
(2) The appropriate hazard warnings; and
(3) The name and address of the chemical manufacturer.

If an employee transfers chemicals from a labeled container to a portable container, a label, which contains the three items listed above, must be affixed to it. If the portable container is intended only for that employee's immediate use (during the same work shift), only a contents label is required. The employee will be responsible to properly empty, clean or dispose of the portable container immediately after use.

As part of the Site-specific health and safety orientation at the initial Site meeting conducted by the SSO, a review of TAMS' Hazard Communication Program will be offered to inform employees and subcontractor employees of hazardous chemicals to which they may be exposed during field activities. If the chemical hazard changes or a new chemical hazard is introduced into the area after work begins, additional training will be provided during the next morning meeting by the SSO.

Site-specific hazard communication training for hazardous chemicals introduced to the Site by TAMS will include:

- Properties and hazard (chemical, physical, toxicological) of hazardous chemicals;

- Health hazards, including signs and symptoms of exposure and any medical condition known to be aggravated by exposure;

- Measures employees can take to protect themselves, including appropriate work practices or methods for proper use and handling, procedures for emergency response, and the proper use and maintenance of personal protective equipment, as required.

- Work procedures for employees to follow to protect themselves when cleaning hazardous chemical spills and leaks.

- Use of the container labeling system and the MSDSs, including MSDSs location, information on the interpretation of both labels and MSDSs, and information on how employees can obtain additional hazard communication information.

The SSO will document any Site training, including the agenda and list of attendees.

This subsection of the SSHP and the hazard communication training conducted as described above will be the mechanism for informing other employers planning to be on-site of hazardous chemicals introduced to the site by TAMS.

5.4 MARINE SAFETY

TAMS will provide marine safety awareness training for personnel who will be performing tasks in or around the Passaic River. The SSO will conduct an initial awareness-training course that will be followed up by the subcontractor responsible for the safety of personnel while conducting tasks from a boat. This training will include the following:

- General Safety Precautions (standing, overhanging vegetation, etc.)
- Man Overboard
- Rescue
- Drowning
- Inclement Weather
- Use of Equipment (radio, vessel controls)
- Use of Personal Flotation Devices (PFDs)
- Anchoring
- Boarding the vessel
- Transferring between the vibracore work boat and the shuttle boat
- Other precautions the captain deems necessary for the type of work being

performed.
- Lifting samples and sample coolers
- Electrical safety (e.g., GFI use)

US Coast Guard safety equipment will be provided aboard each of the vessels used during the fieldwork. PFDs shall be provided and worn by personnel on each boat. The boat captain shall show all boat personnel where safety equipment is located and how to use it.

5.5 CHEMICAL AND WASTE MANAGEMENT

Personnel will be trained in the proper handling and disposal of chemicals and waste generated during this project.

5.6 PERSONAL PROTECTIVE EQUIPMENT

Personnel required to wear PPE will be trained in accordance with 29 CFR 1910.132(f).

6.0 MEDICAL SURVEILLANCE AND EXPOSURE MONITORING

6.1 MEDICAL SURVEILLANCE

TAMS and subcontractor personnel who may have potential exposure to hazardous materials will have an initial medical examination conducted by or under the direction of a physician Board Certified in Occupational Medicine. Employees in the medical surveillance program will undergo an annual medical review and an annual or bi-annual physical as determined by the occupational physician. Employees leaving the program will submit to a termination examination. Medical evaluations will be performed by an approved occupational physician in accordance with TAMS', or the subcontractors', Medical Monitoring Program. TAMS and subcontractor field personnel shall be enrolled in their employer's Medical Monitoring Program, be medically approved to wear respirators, and fit-tested in accordance with OSHA requirements.

Supplemental examinations may be performed whenever there is an actual or suspected excessive exposure to chemical contaminants or upon experience of exposure symptoms, or following injuries or temperature stress. It is proposed that work will be carrying on during January and February; therefore, cold stress is a specific issue of concern.

The following medical or exposure conditions will be monitored during this project:

- Cold Stress
- Noise
- Chemical Exposure

6.2 COLD STRESS MONITORING

Frostbite is a local cold injury, which rarely occurs unless environmental temperatures are less than freezing and usually less than 20°F (-6.7°C). Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body or result in profound generalized cooling, causing death. Areas of the body that have a high surface-area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10°F with a wind of 15 mph is equivalent in chilling effect to still air at -18°F.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of five mph increases to ten mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is soaked with perspiration.

The body's responses to cold exposure include the following:

1. **Frost nip or incipient frostbite**.

   Sudden blanching or whitening of the skin characterizes the condition, which in mild cases is slightly burning or painful.

2. **Superficial frostbite**.

   Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.

3. **Deep frostbite**. Tissues are cold, pale, and solid; extremely serious injury.

Hypothermia is defined as a decrease in a person's body core temperature to 95°F (35°C). A freezing or rapidly dropping temperature is not needed to produce hypothermia. A person's ability to maintain normal body temperature may be affected by medications or drugs, alcohol, wind or becoming wet.

Although protective clothing provides protection from many sources of external wetting, perspiration is often increased while working, causing the skin and clothing to become moist or wet. Wet clothes and skin can conduct body heat at a rapid rate. In addition, the effects of wind and water create a condition for extreme loss of body heat.

In addition, dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

(1) Shivering,
(2) Apathy, listlessness, sleepiness and (sometimes) rapid cooling of the body to less than 95°F,
(3) Unconsciousness, glassy stare, slow pulse and slow respiratory rate,
(4) Freezing of the extremities, and finally,
(5) Death.

The SSO will be vigilant in order to identify hypothermia in its earliest stage, thus preventing a potential hazard to the worker. The single most important sign of hypothermia is a change in behavior; often subtle and best recognized by a co-worker or the SSO. Physical and behavioral symptoms of hypothermia include:

- Pain in the extremities (may be the first, early warning of danger from cold stress).
- Decrease in usual efficiency.

- Forgetfulness and a decreased level of communication.
- Decline in manual dexterity.
- Poor motor skills or repetitive behavior.
- Poor judgment.
- Lack of concern for physical needs.
- Cold, pale skin appearance, shivering and "goose flesh."
- Maximum severe shivering develops when the body temperature has fallen to 95°F. This must be taken as a sign of danger to workers and exposure to cold should be immediately terminated.

The following actions will be taken to reduce the potential for workers to develop cold stress injuries, such as frostbite and hypothermia, in cold environments:

- Shield the work area from the wind or wear a windbreaker to reduce wind chill effect (a water-repellant outer garment with good ventilation should be worn).

- Take special precautions for older workers or workers with circulatory problems such as the use of extra insulating clothing and/or a reduction in the duration of exposure period.

- Exposed skin should not be permitted when the wind chill factor results in a relative temperature of -25°F or below - cover exposed flesh with loose, dry clothing.

- Field personnel will frequently (e.g., every 15 minutes) observe each other for signs of frostbite under very cold-weather conditions.

- Wet clothes should be replaced at temperatures below 36°F - efforts should be made to maintain dry clothing. Workers will be encouraged to bring a change of clothing to the work site.

- Warm, sweet drinks and soups are recommended.

- Avoid skin contact with bare metal, gasoline or other hydrocarbons.

- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is made available or until weather conditions improve.

Mild cases of **frostbite** (the affected area is still painful) may be treated in the field by re-warming. More serious cases of frostbite should be treated at a medical facility since attempting to thaw the frozen area can cause severe damage. A victim of serious frostbite will be protected from the environment and further heat loss prevented, but the skin should not be rubbed or thawed with warm water or dry heat.

Mild hypothermia is treated by re-warming the affected person by:

- Moving to a protected area.
- Removing wet or damp clothing and changing in to dry clothing.
- Drinking warm fluids.
- Wrapping in dry blankets.

More **severe cases of hypothermia** require prompt intervention by medical personnel in addition to the above activities. Refer to Attachment A for a directions to St. James Hospital.

In addition, if the core processing area is located outdoors, a tent and generator-driven heater will be provided to prevent cold stress. It is recommended that a cube van be used as the core processing area. Heat, light and proper air monitoring can be provided at this location.

Activities carried out on boats when the water temperature is below 50°F will require the use of United States Coast Guard (USCG) Anti-Exposure Survival work suits to prevent cold stress in the event of a man overboard.

6.3 NOISE EXPOSURE MONITORING

As part of the required baseline annual or bi-annual medical evaluation employees undergo an audiometric evaluation. The annual or bi-annual audiogram is compared to the baseline to determine if the employee has had a Standard Threshold Shift (STS). While working on various tasks during this project, employees may be exposed to noise levels in excess of the OSHA Permissible Exposure Limit (PEL) of 90 decibels on the A-weighted scale (dBA) for a short period of time. As part of the hazard evaluation, noise levels will be evaluated during the early stages of this project to identify activities that subject employees to elevated noise levels. If possible, to control these elevated noise levels, engineering or administrative controls will be implemented. If these controls are not possible, hearing protection with an adequate noise reduction rating (NRR) will be issued to these employees. Noise attenuators (e.g., earplug or earmuff) shall be worn when shouting is required to be heard when standing 2 to 3 feet from an individual.

6.4 CHEMICAL EXPOSURE MONITORING

A PID will be used to monitor for elevated levels of volatile organic compounds (see Section 8.0). Mercury vapor will also be monitored with a mercury vapor analyzer. Given the short duration of this task, formal medical baseline testing will not be required. However, common symptoms of exposure to COCs are eye, nose and throat irritation, headache, nausea, dizziness, blurred vision, cramps, and skin rashes. Whenever any of these symptoms are experienced, field work should stop immediately and affected personnel should seek medical attention. Work will begin only after the SSO evaluates the situation and gives approval for commencing work Physiochemical characteristics of chemicals of concern are in Attachment B. Action levels for worker respiratory protection are provided on Table 6-1.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 GENERAL PROTECTION LEVELS

Personnel must wear personal protective equipment (PPE) when work activities are expected to involve known or suspected atmospheric or surface contamination; when vapors, gases, or particulates may be generated by the work; or when direct contact with dermally active substances may occur. Respirators can protect the lungs, the gastro-intestinal tract and the eyes against air toxicants. Chemical-resistant clothing can protect the skin from contact with corrosive/irritants and skin absorbable chemicals. Good personal hygiene limits or prevents the ingestion of materials.

Appropriate PPE will be worn to protect workers against physical hazards such as sharp objects, overhead hazards, hazards to eyes and feet, and drowning.

7.2 PPE REQUIREMENTS FOR EACH TASK

This section outlines the PPE requirements for personnel working on this project by the various anticipated tasks. All contractors are required to provide appropriate PPE to their employees and ensure that it meets the requirements of this section.

7.2.1 Sediment Coring Program

<u>Core Retrieval Oversight and Offloading of Cores</u>

- Coveralls or suitable work uniform, insulated coveralls or similar during cold months.
- Tyvek coveralls (or Saranex) when splash or contact hazard is present
- Safety glasses/sunglasses
- Hardhat, if overhead hazards are present
- Hardhat liner, or winter hat, as needed
- <u>Double</u> "blue" nitrile inner surgical type gloves (replace outermost glove, or both layers) when ripped)
- Outer "green" nitrile gloves, when heavy-duty gloves are required
- Any other type of work glove over the double blue nitrile gloves
- Hearing protection, as required
- Steel toed work boots shall be worn. Booties or overboots shall be worn to keep feet dry, if necessary. Deck shoes shall not be worn.
- Personal Flotation Device (to be worn while on a boat)
- United States Coast Guard (USCG) Anti-Exposure Survival work suits. (To be worn on a boat when water temperature is below 50°F.)

<u>Core Sample Management</u>

- Disposable coveralls (Saranex or Tyvek)

- Chemical resistant outer gloves (Green Nitrile), if necessary
- Chemical resistant inner gloves (Double layer “blue” nitrile)
- Steel toe work boots
- Chemical safety goggles
- Half face or full-face respirator with organic vapor and HEPA cartridges (if determined necessary from the PID and mercury vapor monitoring).

7.2.2 Geophysical Survey

Data Collection from Vessel

- Coveralls or suitable work uniform, insulated coveralls or similar during cold months.
- Safety glasses/sunglasses
- Hardhat, if overhead hazard is present
- Double “blue” Nitrile gloves (if contact with sample is required)
- Outer “green” nitrile glove when heavy duty glove is required
- Hearing protection
- Steel toed work boots shall be worn. Booties or overboots shall be worn to keep feet dry. Deck shoes will not be worn.
- Personal Flotation Device (to be worn while on a boat)
- United States Coast Guard (USCG) Anti-Exposure Survival work suits. (To be worn on a boat when water temperature is below 50°F.)

Sample Collection

- Disposable coveralls (Saranex or Tyvek)
- Chemical resistant outer gloves (“Green” Nitrile)
- Chemical resistant inner gloves (Double “blue” nitrile)
- Shoulder-length waterproof glove for attaching bottom cap to core tube
- Steel toe work boots
- Chemical safety goggles
- United States Coast Guard (USCG) Anti-Exposure Survival work suits. (To be worn on a boat when water temperature is below 50°F.)

Sample Management and Decontamination

- Disposable coveralls (Saranex or Tyvek)
- Chemical resistant outer gloves (“green” Nitrile), where required
- Chemical resistant inner gloves (Double “blue” nitrile)
- Steel toe work boots
- Booties or overboots, if required
- Chemical safety glasses or goggles, as required

7.3 INSPECTION OF PPE

Personal Protective Equipment will be inspected regularly and maintained in serviceable and sanitary condition. The equipment will be cleaned, disinfected if necessary, inspected after each use, and repaired as necessary before being returned to storage. Respirators shall be dedicated to individual workers. Voluntary use of filtering facepieces is encouraged for all workers who may be exposed to site contaminants on dusts, especially those processing sediment cores in the cube van or other enclosed space.

7.4 GUIDELINES FOR PPE SELECTION

It is the responsibility of the SSO to evaluate tasks that are performed on this project and determine the appropriate PPE for these tasks. When there is a modification to any of the tasks, a hazard assessment is to be performed. If a task is added during the course of this project, the SSO is to be involved during planning to develop a list of appropriate PPE to be used at the onset, conduct a hazard assessment of the task to verify the selected PPE is adequate, and make any changes as he/she sees fit. In determining the appropriate PPE for each task, the following guidelines will be followed.

7.4.1 Survey

Due to the short duration of this task, the SSO will conduct a survey each morning to ensure that the PPE guidelines set forth in Section 7.2 are followed. In addition, this survey will identify sources of hazards to workers. The basic hazard categories that will be looked at during this survey include impact, penetration, compression, chemical, heat, and light. Appropriate action will be taken by the SSO to get compliance to the PPE requirements.

7.4.2 Source Identification

During the survey the SSO will identify sources of potential hazards that potentially pose a threat of injuries to employees. These sources include falling objects, chemical exposure, pinching objects, rotating parts, etc.

7.4.3 Organize and Analyze Data

Following the survey, the SSO will organize and analyze the data collected during the survey. Potential hazards noticed will be reviewed and determination will be made as to the type, associated risk, and seriousness of potential injury from each of the potential hazards. If applicable, the combination of several hazards together should be considered.

7.4.4 Selection

In selecting the appropriate PPE the SSO will compare potential hazards and the type of PPE that is available and what it can do, and if it is appropriate for that specific task.

Most important is the fit of the selected PPE. PPE that does not properly fit the worker can create another hazard. Employees will provide feedback on whether PPE fits comfortably to the SSO.

Once the PPE is selected, the SSO is required to make each employee aware of the limitations of the PPE through effective training.

7.4.5 Reassessment

At the daily safety meetings the SSO will ask if the original PPE is adequate. If the PPE is not adequate for the tasks being performed, the SSO will re-evaluate that task by performing the above steps.

8.0 EXPOSURE MONITORING

8.1 GENERAL

Emergency Response actions and PPE selection will be based, in part, on air monitoring results. The following monitoring instruments will be used, as needed, during tasks being conducted at the various site locations along the Passaic River to make quantitative determinations of exposure to various chemical and physical hazards potentially present at the site:

- MiniRAE or Hnu Photoionization Detector (PID)
- Jerome Mercury Vapor Analyzer (MVA)

Prior to the start of any work at this site, an initial monitoring survey will be conducted to establish background conditions. During site activities, necessary equipment will be set to monitor the work area.

Contaminant concentrations detected, instrument type and calibration data will be documented in a field logbook or similar and maintained at the field office. Instruments used on this project will be calibrated before and after each day's use by the SSO or other field personnel and periodic calibration checks will be made and documented in the field logbook.

Instrumentation will be maintained in accordance with the manufacturer's specifications. Monitoring instruments will be protected from surface contamination during use to minimize the need for decontamination.

8.2 MINIRAE PHOTOIONIZATION DETECTOR

A MiniRAE, or Hnu, PID with a 10.2 eV lamp will be used to monitor the breathing zone of the employees processing core samples in the processing center (field support facility). Testing will be conducted each time a new core tube is opened. An action level of 1 ppm above background levels sustained for at least ten minutes will be used to determine what types of engineering controls will be put into place and if Level C PPE should be implemented. See Table 6-1 for Action Levels.

8.3 JEROME MERCURY VAPOR ANALYZER

A Jerome 431-X Mercury Vapor Analyzer will be used for the detection and accurate measurement of toxic mercury vapor in the breathing zone of the employees processing core samples in the processing center (field support facility). Testing will be conducted each time a new core tube is opened. An action level of 0.01 ppm will be used to determine what types of engineering controls will be put into place and if Level C PPE should be implemented with the appropriate mercury filter cartridges. See Table 6-1 for Action Levels.

9.0 SITE CONTROL MEASURES

9.1 GENERAL

A daily log containing the names of personnel, site entry and exit times, job function, and PPE will be maintained throughout this project.

9.2 WORK ZONES

To control the potential spread of contamination at the Site, and to keep visitors from entering potentially hazardous areas, the three (3) work zone approach, outlined below, will be utilized:

Exclusion Zone(s) - Hazardous Work Zone

Sample Processing Center

In this area, a ten-foot radius around the employees processing the sediment core samples, or within the cube van if utilized, will be identified as the exclusion zone. No eating, drinking or smoking will be allowed in this zone. No personnel will be allowed in the exclusive zone without:

- Proper PPE
- Medical Clearance
- Training Certification.

The level of personal protective equipment required in the Exclusion Zone shall be in accordance with the specified requirements in Section 7.0 as a minimum or as determined by the SSO.

Contamination Reduction (Buffer) Station

The Contamination Reduction Zone or station will be used for the general entry and exit station to and from the Exclusion Zone. This area will be the area designated for the decontamination of personnel and clothing prior to entering the Support Zone, and for the physical segregation of the Support and Exclusion Zones. When exiting the sediment collection vessel, decon/doffing of PPE may be done close to the shore in an area safe for personnel to so do. If the spread of contamination is best achieved while still on the boat this will be assessed in the field.

The level of personal protective equipment required in this area shall be in accordance with the specified requirements as a minimum or as determined by the SSO after monitoring the Site. Eating, drinking or smoking is strictly prohibited in this area. Sanitizer liquids, water and soap or other equipment shall be provided to adequately allow personnel to wash. The contamination reduction station will also contain appropriate safety and emergency equipment, such as a first aid kit.

Support (Safe or Clean) Zone(s)

This Zone will be established on the Site and is defined as the area outside the zone of significant contamination. The Support Zone shall be protected from worksite contamination. Eating and drinking will be allowed only in this Zone. The function of the Support Zone is to provide:

- An entry area for personnel, material and equipment to the Exclusion Zone.
- An exit area for decontaminated personnel, materials and equipment from the Contamination Reduction Zone.
- An area for location of Support Area facilities; and
- A storage area for clean safety and work equipment.

Access of non-essential personnel to the Exclusion and Contamination Reduction Zones will be controlled. Only personnel who are essential to the completion of the task and wearing the prescribed level of protection will be allowed access to these areas. A vehicle will always be available at the support zone to transport personnel to the nearby hospital, if needed. Entrance of non-contractor or subcontractor personnel must be approved by the SSO based on that person's documentation of training described in Section 5.0.

These zones will be identified during the safety briefing. The primary purpose for these zones is to minimize the spread of contamination from the sediments to other locations on land and to protect personnel from contacting this contamination. The SSO will each day evaluate the effectiveness of the established zones and the level of compliance by site personnel. Changes in the zones, or the personnel, may be required if hazards have been created.

10.0 STANDARD OPERATING PROCEDURES FOR SAFETY

10.1 GENERAL REQUIREMENTS

The understanding of basic, precautionary concepts regarding personal health and safety is essential for workers assigned to sites where chemical contamination is known or suspected to be present. The following measures are designed to augment the specific health and safety guidelines provided in this SSHP.

- Avoidance of contamination is of the utmost importance. Whenever possible, contact with contaminated or potentially contaminated surfaces or materials will be avoided to minimize the potential for transfer to personnel. Walk around, not through, puddles and discolored surfaces. Do not kneel on the ground or set equipment on the ground in the area where samples have been.

- The number of personnel and equipment on the site shall be minimized, consistent with effective site operations.

- Site activities are to be performed in a manner designed to minimize dust production and splashing of contaminated sediment and surface water.

- Eating, drinking, chewing gum or tobacco, smoking or any practice which increases the probability of hand-to-mouth transfer of contaminated material is strictly prohibited where field investigative activities are taking place.

- Any required respiratory protective equipment and clothing must be worn by personnel entering those designated areas of the site. Any facial hair that interferes with the respirator seal is prohibited.

- Medicine and alcohol can potentiate the effects of exposure to toxic chemicals. Due to possible contraindications, Company Occupational Physicians should review use of prescribed drugs by field personnel. Alcoholic beverages and illegal drug intake are strictly forbidden during site work activities.

- On-site personnel shall use the "buddy" system. No one will work alone; i.e., out of earshot or visual contact with other workers.

- Employees have the obligation to correct or report unsafe work conditions.

- Use of contact lenses on-site is not recommended. Spectacle kits for insertion into full-face respirators will be provided, as required.

- Personnel shall be familiar with standard operating safety procedures and additional instructions contained in this HASP

- Personnel working on water must wear U.S. Coast Guard approved personal flotation devices.

- When the water temperature is below 50°F, personnel working on boats must wear United States Coast Guard (USCG) Anti-Exposure Survival work suits.

10.2 RIVER SAFETY

Personnel operating a vessel or performing any fieldwork from shore or from a vessel will follow the following SOPs:

- Follow applicable USCG and New Jersey State Navigational rules

- Work conducted from a bridge, boat, or shore will be done during daylight hours only.

- Extra care is required if the shore is snow or ice covered.

- No one shall approach the river alone: the buddy system is required.

- Work on the river during adverse weather will be suspended when conditions pose an immediate or significant health risk to employees.

- While on a boat or working from bridges personnel will wear a USCG approved PFD.

- At least one Type IV throwable flotation device with a minimum of 90 feet of rope will be on board each vessel, with the lose end attached to the vessel.

- For boats greater than 18 feet in length, at least 3 handheld type flares and a 1 square foot fluorescent orange flag will be kept on board.

- If gasoline is carried on board it will be kept in an Underwriters Laboratory (UL) approved container. Sufficient absorbent will be kept on the boat, while gasoline is stored, to clean up fuel spills.

- When the water temperature is below 50°F, all personnel working on boats must wear United States Coast Guard (USCG) Anti-Exposure Survival work suits.

- The Coast Guard will notify the field crew of approaching river traffic via marine radio (Channel 13 or 16, to be confirmed with the USCG)

- ASI personnel are responsible for the launching and operation of their vessels.

- ASI is responsible for the operation of the Vibracore and the retrieval and capping of the core tube.

- ASI captains shall direct field personnel on the safe boarding and de-boarding procedures for their vessels.

- ASI captains shall instruct personnel how and when to transfer between the sediment coring vessel and the shuttle vessel.

- ASI captains shall direct field personnel where to stand during sediment core collection and during the launching of the side-scan sonar fish.

11.0 DECONTAMINATION

11.1 PERSONNEL DECONTAMINATION

The degree of decontamination required is a function of both a particular activity and the physical environment within which it takes place. Decontamination procedures are described below. The SSO will monitor these procedures. Further, on-site activities will be carried out in such a manner as to avoid contamination of personnel, protective equipment, tools, and machinery.

Decontamination will take place in the area designated as the contamination reduction zone (CRZ), or on the boat if so designated by the SSO. Personnel egress to and from these zones will be limited. This will minimize the potential spread of contaminated materials to clean areas. Under no circumstances is a potentially contaminated person to exit the site by means other than through the CRZ. Upon leaving the site for lunch break or at the end of each work shift, personnel will be required to remove PPE, contaminated clothing or equipment. Upon completion of tasks that require the use of safety equipment, at each time of break, or at the end of each work shift, the work crew will proceed toward the designated decontamination area.

11.2 FIELD EQUIPMENT

Potentially contaminated equipment will remain in the Exclusion Zone until the end of the activity. Removed PPE will be immediately placed in a plastic bag unless it is grossly contaminated with river sediments In order to contain/control contamination in the Contaminant Reduction Zone, a large plastic sheet will be placed on the ground and disposable towels will be used to contain spilled and splashed water. A bristle brush and a soap and water solution (Alconox) will be used to remove gross sediment contamination from equipment and decontaminated accordingly before being removed from the CRZ. A pump sprayer may be utilized for each rinse station.

A bucket or tub may be used to store the core tube(s), and decant the liquid, prior to processing. Appropriate containers will be used to contain the spread of sediment and water during the processing of the core tubes. Core tubes will be measured and cut within this area. Two people will work together to process each core tube. Cutting, homogenizing, and placing in sample bottles will be done within the core processing area. Monitoring of the breathing zone using the PID and MVA will be performed to assure worker safety. Appropriate increases in level of protection shall be implemented, as monitoring requires. No personnel, aside from those directly processing the cores shall be permitted within the sample processing area. The SSO, or designee, may enter this area to perform air monitoring, if wearing the proper PPE.

If they are to be reused, boot covers or boots, aprons and outer gloves, prior to their removal from the CRZ, will be washed in large tubs with a soap and water solution and rinsed with fresh water. When a Tyvek or other disposable type of PPE is required, it will be removed in such a way as not to contaminate the CRZ and placed in a trash bag and, if necessary, labeled accordingly.

In the event that field decontamination of equipment is necessary, the following reagents may be used: Alconox; analyte free water; nitric acid, isopropyl alcohol, or acetone. Material Safety Data Sheets (MSDS's) for these chemicals can be found in Attachment E.

11.3 DECONTAMINATION FOR MEDICAL EMERGENCIES

In the event of a minor, non-life-threatening injury, personnel should follow the decontamination procedures as outlined above, and then administer first aid.

In the event of a major injury or other serious medical concern, immediate first-aid is to be administered in lieu of further decontamination efforts unless the environmental conditions would be considered "Immediately Dangerous to Life or Health," in which case personnel shall evacuate the site.

11.4 WASTE DISPOSAL PROCEDURES

Discarded materials, waste materials, or other objects will be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left on-site. Potentially contaminated investigation derived materials will be bagged or containerized as necessary and segregated for proper disposal. Contaminated waste materials will be disposed of in a manner consistent with regulatory requirements. Non-contaminated materials will be collected and bagged for appropriate disposal as normal domestic waste.

Food waste will be removed daily, unless it can be placed in a locked area such as the cube van, to prevent dogs and other animals from distributing trash over the site.

12.0 EMERGENCY RESPONSE

12.1 EMERGENCY PLANNING

The SSO shall implement the emergency response plan whenever conditions at the Site warrant such action. The SSO will be responsible for assuring the evacuation, emergency treatment, emergency transport of Site personnel as necessary, and notification of emergency response units and the appropriate staff.

The SSO will inform the local fire department about the nature and duration of the work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants.

12.2 EMERGENCY EQUIPMENT

Emergency equipment will be readily accessible and distinctly marked. TAMS and/or subcontractor personnel shall be familiar with the location of, and trained in the use of, emergency equipment. Emergency equipment that will be available on-Site includes:

Fire Extinguishers

- TAMS and subcontractors will provide fire extinguishers.
- Class A, B dry chemical fire extinguishers shall be located on-site.
- Immediately after each use, fire extinguishers are to be either recharged or replaced.
- Fire extinguishers are to be suitably placed, distinctly marked, and readily accessible at the cube van or on the vessels.

First Aid Kits

First Aid Kits shall conform to Red Cross and other applicable good health standards, and shall consist of a weatherproof container with individually-sealed packages for each type of item. First Aid Kits will be fully equipped before being sent out on each job and will be checked by the SSO to ensure that the expended items are replaced. First Aid Kits shall be suitably placed, distinctly marked, and readily accessible.

Eye Wash

In the event of contamination from splashed sediments during any remedial activity, an emergency eyewash will be available onsite during field activities. In such an emergency, the eye will be immediately flushed with large amounts of water, occasionally lifting the lower and upper lids. Professional medical attention will be sought immediately.

12.3 PERSONNEL ROLES, LINES OF AUTHORITY, COMMUNICATION

The SSO is the primary authority for directing operations at the Site under emergency conditions.

Section 3.0, Project Organization and Responsibility, outlines the roles and responsibilities of safety personnel for the project.

Telephones, portable radios, and hand signals will be used at the Site for communication.

Telephones/Radios

Cellular phones will be provided for each team working in the field. Personnel captaining the sample transfer boats will have access to one of these phones at all times. At least one member of each team is required to have one of these phones with them at all times.

Hand Signals

To be employed by downrange field teams along with utilizing the buddy system. These signals (Table 12-1) are also very important when working with heavy equipment. The entire field team shall know them before operations commence and covered during site-specific training prior to fieldwork.

