Appendix B
Data Characterization Reports

(Appendix files provided on DVD)

616195

The following reports are in draft form, either undergoing review or revision. They are not included in Appendix B at this time.

AECOM, 2014. *Low Resolution Coring Supplemental Sampling Program Characterization Summary Report*. Draft. Lower Passaic River Study Area RI/FS. Prepared on behalf of USEPA. November 2014.

AECOM, 2015. *Low Resolution Coring Supplemental Sampling Program Addendum Second Supplemental Sampling Program Characterization Summary*. Draft. Lower Passaic River Study Area RI/FS. Prepared on behalf of USEPA. November 2015.

CH2M Hill and AECOM, 2012. *River Mile 10.9 Characterization Program Summary, Lower Passaic River Study Area*. Draft. Lower Passaic River Study Area RI/FS. Prepared on behalf of USEPA. April 19, 2012.

TECHNICAL REPORT, GEOPHYSICAL SURVEY, LOWER PASSAIC RIVER RESTORATION PROJECT

SPONSOR

NEW JERSEY DEPARTMENT OF TRANSPORTATION-OMR
OFFICE OF MARITIME RESOURCES
1035 Parkway Avenue, E&O Building
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SURVEY COMPANY

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469 Point Breeze Rd.
Flemington, NJ 08822

ASI Project Number 25-068

June 16, 2006

TECHNICAL REPORT, GEOPHYSICAL SURVEY, LOWER PASSAIC RIVER RESTORATION PROJECT

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17-17 Route 208 North
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ASI Project Number 25-068

This report, as well as all records and raw data were audited and found to be an accurate reflection of the study. Copies of raw data will be maintained by Aqua Survey, Inc., 469 Point Breeze Road, Flemington, NJ 08822.

Kenneth Hayes **Date**
President

James Nickels **Date**
Vice President and Field Project Manager

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I. EXECUTIVE SUMMARY

The primary goal of the geophysical survey was to investigate the surficial and sub-surface geology of the Lower Passaic River from the Dundee Dam to its confluence with Newark Bay. As part of the investigation, targets that may be potential hazards to future dredging operations on the river, if dredging is deemed necessary, were also described.

The survey work encompassed the entire river bottom within the channel between the confluence with Newark Bay and the removed Conrail swing bridge between Newark and Kearny, and from shoreline to shoreline above that point to about one mile below the Dundee Dam where the river was too shallow for the remote sensing equipment to effectively operate (Figure 1). The survey work results were produced in New Jersey State Plane feet NAD83 for the horizontal datum and Mean Lower Water (MLW) for the vertical datum.

The geophysical survey was conducted between April 21, 2005 and June 16, 2005. Technologies and techniques employed included side scan sonar, sub-bottom profiler, fathometer, magnetometer, real-time kinematic differential global positioning (RTK-DGPS), shallow push coring, and deep vibracoring. Five survey lines were initially run longitudinally along the river (with one line being adjacent to each shoreline) using the fathometer, side scan sonar, gradiometer, and sub-bottom profiler. Fifty-one lines across the river were subsequently surveyed using the fathometer and sub-bottom profiler. Laboratory analysis on the shallow push cores included grain size and total organic carbon. Laboratory analysis of the deep cores included grain size, total organic carbon, Atterberg limits, bulk density, moisture content, and percent solids.

An Innerspace Technologies model 455 fathometer was used to conduct the hydrographic survey. A Trimble RTK-DGPS system was used for both horizontal positioning and vertical positioning in order to collect tidal corrections. Horizontal positioning was collected from the RTK-DGPS and electronically paired with the soundings from an Innerspace Technologies IT-455 fathometer in Hypack Max 4.3a survey control software. Following the survey, the data set was processed and point plotted with elevations presented in MLW.

A Marine Sonics 600-khz side scan sonar system was used for this survey. Range scale was set to 50 meters, with approximately 100 foot lane spacing, which resulted in greater than 200 percent coverage of the riverbed (the entire riverbed being insonified at least twice). Following the survey, the individual records were analyzed to detect any targets that might pose a threat to future dredging operations, if dredging is deemed necessary. Forty sonar targets were found, 16 of which were probably cars, which could pose a potential problem to future dredging operations, if dredging is deemed necessary. Locations of the probable cars were given to the New Jersey State Police for further investigation. One wreck was found that should be investigated further, should future operations impact the site. The sonar records were mosaiced using Chesapeake Technologies SonarWeb Pro software to provide a better overall view of the project area. The sonar data were processed with Quester Tangent SIDEVIEW software in order to better classify surficial seabed types. A simplified surficial sediment texture map was created based on the side scan sonar images, Quester Tangent categorization, and shallow push core results.

Shallow sediment cores were taken and analyzed to help ground-truth the images in the side scan sonar as well as to help identify the classification results from Quester Tangent. Five shallow cores were taken approximately every half mile along the length of the project area resulting in 170 cores. Following analysis of the side scan sonar records, an additional 105 locations were chosen to ground truth based on differential appearances in the side scan sonar records.

Deep sediment cores were taken and analyzed to help ground-truth the sub-bottom profiler results and help characterize the subsurface geology. Three vibracores were taken at each of the 17 transects that were chosen along the length of the river. Transect spacing was approximately every mile, though the actual locations of the transects were chosen based on the sub-bottom reflectors detected during the remote sensing survey. Rossfelder P-3, P-4, and VT-6 vibracorers were used in order to get penetrations up to 33 feet below the riverbed. The Holocene silt layer thickness varied from none to almost 19 feet, with the greatest thickness being in the lowest four miles of the river.

An Edgetech X-STAR sonar system with a SB-216S towfish was used to collect the chirp sub-bottom profiling data during the survey along the Lower Passaic River. The principal objective of the survey was to collect chirp images to characterize subsurface sediments beneath the river bed and to use the chirp images to aid in the selection of sites where shallow (<3 feet) and deeper (>12-20 feet) core samples could be collected. During the survey, the towfish was towed at a depth between 3 to 5 feet to minimize interference from the vessel and to help avoid hitting rocks and other debris.

The maximum depth of penetration of the chirp sonar was on the order of 20 feet with the greatest penetration depths occurring along the Kearny Point Reach. Additional areas along the river where depths of penetration deeper than 10 feet were observed included the area near the Arlington and Belleville Reaches. Based on an analysis of the chirp data, approximately 5%, or 4.5 out of the 85 miles of trackline surveyed along the Lower Passaic River had no significant penetration of chirp sound energy into the sub-bottom. Between 70 and 75% of the region surveyed was characterized by penetration into the sub-bottom to depths between 1 to 9 feet. Most of this region had penetration depths less than 6 feet. As documented in the shallow and deep cores, the predominant sediment type was silt and the major variations in the sediments were the amount of silt relative to clays, sands, and gravels. These variations could be correlated with chirp sub-bottom reflections. Of the shallow (<1 to 2 feet) chirp reflection events, the occurrence of “soft” silts overlying either firmer/tighter silts or silts with fine sands was one of the most pronounced events observed.

The chirp sub-bottom profiling was of limited success in terms of the ability to use the profiles to generate geologic cross-sections of the sub-bottom sediments. There was a great deal of variability and a general lack of continuity of the chirp reflections over even the relatively short distances (50 to 200 feet) between the deep cores along individual transects. Furthermore, with the exception of the Kearny Point Reach near Transect #1A, deeper reflection events in the chirp data could not be “ground-truthed” by correlation with sediments due to the lack of penetration to these depths by the deep cores that were collected.

The principal limiting factors to the quality of the chirp data were the relatively shallow water depths, the presence of organic- gaseous materials in the shallow sub-bottom, and the similar nature of the sub-bottom sediments in the project area. The shallow waters exacerbated the problem of multiples in the sonar data. Multiples are generated by sound energy reverberating in the water column as opposed to penetrating into the sub-bottom. In the chirp profiles, the presence of multiples, which essentially parallel the river bottom, mask the presence of possible deeper reflection events. Depth of penetration of the chirp acoustic signal was limited by the presence of organic leaf material and/or organic-rich silts along the river bottom. Decomposition of the leafy and organic material in these sediments produces gas. Since gases are characterized by very high acoustic impedance (the product of a material's density and sound velocity) contrasts with surrounding materials, when trapped, they limit the passage of sound waves deeper into the sub-surface. The predominance of silts with varying amounts of sands, clays, and gravels meant that there was not a great deal of variability in acoustic impedance in the sub-bottom sediments. This in turn, would limit the occurrence of high-amplitude chirp reflections that could be used to delineate significant changes in sediment types. This was further exacerbated by the fact that in this riverine environment changes in sediment types are sometimes gradational rather than discrete and thus large changes in acoustic impedance are not generated.

The magnetic survey was conducted using dual Geometrics G-882 marine cesium magnetometer systems configured both as individual magnetometers and as a horizontal gradiometer in order to detect exposed and buried ferrous objects within the project area. During the survey, the sensors were towed at several different depths to get them as near the bottom as possible and to ensure the sensors were not detecting the vessel itself. The Lower Passaic River is a very difficult area in which to conduct a magnetic survey due to the nature of the geology, the large amount of ferrous materials along the banks, as well as the number of bridges that can create false targets, as well as masking true targets. Through the processing of the data as both individual magnetometers and as a horizontal gradiometer, the results of the magnetic survey were much more accurate than from a single magnetometer. The gradiometer survey identified 147 magnetic anomalies that were detected during the survey. Of those, 9 were associated with the non-car side scan sonar targets. The ability to detect magnetic anomalies very close to metal bulkheads and bridges was made possible through the surveying and processing techniques used. Of the magnetic anomalies that were not associated with a sonar target, none were found to have signatures indicative of a potentially significant submerged cultural resource that would be impacted by future dredging operations, if dredging is deemed necessary.

One of the targets located, sonar target "Wreck" with associated magnetic anomaly Mag-91, was found to have an image indicative of a potentially historically significant submerged cultural resource. Further investigation may be necessary to determine the identity and potential significance of the wreck.

Figure 1. Lower Passaic River project area from Newark to Garfield, NJ.

II. TEST ADMINISTRATION

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C. Dates of Survey

Date of Survey Initiation:	April 21, 2005
Date of Survey Completion:	June 16, 2005

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III. MATERIALS, METHODS, AND RESULTS

A. Horizontal and Vertical Positioning

All aspects of the remote sensing survey were conducted using a real-time kinematic differential global positioning system (RTK-DGPS). This system consisted of a stationary base station operating over a precisely know control point. Positioning corrections calculated by the base station were transmitted at 10 times per second via radio modem to another differential global positioning system (DGPS) receiver on the survey vessel. This allows the positioning accuracy for the survey vessel to be on the order of 1-cm in the horizontal and 2-cm in the vertical planes. In order to ensure constant communication between the base station and rover and to minimize the effects of geoidal/ellipsoidal model variations, it was decided to establish a series of base station locations along the length of the project area. Six separate locations were used. As the locations of National Geodetic Survey (NGS) benchmarks were not always ideal, new base station locations were surveyed in prior to the commencement of remote sensing operations. One base station location was established over NGS benchmark AI7796; the remaining 5 were relocated to better positions.

In order to establish these new locations, the base station, consisting of a Trimble 5700 24-channel dual frequency GPS receiver, Trimble TSCe survey controller, and Trimble Trimmark 3, was set-up on a known NGS benchmark. The rover, consisting of a Trimble MS-750 9-channel dual frequency GPS receiver and Teledyne radio modem, was set-up over the spot to become a future base station location. The position of the rover was recorded, and the base station was moved to another known NGS benchmark. Once communication was again established between the base station and rover, the position of the rover was checked against the previous coordinates determined for the future base station location to ensure the accuracy of the coordinates. The base station locations used during the survey can be seen in Figure 2.

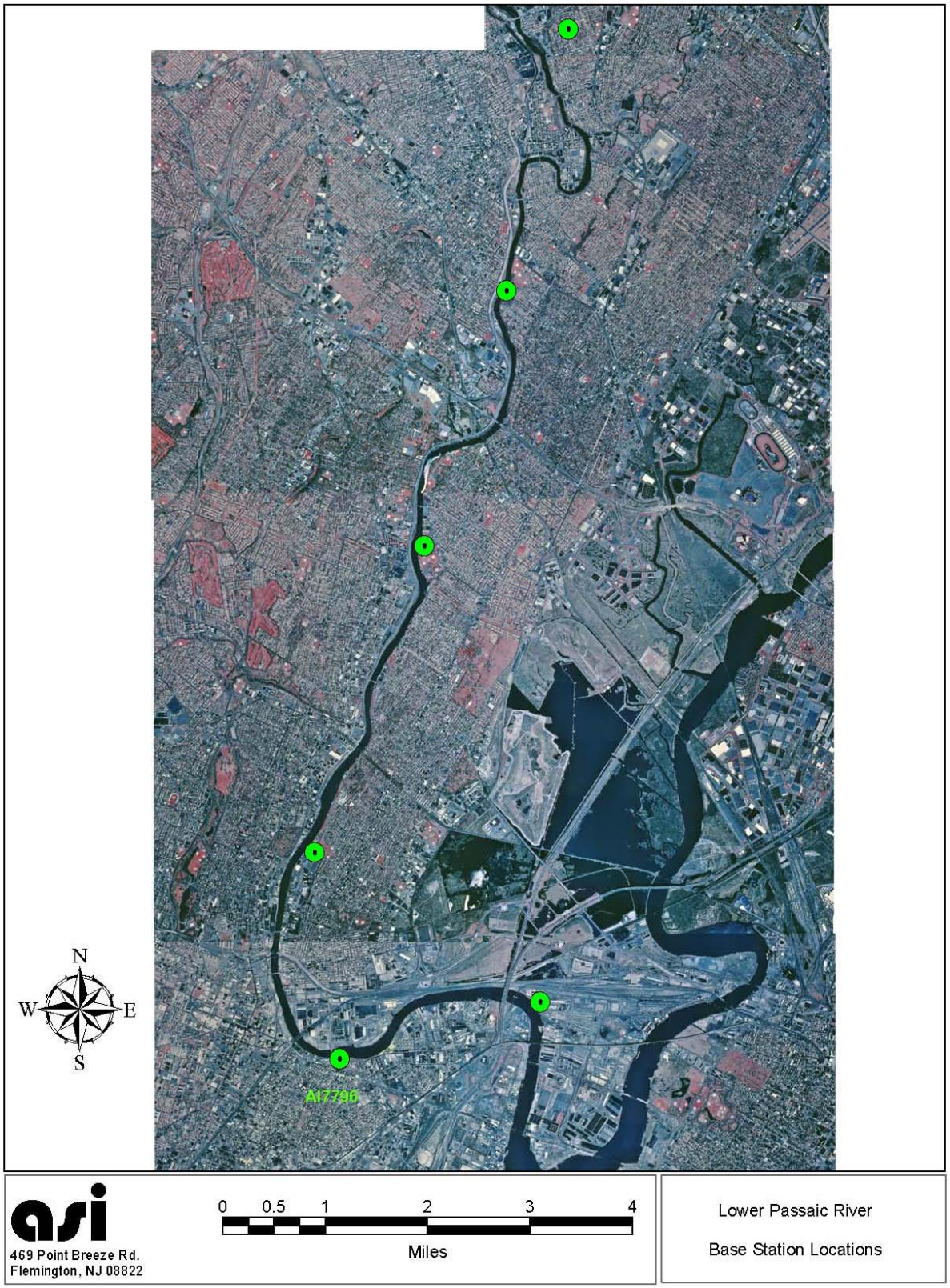


Figure 2. Locations of RTK-DGPS base stations.

B. Bathymetric Data Collection

A bathymetric survey was conducted along the entire length of the project area. Five lines were initially run longitudinally along the river with one line adjacent to each shoreline. Fifty-one cross lines were run in conjunction with the sub-bottom profiler. Horizontal positioning was collected from the RTK-DGPS and electronically paired with soundings from an Innerspace Technologies IT-455 fathometer in Hypack Max 4.3a survey control software at a rate of 10 points per second. The survey was conducted in New Jersey State Plane feet NAD 83 horizontal datum and vertical datum NAVD88.

Prior to the start of the bathymetric survey, a latency test was run to determine what, if any, latency there was in the system to ensure accurate sounding positioning. The latency test revealed no latency. Prior to the commencement of survey operations each day, a bar check was conducted to adjust for draft and speed of sound in order to ensure accurate sounding data. A bar check was also conducted at the end of each day to be sure the settings continued to be correct. The antennae for the RTK-DGPS was mounted directly above the transducer, eliminating any positioning offset errors.

Positioning was lost periodically under bridges, but was quickly regained. Positions that were collected when the RTK-DGPS was not in 'fix' mode were discarded as the horizontal or vertical corrections are not accurate or reliable enough to be included in the survey. These occurrences can be seen as gaps in the sounding data point plot.

Post processing involved correcting the sounding data for tides based on the RTK-DGPS elevations. The vertical data were then corrected to Mean Low Water through a correction from the nearest National Geodetic Service tidal benchmark to where the point was collected, PID=KV0266 or KV3412. The data were then sorted to eliminate points closer than 20 feet apart and to reduce the data to an X, Y, Z file. Finally, the sorted data were point plotted and annotated on geo-referenced AutoCAD and GIS drawings.

C. Gradiometer Data Collection and Results

A gradiometer survey was conducted in order to detect the presence of submerged ferrous debris that could pose a hazard to future dredging operations, if any. The gradiometer also serves to help detect the presence and locations of buried pipes and cables. The gradiometer survey complemented and aided in the interpretation of the side scan sonar survey results regarding debris and potentially significant historic submerged cultural resources. The survey methodology was designed to provide data indicating the position and relative size of ferrous targets in the project area, as well as archaeological data essential for complying with the National Historic Preservation Act of 1966, as amended, through 1992 (36 CFR 800, *Protection of Historic Properties*) and the Abandoned Shipwreck Act of 1987 (*Abandoned Shipwreck Act Guidelines*, National Park Service, *Federal Register*, Vol. 55, No. 3, December 4, 1990, pages 50116-50145).

Due to localized geological variations, it was decided to conduct the survey using dual Geometrics G-882 marine cesium magnetometer systems capable of plus or minus 0.01 gamma resolution configured as both individual magnetometers and a horizontal gradiometer. The sensors were separated by 2 meters horizontally, and towed the exact same distance behind the survey vessel. A vertical gradiometer configuration allows for good depth resolution of targets as well as enhancing shallow magnetic features while offering less detail for linear objects. A horizontal configuration of a gradiometer allows for better delineation of linear objects such as cables and pipelines, though it offers less detail for deeper features (*Field Analytical Technologies Encyclopedia*, "Magnetics for Environmental Applications," U.S. EPA Technology Innovation Office, January, 2003). As this survey was designed to detect linear features such as cables and pipelines, as well as to detect large shallow objects that pose a possible threat to future dredging operations, if dredging is deemed necessary, it was decided that the horizontal configuration was best suited for this application. Survey lines were run at approximately 100-foot intervals to ensure complete coverage of the project area. Data were recorded at 0.1 second intervals and electronically paired with positioning data from the RTK-DGPS using an onboard computer running Hypack Max 4.3a survey software.

To ensure reliable target identification and assessment, analysis of the magnetic data were initially carried out as it was generated. Due to large number of bridges and the fact that significant portions of the shoreline have been protected with sheet piling and other debris-containing ferrous materials, notations were made during the survey to help eliminate the false identification of targets during post-processing. Significant unidentified magnetic anomalies were marked as targets during the survey and were re-surveyed using the magnetometer to better determine the size and characteristics of the anomaly.

Post-processing of the data involved examining each survey line individually and annotating anomalies detected. The two individual magnetometer results were processed together for gradiometer results. Gradiometer processing involved combining the data into an Excel file to calculate the gradiometer field readings. These readings were obtained by subtracting the gamma values of magnetometer two from magnetometer one. In Microsoft Excel, a distance

versus gradiometer chart was generated to identify potential targets. Each target was evaluated according to intensity, duration and signature characteristics. These results helped minimize the influence of external natural causes on the magnetometer data and better resolve individual targets. Using contouring software, magnetic data generated during the survey was contour plotted at 50 gamma intervals for analysis and accurate location of the material generating each magnetic anomaly as well as determining the presence of clusters of targets. Data generated by the remote sensing equipment was used to support an assessment of each magnetic signature regarding the potential hazard to future dredging operations, if dredging is deemed necessary. Analysis of each target signature also included consideration of magnetic characteristics previously demonstrated to be reliable indicators of historically significant submerged cultural resources. Of the magnetic anomalies that were not associated with a sonar target, none were found to have signatures indicative of a potentially significant submerged cultural resource that would be impacted by future dredging operations, if dredging is deemed necessary. All targets are listed and described in Table 1 and maps have been produced that show their locations within the project area (Figures 3 to 38). Some targets were detected on more than one survey line. In those cases, the target will have more than one entry in the table. The table includes the location of the target as derived from a combination of signature interpretation and magnetic contouring. This location is either highlighted in bold if it was from an individual signature or it is described as the refined position in the table.

The gradiometer survey revealed 147 distinct magnetic anomalies, 9 of which were associated with non-car side scan sonar targets. The magnetic anomalies associated with the cars in the side scan sonar records have not been included. Of those remaining 138 magnetic anomalies, 46 have magnetic signatures indicative of larger shallow objects. The remaining 92 magnetic anomalies have signatures indicative of large-deep objects or smaller shallow targets. The size of an object that can be considered a possible obstruction to future dredging operations from a mechanical standpoint depends on the dredging methodology used. Prior to future operations, if any, the dredger should be consulted regarding mass of what is to be considered an obstruction to their operations. The magnetic targets to be impacted should be evaluated against this factor and the proposed dredge depth, and investigated further should they be determined to be an obstruction.

Table 1 – Magnetic Anomalies

Mag Target	Lane	Name	Type	Gamma	Distance	Easting	Northing	Description
1	4_1533	12n116235	Negative	116.9	235	596975.7	685247.4	Probably deeper
2	8_1442	18m82g49	Multi-Component	81.82	49	596760.2	685650	Probably small/shallow
3	4_1533	11d217g89	Dipolar	217.39	89	596975.6	685749.8	Probably large/shallow
4	6_1507	13m56g153	Multi-Component	56.17	153	597224.2	688122.3	Probably deeper
5	4_1533	10n51g89	Negative	51.37	89	597912.6	690101.2	Probably small/shallow
6	4_1533	9n51g89	Negative	49	43	597999.8	690479.2	Probably small/shallow
7	4_1533	8d222g144	Dipolar	222.3	144	598316.5	692471.1	Probably deeper
8	4_1533	6m761g241	Multi-Component	761.15	241	598285 598287.9	694278.7 694209.1	Associated with SSST-17
9	4_1533	4d109g77	Dipolar	108.9	77	595926.5	695779.7	Probably small/shallow
10	12_1641	26p530g243	Positive	530.15	243	595787.9	695400.4	Probably deeper
11	14_1633	32n68g53	Negative	67.93	53	594903.5	695357.6	Probably small/shallow
12	12_1627	22m217g104	Multi-Component	217.72	104	594543.2	695260.4	Probably small/shallow
13	14_1633	33m79g47	Multi-Component	79.37	47	594226.1	695274.1	Probably small/shallow
14	4_1533	3n149g93	Negative	149.18	93	593496.2	695533.9	Probably small/shallow
15	4_1533	2d94g69	Dipolar	94.45	69	592393	695259.7	Probably small/shallow
16	4_1533	1d135g84	Dipolar	135.83	84	592061.7	695130.1	Probably small/shallow
17	10_1601	21p94g831	Positive	94.09	831	592116.3	694870.5	Probably deeper
18	12_1340	63p286g226	Positive	285.87	226	590920.3	693484.7	Probably deeper
19	8_1362	53n46g529	Negative	46.5	529	590585.6	693145.6	Probably deeper
20	10_1411	55d1194g124	Dipolar	1,193.55	124	590595.6	693006.2	Associated with SSST-13
21	12_1340	65d121g178	Dipolar	121	178	589818.7	692375.8	Probably deeper
22	12_1340	66d287g50	Dipolar	287.37	50	589340.5	692269.8	Probably large/shallow
23	4a_1329	40n80g109	Negative	79.52	109	588738.7	692590.5	Probably deeper
24	6_1428	46p53g73	Positive	53.22	73	588506.4	692484.6	Probably small/shallow
24	8_1361	52p84g96	Positive	83.92	96	**588591.3**	**692394**	Probably small/shallow
24	10_1411	56d84g75	Dipolar	83.97	75	588707	692331.6	Probably small/shallow
25	4a_1328	39d246g102	Dipolar	246.91	102	587022.7	692490	Probably large/shallow
25	6_1428	45m254g975	Multi-Component	254.22	975	586655.3 587022.4	692530 692425.7	Probably large/shallow
25	8_1360	51m271g1154	Multi-Component	270.58	1,154	586765.7 587008.2	692462.7 692387.8	Probably large/shallow

Table 1 – Magnetic Anomalies

Mag Target	Lane	Name	Type	Gamma	Distance	Easting	Northing	Description
25	12_1340	67m1541g996	Multi-Component	1,541.83	996	586529.8 586961.1	692476.8 692301.8	Probably large/shallow
26	10_1411	57m878g975	Multi-Component	877.94	975	586914.2 586583.7	692358.3 692489.3	Associated with SSST-14
27	4a_1327	38p994g82	Positive	993.88	82	586586.3	692643.6	Probably large/shallow
28	10_1411	58m192g83	Multi-Component	191.93	83	586227.9	692735.9	Probably large/shallow
29	6_1428	43d114g146	Dipolar	114.36	146	585486.8	694460.8	Probably deeper
30	10_1411	60p79g76	Positive	79.08	76	585209.5	694802.7	Probably small/shallow
30	8_1359	50m97g123	Multi-Component	96.75	123	585282.2	694828	Probably small/shallow
30		Refined Position				585255	694820	Probably small/shallow
31	8_1358	49d73g145	Dipolar	72.81	145	585249.7	694955.8	Probably large/shallow
31	10_1411	61p610g143	Positive	609.98	143	585168.6	694961	Probably large/shallow
31		Refined Position				585194	694959	Probably large/shallow
32	8_1357	48d55g128	Dipolar	55.31	128	585146	695207.7	Probably deeper
33	10_1411	62p48g245	Positive	48.6	245	584771.3	696068.2	Probably deeper
34	4a_1324	35d288g106	Dipolar	288.17	106	584946.2	696227.7	Probably large/shallow
35	6_1428	41p103g167	Positive	102.54	167	584859.4	698317.4	Probably deeper
35	8_1357	47n127g71	Negative	127.34	71	584846.1	698388.4	Probably deeper
35	4a_1324	34p392g169	Positive	391.85	169	584923.3	698351.5	Probably deeper
35		Refined Position				584897	698366	Probably deeper
36	4_0854	70n14g128	Negative	143.58	128	585091.5	699468.6	Probably deeper
37	9_0943	92p68g134	Positive	68.27	134	584930	699528.8	Probably deeper
38	12_0957	95m190g170	Multi-Component	190.65	170	584950.1	700346.8	Associated with SSST-10
39	6_0912	82d73g113	Dipolar	73.27	113	586503.7	703392.1	Probably deeper
40	6_0912	81d66g75	Dipolar	65.59	75	586996.9	704144.7	Probably small/shallow
41	12_0957	98p363g299	Positive	363.71	299	587157.5	705413.2	Probably deeper
42	6_0912	77p55g47	Positive	54.84	47	587599.6	705700.8	Probably small/shallow
43	8_0926	85d58g62	Dipolar	58.55	62	587561.3	705993.4	Probably small/shallow
44	4_0854	72m1661g86	Multi-Component	1,661.86	86	587777.3	706173.3	Probably large/shallow
44	6_0912	76m3907g113	Multi-Component	3,907.32	113	**587803.8**	**706184.4**	Probably large/shallow
45	8_0926	86n66g96	Negative	66.21	96	587690.1	706273.3	Probably small/shallow
46	8_0926	87p61g102	Positive	61.02	102	588491.3	707424.4	Probably small/shallow

Table 1 – Magnetic Anomalies

Mag Target	Lane	Name	Type	Gamma	Distance	Easting	Northing	Description
47	4_0854	73d63g171	Dipolar	62.59	171	589610.1	708918.5	Probably deeper
47	9_0943	90m143g273	Multi-Component	143.36	273	589573.6	709094.9	Probably deeper
47	12_0957	99m3506g149	Multi-Component	3,506.29	149	**589526.6**	**708917.7**	Probably deeper
48	6_0912	75d96g74	Dipolar	96.2	74	589614.5	711134.1	Probably small/shallow
49	4_1017	103p245g65	Positive	245.34	65	590168.6	712253.6	Probably small/shallow
50	8_1058	133m456g256	Multi-Component	456.31	256	590156.7 590117.9	712463.4 712398.8	Probably deeper
50	6_1124	132m1630g199	Multi-Component	1,630.30	199	590162.1	712391.6	Probably deeper
50		Refined Position				590158	712409	Probably deeper
51	6_1124	131n208g162	Negative	208.42	162	590258.6	712590.6	Probably deeper
51	8_1058	134p250g192	Positive	250.29	192	590229.3	712627.5	Probably deeper
51		Refined Position				590243	712608	Probably deeper
52	4_1017	104m553g73	Multi-Component	552.71	73	590433.4	712785.6	Probably large/shallow
53	6_1124	130d51g117	Dipolar	51.21	117	590619.1	713144.8	Probably large/shallow
53	4_1017	105p127g88	Positive	127.26	88	590622.1	713084.3	Probably large/shallow
53		Refined Position				590613	713103	Possible Sonar Image
54	10_1143	143m92g104	Multi-Component	91.94	104	590591.6	713352.3	Probably deeper
55	4_1017	106p663g89	Positive	663	89	590786.7	713316.8	Probably large/shallow
56	8_1058	135n54g80	Negative	54.27	80	590712.3	713414.6	Probably small/shallow
56	10_1143	144p105g62	Positive	104.63	62	590679.9	713472.1	Probably small/shallow
56		Refined Position				590688	713540	Probably small/shallow
57	12_1039	178n64g107	Negative	63.70	107	590803.6	713683.1	Probably small/shallow
58	4_1017	107d173g68	Dipolar	173.14	68	590980.4	713566	Probably small/shallow
59	4_1017	108p304g64	Positive	304.35	64	591118.6	713770.8	Probably small/shallow
60	6_1124	129n57g107	Negative	57.29	107	591219.3	714053.5	Possible Sonar Image
61	12_1039	176d89g71	Dipolar	88.82	71	591214.3	714311.3	Probably small/shallow
62	12_1039	177d103g79	Dipolar	103.01	79	591152.3	714190.6	Probably small/shallow
63	12_1039	173d77g79	Dipolar	77.36	79	591506.8	714842.5	Probably small/shallow
64	8_1058	136p156g108	Positive	155.70	108	591729.1	715087.4	Probably deeper
64	10_1143	145p232g176	Positive	232.11	176	**591692.9**	**715097.4**	Probably deeper
65	12_1039	172d66g87	Dipolar	65.55	87	591621.4	715069.8	Probably small/shallow

Table 1 – Magnetic Anomalies

Mag Target	Lane	Name	Type	Gamma	Distance	Easting	Northing	Description
66	4_1017	109d1114g153	Dipolar	1,114.14	153	591818.8	715090.3	Probably large/shallow
67	4_1017	110d5511g96	Dipolar	5,511.20	96	592205.6	715655.9	Associated with SSST-3
68	4_1017	111m202g86	Multi-Component	202.45	86	592387.2	716063.9	Probably small/shallow
69	6_1124	128n44g232	Negative	44.41	232	592351	716319.5	Probably deeper
70	8_1058	138p48g64	Positive	47.66	64	592293.1	716450.4	Probably small/shallow
71	12_1039	170p104g55	Positive	104.26	55	592148.8	716676.7	Probably small/shallow
72	6_1124	127d74g115	Dipolar	74.44	115	592077	717367.1	Possible Sonar Image
73	6_1124	126d89g142	Dipolar	86.18	142	592044.7	717486.8	Probably deeper
74	10_1143	148d522g142	Dipolar	521.82	142	591833.4	718300.4	Probably deeper
75	12_1039	166m571g149	Multi-Component	570.61	149	591758.3	718540.7	Probably deeper
76	4_1017	112n147g101	Negative	147.37	101	592219.1	719265.8	Probably large/shallow
76	6_1124	125n562g91	Negative	562.22	91	592157.3	719207.1	Probably large/shallow
76		Refined Position				592188	719234	Probably large/shallow
77	4_1017	113d1015g98	Dipolar	1,015.16	98	592234	719614.3	Associated with SSST-1
78	10_1143	150d216g96	Dipolar	216.25	96	592129.8	721138.7	Probably large/shallow
79	6_1124	123d98g63	Dipolar	98.43	63	592283.5	721421.8	Probably small/shallow
80	4_1017	115m971g150	Multi-Component	970.65	150	592288.7	721653.8	Probably large/shallow
81	10_1143	151d84g113	Dipolar	84.17	113	592233.2	721738.3	Probably deeper
82	8_1058	140p57g50	Positive	56.99	50	592304.8	721833.8	Probably small/shallow
83	8_1058	141m441g216	Multi-Component	440.62	216	593007.2	723286	Pipeline or Cable
83	6_1124	122m467g191	Multi-Component	467.29	191	593044.8	723212.3	Probably deeper
83	12_1039	162m535g168	Multi-Component	534.98	168	592924.5	723364.4	Pipeline or Cable
83	10_1143	152m726g269	Multi-Component	725.6	269	592971.7 593033	723320.6 723348.2	Pipeline or Cable
84	4_1017	117n971g83	Negative	971.21	83	593818.2	723494	Probably large/shallow
85	6_1124	121d489g62	Dipolar	489.33	62	**593912**	**723522.1**	Probably large/shallow
85	4_1017	118d2105g123	Dipolar	2,105.32	123	593911.9	723521.6	Probably large/shallow
86	10_1143	153n374g51	Negative	374.17	51	593793.7	723637	Probably large/shallow
87	10_1143	154p488g111	Positive	487.67	111	594099.3	723712.4	Probably large/shallow
87	12_1039	160n2298g122	Negative	2,297.64	122	594036.2	723753.3	Probably large/shallow
87		Refined Position				594064	723746	Probably large/shallow

Table 1 – Magnetic Anomalies

Mag Target	Lane	Name	Type	Gamma	Distance	Easting	Northing	Description
88	12_1039	159d225g66	Dipolar	224.97	66	594192.4	723798.8	Probably large/shallow
89	10_1143	155n94g86	Negative	93.51	86	594529.2	723842.4	Probably large/shallow
89	12_1039	158m1704g201	Multi-Component	1,703.55	201	594462.9 594551.3	723874 723891.4	Probably large/shallow
89		Refined Position				594522	723914	Probably large/shallow
90	12_1039	157d314g76	Dipolar	313.59	76	594665.9	723924	Probably large/shallow
91	12_1039	156m921g147	Multi-Component	920.58	147	594863.7	723983.6	Probably large/shallow
92	4_1017	119n57g88	Negative	56.92	88	595848.8	724302.1	Probably small/shallow
93	6_1257	210p175g62	Positive	174.82	62	596600.5	725748.1	Probably small/shallow
94	4_118	191n78g115	Negative	77.53	115	596981.8	727202.1	Probably deeper
95	12_1141	237d92g73	Dipolar	91.82	73	596914	727823.1	Probably small/shallow
96	12_1141	238d267g114	Dipolar	266.82	114	596855.3	728577.2	Associated with SSST-22
97	4_118	190m1459g180	Multi-Component	1,459.21	180	596670.2	729276.3	Probably deeper
98	10_1230	219d556g85	Dipolar	556.04	85	596496	729486.6	Probably large/shallow
99	12_1141	241m816g117	Multi-Component	816.47	117	596413	729635.9	Probably large/shallow
100	12_1141	242n134g66	Negative	133.73	66	596398.2	729701.5	Probably small/shallow
101	10_1230	220n418g143	Negative	417.95	143	596341.4	729939.9	Associated with SSST-19
101	12_1141	243d1886g141	Dipolar	1,886.43	141	**596321.2**	**729911.9**	Associated with SSST-19
102	6_1257	208n59g117	Negative	58.92	117	596721.9	732143.9	Probably deeper
103	10_1230	222d54g176	Dipolar	53.76	176	596626.2	732234.4	Probably deeper
104	12_1141	245n225g67	Negative	224.84	67	596598	732381.4	Probably large/shallow
105	4_118	188p222g138	Positive	221.77	138	597187.5	734160.4	Probably deeper
106	6_1257	206m63g106	Multi-Component	63.46	106	597199.8	734299.1	Probably deeper
107	6_1257	205d67g129	Dipolar	66.86	129	597313.5	734586.3	Probably deeper
108	4_118	187d144g106	Dipolar	143.8	106	597492.9	735165	Probably large/shallow
108	6_1257	204n232g93	Negative	231.8	93	597467.7	735192.3	Probably large/shallow
108		Refined Position				597478	735182	Probably large/shallow
109	10_1230	224n74g104	Negative	73.75	104	597412.5	735546.5	Probably deeper
110	10_1230	225p100g126	Positive	99.93	126	597388.2	735901.5	Probably deeper
111	10_1230	226m330g105	Multi-Component	330.15	105	597331	736206.5	Probably large/shallow
112	6_1257	203m226g96	Multi-Component	226.21	96	597310.6	736612.6	Probably large/shallow
113	10_1230	228p105g169	Positive	104.97	169	597214.4	736967.8	Pipeline or Cable

Table 1 – Magnetic Anomalies

Mag Target	Lane	Name	Type	Gamma	Distance	Easting	Northing	Description
113	4_118	185p349g177	Positive	348.69	177	597317.1	736931.1	Pipeline or Cable
113	6_1257	202p1269g182	Positive	1,268.68	182	597318.3	736925.7	Pipeline or Cable
113	8_1206	215n2801g216	Negative	2,800.73	216	597261.9	736947	Pipeline or Cable
114	6_1257	200n78g86	Negative	77.54	86	597384.8	737456	Probably small/shallow
115	12_1141	249p61g122	Positive	61.01	122	597328.2	737661.4	Probably deeper
116	6_1257	199p127g115	Positive	126.88	115	597512.8	737893.5	Probably deeper
116	8_1206	213d146g110	Dipolar	146.33	110	597472.2	737912.4	Probably deeper
116		Refined Position				597495	737907	Probably deeper
117	6_1257	198d680g96	Dipolar	680.36	96	597588.5	738045.5	Probably large/shallow
118	10_1230	231p109g226	Positive	109.09	226	598982.3	738319.4	Probably deeper
118	12_1141	253p346g172	Positive	346.26	172	**598992.4**	**738335.7**	Probably deeper
119	4_118	184m544g53	Multi-Component	543.67	53	599194.3	737916.2	Probably large/shallow
120	6_1257	197d1076g100	Dipolar	1,076.06	100	599268.7	737684.6	Possible Sonar Image
121	12_1141	254d218g163	Dipolar	218.31	163	599369.6	737637.5	Probably deeper
122	6_1257	196m230g100	Multi-Component	229.65	100	599269.9	737594.6	Probably large/shallow
123	4_118	183p330g159	Positive	329.58	159	599254.6	737354.7	Possible Sonar Image
124	8_1004	263p54g50	Positive	54.04	50	600192.2	736736	Probably small/shallow
125	14_1028	280m110g77	Multi-Component	109.93	77	600442	736897.1	Probably small/shallow
125	6_0956	262m111g81	Multi-Component	111.03	81	600464.5	736907.8	Probably small/shallow
125		Refined Position				600456	736898	Probably small/shallow
126	14_1028	281d327g96	Dipolar	326.71	96	600616.9	737177.5	Probably large/shallow
127	6_0956	261d669g80	Dipolar	668.79	80	600831	737230.8	Probably large/shallow
128	10_1013	276m463g65	Multi-Component	462.57	65	600641.2	737485.3	Probably large/shallow
129	12_1020	277m556g68	Multi-Component	555.76	68	600674.9	737741.7	Probably large/shallow
130	8_1004	264d76g75	Dipolar	75.95	75	600827.3	738426.1	Probably small/shallow
131	10_1013	275d141g79	Dipolar	141.18	79	600797.6	738527.6	Probably small/shallow
132	6_0956	260n129g90	Negative	129.08	90	600852	738694.6	Probably small/shallow
133	8_1004	266d79g75	Dipolar	78.62	75	600833.2	738831.6	Probably small/shallow
134	14_1028	282p123g50	Positive	123.11	50	600886	738842.2	Probably small/shallow
135	14_1028	283m1843g75	Multi-Component	1,842.75	75	600888	738942.4	Probably large/shallow
136	8_1004	267d410g60	Dipolar	410.15	60	600836.3	738984	Probably large/shallow

Table 1 – Magnetic Anomalies

Mag Target	Lane	Name	Type	Gamma	Distance	Easting	Northing	Description
137	6_0956	259d80g112	Dipolar	80.31	112	600746.5	739551.1	Probably deeper
138	14_1028	284p82g50	Positive	82.39	50	600639.6	739728.4	Near SSST-23, Probably large/shallow
138	6_0956	258d1759g57	Dipolar	1,758.77	57	**600624.1**	**739735**	Near SSST-23, Probably large/shallow
139	8_1004	268d217g51	Dipolar	217.02	51	600554.9	739749.8	Probably large/shallow
140	12_1020	278d2575g55	Dipolar	2,574.77	55	600333.8	739811.6	Probably large/shallow
141	8_1004	269m281g80	Multi-Component	280.53	80	600303.1	739980.6	Probably large/shallow
142	14_1028	285p256g60	Positive	256.13	60	600288.4	740049.4	Probably large/shallow
143	10_1013	273m97g105	Multi-Component	97.37	105	599778.6	740255.5	Probably deeper
144	14_1028	286n216g50	Negative	215.93	50	599675.8	740530.8	Probably small/shallow
145	10_1013	272d175g62	Dipolar	174.82	62	599476.9	740831.9	Probably small/shallow
146	10_1013	271m474g52	Multi-Component	473.72	52	599446.6	740941.8	Probably large/shallow
147	10_1013	270d1263g85	Dipolar	1,262.97	85	599402.1	741121	Probably large/shallow

Table 1. Table of Magnetic Anomalies. Targets detected on multiple lanes have either a refined position indicating where the material generating the signature is located or the probable target location is in bold under the individual target description.

Figure 3. Locations of magnetic anomalies Mag-1 to Mag-3.

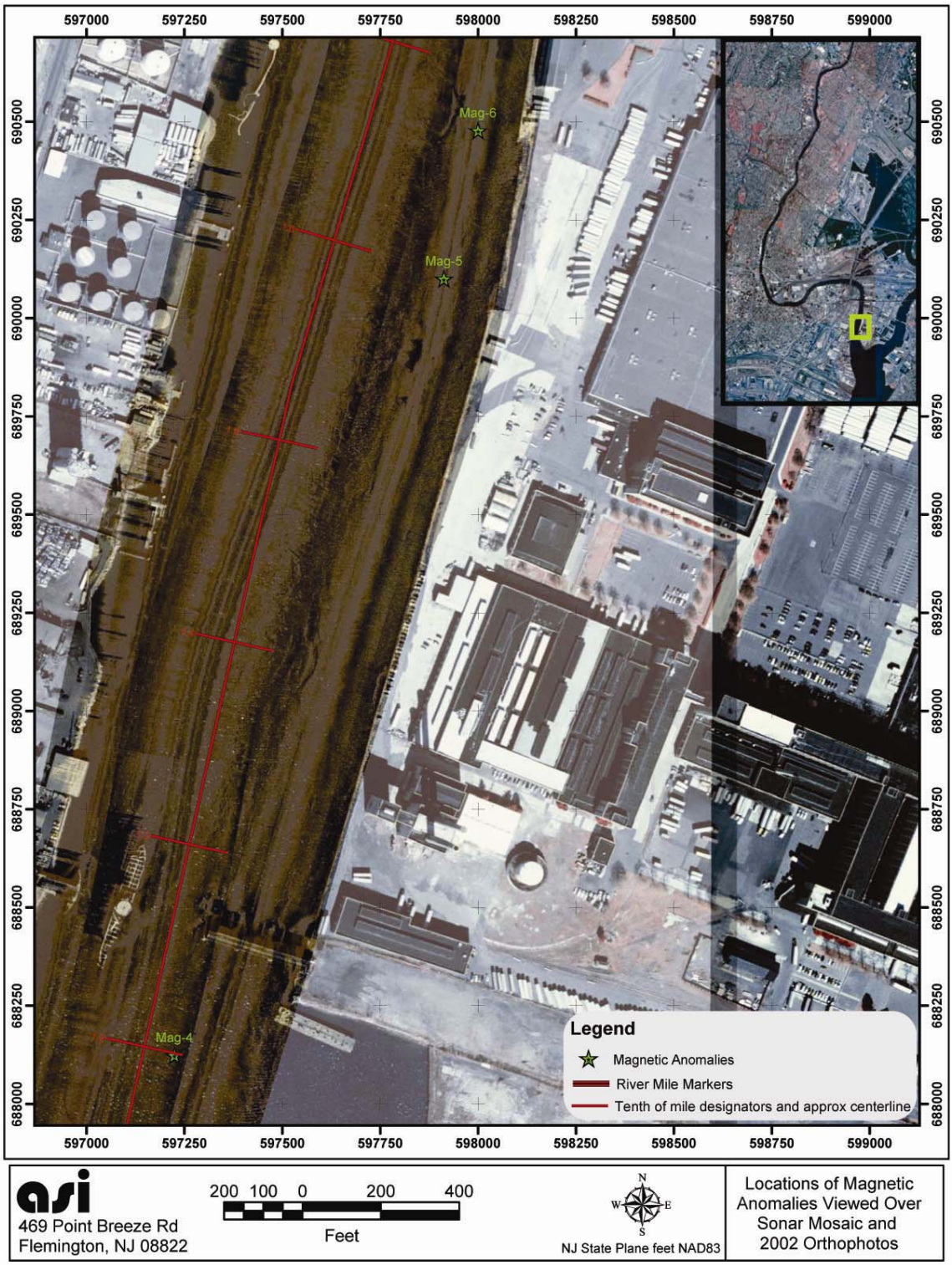


Figure 4. Location of magnetic anomaly Mag-4 to Mag 6.

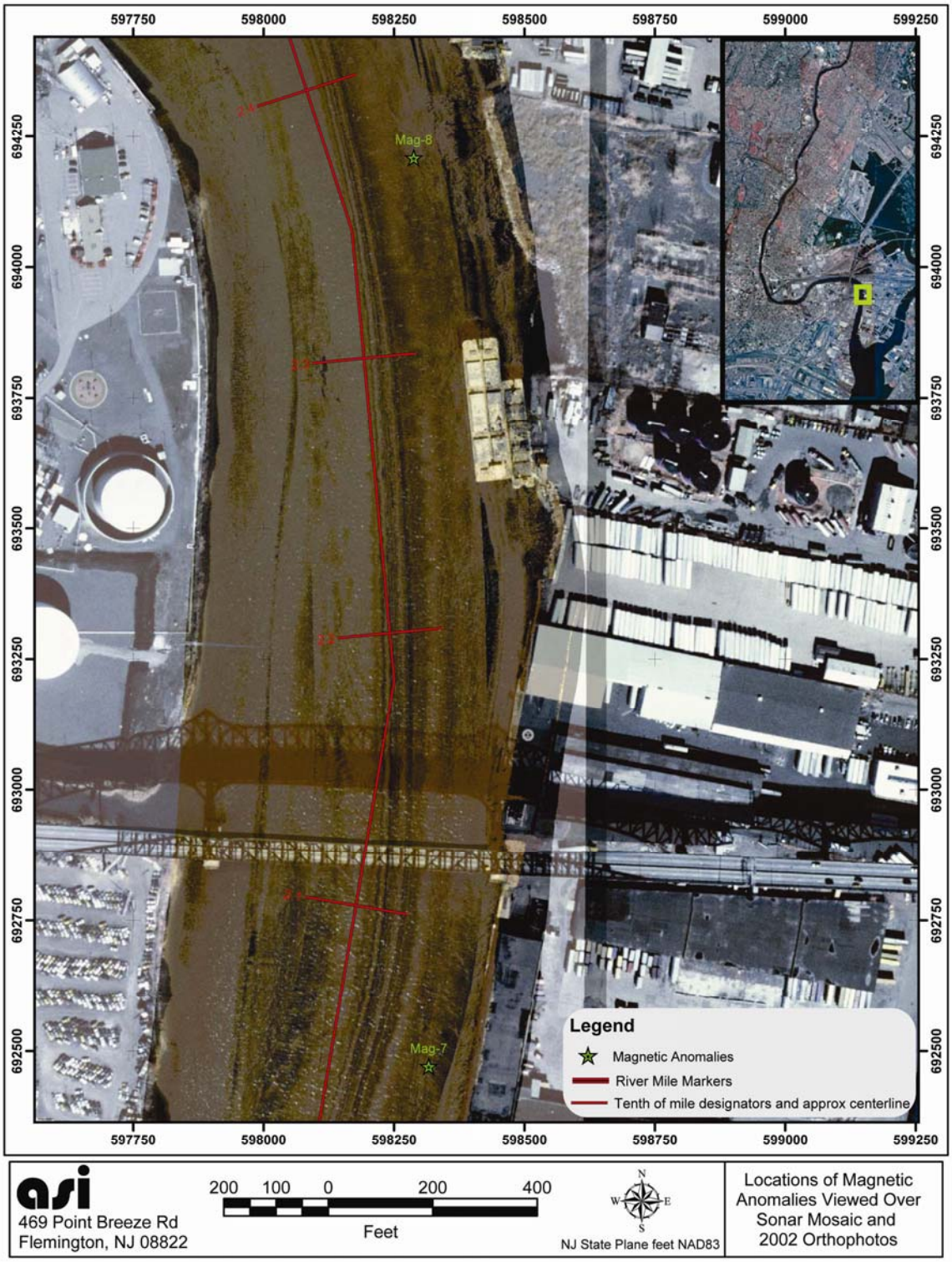


Figure 5. Locations of magnetic anomalies Mag-7 and Mag-8.

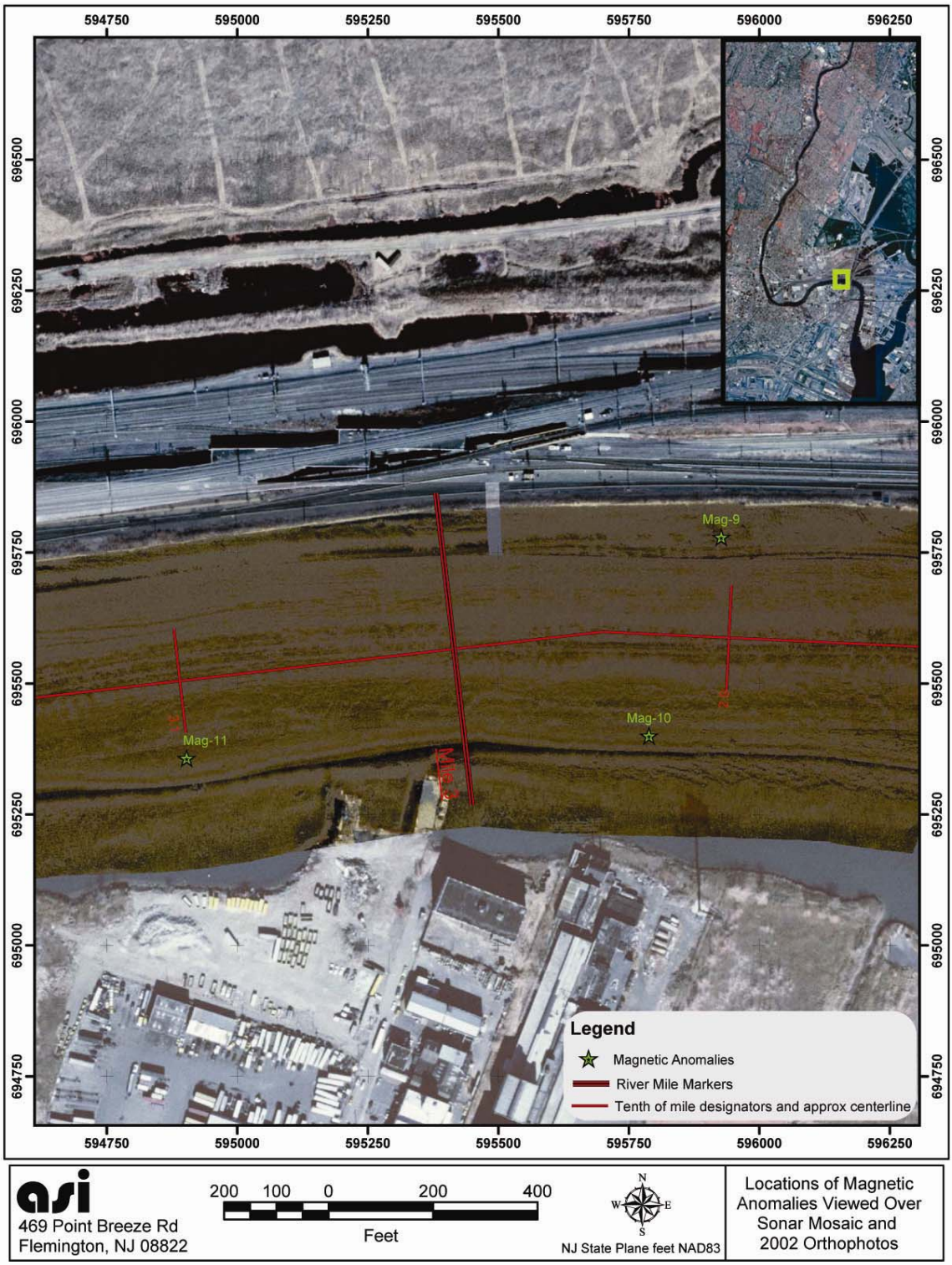


Figure 6. Locations of magnetic anomalies Mag-9 to Mag-11.

Figure 7. Locations of magnetic anomalies Mag-11 to Mag-14.

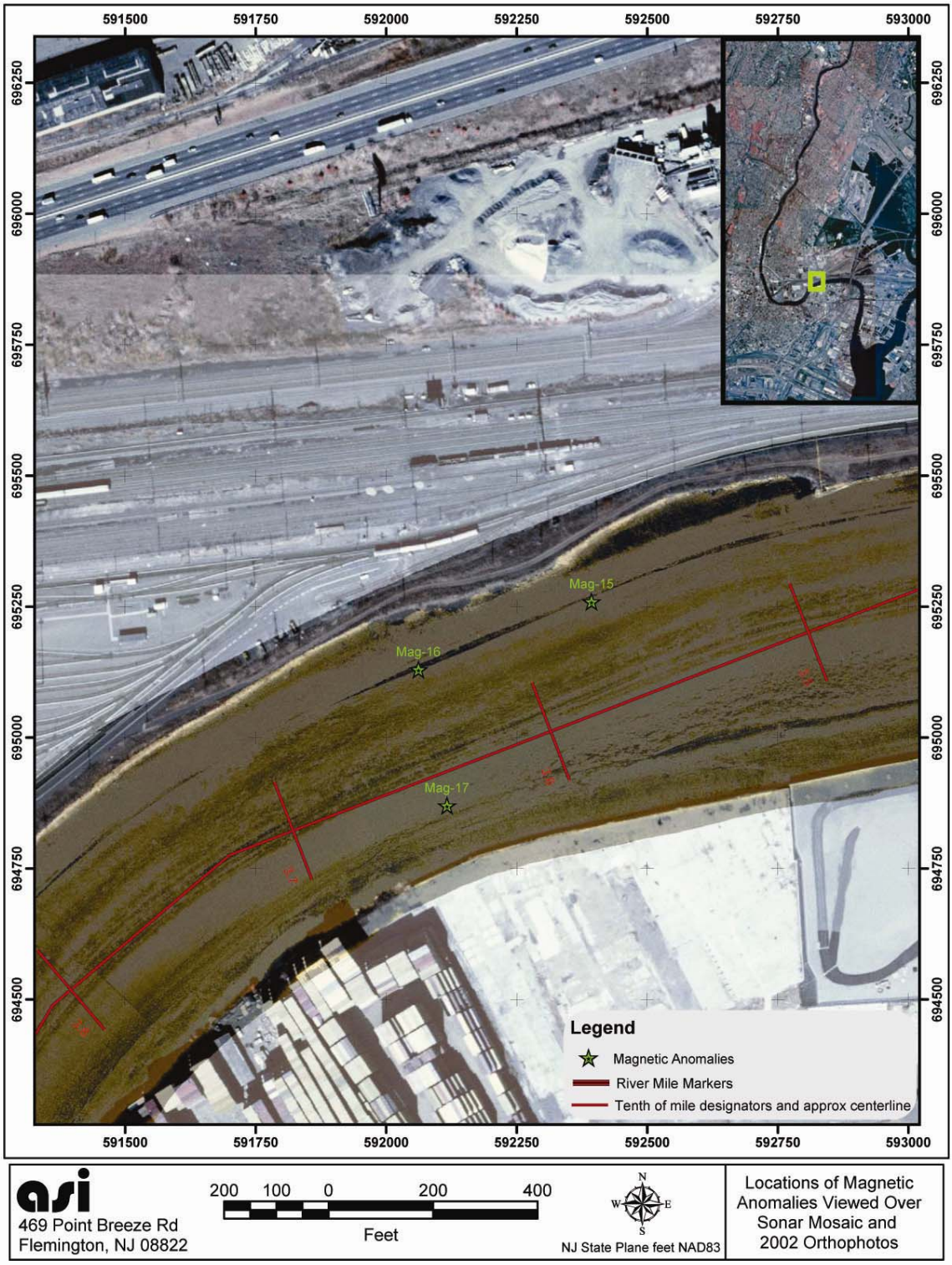


Figure 8. Locations of magnetic anomalies Mag-15 to Mag-17.

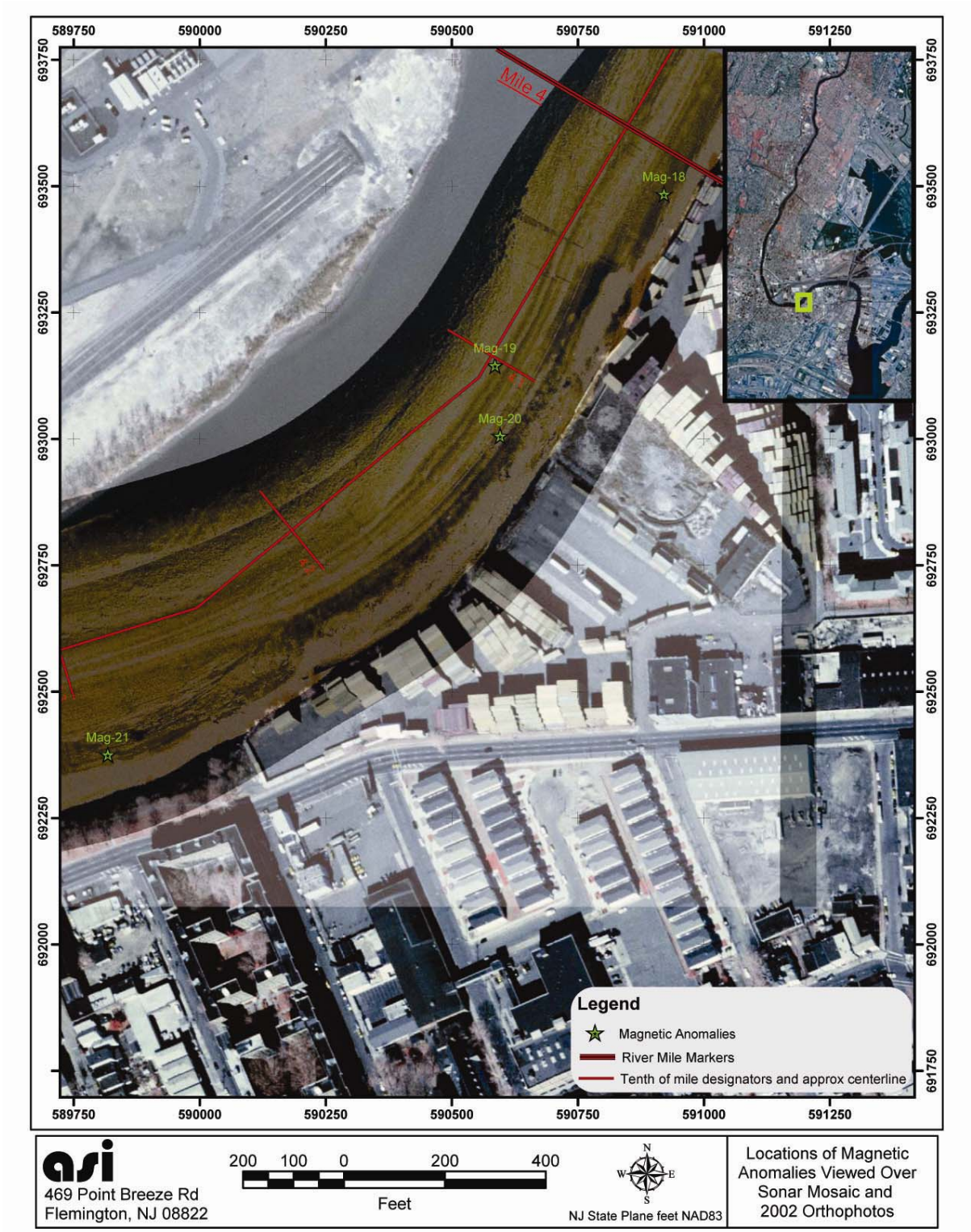


Figure 9. Locations of magnetic anomalies Mag-18 to Mag-21.

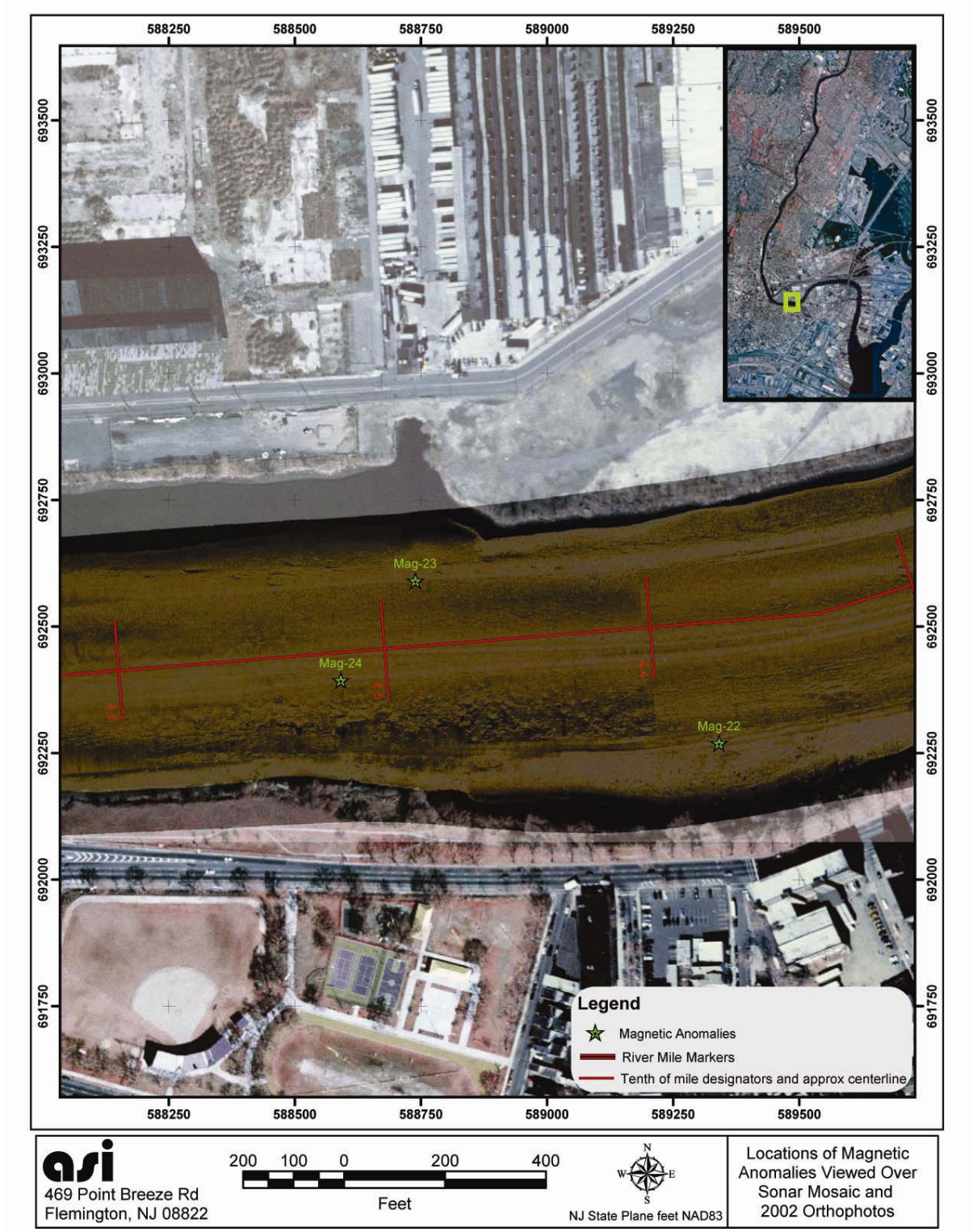


Figure 10. Locations of magnetic anomalies Mag-22 to Mag-24.