TABLE 12-1
HAND SIGNALS AND THEIR MEANINGS

HAND SIGNAL	MEANING
Hand gripping throat	**CAN'T BREATHE**
Grip wrist or both hands around waist	**LEAVE AREA IMMEDIATELY**
Hands on top of head	**NEED ASSISTANCE**
Thumbs up	**OK, I AM ALL RIGHT, I UNDERSTAND**
Thumbs down	**NO, NEGATIVE**

12.4 EMERGENCY RECOGNITION AND PREVENTION

As part of the initial site-specific health and safety briefing, the SSO will address emergency recognition and prevention. Topics will include hazard recognition regarding tasks to be performed in addition to hazards associated with site contaminants. Section 4.0, Hazard Assessment, discusses the characteristics of hazardous substances likely to be found at the site and the potential hazards associated with the field activities planned during this project. Section 7.0, PPE, discusses the protective equipment associated with each field activity and a process for the SSO to follow when determining PPE for each task. Section 8.0, Exposure Monitoring, discusses the action levels associated with various monitoring instruments. Section 9.0, Site Control Measures, discusses the set up of work zones to delineate hazardous and safe zones during site activities. Section 10.0, Standard Operating Procedures for Safety, discusses precautionary work practices to minimize the likelihood of an emergency situation. Section 11.0, Decontamination, discusses proper decontamination procedures at the site.

12.5 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the SSO will determine if work can continue without sacrificing the health and safety of the site workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for Cold Stress
- Inclement weather-related working conditions
- Limited visibility
- Potential for Electrical Storms

12.6 EMERGENCY MEDICAL TREATMENT/FIRST AID

In the event of injury to a Site worker, emergency first aid will be applied onsite as deemed necessary. The injured person is to undergo PPE decontamination procedures as appropriate, and to be transported to the nearest medical clinic, if needed. During field activities, there is to be at least one person on the site certified in First Aid and CPR. Appropriate material safety data sheets relevant to the injury will be provided by the SSO to any medical facility to which an injured person is taken. In the event of an injury to a site worker, the SSO will complete the Supervisor's Incident Investigation Report.

If any person has been directly exposed to chemicals or contaminants of concern, the following procedures are to be implemented:

<u>Skin Contact</u>

Use large amounts of soap and water. Wash/rinse affected area for at least 15 minutes. Implement decontamination procedures and provide medical attention. Eye wash stations will be provided on site. If necessary, transport to the nearest medical facility.

Inhalation

Move to fresh air and, if necessary, transport to the nearest medical facility.

Ingestion

Implement decontamination procedures and transport to the nearest medical facility. Workers are trained to not put hands in mouth while working onsite which will minimize the potential for ingestion.

Serious Medical Emergency

In the event of a serious medical emergency, victims shall be treated at Saint James Hospital. If contamination is present on the victim the 911 emergency personnel shall be notified.

12.7 ROUTE TO EMERGENCY MEDICAL FACILITY

The route to Saint James Hospital can be found in Attachment A.

12.8 EMERGENCY PHONE NUMBERS

A list of emergency phone numbers can be found in Attachment A.

12.9 EVACUATION PROCEDURES AND SAFE DISTANCES

Evacuation procedures will occur at three levels: (1) withdrawal from immediate work area (100 feet or more upwind), (2) Site evacuation, and (3) evacuation of surrounding area. If site evacuation is required, field team members will be notified by cellular phone. Anticipated conditions that require these responses are described in the following subsections.

Withdrawal Upwind

Withdrawing upwind will be required when: (1) during periodic monitoring the ambient air conditions contain greater contaminant concentrations than guidelines allow for the type of respiratory protection being worn (the work crew may return after obtaining greater respiratory protection and/or assessing the situation as stabilized). (2) A breach in protective clothing or a minor accident occurs (the work crew may return when the tear or other malfunction is repaired and first aid or decontamination has been administered); or (3) the respirator malfunctions requiring replacement.

Site Evacuation

Evacuation of the Site will be required when:

(1) Ambient air conditions contain explosive and persistent levels of combustible gas or excessive levels of toxic gases;
(2) A fire or major accident occurs; or
(3) Explosion is imminent or has occurred.

After determining that Site evacuation is warranted, the work crew will proceed upwind of the work site and notify the SSO of site conditions. As more facts are determined from the field crew, they will be relayed to the appropriate agencies. The advisability and type of further response action will be coordinated and implemented by the SSO.

Surrounding Area Evacuation

Aside from fire, no site activities are anticipated to create such a condition. 911 will be called in the event of fire at any onsite or offsite uncontrollable level.

12.10 SITE SECURITY AND CONTROL

A daily log containing the names of personnel, Site entry and exit times, and their levels of personnel protection shall be maintained by the SSO.

In order to control the potential spread of contaminants, and to keep visitors from entering potentially hazardous areas, caution tape will mark the parking area.

12.11 FIRE OR EXPLOSION

Notify local fire and police department and other appropriate emergency response groups if an actual fire or explosion has taken place.

12.12 SPILL CONTAINMENT

The goal of spill control is to avoid spilling potentially hazardous liquids or solids at anytime, especially during transfer, transport or disposal of these materials. In the unlikely event that a spill occurs, the spill will be contained and cleaned up in accordance with applicable federal and state requirements including 29 CFR 1910.120(j).

The following specific steps are to be taken to avoid spill control/containment if needed:

- Pails and containers will be labeled indicating their contents and origin.
- Pails will be inspected prior to moving to ensure their integrity.
- The amount of pail movement will be minimized to the extent practical.
- Appropriate personal protective equipment will be used when cleaning up spills.

If liquids are spilled, they will be contained with contents and placed in pails. Spilled soils or liquids spilled on soils will be placed in pails for future disposal. Spills of petroleum from leaking equipment or containers into the river must be reported to the Coast Guard immediately. Magnitude of the spill, and a final notification regarding the resolution of the problem must be documented.

If an Immediately Dangerous to Life or Health (IDLH) atmosphere does not exist and adequate personal protective equipment is being used, the spread of any contamination is to be controlled whenever possible. The Field Team Leader and the SSO will be notified if a spill occurs.

Based on the quantities of materials expected onsite no major spills can occur.

12.13 EMERGENCY RESPONSE EVALUATION

In the aftermath of an emergency, before normal Site activities are resumed, personnel will be prepared and fully equipped to handle another emergency. The SSO will be responsible for restocking emergency supplies, replacing or repairing damaged equipment, and determining that the Exclusion, Contaminant Reduction and Support Zones have been redefined. The Project Manager will notify appropriate government agencies as required. This includes OSHA if there has been a fatality or if five or more workers have been hospitalized.

The Project Manager and Health and Safety Manager are responsible for initiating an investigation and documenting the incident. This investigation will be designed to develop information about the institutional, organizational, technical, and operational root causes of the accident or injury. Documentation will include:

- A chronological history of the incident.
- Facts about the incident and when they became available.
- Title and names of involved personnel.
- Decisions made, orders given - to whom, by whom and when.
- Actions taken, who did what, when, where and how.
- Environmental measurements.
- Potential exposures of Site personnel.
- History of injuries or illnesses during or as a result of the incident.

Documentation will include the completion of the TAMS Supervisor's Incident Investigation Report.

Before Site work resumes, a meeting will be held to review and revise aspects of the HASP according to new Site conditions, cleanup and/or other additional tasks required as a result of the incident, and lessons learned from the emergency response. This meeting will be attended by the PM, the Corporate HSA, the Field Team Leader, the SSO, representatives of partner firms whose operations or tasks were or could be impacted by the incident, and by representatives of any contractors whose operations or tasks were or could be impacted by the incident.

The purpose of the meeting will be to:

- Review the incident and unsafe conditions and/or act that resulted in the incident.
- Determine if and how these conditions or acts were preventable.
- Replace, or correct procedures that failed to result in desirable responses or activities.
- Determine if the incident has changed the Site profile and where and what that impact might be.

The result of the meeting will be:

- The generation of a series of action items which must be satisfactorily completed prior to the re-initiation of the Site activities.
- Developing, if required, appropriate changes to this SSHP.
- Retraining Site personnel in the changes to this SSHP.

13.0 ACCIDENT INVESTIGATION

Due to the nature of the work and the locations in which it is to take place, there is a potential for serious injury if the proper safety measures are not put into place. These measures include what is outlined in this SSHP and regular training throughout the duration of this project. Minor injuries including cuts, bruises, sprains, etc., will be investigated by the SSO. The SSO will write a brief report describing the location of the accident, how the accident occurred, what the employee was doing at the time of the accident, witnesses, and what corrective action was put in place in conjunction with completing TAMS' Accident Investigation Form. A copy of this form is included in Attachment D.

For major accidents including heat and cold related injuries, drowning, boating accidents, and accidents that require hospitalization and lost time, the SSO and HSA are to conduct an immediate investigation and contact the Corporate EH&S Officer, and brief him on the nature of the accident. The HSA will conduct a thorough investigation to determine the root cause of the accident, as required. For operations similar to that where the accident occurred, a Stop Work Order will be given until the investigation is complete and proper safety measures can be implemented to prevent a similar accident.

Following any accident, the SSO or the HSA will make the field team aware of the accident and the cause and what lessons were learned. The field team will be briefed on what corrective actions were put into place to prevent a recurrence and trained accordingly.

13.1 ACCIDENT REPORTING

For the purposes of this project minor accidents and injuries as described above and near misses will be reported to the SSO in a timely manner.

Accidents that result in a reportable injury and/or lost time must be reported to the NJDOT-OMR within three days.

Accidents that result in damages exceeding $10,000 must be reported to the HSA, Project Manager (PM), and the NJDOT-OMR immediately.

Any accident that results in a death or causes three or more workers to be hospitalized will be reported to the HSA, the subcontractor whose employees were injured, and the NJDOT-OMR immediately. The HSA will report this accident to the Occupational Safety and Health Administration (OSHA) within eight (8) hours as required by 29 CFR 1904.39(a).

The toll-free number for the OSHA Central Office is 1-800-321-OSHA. When speaking to a representative of OSHA the HSA will provide the following information:

- The establishment name;
- The location of the incident;
- The time of the incident;
- The number of fatalities or hospitalized employees;
- The names of any injured employees;
- Your contact person and his or her phone number; and
- A brief description of the incident.

For accidents in which the boat incurred damages of $500 or greater, the Captain of the vessel will fill out the USCG Boating Accident Report Form 3865 (CG 3865) as required, see Attachment D. A copy of this completed form will be kept in the field office for the duration of the project.

13.2 SAFETY AUDITS

Given the short duration of this project, formal safety audits will not be required. However, minor deficiencies that are noted will be corrected in the field as they occur. If major deficiencies are noted (those that cannot be immediately corrected in the field), a Stop-Work Order will be issued until appropriate measures can be taken to correct the problem.

14.0 RECORDKEEPING

Recordkeeping will include Medical Surveillance Reports, Personnel Training Records, the Site Safety and Health Plan and addenda, Incident Reports, and Field Audit Reports. In addition to these documents, records of meetings, including the morning safety meetings, will be maintained on-site and available to personnel.

14.1 MEDICAL SURVEILLANCE REPORTS

TAMS will maintain copies of medical monitoring records for its employees and ClinNet, TAMS's medical provider, will maintain originals. As required by 29 CFR 1910.1020 (d)(1)(i), these medical records will be maintained throughout the employee's employment plus an additional thirty years. TAMS will maintain a copy of the employee's Disclosure Agreement and Physician's Statement. Proof of medical monitoring will be available for TAMS employees working at the job site. Other companies working onsite shall also maintain records in a similar manner.

14.2 PERSONNEL TRAINING RECORDS

Personnel health and safety training records are maintained to document personnel qualifications and capabilities and to demonstrate compliance with company training requirements. Each site-specific training session will be documented by a training report, as required. The SSO will prepare the report and include the date of training, location, the list of attendees, and a description of the material covered. The original report will be filed and maintained on-site. Copies of CPR/First Aid training certificates will be retained on-site as well as respirator fit test reports, as required.

14.3 SITE SAFETY AND HEALTH PLAN

SSHPs will be completed and in place prior to each work assignment involving field activities. The SSHP will be signed and approved by the HSA and PM. The original of each completed SSHP will be maintained in the Project File. A copy will accompany each field team and be readily available at the work site under the control of the SSO. Copies of this SSHP will be available to employees when site-specific training is provided prior to any work beginning. Employees are required to read this SSHP and sign a form stating they have done so and understand the requirements herein. Employees will be made aware of updates or addendums made to this SSHP and will be trained accordingly.

14.4 INCIDENT REPORTS

Incident and accident investigations will be performed in a timely manner following the incident. The incident form will be kept on file for the duration of the project. See Section 14 for incident reporting requirements. The SSO or HSA, depending on the severity of the incident, (See Section 14.1) will file the form in the Project File. See Attachment D for a copy of the Incident Report Form. A copy of this form along with applicable documentation from the hospital or clinic will also be maintained in the employee's personal file.

ATTACHMENT A

- **ROUTE TO ST. JAMES HOSPITAL**
- **EMERGENCY PHONE NUMBERS**

Starting from: A 34 Jersey St, Newark, NJ 07105-2209

Arriving at: B 155 Jefferson St, Newark, NJ 07105-1706

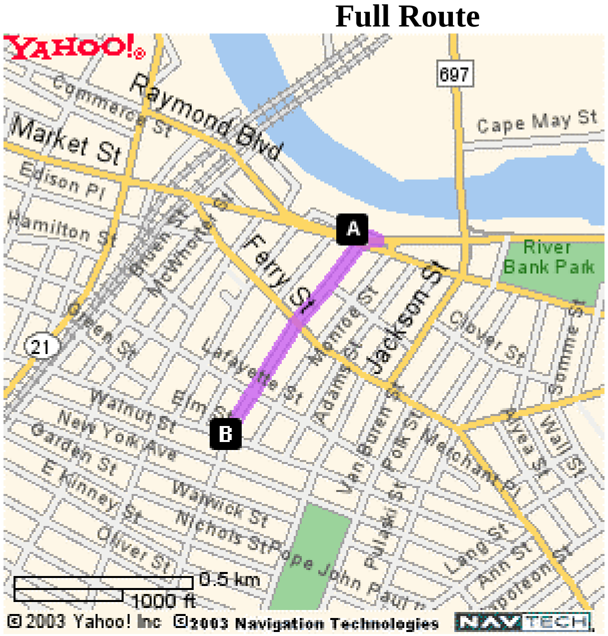
Distance: 0.5 miles **Approximate Travel Time:** 1 min

Directions

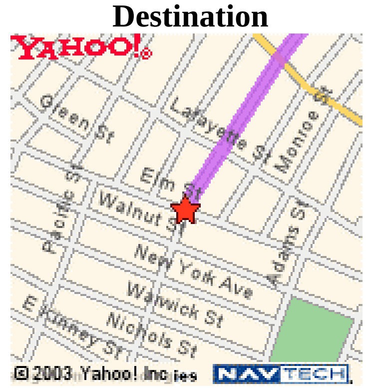
1. Start at **34 JERSEY ST, NEWARK** - go **< 0.1** mi
2. Make a Hard R Turn on **RAYMOND BLVD** - go **< 0.1** mi
3. Continue on a local road - go **< 0.1** mi
4. Bear L on **JEFFERSON ST** - go **0.4** mi
5. Arrive at **155 JEFFERSON ST, NEWARK**

When using any driving directions or map, it's a good idea to do a reality check and make sure the road still exists, watch out for construction, and follow all traffic safety precautions. This is only to be used as an aid in planning.

Full Route



Destination



155 Jefferson St
Newark, NJ 07105-1706

EMERGENCY PHONE NUMBERS

Emergency Service	Telephone Number
Ambulance	(201) 456-7000 or 911
Fire Department	(201) 733-7400 or 911
Police Department	(201) 733-6000 or 911
St. James Hospital	(201) 589-1300
NJ Poison Information and Education System, Newark NJ	(800) 222-1222
NJDEP Environmental Incident Hotline	(877) 927-6337
U.S. Coast Guard	Channel 16 Marine Band Radio

Additional notification requirements for TAMS personnel:

TAMS 24/7 ENERGENCY/INCIDENT TELEPHONE NUMBERS		
NJDOT-OMR Project Manager	Lisa Baron	609.530.4779 (O) 609-203-5494 (C)
TAMS Project Manager	Maheyar Bilimoria	973.338.6680 (O)
TAMS Health & Safety Manager	Christopher Purkiss	973.338.6680 (O) 973.568.9273 (Cell)

ATTACHMENT B

CHEMICALS OF CONCERN (COC)

- **Table 4-1 – Estimated Maximum Concentration of Hazardous Chemicals on Site**

- **Table 6-1 – Physicochemical Characteristics of Chemicals of Concern**

(Tables taken from RI/FS HASCP)

TABLE 4-1

ESTIMATED MAXIMUM CONCENTRATIONS OF HAZARDOUS CHEMICALS ON SITE[1]

Date	Compound	Max. Conc. (mg/kg)
Jul-93	2,3,3',4,4'-PCB	1.4
Jul-93	2,3,4,4',5-PCB	1.5
Mar-93	3,3',4,4',5,5'-PCB	0.0004
Jul-93	3,3',4,4',5-PCB	0.04
Jul-93	3,3',4,4'-PCB	1.6
1991	PCB 1242	3.8
Jul-93	PCB 1248	47.7
Mar-93	PCB 1254	5.1
Jul-93	PCB 1260	8.7
Jul-93	2,3,7,8-TCDD	0.24
1991	2,3,7,8-TCDF	0.001
1992	Total HPCDD	0.21
1992	Total HPCDF	0.16
1992	Total HXCDD	0.017
1992	Total HXCDF	0.065
Jul-93	Total PECDD	0.0064
Jul-93	Total PECDF	0.041
Jul-93	Total TCDD	0.27
Jul-93	Total TCDF	0.076
1992	2-Butanone	7.2
Jul-93	2-Hexanone	0.038
Jul-93	Acetone	50
Jul-93	Benzene	1.3
Jul-93	Carbon Disulfide	0.022
Jul-93	Chlorobenzene	29
Jul-93	Ethyl Benzene	2.3

TABLE 4-1
(Continued)

Date	Compound	Max. Conc. (mg/kg)
1992	Methylene Chloride	0.68
Jul-93	Toluene	0.87
Jul-93	Xylene (total)	150
Jul-93	4,4 DDD	221
1991	4,4 DDE	2.72
1991	4,4 DDT	7.69
Jul-93	Aldrin	0.0598
Jul-93	Alpha-BHC	0.0346
1992	alpha-Chlordane	0.129
Jul-93	Beta-BHC	8.44
1991	Delta-BHC	0.0454
Jul-93	Dieldrin	0.270
1992	Endosulfan I	0.151
Jul-93	Endosulfan II	0.123
Jul-93	Endosulfan sulfate	0.107
Jul-93	Endrin	1.25
Jul-93	Endrin aldehyde	0.452
Mar-93	Endrin ketone	0.166
1991	Gamma-BHC (Lindane)	0.0368
1992	gamma-Chlordane	0.128
Mar-93	Heptachlor	0.003
1991	Heptachlor epoxide (exo)	0.108
1991	Methoxychlor	0.083
1991	Nonachlorbiphenyl	0.020
1991	Decachlorbiphenyl	0.001
Jul-93	Dibutyltin	3.18
Jul-93	Monobutyltin	5.07
1992	Tributyltin	584

TABLE 4-1
(Continued)

Date	Compound	Max. Conc. (mg/kg)
1991	As	233
1991	Ba	968
1991	Be	2.7
1991	Cd	45.4
Jul-93	Cr	1,530
1991	Cy	6.02
1991	Hg	29.6
1992	Mg	11,100
Jul-93	Mn	3,190
1990	Ni	230
Jul-93	Pb	2490
Jul-93	Va	199
Jul-93	1,2 Dichlorobenzene	17
Jul-93	1,2,4 Trichlorobenzene	120
Jul-93	1,3 Dichlorobenzene	21
Jul-93	1,4 Dichlorobenzene	35
1991	2-Methylnaphthalene	850
1990	2-Methylphenol	0.29
Jul-93	4-Chloroaniline	1.8
1990	4-Methylphenol	7.5
1990	4-Nitrophenol	0.53
1991	Acenaphthene	1,000
1991	Anthracene	500
1991	Benzo(a)anthracene	320
1991	Benzo(a)pyrene	210
1991	Benzo(b)fluoranthene	110
1991	Benzo(ghi)perylene	46
1991	Benzo(k)fluoranthene	110

TABLE 4-1
(Continued)

Date	Compound	Max. Conc. (mg/kg)
Jul-93	bis(2-Ethylhexyl)phthalate	1,700
1991	Butyl benzyl phthalate	1.8
Jul-93	Carbazole	26
1991	Chrysene	340
Jul-93	Di-n-butyl phthalate	38
Jul-93	Di-n-octyl phthalate	170
1991	Dibenzo(a,h)anthracene	29
Jul-93	Dibenzofuran	74
1991	Fluoranthene	420
1991	Fluorene	530
Jul-93	Hexachlorobenzene	4.7
1991	Indeno(1,2,3-c,d)pyrene	55
1991	Naphthalene	1,300
1991	Phenanthrene	1,200
1990	Phenol	0.35
1991	Pyrene	650
1991	2,4 Dichlorophenol	350
1991	2,4,6 Trichlorophenol	1.2
1991	2-Chlorophenol	40
Jul-93	4-Methylphenol	6.3
Jul-93	TEPH as Diesel	52,000

(1) Estimated Maximum Concentration was derived through examination of analytical data on samples collected within the Passaic River Study Area between 1990 and 1993 and did not include review of all analytical data for samples from the Site.

TABLE 6-1

PHYSICOCHEMICAL CHARACTERISTICS OF CHEMICALS OF CONCERN

	CAS #	OSHA PEL	ACGIH TLV/ Recommended Exposure Limits	IDLH	Vapor Pressure mm @ 68 F	Specific Gravity @ 68 F	Skin Hazard	Odor Threshold	Carcinogen Category	OVA % (Methane) Response	MW grams
Acetone	67-64-1	750 ppm 1000 ppm S	750 ppm 1000 ppm S	2000 ppm	180	0.79	NO	mint like 47.5 - 1613.9 mg/m³	IRIS D	60	58.1
Aldrin	309-00-2	0.25 mg/m³	0.25 mg/m³	100 mg/m³	0.00008	1.6	YES	odorless	IRIS B2	NA	364.9
Alpha-BHC (alpha-hexachlorocyclohexane)	319-84-6	NE	NE	NE	0.02	1.87	YES	0.088 ppm (in water)	IRIS B2	NE	290.83
Ancenapthalene	83-32-9	0.2 mg/m³ (b)	0.2 mg/m³ (b)	NE	2.5					NA	154.21
Anthracene	120-12-7	0.2 mg/m³ (b)	0.2 mg/m³ (b)	NE	0.23	1.283 @25C	YES	Weak aromatic odor	IRIS A1	NA	178.23
Antimony	7440-36-0	0.5 mg/m³	0.5 mg/m³	80 mg/m³	0.04	6.69	NO		NE	NA	121.75
Aroclor 1248 (Polychlorinated Biphenyl, 48% chlorine)	12672-29-6	NE	NE	NE	0.0004	1.4 @ 15.5C	YES	~odorless	IRIS B2	NA	299.5
Aroclor 1254 (Polychlorinted Biphenyl, 54% chlorine)	11097-69-1	0.5 mg/m³	0.5 mg/m³	5 mg/m³	0.00006	1.38 @ 77F	YES	~odorless	IRIS B2	NA	328.4
Arsenic (Inorganic)(Metal)	7440-38-2	0.01 mg/m³ (a) 0.2 mg/m³	0.2 mg/m³	100 mg/m³	0.097	5.73	NO	~odorless	IRIS A	NA	74.9
Barium	7440-39-3	0.5 mg/m³	0.5 mg/m³	1100 mg/m³	0.35	3.51	NO	~odorless	NE	NA	137.33
Benzene	71-43-2	1 ppm 5 ppm S	0.1 ppm (a) 10 ppm	3000 ppm	75	0.88	YES	aromatic 5 - 119 ppm	IRIS A	150	78.11
Benzo(a)anthracene	56-55-3	0.2 mg/m³ (b)	0.2 mg/m³ (b)	NE	5.00E-09					NA	228.3
Benzo(a)pryene	50-32-8	0.2 mg/m³ (b)	0.2 mg/m³ (b)	NE	5.00E-09	1.351	YES	faint aroma	IRIS B2	NA	252.3
Benzo(b)fluoranthene	205-99-2	0.2 mg/m³ (b)	0.2 mg/m³ (b)	NE	~0		YES		IRIS B2	NA	252.3
Benzo(g,h,i)perylene, methyl	191-24-2	0.2 mg/m³ (b)	0.2 mg/m³ (b)	NE	1.00E-10				IRIS D	NA	276.34
Benzo(k)fluoranthene	207-08-9	0.2 mg/m³ (b)	0.2 mg/m³ (b)	NE	9.60E-11		YES		IRIS B2	NA	252.32
Beryllium	7440-41-7	0.002 mg/m³ 0.005 mg/m³ C	0.002 mg/m³	10 mg/m³	~0	1.85	NO		IRIS B2	NA	9.01
Beta-BHC (trans-alpha-benzene hexachloride)	319-85-7	NE	NE	NE	0.005	1.89 @ 19 C	YES		IRIS C	NE	290.83
BHC, gamma-	319-86-8	NE	NE		0.02						290.83
bis(2-ethyl hexyl) Phthalate	117-81-7	5 mg/m³ 10 mg/m³ S	5 mg/m³ 10 mg/m³ S	NE	0.2	0.99	NO		IARC 2B	NA	390.57
Butanone 2- (Methyl Ethyl Ketone)	78-93-3	200 ppm 300 ppm S	200 ppm 300 ppm S	3000 ppm	71	0.81	NO	mint or acetone like 10 - 20 ppm	IRIS D	80	72.1
Butyl Benzopthalate	85-68-7	NE	NE		0.0000086						312.4
Butyl Pthalate di-n-	84-74-2	5 mg/m³	5 mg/m³	9300 mg/m³	0.03	1.05	NO			NA	278.35
Cadmium (dust)	7440-43-9	.005 mg/m³	0.01 mg/m³ T(a) 0.002 mg/m³ R(a) 0.05 mg/m³	50 mg/m³	0.09	8.65 @ 77 F	NO	~odorless	IRIS B1	NA	112.4
Carbon Disulfide	75-15-0	4 ppm 12 ppm S	10 ppm	500 ppm	297	1.26	YES	ether-like odor	NE	NE	76.1
Chlorobenzene (Monochlorobenzene)	108-90-7	75 ppm	10 ppm (a) 75 ppm	2400 ppm	11	1.11	NO	almond-like 1 mg/m³ 280 mg/m³	IRIS D	200	112.56

TABLE 6-1

PHYSICOCHEMICAL CHARACTERISTICS OF CHEMICALS OF CONCERN

	CAS #	OSHA PEL	ACGIH TLV/ Recommended Exposure Limits	IDLH	Vapor Pressure	Specific Gravity	Skin Hazard	Odor Threshold	Carcinogen Category	OVA % (Methane) Response	MW
					mm @ 68 F	@ 68 F					grams
Chlorophenol 2-	95-57-8	NE	NE	NE	2.2	1.26	YES	Unpleasant, penetrating 0.00018 mg/l	IARC 2B	NE	128.56
Chromium (metal)	7440-47-3	1 mg/m³	0.5 mg/m³	NE	0.02	7.14	NO	~odorless	NE	NA	520
Chromium III	16065-83-1	0.5 mg/m³	0.5 mg/m³	NE	0.02	varies	YES	~odorless	NA	NA	520
Chromium VI	7440-47-3	0.1 mg/m³ C (for chromic acids and chromates)	0.05 mg/m³	NE	0.02		NO	~odorless	IRIS A	NA	520
Chrysene (1,2-Benzphenanthrene)	218-01-9	0.2 mg/m³ (b)	0.2 mg/m³ (b)	NE	0.000000006	1.274	YES		IRIS B2	NA	228.29
Coal Tar Pitch Volatiles	65996-93-2	0.2 mg/m³		700 mg/m³	varies	varies	YES		IARC I	NA	
Cyanide, potassium salt	151-50-8	5 mg/m³	5 mg/m³	50 mg/m³	~0	1.55	YES	faint, bitter, almond	NE	NA	65.12
Cyanide, sodium salt	14-33-9	5 mg/m³	5 mg/m³	50 mg/m³	~0	1.6	YES	faint, bitter, almond	NE	NA	49
DDE (p,p' Dichlorophenyldichloroethylene)	72-55-9	NE	0.00029 (D)	NE	0.0000065				IRIS B2	NA	318.03
DDT (Dichlorodiphenyltrichloroethane)	50-29-3	1 mg/m³	1 mg/m³	NE	0.00000015	0.99	YES	fruit-like, aromatic 0.35 ppm in water	IRIS B2	NA	354.49
Dibenzofuran	132-64-9	NE	NE								168.2
Dichlorobenzene 1,2- (o - Dichlorobenzene)	95-50-1	50 ppm C	25 ppm 50 ppm C	1000 ppm	1	1.3	YES	Aromatic 50 ppm	IRIS D	50	147
Dichlorobenzene 1,3- (m-Dichlorobenzene)	541-73-1	NE	NE	NE	2	1.2884	YES		IRIS D	NE	147
Dichlorobenzene 1,4- (p-Dichlorobenzene)	106-46-7	75 ppm 110 ppm S	75 ppm 110 ppm S	1000 ppm	0.18	1.25	NO	Mothball-like Aromatic (stong at 30-60 ppm)	IARC 2B	113	147
Dichlorophenol 2,4-	120-83-2	NE	NE		0.53						163
Dieldrin	60-57-1	0.25 mg/m³	0.25 mg/m³	450 mg/m³	0.00000016	1.75	YES	odorless to mild, chemical 0.041 ppm	IRIS B2	NA	380.93
Endrin	72-20-8	0.1 mg/m³	0.1 mg/m³	2000 mg/m³	0.00000017	1.7	YES	odorless to faint chemical 0.018 ppm	IRIS D	NA	380.93
Ethyl Benzene	100-41-4	100 ppm 125 ppm S	100 ppm 125 ppm S	2000 ppm	8.6	0.87	NO	aromatic	IRIS D	100	106.2
Fluoranthene (1,2-Benzacenaphthene)	206-44-0	0.2 mg/m³ (b)	0.2 mg/m³ (b)	NE	0.01	1.25 @ 0C	YES		IRIS D	NE	202.26
Fluorene (2,3-Benzindene)	867-37-1	0.2 mg/m³ (b)	0.2 mg/m³ (b)	NE	1.7	1.203 @ 0C	Yes		IARC 3	NE	166.22
Hexachlorobenzene	118-74-1	NE	0.025 mg/m³ (a)	NE	0.28	1.569 @ 23.6C	YES		IRIS B2	NE	284.78
Hexanone 2- (methyl butyl ketone)	591-78-6	5 ppm	5 ppm	5000 ppm	3.5	0.81	YES	acetone-like odor		NE	100.16
Indeno(1,2,3-c,d)pyrene	193-39-5	0.2 mg/m³ (b)	0.2 mg/m³ (b)	NE	~0		YES		IRIS B2	NA	276.34