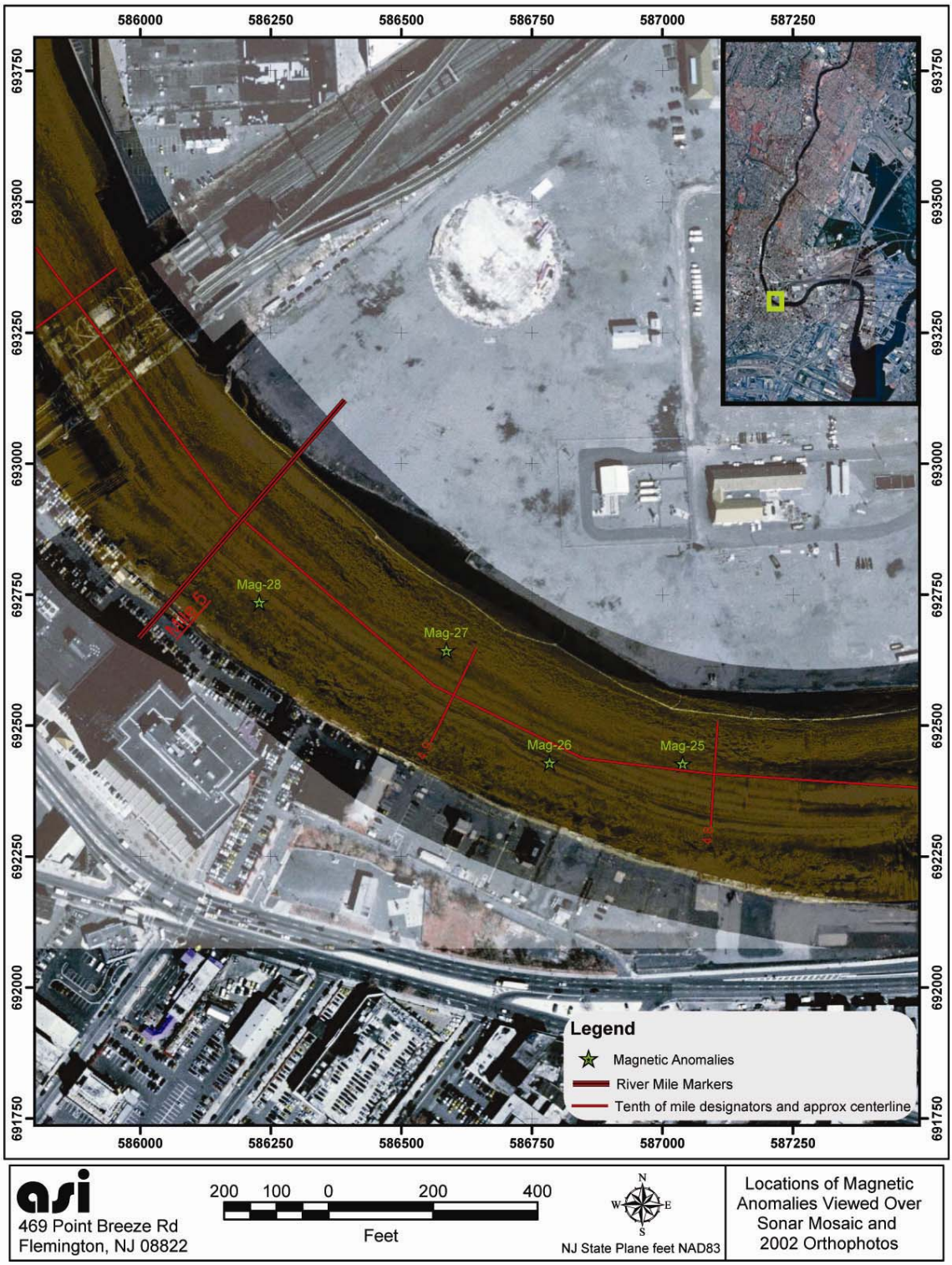


Figure 11. Locations of magnetic anomalies Mag-25 to Mag-28.

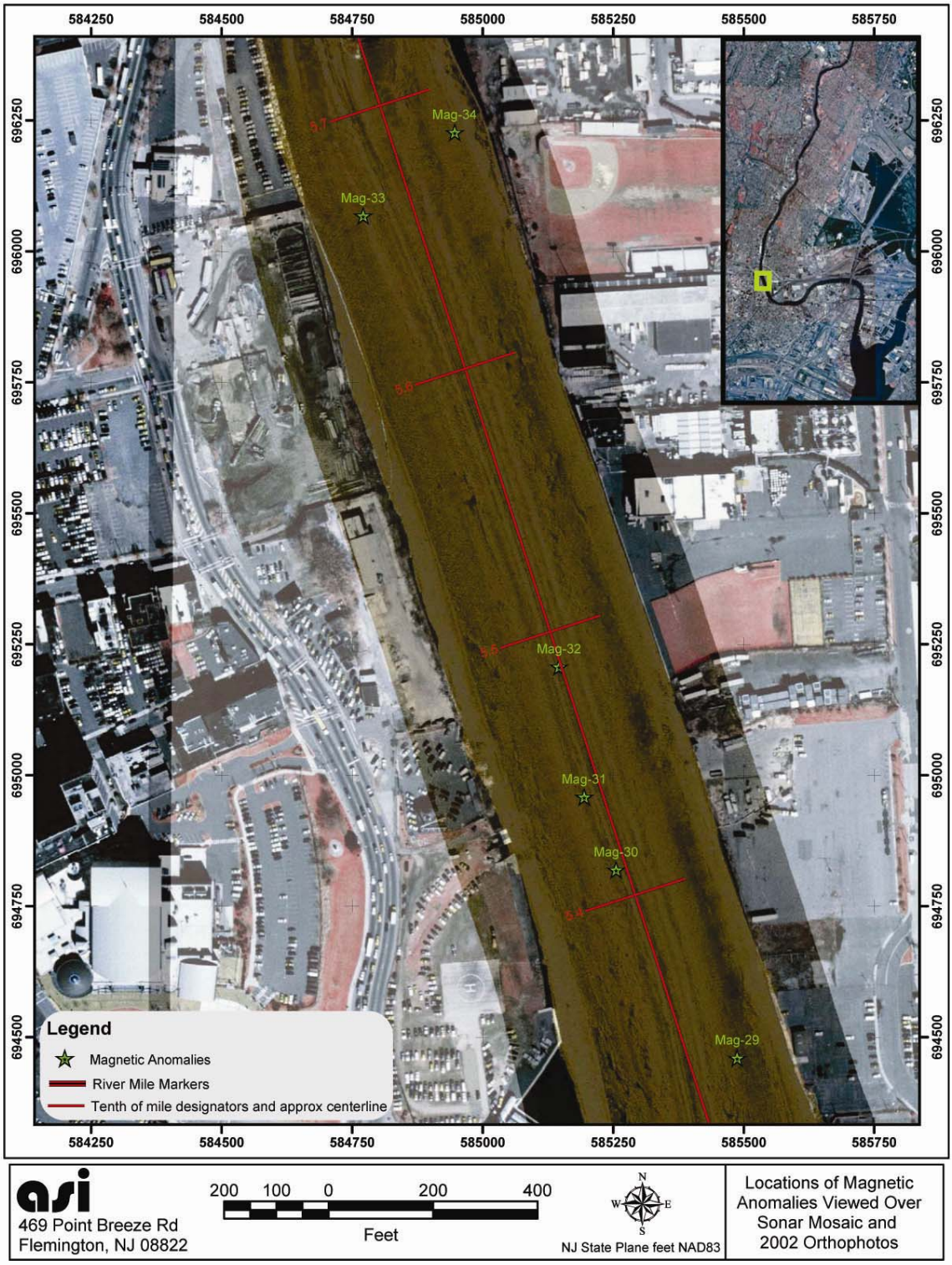


Figure 12. Locations of magnetic anomalies Mag-29 to Mag-34.

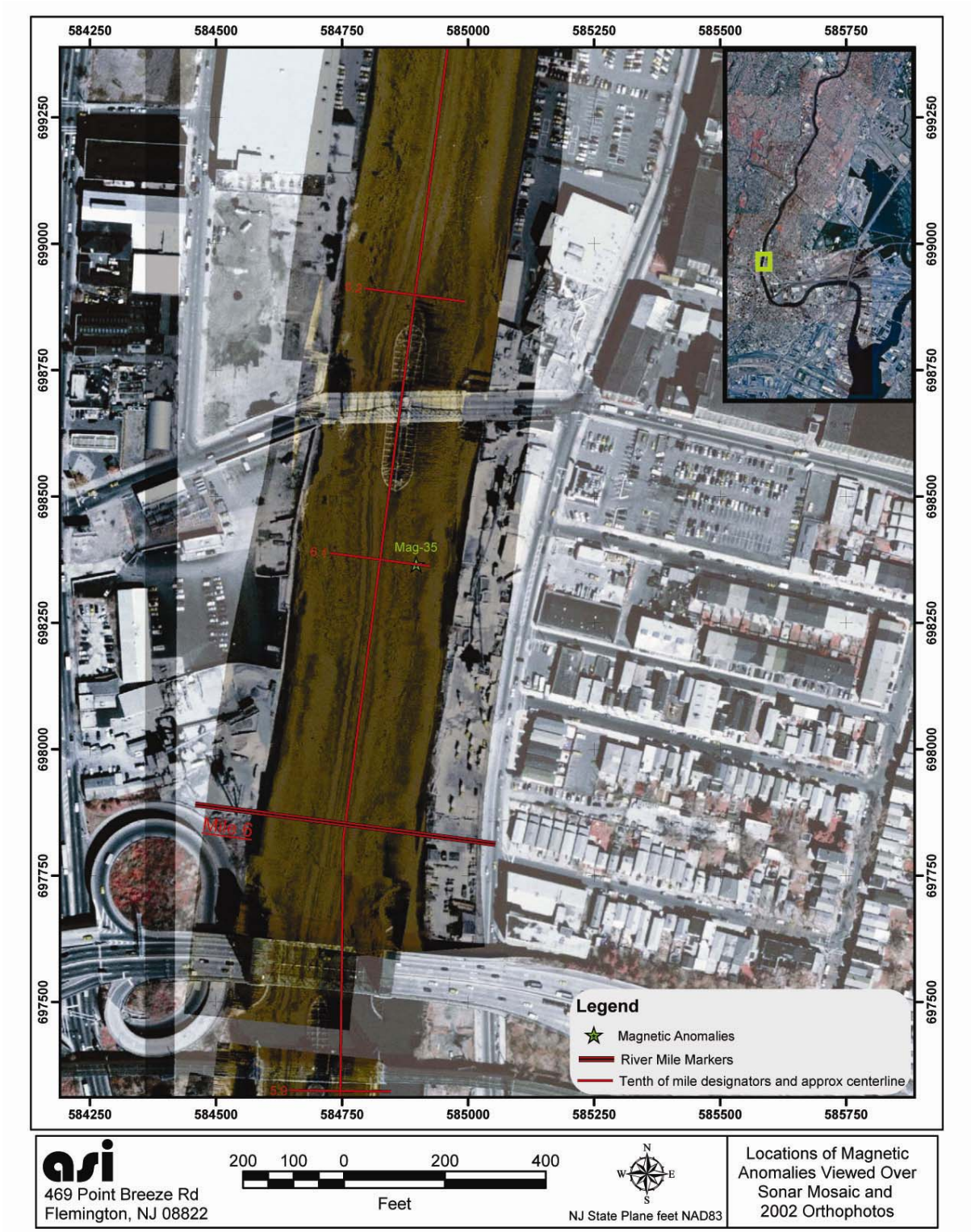


Figure 13. Location of magnetic anomaly Mag-35.

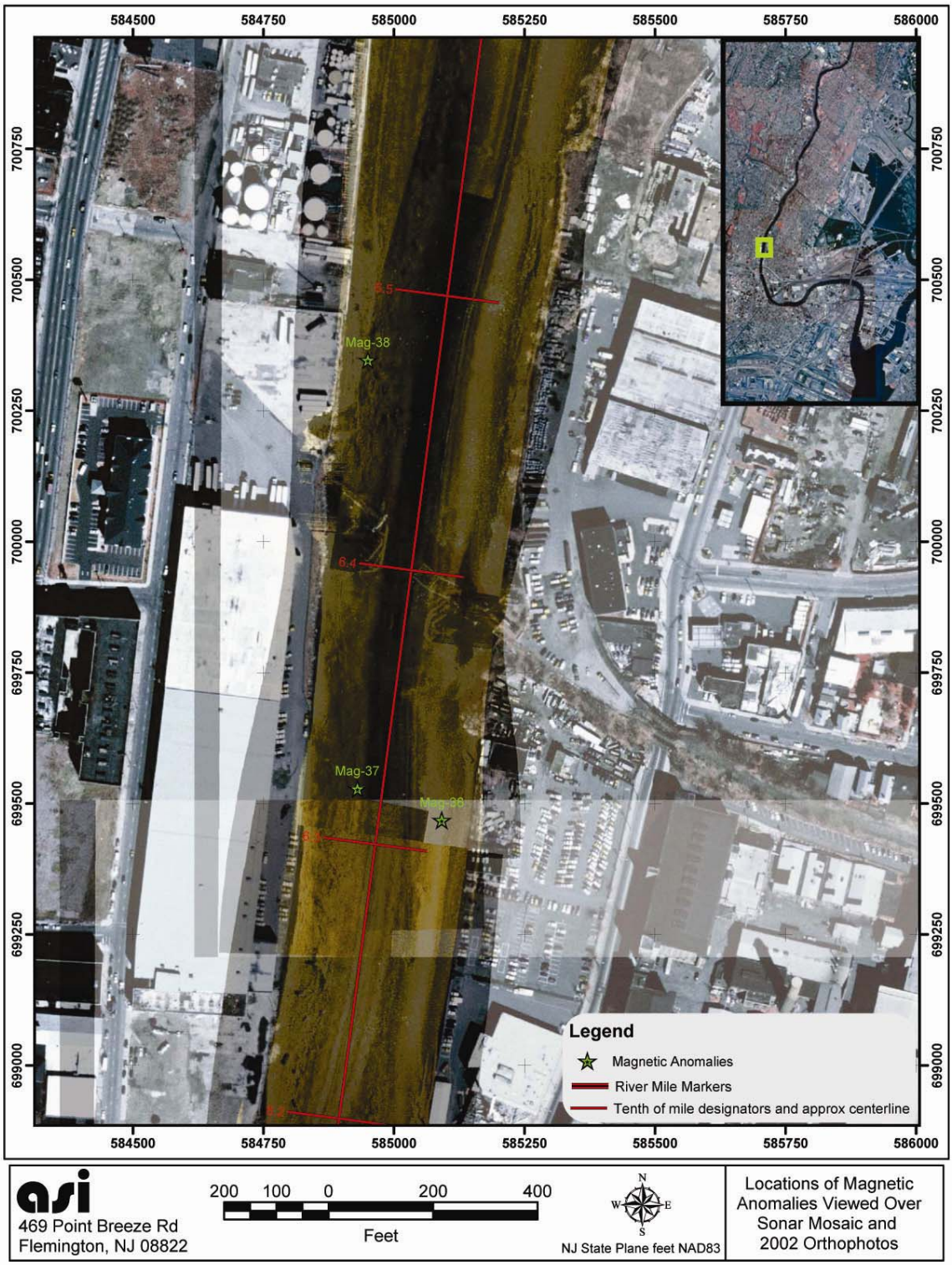


Figure 14. Locations of magnetic anomalies Mag-36 to Mag-38.

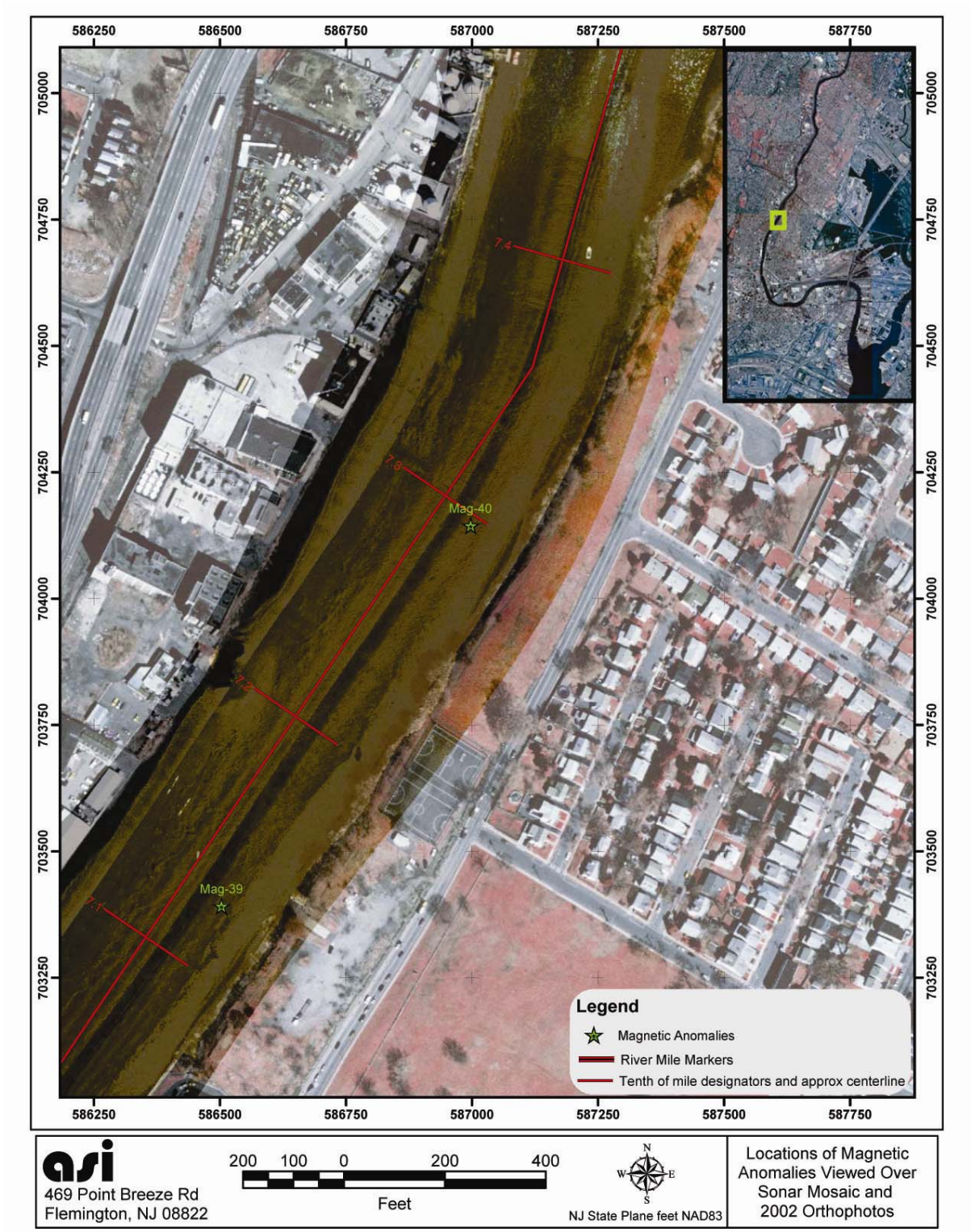


Figure 15. Locations of magnetic anomalies Mag-39 to Mag-40.

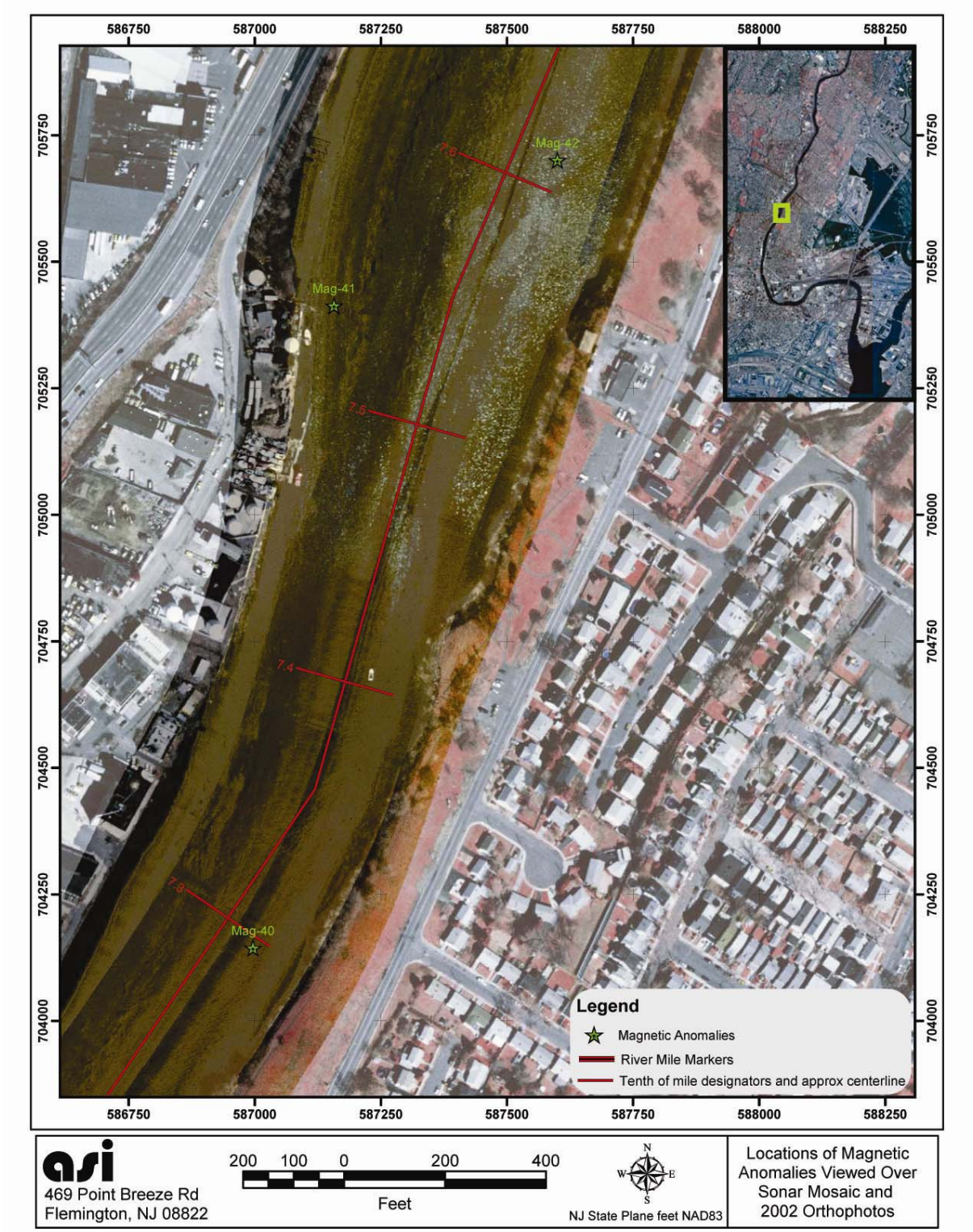


Figure 16. Locations of magnetic anomalies Mag-40 to Mag-42.

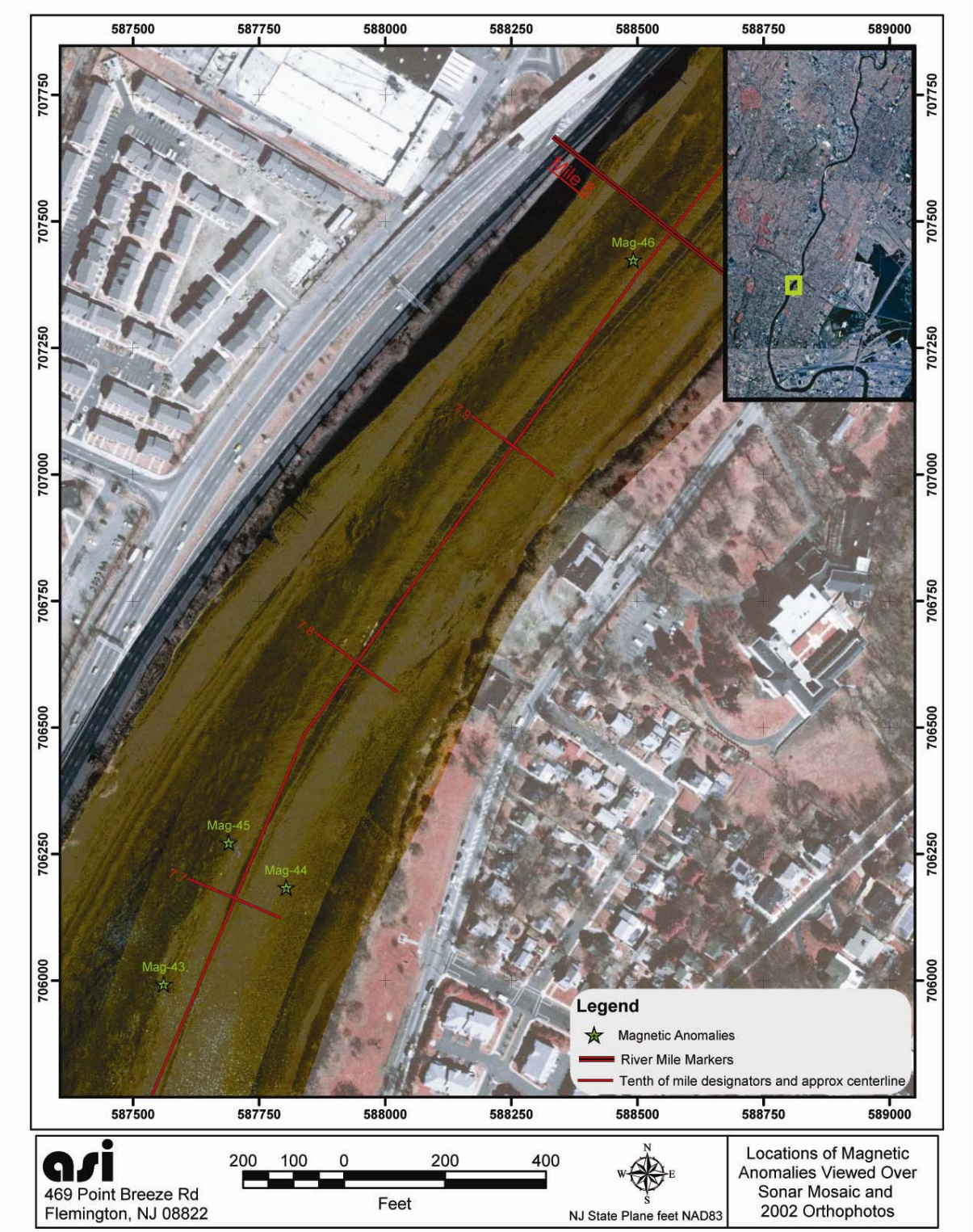


Figure 17. Locations of magnetic anomalies Mag-43 to Mag-46.

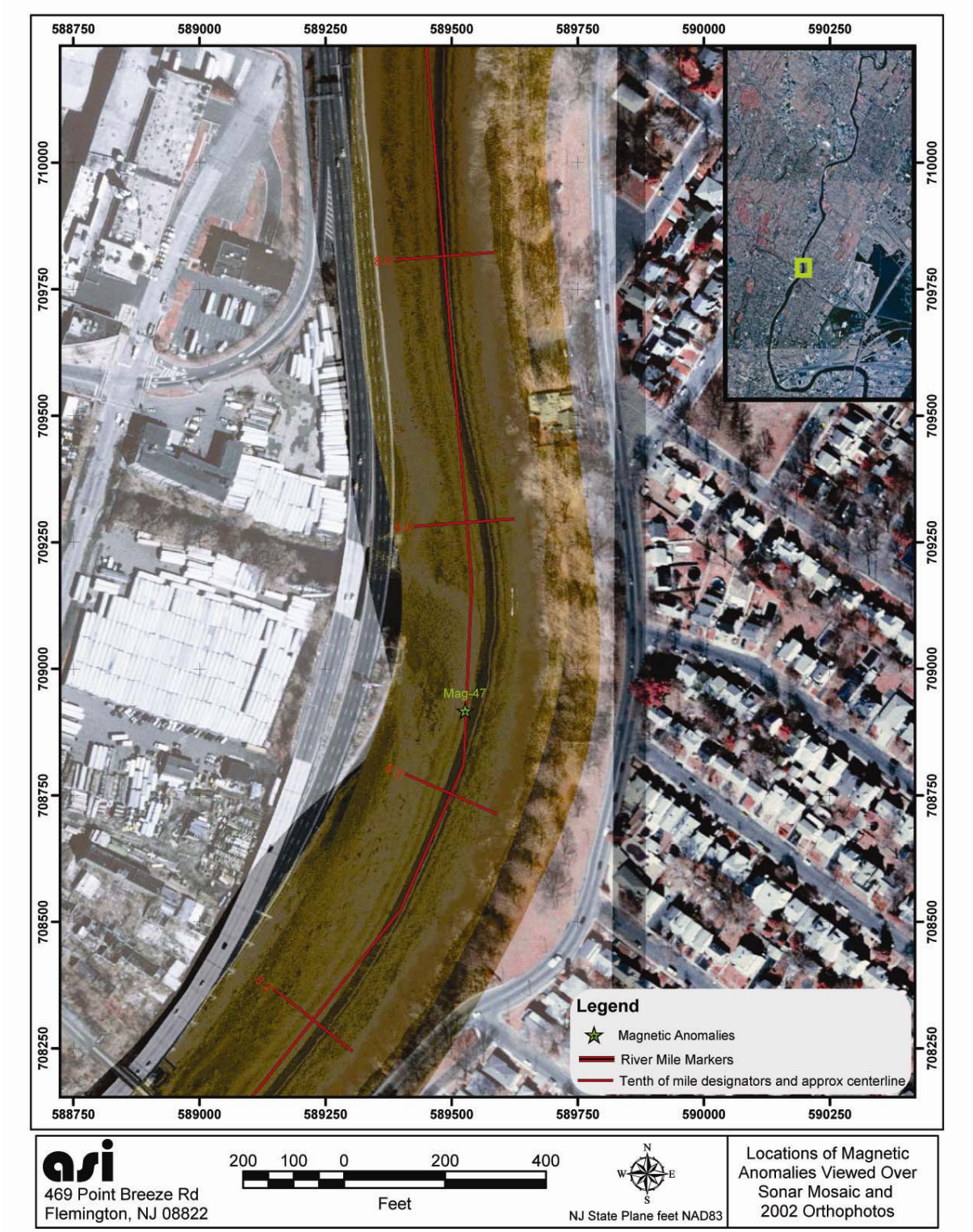


Figure 18. Location of magnetic anomaly Mag-47.