TABLE 6-1

PHYSICOCHEMICAL CHARACTERISTICS OF CHEMICALS OF CONCERN

	CAS #	OSHA PEL	ACGIH TLV/ Recommended Exposure Limits	IDLH	Vapor Pressure mm @ 68 F	Specific Gravity @ 68 F	Skin Hazard	Odor Threshold	Carcinogen Category	OVA % (Methane) Response	MW grams
Lead (inorganic)	7439-92-1	0.05 mg/m^3	0.15 mg/m^3	700 mg/m^3	0.04	11.34	NO	~odorless	IRIS B2	NA	207
Magnesium (dust)	1309-48-4	10 mg/m^3 T 5 mg/m^3 R	10 mg/m^3	NE	~0	3.58	NO		NE	NA	40.3
Manganese	7439-96-5	5 mg/m^3 C	0.2 mg/m^3 (a) 5 mg/m^3	NE	0.029	7.2	NO		IRIS D	NA	54.9
Mercury (organo) alkyl compounds (as Hg)	7439-97-6	0.01 mg/m^3 0.03 mg/m^3 S	0.01 mg/m^3 0.03 mg/m^3 S	10 mg/m^3	varies	varies	YES		IRIS D	NA	
Methyl Naphthalene 2-	91-57-6	0.2 mg/m^3 (b)	0.2 mg/m^3 (b)	NE	3.1	1.01 @ 20C	NO	0.01 - 0.05 ppm	NE		142.2
Methylene Chloride	75-09-2	25 ppm 125 ppm S	50 ppm	5000 ppm	350	1.33	NO	sweet, pleasant 160 - 307 ppm	IRIS B2	90	84.9
Methylphenol 2-	95-48-7	NE	NE		0.21						108.14
Methylphenol 4-	106-44-5	NE	NE		0.097						108.14
Naphthalene	91-20-3	10 ppm 15 ppm S	10 ppm 15 ppm S	500 ppm	0.08	1.15	NO	Odor fo mothballs		NA	128.2
Nickel (soluble salts)	7440-02-0	1 mg/m^3	1 mg/m^3 0.05 mg/m^3 (a)		0.02	8.9	NO		IRIS A1 (refinery dust)	NA	58.69
Nitrophenol 4-	100-02-7	NE	NE		0.5	1.27	YES	~odorless	NE	NA	139.11
Octyl Phthtalate di-n-	117-84-0	NE	NE	NE	0.05	0.973 @ 25 C	NE		NE	NA	390.56
Phenanthrene	85-01-8	0.2 mg/m^3 (b)	0.2 mg/m^3 (b)	NE	0.28	0.98 @4C	YES	faint, aromatic	IRIS D	NA	178.22
Phenol	108-95-2	5 ppm	5 ppm	250 ppm	0.4	1.06	YES	sweet aromatic 0.05 - 16.4 ppm	IRIS D	54	94.1
Potassium (dust)	7440-09-7	10 mg/m^3 T 5 mg/m^3 R	10 mg/m^3	NE	0.11	0.86				NA	39.1
Pyrene (Benzo(d,e,f)phenanthrene)	129-00-0	0.2 mg/m^3 (b)	0.2 mg/m^3 (b)	NE	0.43	1.271 @ 23 C	YES		IRIS D	NA	202.26
Tetrachlorodibenzo-p-dioxin 2,3,7,8-	1746-01-6	NE	NE	NE	6.40E-10		YES		IARC B2	NA	321.96
Tin (soluable)	7440-31-5	2 mg/m^3	2 mg/m^3	400 mg/m^3	0.03	7.28	YES			NA	118.69
Toluene	108-88-3	100 ppm 150 ppm S	50 ppm	2000 ppm	21	0.87	YES	sweet pungent 2.14 ppm	IRIS D	110	92
Trichlorobenzene 1,2,4-	120-82-1	5 ppm C	5 ppm C	NE	0.26	1.45	YES	Aromatic 3 ppm	IRIS D	100	181.46
Trichlorophenol 2,4,6-	88-06-6	NE	NE		0.4						197.45
Vanadium	1314-62-1	0.05 mg/m^3	0.05 mg/m^3	70 mg/m^3	~0	3.36	NO		NE	NA	181.88
Xylene, all isomers	1330-20-7	100 ppm 150 ppm S	100 ppm 150 ppm S	1000 ppm	9	NA	NO	aromatic	IRIS D	NE	106.2
Xylene, m-	106-42-3	100 ppm 150 ppm S	100 ppm 150 ppm S	1000 ppm	9	0.86	NO	aromatic	IRIS D	111	106.2
Xylene, o-											
Xylene. p-	108-38-3	100 ppm 150 ppm S	100 ppm 150 ppm S	1000 ppm	9	0.86	NO	aromatic	IRIS D	116	106.2
Zinc Oxide Dust	1314-13-2	10 mg/m^3 T 5 mg/m^3 R	10 mg/m^3	NE	~0		NO		IRIS D	NA	81.4

TABLE 6-1

PHYSICOCHEMICAL CHARACTERISTICS OF CHEMICALS OF CONCERN

	CAS #	OSHA PEL	ACGIH TLV/ Recommended Exposure Limits	IDLH	Vapor Pressure	Specific Gravity	Skin Hazard	Odor Threshold	Carcinogen Category	OVA % (Methane) Response	MW
					mm @ 68 F	@ 68 F					grams
Zinc O:ide Fume	1314-13-2	5 mg/m³ 10 mg/m³ S	5 mg/m³ 10 mg/m³ S	NE	˜0	5.61	NO		IRIS D	NA	81.4

NOTES:

a	These TLVs have not yet been adopted. ACGIH has placed them under notice of intended changes.
ACGIH	American Conference of Governmental Industrial Hygienists
b	This PEL/TLV is for all Coal Tar Pitch Volatiles combined. Separate PEL/TLVs have not been established to date.
C	Ceiling Limit, shall not be exceeded at any time during the work day.
CAS #	Chemical Abstracts Service Registry Number
D	Contaminant intake that should not induce adverse effects to human health or should not pose a risk of cancer occurrence greater than a predetermined risk level. Developed by U.S. Army Medical Bioengineering R&D Laboratory. Expressed in mg/kg/day.
IARC	International Agency for Research on Cancer
IDLH	Immediately Dangerous to Life or Health
IRIS	Integrated Risk Information System
MW	Molecular weight
mg/m³	milligrams of contaminant per cubic meter of air
NA	Not Applicable
NE	Not Established
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit, unless noted is the TWA, Time Weighted Average (usually for 8 hours a day, 5 days a week), mandated by law (1989 standards)
ppm	parts of contaminant per million parts of air
R	Respirable Dust
S	Short Term Exposure Limit (STEL) usually 15 minutes, four times in one day
S/5/2	STEL for 5 minutes, twice per day
Skin Hazard	Contaminant can be absorbed through intact skin.
T	Total Dust
TLV	Threshold Limit Value, unless noted is the TWA, Time Weighted Average (usually for 8 hours a day, 5 days a week), recommended

Carcinogenic Category

IRIS	IARC	
A	1	Human Carcinogen
B1	2A	Probable Human Carcinogen (limited human data)
B2	2B	Probable Human Carcinogen (sufficient in animals, inadequate evidence in humans).
C	3	Possible Human Carcinogen
D	4	Not Classifiable
E		Evidence of Non-Carcinogen

ATTACHMENT C

TRAINING DOCUMENTATION
FOR FIELD PERSONNEL

(To be Provided prior to the Field Activity)

ATTACHMENT D

- **SUPERVISOR’S REPORT OF INCIDENCE**
- **VEHICLE ACCIDENT REPORT FOR EARTH TECH**

Supervisor's Report of Incident

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

This is an official document to be initiated by the injured employee's Supervisor regarding possible employee injury. Please answer all questions completely. Fax to Health and Safety within 24 hours of the injury: (804) 515-8313. See 2nd page for instructions.

Section 1: Data for Employee Involved in Incident – To be completed by supervisor. Avoid reporting delays and complete as much as possible now, submit fully completed form (including corrective actions) at a later time.

Complete Sections 1 & 2, then call 877-261-8926 (TYCO) to obtain a Sedgwick Claim#: ___________________________________

Office Location Code (3-digit number) ______________ Employee Department (4-digit number) ________________

Employee Office Location Address____

Injury Illness Injury From a Vehicle Incident Near Miss

Employee Name	Work Phone	Home Phone	Birth Date	SSN
Home Address (City, State, Zip)				

Hire Date	Hourly Wage	Marital Status	Dependents	Job Title

Section 2: Supervisor (Must complete each item) - Print Clearly

Date of Incident	Time	Date/Time Reported	To Whom
Client Name/Job Number	Job Assignment at Time of Incident		Time Shift Began
Exact Location & Address of Incident			
Describe Incident			
Root cause of Incident			
Nature of Injury			
Medical Attention? Yes No If yes, describe treatment			
Dr./Hospital Name		Address/Phone of Hosp.	
Witness Name *(Any witnesses should attach a short statement)*			
Did injured leave work? When?		Has injured returned to work? Yes No	
Corrective Action(s) to Prevent Future Occurrence:			
Supervisor/Foreman (Print Name)		Signature	Telephone Date

Section 3: Manager

Comprehensive comments on root cause of incident and corrective action		
Manager (Print Name)	Signature	Telephone Date

Section 4: Environmental Safety and Health Professional

Concur with action taken? Yes No Remarks:	
No Medical Care First Aid Only Medical Care by Medical Professional Fatality OSHA Recordable Yes No Pending Days away from work _____ Restricted Days ________	
ESH Professional (Print Name)	Signature Date

EHS101-F1 Revised July 2, 2002 This report contains information protected by the Privacy Act.

Supervisor's Report of Incident
Instructions For Completion

The following types of incidents must be reported using this form:

1. Occupational Injury or Illness (includes first aid only, medical treatment, hospitalization, fatality)
2. Vehicle Accident Injuries
3. Near Miss (incident where employee(s) could have been injured) this includes vehicle incidents

INSTRUCTIONS

1. Employees must report such incidents to their Supervisor **immediately**.
2. The Supervisor must complete **Sections 1 and 2, Employee Data and the Supervisor Section** of the SRI. Any work-related injury or illness that requires medical or care in the United States will require notifying SCMS at 877-261-8926.
3. The Supervisor must verbally notify his/her Manager, who in turn must sign **Section 3, Manager**, of the SRI. To avoid delaying SRI process, a separate copy of the SRI with the Manager's signature can be faxed within 3 days to Health and Safety.
4. The Supervisor must verbally notify Health and Safety with a follow-up SRI faxed within 24 hours (see below for fax numbers). Health and Safety will review and complete **Section 4, Environmental Health and Safety**. For near-miss situations that could have resulted in an injury to an employee, the Supervisor must notify his/her Manager (see Item 3 above) and Health and Safety with a follow-up SRI faxed within 24 hours.

PRIMARY CONTACTS

Environmental/Engineering/Transportation		**Construction**
East:	Dale Prokopchak, CIH, CSP Telephone: 804-515-8556 Fax: 804-515-8313	Chuck Pryor, CSP Telephone: 510-419-5133 Fax: 510-419-6746
West:	Bob Poll, CIH, CSP Telephone: 562-951-2242 Fax: 562-951-2100	**Contract Operations** Mark Robinson, CSP Telephone: 920-451-2862 Fax: 920-458-0537
Administrator:	Chelsea Ryan Telephone: 804-515-8557 Fax: 804-515-8313	

 This report contains information protected by the Privacy Act.

Tyco International – Vehicle Accident Report for Earth Tech
To Be Completed in the Event of any Vehicle Incident

ACCIDENT INFORMATION	Date of Accident	State of Accident	Driver Home Office & Dept #	Jobsite name/ # if applicable	Time of Accident
	Description of Accident				
	Intersection/Highway of Accident with Closest Cross Street/Exit. If Exact location is known provide address, city, state, zip.				
	Were Authorities Contacted? Yes No	If so, What Department?	Any Citations Issued? Yes No	Who Received Citation?	What citation?
EARTH TECH DRIVER AND VEHICLE INFORMATION	Earth Tech Driver Name	Home Address, City, State, Zip			
	Home Telephone	Work Telephone	Social Security #	Drivers License # / State Issued / Expiration Date / /	
	Vehicle Year	Vehicle Make/ Model	VIN Number	License Plate # and State	
	Circle One: Earth Tech Owned / Leased / Rented / Employee's Personal Vehicle	If leased or rented, list company:			
	What was Vehicle Being Used For? Business Personal	Was Vehicle Used With Permission? Yes No			
	What are the Damaged Areas of Vehicle?	Estimated Dollar Amount of Damage			
OTHER DRIVER AND VEHICLE INFORMATION	Vehicle Year	Vehicle Make/Model	VIN Number	Was Vehicle Driveable? Yes No	
	License Plate # and State	Name of Insurance Carrier	Policy Number		
	Name of *Owner* of Vehicle	Address, City, State, Zip of *Vehicle Owner*			
	Home Telephone # - Vehicle Owner ( ) - Work Telephone # - Vehicle Owner ( ) -	Where can vehicle be seen?			
	Name of *Driver* of Vehicle	Address, City, State, Zip of *Vehicle Driver*			
	Home Telephone # - Vehicle Driver ( ) - Work Telephone # - Vehicle Driver ( ) -	Date of Birth	Drivers License # / State Issued / Expiration Date / /		
	What are the Damaged Areas of Vehicle?	Estimated Dollar Amount of Damage			

	Name	Address, City, State, Zip	Telephone #
INJURED PERSON(S)	1		
	2		
	3		

	Name	Address, City State, Zip	Telephone #
WITNESSES	1		
	2		
	3		

REPORTING PROCEDURE

If this incident was the Earth Tech driver's fault, the other driver is uninsured or you are not sure about fault, call Sedgwick (877) 261-8926(TYCO) and open an auto liability claim. If there was Earth Tech employee injury also, complete the SRI and open a work-related injury claim with Sedgwick at the same time that you report the vehicle claim.

Sedgwick Claim Number: ____

Forward this form to Earth Tech Health and Safety fax: (804) 515-8313 phone: (804) 515-8557.

BOATING ACCIDENT REPORT

THE OPERATOR/OWNER OF A VESSEL USED FOR RECREATIONAL PURPOSES IS REQUIRED TO FILE A REPORT IN WRITING WHENEVER AN ACCIDENT RESULTS IN: LOSS OF LIFE OR DISAPPEARANCE FROM A VESSEL; AN INJURY WHICH REQUIRES MEDIAL TREATMENT BEYOND FIRST AID; OR PROPERTY DAMAGE IN EXCESS OF $500 OR COMPLETE LOSS OF THE VESSEL. REPORTS IN DEATH AND INJURY CASES MUST BE SUBMITTED WITHIN 48 HOURS. REPORTS IN OTHER CASES MUST BE SUBMITTED WITHIN 10 DAYS. REPORTS MUST BE SUBMITTED TO THE REPORTING AUTHORITY IN THE STATE WHERE THE ACCIDENT OCCURRED. THIS FORM IS PROVIDED TO ASSIST THE OPERATOR IN FILING THE REQUIRED WRITTEN REPORT.

COMPLETE ALL BLOCKS (INDICATE THOSE NOT APPLICABLE BY "NA")

ACCIDENT DATA

DATE OF ACCIDENT	TIME AM PM	NAME OF BODY OF WATER	LOCATION (GIVE LOCATION PRECISELY)	
NUMBER OF VESSELS INVOLVED	NEAREST CITY OR TOWN	COUNTY	STATE	ZIP CODE

WEATHER (CHECK ALL APPLICABLE)
☐CLEAR ☐RAIN
☐CLOUDY ☐SNOW
☐FOG ☐HAZY

WATER CONDITIONS
☐CALM (WAVES LESS THAN 6")
☐CHOPPY (WAVES 6" TO 2')
☐ROUGH (WAVES 2' TO 6')
☐VERY ROUGH (GREATER THAN 6')
☐STRONG CURRENT

TEMPERATURE (ESTIMATE)
AIR ____°F
WATER ____°F

WIND
☐NONE
☐LIGHT (0-6 MPH)
☐MODERATE (7-14 MPH)
☐STRONG (15-25 MPH)
☐STORM (OVER 25 MPH)

VISIBILITY

DAY		NIGHT
☐	GOOD	☐
☐	FAIR	☐
☐	FOG	☐

NAME OF OPERATOR	OPERATOR ADDRESS

OPERATOR TELEPHONE NUMBER ( )
☐MALE ☐FEMALE

DATE OF BIRTH: MO DAY YR

OPERATOR'S EXPERIENCE
☐NONE
☐UNDER 100 HOURS
☐OVER 100 HOURS

INSTRUCTION IN BOATING SAFETY
☐STATE COURSE ☐U.S.POWER SQUADRON
☐USCG AUXILIARY ☐AMERICAN RED CROSS☐ NONE

NAME OF OWNER	OWNER ADDRESS		
OWNER TELEPHONE NUMBER ( )	NUMBER OF PEOPLE ON BOARD	NUMBER OF PEOPLE BEING TOWED	RENTED BOAT? ☐YES ☐NO

BOAT NO. 1 (THIS VESSEL)

BOAT REGISTRATION OR DOCUMENTATION NUMBER	STATE	HULL IDENTIFICATION NUMBER	BOAT NAME
BOAT MANUFACTURER	LENGTH	MODEL	YEAR BUILT

TYPE OF BOAT
☐OPEN MOTORBOAT
☐CABIN MOTORBOAT
☐AUXILIARY SAIL
☐SAIL (ONLY)
☐ROWBOAT
☐CANOE/KAYAK
☐PERSONAL WATERCRAFT
☐PONTOON BOAT
☐HOUSEBOAT
☐OTHER (SPECIFY)

HULL MATERIAL
☐WOOD
☐ALUMINUM
☐STEEL
☐FIBERGLASS
☐RUBBER/VINYL/CANVAS
☐RIGID HULL INFLATABLE
☐OTHER (SPECIFY)

ENGINE
☐OUTBOARD
☐INBOARD
☐INBOARD-STERNDRIVE (I/O)
☐AIRBOAT

☐NONE
☐LIGHT (0-6 MPH)
☐MODERATE (7-14H)

PROPULSION
☐PROPELLER
☐WATER JET
☐AIR THRUST
☐MANUAL
☐SAIL

NUMBER OF ENGINES

TOTAL HORSEPOWER

PERSONAL FLOATATION DEVICES (PFDS): WAS BOAT ADEQUATELY EQUIPPED WITH COAST GUARD APPROVED PFDS?
☐YES ☐NO
WERE PFDS ACCESSIBLE?
☐YES ☐NO

FIRE EXTINGUISHERS OB BOARD? ☐YES ☐NO
USED? ☐YES ☐NO

OPERATION AT TIME OF ACCIDENT (CHECK ALL APPLICABLE)
☐CRUISING
☐CHANGING DIRECTION
☐CHANGING SPEED
☐DRIFTING
☐TOWING
☐BEING TOWED
☐ROWING/PADDLING
☐SAILING
☐LAUNCHING
☐DOCKING/UNDOCKING
☐AT ANCHOR
☐TIED TO DOCK/MOORED
☐OTHER (SPECIFY)

ACTIVITY AT TIME OF ACCIDENT (CHECK ANY IF APPLICABLE)
☐FISHING
☐TOURNAMENT
☐HUNTING
☐SWIMMING/DIVING
☐MAKING REPAIRS
☐WATERSKIING/TUBING/ETC.
☐RACING
☐WHITEWATER SPORTS
☐FUELING
☐STARTING ENGINE
☐NON-RECREATIONAL
☐OTHER (SPECIFY)

ESTIMATED SPEED
☐NONE ☐UNDER 10 MPH
☐10 - 20 MPH ☐21 – 40 MPH ☐OVER 40 MPH

TYPE OF ACCIDENT
☐GROUNDING
☐CAPSIZING
☐FLOODING/SWAMPING
☐SINKING
☐FIRE OR EXPLOSION(FUEL)
☐FIRE OR EXPLOSION(OTHER)
☐SKIER MISHAP
☐COLLISION WITH VESSEL
☐COLLISION W/FIXED OBJECT
☐COLLISION W/FLOATING OBJ.
☐FALLS OVERBOARD
☐FALLS IN BOAT
☐STRUCK BY BOAT
☐STRUCK BY MOTOR/PROPELLER
☐STRUCK BY SUBMERGED OBJ.
☐OTHER (SPECIFY)

☐HIT AND RUN

WHAT CONTRIBUTED TO ACCIDENT? (CHECK ALL APPLICABLE)
☐WEATHER
☐EXCESSIVE SPEED
☐IMPROPER LOCKOUT
☐RESTRICTED VISION
☐OVERLOADING
☐IMPROPER LOADING
☐HAZARDOUS WATERS
☐ALCOHOL USE
☐DRUG USE
☐HULL FAILURE
☐MACHINERY FAILURE
☐EQUIPMENT FAILURE
☐OPERATOR INEXPERIENCE
☐OPERATOR INATTENTION
☐CONGESTED WATERS
☐PASSENGER/SKIER BEHAVIOR
☐DAM/LOCK
☐OTHER (SPECIFY)

BOATING ACCIDENT REPORT

DECEASED (IF MORE THAN 2 FATALITIES, ATTACH ADDITIONAL FORMS)		
NAME OF VICTIM	ADDRESS OF VICTIM	WAS PFD WORN? ☐YES ☐NO
DATE OF BIRTH ☐MALE ☐FEMALE	DEATH CAUSED BY ☐DROWNING ☐OTHER	☐DISAPPEARANCE
NAME OF VICTIM	ADDRESS OF VICTIM	WAS PFD WORN? ☐YES ☐NO
DATE OF BIRTH ☐MALE ☐FEMALE	DEATH CAUSED BY ☐DROWNING ☐OTHER	☐DISAPPEARANCE

INJURED (IF MORE THAN 2 INJURIES, ATTACH ADDITIONAL FORMS)		
NAME OF VICTIM	ADDRESS OF VICTIM	
DATE OF BIRTH	MEDICAL TREATMENT BEYOND FIRST AID? ☐YES ☐NO ADMIITTED TO HOSPITAL? ☐YES ☐NO	DESCRIBE INJURY
WAS PFD WORN? ☐YES ☐NO WAS IT INFLATABLE? ☐YES ☐NO	PRIOR TO ACCIDENT? ☐YES ☐NO	AS A RESULT OF ACCIDENT? ? ☐YES ☐NO
NAME OF VICTIM	ADDRESS OF VICTIM	
DATE OF BIRTH	MEDICAL TREATMENT BEYOND FIRST AID? ☐YES ☐NO ADMIITTED TO HOSPITAL? ☐YES ☐NO	DESCRIBE INJURY
WAS PFD WORN? ☐YES ☐NO WAS IT INFLATABLE? ☐YES ☐NO	PRIOR TO ACCIDENT? ☐YES ☐NO	AS A RESULT OF ACCIDENT? ? ☐YES ☐NO

OTHER PEOPLE ABOARD THIS BOAT (IF MORE THAN 2 PEOPLE, ATTACH ADDITONAL FORMS)	
NAME OF VICTIM	ADDRESS OF VICTIM
DATE OF BIRTH	
NAME OF VICTIM	ADDRESS OF VICTIM
DATE OF BIRTH	

BOAT NO. 2 (IF MORE THAN 2 VESSELS, ATTACH ADDITIONAL IDENTIFYING INFORMATION)	
NAME OF OPERATOR	OPERATOR ADDRESS
OPERATOR TELEPHONE NUMBER ( )	BOAT REGISTRATION OR DOCUMENTATION NUMBER STATE
NAME OF OWNER	OWNER ADDRESS
OWNER TELEPHONE NUMBER ( )	

PROPERTY DAMAGE		
ESTIMATED AMOUNT: THIS BOAT AND CONTENTS: $	OTHER BOAT AND CONTENTS: $	OTHER PROPERTY: $
DESCRIBE PROPERTY DAMAGED		

WITNESSES NOT ON THIS VESSEL		
NAME	ADDRESS	TELEPHONE NUMBER ( )
NAME	ADDRESS	TELEPHONE NUMBER ( )

PERSON COMPLETIN REPORT		
NAME	ADDRESS	TELEPHONE NUMBER ( )
SIGNATURE	QUALIFICATION ☐OPERATOR ☐OWNER ☐INVESTIGATOR ☐OTHER	DATE SUBMITTED

FOR ACCIDENT INVESTIGATION TEAM USE ONLY	
CAUSES BASED ON (CHECK ONE) ☐THIS REPORT ☐INVESTIGATION	☐INVESTIGATION AND THIS REPORT ☐OTHER
NAME OF REVIEWING OFFICE DATE RECEIVED	RECREATIONAL ☐ NON-REPORTABLE ☐ COMMERCIAL ☐
PRIMARY CAUSE	SECONDARY CAUSE

BOATING ACCIDENT REPORT

ACCIDENT DESCRIPTION
DESCRIBE WHAT HAPPENED (SEQUENCE OF EVENTS. INCLUDE FAILURE OF EQUIPMENT. INCLUDE A DIAGRAM IF NEEDED. CONTINUE ON ADDITIONAL SHEETS IF NECESSARY. INCLUDE ANY INFORMATIKON REGARDING THE INVOLVEMENT OF ALCOHOL AND/OR DRUGS IN CAUSING OR CONTRIBUTING TO THE ACCIDENT. INCLUDES ANY DESCRIPTIVE INFORMATION ABOUT THE USE OF PFD'S.)

ATTACHMENT E

MSDS SHEETS FOR DECONTAMINATION REAGENTS

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

MSDS Number: N3660 --- *Effective Date: 07/13/00*

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%
CAS No.: 7697-37-2
Molecular Weight: 63.01
Chemical Formula: HNO_3
Product Codes:
J.T. Baker: 411D, 412D, 5371, 5555, 5801, 5826, 5876, 9597, 9598, 9600, 9601, 9602, 9603, 9604, 9606, 9607, 9616, 9617
Mallinckrodt: 1409, 2703, 2704, 412D, 6623, H988, H993, H998, V069, V077, V336, V561, V633, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	50 - 70%	Yes
Water	7732-18-5	30 - 50%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Yellow (Reactive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or

combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.
Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Water spray may be used to keep fire exposed containers cool. Do not get water inside container.
Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(R) or TEAM(R) 'Low Na+' acid neutralizers are recommended for spills of this product.

Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact

with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.

Odor:
Suffocating, acrid.

Solubility:
Infinitely soluble.

Specific Gravity:
1.41

pH:
1.0 (0.1M solution)

% Volatiles by volume @ 21C (70F):
100 (as water and acid)

Boiling Point:
122C (252F)

Melting Point:
-42C (-44F)

Vapor Density (Air=1):
2-3

Vapor Pressure (mm Hg):
48 @ 20C (68F)

Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.

Conditions to Avoid:
Light and heat.

11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

--------\Cancer Lists\--------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 150LB

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 150LB

International (Air, I.C.A.O.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 150LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	--Canada-- NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	-SARA 302- TPQ	------SARA 313------ List	------SARA 313------ Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.

Store in a tightly closed container.
Remove and wash contaminated clothing promptly.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 1.

Disclaimer:

****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ISOPROPYL ALCOHOL (90 - 100%)

MSDS Number: I8840 --- ***Effective Date: 07/21/00***

1. Product Identification

Synonyms: 2-Propanol; sec-propyl alcohol; isopropanol; sec-propanol; dimethylcarbinol
CAS No.: 67-63-0
Molecular Weight: 60.10
Chemical Formula: (CH3)2 CHOH
Product Codes:
J.T. Baker: 5082, 9037, 9080, U298
Mallinckrodt: 0562, 3027, 3031, 3032, 3035, 3037, 3043, 4359, 6569, H604, H982, V345, V555, V566

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Isopropyl Alcohol	67-63-0	90 - 100%	Yes
Water	7732-18-5	0 - 10%	No

3. Hazards Identification

Emergency Overview

WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE IRRITATION TO SKIN.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 4 - Extreme (Flammable)

Reactivity Rating: 2 - Moderate
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors irritates the respiratory tract. Exposure to high concentrations has a narcotic effect, producing symptoms of dizziness, drowsiness, headache, staggering, unconsciousness and possibly death.
Ingestion:
Can cause drowsiness, unconsciousness, and death. Gastrointestinal pain, cramps, nausea, vomiting, and diarrhea may also result. The single lethal dose for a human adult = about 250 mls (8 ounces).
Skin Contact:
May cause irritation with redness and pain. May be absorbed through the skin with possible systemic effects.
Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.
Chronic Exposure:
Chronic exposure may cause skin effects.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired liver, kidney, or pulmonary function may be more susceptible to the effects of this agent.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Call a physician if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Flash point: 12C (54F) CC
Autoignition temperature: 399C (750F)
Flammable limits in air % by volume:
lel: 2.0; uel: 12.7
Listed fire data is for Pure Isopropyl Alcohol.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.

Fire Extinguishing Media:
Water spray, dry chemical, alcohol foam, or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Small quantities of peroxides can form on prolonged storage. Exposure to light and/or air significantly increases the rate of peroxide formation. If evaporated to a residue, the mixture of peroxides and isopropanol may explode when exposed to heat or shock.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Isopropyl Alcohol (2-Propanol):
-OSHA Permissible Exposure Limit (PEL):
400 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):
400 ppm (TWA), 500 ppm (STEL)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator.

WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene and nitrile rubber are recommended materials.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Rubbing alcohol.
Solubility:
Miscible in water.
Specific Gravity:
0.79 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
82C (180F)
Melting Point:
-89C (-128F)
Vapor Density (Air=1):
2.1
Vapor Pressure (mm Hg):
44 @ 25C (77F)
Evaporation Rate (BuAc=1):
2.83

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Heat and sunlight can contribute to instability.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Heat, flame, strong oxidizers, acetaldehyde, acids, chlorine, ethylene oxide, hydrogen-palladium combination, hydrogen peroxide-sulfuric acid combination, potassium tert-butoxide, hypochlorous acid, isocyanates, nitroform, phosgene, aluminum, oleum and perchloric acid.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

1. Toxicological Information

Oral rat LD50: 5045 mg/kg; skin rabbit LD50: 12.8 gm/kg; inhalation rat LC50: 16,000 ppm/8-hour;

investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\--

Ingredient	NTP Carcinogen Known	NTP Carcinogen Anticipated	IARC Category
Isopropyl Alcohol (67-63-0)	No	No	3
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to quickly evaporate. When released into the soil, this material may leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. When released into water, this material may biodegrade to a moderate extent. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.
Environmental Toxicity:
The LC50/96-hour values for fish are over 100 mg/l. This material is not expected to be toxic to aquatic life.

3. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ISOPROPANOL
Hazard Class: 3
UN/NA: UN1219
Packing Group: II
Information reported for product/size: 355LB

International (Water, I.M.O.)

Proper Shipping Name: ISOPROPANOL
Hazard Class: 3.2
UN/NA: UN1219
Packing Group: II
Information reported for product/size: 355LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Isopropyl Alcohol (67-63-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	--Canada-- NDSL	Phil.
Isopropyl Alcohol (67-63-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	-SARA 302- TPQ	------SARA 313------ List	------SARA 313------ Chemical Catg.
Isopropyl Alcohol (67-63-0)	No	No	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Isopropyl Alcohol (67-63-0)	No	No	No
Water (7732-18-5)	No	No	No

emical Weapons Convention: No TSCA 12(b): Yes CDTA: Yes
.RA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2[S]2
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE IRRITATION TO SKIN.
Label Precautions:
Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor or mist.
Avoid contact with eyes, skin and clothing.
Label First Aid:
If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious

person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 7.

Disclaimer:

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ALCONOX(R)

MSDS Number: A2052 --- *Effective Date: 02/21/00*

1. Product Identification

Synonyms: Proprietary blend of sodium linear alkylaryl sulfonate, alcohol sulfate, phosphates, and carbonates.
CAS No.: Not applicable.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Not applicable to mixtures.
Product Codes: A461

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Alconox(R) proprietary detergent mixture	N/A	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA$^{(tm)}$ Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT

Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.
Ingestion:
May cause irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.
Skin Contact:
No adverse effects expected.
Eye Contact:
May cause irritation, redness and pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
No information found.

4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not expected to be a fire hazard.
Explosion:
No information found.
Fire Extinguishing Media:
Dry chemical, foam, water or carbon dioxide.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. When mixed with water, material foams profusely. Small amounts of residue may be flushed to sewer with plenty of water.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Moisture may cause material to cake. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
15 mg/m3 total dust, 5 mg/m3 respirable fraction for nuisance dusts.
- ACGIH Threshold Limit Value (TLV):
10 mg/m3 total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
White powder interspersed with cream colored flakes.
Odor:
No information found.
Solubility:
Moderate (1-10%)
Specific Gravity:
No information found.
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
No information found.
Melting Point:
No information found.
Vapor Density (Air=1):

No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
No information found.
Conditions to Avoid:
No information found.

---

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

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--------\Cancer Lists\------------------------------------------------------
                                            ---NTP Carcinogen---
Ingredient                                  Known    Anticipated     IARC Category
------------------------------------        -----    -----------     -------------
Alconox(R)                                   No          No              None
proprietary detergent mixture
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12. Ecological Information

Environmental Fate:
This product is biodegradable.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Alconox(R) proprietary detergent mixture	Yes	No	No	No

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	--Canada-- NDSL	Phil.
Alconox(R) proprietary detergent mixture	No	No	Yes	No

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	-SARA 302- TPQ	------SARA 313------ List	------SARA 313------ Chemical Catg.
Alconox(R) proprietary detergent mixture	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Alconox(R) proprietary detergent mixture	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: No information found.
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **0** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes.
Keep container closed.
Use with adequate ventilation.
Avoid breathing dust.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial

respiration. If breathing is difficult, give oxygen. In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16.

Disclaimer:

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

GEOPHYSICAL SURVEYS AND SEDIMENT CORING

SITE SAFETY AND HEALTH PLAN

Environmental Dredging and Sediment
Decontamination Technology Demonstration
Pilot Study

Lower Passaic River Restoration Project

Prepared for

New Jersey Department of Transportation -OMR

Prepared by

Malcolm Pirnie, Inc.
104 Corporate Park Drive
White Plains, NY 10602

June 2004

GEOPHYSICAL SURVEY AND SEDIMENT CORING SITE SAFETY AND HEALTH PLAN

Dredging and Decontamination Pilot Study
Lower Passaic River Restoration Project

List of Tables

List of Attachments

1.0 INTRODUCTION

1.1 SCOPE

This Site Specific Safety and Health Plan (SSHP) has been developed to address overall health and safety requirements for Malcolm Pirnie conducting investigations in conjunction with a pilot-scale dredging and sediment decontamination technology demonstration. This SSHP has been prepared in accordance with the Occupational Safety and Health Administration's (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard 29 CFR 1910.120. The activities covered under this SSHP are:

- Sediment Coring
- Geophysical Surveys (Hydrographic and side scan sonar)

This SSHP describes in detail the requirements and procedures for Malcolm Pirnie employee protection for the various investigation activities to be conducted at this site. TAMS, an EarthTech Company (TAMS), is the prime consultant for the task, and has developed a separate SSHP included in the work plan. The subcontractor, Aqua Surveys, Inc. (ASI), is required to develop a SSHP addendum that will contain a hazard evaluation and methods to control hazards that may be encountered in their tasks. All addenda prepared by ASI will be appended to this SSHP and will be consistent with the provisions and restrictions outlined herein. This SSHP and all appended subcontractor safety documents will be submitted to the NJDOT-OMR prior to commencement of any field activities.

Included in this SSHP are safety and emergency response procedures for preventing accidents and protecting personnel from occupational injuries and illnesses during the site activities. Also included in this SSHP are the assignments of responsibilities, minimum personal protective equipment requirements, standard operating procedures for safety, accident investigation and reporting requirements, and emergency response procedures. The content of this document is based upon historical information and the assessment of the potential physical and chemical hazards associated with the site. A copy of this SSHP will be available on site during site investigations. Compliance with this SSHP is required of all project personnel and visitors.

1.2 REGULATORY REQUIREMENTS AND GUIDELINES

The procedures outlined in this SSHP comply with the OSHA requirements contained in 29 CFR 1910 including the final rule contained in 29 CFR 1910.120. The procedures are also consistent with the guidance contained in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, which has been prepared jointly by the United States Environmental Protection Agency (USEPA), Occupational Safety and Health Administration (OSHA), National Institute for Occupational Safety and Health (NIOSH), and the United States Coast Guard (USCG), the United States Army

Corps of Engineers' (USACE) Safety and Health Requirements Manual EM385-1-1, and the USEPA's Standard Operating Safety Guidelines.

2.0 SITE BACKGROUND AND SETTING

The Harrison Reach of the Passaic River is the general Study Area for the pilot-scale dredging program being developed pursuant to OMR Task 1. Sediments within the Harrison Reach are among the most severely contaminated and several of the principal sources of contaminants to the river also are/were situated here. This reach has become a particular focal point for the pilot program since it provides an opportunity to handle and process the widest range of contaminated sediments and, therefore, the results obtained from the pilot program can be expected to have the broadest applicability to ultimate remediation of the river system.

2.1 SITE LOCATION

The Harrison Reach extends approximately 2 miles from the NJ Turnpike Bridge to the Jackson Street Bridge that connects Harrison with Newark. The Study Area is bordered to the north by the City of Harrison in Hudson County and to the south by the City of Newark in Essex County. The Passaic River is aligned in a nearly true east-west direction in the central portion of the Harrison reach. Upstream and downstream of this central area the River exhibits a series of bends. To simplify evaluation and monitoring of dredging operations, the proposed demonstration project would preferably occur in the portion of the Harrison Reach that is aligned east-west.

The USACE had historically designated a 300-foot wide navigation channel within the Harrison Reach with a Project Depth of 20 feet MLW. Based on a hydrographic survey conducted by USACE in 1989, water depths in the Reach ranged from 21.1 feet at mean low water (MLW) at the downstream end of the Reach to approximately 19.2 feet (MLW) at the upstream end. However, a more recent USACE channel condition report (2002) noted significant shoaling. According to the Work Plan for the RI/FS submitted to the USEPA in 1995, the only dredging event in the Harrison Reach within the period of interest (1940 to present) was performed in 1949 to the Project Depth of 20 feet.

2.2 NATURE OF CONTAMINATION

During the 1980s and early 1990s, several investigations were conducted to evaluate the concentrations of various potential contaminants in sediments within the Study Area boundaries. These studies include investigations conducted as part of the remedial investigation work at the Diamond Alkali Superfund Site, investigations conducted on behalf of OCC in the early 1990s, and investigations conducted by various governmental agencies, including the National Oceanic and Atmospheric Administration (NOAA), US Fish and Wildlife Service (USFWS), and EPA. These investigations indicated that sediments of the Passaic River Study Area contain elevated concentrations of numerous hazardous substances including, but not limited to, cadmium, copper, lead, mercury, nickel, zinc, bis (2-ethylhexyl) phthalate, polynucleararomatic hydrocarbons, polychlorinated biphenyls (PCBs), 4,4'-dichlorodiphenyltrichloroethane (4,4'- DDT), diesel range organics (Total Extractable Petroleum Hydrocarbons), polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans, and chlorinated herbicides and phenols.

2.3 SITE ACCESS

In order to access the Harrison Reach from the Newark Bay, there are a series of low and high bridges beneath which demonstration project equipment must navigate, starting from the Garden State Parkway Bridge across the Raritan River to the New Jersey Turnpike Bridge within the Harrison reach. Given that towboats hauling barges laden with project sediments will generally require 25 feet of air draft, a number of the low bridges will be required to open to enable project equipment to pass.

It is anticipated that a staging area will be established at a Fire Training Facility located on the east bank for the Harrison Reach. The address of the facility is 34 Jersey St., Newark, NJ, 07105.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

3.1 ORGANIZATION AND RESPONSIBILITIES OF SAFETY PERSONNEL

Project Officer

The Project Officer, Ken Goldstein, has the final responsibility for the quality of the work performed under the contract and will be the primary point of contact with the NJDOT-OMR senior management.

Project Manager (PM)

The PM, Scott Thompson, is primarily responsible for the development and implementation of the investigation and for the health and safety of all Malcolm Pirnie personnel assigned to the field investigation.

Deputy Project Manager

This individual reports directly to and works with the Project Manager. The Deputy Project Manager, Daria Navon, is responsible for assisting the PM, as needed, on all health and safety issues.

Corporate Health and Safety Manager (HSM)

The Corporate HSM, Mark McGowan, CIH, CSP, is responsible for the development and implementation of Malcolm Pirnie's health and safety program. The HSM functions as a liaison with the USACE, OSHA, and other agencies on health and safety issues. The HSM will have the final say on any changes to this SSHP.

Site Safety Officer (SSO)

The SSO is knowledgeable in safety and worker protection techniques as they relate to the project. Primary responsibilities of this individual include daily inspections of all work locations to ensure compliance with this SSHP, correcting deficiencies noticed in the field and implementing procedures to prevent the same deficiency from reoccurring, conducting routine hazard analyses of the tasks being performed to ensure current practice is adequate, conducting hazard analyses on all new or modified tasks, and assisting the PM with problems relating to worksite safety.

The SSO will report directly to the HSM and brief him on unsafe work practices as they are observed. This individual will oversee all exposure monitoring conducted throughout this project and has the authority to stop work or upgrade PPE requirements based on this data.

This individual is responsible for the development and set-up of emergency procedures and personal decontamination procedures. Resolution of all on-site health and safety problems will be coordinated through the PM with the assistance from the HSM.

The SSO will be present on site at all times and will conduct all pertinent health and safety training for employees working on the site, including the site orientation training, morning safety meetings, and training on controls put in place to address unsafe work practices noticed in the field.

The SSO is responsible for maintaining all training, medical surveillance, and any other health and safety related documentation generated during the course of this project.

The SSO is responsible for ordering, maintaining, and issuing all PPE used on the site.

Malcolm Pirnie Field Personnel

All field personnel are required to become very familiar with the requirements set forth in this SSHP, follow the health and safety procedures and guidelines outlined in this SSHP, and use all PPE properly to protect themselves and their co-workers. Field personnel will contribute any suggestions and assist in discovering or correcting unsafe work conditions.

Malcolm Pirnie field personnel may include Solomon Gbondo-Tugbawa, Andrew Schell, Daria Navon, and Liam Bossi. Training dates for these individuals can be found in Appendix C.

Subcontractors

The subcontractor, ASI, will designate one or more safety and health coordinators, one of whom will be assigned to the site during any site activities involving that subcontractor. This individual will develop a SSHP Addendum addressing the hazards associated with the subcontractor's project tasks and act as a liaison between the Malcolm Pirnie SSO and subcontractor.

Subcontractor Personnel

Subcontractors whose work will be performed on-site, or who otherwise could be exposed to health and safety hazards, will be advised of known hazards through distribution of site information obtained by Malcolm Pirnie and this SSHP. They will be solely responsible for the health and safety of their employees and will comply with all applicable health, safety, and environmental regulations. All subcontractors are responsible for the following:

- Providing their own PPE.

- Training their employees in accordance with applicable State, Federal and local laws and regulations.

- Providing medical surveillance and obtaining medical approvals for their employees.

- Ensuring their employees are advised of and meet the minimum requirements of their SSHP and any other additional measures required by their site activities.

Subcontractors will ensure that their personnel are familiar with the proper use of protective equipment in order to protect themselves and those around them from injury and to prevent damage to materials, equipment, and facilities. Subcontractor personnel will contribute any suggestions and assist in discovering or correcting unsafe work conditions. Malcolm Pirnie will document their subcontractor's compliance with the requirements of this SSHP, and inspect their PPE to ensure it is fit for duty.

4.0 SAFETY AND HEALTH RISK ANALYSIS

4.1 PROJECT TASKS

Listed below are the proposed tasks that TAMS, Malcolm Pirnie (MPI), and ASI will be involved with and a description of the work they will be performing. This information is used as the basis for the task hazard analysis defined in Section 4.2.

4.1.1 Geophysical Survey

- MPI and TAMS personnel accompany ASI on a small vessel to oversight collection of geophysical data (i.e. river-bottom hydrographic survey and side scan sonar) and collect field notes.

- MPI and TAMS personnel accompany ASI on a small vessel to collect sediment samples for physical properties analysis to "calibrate" the findings of the side scan sonar, etc. (MPI tasks: record field notes, accept custody of retrieved sediment sample, place in sample jar while aboard vessel and store in cooler with ice.)

- Additional sample management at field staging area.

4.1.2 Sediment Coring Programs

- MPI and TAMS personnel accompany ASI on a small vessel to oversee sediment core retrieval (MPI tasks: record field notes, accept custody of retrieved sediment core, label exterior of core tube and place in container with ice.)

- Personnel will transport cores via small vessels to off-loading points.

- MPI and TAMS personnel oversee off-loading of retrieved cores at the field staging area.

- MPI and TAMS personnel to process samples at processing center (field support facility).

  - Cut core tubes into subsamples, each approximately one foot long
  - Transfer sediment into bowls and homogenize by hand
  - Transfer homogenized sample into laboratory jars
  - Decontaminate non-dedicated sampling tools using solvents (if necessary)
  - Manage excess sample material, discarded core tubes, discarded PPE, and spent decontamination fluids

4.2 TASK HAZARD ANALYSIS

Table 4.1 evaluates the safety and health hazards known to be associated with the planned activities for Malcolm Pirnie personnel at the various locations on the Passaic River. Table 4.1 develops each task or step, describes the potential safety hazards associated with the task, and recommends various site controls, personal protective equipment, and operating procedures to control the hazards.

Field work for this task is scheduled to take place during January and February, 2004. Therefore, heat stress is not a concern.

4.3 GENERAL PHYSICAL/BIOLOGICAL HAZARDS

Anticipated physical/biological hazards include:

- Cold Stress (low ambient temperature)
- Noise
- Slips, Trips, and Falls
- Equipment Operation
- Storms
- Falling Objects
- Biological Hazards
- Drowning/Man Overboard

4.3.1 Cold Stress

Exposure monitoring for cold stress is described in Section 6.2.

4.3.2 Noise

Noise exposure monitoring is covered in Section 6.3.

4.3.3 Slips, Trips, and Falls

Ground irregularities due to topography or protruding materials may pose slip, trip, and fall hazards to employees who will be working from the banks of the Passaic River. Wet surfaces and limited room to move around on the vessels also pose this type of hazard to employees. Field personnel will be briefed by the SSO each morning during the morning safety meeting on the location and type of obvious hazards in the various work areas. Site workers are to take care in areas where ground irregularities and slick surfaces exist. Boat decks will be maintained in an orderly manner.

4.3.4 Equipment Operation

To prevent entrainment in moving machinery, all MPI employees will maintain a safe distance from heavy machinery. More importantly, MPI personnel will remain out of the swing radius of all such equipment on boats. It is mandatory that all subcontractors who will be operating boats to place a worker near the equipment to guide the operator and warn others of equipment hazards.

4.3.5 Storms

Thunderstorms may pose an electrocution hazard. During thunderstorms, all heavy equipment will be shut down, sampling activities will be terminated and all personnel on-site will take refuge in the building or on-shore. All employees on a boat are to head back to the marina immediately in the threat of a thunderstorm. Each boat will be equipped with a lightning proximity indicator.

4.3.6 Falling Objects

If there is a danger of falling objects at any location, the entire area inside the exclusion zone will be deemed a hardhat area.

4.4 CHEMICAL HAZARDS

A variety of industrial sources are believed to have contributed to contamination of the sediment in the Passaic River. Sampling results indicate that there are chemicals present at various depths and locations within the Site.

The chemicals of concern (COCs) with respect to personnel safety at the Site include polychlorinated dibenzodioxins, polychlorinated dibenzofurans (PCDDs/PCDFs), polychlorinated biphenyls (PCBs), aromatic hydrocarbons, phenols, pesticides, chlorinated organic compounds, polynuclear aromatic hydrocarbons (PAHs), phthalates, and metals. Some of the COCs are known or suspected human carcinogens. Two tables from the 1995 Remedial Investigation Work Plan have been included in Appendix A. Table 4-1 presents the maximum concentrations of COCs based on review of historical analytical data. Table 6-1 lists the PEL-TWA (Permissible Exposure Limit - Time Weighted Average) and the TLV-TWA (Threshold Limit Value -Time Weighted Average) for most of the compounds listed in Table 4-1. These limits are defined as the concentration of a chemical in air to which nearly all workers can be repeatedly exposed, day after day, for a normal 8-hour workday and a 40-hour workweek, without adverse effect. Exposure limits have not been established for all the compounds listed in Table 6-1. If presented, the exposure limits were obtained from the 1994 "Guide to Occupational Exposure Values" compiled by the American Conference of Governmental Industrial Hygienists (ACGIH). Acute or chronic symptoms of exposure to the COCs are not included in Table 6-1 due to the number of COCs listed. However, common symptoms of exposure to COCs are eye, nose and throat irritation, headache, nausea, dizziness, blurred vision, cramps, and skin rashes. Whenever any of these symptoms are experienced, field work should stop immediately and affected personnel should seek medical attention. Work will begin only after the SSO evaluates the situation and gives approval for commencing work. Common routes of entry are inhalation, ingestion and dermal contact.

Exposure Routes

The primary exposure pathways of concern for these constituents are inhalation and skin absorption.

Inhalation of Contaminated Dust

PCDDs/PCDFs, pesticides, hexachlorobenzene, metals, and PCBs are solids at normal outside temperatures and become airborne in the breathing zone only as a result of dust-generating activities. Dust suppression techniques (i.e., water misting, ventilation, mopping sediments off the boat) shall be used to reduce airborne exposures.

Inhalation of Volatile Contaminants

Aromatic hydrocarbons, phenols, and chlorinated organic compounds, may volatilize from the sampling media. There is a possibility that personnel may be exposed to volatile organic contaminants (VOCs) during activities which require contact with the river sediments. Volatilization is expected to increase with increasing ambient temperatures. Disturbance of the sediments such as will be required during sample processing will also result in increased air concentrations.

Ingestion

Personnel may be exposed to accidental ingestion of contaminants by hand to mouth contact after contact with contaminated materials. Ingestion of constituents of concern will be controlled by specific work practices and decontamination procedures.

Skin and Eye Contact

Skin and eye contact with some of the constituents at the site may cause skin or mucous membrane irritation. Many of those constituents can be absorbed into the bloodstream through the skin or eyes.

5.0 HEALTH & SAFETY TRAINING

5.1 GENERAL REQUIREMENTS

Malcolm Pirnie personnel involved with the investigation and sampling tasks are required to have completed the 40-hour hazardous materials health and safety training specified in 29 CFR 1910.120(e)(3)(i). This training, designed to orient personnel potentially exposed to hazardous substances, health hazards, or safety hazards includes the following:

- Safety and health risk analysis
- Use of Personal Protective Equipment
- Work practices by which an employee can minimize risk
- Safe use of engineering controls and equipment
- Medical Surveillance requirements
- How to recognize hazards and signs that indicate overexposure
- Procedures for environmental monitoring, site control, and decontamination
- Emergency Response Plans

All personnel will have proof of 24-hours of supervised fieldwork at the level of protection proposed for the tasks assigned them. All personnel will have proof of attendance at an annual 8-hour health and safety refresher course if their 40-hour course was completed more than a year prior to the start of field activities. In addition, a minimum of one field person with current CPR/First Aid Training will be present on-site during all field activities.

5.2 SPECIALIZED TRAINING

Malcolm Pirnie, subcontractor, and other field personnel are to be knowledgeable in the particular hazards that may be encountered during this project and be familiar with safe operating procedures (See Section 10). This will be accomplished through regular safety meetings during the program as discussed below.

All field personnel must have a minimum of three days of actual field experience under a skilled supervisor and be familiar with emergency response procedures outlined in Section 12 of this HASP. The SSO and all supervisory personnel will have additional training, including CPR/First Aid and the 8-hour Supervisor Course for hazardous materials. All subcontractors will be responsible for ensuring their employees have received specialized training for their specific job functions and responsibilities.

5.2.1 Captain's Qualifications

Each captain must have proof of attendance at a Safe Boating Course offered by either the USPS or the U.S. Coast Guard and be certified in CPR and First Aid.

5.2.2 Morning Safety Meetings

The SSO will conduct a morning health and safety briefing. Issues uncovered and lessons learned from the previous day's activities or the interpretation of newly available environmental monitoring data are examples of topics that might be covered during these briefings. An outline report of meetings giving the date, time, attendees, subjects discussed, and instructor will be maintained. All visitors, including NJDOT-OMR and consultant personnel conducting a routine visit, will be properly oriented to existing site conditions, planned activities, levels of protection, and other procedures outlined in this SSHP.

5.3 HAZARD COMMUNICATION

Malcolm Pirnie has a written hazard communication program that was established to meet the requirements of 29 CFR 1910.1200, and field activities shall be implemented in accordance with that program, as described below. All employees will be trained in accordance with subsection (h) of the above referenced standard.

The multi-employer section of the standard, 29 CFR 1910.1200(e)(2), requires Malcolm Pirnie to make our subcontractors aware of the hazardous substances we store and use on-site and requires subcontractors to inform Malcolm Pirnie personnel of the hazardous substances they store or use on site.

Material Safety Data Sheets (MSDSs) for hazardous chemicals introduced to the Site by Malcolm Pirnie and others will be kept in a labeled binder on-site as these materials arrive, for reference and review by all on-Site personnel.

Labels on containers used by Malcolm Pirnie are as originally received (not to be defaced) and are to contain the following information:

(1) The identity of the hazardous chemical(s);
(2) The appropriate hazard warnings; and
(3) The name and address of the chemical manufacturer.

If an employee transfers chemicals from a labeled container to a portable container, a label, which contains the three items listed above, must be affixed to it. If the portable container is intended only for that employee's immediate use (during the same work shift), only a contents label is required. The employee will be responsible to properly empty, clean or dispose of the portable container immediately after use.

As part of the Site-specific health and safety orientation at the initial Site meeting conducted by the SSO, a review of Malcolm Pirnie's Hazard Communication Program will be offered to inform employees and subcontractor employees of hazardous chemicals to which they may be exposed during field activities. If the chemical hazard changes or a new chemical hazard is introduced into the area after work begins, additional training will be provided during the next morning meeting by the SSO.

Site-specific hazard communication training for hazardous chemicals introduced to the Site by Malcolm Pirnie will include:

- Properties and hazard (chemical, physical, toxicological) of hazardous chemicals;

- Health hazards, including signs and symptoms of exposure and any medical condition known to be aggravated by exposure;

- Measures employees can take to protect themselves, including appropriate work practices or methods for proper use and handling, procedures for emergency response, and the proper use and maintenance of personal protective equipment, as required.

- Work procedures for employees to follow to protect themselves when cleaning hazardous chemical spills and leaks.

- Use of the container labeling system and the MSDSs, including MSDSs location, information on the interpretation of both labels and MSDSs, and information on how employees can obtain additional hazard communication information.

The SSO will document any Site training, including the agenda and list of attendees.

This subsection of the SSHP and the hazard communication training conducted as described above will be the mechanism for informing other employers planning to be on-site of hazardous chemicals introduced to the site by Malcolm Pirnie.

5.4 MARINE SAFETY

Malcolm Pirnie will provide marine safety awareness training for all employees who will be performing tasks in or around the Passaic River. The SSO will conduct an initial awareness training course that will be followed up by the subcontractor responsible for the safety of Malcolm Pirnie employees while conducting tasks from a boat. This training will include the following:

- General Safety Precautions (standing, overhanging vegetation, etc.)
- Man Overboard
- Rescue
- Drowning
- Inclement Weather
- Use of Equipment (radio, vessel controls)
- Use of Personal Flotation Devices (PFDs)
- Anchoring
- Other precautions the captain deems necessary for the type of work being performed.

5.5 CHEMICAL AND WASTE MANAGEMENT

All personnel will be trained in the proper handling and disposal of all chemicals and waste generated during this project.

5.6 PERSONAL PROTECTIVE EQUIPMENT

All employees required to wear PPE will be trained in accordance with 29 CFR 1910.132(f).

6.0 MEDICAL SURVEILLANCE AND EXPOSURE MONITORING

6.1 MEDICAL SURVEILLANCE

Malcolm Pirnie and subcontractor personnel who may have potential exposure to hazardous materials will have an initial medical examination conducted by or under the direction of a physician Board Certified in Occupational Medicine. Employees in the medical surveillance program will undergo an annual medical review and an annual or bi-annual physical as determined by the occupational physician. Employees leaving the program will submit to a termination examination. Medical evaluations will be performed by an approved occupational physician in accordance with Malcolm Pirnie's Medical Monitoring Program. All Malcolm Pirnie and subcontractor field personnel shall be enrolled in their employer's Medical Monitoring Program, be medically approved to wear respirators, and fit-tested in accordance with OSHA requirements.

Supplemental examinations may be performed whenever there is an actual or suspected excessive exposure to chemical contaminants or upon experience of exposure symptoms, or following injuries or temperature stress. It is proposed that work will be carrying on during January and February; therefore, cold stress is an issue of concern.

The following medical or exposure conditions will be monitored during this project:

- Cold Stress
- Noise
- Chemical Exposure

6.2 COLD STRESS MONITORING

Frostbite is a local cold injury, which rarely occurs unless environmental temperatures are less than freezing and usually less than 20°F (-6.7°C). Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body or result in profound generalized cooling, causing death. Areas of the body that have a high surface-area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10°F with a wind of 15 mph is equivalent in chilling effect to still air at -18°F.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of five mph increases to ten mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is soaked with perspiration.

The body's responses to cold exposure include the following:

1. **Frost nip or incipient frostbite**.

   Sudden blanching or whitening of the skin characterizes the condition, which in mild cases is slightly burning or painful.

2. **Superficial frostbite**.

   Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.

3. **Deep frostbite**. Tissues are cold, pale, and solid; extremely serious injury.

Hypothermia is defined as a decrease in a person's body core temperature to 95°F (35°C). A freezing or rapidly dropping temperature is not needed to produce hypothermia. A person's ability to maintain normal body temperature may be affected by medications or drugs, alcohol, wind or becoming wet.

Although protective clothing provides protection from many sources of external wetting, perspiration is often increased while working, causing the skin and clothing to become moist or wet. Wet clothes and skin can conduct body heat at a rapid rate. In addition, the effects of wind and water create a condition for extreme loss of body heat.

In addition, dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

(1) Shivering,
(2) Apathy, listlessness, sleepiness and (sometimes) rapid cooling of the body to less than 95°F,
(3) Unconsciousness, glassy stare, slow pulse and slow respiratory rate,
(4) Freezing of the extremities, and finally,
(5) Death.

The SSO will be vigilant in order to identify hypothermia in its earliest stage, thus preventing a potential hazard to the worker. The single most important sign of hypothermia is a change in behavior; often subtle and best recognized by a co-worker or the SSO. Physical and behavioral symptoms of hypothermia include:

- Pain in the extremities (may be the first, early warning of danger from cold stress).
- Decrease in usual efficiency.

- Forgetfulness and a decreased level of communication.
- Decline in manual dexterity.
- Poor motor skills or repetitive behavior.
- Poor judgment.
- Lack of concern for physical needs.
- Cold, pale skin appearance, shivering and "goose flesh."
- Maximum severe shivering develops when the body temperature has fallen to 95°F. This must be taken as a sign of danger to workers and exposure to cold should be immediately terminated.

The following actions will be taken to reduce the potential for workers to develop cold stress injuries, such as frostbite and hypothermia, in cold environments:

- Shield the work area from the wind or wear a windbreaker to reduce wind chill effect (a water-repellant outer garment with good ventilation should be worn).