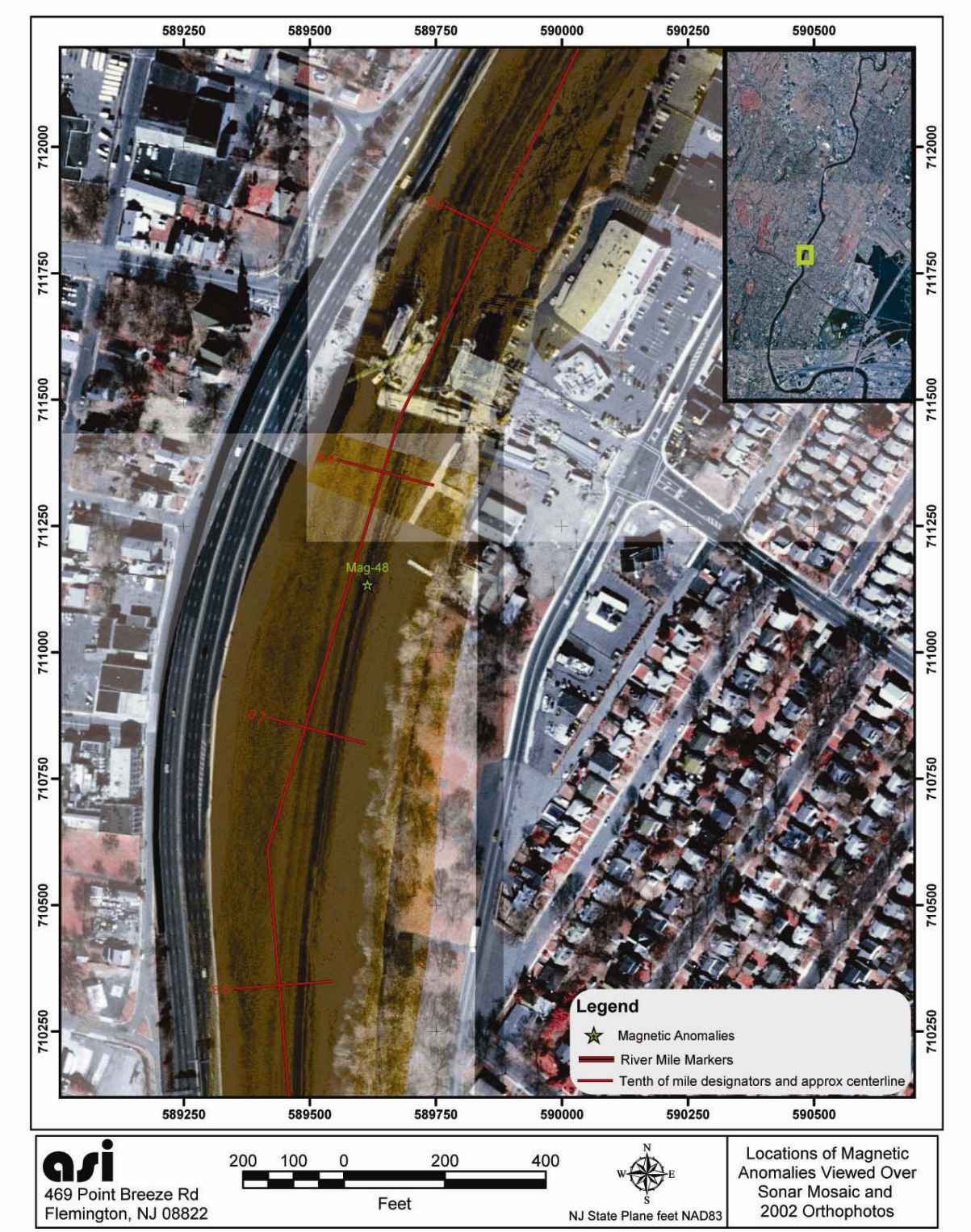


Figure 19. Location of magnetic anomaly Mag-48.

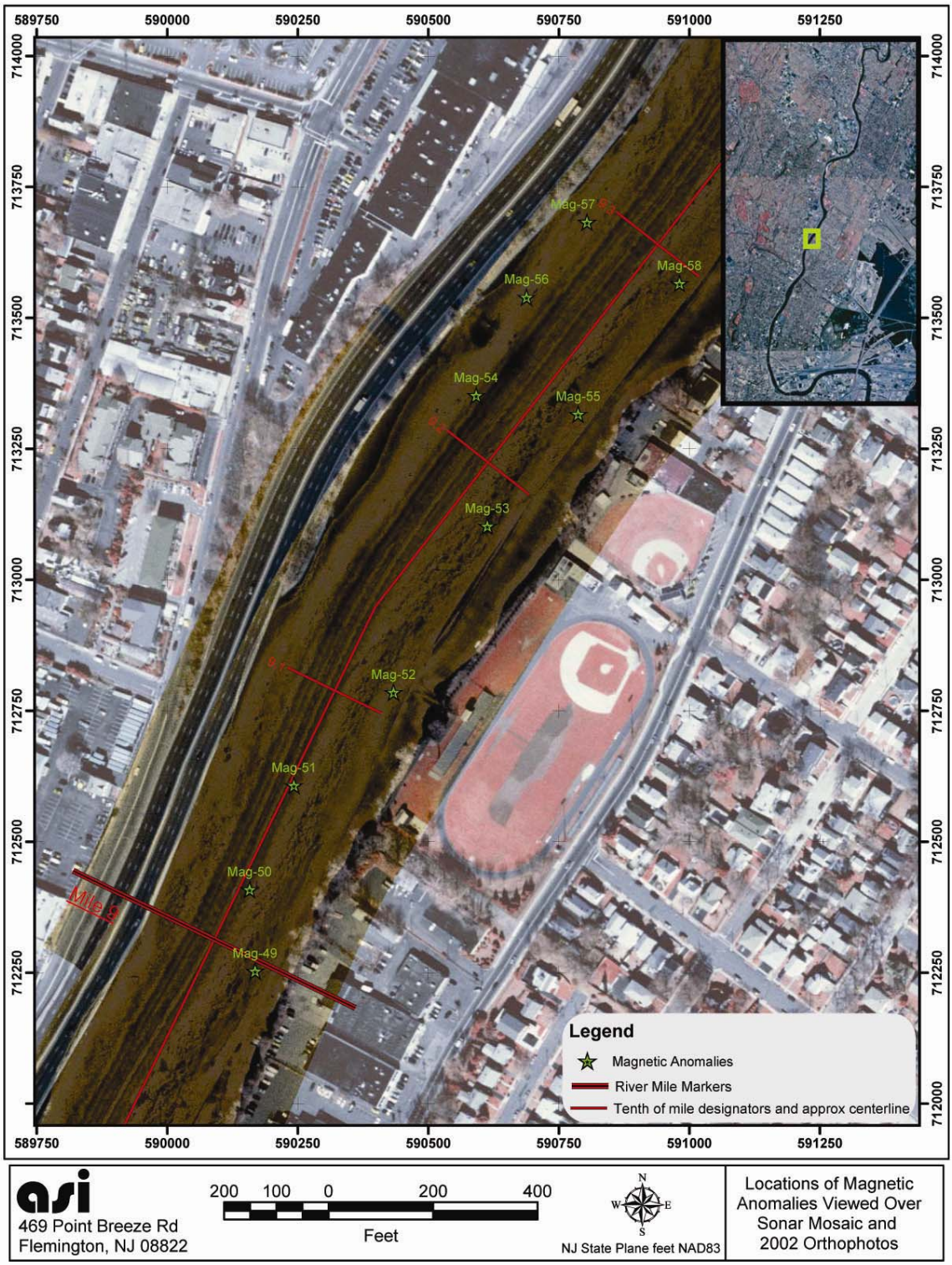


Figure 20. Locations of magnetic anomalies Mag-49 to Mag-58.

Figure 21. Locations of magnetic anomalies Mag-55 to Mag-66.

Figure 22. Locations of magnetic anomalies Mag-67 to Mag-73.

Figure 23. Locations of magnetic anomalies Mag-74 to Mag-77.

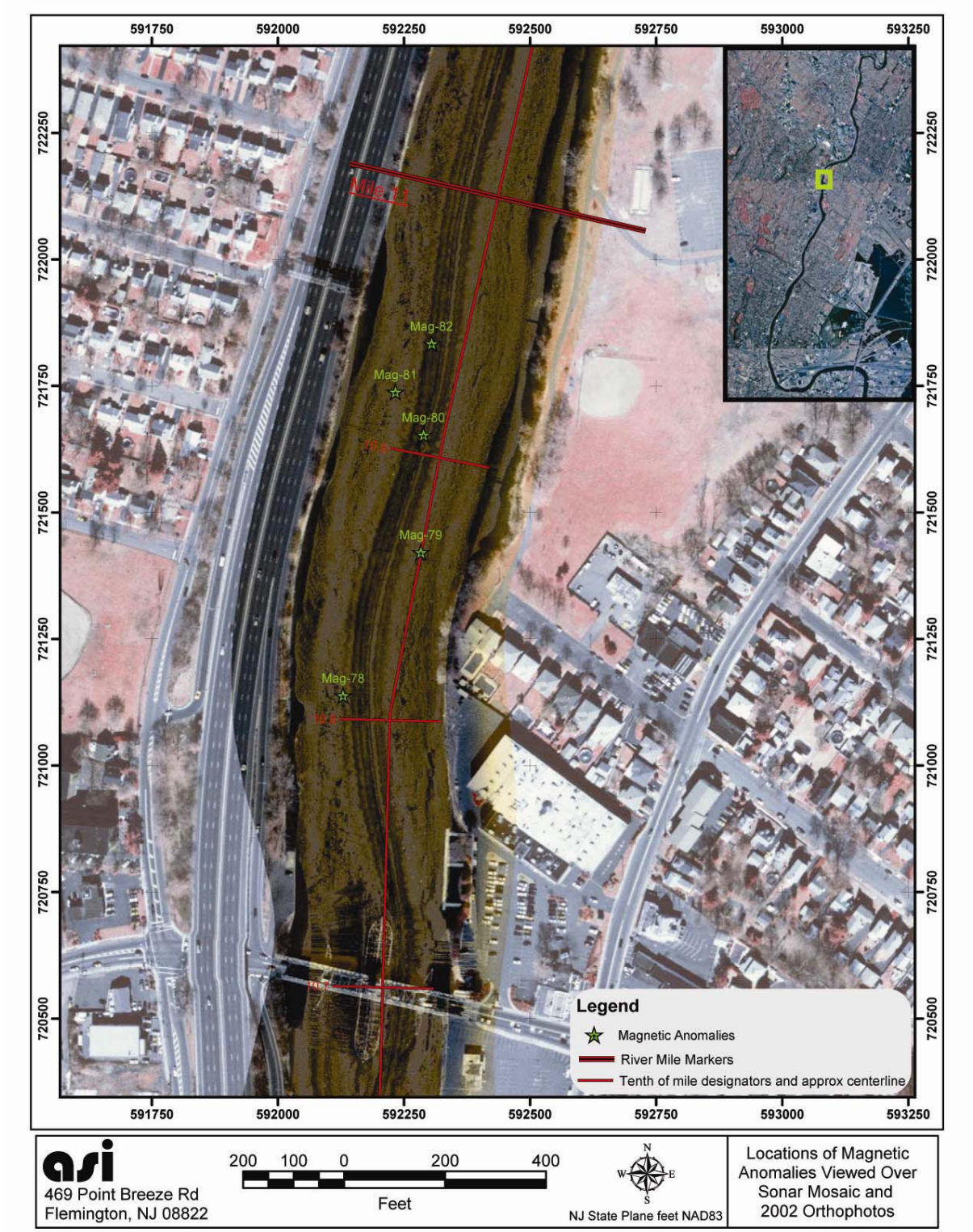


Figure 24. Locations of magnetic anomalies Mag-78 to Mag-82.

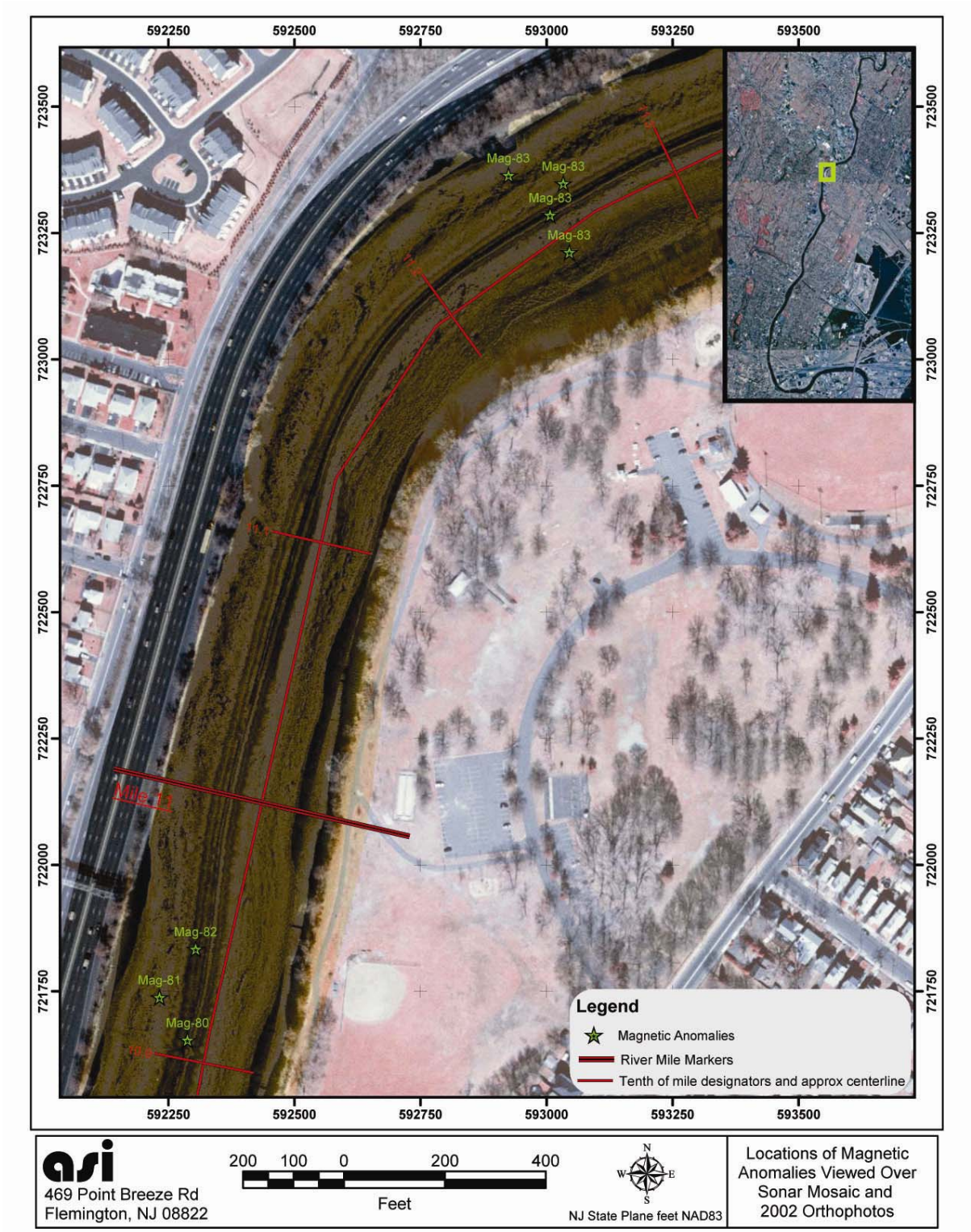


Figure 25. Locations of magnetic anomalies Mag-80 to Mag-83.

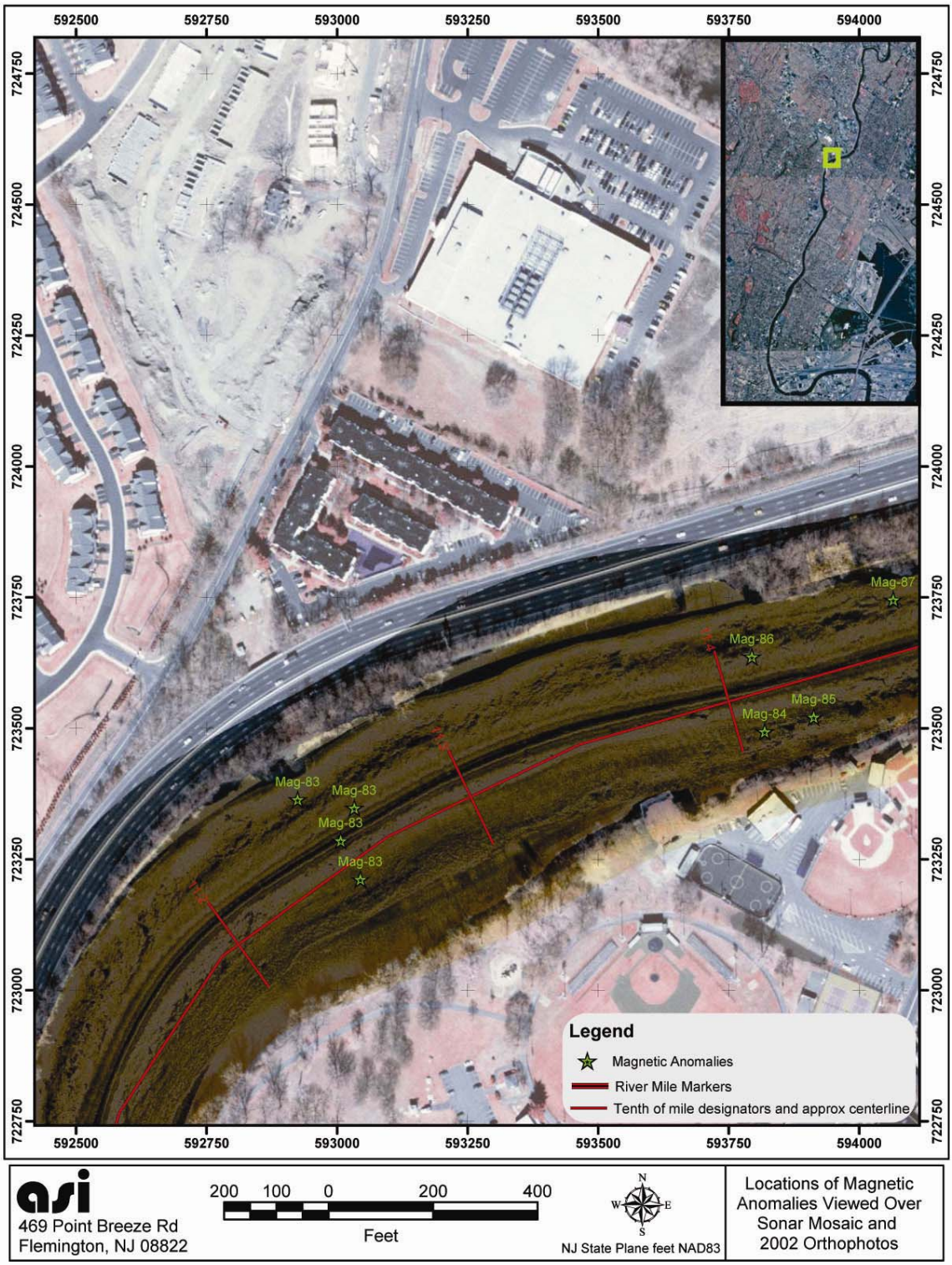


Figure 26. Locations of magnetic anomalies Mag-83 to Mag-87.

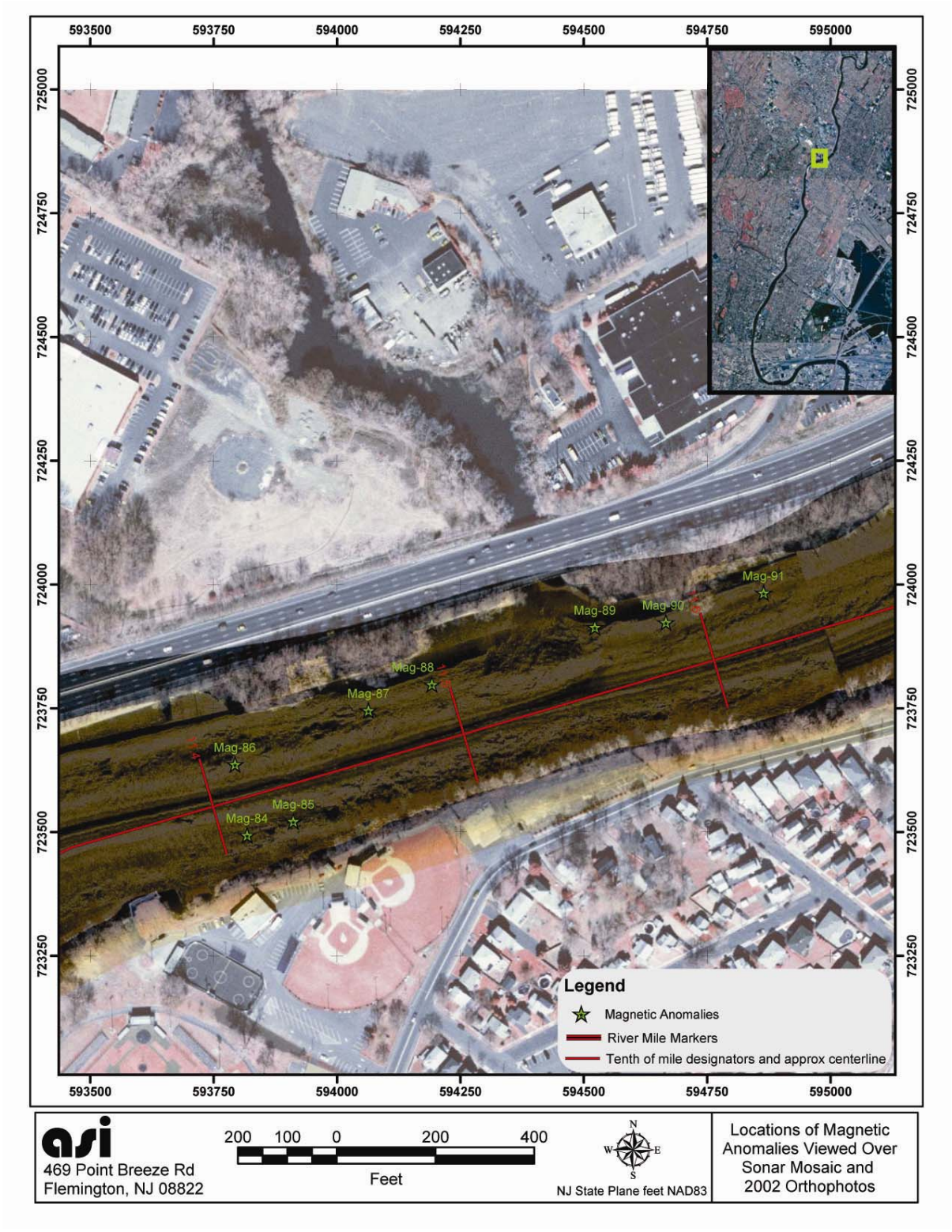


Figure 27. Locations of magnetic anomalies Mag-84 to Mag-91.

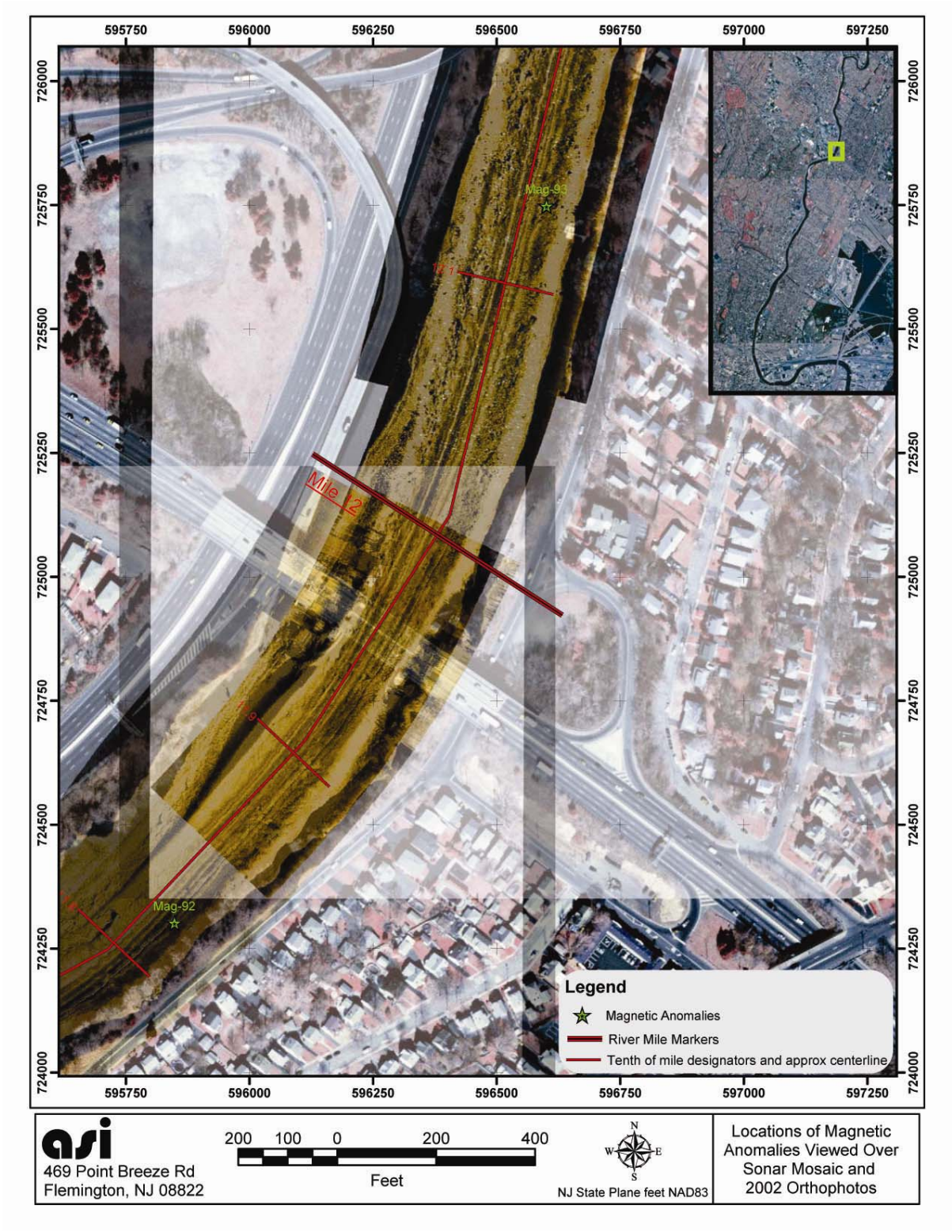


Figure 28. Locations of magnetic anomalies Mag-92 and Mag-93.

Figure 29. Locations of magnetic anomalies Mag-94 to Mag-96.

Figure 30. Locations of magnetic anomalies Mag-96 to Mag-101.

Figure 31. Locations of magnetic anomalies Mag-102 to Mag-104.

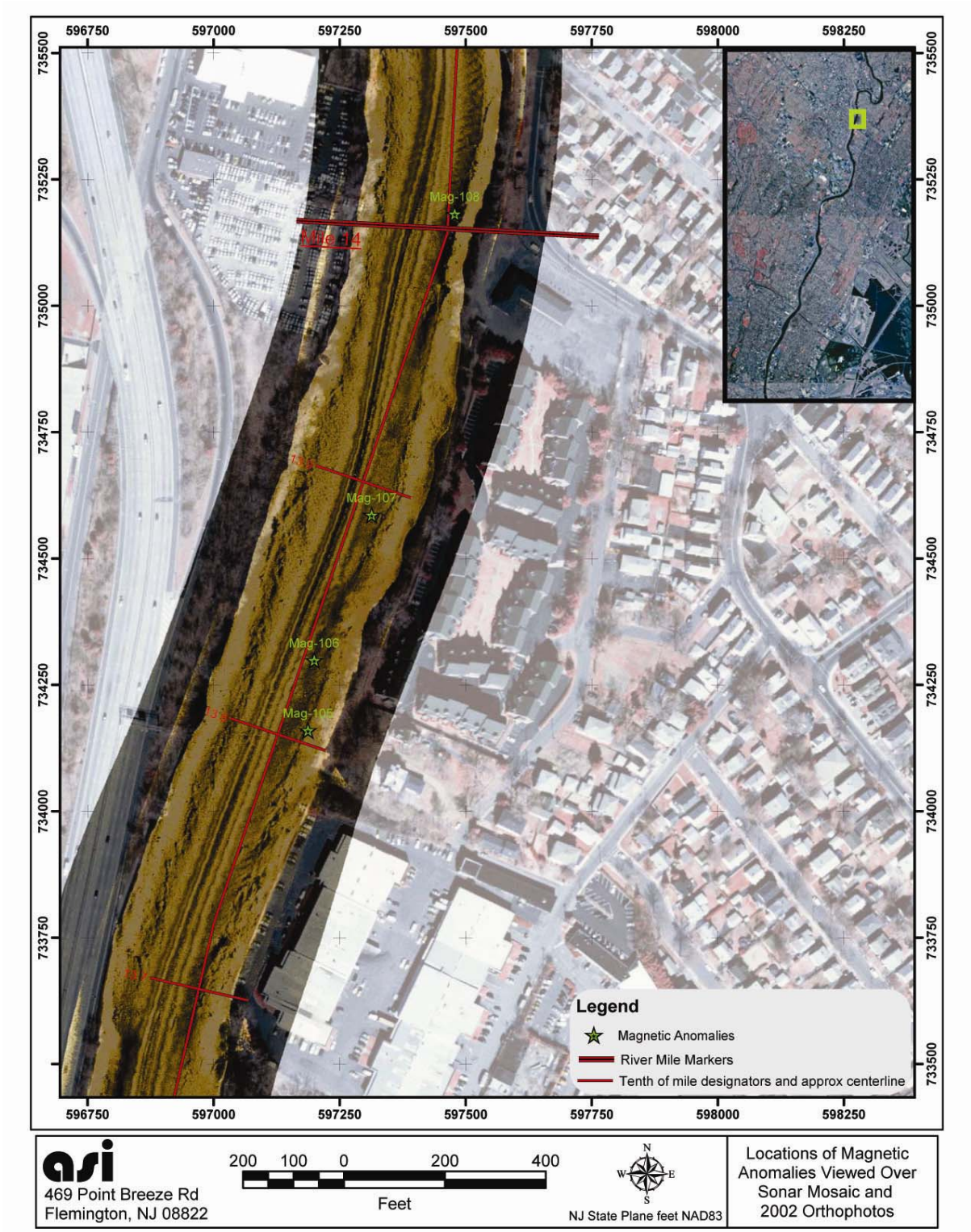


Figure 32. Locations of magnetic anomalies Mag-105 to Mag-108.

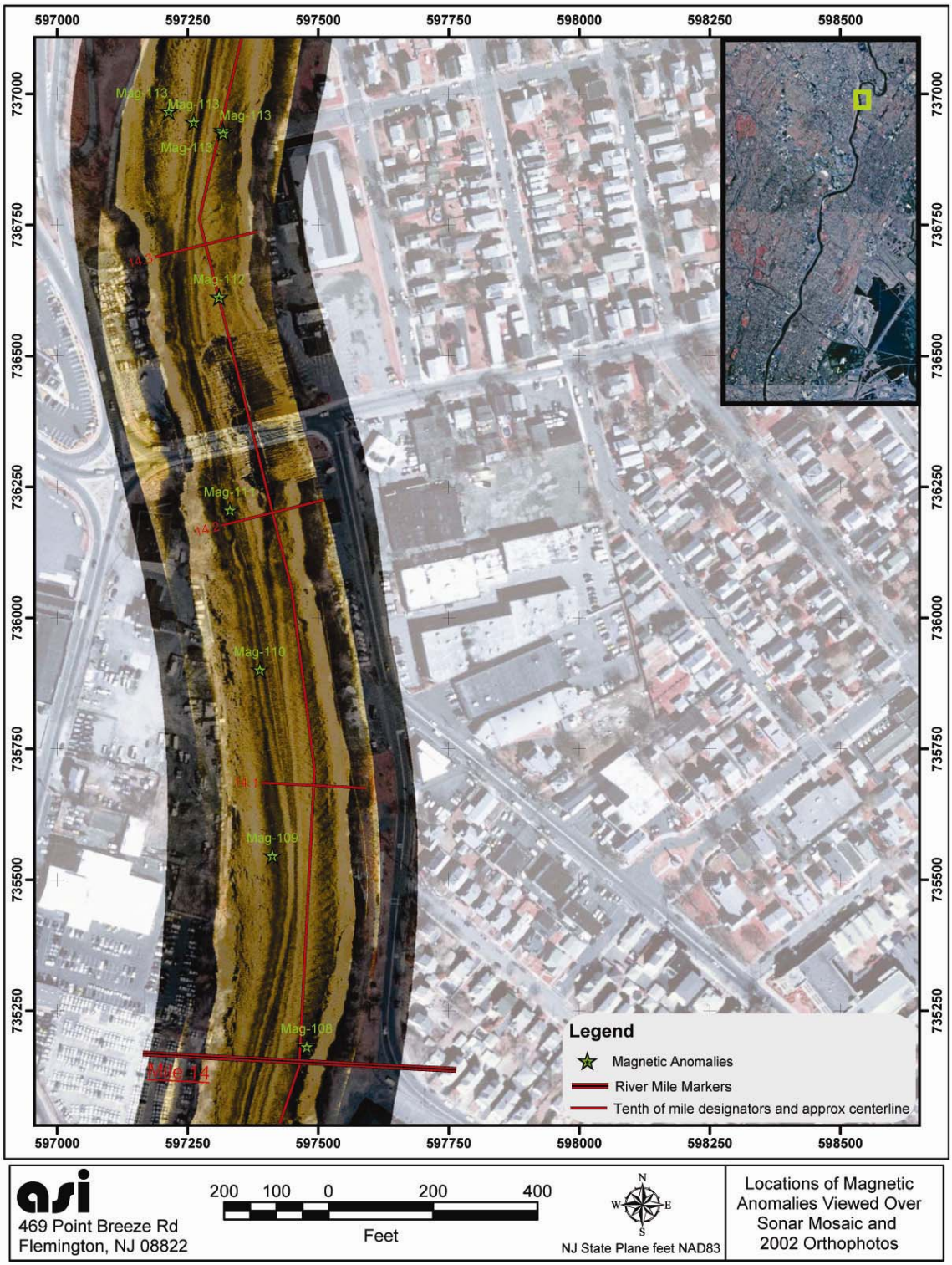


Figure 33. Locations of magnetic anomalies Mag-108 to Mag-113.