- Take special precautions for older workers or workers with circulatory problems such as the use of extra insulating clothing and/or a reduction in the duration of exposure period.

- Exposed skin should not be permitted when the wind chill factor results in a relative temperature of -25°F or below - cover exposed flesh with loose, dry clothing.

- Field personnel will frequently (e.g., every 15 minutes) inspect each other for signs of frostbite under very cold-weather conditions.

- Wet clothes should be replaced at temperatures below 36°F - efforts should be made to maintain dry clothing.

- Warm, sweet drinks and soups will be provided for caloric intake and fluid.

- Avoid skin contact with bare metal, gasoline or other hydrocarbons.

- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is made available or until weather conditions improve.

Mild cases of **frostbite** (the affected area is still painful) may be treated in the field by re-warming. More serious cases of frostbite should be treated at a medical facility since attempting to thaw the frozen area can cause severe damage. A victim of serious frostbite will be protected from the environment and further heat loss prevented, but the skin should not be rubbed or thawed with warm water or dry heat.

Mild hypothermia is treated by re-warming the affected person by:

- Moving to a protected area.
- Removing wet or damp clothing.
- Providing hot fluids.
- Wrapping in dry blankets.

More **severe cases of hypothermia** require prompt intervention by medical personnel in addition to the above activities. Refer to Appendix A for a directions to St. James Hospital.

In addition, if the core processing area is located outdoors, a tent and generator-driven heater will be provided to prevent cold stress.

Activities carried out on boats when the water temperature is below 50°F will require the use of United States Coast Guard (USCG) Anti-Exposure Survival work suits to prevent cold stress in the event of a man overboard.

6.3 NOISE EXPOSURE MONITORING

As part of the required baseline annual or bi-annual medical evaluation all employees undergo an audiometric evaluation. The annual or bi-annual audiogram is compared to the baseline to determine if the employee has had a Standard Threshold Shift (STS). While working on various tasks during this project, employees may be exposed to noise levels in excess of the OSHA Permissible Exposure Limit (PEL) of 90 decibels on the A-weighted scale (dBA) for a short period of time. As part of the hazard evaluation, noise levels will be evaluated during the early stages of this project to identify activities that subject employees to elevated noise levels. If possible, to control these elevated noise levels, engineering or administrative controls will be implemented. If these controls are not possible, hearing protection with an adequate noise reduction rating (NRR) will be issued to these employees.

6.4 CHEMICAL EXPOSURE MONITORING

A PID will be used to monitor for elevated levels of volatile organic compounds (see Section 8.0). Given the short duration of this task, formal medical baseline testing will not be required. However, common symptoms of exposure to COCs are eye, nose and throat irritation, headache, nausea, dizziness, blurred vision, cramps, and skin rashes. Whenever any of these symptoms are experienced, field work should stop immediately and affected personnel should seek medical attention. Work will begin only after the SSO evaluates the situation and gives approval for commencing work.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 GENERAL PROTECTION LEVELS

Personnel must wear protective equipment (PPE) when work activities are expected to involve known or suspected atmospheric or surface contamination; when vapors, gases, or particulates may be generated by the work; or when direct contact with dermally active substances may occur. Respirators can protect the lungs, the gastro-intestinal tract and the eyes against air toxicants. Chemical-resistant clothing can protect the skin from contact with corrosive/irritants and skin absorbable chemicals. Good personal hygiene limits or prevents the ingestion of materials.

Appropriate PPE will be worn to protect workers against physical hazards such as sharp objects, overhead hazards, hazards to eyes and feet, and drowning.

7.2 PPE REQUIREMENTS FOR EACH TASK

This section outlines the PPE requirements for all employees working on this project by the various anticipated tasks. All contractors are required to provide appropriate PPE to their employees and ensure that it meets the requirements of this section.

7.2.1 Sediment Coring Program

<u>Core Retrieval Oversight and Offloading of Cores</u>

- Coveralls or suitable work uniform, insulated coveralls or similar during cold months.
- Safety glasses/sunglasses
- Hardhat
- Nitrile or Latex gloves (if contact with sample is required)
- Hearing protection
- Deck Shoes while on boat
- Personal Flotation Device (to be worn at all times while on a boat)
- United States Coast Guard (USCG) Anti-Exposure Survival work suits. (To be worn on a boat when water temperature is below 50°F.)

<u>Core Sample Management</u>

- Disposable coveralls (Saranex or Tyvek)
- Chemical resistant outer gloves (Nitrile)
- Chemical resistant inner gloves (Latex)
- Leather boots
- Chemical safety goggles
- Half face or full-face respirator with organic vapor and HEPA cartridges (if determined necessary from the PID monitoring).

7.2.2 Geophysical Survey

Data Collection from Vessel

- Coveralls or suitable work uniform, insulated coveralls or similar during cold months.
- Safety glasses/sunglasses
- Hardhat
- Nitrile or Latex gloves (if contact with sample is required)
- Hearing protection
- Deck Shoes while on boat
- Personal Flotation Device (to be worn at all times while on a boat)
- United States Coast Guard (USCG) Anti-Exposure Survival work suits. (To be worn on a boat when water temperature is below 50°F.)

Sample Collection

- Disposable coveralls (Saranex or Tyvek)
- Chemical resistant outer gloves (Nitrile)
- Chemical resistant inner gloves (Latex)
- Deck shoes while on boat
- Chemical safety goggles
- United States Coast Guard (USCG) Anti-Exposure Survival work suits. (To be worn on a boat when water temperature is below 50°F.)

Sample Management and Decontamination

- Disposable coveralls (Saranex or Tyvek)
- Chemical resistant outer gloves (Nitrile)
- Chemical resistant inner gloves (Latex)
- Deck shoes while on boat or leather bootsdepending on location
- Chemical safety goggles
- United States Coast Guard (USCG) Anti-Exposure Survival work suits. (To be worn on a boat when water temperature is below 50°F.)

7.3 INSPECTION OF PPE

Personal Protective Equipment will be inspected regularly and maintained in serviceable and sanitary condition. The equipment will be cleaned, disinfected, inspected after each use, and repaired as necessary before being reissued to another person or returned to storage.

7.4 GUIDELINES FOR PPE SELECTION

It is the responsibility of the SSO to evaluate all tasks that are performed on this project and determine the appropriate PPE for these tasks. When there is a modification to any of the tasks, a hazard assessment is to be performed. If a task is added during the course of this project, the SSO is to be involved during planning to develop a list of appropriate PPE to be used at the onset, conduct a hazard assessment of the task to verify the selected PPE is adequate, and make any changes as he/she sees fit. In determining the appropriate PPE for each task, the following guidelines will be followed.

7.4.1 Survey

Due to the short duration of this task, the SSO will conduct a survey each morning to ensure that the PPE guidelines set forth in Section 7.2 are followed. In addition, this survey will identify sources of hazards to all workers. The basic hazard categories that will be looked at during this survey include impact, penetration, compression, chemical, heat, and light.

7.4.2 Source Identification

During the survey the SSO will identify sources of potential hazards that potentially pose a threat of injuries to employees. These sources include falling objects, chemical exposure, pinching objects, rotating parts, etc.

7.4.3 Organize and Analyze Data

Following the survey, the SSO will organize and analyze the data collected during the survey. Potential hazards noticed will be reviewed and determination will be made as to the type, associated risk, and seriousness of potential injury from each of the potential hazards. If applicable, the combination of several hazards together should be considered.

7.4.4 Selection

In selecting the appropriate PPE the SSO will compare potential hazards and the type of PPE that is available and what it can do, and if it is appropriate for that specific task. Most important is the fit of the selected PPE. PPE that does not properly fit the worker can create another hazard. Employees will provide feedback on whether PPE fits comfortably to the SSO.

Once the PPE is selected, the SSO is required to make each employee aware of the limitations of the PPE through effective training.

7.4.5 Reassessment

Periodically, the SSO will conduct another survey of all work tasks and evaluate whether the original PPE is adequate. If the PPE is not adequate for the tasks being performed, the SSO will re-evaluate that task by performing the above steps.

8.0 EXPOSURE MONITORING

8.1 GENERAL

Emergency Response actions and PPE selection will be based, in part, on air monitoring results. The following monitoring instruments will be used, as needed, during all tasks being conducted at the various site locations along the Passaic River to make quantitative determinations of exposure to various chemical and physical hazards potentially present at the site:

- MiniRAE Photoionization Detector (PID)

Prior to the start of any work at this site, an initial monitoring survey will be conducted to establish background conditions. During site activities, necessary equipment will be set to monitor continuously in the work area.

Contaminant concentrations detected, instrument type and calibration data will be documented in a field logbook or similar and maintained at the field office. All instruments used on this project will be calibrated before and after each day's use by the SSO or other field personnel and periodic calibration checks will be made and documented in the field logbook.

All instrumentation will be maintained in accordance with the manufacturer's specifications. All monitoring instruments will be protected from surface contamination during use to minimize the need for decontamination.

8.2 MINIRAE PHOTOIONIZATION DETECTOR

A MiniRAE PID with a 10.2 eV lamp will be used to monitor the breathing zone of the employees processing core samples in the processing center (field support facility). Testing will be conducted each time a new core tube is opened. An action level of 1 ppm above background levels sustained for at least ten minutes will be used to determine what types of engineering controls will be put into place and if Level C PPE should be implemented.

9.0 SITE CONTROL MEASURES

9.1 GENERAL

A daily log containing the names of personnel, site entry and exit times, job function, and PPE will be maintained throughout this project.

9.2 WORK ZONES

To control the potential spread of contamination at the Site, and to keep visitors from entering potentially hazardous areas, the three (3) work zone approach, outlined below, will be utilized:

Exclusion Zone(s) - Hazardous Work Zone

<u>Sample Processing Center</u>

In this area, a ten-foot radius around the employees processing the sediment core samples will be identified as the exclusion zone. No eating, drinking or smoking will be allowed in this zone. No personnel will be allowed in the exclusive zone without:

- Proper PPE
- Medical Clearance
- Training Certification.

The level of personal protective equipment required in the Exclusion Zone shall be in accordance with the specified requirements in Section 7.0 as a minimum or as determined by the SSO.

Contamination Reduction (Buffer) Station

The Contamination Reduction Zone or station will be used for the general entry and exit station to and from the Exclusion Zone. This area will be the area designated for the decontamination of personnel and clothing prior to entering the Support Zone, and for the physical segregation of the Support and Exclusion Zones.

The level of personal protective equipment required in this area shall be in accordance with the specified requirements as a minimum or as determined by the SSO after monitoring the Site. Eating, drinking or smoking is strictly prohibited in this area. The contamination reduction station will also contain appropriate safety and emergency equipment, such as a first aid kit.

Support (Safe or Clean) Zone(s)

This Zone will be established on the Site and is defined as the area outside the zone of significant contamination. The Support Zone shall be protected from work Site contamination. Eating and drinking will be allowed only in this Zone. The function of the Support Zone is to provide:

- An entry area for personnel, material and equipment to the Exclusion Zone.
- An exit area for decontaminated personnel, materials and equipment from the Contamination Reduction Zone.
- An area for location of Support Area facilities; and
- A storage area for clean safety and work equipment.

Access of non-essential personnel to the Exclusion and Contamination Reduction Zones will be controlled. Only personnel who are essential to the completion of the task and wearing the prescribed level of protection will be allowed access to these areas. Entrance of non-contractor or subcontractor personnel must be approved by the SSO based on that person's documentation of training described in Section 5.0.

10.0 STANDARD OPERATING PROCEDURES FOR SAFETY

10.1 GENERAL REQUIREMENTS

The understanding of basic, precautionary concepts regarding personal health and safety is essential for workers assigned to sites where chemical contamination is known or suspected to be present. The following measures are designed to augment the specific health and safety guidelines provided in this SSHP.

- Avoidance of contamination is of the utmost importance. Whenever possible, contact with contaminated or potentially contaminated surfaces or materials will be avoided to minimize the potential for transfer to personnel. Walk around, not through, puddles and discolored surfaces. Do not kneel on the ground or set equipment on the ground.

- The number of personnel and equipment on the site shall be minimized, consistent with effective site operations.

- Site activities are to be performed in a manner designed to minimize dust production and splashing of contaminated sediment and surface water.

- Eating, drinking, chewing gum or tobacco, smoking or any practice which increases the probability of hand-to-mouth transfer of contaminated material is strictly prohibited where field investigative activities are taking place.

- Any required respiratory protective equipment and clothing must be worn by all personnel entering those designated areas of the site. Any facial hair that interferes with the respirator seal is prohibited.

- Medicine and alcohol can potentiate the effects of exposure to toxic chemicals. Due to possible contraindications, Malcolm Pirnie's Occupational Physician should review use of prescribed drugs by Malcolm Pirnie field personnel. Alcoholic beverages and illegal drug intake are strictly forbidden during site work activities.

- On-site personnel shall use the "buddy" system. No one will work alone; i.e., out of earshot or visual contact with other workers.

- All employees have the obligation to correct or report unsafe work conditions.

- Use of contact lenses on-site is not recommended. Spectacle kits for insertion into full-face respirators will be provided for Malcolm Pirnie employees, as required.

- All personnel shall be familiar with standard operating safety procedures and additional instructions contained in this HASP

- All Personnel working on water must wear U.S. Coast Guard approved personal flotation devices.

- When the water temperature is below 50°F, all personnel working on boats must wear United States Coast Guard (USCG) Anti-Exposure Survival work suits.

10.2 RIVER SAFETY

All personnel operating a vessel or performing any fieldwork from shore or from a vessel will follow the following SOPs:

- Follow all applicable USCG and New York State Navigational rules

- All work conducted from a bridge, boat, or shore will be done during daylight hours only.

- Work on the river during adverse weather will be suspended when conditions pose an immediate or significant health risk to employees.

- While on a boat or working from bridges all personnel will wear a USCG approved PFD.

- At least one Type IV throwable flotation device with a minimum of 90 feet of rope will be on board each vessel.

- For all boats greater than 18 feet in length, at least 3 handheld type flares and a 1 square foot fluorescent orange flag will be kept on board.

- If a boat with an outboard engine is used, a USCG Class B-1 fire extinguisher will be kept on board in an immediately accessible area.

- If gasoline is carried on board it will be kept in an Underwriters Laboratory (UL) approved container. Sufficient absorbent will be kept on the boat at all times while gasoline is stored to clean up any spills.

- When the water temperature is below 50°F, all personnel working on boats must wear United States Coast Guard (USCG) Anti-Exposure Survival work suits.

11.0 DECONTAMINATION

11.1 PERSONNEL DECONTAMINATION

The degree of decontamination required is a function of both a particular activity and the physical environment within which it takes place. Decontamination procedures are described below. The SSO will monitor these procedures. Further, all on-site activities will be carried out in such a manner as to avoid excessive contamination of personnel, protective equipment, tools, and machinery.

Decontamination will take place in the area designated as the contamination reduction zone (CRZ). Personnel egress to and from these zones will be limited. This will minimize the potential spread of contaminated materials to clean areas. Under no circumstances is a potentially contaminated person to exit the site by means other than through the CRZ. Upon leaving the site for lunch break or at the end of each work shift, personnel will be required to remove all contaminated clothing or equipment. Upon completion of tasks that require the use of safety equipment, at each time of break, or at the end of each work shift, the work crew will proceed toward the designated decontamination area.

11.2 FIELD EQUIPMENT

All potentially contaminated equipment will remain in the Exclusion Zone until the end of the activity. In order to contain/control contamination in the Contaminant Reduction Zone, a large plastic sheet will be placed on the ground and disposable towels will be used to contain spilled and splashed water. A bristle brush and a soap and water solution (Alconox) will be used to remove gross sediment contamination from all equipment and decontaminated accordingly before being removed from the CRZ. A pump sprayer may be utilized for each rinse station.

Boot covers or boots, aprons and outer gloves, prior to their removal from the CRZ, will be washed in large tubs with a soap and water solution and rinsed with fresh water. When a Tyvek or other disposable type of PPE is required, it will be removed in such a way as not to contaminate the CRZ and placed in a trash bag and, if necessary, labeled accordingly.

In the event that field decontamination of equipment is necessary, the following reagents may be used: Alconox; analyte free water; nitric acid, isopropyl alcohol, or acetone. Material Safety Data Sheets (MSDS's) for these chemicals can be found in Appendix E.

11.3 DECONTAMINATION FOR MEDICAL EMERGENCIES

In the event of a minor, non-life-threatening injury, personnel should follow the decontamination procedures as outlined above, and then administer first aid.

In the event of a major injury or other serious medical concern, immediate first-aid is to be administered in lieu of further decontamination efforts unless the environmental conditions would be considered “Immediately Dangerous to Life or Health,” in which case all personnel shall evacuate the site.

11.4 WASTE DISPOSAL PROCEDURES

All discarded materials, waste materials, or other objects will be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left on-site. All potentially contaminated materials will be bagged or containerized as necessary and segregated for proper disposal. All contaminated waste materials will be disposed of in a manner consistent with regulatory requirements. All non-contaminated materials will be collected and bagged for appropriate disposal as normal domestic waste.

12.0 EMERGENCY RESPONSE

12.1 EMERGENCY PLANNING

The SSO shall implement the emergency response plan whenever conditions at the Site warrant such action. The SSO will be responsible for assuring the evacuation, emergency treatment, emergency transport of Site personnel as necessary, and notification of emergency response units and the appropriate staff.

The SSO will inform the local fire department about the nature and duration of the work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants.

12.2 EMERGENCY EQUIPMENT

Emergency equipment will be readily accessible and distinctly marked. Malcolm Pirnie and/or subcontractor personnel shall be familiar with the location of, and trained in the use of, emergency equipment. Emergency equipment that will be available on-Site includes:

Fire Extinguishers

- Malcolm Pirnie and subcontractors will provide fire extinguishers.
- Class A, B dry chemical fire extinguishers shall be located on-site.
- Immediately after each use, fire extinguishers are to be either recharged or replaced.
- Fire extinguishers are to be suitably placed, distinctly marked, and readily accessible.

First Aid Kits

First Aid Kits shall conform to Red Cross and other applicable good health standards, and shall consist of a weatherproof container with individually-sealed packages for each type of item. First Aid Kits will be fully equipped before being sent out on each job and will be checked by the SSO to ensure that the expended items are replaced. First Aid Kits shall be suitably placed, distinctly marked, and readily accessible.

Eye Wash

In the event of contamination by dust particles during any remedial activity, an emergency eye wash will be available on-Site during all field activities. In such an emergency, the eye will be immediately flushed with large amounts of water, occasionally lifting the lower and upper lids. Professional medical attention will be sought immediately.

12.3 PERSONNEL ROLES, LINES OF AUTHORITY, COMMUNICATION

The SSO is the primary authority for directing operations at the Site under emergency conditions.

Section 3.0, Project Organization and Responsibility, outlines the roles and responsibilities of safety personnel for the project.

Telephones, portable radios, and hand signals will be used at the Site for communication.

Telephones/Radios

Cellular phones will be provided for each team working in the field. Personnel captaining the sample transfer boats will have access to one of these phones at all times. At least one member of each team is required to have one of these phones with them at all times.

Hand Signals

To be employed by downrange field teams along with utilizing the buddy system. These signals (Table 12-1) are also very important when working with heavy equipment. The entire field team shall know them before operations commence and covered during site-specific training prior to fieldwork.

TABLE 12-1
HAND SIGNALS AND THEIR MEANINGS

HAND SIGNAL	MEANING
Hand gripping throat	**CAN'T BREATHE**
Grip wrist or both hands around waist	**LEAVE AREA IMMEDIATELY**
Hands on top of head	**NEED ASSISTANCE**
Thumbs up	**OK, I AM ALL RIGHT, I UNDERSTAND**
Thumbs down	**NO, NEGATIVE**

12.4 EMERGENCY RECOGNITION AND PREVENTION

As part of the initial site-specific health and safety briefing, the SSO will address emergency recognition and prevention. Topics will include hazard recognition regarding tasks to be performed in addition to hazards associated with site contaminants. Section 4.0, Hazard Assessment, discusses the characteristics of hazardous substances likely to be found at the site and the potential hazards associated with the field activities planned during this project. Section 7.0, PPE, discusses the protective equipment associated with each field activity and a process for the SSO to follow when determining PPE for each task. Section 8.0, Exposure Monitoring, discusses the action levels associated with various monitoring instruments. Section 9.0, Site Control Measures, discusses the set up of work zones to delineate hazardous and safe zones during site activities. Section 10.0, Standard Operating Procedures for Safety, discusses precautionary work practices to minimize the likelihood of an emergency situation. Section 11.0, Decontamination, discusses proper decontamination procedures at the site.

12.5 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the SSO will determine if work can continue without sacrificing the health and safety of the site workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for Cold Stress
- Inclement weather-related working conditions
- Limited visibility
- Potential for Electrical Storms

12.6 EMERGENCY MEDICAL TREATMENT/FIRST AID

In the event of injury to a Site worker, emergency first aid will be applied on-Site as deemed necessary. The injured person is to undergo PPE decontamination procedures as appropriate, and to be transported to the nearest medical clinic, if needed. During all field activities, there is to be at least one person on the site certified in First Aid and CPR. Appropriate material safety data sheets relevant to the injury will be provided by the SSO to any medical facility to which an injured person is taken. In the event of an injury to a site worker, the SSO will complete the Supervisor's Incident Investigation Report.

If any person has been directly exposed to chemicals or contaminants of concern, the following procedures are to be implemented:

<u>Skin Contact</u>

Use large amounts of soap and water. Wash/rinse affected area for at least 15 minutes. Implement decontamination procedures and provide medical attention. Eye wash stations will be provided on site. If necessary, transport to the nearest medical facility.

Inhalation

Move to fresh air and, if necessary, transport to the nearest medical facility.

Ingestion

Implement decontamination procedures and transport to the nearest medical facility.

In the event of a serious medical emergency, victims shall be treated at Saint James Hospital. Prior to each mobilization of personnel for site work, the SSO shall contact the Emergency Room Supervisor at the closest hospital regarding the potential need for emergency transport and medical attention and to update Hospital staff regarding Site activities and hazards.

In the event of a serious medical emergency, the SSO will contact and brief the Emergency Room Supervisor (ERS) on the situation including potential hazards and substances involved. The ERS will determine the appropriate mode of transportation (i.e., by personal vehicle, ambulance, or ambulance after on-site treatment by paramedics) and then the hospital will be contacted and briefed on the situation, including the potential hazards, and the substances involved.

12.7 ROUTE TO EMERGENCY MEDICAL FACILITY

The route to Saint James Hospital can be found in Appendix A.

12.8 EMERGENCY PHONE NUMBERS

A list of emergency phone numbers can be found in Appendix A.

12.9 EVACUATION PROCEDURES AND SAFE DISTANCES

Evacuation procedures will occur at three levels: (1) withdrawal from immediate work area (100 feet or more upwind), (2) Site evacuation, and (3) evacuation of surrounding area. If site evacuation is required, all field team members will be notified by cellular phone. Anticipated conditions that require these responses are described in the following subsections.

Withdrawal Upwind

Withdrawing upwind (100 feet or more) will be required when: (1) during periodic monitoring the ambient air conditions contain greater contaminant concentrations than guidelines allow for the type of respiratory protection being worn (the work crew may return after obtaining greater respiratory protection and/or assessing the situation as stabilized). (2) A breach in protective clothing or a minor accident occurs (the work crew may return when the tear or other malfunction is repaired and first aid or decontamination has been administered); or (3) the respirator malfunctions requiring replacement.

Site Evacuation

Evacuation of the Site will be required when:

(1) Ambient air conditions contain explosive and persistent levels of combustible gas or excessive levels of toxic gases;
(2) A fire or major accident occurs; or
(3) Explosion is imminent or has occurred.

After determining that Site evacuation is warranted, the work crew will proceed upwind of the work site and notify the SSO of site conditions. If the decontamination area is upwind and more than 500 feet from the work site, the crew will pass quickly through the decontamination area to remove contaminated outer suits. However, if the hazard is toxic gas, respirators will be retained. The crew will proceed to the field office to assess the situation, where the respirators may be removed (if instrumentation indicates an acceptable condition). As more facts are determined from the field crew, they will be relayed to the appropriate agencies. The advisability and type of further response action will be coordinated and implemented by the SSO.

Surrounding Area Evacuation

The area surrounding the Site will be evacuated when persistent, insuppressible toxic or explosive vapors are detected, or air quality monitored at several points downwind assess danger to the surrounding area.

When the SSO determines that conditions warrant evacuation of downwind residences and commercial operations, the local agencies will be notified and assistance requested. Designated on-site personnel will initiate evacuation of the immediate off-site area without delay.

12.10 SITE SECURITY AND CONTROL

A daily log containing the names of personnel, Site entry and exit times, and their levels of personnel protection shall be maintained by the SSO.

In order to control the potential spread of contaminants, and to keep visitors from entering potentially hazardous areas, caution tape will mark the work zones.

12.11 FIRE OR EXPLOSION

Notify local fire and police department and other appropriate emergency response groups if an actual fire or explosion has taken place.

12.12 SPILL CONTAINMENT

The goal of spill control is to avoid spilling potentially hazardous liquids or solids at anytime, especially during transfer, transport or disposal of these materials. In the unlikely event that a spill occurs, the spill will be contained and cleaned up in accordance with applicable federal and state requirements including 29 CFR 1910.120(j).

The following specific steps are to be taken to avoid spill control/containment if needed:

- Drums and containers will be labeled indicating their contents and origin.
- Drums will be inspected prior to moving to ensure their integrity.
- The amount of drum movement will be minimized to the extent practical.
- Appropriate personal protective equipment will be used when cleaning up spills.

If liquids are spilled, they will be contained with contents and placed in drums. Spilled soils or liquids spilled on soils will be placed in drums for future disposal.

If an Immediately Dangerous to Life or Health (IDLH) atmosphere does not exist and adequate personal protective equipment is being used, the spread of any contamination is to be controlled whenever possible. The Field Team Leader and the SSO will be notified if a spill occurs. The SSO will notify other appropriate emergency response groups and management as necessary. The SSO will also determine whether an evacuation of the immediate areas is necessary and will announce that decision. If possible, personnel should leave the area through the Contamination Reduction Zone. If this is not possible, personnel should leave via the shortest route possible in a direction away from any potential danger.

If a significant release has occurred, the Field Team Leader will contact the National Response Center. If required, the National Response Center will alert National or Regional Response Teams of the significant release.

12.13 EMERGENCY RESPONSE EVALUATION

In the aftermath of an emergency, before normal Site activities are resumed, personnel will be prepared and fully equipped to handle another emergency. The SSO will be responsible for restocking emergency supplies, replacing or repairing damaged equipment, and determining that the Exclusion, Contaminant Reduction and Support Zones have been redefined. The Project Manager will notify appropriate government agencies as required. This includes OSHA if there has been a fatality or if five or more workers have been hospitalized.

The Project Manager and Health and Safety Manager are responsible for initiating an investigation and documenting the incident. This investigation will be designed to develop information about the institutional, organizational, technical, and operational root causes of the accident or injury. Documentation will include:

- A chronological history of the incident.
- Facts about the incident and when they became available.
- Title and names of involved personnel.
- Decisions made, orders given - to whom, by whom and when.
- Actions taken, who did what, when, where and how.
- Environmental measurements.
- Potential exposures of Site personnel.
- History of all injuries or illnesses during or as a result of the incident.

Documentation will include the completion of the Malcolm Pirnie Supervisor's Incident Investigation Report.

Before Site work resumes, a meeting will be held to review and revise all aspects of the HASP according to new Site conditions, cleanup and/or other additional tasks required as a result of the incident, and lessons learned from the emergency response. This meeting will be attended by the PM, the Corporate HSM, the Field Team Leader, the SSO, representatives of partner firms whose operations or tasks were or could be impacted by the incident, and by representatives of any and all contractors whose operations or tasks were or could be impacted by the incident.

The purpose of the meeting will be to:

- Review the incident and unsafe conditions and/or act that resulted in the incident.
- Determine if and how these conditions or acts were preventable.
- Replace, or correct procedures that failed to result in desirable responses or activities.
- Determine if the incident has changed the Site profile and where and what that impact might be.

The result of the meeting will be:

- The generation of a series of action items which must be satisfactorily completed prior to the re-initiation of the Site activities.

- Developing, if required, appropriate changes to this SSHP.
- Retraining Site personnel in the changes to this SSHP.

13.0 ACCIDENT INVESTIGATION

Due to the nature of the work and the locations in which it is to take place, there is a potential for serious injury if the proper safety measures are not put into place. These measures include what is outlined in this SSHP and regular training throughout the duration of this project. All minor injuries including cuts, bruises, sprains, etc., will be investigated by the SSO. The SSO will write a brief report describing the location of the accident, how the accident occurred, what the employee was doing at the time of the accident, witnesses, and what corrective action was put in place in conjunction with completing Malcolm Pirnie's Accident Investigation Form. A copy of this form is included in Appendix A.

For major accidents including heat and cold related injuries, drowning, boating accidents, and accidents that require hospitalization and lost time, the SSO is to conduct an immediate investigation and contact the Corporate HSM immediately, and brief the HSM on the nature of the accident. The HSM will conduct a thorough investigation to determine the root cause of the accident. For all operations similar to that where the accident occurred, a Stop Work Order will be given until the investigation is complete and proper safety measures can be implemented to prevent a similar accident.

Following any accident, the SSO or the HSM will make the field team aware of the accident and the cause and what lessons were learned. The field team will be briefed on what corrective actions were put into place to prevent a recurrence and trained accordingly.

13.1 ACCIDENT REPORTING

For the purposes of this project all minor accidents and injuries as described above and near misses will be reported to the SSO in a timely manner.

Accidents that result in a reportable injury and/or lost time must be reported to the NJDOT-OMR within three days.

Accidents that result in damages exceeding $10,000 must be reported to the HSM, Project Manager (PM), and the NJDOT-OMR immediately.

Any accident that results in a death or causes three or more workers to be hospitalized will be reported to the HSM, the subcontractor whose employees were injured, and NJDOT-OMR immediately. The HSM will report this accident to the Occupational Safety and Health Administration (OSHA) within eight (8) hours as required by 29 CFR 1904.39(a).

The toll-free number for the OSHA Central Office is 1-800-321-OSHA. When speaking to a representative of OSHA the HSM will provide the following information:

- The establishment name;
- The location of the incident;
- The time of the incident;
- The number of fatalities or hospitalized employees;
- The names of any injured employees;
- Your contact person and his or her phone number; and
- A brief description of the incident.

For accidents in which the boat incurred damages of $500 or greater, the Captain of the vessel will fill out the USCG Boating Accident Report Form 3865 (CG 3865) as required, see Appendix F. A copy of this completed form will be kept in the field office for the duration of the project.

13.2 SAFETY AUDITS

Given the short duration of this project, formal safety audits will not be required. However, minor deficiencies that are noted will be corrected in the field as they occur. If major deficiencies are noted (those that cannot be immediately corrected in the field), a Stop-Work Order will be issued until appropriate measures can be taken to correct the problem.

14.0 RECORDKEEPING

Recordkeeping will include Medical Surveillance Reports, Personnel Training Records, the Site Safety and Health Plan and addenda, Incident Reports, and Field Audit Reports. In addition to these documents, records of all meetings, including the morning safety meetings, will be maintained on-site and available to all employees.

14.1 MEDICAL SURVEILLANCE REPORTS

Malcolm Pirnie will maintain copies of all medical monitoring records for its employees and Continuum, Malcolm Pirnie's medical provider, will maintain all originals. As required by 29 CFR 1910.1020 (d)(1)(i), these medical records will be maintained throughout the employee's employment plus an additional thirty years. Malcolm Pirnie will maintain a copy of the employee's Disclosure Agreement and Physician's Statement.

14.2 PERSONNEL TRAINING RECORDS

Personnel health and safety training records are maintained to document personnel qualifications and capabilities and to demonstrate compliance with company training requirements. Each site-specific training session will be documented by a training report. The SSO will prepare the report and include the date of training, location, the list of attendees, and a description of the material covered. The original report will be filed and maintained on-site. Copies of CPR/First Aid training certificates will be retained on-site as well as respirator fit test reports.

14.3 SITE SAFETY AND HEALTH PLAN

SSHPs will be completed and in place prior to each work assignment involving field activities. The SSHP will be signed and approved by the HSM and PM. The original of each completed SSHP will be maintained in the Project File. A copy will accompany each field team and be readily available at the work site under the control of the SSO. Copies of this SSHP will be available to all employees when site-specific training is provided prior to any work beginning. All employees are required to read this SSHP and sign a form stating they have done so and understand the requirements herein. All employees will be made aware of all updates or addendums made to this SSHP will be trained accordingly.

14.4 INCIDENT REPORTS

All incident and accident investigations will be performed in a timely manner following the incident. The incident form will be kept on file for the duration of the project. See Section 14 for incident reporting requirements. The SSO or HSM, depending on the severity of the incident, (See Section 14.1) will file the form in the Project File. See Appendix C for a copy of the Incident Report Form. A copy of this form along with applicable documentation from the hospital or clinic will also be maintained in the employee's personal file.

ATTACHMENT A

ROUTE TO ST. JAMES HOSPITAL
AND
EMERGENCY PHONE NUMBERS

Starting from: A 34 Jersey St, Newark, NJ 07105-2209

Arriving at: B 155 Jefferson St, Newark, NJ 07105-1706

Distance: 0.5 miles **Approximate Travel Time:** 1 min

Directions

1.	Start at **34 JERSEY ST, NEWARK** - go **< 0.1** mi
2.	Make a Hard R Turn on **RAYMOND BLVD** - go **< 0.1** mi
3.	Continue on a local road - go **< 0.1** mi
4.	Bear L on **JEFFERSON ST** - go **0.4** mi
5.	Arrive at **155 JEFFERSON ST, NEWARK**

When using any driving directions or map, it's a good idea to do a reality check and make sure the road still exists, watch out for construction, and follow all traffic safety precautions. This is only to be used as an aid in planning.

Full Route

Destination

155 Jefferson St
Newark, NJ 07105-1706

EMERGENCY PHONE NUMBERS

Emergency Service	Telephone Number
Ambulance	(201) 456-7000 or 911
Fire Department	(201) 733-7400 or 911
Police Department	(201) 733-6000 or 911
St. James Hospital	(201) 589-1300
NJ Poison Information and Education System, Newark NJ	(800) 222-1222
NJDEP Environmental Incident Hotline	(877) 927-6337
U.S. Coast Guard	Channel 16 Marine Band Radio

Additional notification requirements for Malcolm Pirnie personnel:

MALCOLM PIRNIE 24 / 7 EMERGENCY / INCIDENT TELEPHONE NUMBERS		
(800) 478-6870 (24 HOURS)		
NJDOT-OMR PROJECT MANAGER	**LISA BARON**	**Office (609) 530-4779**
MPI PROJECT OFFICER	**KEN GOLDSTEAIN**	**Office (914) 641-2615** **Fax (914) 641-2455**
MPI PROJECT MANAGER	**BRUCE FIDLER**	**Office (201) 398-4365**
MPI DEPUTY PROJECT MANAGER	**SCOTT THOMPSON**	**Office (914) 641-2628** **Fax (914) 641-2455**

MPI CORPORATE HEALTH AND SAFETY	**MARK MCGOWAN, CIH, CSP**	**(914) 641-2484 WHI (410) 230-9954 BAL cell (914) 906-7093**
	JOSEPH GOLDEN, EMT-P, CET, CHMM	**(914) 641-2978 WHI Pager (800) 403-4369**
CORPORATE HUMAN RESOURCES **	**HOLLY LYONS (WORKERS COMP / OSHA LOG)**	**(914) 641-2674 WHI**
LEGAL DEPARTMENT **	**JERRY CAVALUZZI**	**(914) 641-2950 WHI**

**** TO BE NOTIFIED IN CASE OF ACCIDENT**

ATTACHMENT B

CHEMICALS OF CONCERN (COC)
TABLES 4-1 AND 6-1 FROM RI/FS HASCP

(Refer to Attachment B of the TAMS Site Health and Safety Plan)

ATTACHMENT C

TRAINING DOCUMENTATION FOR FIELD PERSONNEL

(C) HEALTH AND SAFETY TRAINING, MEDICAL MONITORING, AND FIT TESTING PROGRAM

The following project staff is included in the Malcolm Pirnie Health and Safety Training and Medical Monitoring programs. The details of these programs can be found in the Health and Safety Policies and Written Programs. (NOTE: At least one CPR/First Aid Trained person must be on-site during HAZWOPER and confined space entry activities.)

	HAZWOPER TRAINING			OTHER TRAINING						FIT TEST			
NAME	INITIAL (DATE)	8HR (DATE)	MGR (DATE)	DOT (DATE)	CSE (DATE)	CPR / (DATE)	First Aid / (DATE)	BBP (DATE)	MEDICAL (DATE)	MAKE /	SIZE /	TYPE	(DATE)
Liam Bossi	10/03								07/04				
Solomon Gbondo-Tugbawa	07/01	08/03							08/04	MSA	SML	FF	12/04
Daria Navon	01/96	12/04		11/01		09/04	09/04		08/04	MSA	SML	FF	01/04
Andrew Schell	05/00	11/04			05/02				10/04	MSA	MED	FF	05/02

ATTACHMENT D

INCIDENT INVESTIGATION
AND
ACCIDENT REPORTS

INSTRUCTIONS FOR COMPLETING WORKPLACE INCIDENT/ILLNESS REPORT

Please do not leave any spaces blank. Indicate "NA" when the question is not applicable.

1. - 13. **Self-Explanatory**

14. **Group** (where regularly employed). Enter the name of the group or section in which the individual is regularly employed, even though temporarily working in another department at the time of the injury.

15. - 16. **Self-Explanatory**

17. **Treatment**. Describe briefly treatment given for injury or illness, (e.g., sutured laceration on left wrist, x-rayed right arm for possible fracture, hospitalized for observation. etc.)

18. - 22. **Self-Explanatory.**

23 Case number from the OSHA No. 300 Log. (See your Human Resource Representative and/or Health & Safety Department)

24. - 27. **Self-Explanatory.**

28. Describe the activity, as well as the tools, equipment, or material employee was using. Be specific. Examples: "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry." Tell us how the injury occurred. Examples: "When ladder slipped on wet floor, worker fell 20 feet", "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time.")

29. (Tell us the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or "sore." Examples: "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."

30. - 31. **Self-Explanatory.**

32. Examples: "concrete floor"; "chlorine floor"; "radial arm saw." If this question does not apply to the incident, leave it blank.

33. - 38. **Self-Explanatory.**

39. - 43. **Workman's Compensation/**Insurance Carrier Information

44. **AW, Away-From-Work-Case** - is any occupational injury or illness which results in death, permanent impairment, or which renders the injured person unable to work for a <u>full</u> day on **any** job on **any** regularly scheduled work day after the injury. (Do not include partial day off)

    RA, Restricted Activity Case - is any occupational injury or illness which renders an employee unable to perform all duties of his regularly scheduled job or the employee was assigned to do a temporary job on any regularly scheduled day after the injury or illness.

    NF, Non-Fatal Case - is an occupational injury or illness which did not involve a fatality or lost work days, but did result in: a) transfer to another job or termination of employment or b) medical treatment other than first aid or c) diagnosis of occupational illness or d) loss of consciousness.

    FA, First Aid Case - One time treatment and subsequent observation of minor scratches, cuts, burns, splinters, which do not ordinarily require professional medical care even though the treatment was provided by a physician or registered professional personnel.

    PC, Precautionary Case - When no injury or illness can be detected by qualified personnel or physicians, but the employee still alleges injury or illness, the case is precautionary. Documentation is mandatory.

    NFR, Not For Record - In many situations which a case is PC the case will not be recorded on Company Records or in the U.S. on the Osha No. 300 Log. Documentation is mandatory.

45. All signatures are required.

MALCOLM PIRNIE

WORKPLACE INCIDENT/ILLNESS REPORTING REPORT

1. COMPLETED BY	2. TITLE	3. TELEPHONE NUMBER	4. DATE
5. OFFICE LOCATION	OFFICE ADDRESS		

INFORMATION ABOUT THE INJURED EMPLOYEE

6. EMPLOYEE NAME	7. EMPLOYEE #	8. SOCIAL SECURITY #	9. ☐MALE ☐FEMALE
10. EMPLOYEE HOME ADDRESS			

11. DATE OF BIRTH	12. AGE	13. JOB TITLE	14. GROUP #

INFORMATION ABOUT THE PHYSICIAN OR OTHER HEALTH CARE PROFESSIONAL

15. NAME OF THE TREATING PHYSICIAN OR OTHER HEALTH CARE PROFESSIONAL

16. IF TREATMENT WAS GIVEN AWAY FROM THE WORKPLACE, WHERE WAS IT GIVEN?	NAME OF HOSPITAL/CLINIC	ADDRESS

17. WHAT WAS THE TREATMENT PROVIDED TO THE INJURED?

18. WAS A TETANUS SHOT GIVEN? ☐YES ☐NO

19. WAS A PRESCRIPTION FOR MEDICATION GIVEN? ☐YES ☐NO

20. WAS EMPLOYEE TREATED IN AN EMERGENCY ROOM? ☐YES ☐NO	21. WAS EMPLOYEE HOSPITALIZED OVERNIGHT AS AN INPATIENT? ☐YES ☐NO	22. DATE AND TIME OF TREATMENT:

INFORMATION ABOUT THE INCIDENT/ILLNESS

23. CASE # FROM THE LOG (TRANSFER THE CASE # FROM THE LOG AFTER YOU RECORD THE CASE.)	24. DATE OF INJURY OR ILLNESS:

25. LOCATION OF ACCIDENT OR CAUSE OF ILLNESS (GIVE ADDRESS FOR LOCATIONS OF EMPLOYER'S PREMISES.)

26. TIME EMPLOYEE BEGAN WORK ☐AM ☐PM	27. TIME OF EVENT ☐AM ☐PM ☐CHECK IF CANNOT BE DETERMINED

28. WHAT HAPPENED? DESCRIBE THE DIRECT CAUSE OF THE ACCIDENT/ILLNESS AND LIST ANY OTHER CONTRIBUTING CAUSES.

29. DESCRIBE THE INJURY OR ILLNESS:

30. DID THE EMPLOYEE LOSE TIME AT WORK AS A RESULT OF THIS ACCIDENT? ☐YES ☐NO
HOW MANY DAYS?

31. DID THE PHYSICIAN PRESCRIBE RESTRICTED DUTY? ☐YES ☐NO HOW MANY DAYS?

32. WHAT OBJECT OR SUBSTANCE DIRECTLY HARMED THE EMPLOYEE? (EXAMPLES: CONCRETE FLOOR, CHLORINE GAS, RADIAL ARM SAW.)

MALCOLM PIRNIE

WORKPLACE INCIDENT/ILLNESS REPORTING REPORT

33. WAS PERSONAL PROTECTION EQUIPMENT REQUIRED? ☐YES ☐NO	34. WAS PERSONAL PROTECTION EQUIPMENT BEING WORN? ☐YES ☐NO DESCRIBE:
35. IF THE EMPLOYEE DIED, WHEN DID THE DEATH OCCUR? DATE OF DEATH:	
36. NAME AND PHONE # OF WITNESS(ES) IF APPLICABLE	

TO BE FILLED OUT BY HUMAN RESOURCES

37. DATE HIRED	38. AVERAGE EARNINGS PER WEEK	
39. WCB CASE # (IF KNOWN)	40. CARRIER CASE #	CARRIER CODE #
41. WC POLICY #	42. INSURANCE CARRIER	
43. CARRIER'S ADDRESS		

44. CLASSIFICATION OF INJURY OR ILLNESS (CHECK ONE BELOW)

AW CASE ☐	RA CASE ☐	NF CASE ☐	FA CASE ☐	PC CASE ☐	NFR CASE ☐	ILLNESS ☐

45. SIGNATURES (*Must Be Original*)

SIGNATURE OF PERSON COMPLETING THIS FORM	DATE
ASSOCIATE'S SIGNATURE	DATE
OFFICER'S SIGNATURE	DATE
COMP. & BENEFITS MANAGER'S SIGNATURE	DATE

Distribution:

Original –	Holly Lyons – HR – WHI
Copy	Mark McGowan – H&S - WHI
Copy	Legal Department - WHI
Copy	Ed Dudek - DPM - WHI

INCIDENT REPORT
(INVOLVING CONTRACTORS OR OTHER NON-MALCOLM PIRNIE PERSONNEL OR PROPERTY)

(To be completed by the Malcolm Pirnie employee with the most direct knowledge of the incident. Attach supplemental pages as necessary.)

1. Malcolm Pirnie Office (No. & Street) (City or Town) (State) (Zip) 2. Project No.

3. Name of Injured and Employee # 4. Age 5. Sex Male ☐ Female ☐

6. Employer of Injured (Provide address, if known.)

7. Occupation/Job Title 8. Date & Time of Injury or Illness 9. Location of accident or cause of illness (Give address)

10. Nature and extent of injury of illness, including affected body part(s)

11. Severity of Injury/Illness (check all applicable items)
Non-Disabling ☐ Disabling ☐
Medical Treatment ☐ Hospitalized Fatality ☐

12. If Property Damage, state:
A. Equipment Involved______________________________
B. Nature of Damage______________________________
C. Preliminary Estimate of Cost to Repair or Replace (if known) ______________________________
D. Ownership of Damaged Property ______________________________

13. Describe all events leading up to the injury, including injured's actions. Clearly state activity being performed at that time.

14. Was personal protection equipment being worn? If so, describe.

15. Name the object, material or substance, which directly injured the employee.

16. Date & time & description of treatment provided to the injured.

17. Name & address of treating physician or attendant, first aid or emergency response attendants (if known) & state action taken.

18. Name & address of hospital or clinic (if applicable)

19. Name(s) of witness(es) (if applicable). Were written statements made by witness(es)? Attach.

20. Any Police Reports or other Government Reports? Yes ☐ No ☐ (Note: **Request only with prior approval from counsel**.)

21. Photographs taken? (If yes, forward upon receipt.) Yes ☐ No ☐ .

SUBMIT TO PROJECT OFFICER/MANAGER, CORPORATE HEALTH & SAFETY COUNSEL WITHIN 3 WORKING DAYS
Forward to Counsel copies of all related records made and/or kept in the ordinary course of business. Unless directed otherwise, continue to provide such information to Counsel on an on-going basis.

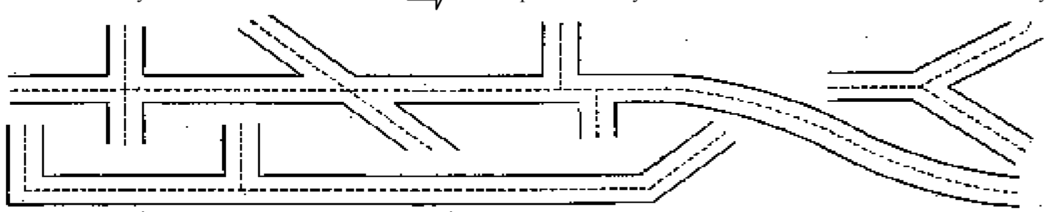
Report by: ______________________________
Employee Signature

Title: ______________________________

TIME AND PLACE OF ACCIDENT	Accident Date ____________________a.m./p.m.(circle one). Has state motor vehicle accident report been filed? ☐ Yes ☐ No If no, explain ________________________________ Where ________________________________ ______________ ____________ _ Street City County State Weather Conditions (e.g. dry, wet, "black ice") ________________________
MALCOLM PIRNIE DRIVER	Your Name and Title ________________________________ Home Address ________________________________ Home Telephone No. ________________________________
MALCOLM PIRNIE (VEHICLE 1)	Model ______________ Type ______________ License Plate ________ State ______ Number ______ Year _ Parts Damaged ________________________________ Your Estimate of Damage $ ______________ Where can insurance adjuster see it? ______________ Who should they call to arrange? ____________________Telephone ______________
VEHICLE 2 THE OTHER DRIVER(S) & VEHICLE(S) VEHICLE 3	Name of Owner ______________ Address ______________ Phone __________ Name of Driver ______________ Address ______________ Phone __________ Insurance Company/Policy # ____________________Driver's License # __________ Model ______________ Type ______________ License Plate ________ State ______ Number ______ Year _ Parts Damaged ________________________________ Your Estimate of Damage $ ____________________ Vehicle 3 – If more than one other vehicle is involved, please attach a page with the same information as vehicle 2 filled out above.
PERSONS INJURED	Name Address Telephone 1. ______________ ______________ ________ 2. ______________ ______________ ________ 3. ______________ ______________ ________ Name and Extent of Injuries Health Care Facility Taken to and by Whom 1. ______________ ______________ ________ 2. ______________ ______________ ________ 3. ______________ ______________ ________

Malcolm Pirnie Vehicle Number ____________ Location ____________

VEHICLE ACCIDENT REPORT

OCCUPANTS OF MALCOLM PIRNIE CAR (BESIDES YOU)	Name / Address / Telephone / Relationship to You
OCCUPANTS OF OTHER CAR(S) BESIDES DRIVER(S)	Name / Address / Telephone / Relationship to Driver
WITNESSES NOT INVOLVED IN ACCIDENT	Name / Address / Telephone / Where was Witness At Time of Accident
SPECIAL DATA	Speed: How fast were you traveling? _____*mph* How fast was the other car traveling? Vehicle 1_____*mph* Vehicle 2 _____*mph* Vehicle 3_____ *mph* Responsibility: In your opinion, who was at fault and why? ____________ Is the other driver(s) making a claim against Malcolm Pirnie? ____________ Statements about accident made by you (to whom?) ____________ Made by anyone else (to whom?) ____________ Did police appear at scene of accident? ☐ Yes ☐ No Were they summoned? ☐ Yes ☐ No Name of Officer summoned to accident / Badge Number / Phone # List Vehicle/traffic violations: by you ____________by other driver(s) ____________ Police, i.e., criminal charges against you: ____________ against other driver(s) ____________
PLEASE SHOW HOW THE ACCIDENT HAPPENED	Identify each car and direction of travel by numbered arrow ⇨. Show each car's position at the moment when crash happened. Show direction and distance each car traveled before the crash with a solid line: ————⇨. Show direction and distance after crash by a dotted line - - - - - - - - - - -⇨. Show pedestrians by small circle ○. Show location of witnesses by a "W". 
BRIEF DESCRIPTION OF ACCIDENT OR LOSS	Explain briefly how this accident occurred: ____________ Purpose of trip you were on when this accident happened? ____________ Job # ____________ Group # ____________

____________________ (Driver's signature required) ____________ Date

BOATING ACCIDENT REPORT

THE OPERATOR/OWNER OF A VESSEL USED FOR RECREATIONAL PURPOSES IS REQUIRED TO FILE A REPORT IN WRITING WHENEVER AN ACCIDENT RESULTS IN: LOSS OF LIFE OR DISAPPEARANCE FROM A VESSEL; AN INJURY WHICH REQUIRES MEDIAL TREATMENT BEYOND FIRST AID; OR PROPERTY DAMAGE IN EXCESS OF $500 OR COMPLETE LOSS OF THE VESSEL. REPORTS IN DEATH AND INJURY CASES MUST BE SUBMITTED WITHIN 48 HOURS. REPORTS IN OTHER CASES MUST BE SUBMITTED WITHIN 10 DAYS. REPORTS MUST BE SUBMITTED TO THE REPORTING AUTHORITY IN THE STATE WHERE THE ACCIDENT OCCURRED. THIS FORM IS PROVIDED TO ASSIST THE OPERATOR IN FILING THE REQUIRED WRITTEN REPORT.

COMPLETE ALL BLOCKS (INDICATE THOSE NOT APPLICABLE BY "NA")

ACCIDENT DATA

DATE OF ACCIDENT	TIME AM PM	NAME OF BODY OF WATER	LOCATION (GIVE LOCATION PRECISELY)	
NUMBER OF VESSELS INVOLVED	NEAREST CITY OR TOWN	COUNTY	STATE	ZIP CODE

WEATHER (CHECK ALL APPLICABLE)	WATER CONDITIONS	TEMPERATURE (ESTIMATE)	WIND	VISIBILITY
☐CLEAR ☐RAIN ☐CLOUDY ☐SNOW ☐FOG ☐HAZY	☐CALM (WAVES LESS THAN 6") ☐CHOPPY (WAVES 6" TO 2') ☐ROUGH (WAVES 2' TO 6') ☐VERY ROUGH (GREATER THAN 6') ☐STRONG CURRENT	AIR ____°F WATER ____°F	☐NONE ☐LIGHT (0-6 MPH) ☐MODERATE (7-14 MPH) ☐STRONG (15-25 MPH) ☐STORM (OVER 25 MPH)	DAY NIGHT ☐ GOOD ☐ ☐ FAIR ☐ ☐ FOG ☐

NAME OF OPERATOR		OPERATOR ADDRESS	
OPERATOR TELEPHONE NUMBER ( ) ☐MALE ☐FEMALE	DATE OF BIRTH MO DAY YR	OPERATOR'S EXPERIENCE ☐NONE ☐UNDER 100 HOURS ☐OVER 100 HOURS	INSTRUCTION IN BOATING SAFETY ☐STATE COURSE ☐U.S.POWER SQUADRON ☐USCG AUXILIARY ☐AMERICAN RED CROSS☐ NONE

NAME OF OWNER		OWNER ADDRESS	
OWNER TELEPHONE NUMBER ( )	NUMBER OF PEOPLE ON BOARD	NUMBER OF PEOPLE BEING TOWED	RENTED BOAT? ☐YES ☐NO

BOAT NO. 1 (THIS VESSEL)

BOAT REGISTRATION OR DOCUMENTATION NUMBER	STATE	HULL IDENTIFICATION NUMBER	BOAT NAME
BOAT MANUFACTURER	LENGTH	MODEL	YEAR BUILT

TYPE OF BOAT	HULL MATERIAL	ENGINE	PROPULSION	PERSONAL FLOATATION DEVICES (PFDS)
☐OPEN MOTORBOAT ☐CABIN MOTORBOAT ☐AUXILIARY SAIL ☐SAIL (ONLY) ☐ROWBOAT ☐CANOE/KAYAK ☐PERSONAL WATERCRAFT ☐PONTOON BOAT ☐HOUSEBOAT ☐OTHER (SPECIFY)	☐WOOD ☐ALUMINUM ☐STEEL ☐FIBERGLASS ☐RUBBER/VINYL/CANVAS ☐RIGID HULL INFLATABLE ☐OTHER (SPECIFY)	☐OUTBOARD ☐INBOARD ☐INBOARD-STERNDRIVE (I/O) ☐AIRBOAT ☐NONE ☐LIGHT (0-6 MPH) ☐MODERATE (7-14H)	☐PROPELLER ☐WATER JET ☐AIR THRUST ☐MANUAL ☐SAIL NUMBER OF ENGINES TOTAL HORSEPOWER	DEVICES (PFDS): WAS BOAT ADEQUATELY EQUIPPED WITH COAST GUARD APPROVED PFDS? ☐YES ☐NO WERE PFDS ACCESSIBLE? ☐YES ☐NO FIRE EXTINGUISHERS OB BOARD? ☐YES ☐NO USED? ☐YES ☐NO

OPERATION AT TIME OF ACCIDENT (CHECK ALL APPLICABLE)	ACTIVITY AT TIME OF ACCIDENT (CHECK ANY IF APPLICABLE)	TYPE OF ACCIDENT	WHAT CONTRIBUTED TO ACCIDENT? (CHECK ALL APPLICABLE)
☐CRUISING ☐CHANGING DIRECTION ☐CHANGING SPEED ☐DRIFTING ☐TOWING ☐BEING TOWED ☐ROWING/PADDLING ☐SAILING ☐LAUNCHING ☐DOCKING/UNDOCKING ☐AT ANCHOR ☐TIED TO DOCK/MOORED ☐OTHER (SPECIFY)	☐FISHING ☐TOURNAMENT ☐HUNTING ☐SWIMMING/DIVING ☐MAKING REPAIRS ☐WATERSKIING/TUBING/ETC. ☐RACING ☐WHITEWATER SPORTS ☐FUELING ☐STARTING ENGINE ☐NON-RECREATIONAL ☐OTHER (SPECIFY)	☐GROUNDING ☐CAPSIZING ☐FLOODING/SWAMPING ☐SINKING ☐FIRE OR EXPLOSION(FUEL) ☐FIRE OR EXPLOSION(OTHER) ☐SKIER MISHAP ☐COLLISION WITH VESSEL ☐COLLISION W/FIXED OBJECT ☐COLLISION W/FLOATING OBJ. ☐FALLS OVERBOARD ☐FALLS IN BOAT ☐STRUCK BY BOAT ☐STRUCK BY MOTOR/PROPELLER ☐STRUCK BY SUBMERGED OBJ. ☐OTHER (SPECIFY) ☐HIT AND RUN	☐WEATHER ☐EXCESSIVE SPEED ☐IMPROPER LOCKOUT ☐RESTRICTED VISION ☐OVERLOADING ☐IMPROPER LOADING ☐HAZARDOUS WATERS ☐ALCOHOL USE ☐DRUG USE ☐HULL FAILURE ☐MACHINERY FAILURE ☐EQUIPMENT FAILURE ☐OPERATOR INEXPERIENCE ☐OPERATOR INATTENTION ☐CONGESTED WATERS ☐PASSENGER/SKIER BEHAVIOR ☐DAM/LOCK ☐OTHER (SPECIFY)
ESTIMATED SPEED ☐NONE ☐UNDER 10 MPH ☐10 - 20 MPH ☐21 – 40 MPH ☐OVER 40 MPH			

BOATING ACCIDENT REPORT

DECEASED (IF MORE THAN 2 FATALITIES, ATTACH ADDITIONAL FORMS)			
NAME OF VICTIM		ADDRESS OF VICTIM	WAS PFD WORN? ☐YES ☐NO
DATE OF BIRTH	☐MALE ☐FEMALE	DEATH CAUSED BY ☐DROWNING ☐OTHER	☐DISAPPEARANCE
NAME OF VICTIM		ADDRESS OF VICTIM	WAS PFD WORN? ☐YES ☐NO
DATE OF BIRTH	☐MALE ☐FEMALE	DEATH CAUSED BY ☐DROWNING ☐OTHER	☐DISAPPEARANCE

INJURED (IF MORE THAN 2 INJURIES, ATTACH ADDITIONAL FORMS)		
NAME OF VICTIM	ADDRESS OF VICTIM	
DATE OF BIRTH	MEDICAL TREATMENT BEYOND FIRST AID? ☐YES ☐NO ADMIITTED TO HOSPITAL? ☐YES ☐NO	DESCRIBE INJURY
WAS PFD WORN? ☐YES ☐NO WAS IT INFLATABLE? ☐YES ☐NO	PRIOR TO ACCIDENT? ☐YES ☐NO	AS A RESULT OF ACCIDENT? ? ☐YES ☐NO
NAME OF VICTIM	ADDRESS OF VICTIM	
DATE OF BIRTH	MEDICAL TREATMENT BEYOND FIRST AID? ☐YES ☐NO ADMIITTED TO HOSPITAL? ☐YES ☐NO	DESCRIBE INJURY
WAS PFD WORN? ☐YES ☐NO WAS IT INFLATABLE? ☐YES ☐NO	PRIOR TO ACCIDENT? ☐YES ☐NO	AS A RESULT OF ACCIDENT? ? ☐YES ☐NO

OTHER PEOPLE ABOARD THIS BOAT (IF MORE THAN 2 PEOPLE, ATTACH ADDITONAL FORMS)	
NAME OF VICTIM	ADDRESS OF VICTIM
DATE OF BIRTH	
NAME OF VICTIM	ADDRESS OF VICTIM
DATE OF BIRTH	

BOAT NO. 2 (IF MORE THAN 2 VESSELS, ATTACH ADDITIONAL IDENTIFYING INFORMATION)	
NAME OF OPERATOR	OPERATOR ADDRESS
OPERATOR TELEPHONE NUMBER ( )	BOAT REGISTRATION OR DOCUMENTATION NUMBER STATE
NAME OF OWNER	OWNER ADDRESS
OWNER TELEPHONE NUMBER ( )	

PROPERTY DAMAGE		
ESTIMATED AMOUNT: THIS BOAT AND CONTENTS: $	OTHER BOAT AND CONTENTS: $	OTHER PROPERTY: $
DESCRIBE PROPERTY DAMAGED		

WITNESSES NOT ON THIS VESSEL		
NAME	ADDRESS	TELEPHONE NUMBER ( )
NAME	ADDRESS	TELEPHONE NUMBER ( )

PERSON COMPLETIN REPORT		
NAME	ADDRESS	TELEPHONE NUMBER ( )
SIGNATURE	QUALIFICATION ☐OPERATOR ☐OWNER ☐INVESTIGATOR ☐OTHER	DATE SUBMITTED

FOR ACCIDENT INVESTIGATION TEAM USE ONLY	
CAUSES BASED ON (CHECK ONE) ☐THIS REPORT ☐INVESTIGATION ☐INVESTIGATION AND THIS REPORT ☐OTHER	
NAME OF REVIEWING OFFICE DATE RECEIVED	RECREATIONAL ☐ COMMERCIAL ☐ NON-REPORTABLE ☐
PRIMARY CAUSE	SECONDARY CAUSE

BOATING ACCIDENT REPORT

ACCIDENT DESCRIPTION
DESCRIBE WHAT HAPPENED (SEQUENCE OF EVENTS. INCLUDE FAILURE OF EQUIPMENT. INCLUDE A DIAGRAM IF NEEDED. CONTINUE ON ADDITIONAL SHEETS IF NECESSARY. INCLUDE ANY INFORMATIKON REGARDING THE INVOLVEMENT OF ALCOHOL AND/OR DRUGS IN CAUSING OR CONTRIBUTING TO THE ACCIDENT. INCLUDES ANY DESCRIPTIVE INFORMATION ABOUT THE USE OF PFD'S.)