Figure 34. Locations of magnetic anomalies Mag-113 to Mag-117.

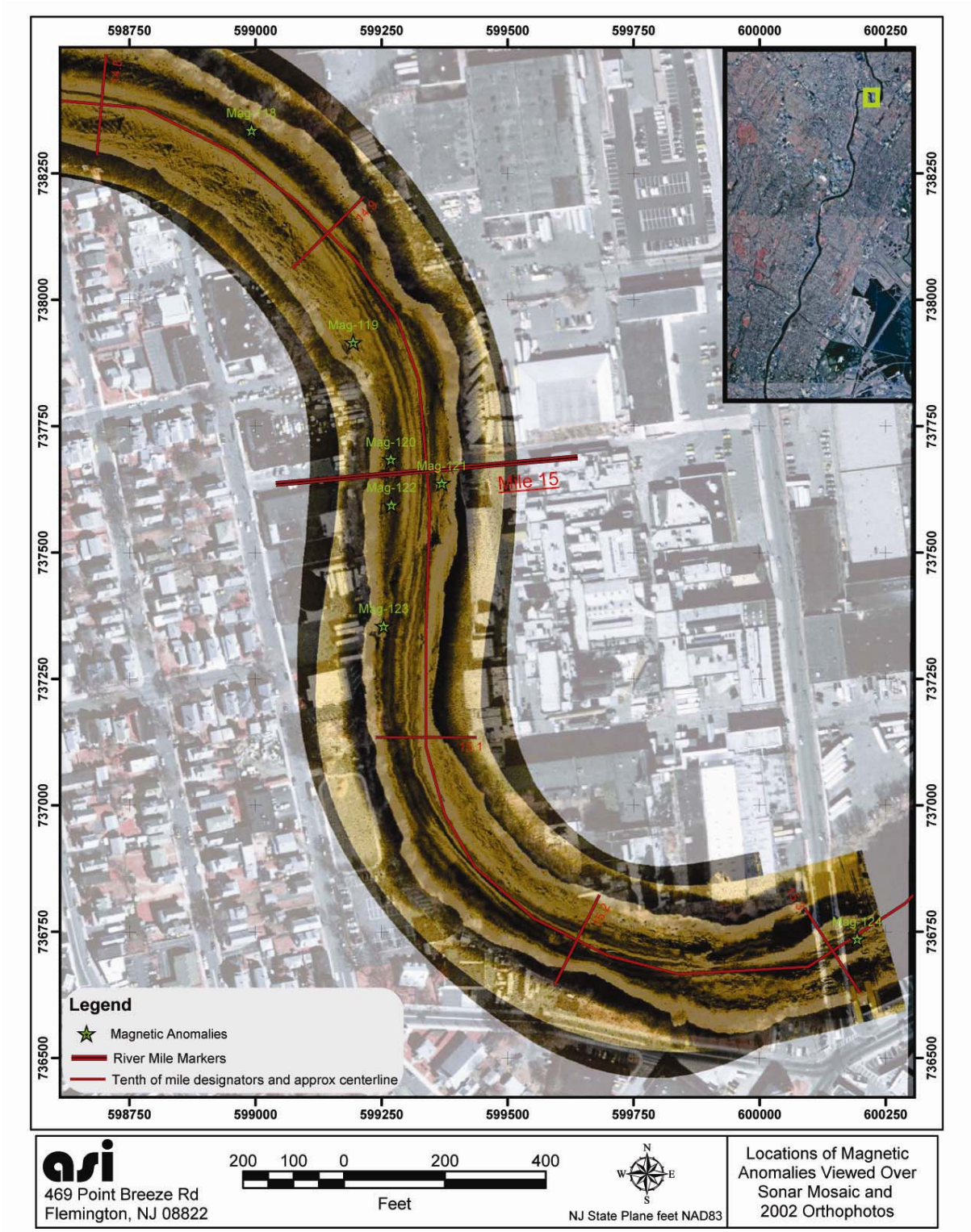


Figure 35. Locations of magnetic anomalies Mag-118 to Mag-124.

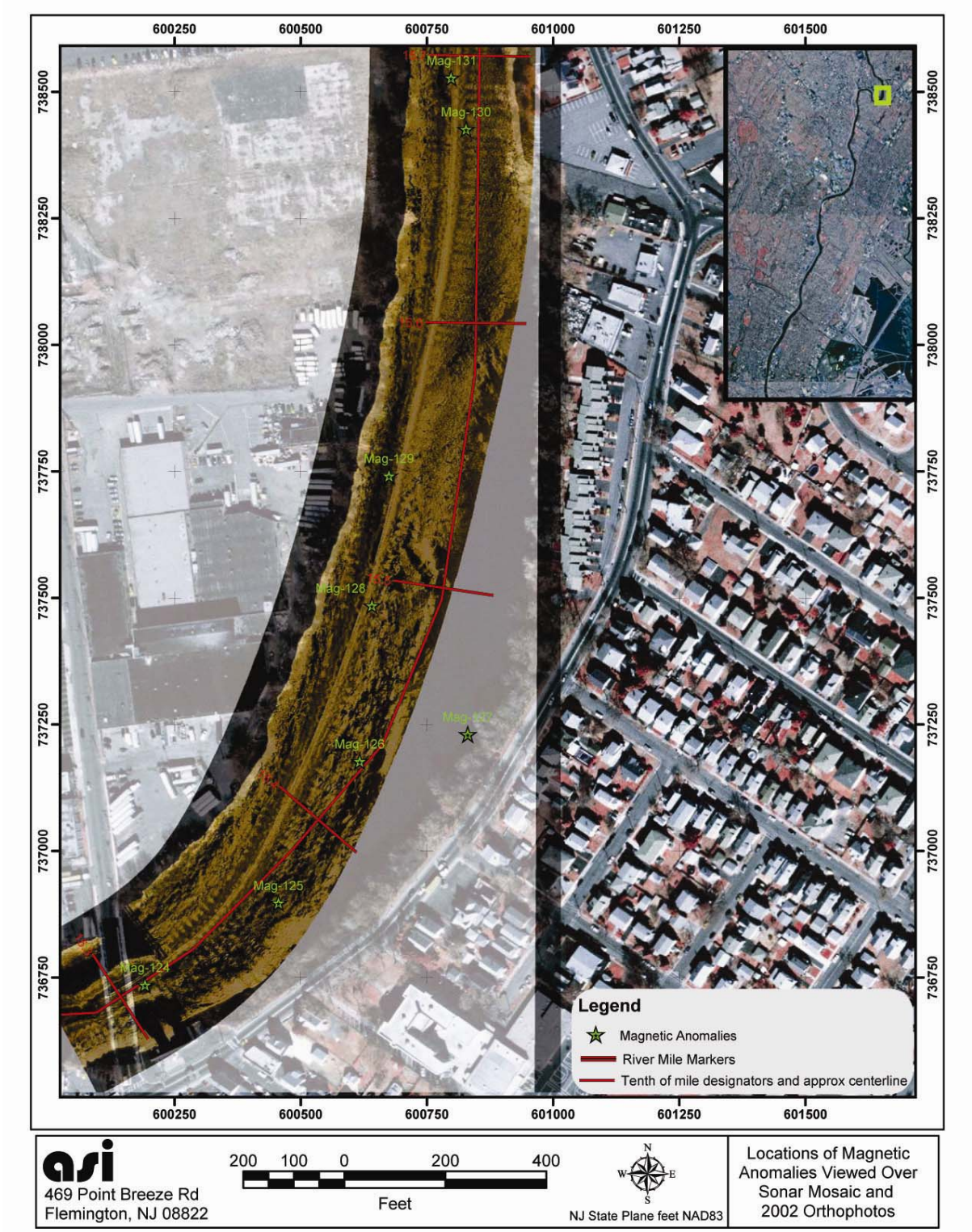


Figure 36. Locations of magnetic anomalies Mag-124 to Mag-131.

Figure 37. Locations of magnetic anomalies Mag-130 to Mag-142.

Figure 38. Locations of magnetic anomalies Mag-138 to Mag-147.

D. Side scan Sonar Ground Truthing

Shallow sediment cores were taken and analyzed to help ground-truth the images in the side scan sonar records as well as to help identify the classification results from the Quester Tangent seabed classification software. Five shallow cores were taken approximately every half mile along the length of the project area resulting in 170 cores. Following analysis of the side scan sonar records, an additional 105 locations were chosen to ground truth the side scan results based on differential sediment appearances in those records. These shallow cores were primarily collected by pushing a 1.5 inch diameter hollow tube into the sediment. A check valve attached to the tube allowed for the collection of samples without the use of a nose cone or core catcher which could have potentially disturbed the sample. In areas where the bottom material did not allow collection with the push coring device, a ponar grab sampler was used to collect the sample. Photographs were taken of each sample and the sample was field logged and visually classified. The photographs are included in the associated GIS. One hundred of the samples were retained and sent to an EPA laboratory (DESA) for grain size and total organic carbon analysis. The field logs and DESA lab results are included in Appendix B. The results from Quester Tangent were compared with the sonar mosaics and the results of the shallow core ground truthing to produce a simplified surficial seabed classification map of the project area. Charts were made comparing the surficial seabed classification map, field classification, and DESA results in order to statistically determine how similar the results compare between the different analytical sources to gain confidence in the results. These charts are included in Appendix C.

E. Sub-Bottom Profiler Ground Truthing

Deep sediment cores were taken and analyzed to help ground-truth the sub-bottom profiler results and help characterize the subsurface geology. Three vibracores were taken at 17 of the 51 sub-bottom profiler transects that were chosen along the length of the river. Transect spacing was approximately every mile, though the actual location of each transect was chosen based on the sub-bottom reflectors detected during the remote sensing survey.

Rossfelder P-3, P-4, and VT-6 vibracorers were used in order to get penetrations up to 33 feet below the riverbed. Initial attempts to vibracore without a core catcher resulted in no recovery, so it was decided to use the catchers for the deep coring program. A 4-inch diameter steel barrel was used in conjunction with soft liner to facilitate sample analysis and inspection. All cores were logged and field classified by geologists from Malcolm Pirnie. Approximately 50 sediment samples were chosen and analyzed by Aqua Survey for grain size, total organic carbon, Atterberg limits, bulk density, moisture content, and percent solids. These results can be found in Appendix D.

F. Side scan Sonar Survey Data Collection and Results

The side scan sonar survey encompassed the entire river bottom within the channel between the confluence with Newark Bay and the removed bridge between Newark and Kearny, and from shoreline to shoreline above that point to about one mile below the Dundee Dam where the river was too shallow for the sonar to effectively operate. This survey was conducted using a Marine Sonic Sea Scan PC sonar system with a single frequency 600-KHz towfish. The RTK-DGPS was used for positioning and Hypack Max survey management software was used for survey control and ship track recording. This survey was conducted by running five lines longitudinally along the river spaced approximately 100-feet apart with one line immediately adjacent to each shoreline. Range was set to 50 meters per side, resulting in greater than 200% coverage (the entire riverbed being insonified at least twice). In areas where the river was narrower, greater than 400% coverage was obtained.

The side scan survey was designed to optimize resolution of the side scan sonar records. Prior to commencing survey operations, the sonar was tuned and adjusted to find the optimal combination of control settings that yielded the best image. Gain settings were adjusted as little as possible, to allow accurate post-processing. Data were logged to the onboard computer for later review.

1. Debris/Obstruction Survey

Side scan sonar records were analyzed in conjunction with the bathymetry data for evidence of objects on the seafloor and geophysical processes and sediment types. Detected features were plotted at their locations on the geo-referenced GIS drawing. Targets marked included all sonar features with significant areal extent and acoustic shadow (indicating projection above the seafloor) and seafloor topographic features that could pose a threat to or serve as an obstruction for future dredging operations, if any. Sonar features were analyzed to determine locations, ranges, shadow lengths, scaled sizes, towfish heights and descriptions.

Forty sonar targets were found that fit the target criteria. Of those, 16 targets with acoustic signatures similar in dimension and appearance to cars were detected (Figures 58 to 69). Basic descriptions and locations for the cars can be found in Table 2. The majority of the car targets are clustered in the river in the vicinity of Newark, NJ (Figures 40 to 45). One car target was found considerably further upriver between the Conrail and Rutherford Ave. (Rt. 3) bridges (Figure 53). Though side scan sonar cannot guarantee that all of these targets are automobiles, further investigation is recommended to determine the nature of the objects detected. Twenty-four other sonar targets were found that could be obstructions or pose a threat to future operations on the river. Basic descriptions and locations for those targets can be found in Table 3. Maps showing their individual locations can be found Figures 39 to 57. The target images from the sonar records can be found in Figures 70 to 91. One sonar target, the remains of a vessel, should be investigated further should future project operations impact the site (Figures 51, 92, and 93).

Car Number	Easting	Northing	General Area/Description
1	590719.1	693114.6	Probable car, 22 feet off bank on west side of gravel pile
2	586740.9	692360.1	Probable car, 25 feet off of west bulkhead, between Jackson St and Dock RR Bridge
3	586013.8	692817.5	33 feet off of bulkhead
4	585975.1	692867.8	50 feet off of west side, 98 feet upriver from car 3
5	585377.5	695026.3	Probable car, 26 feet off of bulkhead
6	584589.2	697069.5	69 feet off of shoreline
7	584721.2	698499	Probable car, 44 feet off of west shore
8	584803.5	699007.2	34 feet off of bulkhead, 145 feet downstream from car 9
9	584821.5	699140.8	33 feet off of bulkhead, 67 feet downstream from car 10
10	584853.5	699201.7	53 feet off of bulkhead
11	584883.7	699778.6	On Western side below out of service bascule bridge, 34' downstream from car 12
12	584874.3	699815	On Western side below out of service bascule bridge, 55' downstream from car 13
13	584887.9	699875.7	On Western side below out of service bascule bridge
14	584936.7	700398.1	Probable car, western side above out of service bascule bridge
15	585500.6	702235.1	Probable Car
16	595978.2	724424.3	55 feet off of eastern shore

Table 2. Locations and descriptions of probable cars.

Name	Easting	Northing	Length (feet)	Width (feet)	Exposed Height (feet)	Description
SSST-1	592245.1	719671.0	15.0	4.0	0.5	Unknown rounded object, similar to storage tank or pipe
SSST-2	592047.2	720777.1	52.0	22.0	low lying	Linear object, possible pipe, log, or edge of buried barge
SSST-3	592198.7	715626.5	20.0	8.0	4.0	Possible boat on edge of rock pile
SSST-4	587985.1	706293.2	105.0	30.0	low lying	Mostly buried remains of a barge
SSST-5	587887.8	706193.5	80.0	27.0	low lying	Mostly buried remains of a barge
SSST-6	585141.8	699584.9	24.0	8.0	1.5	Submerged remains of a boat
SSST-7	586497.1	703310.6	16.0	6.0	4.0	Unknown debris/object
SSST-8	586763.8	703682.1	23.0	7.0	2.0	Unknown debris/object
SSST-9	589485.4	709069.3	250.0	150.0	pile	Large, shallow pile of rocks
SSST-10	584937.4	700338.6	68.0	22.0	low lying	Probable remains of a mostly buried barge
SSST-11	587104.5	705358.6	32.0	10.0	2.0	Submerged remains of a boat
SSST-12	584952.5	699288.9	30.0	2.0	0.5	Linear object, possible pipe, piling, or log
SSST-13	590578.4	692980.0	36.0	20.0	1.5	Unknown object, pile of debris
SSST-14	586952.5	692358.1	100.0	30.0	1.0	Debris pile
SSST-15	584952.7	699223.9	36.0	2.0	0.5	Unknown object
SSST-16	590028.6	692444.8	15.0	5.0	2.0	Unknown object
SSST-17	598357.3	694256.1	145.0	100.0	4.0	Piles of lumber, logs, or debris
SSST-18	596506.4	731818.3	24.0	3.0	1.0	Unknown debris, probably logs
SSST-19	596303.4	729919.1	105.0	29.0	3.0	Mostly submerged remains of barge
SSST-20	597474.1	736050.2	13.0	5.0	2.0	Unknown debris/object
SSST-21	596314.6	731563.1	21.0	9.0	low lying	Unknown debris/object
SSST-22	596815.9	728594.6	45.0	32.0	low lying	Unknown debris, possible barge or dock remains
SSST-23	600650.4	739752.1	11.0	7.0	2.5	Large boulder
Wreck	594802.2	723987.2	80	16	low lying	Unknown vessel remains, investigation recommended if impacted

Table 3. Locations and descriptions of additional sonar targets.

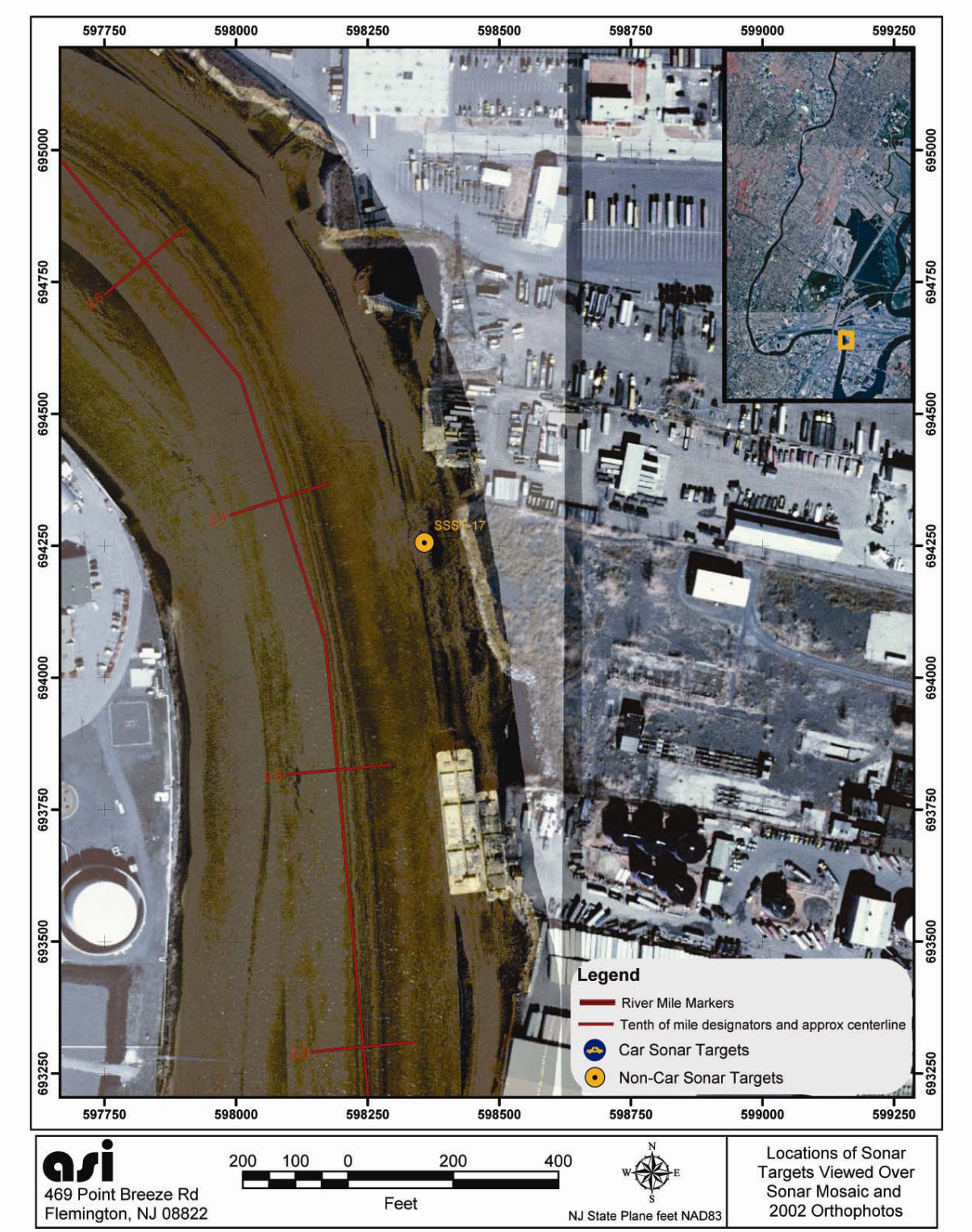


Figure 39. Location of sonar target SSST-17.

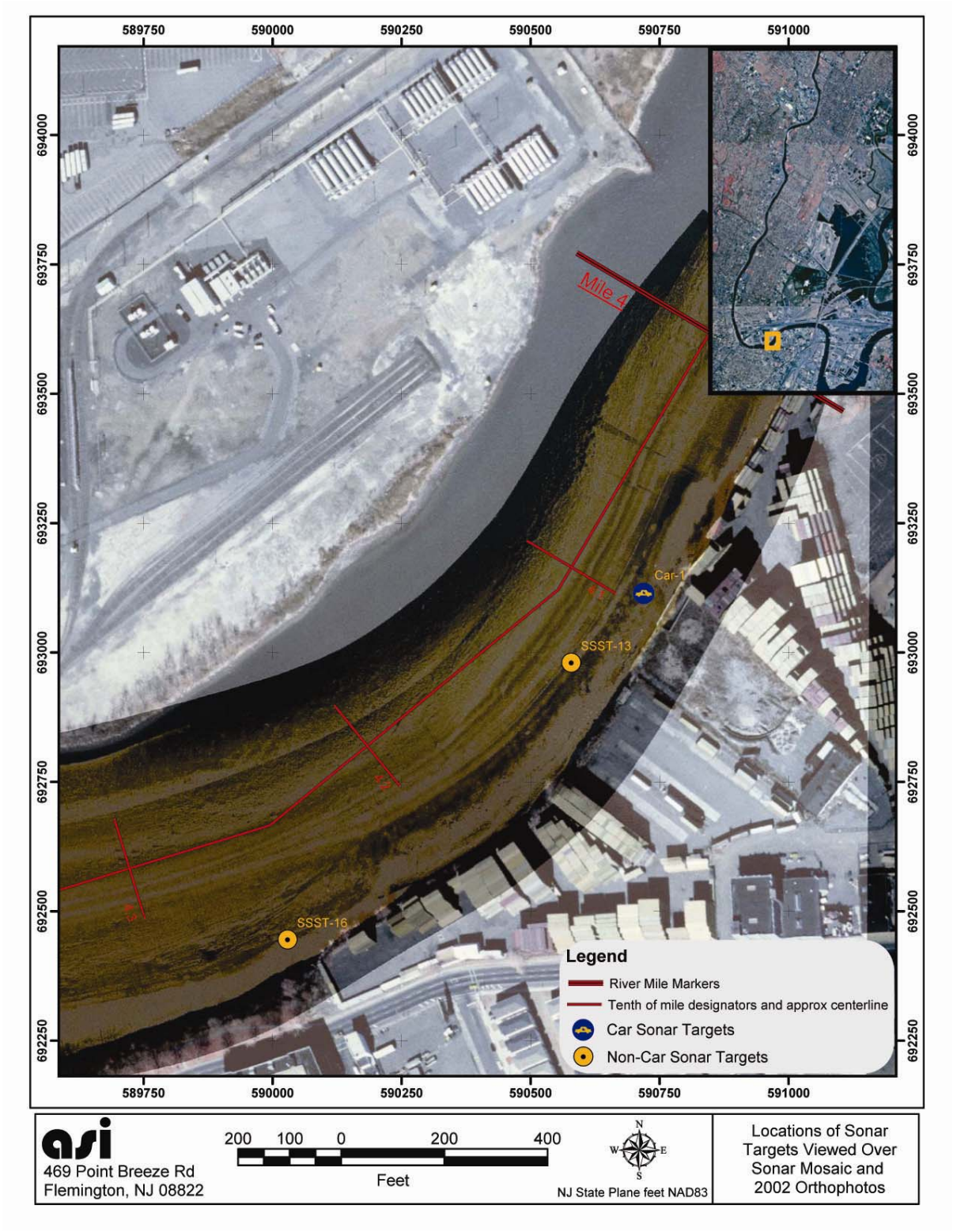


Figure 40. Locations of sonar targets Car-1, SSST-13 and SSST-16.

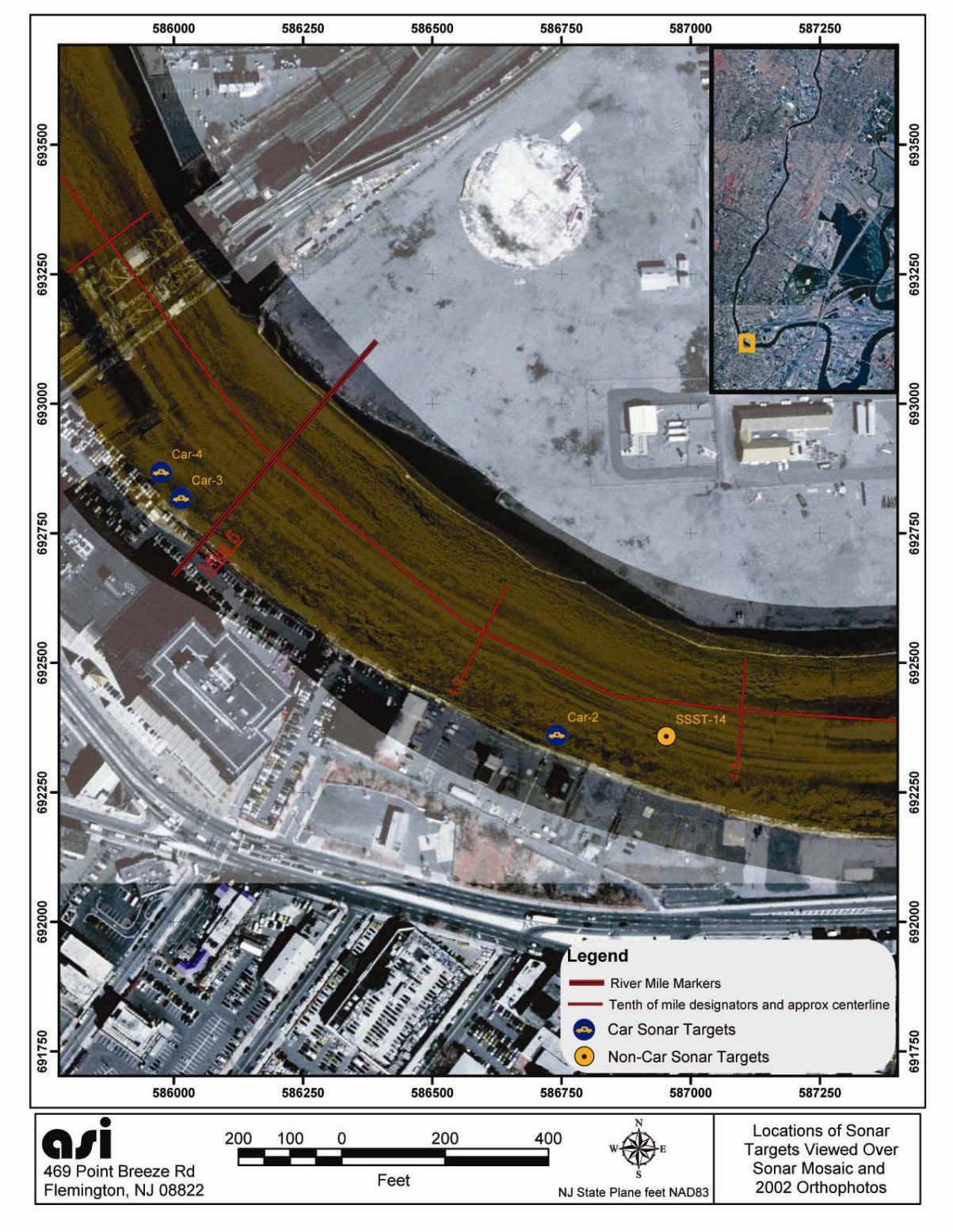


Figure 41. Locations of sonar targets Car-2 to Car-4 and SSST-14.

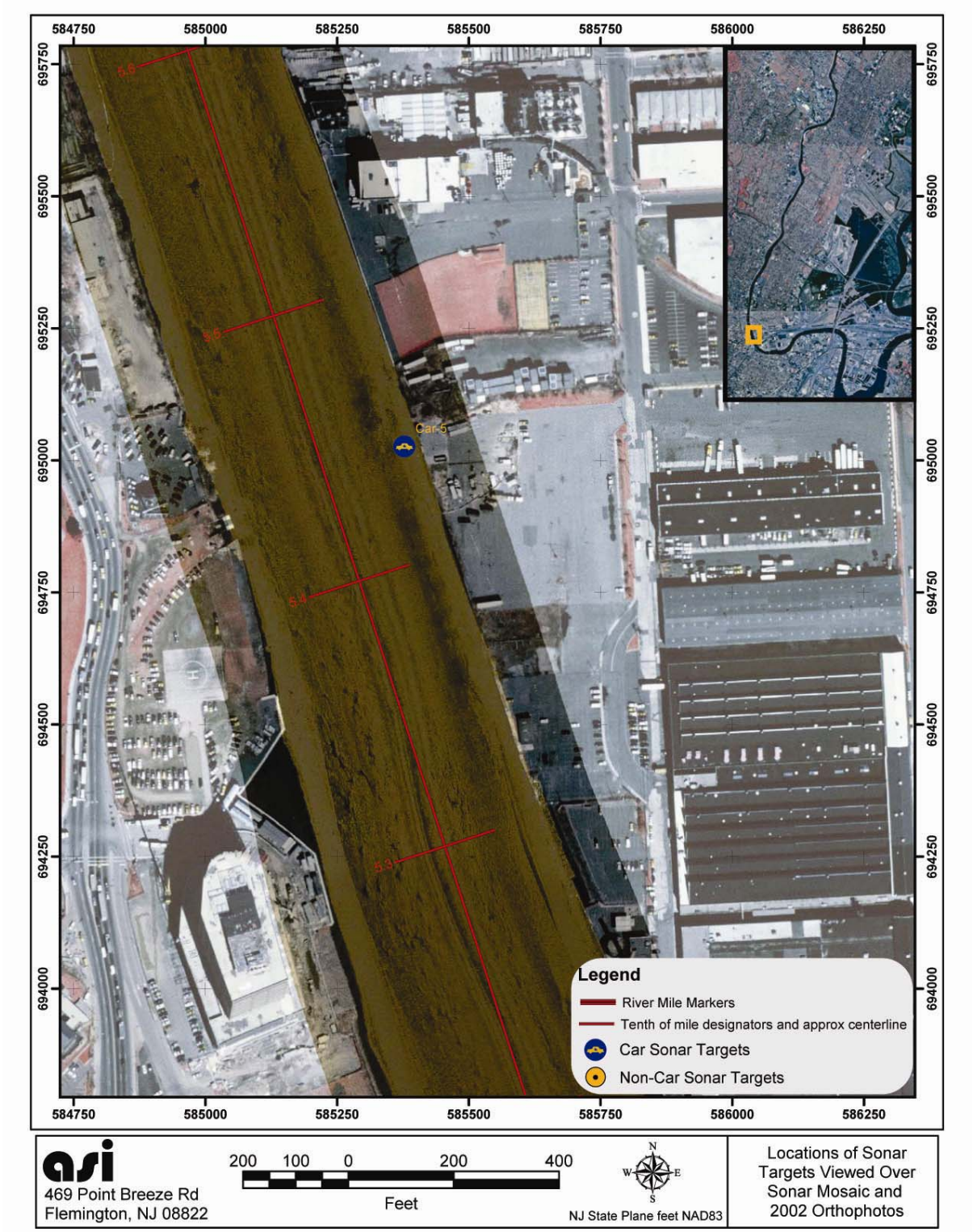


Figure 42. Location of sonar target Car-5.

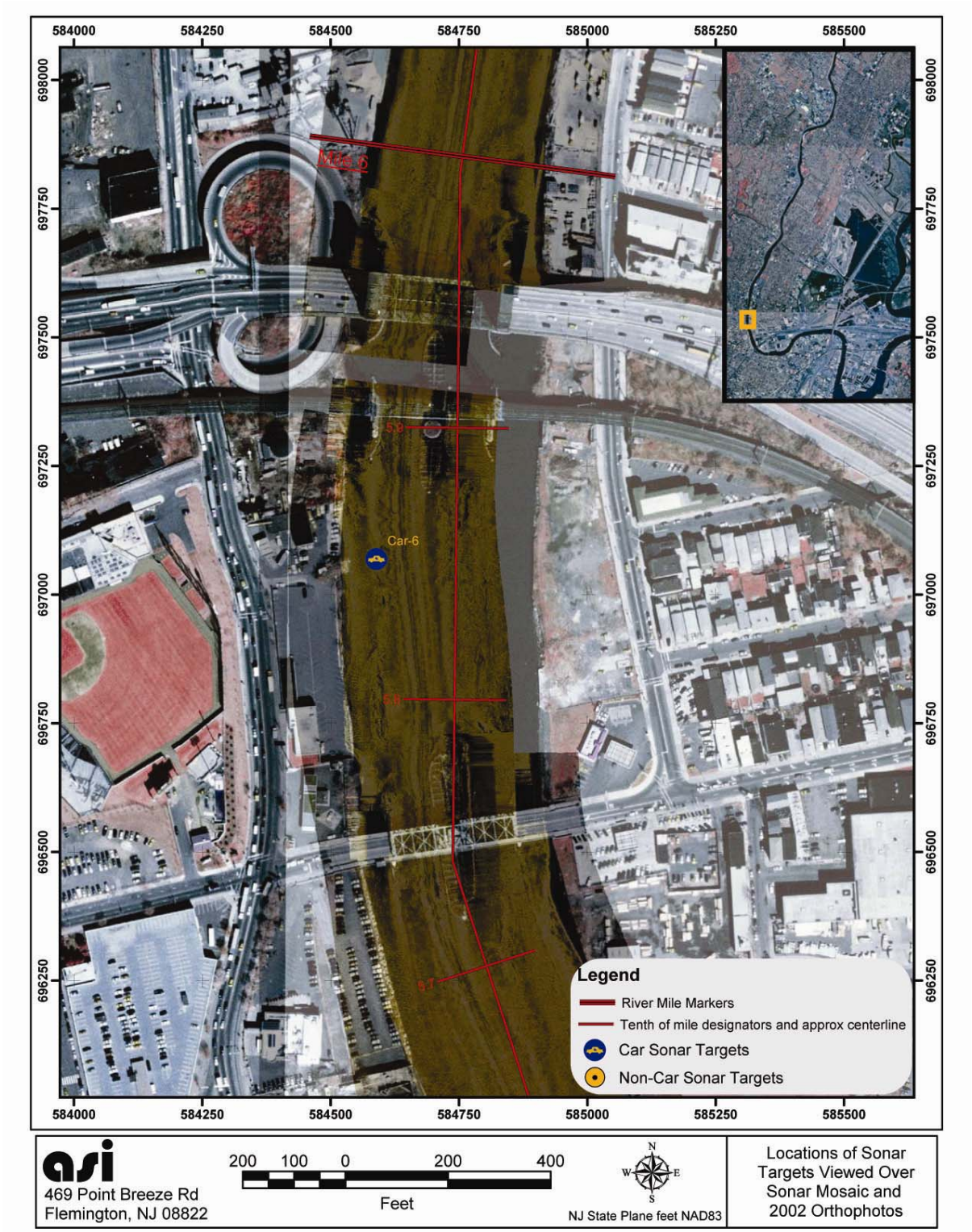


Figure 43. Location of sonar target Car-6.

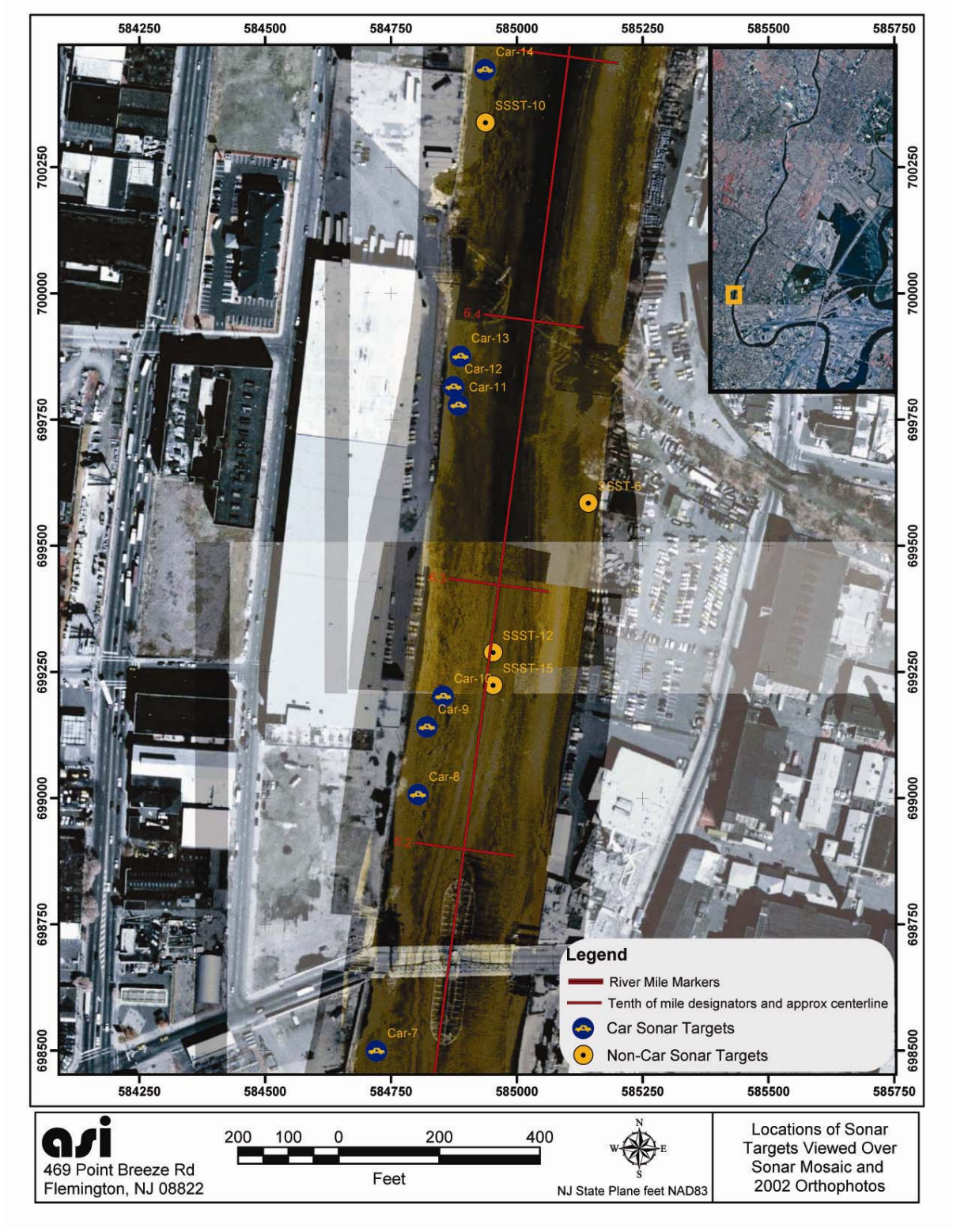


Figure 44. Locations of sonar targets Car-7 to Car-14 and SSST-6, -10, -12, -15.

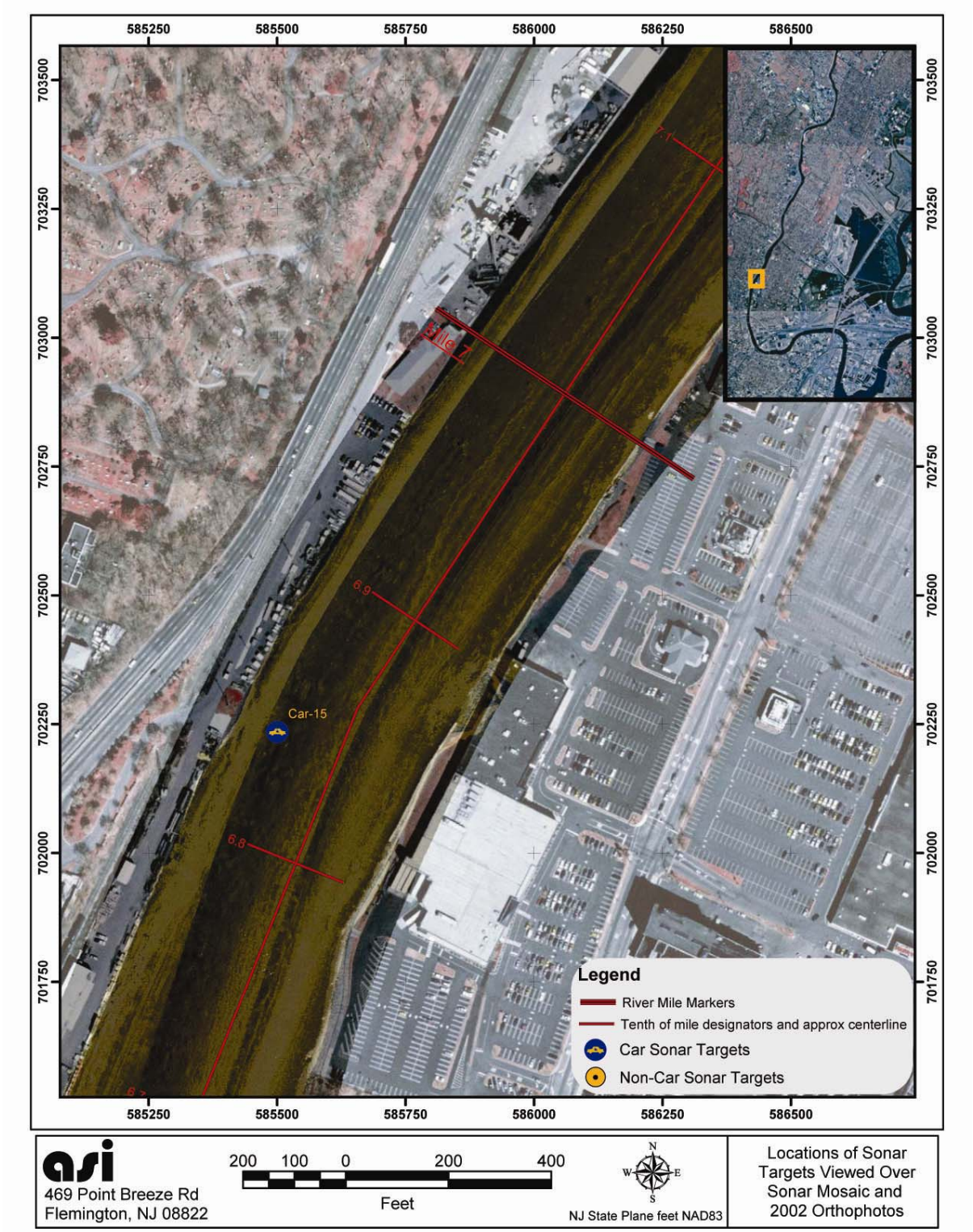


Figure 45. Location of sonar target Car-15.

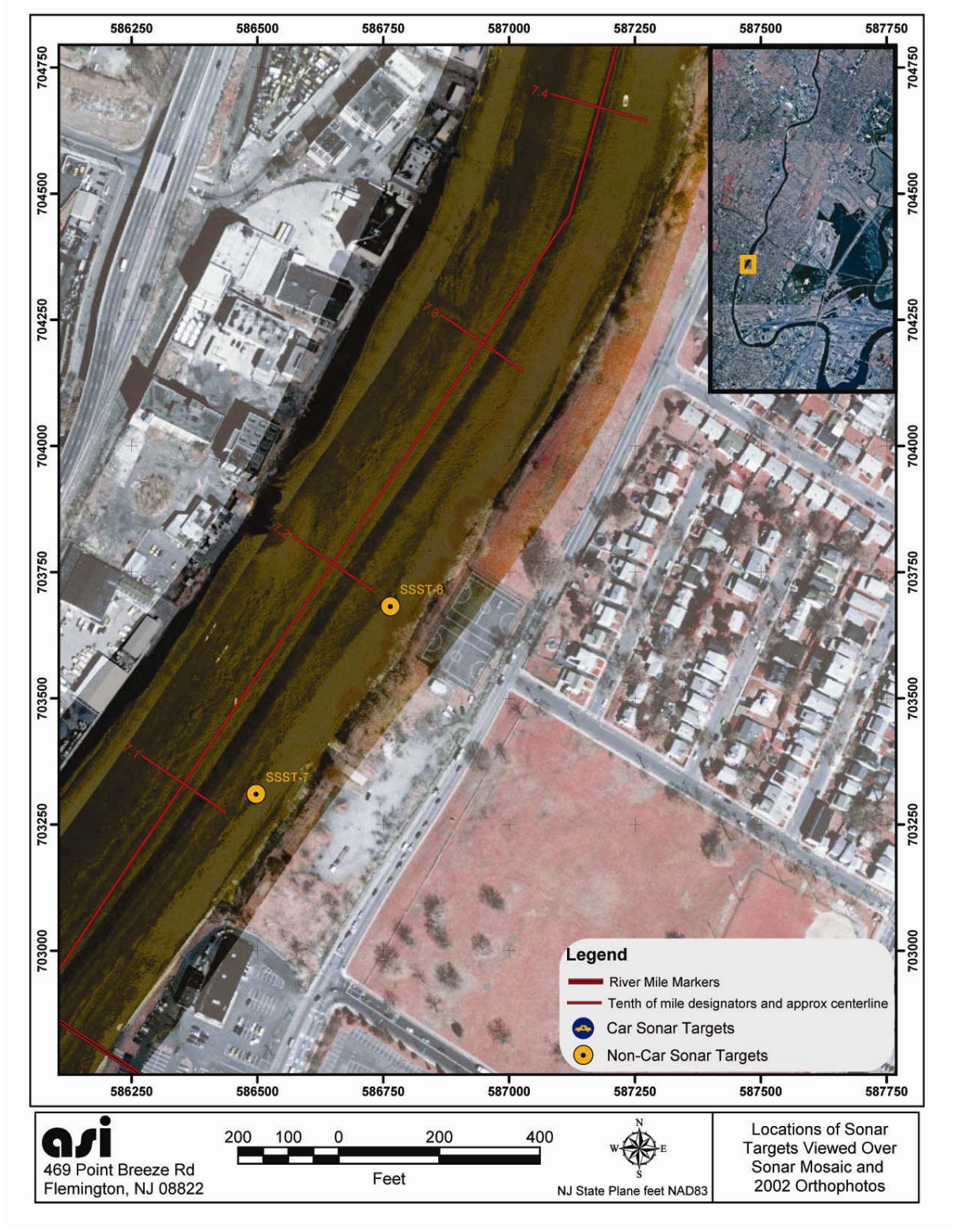


Figure 46. Locations of sonar targets SSST-7 and SSST-8.

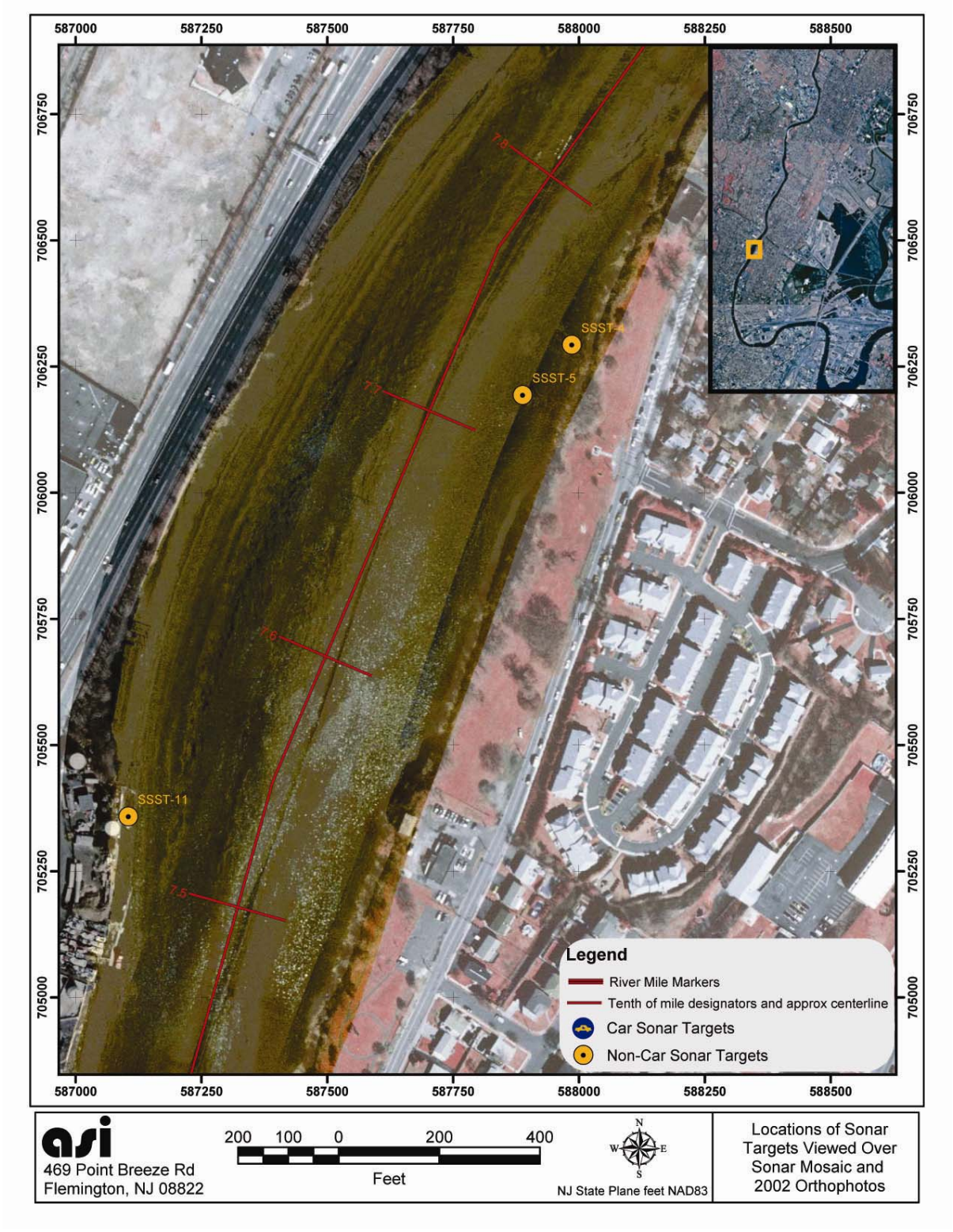


Figure 47. Locations of sonar targets SSST-4, SSST-5, and SSST-11.

Figure 48. Location of sonar target SSST-9.

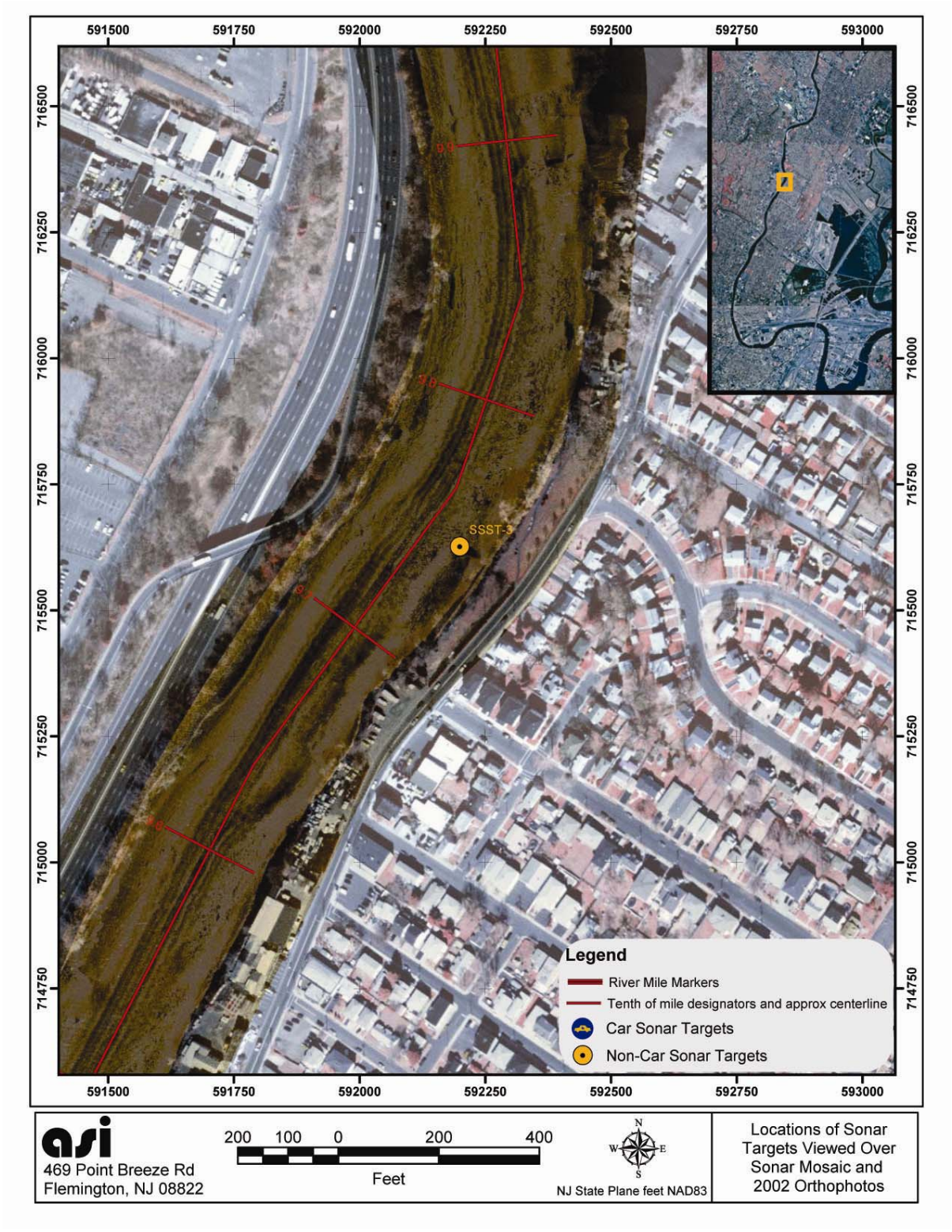


Figure 49. Location of sonar target SSST-3.

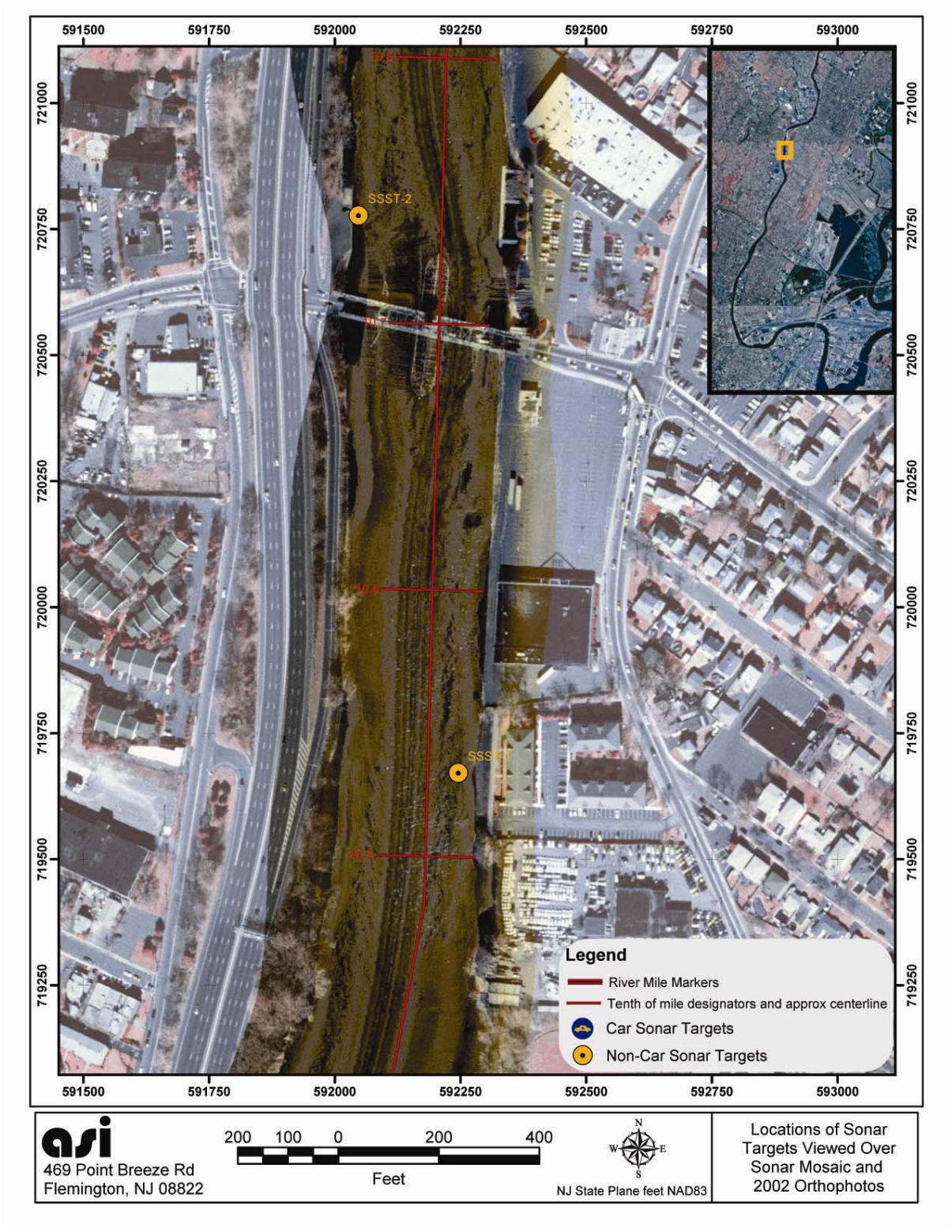


Figure 50. Locations of sonar targets SSST-1 and SSST-2.

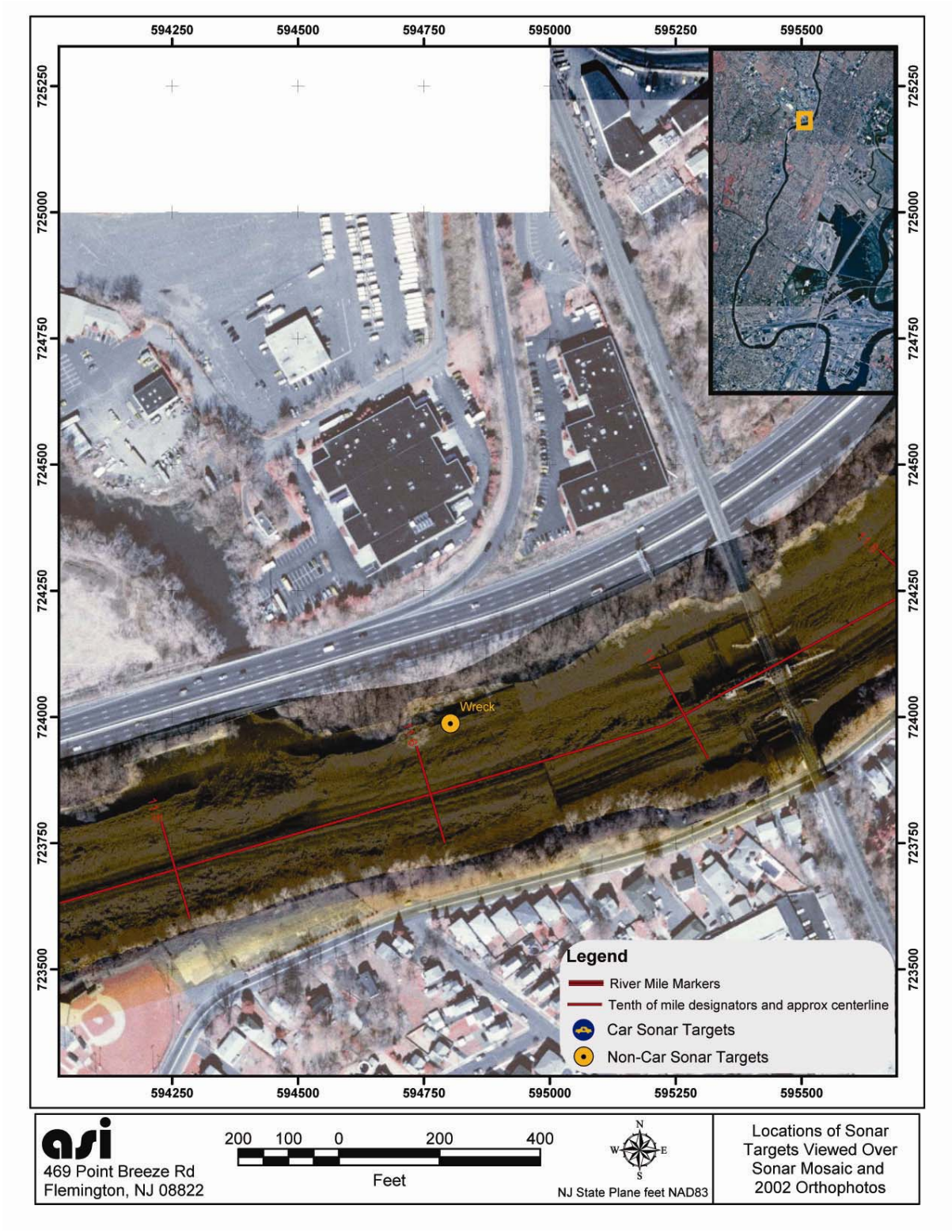


Figure 51. Location of sonar target Wreck.

Figure 52. Location of sonar target SSST-22.

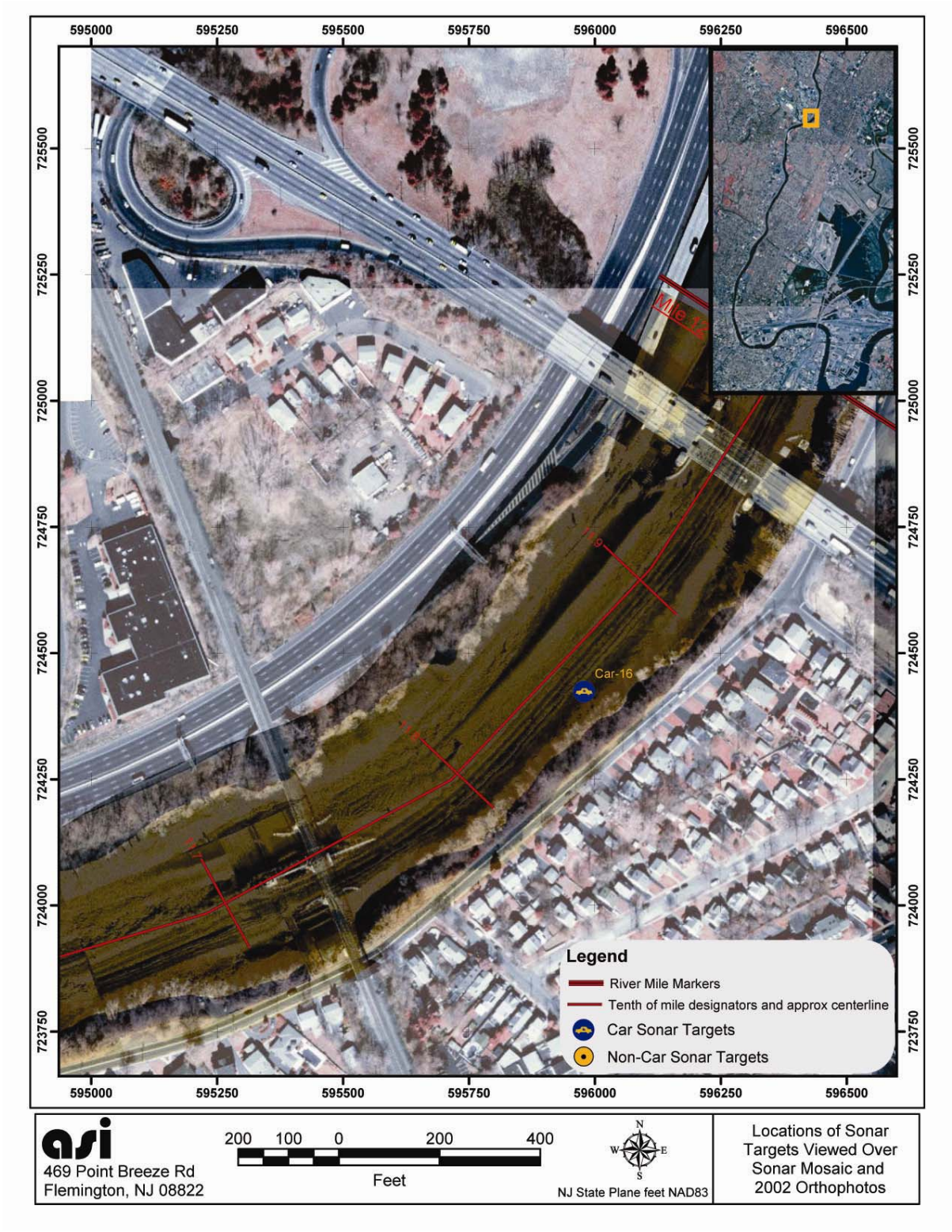


Figure 53. Location of sonar target Car-16.