ATTACHMENT E

MSDS SHEETS FOR DECONTAMINATION REAGENTS

(Refer to Attachment E of the TAMS Site Health and Safety Plan)

Aqua Survey, Inc.

Field Operations
Health & Safety Plan

HYDROGRAPHIC SURVEY
PASSAIC RIVER PROJECT

469 Point Breeze Road
Flemington, NJ 08822

(Ph.) 908/788-8700 (Fax) 908/788-9165
mail@aquasurvey.com www.aquasurvey.com

1.0 Introduction

This Site Specific Health and Safety Plan (HASP) is designed to provide practices and procedures for Aqua Survey, Inc. (ASI) personnel engaged in Hydrographic Surveying and sediment coring within the Harrison Reach of the Passaic River , NJ. This plan has been developed to conform to the requirements of OSHA Standard 29 CFR 1910.120, as well as Coast Guard Regulations.

1.1 Key Project Personnel and Organization

The table below presents Key Project Personnel and Responsibilities and established responsibility for site safety and health. Aqua Survey is responsible for the overall direction and implementation of health and safety for this project.

Name	Responsibility
James Nickels	Project Manager
Mark Padover	Field Team Leader for ASI

1.2 Site/Project Background

Aqua Survey, Inc. of Flemington, NJ (ASI) has been contracted to conduct a hydrographic survey of approximately a 1000-foot section the Lower Passaic River within the Harrison Reach.

1.3 Scope of Work

ASI will conduct the hydrographic surveys using a 21 foot outboard Monark vessel with a boat mounted Innerspace Model 455 Fathometer transducer. A Trimble RTK GPS system will be used for positioning and Hypack Max will be used for data collection and navigation. For the coring work, ASI will be using a 26 foot inboard Monark vessel equipped with an electrically driven winch and davit assembly. During this phase of the operation the smaller Monark or a 15 foot john boat will be used to shuttle samples from the coring vessel to the shore based core processing area. ASI will be using licensed Coast Guard captains to operate their vessels.

2.0 Hazard Assessment

This section presents information regarding known and suspected chemical and physical hazards associated with the work areas, tasks and operations described in Section 1.3 of this Plan. Measures to control the hazards presented below can be found in Sections 3.0, 4.0, and 5.0 of this Plan.

2.1 Hazard Assessment

This section provides an assessment of the hazards that may be encountered during work activities. The following potential hazards have been identified.

- hazards associated with working on or near water;
- physical hazards associated with the use of heavy equipment;
- noise exposure;
- slipping/tripping hazards;
- physical restrictions and burdens imposed by use of personal protective equipment;
- heat stress;
- cold exposure; and,
- working over water

2.2 Chemical Hazards Health Hazards

No chemical hazards have been identified at this work site and are not expected, based on previous work at the site.

2.3 Physical Safety Hazards Safety Hazards

2.3.1 Biological Hazards

Because the work will take place on water, no significant biological hazards are expected to be encountered.

2.3.2 Specific Task Hazards and Exposure Potential

Inhalation Exposure

Based on the nature of proposed field activities (i.e., hydrographic survey) the potential for dust exposure is considered to be negligible. Therefore, no dust suppression techniques are anticipated. However, field personnel may potentially be exposed to organic vapors during collection of sediment samples from the vibracore. The potential for inhalation of vapors is expected to be low since sediment samples will be wet.

Noise Exposure

Work may be conducted in areas where operation of heavy equipment may generate high noise levels. In accordance with OSHA Regulations 29 CFR 1910.95, hearing protection will be used when noise levels exceed 85 dBA over an 8-hour day. Hearing protection is required to be worn for exposures of greater than 100 dBA for any length of time. In the absence of instrumentation, an appropriate rule of thumb is that when normal conversation is difficult at a distance of 2 to 3 feet, hearing protection is required. The Site HSC will monitor noise levels on an “as needed” basis using a standard sound level meter to provide information relative to compliance with OSHA requirements.

Slipping/Tripping Hazards

Working in and around the site will pose slip, trip and fall hazards due to the presence of uneven terrain, steps, or slippery surfaces.

Working Near Heavy Equipment

The potential may exist for physical injury, resulting from contact with heavy equipment that may be used during the field activities (ie. Trailer and Boat Lauch). Field personnel should be aware of the presence of these hazards and take steps to avoid them.

Working on Water

All vessels will contain US Coast Guard required safety equipment (life vests, fire extinguishers, etc.) and all survey personnel will be wearing work vests during survey operations.

3.0 Hazard Monitoring and Control Training

3.1 Initial Level of Protection

Based on the existing information, initial field activities at the Site will be conducted in Level D protection for non-intrusive work .

3.2 Initial Monitoring

Noise level testing (using a standard sound level meter) will not be conducted to evaluate baseline conditions with respect to OSHA action levels. Due to the nature of the Site, industrial location, and nature of the field activities that will not involve disturbance of soils, no dust monitoring is anticipated.

All personnel involved in the conduct of this program have completed the 40-hour hazardous waste site training, annual 8-hour refresher course, and appropriate medical monitoring in accordance with CFR 1910.120. ASI also has some personnel that have completed the 8-hour supervisor training course. Training certifications for all possible ASI site workers are attached as an appendix.

4.0 Personal Protective Clothing and Equipment (PPE)

Each field member is expected to bring clothing appropriate to the weather and task to minimize the hazards of exposure and heat or cold stress.

5.0 Medical Surveillance

All scientific crew have had the appropriate medical monitoring in accordance with CFR 1910.120 for this program. No site-specific medical monitoring is required.

6.0 Site Control Measures

No site specific zones will be established.

7.0 Decontamination Plan

There will be no need for a Decontamination Plan for this project

8.0 Investigation Derived Waste Management Plan

There will be no derived waste for this project

9.0 Other Hazard Control Measures

Site- and situation-specific hazard control measures shall be identified and incorporated as revisions or addenda to this HASP, as required.

10.0 Enforcement of the HASP

To protect all personnel visiting ASI field site activities from any adverse health effects that may result from those site activities, all employees, contractors, and visitors to the work site are required to follow the requirements of this plan. All personnel involved with the investigation will check in with the Field Manager prior to site entry.

11.0 Emergency Response Plan

For all Health and Medical Emergencies, Aqua Survey personnel, who had been equipped with cell phones, will notify 911 Operators with details germane to the specific emergency. All Aqua Survey personnel will be informed, prior to the initiation of work, of the exact street address/work location, so that they can efficiently dispatch emergency teams to the site.

Fire or Explosion:

Turn off all motorized equipment; evacuate the work area; meet at designated upwind assembly area (to be assigned on a daily basis).

Equipment Failure:

If any other equipment on-site fails to operate properly, the Field Manager shall be notified, and they shall determine the effect of this failure on continuing operations on site. If the failure affects the safety of personnel or prevents the proper completion of the tasks described in the work plan, all operations will be secured, and all personnel shall cease activities until the situation has been evaluated and appropriate actions taken.

(S)Company Shared\HASP\Site Specific HASP - Generic

Appendix A

Aqua Survey, Inc.

Geophysical Surveys Work Plan

WORK PLAN
Geophysical Surveys

Characterization of the Pilot Study Area
For the Environmental Dredging Demonstration
And Sediment Decontamination Technology Demonstration
Treatability Study

Prepared for

TAMS/EARTHTECH
TAMS Consultants, Inc.
300 Broadacres Drive
Bloomfield, NJ 07003

Prepared by

Aqua Survey, Inc.
469 Point Breeze Rd.
Flemington, NJ 08822

December 29, 2003

WORK PLAN
GEOPHYSICAL SURVEYS
PASSAIC RIVER PROJECT

1. INTRODUCTION

This Work Plan/Quality Assurance Plan has been developed for the hydrographic and side-scan sonar survey of the Lower Passaic River within the Harrison Reach. This work plan design will document a technically defensible approach to meeting the study objectives. This study design will have sections which discuss 1) the purpose and objectives of the study; 2) methods, and scope of the study area including boundaries; 3) equipment and data collection design and 4) data results and deliverables.

The quality assurance section has been developed in order to ensure that the data collected are of sufficient quality to justify the conclusions of the study.

2. OBJECTIVES

Aqua Survey, Inc. of Flemington, NJ (ASI) has been contracted to conduct a hydrographic and side-scan sonar survey of an approximately 1000-foot section of the Lower Passaic River within the Harrison Reach. The objectives of this surveying study are two fold:

1. Supply a detailed hydrographic survey of the Passaic River bed in the specified Work Area, to decision makers in order to finalize future study area of approximately 100 x 75 yard grid for pilot sediment coring, dredging and decontamination project.
2. Use hydrographic data to support dredge volume calculations and post dredge surveys.

3. METHODS

The survey work will be within the Harrison Reach as shown on Figure 1. The survey area will include the entire river bottom to the mean low water (MLW) line along each shoreline and extend 1000 feet along the river centerline.

3.1 Preplanning

Prior to the commencement of fieldwork, the New Jersey Department of Transportation (NJDOT) will provide a geo-referenced base map to Aqua Survey, Inc. Using Hypack Max, (a PC-based Windows program for planning, conducting, editing and publishing hydrographic surveys), survey lines will be created perpendicular to the shoreline. Survey lines will be spaced at intervals of 25 feet for the hydrographic and 50 feet for the sidescan survey.

A vertical control will be established in the survey area using a United States Geological Survey (USGS) benchmark as a reference point. The elevation will be transferred to a tide gauge positioned inside the study area using a surveyors level. The vertical datum will be set to the National Geodetic Vertical Datum of 1929 (NGVD 29).

3.2 Survey equipment

Hypack Max will be used during the survey to display survey vessel positioning and to correlate and record fathometer and positioning data. The geo-referenced base map will be displayed as a background file during the survey to allow ground truthing of the map.

A Trimble real-time kinematic global positioning system (RTK GPS) will be used for vessel positioning. This system is capable of 1-centimeter horizontal and 2-centimeter vertical accuracy. Positioning data will be recorded in both geographic NAD83 and New Jersey State Plane feet NAD 83. The Trimble 5700 dual frequency GPS receiver will be set as a base station over the established vertical control point. The Trimble 5700 receiver will communicate via radio modem with a Trimble MS750 dual frequency RTK GPS receiver mounted on the survey vessel. Technical specifications on the Trimble RTK System can be located in Appendix A.

An Innerspace Technologies 455 (IT-455) single beam survey fathometer will be used to collect sounding data. The sounder will be calibrated at the beginning of each day to compensate for variations in the speed of sound in water and transducer mounting depth using a standard bar check. Calibration will be confirmed at the end of day with another bar check. The IT-455 is capable of 0.1-foot resolution. The RTK GPS antennae will be mounted to the top of transducer mounting pole to eliminate potential positioning offset errors. Sounding data generated by the IT-455 will be recorded internally and output to the computer and recorded using Hypack Max survey software. Technical specifications on the Innerspace Model 455 can be located in Appendix B.

A Marine Sonics Centurion side-scan sonar system will be used with a 600 khz towfish. This is a high-resolution side scan sonar system designed to locate large and small objects underwater as well as display bottom information used for biological research and survey operations. The system provides a near photographic sonic image, regardless of underwater visibility, and employs a state of the art personal computer (PC) for all control, display, analysis and storage functions. This unit will be interfaced with the GPS receiver to allow target locations to be accurately determined. Technical specifications on the Marine Sonics Centurion system can be located in Appendix C.

3.3 Data collection

Survey data collection will begin once the surveyor has completed the preplanning stage and has satisfied the accuracy requirements with calibration checks. The survey vessel will begin data collection and continue until the entire study area has been covered.

4.0 RESULTS

Data will be processed using the Hypack Max single beam editor utility to examine data from each line individually. This will ensure there are no anomalous readings. The data will be sorted using Hypack Max to eliminate overlying soundings. The sorted sounding data will be exported as an ASCII data file containing Easting, Northing, and depth data. This data file will be imported into the geo-referenced NJDOT AutoCAD 2000 base map using Quicksurf 2000 software. Each sounding will be placed in three-dimensional model space in its true x, y, and z datum coordinates. Quicksurf 2000 will be used to depict the soundings as a point plot showing depths to the nearest 0.1-foot as well as to produce contours of the data at 1 foot intervals. The contours will be labeled at 5-foot intervals.

A graphic scale will be created which relates Mean Low Water to Mean Lower Low Water to Mean Sea Level 1929 to Mean High Water to Mean Higher High Water.

Two copies of the final drawings will be submitted in plan view showing approximately 1000 feet of riverbank at scales of 1-inch equals 50-feet and 1-inch equals 100-feet. A cd-rom will be created containing survey files in AutoCAD 2000 format. The data will be positioned in NJ State Plane grid and NGVD 1929. Hydrographic and topographic data will also be submitted in an ASCII text file. These data points shall be provided as Land Development Desktop (LDDT) standard point blocks, in ASCII, comma-delineated PENZD (Points, Easting, Northing, Elevation, and Description) format with attributes properly valued.

A metadata file for all geospatial data associated with the production of the survey drawings shall be submitted on the CD-ROM as well. The metadata file shall be formatted to comply with the Federal Geographic Data Committee content standards for Digital Geospatial Metadata, version 1.0 or higher.

5.0 QUALITY ASSURANCE

This section describes the quality assurance procedures that will be implemented as part of the Hydrographic Survey of Harrison Reach. These procedures are designed to ensure that the results of the meet the following survey requirements:

- Elevation – 0.5 feet
- Horizontal position – 1.75 feet

Throughout the survey, calibration checks will be conducted to check that the horizontal and vertical requirements are met. The sounder will be calibrated at the beginning of each day to compensate for variations in the speed of sound in water and transducer mounting depth, using a standard bar check. Calibration will be confirmed at the end of day with another bar check. RTK positioning will be calibrated at the beginning of the day by checking horizontal and vertical positioning against a known control point. The RTK system will also be compared to a local tide gauge to further ensure data quality.

Mr. James Todd, Vice President, will serve as the Program Manager and will coordinate scheduling (internal and subcontracting). Mr. Todd will be responsible for allocating company resources necessary for project completion and will also serve as point of contact with TAMS.

Mr. James Nickels, Director of Marine Operations for ASI, will be Project Manager for all survey and field crews and will coordinate all field related items for the completion of the project.

Mr. Steve Brodman, and/or Mr. Mark Padover will serve as Field Team Leaders. They will be responsible for the pre-planning, collection, processing and delivery of all data for this project.

APPENDIX A

Receiver

Advanced Dual Frequency GPS and WAAS/EGNOS receiver system with integrated UHF radio modem.

GENERAL

- Tough, lightweight magnesium alloy casing
- Fully integrated internal radio modem fully sealed
- Compact flash data storage expandable up to 96MB
- Integral USB (Universal Serial Bus) for ultra fast download
- Up to 10 hours continuous receiver operation on 2 internal miniature camcorder batteries
  - Tripod clip or integrated base case
  - Mount rover on-the-pole, in a belt pouch or in a backpack
- Front panel for control of power, data logging& formatting of compact flash cards, ephemeris and application file deletion and restoring default controls. Panel indicators for satellite tracking, radio link operation data logging and power monitoring
- Low power consumption

PERFORMANCE SPECIFICATIONS

Measurements

- Advanced Maxwell 4 Custom Survey GPS Chip
- High precision multiple correlator L1 and L2 pseudorange measurements
- Unfiltered, unsmoothed pseudorange measurements data for low noise, low multipath error, low time domain correlation and high dynamic response
- Very low noise L1 and L2 carrier phase measurements with <1mm precision in a 1Hz bandwidth
- L1 and L2 Signal-to-Noise ratios reported in dB-Hz
- Proven Trimble low elevation tracking technology
  - 24 Channels L1 C/A Code, L1/L2 Full Cycle Carrier, WAAS/EGNOS.

Code Differential GPS Positioning [7]

Horizontal: 0.25m + 1ppm RMS
Vertical: 0.50m + 1ppm RMS
WAAS differential positioning accuracy typically <5m 3DRMS[1]

Static and Fast Static GPS Surveying [7]

Horizontal: ±5mm + 0.5ppm RMS **Vertical:** ±5mm + 1ppm RMS

Kinematic Surveying [7]

Real Time and Post-Processed Kinematic Surveys.
Horizontal: 10mm + 1ppm RMS
Vertical: 20mm + 1ppm RMS
0.02 seconds (20 millisecond) latency
Initialization Time: Single / Multi-Base eRTK™ min 10 secs + 0.5 times baseline length in km, up to 30km
VRS initialization time <30 seconds typical any where within coverage area

Initialization Reliability: Typically >99.9%[2]

eRTK Wide Area Coverage

- Conventional RTK typical coverage 300sq km (115 sq mi) per base
  - Single Base eRTK up to 1,250 sq km (500 sq mi)[3]
  - Multiple Base eRTK up to 3,750 sq km (1500 sq mi)[3, 4]
  - Virtual Reference Station eRTK 8500+ sq km (3300 sq mi)[3, 5]

HARDWARE

Physical

Casing: Tough, lightweight fully sealed magnesium alloy IPX7 for submersion to
Waterproof: depth of 1 meter Will survive a 1 meter drop onto
Shock: concrete; shock and vibration tested to 40G random, passes testing per MIL-STD-810F, FIG. 514.5C-17
Weight: With internal batteries, internal radio, internal battery charger, standard UHF antenna: 3 lb. (1.4kg)
As entire RTK Rover with batteries for 7 hours, less than 4kg (8.8lb)

Electrical

Power: DC input 10.5 to 28V with over voltage protection
Power Consumption: 2.5 Watts receiver only, 3.75 Watts including internal radio
Battery: Approximately 10 hours postprocessed, 7 hours RTK (with two internal miniature batteries)
Battery weight: 0.1kg (1.6oz)
Battery charger: Internal with external AC power adapter; no requirement for external charger
Power output: 10.5V - 20V (Port 1), 10.5V - 27.5V (Port 3)
Certification: Class B Part 15 FCC certification and CE Mark approved Environmental
Operating Temp: -40° to +65° C[6] (-40° to +149° F)
Storage Temp: -40° to +80° C (-40° to +176° F)
Humidity: 100%, condensing

COMMUNICATIONS AND DATA STORAGE

- 2 external power ports, 2 internal battery ports, 3 serial ports, 1 USB
  - Integrated USB for data download speeds in excess of 1 megabit per second (10 times faster than even the fastest serial port)
  - Compact Flash - advanced lightweight and compact removable data storage. Options of 48Mb or 96Mb from Trimble
  - More than 2,500 hours continuous L1+L2 logging at 15 seconds with 6 satellites typical. (96Mb)
  - Fully integrated, fully sealed internal UHF radio modem option
  - GSM, Cell Phone and CDPD modem support for eRTK and VRS operation
  - Range pole antenna for eRTK Wide Area Real Time Kinematic. For long range UHF communications without interference to GPS antenna phase center
  - Dual event marker inputs
  - 1Hz, 2Hz, 5Hz and 10Hz Positioning and Data Logging
  - 1 Pulse Per Second Output
  - CMRII, CMR+, RTCM 2.1 Input and Output Standard
  - 10 NMEA outputs

Trimble.

- Dimensions: 16.2cm (6,4") diameter x 5.7cm (2.25") maximum depth
- Weight: 0.45kgs,1lb
- Operating temperature range -40 to +70 C (-40°F to 158°F)
- 100% humidity proof, fully sealed
- The GPS antenna meets the following environmental standards:
  - MIL-810-F Figure 514 5c-17 vibration levels on each axis
  - Shock tested to MIL-810-F Table 516.5-I to survive a 2m (6.56ft) drop
- 4-point antenna feed for sub-mm phase center repeatability.
- Integral Low Noise Amplifier
- 50dB antenna gain
- Phase Center Repeatability <1mm horizontal.

ZEPHYR GEODETIC ANTENNA

- Dimensions: 34.3cm (13.5") diameter x 7.6cm (3") maximum depth
- Weight: 1.0kgs 2.2 lbs
- Operating temperature range -40 to +70 C(-40°F to 158°F)
- 100% humidity proof, fully sealed
- The GPS antenna meets the following environmental standards:
  - MIL-810-F Figure 514 5c-17 vibration levels on each axis
  - Shock tested to MIL-810-F Table 516.5-I to survive a 2m (6.56ft) drop
- Shock tested for a drop of 2 meters (6.56ft)onto concrete
- 4-point antenna feed for sub-mm phase center repeatability.
- Integral Low Noise Amplifier
- 50dB antenna gain
- Trimble Stealth™ Ground Plane for reduced multipath
- Phase Center Repeatability <1mm horizontal.

1 Depends on WAAS system performance
2 May be affected by atmospheric conditions, signal multipath and satellite geometry
3 May require cellular telephone coverage
4 Based on configuration of 3 stations at 40km spacing 5 Based on configuration of 6 stations at 70km spacing
6 Receiver operates normally to -40 but some office based functions such as USB download or internal battery charging are not recommended at temperatures below freezing. 7 Accuracy may be subject to conditions such as multipath, obstructions, satellite geometry, atmospheric parameters. Always follow recommended survey practices. Specifications subject to change without notice

Trimble.

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APPENDIX B

INNERSPACE

SURVEY DEPTH SOUNDER
MODEL 455

DESCRIPTION

The Innerspace Technology Model 455 Survey Depth Sounder provides analog and digital depth on high resolution LCD display screens. The small, lightweight unit is ideal for use on small boats for hydrographic and GIS surveys, and also has applications on general purpose workboats and Corps of Engineers reconnaissance vessels. The 455 has most of the capabilities of Innerspace's legendary thermal printing depth sounder recorders, except for the thermal chart recording, plus it has many new features. Designed with the operator in mind, the easy-to-use menu is controlled via up / down, left / right arrows; no numerical entries are required and, when power is turned off, all entries are saved for next power on. In the operation mode, operator entries are always in view on the LCD display screen, along with the large numeral, digitized depth. The 455's analog display provides a continuous, high resolution bottom profile with alphanumerical annotation of pertinent information including: Speed-of-Sound, Tide, Draft, Time and Fix Number. For a hard copy, a screen print of the analog data may be sent to a standard computer printer or it can be stored internally on a 24 or 48 mb integrated circuit for later recall.

SPECIFICATIONS

GRAPHIC DISPLAY

- 640 x 480 Pixel Monochrome Transflective LCD with Backlight and Contrast Control
- 5 ¾ in. x 4 ¾ in. viewing area
- Emulates paper chart recorder

NUMERIC DISPLAY

- 4 lines x 40 characters with large 1 in. high numerics and Backlight

OPERATION

- Menu driven parameter selection on alphanumeric display

PARAMETER SELECTION

- Speed-of-Sound, Tide, Draft, Gate Width, Scale, Backlight, Com Ports and many more

RESOLUTION

- .1 Unit graphic and numeric

DEPTH RANGES

- 0-45, 40-85, 80-125, 120-165, 160-205 Feet or Meters (dm and cm selection)
- Multipliers: 1, 2, 10
- Auto Ranging

ANNOTATION

- LCD graphic display numerically displays Speed-of-Sound, Tide, Draft, Date, Time, Depth, Fix number and GPS Data

TRANSMITTER

- Front panel switch selectable power levels: 250 watts to 10 watts in 4 levels

RECEIVER

- Time varied automatic gain adjustment under microprocessor control 20 or 30 Log
- Front panel manual gain control 20db
- Adjustable Blanking

DIGITIZER

- Range Gated (selectable widths)
- Initial Depth Entry
- 4 Modes of Operation
- Gate Mark on Graphic Display

UTILITIES

- Depth Simulator
- Chart Speed
- Screen capture to memory

INPUTS/OUTPUTS

- RS232 Port A
- RS232 Port B
- RS232 Port C
- Parallel Port
- Keyboard and VGA Port
- GPS Antenna with GPS option
- Floppy Port

TRANSDUCER

- 200kHz 8°
- Optional: 200kHz 3°

POWER

- 12VDC, 2½ Amp

ENCLOSURE

- Drawn aluminum case
- Aluminum panel painted to resist corrosion.
- Removable handle and soft carry bag included.

OVERALL SIZE

- 13 in. Wide x 9 in. High x 9 in. Deep
- 38.1 cm Wide x 22.86 High x 22.86 Deep

WEIGHT

- 15 lb.
- 6.8 kg

OPTIONS:

- Heave sensor
- Remote VGA display
- Tabletop / overhead mounting bracket
- Custom annotation (1 Line 40 Characters)
- Remote readout (large numeric)
- Continuous analog storage, 48mb
- AC power supply
- Portable transducer mounts
- Floppy Disk Drive in travel case
- Mini keyboard (89 key) and adapter cable
- 125 kHz transceiver and transducer 125kHz 7º
- Laplink software
- Color graphic display

Operator's Manual - A detailed operator's manual is shipped with each system. The manual provides information regarding sonar operations, system setup and testing, the Sea Scan® PC Software, and the Sea Scan® PC Review Program.

Shipping /Storage Cases - Rugged shipping/storage cases are provided with each system except the AUV/ROV systems, which are shipped in protective cartons. The cases contain foam inserts, which provide increased shock protection during handling and shipping.

Limited Warranty -All equipment provided by Marine Sonic Technology, Ltd. is warranted to be free from defects in materials or workmanship for a period of (1) one-year from the date of the original purchase. This warranty covers the original purchaser and is not transferable. The warranty does not cover damage or loss due to abuse or improper handling/operations. Warranty repairs are normally performed at the factory but in some instances local area representatives may make repairs. The cost to return equipment for warranty repairs is the responsibility of the customer.

OPTIONAL EQUIPMENT

Extended Limited Warranty – MSTL is now offering an Extended Limited Warranty Plan that can extend the warranty period up to THREE YEARS from the date of purchase. This is a very cost-effective way of adding increased system protection.

Maintenance and Service Plan – This plan provides yearly preventive maintenance checks/services and warranty repairs when required. Depending on the plan selected maintenance and warranty coverage can be extended out to FOUR YEARS. This plan insures that the system is operating at peak performance at all times.

On-Site Training – On-site training packages, that include both classroom and on-water training, are available and can be tailored to meet specific customer needs. With on-site training, classroom and training boat are the responsibility of the customer.

On-Water Training - MSTL offers an on-water training option that provides the customer with hands-on experience operating the system under the supervision of MSTL personnel. The training is conducted in local Virginia waters aboard MSTL's 36-foot "Sonic Boom". Training includes system setup and testing, discussion of various tow point options, proper boat towing procedures, winch operations, regulating towfish depths, emergency towfish recovery, and side scan search procedures.

GPS – The "Centurion" Splash Proof system comes standard with two GPS systems. The first is a small waterproof Garmin "eTrex" Legend GPS system, which provides an accuracy of approximately 15 meters. The Legend is also WASS capable and if a WASS signal is received accuracy is less than 3 meters. The second is a JRC D/GPS system, which will provide accuracy in the 3-5 meter range. The accuracy listed is dependent on weather conditions and satellite reception.

Stand Alone GPS/DGPS Receivers – Several different GPS or DGPS options are available as stand alone systems for the Portable and Desk Top systems. These units can input navigational information to the Sea Scan® PC, autopilots, digital charts, plotters, and other marine instruments.

Splash Proof Battery Box – The Splash Proof System can be ordered with a self-contained battery box that provides a 12 VDC power source for 8 hrs of scanning operations. The battery box contains a charger and four 12 VDC closed cell batteries.

Removable Media Discs – Desktop models include a built in a R/RW CD drive capable of storing up to 650 MB and a 3.5" internal drive. With the R/RW CD drive the customer can quickly transfer large quantities of image data to other computers for analysis or archive purposes. Since the Sea Scan® PC system operates in a PC, virtually any mass storage device available will interface with the system.

Additional Towfish – One single frequency towfish comes standard with each towed system. Additional frequency towfish should be considered to maximize the capabilities of the system and to provide a backup in case of loss or damage to the primary towfish. A combination that works well together is to have a long-range towfish (150 – 300 kHz) and a high-resolution shorter-range towfish (600, 900 or 1200 kHz). It takes only a few minutes to retrieve and change to a different towfish.

Spare Towcables – Two cables (100-meter and 30-meter) come standard with each towed system. When scanning depths are greater than 50-meters, a cable length longer than 100-meters is needed. Cable lengths up to 800-meters are available, depending on the transducer frequency being used.

12 VDC to 115 VAC Inverters – Several of the Sea Scan® PC systems require 115 or 230 VAC power from either an onboard generator or a DC to AC inverter. High quality inverters are available, which are fully tested for noise free operation.

Analog Output – In certain situations a real time hard copy printout of the images is desired. MSTL offers an analog output capability for operation with a paper recorder on our Desk Top and Portable systems. This option is not available with the Centurion ™.

SEA SCAN® PC SYSTEM FEATURES:

All sonar functions, regardless of the Sea Scan® PC system, are software controlled. The features listed below apply to all systems manufactured by MSTL.

Controls:

- **Power** – Selectable on/off
- **Acoustic Range Scales** - 5, 10, 20, 50, 75, 100, 150, 200, 300, 500 meters (Range listed is out from each side of the transducer. Multiply x 2 to determine total swath scanned). Additional ranges of 30 and 40-meters are available where the PC 104 card is installed.
- **Magnetometer Range Scales** (Only applicable to MagScan System) -1/10, 1/20, 1/50, 10/50, 10/100, 20/100, 50/500, 100/500, gamma per division.
- **Display Color Scales** - Gray, Brown, Bronze, Gold, Mixed, HSV, Hot, Pink, Cool, Bone, Jet, Copper, and Custom. All color scales can be viewed inverted.
- **Time Gain Compensation** (TGC) – Automatic or manual.
- **Speed Control** – Automatically controlled with GPS/DGPS input or manual input.

- **Zoom –** Click and drag zoom window or centered. Both support multiple zooms.
- **Length Measurement –** Distances measured on images in feet, yards, or meters.
- **Area Measurement –** Areas measured in square feet, yards, or meters.
- **Height Measurement –** Shadows created by objects, displayed in the images, can be triangulated to determine height above the sea floor.
- **Channel Selection –** Displays either left or right channels or both left and right channels.
- **Annotations –** Notes regarding details of observed images can be added to images in real time or during post processing analysis.
- **Markers –** Objects in the acoustic image or anomalies in the magnetometer strip chart can be marked in the plotter, which stores the target location, target height, water depth and the magnetic field of information for post analysis. All data is stored in a text file
- **Event Markers –** Event markers can be input by an external source via the serial port or automatically by the system software using selectable ranges.
- **Range Delay –** Range scales can be delayed to eliminate the water column or offset range for optimum viewing/collection.
- **Navigation Plotter –** The integrated full-featured navigation plotter correlates all acoustic information to geographic positions. Up to 100 navigation waypoints can be entered into the plotter. Objects in the acoustic image can be quickly transferred to the plotter. Plotter information can be displayed simultaneously and overlaid on the sonar image in real time.
- **Filter –** More than 50 mathematical filters are available to enhance the acoustic images. These filters are located in the Sea Scan® PC Review Program.

Inputs

- **Desktop Systems –** Operate on either 115 or 230 VAC.
- **Portable and MagScan® Systems –** Operate on either 115/230 AC and/or 12 VDC. Operating voltage depends on the model selected.
- **"Centurion" Splash Proof**- Operates on 12 VDC.
- **AUV and Submerged Systems –** Operate on voltages from 10 to 36 VDC (5.5 amps at 12 VDC, 2.5 amps at 24 VDC)
- **Navigation Input –** Accepts a NEMA 0183 stream from the GPS/DGPS.
- **Analog Inputs –** The towfish provides analog image data that is converted, displayed and stored as digital data.
- **Host/Remote Control –** This feature allows the system, installed in an AUV/ROV, to be controlled from a remote computer using a standard serial port communication.
- **Fathometer –** Water depth data can be input into the system from a Fathometer outputting a NEMA 0183 depth information string. This information can be inputted into the computer from the Fathometer through a standard serial port communication. The depth data can be displayed onscreen overlaid on the image.
- **Event Markers –** Either the operating system or an external source using the standard serial port communication can enter event markers.

Outputs

- **Acoustic Data –** All acoustic data is stored digitally in a MST file format.
- **TIFF Files –** Images can be converted to the standard TIFF file format from the Sea Scan® PC Review Program for use in publishing programs.
- **Navigation Data –** All navigation information is stored digitally in the SVY (Survey) file format (text file).

- **Fathometer Data –** All Fathometer data is stored digitally in the DPT (Depth) file format (text file).
- **Marker –** All marker information is stored digitally in the MKR format (text file).
- **Magnetometer Data –** All magnetometer data is stored digitally in the MAG file format (text file).
- **Printer –** Images can be printed from any PC compatible printer.
- **Analog Output –** As an option, analog output can be provided so that real time, hard copy images can be printed during scanning operations.

Appendix B
Aqua Survey, Inc.
Field Sampling Plan

FIELD SAMPLING PLAN
Lower Passaic River Remediation Project

Characterization of the Pilot Study Area
For the Environmental Dredging Demonstration
And Sediment Decontamination Technology Demonstration
Treatability Study

Prepared for

TAMS/EARTHTECH
TAMS Consultants, Inc.
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Prepared by

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December 29, 2003

1. INTRODUCTION

This work is part of the Lower Passaic River Investigation and Feasibility Study, a joint effort of Federal and State Agencies to remediate and restore the Lower Passaic River Basin. The purpose of the overall Feasibility Study is to develop a comprehensive watershed-based plan for the remediation and restoration of the Lower Passaic River. During this pilot-scale demonstration project, approximately 3,000 to 5,000 cubic yards of contaminated sediment will be dredged from the Harrison Reach of the Passaic River near the Diamond Alkali Superfund Site. As part of this demonstration project, ASI will collect sediment cores from the Harrison Reach of the Passaic River. The goal of the coring effort is to obtain sediment material characteristic of the upper 4 to 5 feet of the Passaic River bed in the specified Work Area.

This Field Sampling Plan was prepared in general accordance with the NJDEP document *The Management and Regulation of Dredging Activities and Dredged Material in New Jersey's Tidal Waters* (NJDEP, 1997) and other NJDEP regulations. In addition to this guidance, specific U.S. Army Corps of Engineers (USACE) documents and best professional judgment were used to prepare this plan.

2. LOCATION OF SEDIMENTS TO BE DREDGED

The Work Area shall be within the Harrison Reach as shown on NOAA Navigation Chart No. 12337 and shall encompass an area of approximately 1 to 2 acres in size with dimensions of approximately 75 x 100 yards. The Work Area will contain water depths in the range of four to fifteen feet. The actual coring locations will be selected after the hydrographic survey has been completed based upon the bottom topography and generally in accordance with **Attachment 1 - Sediment Coring Grid.** The sample sites will be located within the pilot study survey area shown on **Attachment II (Study Area Map).**

3. FIELD SAMPLING ACTIVITIES

The sediment sampling procedures will be conducted in accordance with the *Dredging Activities and Dredged Materials Manual* (NJDEP, 1997) and the *Field Sampling Procedures Manual* (NJDEP, 1992).

Samples will be collected from 26-foot commercial workboat using an electric vibracorer fitted with a 4" OD steel barrel. Samples will be collected at 15 locations. Based upon the sample volume requirements more than one core may need to be collected from each location. The location of each sample site will be determined from by Global Positioning System (DGPS). Horizontal position of the coring locations should be obtained using global positioning methods (GPS) accurate to 1 meter or less horizontally. The coordinates shall be reported in horizontal datum NAD 83 and NJ State Plane feet and vertical datum NGVD 1929.

4. FIELD SAMPLING PROCEDURE

ASI will position the sampling vessel at the location to be sampled. This location will be confirmed by examining the site map, bathymetry survey, landmarks, and the coordinates for the location. Lat/long coordinates will be recorded using (DGPS). Sample number, water depth, stage of the tide, time and the weather conditions will also be recorded at each location. Differential GPS will be used with an accuracy of ± 3-4 meters.

All cores will be collected to a depth of 4 feet below the sediment water interface. No adjustments to the required core length will be made based upon tide stage, overdepth or other factors.

A new Lexan, rigid liner, will be placed inside the core tube. The core liner and core catcher, will be assembled and attached to the vibracorer head as per manufacturers' directions. A confirmation will be made that the check valve has a tight seal and no debris is present. A stainless steel cone and core catcher will then be attached to the bottom of the core tube.

The core will be considered complete when the desired depth is reached (with acceptable recovery) or when point of refusal is encountered. The point of refusal is defined as the depth at which no additional penetration can be obtained in a one-minute period. A recovery of 50 to 100 percent (core length/penetration) can be expected from most unconsolidated sediments (based upon various published data regarding compaction). For this project a minimum recovery of 60% will be required assuming a core catcher is used.

In the event that the required core is not successfully collected, the vessel will be moved within a 3-5 foot radius of the location and a second attempt made. If the proper length cores still cannot be obtained the longer of the two cores will be saved, unless otherwise directed by TAMS/ET.

As the unit is brought up out of the water, penetration depth is confirmed by visually inspecting the core tube for a mud line. This procedure helps to verify that the corer did penetrate into the sediment vertically. The vibracorer and core barrel are then hosed down with site water prior to bringing the unit on board and laying it down horizontally on the work platform. As soon as the core tube is extracted from the barrel the core tube containing the sediment sample will be place upright in a vertical position for processing and storage.

The excess water on the top of the core barrel will be decanted, and the liners cut, capped and tapped. Once drained, measure the length of core in decimal feet specified by starting from the top (zero depth) to the bottom of the core. If the core length is longer than needed, mark the outside surface of the liner at the appropriate lower point and cut the liner cap and tape to seal.

Cores will be held in a vertical position while on board the sampling vessel and will be stored in a cooler with either wet ice or Blue Ice®

5. DECONTAMINATION OF SAMPLING EQUIPMENT

While moving to the next location, the entire work area (when appropriate), equipment and outside surfaces of sample containers (buckets, etc.) are pressure washed.

Between sampling locations the core barrel will be cleaned with a washdown pump. Because of the direct contact with sample material, the core nose catcher assembly will be carefully washed with soap (Alconox) and water to remove any debris and then decontaminated using the following procedure:

- low residual phosphate free detergent wash with site water;
- rinse the core nose-catcher assembly with 10% nitric acid followed by a deionized (DI) water rinse;
- rinse the same parts with methanol or acetone (pesticide grade) as required, followed by a final DI water rinse;
- when new food grade HDPE liner material is used, no washing or decontamination is required except for cleaning of the core barrel as noted above.

6. FIELD OBSERVATIONS/LOGS

A visual examination of each of the cores will be conducted to determine if any significant differences in soil composition are observable based on changes in material color, composition, or texture. A field log of each core will be prepared with a basic description of the sediment characteristics noted. Included in these logs will be such things as sample ID, date and time of collection, northing, easting, water depth, and sediment penetration depth.

7. WASTE DISPOSAL

All wash-down (water) waste is drained overboard while on site. All decontamination chemicals are to be contained for proper disposal. All other waste will be collected and transferred to TAMS/ET at their on-shore processing facility for disposal.

8. SAMPLE TRANPORTATION

ASI will transport these samples to a nearby land-based processing station which shall be manned by TAMS/ET personnel. TAMS/ET staff will perform the following activities associated with each core: photo log, visual description, sample processing and homogenization, sample jarring, chain-of-custody and shipping documentation.

9. QUALITY ASSURANCE / QUALITY CONTROL

The appropriate documentation of sample collection, as well as maintenance of sample integrity is essential any sediment sampling project. Any and all pertinent information will be recorded on the appropriate data sheets and log books. All entries will be signed and dated. All raw data will be placed into the central file in the office in a timely manner. Photocopies of all cruise logs and personal laboratory notebooks containing data pertaining to the project in the central file.

Sample integrity is also critical to the success of the dredge project. Care will be taken to ensure that samples are labeled clearly and accurately in indelible ink. A double check will be performed to ensure that sample labels and all paperwork (chain-of-custody, receiving logs, core logs) match.

In the event of a deviation from this standard operating procedure, inform the Project Manager immediately. Corrective action will be taken as appropriate, up to and including re-sampling - if necessary. Deviations from SOP must be recorded in the project file. The QAU must be informed of all deviations from SOP.

The Quality Assurance / Quality Control (QA/QC) for this SAP will be conducted in accordance with those practices listed in Appendix A of the NJ dredging guidance manual (NJDEP, 1997). The sampling and analysis plan conforms to the general requirements of Appendix B. This section requires the collection of a field (equipment) blank at a frequency of 1 per 20 sample locations.

10. DOCUMENTATION / FIELD REPORT

ASI shall submit two copies of a summary report describing the operation and containing data tables and the original field logs. ASI will also provide a geo-referenced map showing each of the sampling locations. ASI shall provide an electronic file of the field data related to each core, including any unsuccessful attempts, within two weeks of the completion of the coring effort. The data shall be provided in a single data table with columns corresponding to each of the main field measurement variables. This includes but is not limited to sample ID, date and time of collection, northing, easting, water depth, sediment penetration depth, upper depth of segment, and lower depth of segment. This data shall also provide electronic files of the summary report itself in MS Word and in Adobe Acrobat format.

11. REFERENCES

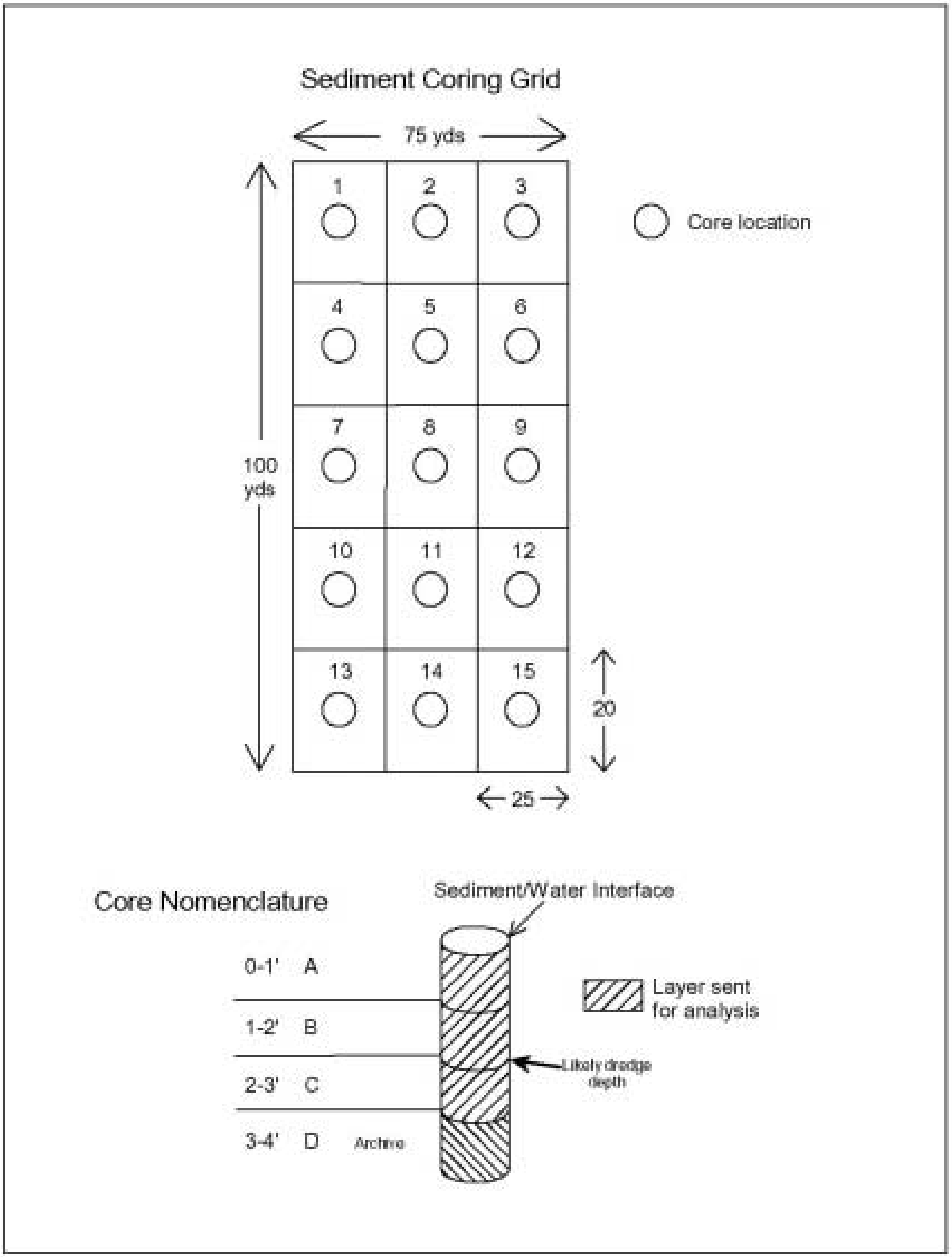
NJDEP (New Jersey Department of Environmental Protection). 1997. *The Management and Regulation of Dredging Activities and Dredged Material in New Jersey's Tidal Waters.* October, 1997.

NJDEP (New Jersey Department of Environmental Protection). 1992. *Field Sampling Procedures Manual.*

EPA/USACE. 1991. Evaluation of Dredged Material for Ocean Disposal (Testing Manual). Environmental Protection Agency/U.S. Army Corps of Engineers. U.S. Army Engineer Waters Experiment Station, Vicksburg, MS.

NYACE/USEPA. 1994. Guidance for Performing Tests on Dredged Material Proposed for Ocean Disposal. NY District Army Corps of Engineers, New York, NY and United States Environmental Protection Agency, Region II, Edison, NJ.

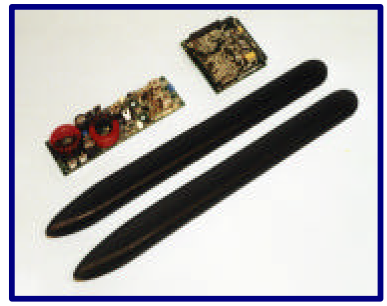
ATTACHMENT I
Sediment Coring Grid



ATTACHMENT II
Study Area Map

APPENDIX C

Marine Sonic Technology, Ltd.
5508 George Washington Memorial Highway
P.O. Box 730
White Marsh, VA 23183



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AUV and ROV System

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E-mail: mstl@marinesonic.com
WWW: www.marinesonic.com.

Sea Scan® PC Side Scan Sonar System Information/Specifications Sheet

GENERAL

Sea Scan® PC is a high-resolution side scan sonar system designed to locate large and small objects underwater as well as display bottom information used for biological research and survey operations. The system provides a near photographic sonic image, regardless of underwater visibility, and employs a state of the art personal computer (PC) for all control, display, analysis and storage functions. This sheet provides operating information and system specifications for all systems manufactured by Marine Sonic Technology, Ltd. (MSTL).

MSTL manufactures the Sea Scan® PC as a Towed System, AUV/ROV System, Submerged System, and as a combination Sea Scan® PC system and Geometrics Magnetometer known as the MagScan®. In addition, MSTL is a leader in custom side scan sonar applications, working with customers to meet their unique and demanding custom installations.

The towed system is MSTL's basic and most popular system. It is available in several different models with each providing near picture quality images, ease of operation, a powerful software package, dependability and affordability. MSTL also offers the Sea Scan® PC system components miniaturized for AUV/ROV applications. The system's electronics card is available as an ISA or PC104 card and the single and dual frequency transducers have been streamlined and miniaturized for AUV/ROV applications.

Two additional and unique side scan sonar systems produced by MSTL are the Submerged System (non-towed) and the MagScan® System (towed). The Submerged System was designed and developed to meet the requirements for a side scan sonar system, which could be operated underwater. A diver inside a wet underwater vehicle can easily operate the system.

FIELDWORKS Portable System

Submerged System

The second unique system is the MagScan ○, which is manufactured in conjunction with Geometrics®, Inc. This system combines, in one towfish, the Sea Scan® PC system and the Geometrics® G-880 magnetometer. This unique combination allows for collection and display of real time sonar images and magnetometer data on the same screen.

Sea Scan® PC systems are used worldwide by law enforcement agencies including the U.S. Customs Service, state and city police departments, sheriffs departments, fire departments, dive teams and naval military forces. Additional Sea Scan® PC systems are employed by treasure hunters, oil companies, diving and salvage companies, survey companies, and major universities for archaeological and biological research.

MSTL has designed and manufactured custom configurations to meet unique customer needs. Some special configurations completed are:

- U.S. Customs Service for detecting illegal drug shipments.
- Woods Hole Oceanographic Institution for use in autonomous underwater vehicle (AUV) research.
- Submerged system for wet underwater manned operations.
- A dual frequency (150-600 kHz) deep system for use aboard the U.S. Navy's research submarine NR-1.
- Several 600 kHz modular transducer sets rated to Full Ocean depth.

Sea Scan® PC is a registered trademark and U.S.Patents 5,142,502 and 5,142,503 cover all equipment.

SYSTEM DESCRIPTIONS

TOWED SYSTEMS

A complete Sea Scan® PC towed system consists of a personal computer, LCD flat panel display, keyboard, mouse, two specially designed towcables and a single frequency towfish. In addition, an operator's manual, small tool kit, asset of towcable line weights, five (5) hours of factory training and a one year limited warranty are part of the system. All components are shipped in rugged, foam lined, shipping containers. The system is covered by a one year limited warranty. A complete towed system with the shipping containers weighs, on average, 100 kg (220 lbs.).

The Sea Scan® PC towed system is available in three different configurations:

- A Desktop Sea Scan® PC system includes a rack mount case computer with Windows Me and an Intel™ based Pentium™ III processor or equivalent CPU. Additional features: 256 MB RAM, 60 GB hard drive, 3.5" floppy drive, internal R/RW CD drive, wireless mouse and keyboard, associated power cords and a 15" LCD flat panel monitor.
- A Portable Sea Scan® PC system includes a portable PC (SBS 904 or Fieldworks 8000) containing a CELERON/Intel™ Pentium™ processor with 32/64 MB RAM, a 30/6 GB hard

drive, 3.5”/CD Rom internal drive, mouse, keyboard, associated power cords and a color active display. Neither system is considered either “Splash-proof” or “Water-proof”.

- The “CENTURION” ○ Splash Proof Sea Scan® PC system, designed and manufactured by MSTL, includes a small rugged case containing a 233 MHz CPU, 128 MB RAM, a 20 GB hard drive, increased connectivity and network/USB compatible. The system comes with a keyboard and waterproof mouse, an external GARMIN “eTrex” Legend GPS plus a second JRC D/GPS system and external R/RW CD-ROM drive. The “CENTURION” ○ features a 10.4” daylight readable screen for easier target recognition and detection. All external connections are splash proof. The unit has been designed for open boat operations in a rain and seawater spray environment. The system normal operates from a 12 VDC battery source. Computer dimensions are 13” x 11” x 6” and weight is 12 pounds.

Towfish

Each of the Sea Scan® PC systems contain one single frequency towfish available in the following frequencies: 150, 300, 600, 900, or 1200 kHz. The towfish is certified to an operating depth of 300-meters (984-ft.).

- The fish is constructed of solid polyvinyl chloride (PVC) and other non-corrosive materials.

TOWFISH SPECIFICATIONS

kHz	150	300	600	900	1200
Length (m/in)	1.1/42	1.1/42	1.1/42	1.1/42	1.1/42
Diameter (cm/in)	10.2/4	10.2/4	10.2/4	10.2/4	10.2/4
Weight in air (kg/lbs.)	16.8/37	15.9/35	15/33	15/33	15/33
Pulse Length (μsec/cycles)	33/5	20/6	10/6	6.7/6	5/6
Typical Range Resolution – (cm/in)	58/23(300)	29/11.4(150)	9.7/3.8(50)	7.8/3(40)	3.9/1.5(20)
Axial Resolution – aperture size (cm/in)	61/24	61/24	30.5/12	22.9/9	15.2/6
Typical Maximum Range (meters)	400-500	200-300	100	40	20

Towcables

- A 100 and 30-meter cable are standard with the towed system. Optional lengths are available up to 800 meters depending on the transducer frequency operating with the cable.

- The cable is constructed using three custom coaxial cables and a 545-kg (1250 lbs.) braided Kevlar ™ strength member covered by either a polyurethane or polyethylene outer jacket to a nominal cable diameter of approximately 0.36” or less.

- 100-meters of cable weighs 9.1 kg (20 lbs.) in air, 4.1 kg (9 lbs.) in water.

- The minimum safe bending radius is 13 cm (5 in.)

Towcable Line Weights

- A set of towcable line weights is a part of each towed system that enables the towfish to achieve greater operating depths. The weights are easily attached to the towcable through the use of two large electrical ties. The weights work best when placed on the cable 8 to 10 feet in front of the towfish

Maintenance

- The Sea Scan® PC system is virtually maintenance free. After use in saltwater the towfish, cable, and wet end connectors should be flushed with fresh water to reduce salt buildup. During cable/towfish hookup the wet end connectors should be sprayed with WD 40 to lubricate the "O" ring seal and clean out any water or dirt that may be in the connector. During cable and towfish storage, the dust shields should be installed to reduce dirt infusion and possible connector damage. Periodically the towcable should be checked for signs of wear and abrasion. A PC technician can perform computer repairs locally. Required repairs to either the Sea Scan® PC system or transducer electronics card must be performed at the factory. The towfish contains no serviceable parts that require either maintenance or adjustments in the field.

AUV/ROV SYSTEMS

MSTL's AUV/ROV systems have been designed and built to the exacting standards of today's AUV/ROV market. The AUV/ROV system components use the same proven technology found in the towed systems but have been redesigned to make them smaller and more energy efficient. A normal AUV/ROV system will consist of the system electronics card, transducer electronics card, a pair of transducers, and connecting cables. To satisfy the uniqueness of each AUV/ROV system, MSTL can tailor a system that ranges from just the basic side scan sonar components to a complete turn-key system that includes the PC, power supply, mounting brackets, connectors, cables, and pressurized containers.

System Electronics

- The Sea Scan® PC system electronics card (installed in the PC) is available in two configurations: Full size, full length, ISA card and a compact PC-104 card for embedded installations.

- System Electronics ISA Card: Size 340mm x 100mm x 19mm (13.4"x 3.9" x 0.75"), Weight: 361 gms (12.7 oz), Power consumption is 6-10 watts (Consumption is dependent on scanning speed and selected range scale).

- System Electronics PC-104 Card: Size 97mm x 92mm x 17mm (3.8" x 3.6" x 0.66"), Weight: 142 gms (5 oz), Power consumption is 4.8 watts maximum (Consumption can be lower depending on scanning speed and selected range).

Transducer Electronics Card

- The Sea Scan® PC transducer electronics card is available in the following frequencies: 150, 300, 600, 900 and 1200 kHz. The card can be mounted inside the AUV/ROV pressurized container or sealed as a wet version for mounting outside the vehicle. Dual frequency cards are available in any combination of frequencies desired by the customer. Standard depth rating, when the card is encased and mounted outside the AUV/ROV, is 300-meters. Greater depth ratings are available.

- Transducer Electronics Card: Size 188mm x 58mm x 23mm (7.4" x 2.3" x 0.9"), Weight 227 gms (8 oz) (unpotted card). Two cards are needed for a dual frequency system.

Transducer Modules

- Transducer modules are available in a variety of shapes, sizes and in the following frequencies: 150, 300, 600, 900 or 1200 kHz. MSTL can make custom shaped modules to meet specific applications. Standard modules are available with a 300-meter depth rating. Deep modules, with a depth rating of either 6000-meters or Full Ocean Depth, are available.

AUV/ROV TRANSDUCER SPECIFICATIONS

kHz	DF*	150	300	600	900	1200
Length (in/mm)	28/711	28/711	28/711	17.5/444	TBD	TBD
Width (in/mm)	4/102	3/76	2.25/57	1.5/38	TBD	TBD
Height (in/mm)	3/76	2/51	2/51	1.5/38	TBD	TBD
Weight (oz/gms)	16lbs/7.3kg	TBD	TBD	34.5/980	TBD	TBD

*Dual Frequency: 150/600 kHz, 300-meter depth rating.

SUBMERGED SYSTEM

MSTL manufactures a unique side scan sonar system for manned sonar operations from a wet underwater vehicle. Housed in a small pressure aluminum case, the unit is easily mounted inside with the transducers fix mounted to the hull. System features and specifications are listed below.

Features

- Sea Scan® PC hardware and software are housed in a pressure tested (tested to Mil Std) aluminum case.

- Windows™ ME operating environment.

- All components have successfully passed "Out Gassing" testing.

- Single or Dual Frequency configured, hull mounted transducers.

- Industrial 233 MHz Processor, 20 GB hard drive, external R/W CD ROM drive, 10.4” Color flat screen display.

- Navigation Data via Mil-1553 interface card or NEMA 0183 data stream.

- Keyboard for setup/file transfer.

- Unique underwater tilt mouse for system operations.

MagScan SYSTEM

This is the first commercially available combined side scan sonar and cesium magnetometer system; a new and powerful tool featuring simultaneous and extremely high resolution display of both data sets using a single towfish. This system provides real time confirmation of acoustic and magnetic effects for targets of all sizes in a user-friendly Windows™ interface.

Features

- High-resolution 600 or 900 kHz sonar images in conjunction with high quality marine magnetics. Sensitivity better than 0.002 nT at 1 Hz, 0.02 nT sensitivity at 10 Hz (samples per second).

- Single tow cable, 100-meter standard with an optional length 200-meter cable.

- Magnetometer cycle rates selectable from 100 Hz to 0.01 Hz.

- Sea Scan® PC side scan sonar specifications are the same as listed for the towed systems.

STANDARD Sea Scan® PC SYSTEM COMPONENTS

Operational Toolkit - Each system comes with a toolkit containing system applicable spare fuses, cable hardware, spanner wrench and other miscellaneous tools.

Operator’s Training - Five (5) hours of factory training, for up to four individuals, is included in the price of each system. This training is designed to provide the basic information necessary to safely setup and operate the system. Areas covered in the classroom training include; fundamentals of sonar operations, operations and features of the system software, system setup and testing, side scan water operations, and system troubleshooting procedures. This training is conducted at the factory in White Marsh, Virginia. Travel and living expenses associated with this training are the responsibility of the customer.

Operation of the Sea Scan® PC system is easily learned by anyone who has a basic familiarity with computers and Windows™ operation. A training mode is also included in the operational software that provides the customer with the ability to practice all controls and functions, in the office or at home, prior to going to sea. Interpretation of the data collected is relatively easy since the image quality is near photographic. As operators gain experience with the system, minor details, shadows, etc. will become more apparent and meaningful.