Figure 54. Locations of sonar targets SSST-19.

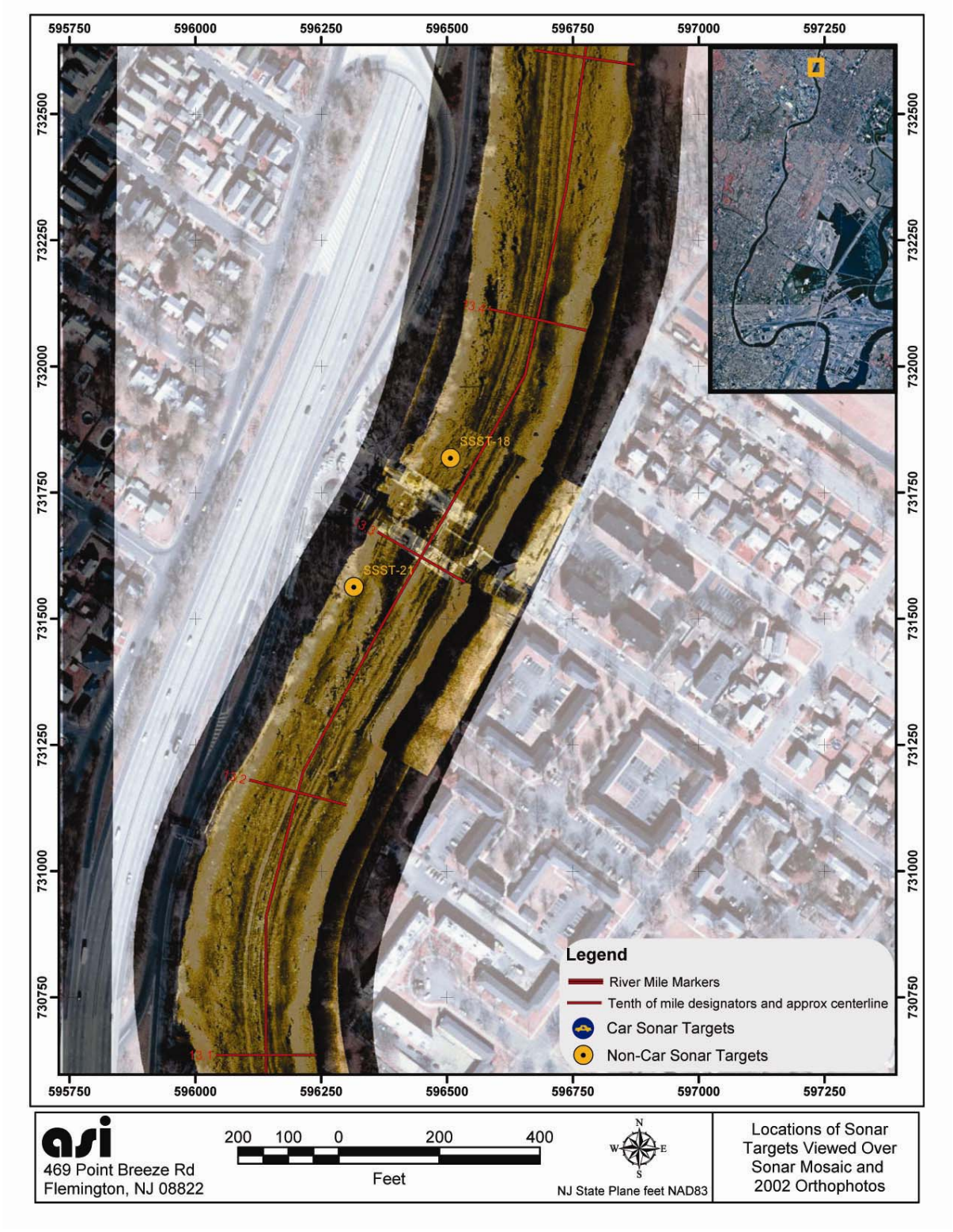


Figure 55. Locations of sonar targets SSST-18 and SSST-21.

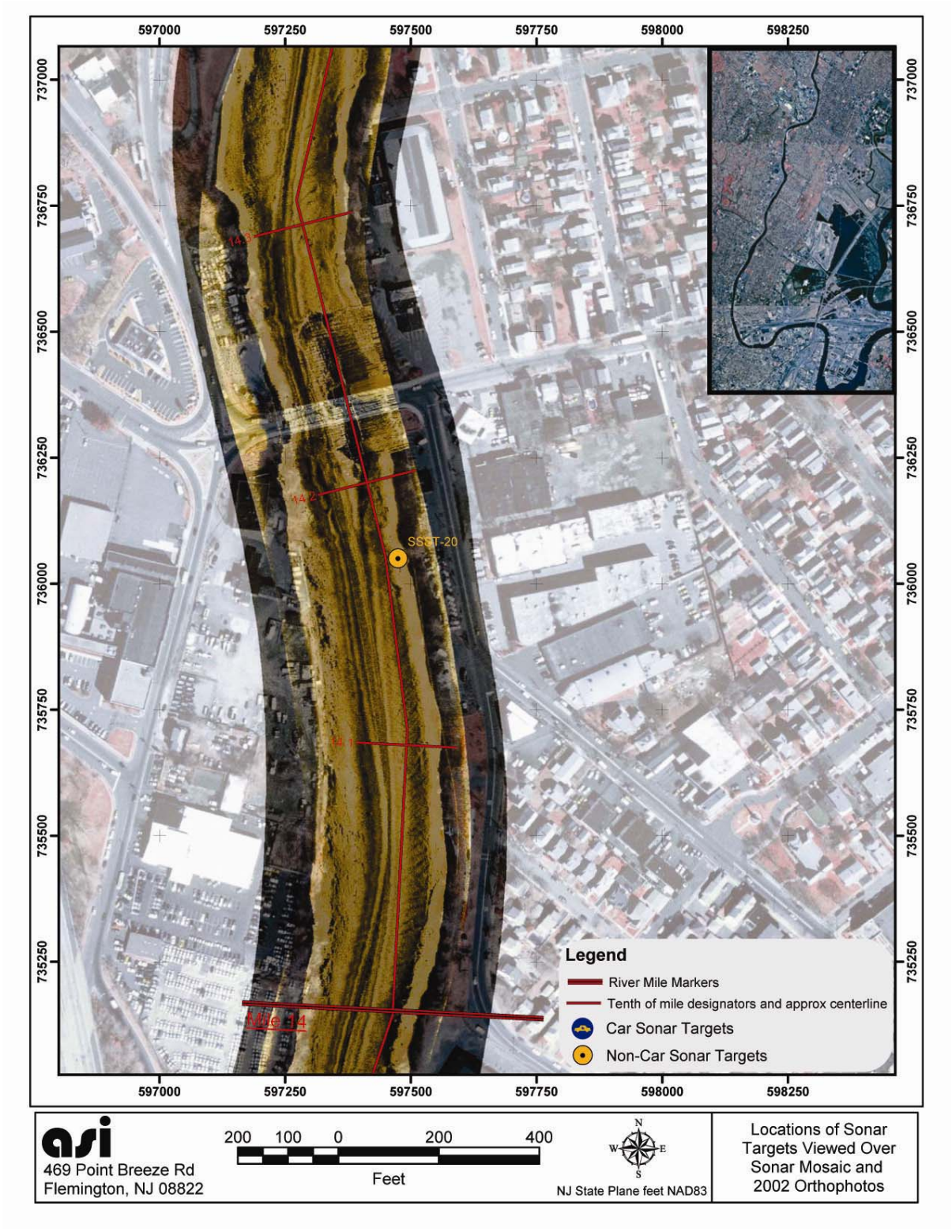


Figure 56. Location of sonar target SSST-20.

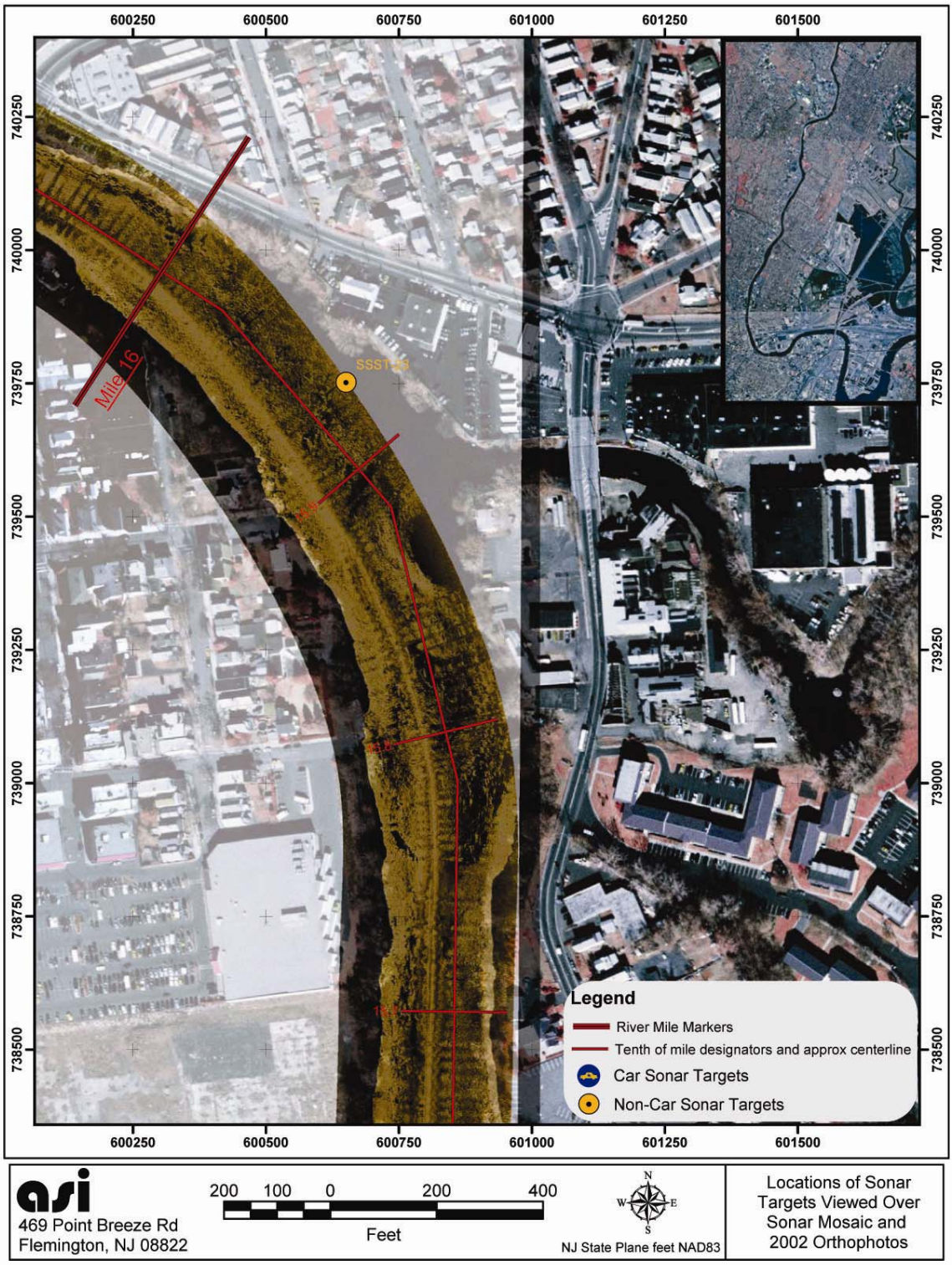


Figure 57. Location of sonar target SSST-23.

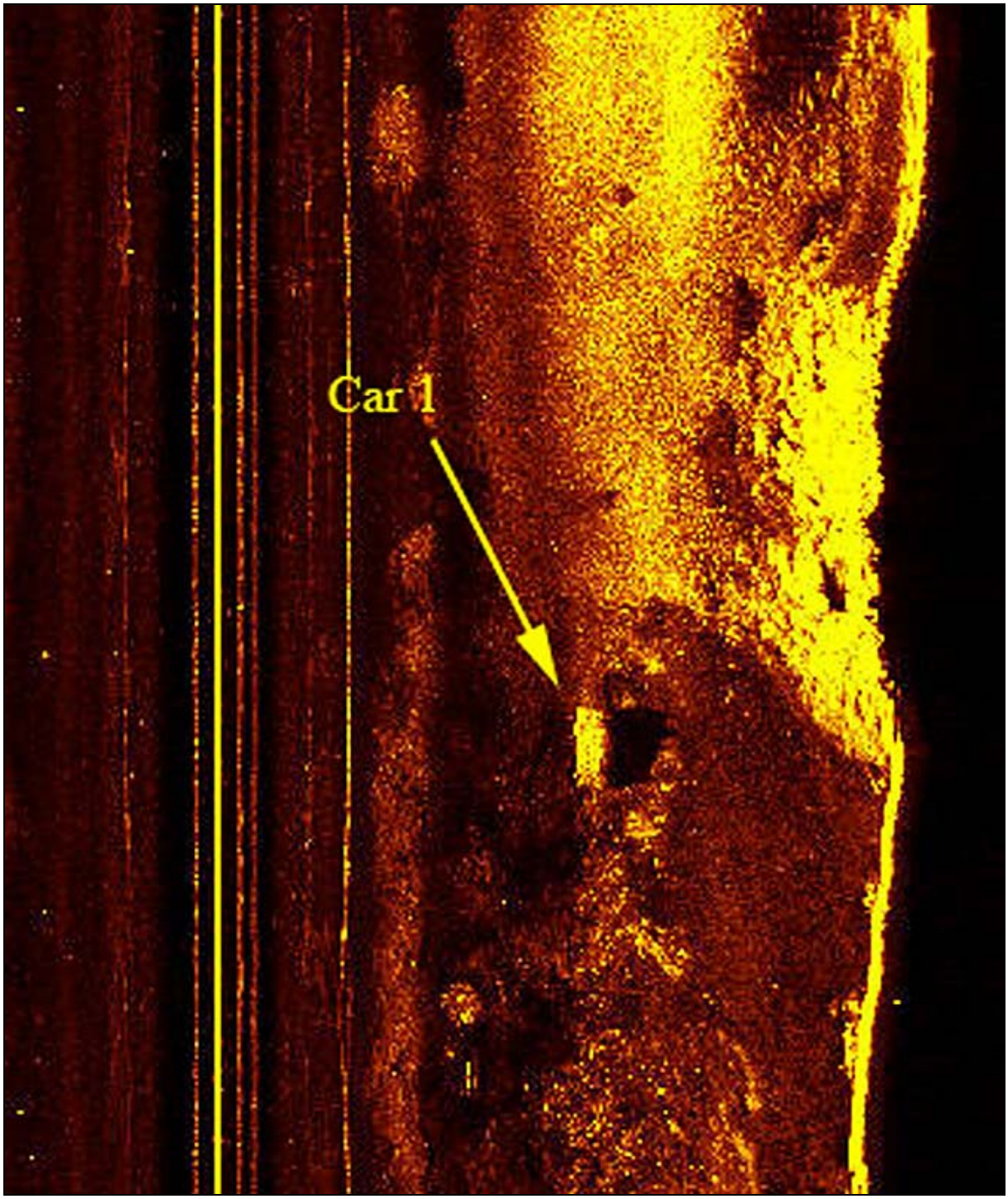


Figure 58. Sonar image of Car 1.

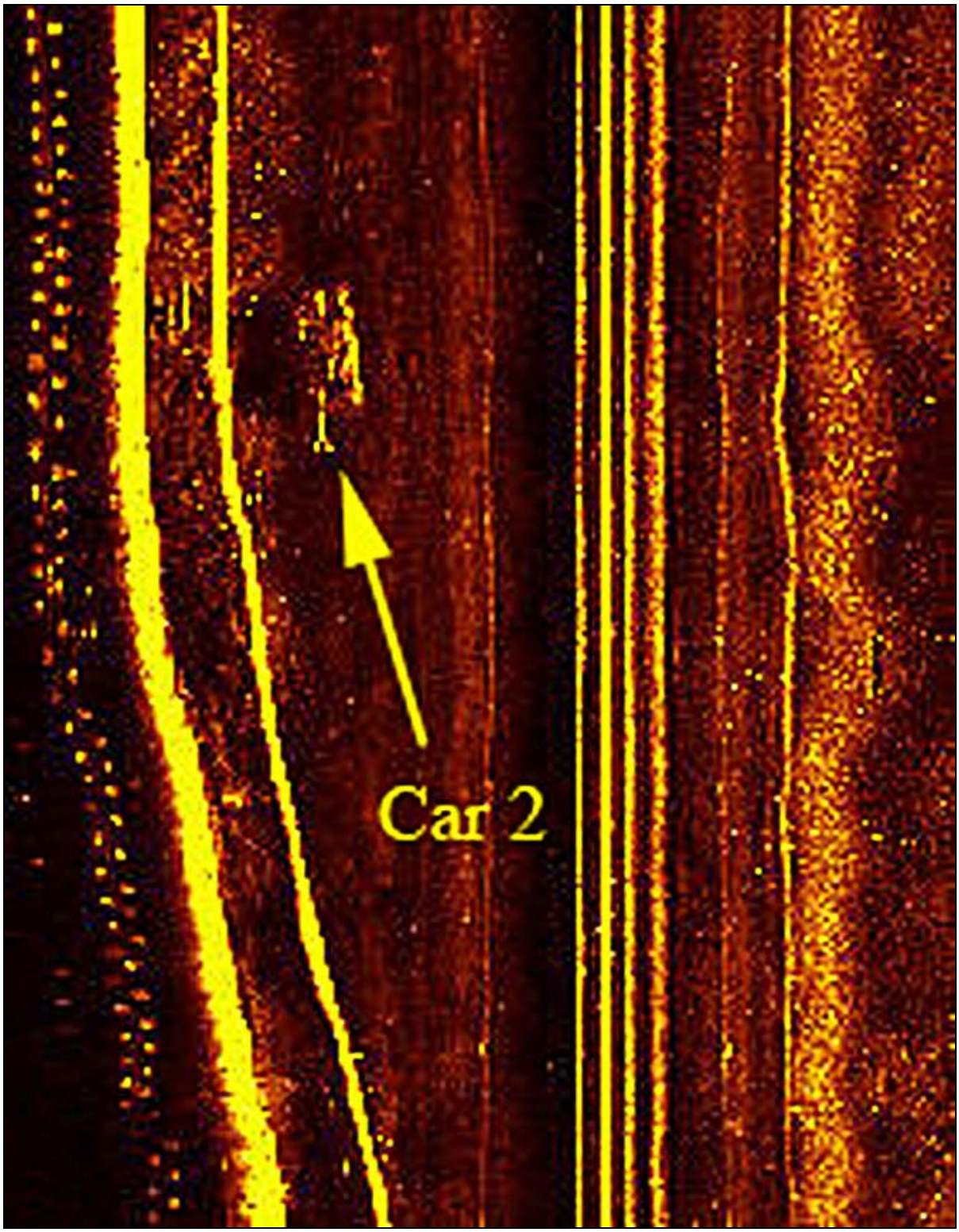


Figure 59. Sonar image of Car 2.

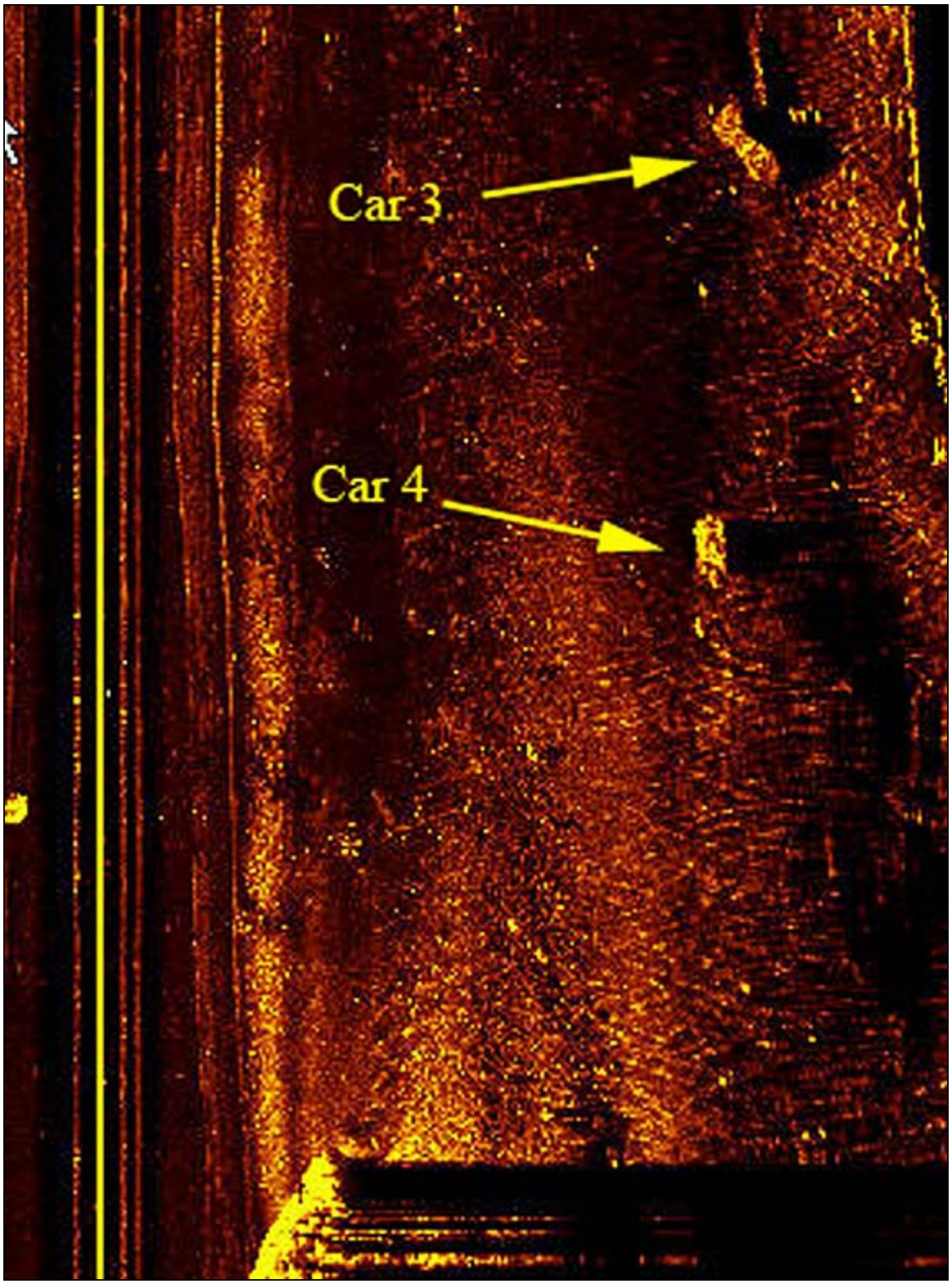


Figure 60. Sonar image of Cars 3 and 4.

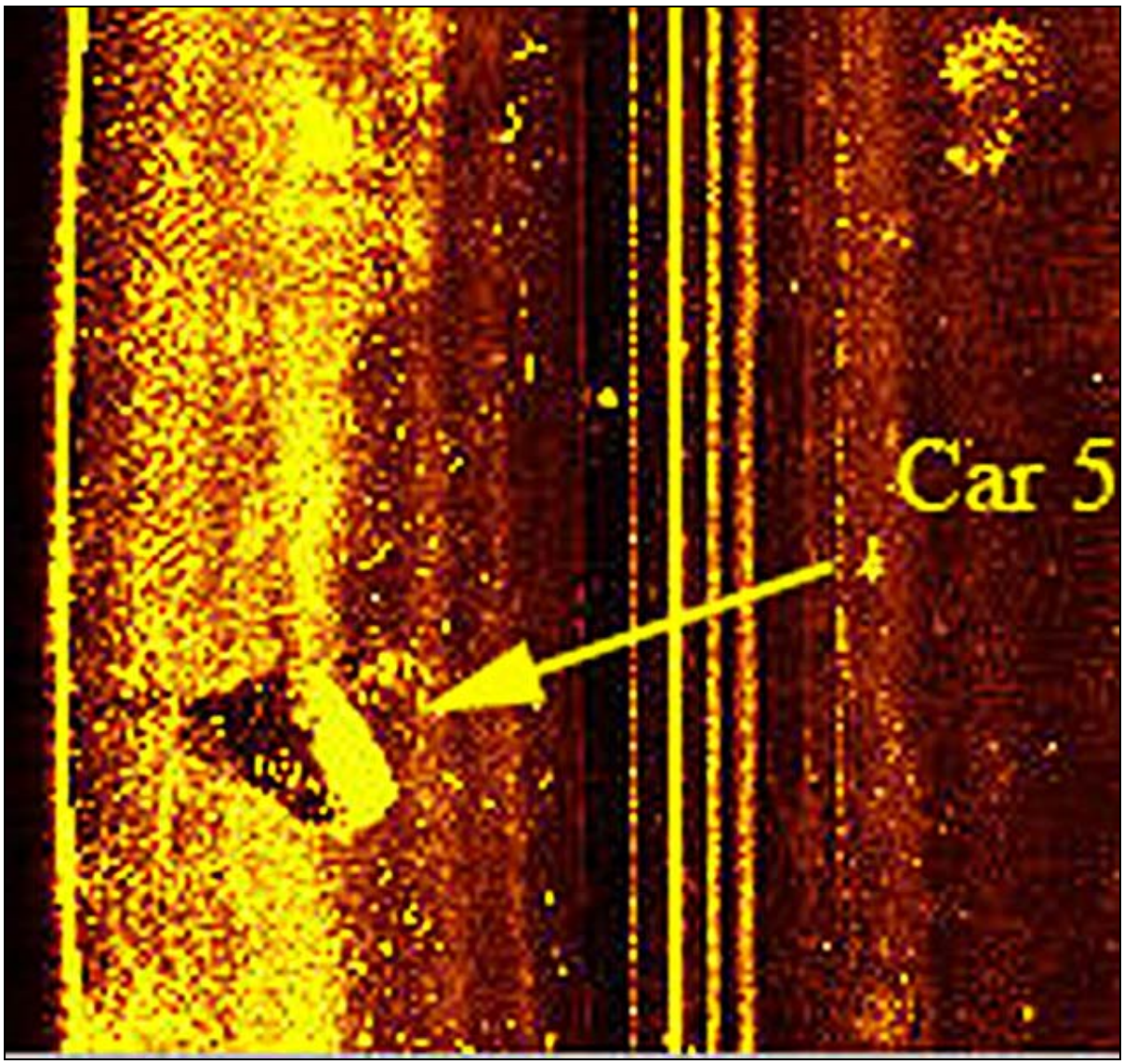


Figure 61. Sonar image of Car 5.

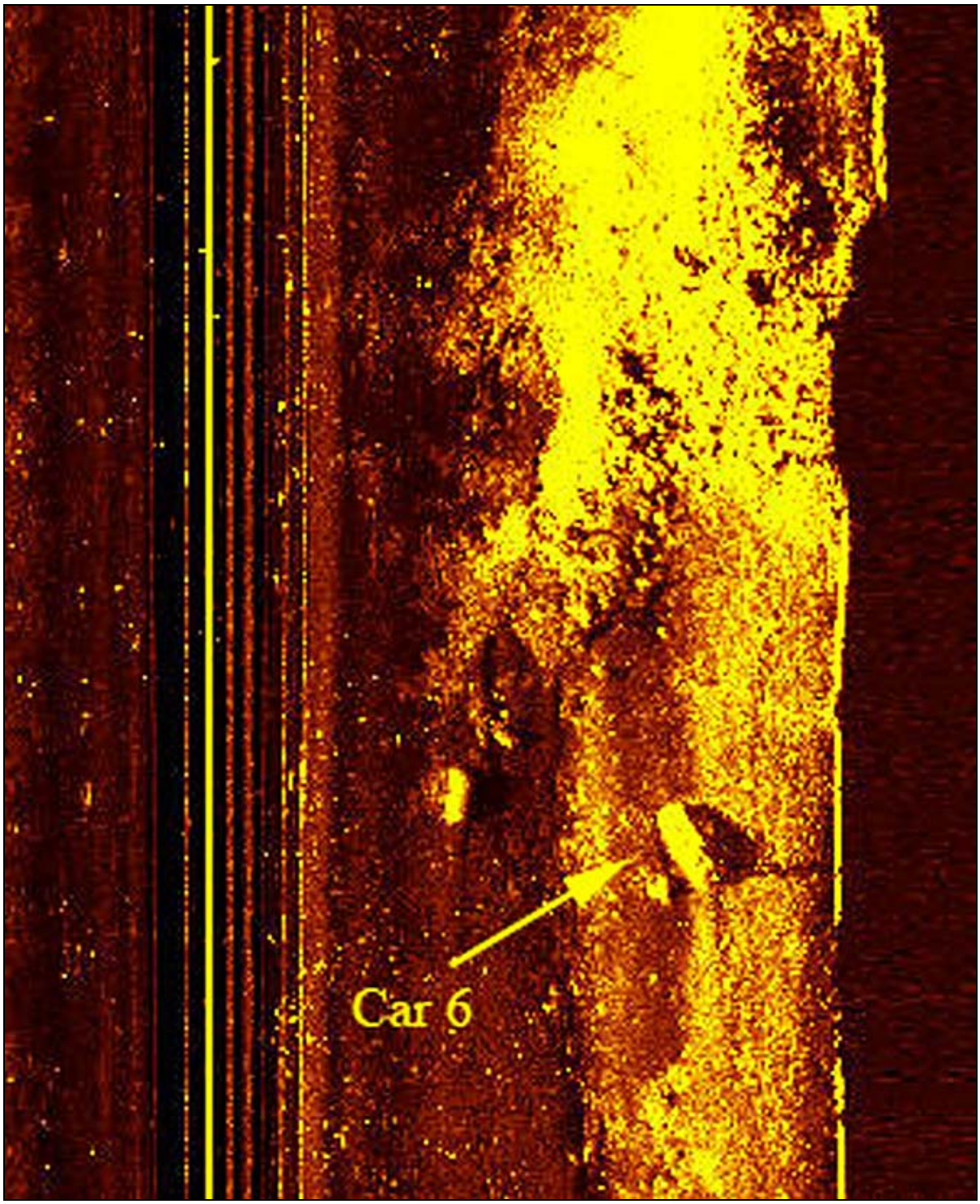


Figure 62. Sonar image of Car 6.

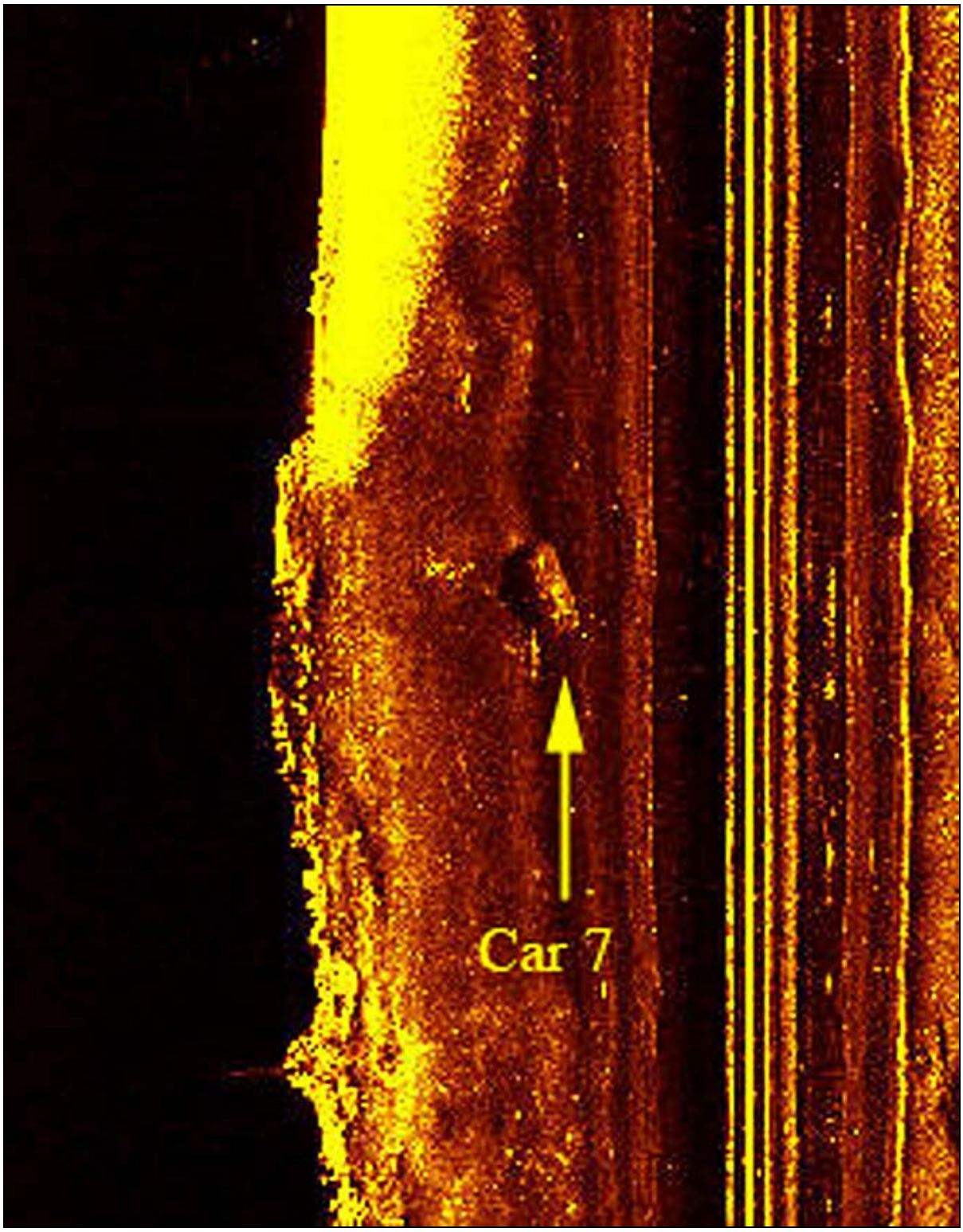


Figure 63. Sonar image of Car 7.

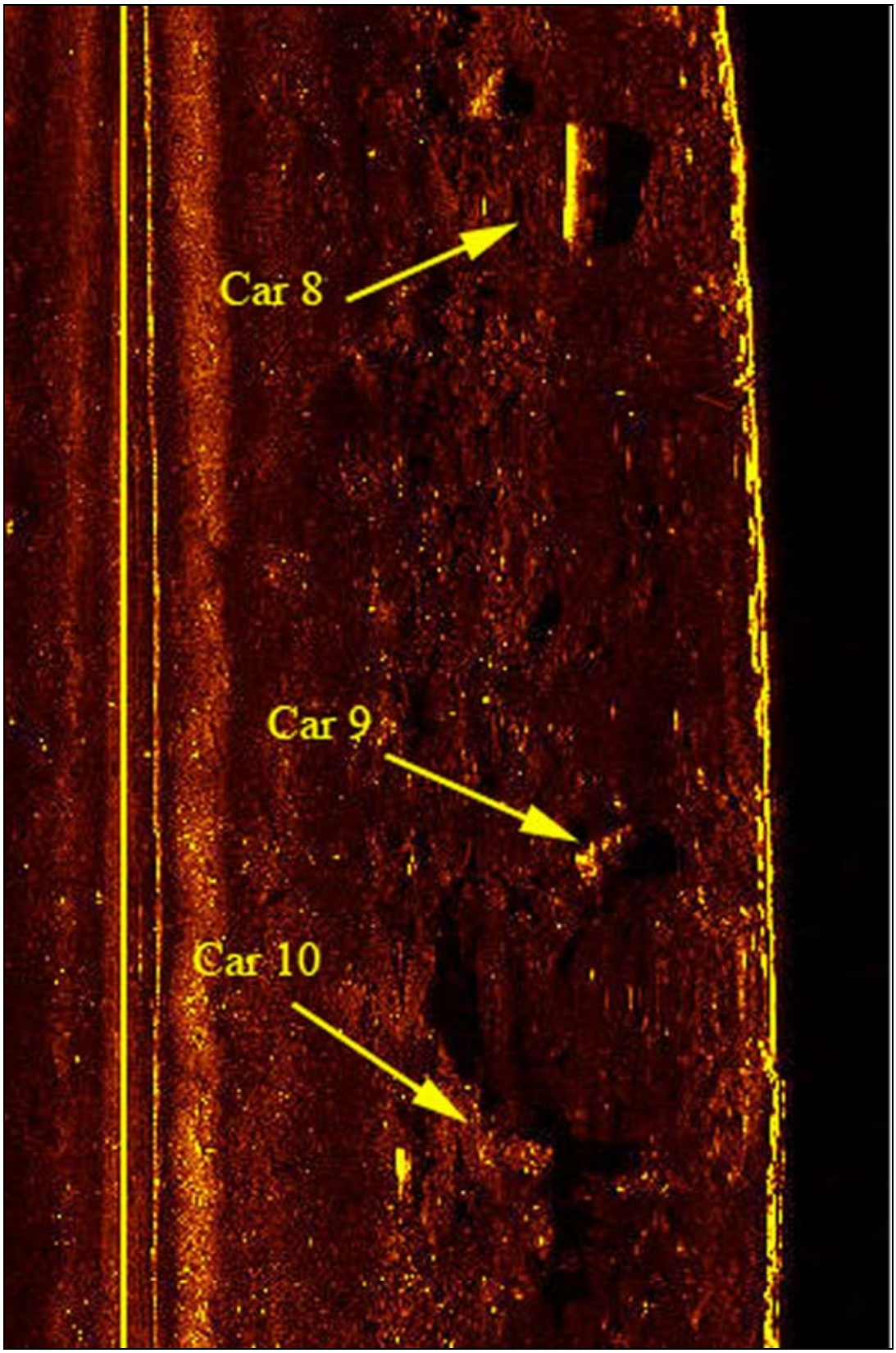


Figure 64. Sonar image of Cars 8, 9, and 10.

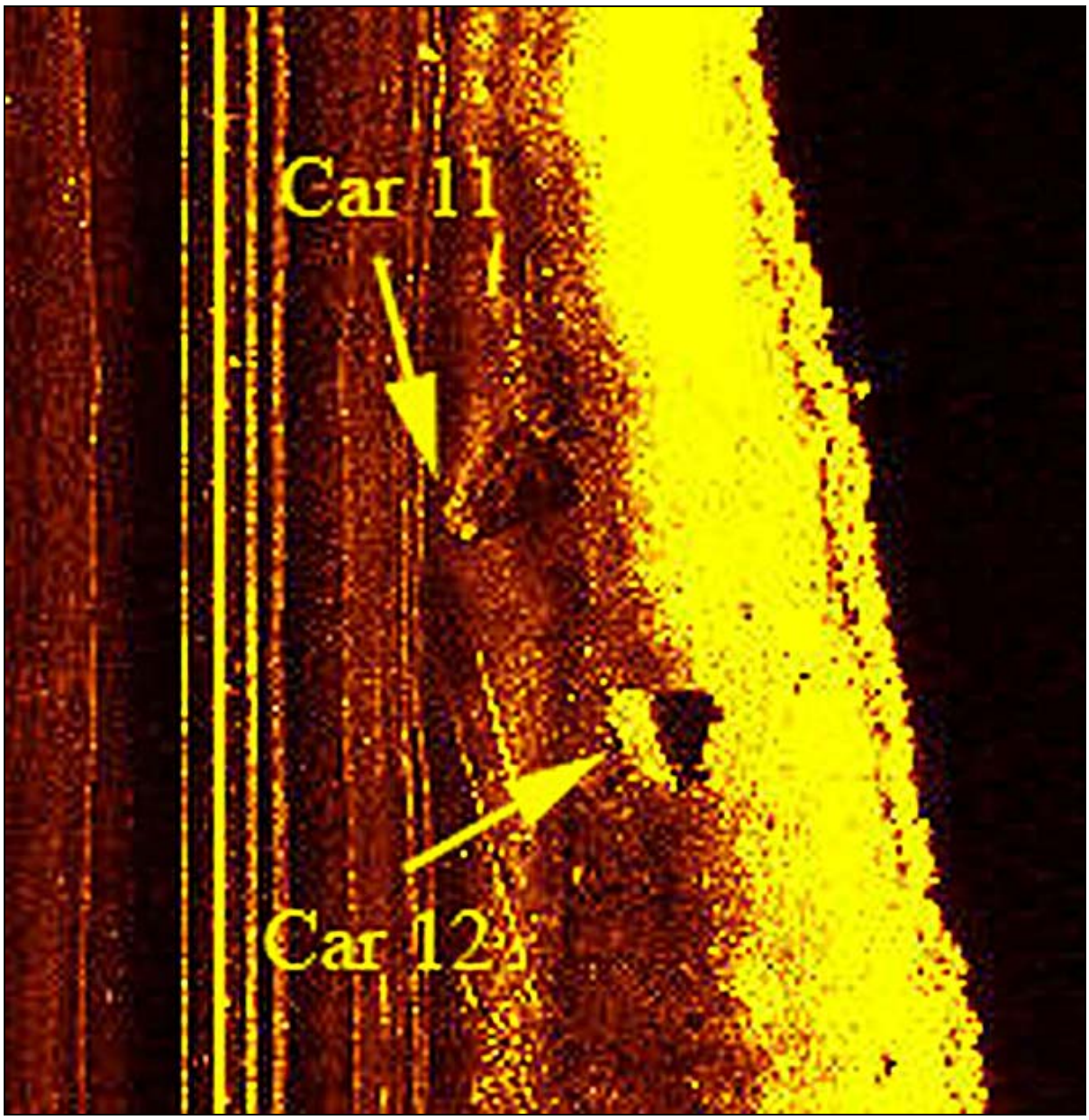


Figure 65. Sonar image of Cars 11 and 12.

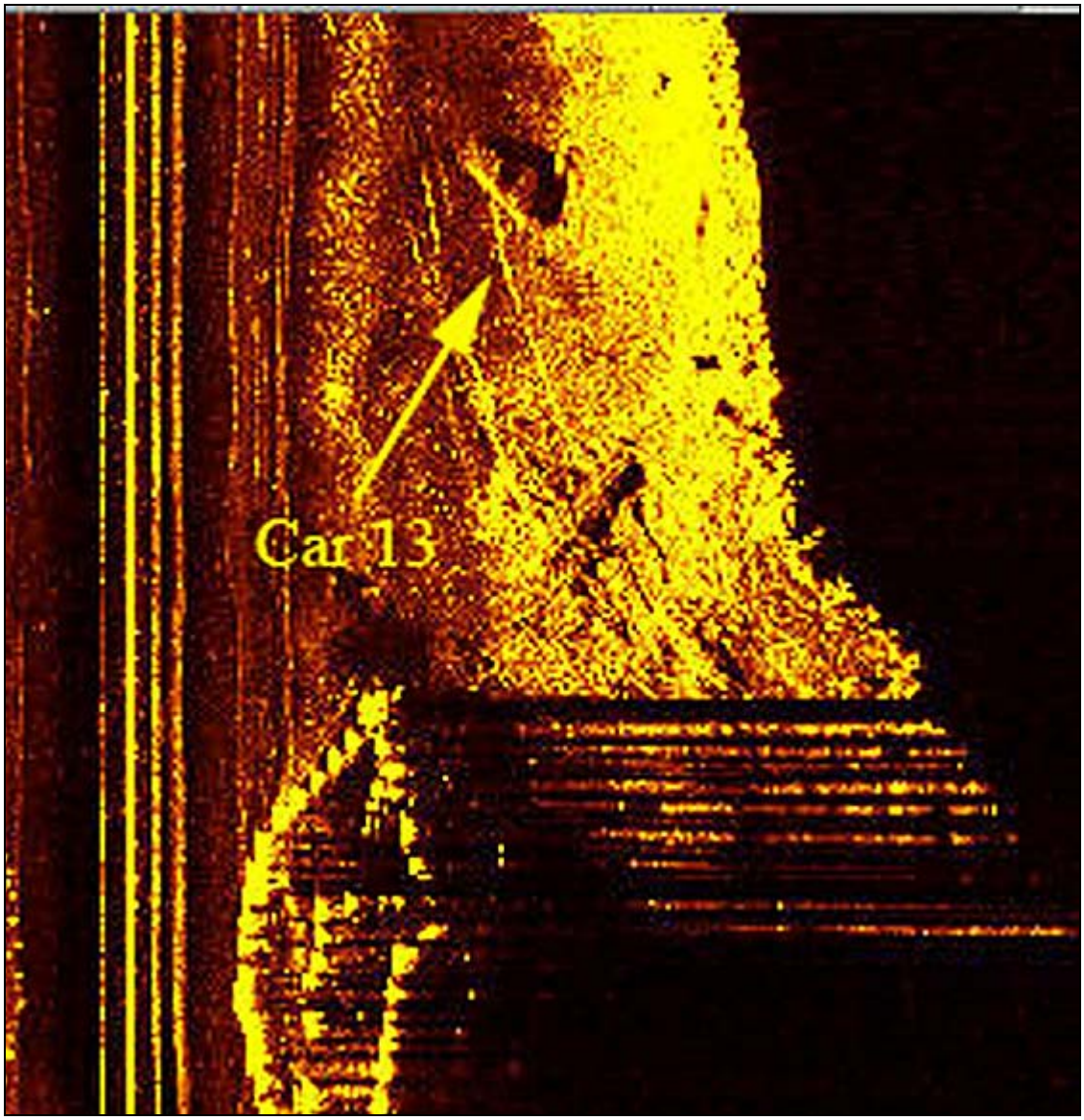


Figure 66. Sonar image of Car 13.

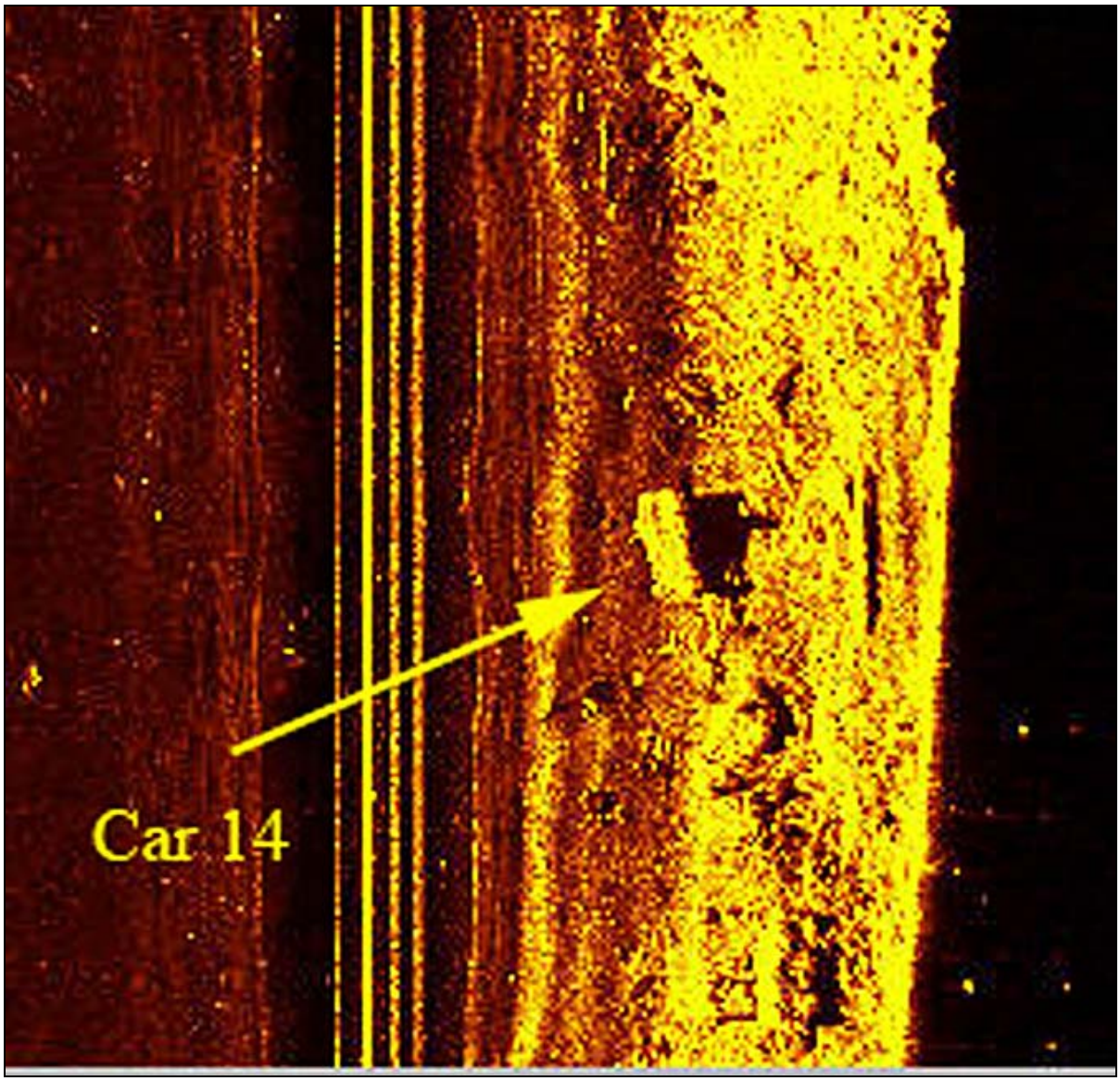


Figure 67. Sonar image of Car 14.

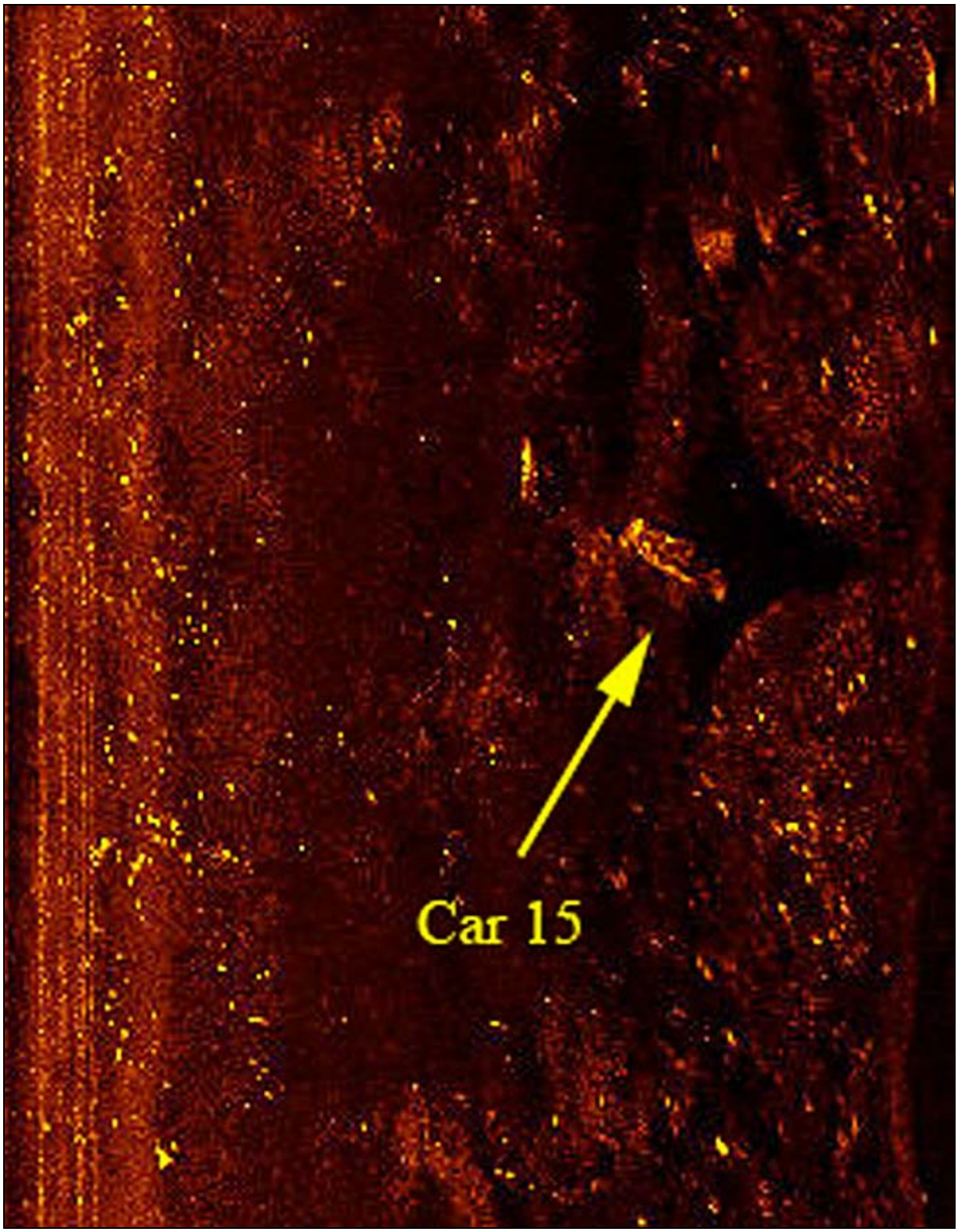


Figure 68. Sonar image of Car 15.

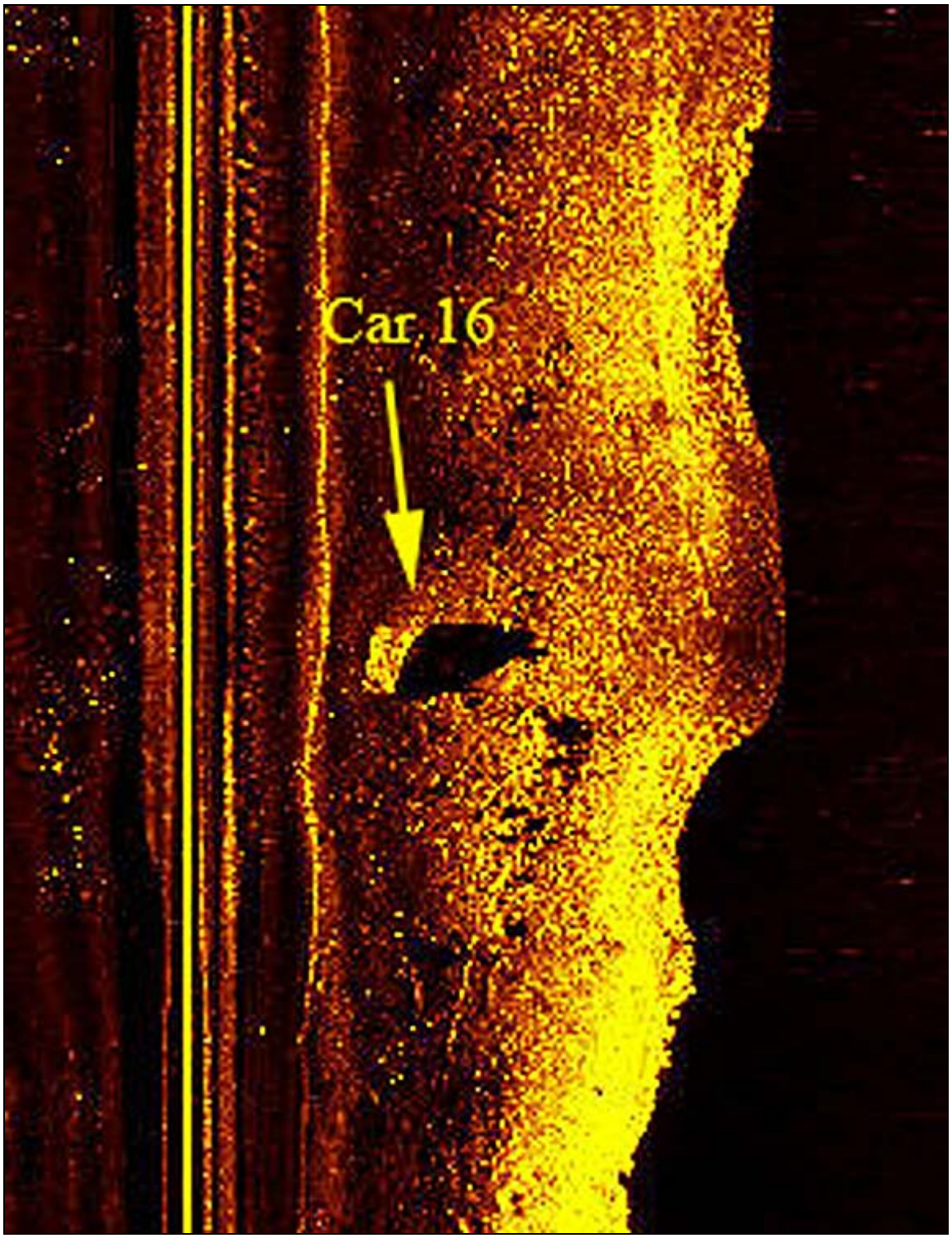


Figure 69. Sonar image of Car 16.

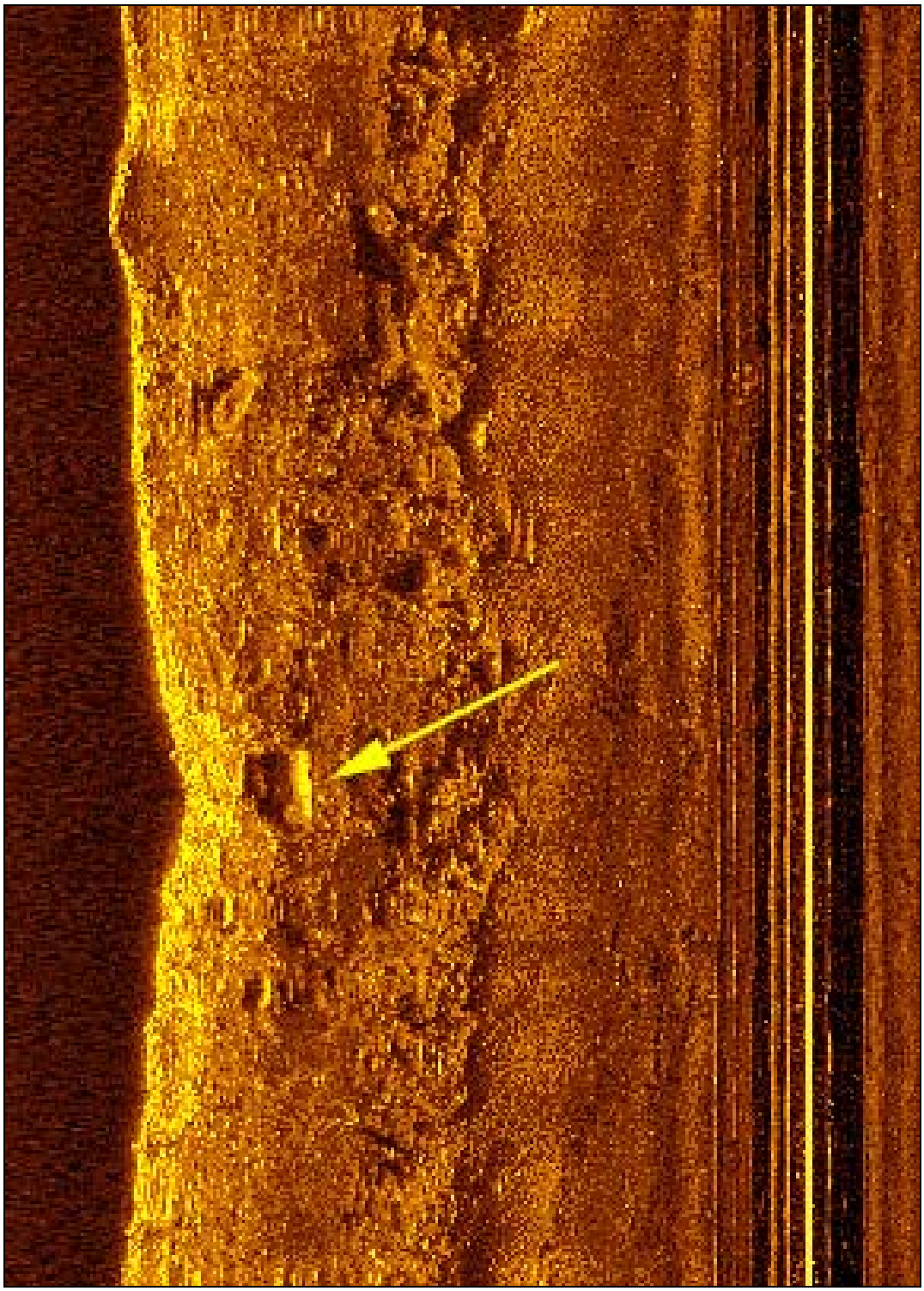


Figure 70. Sonar image of sonar target SSST-1.

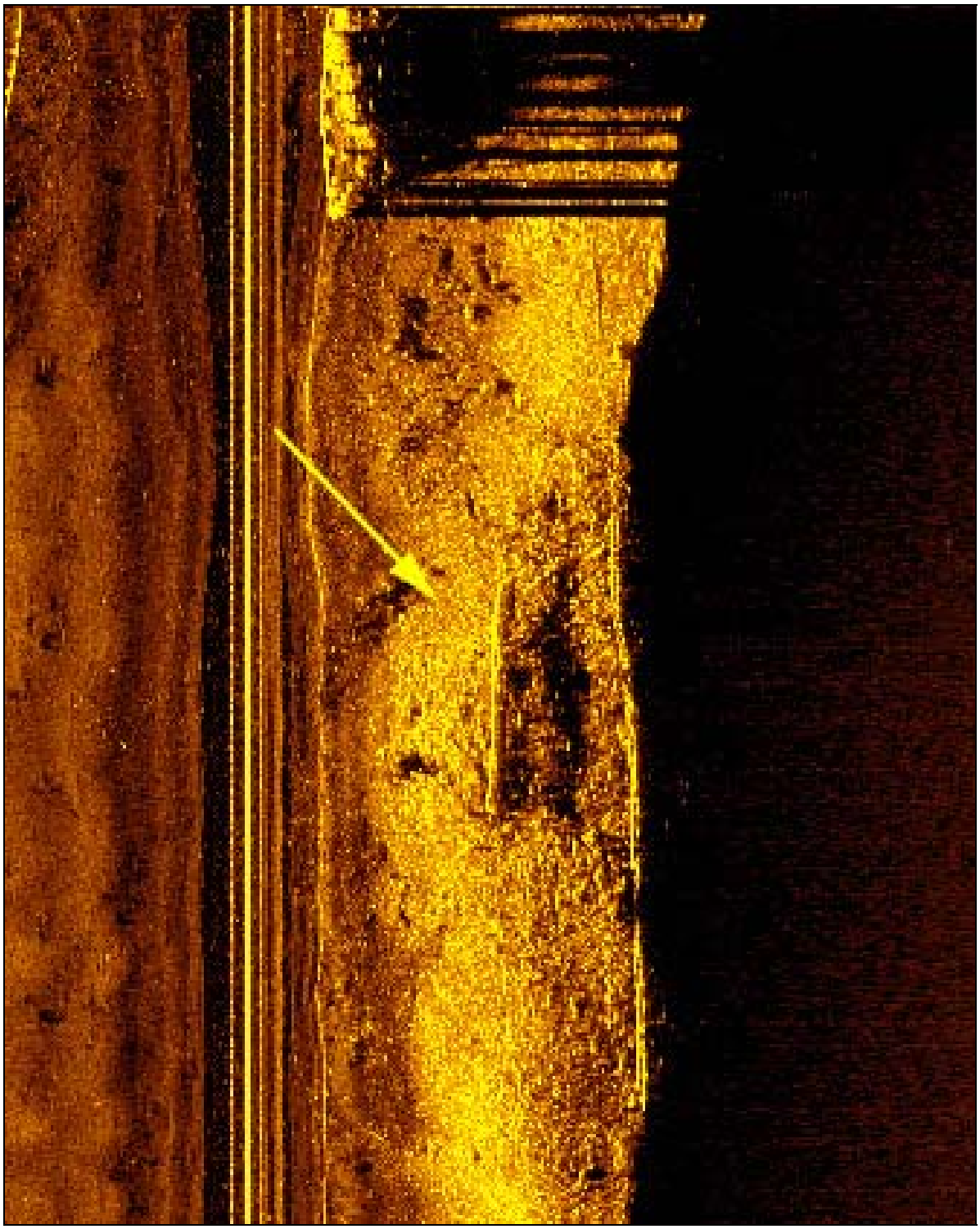


Figure 71. Sonar image of sonar target SSST-2.

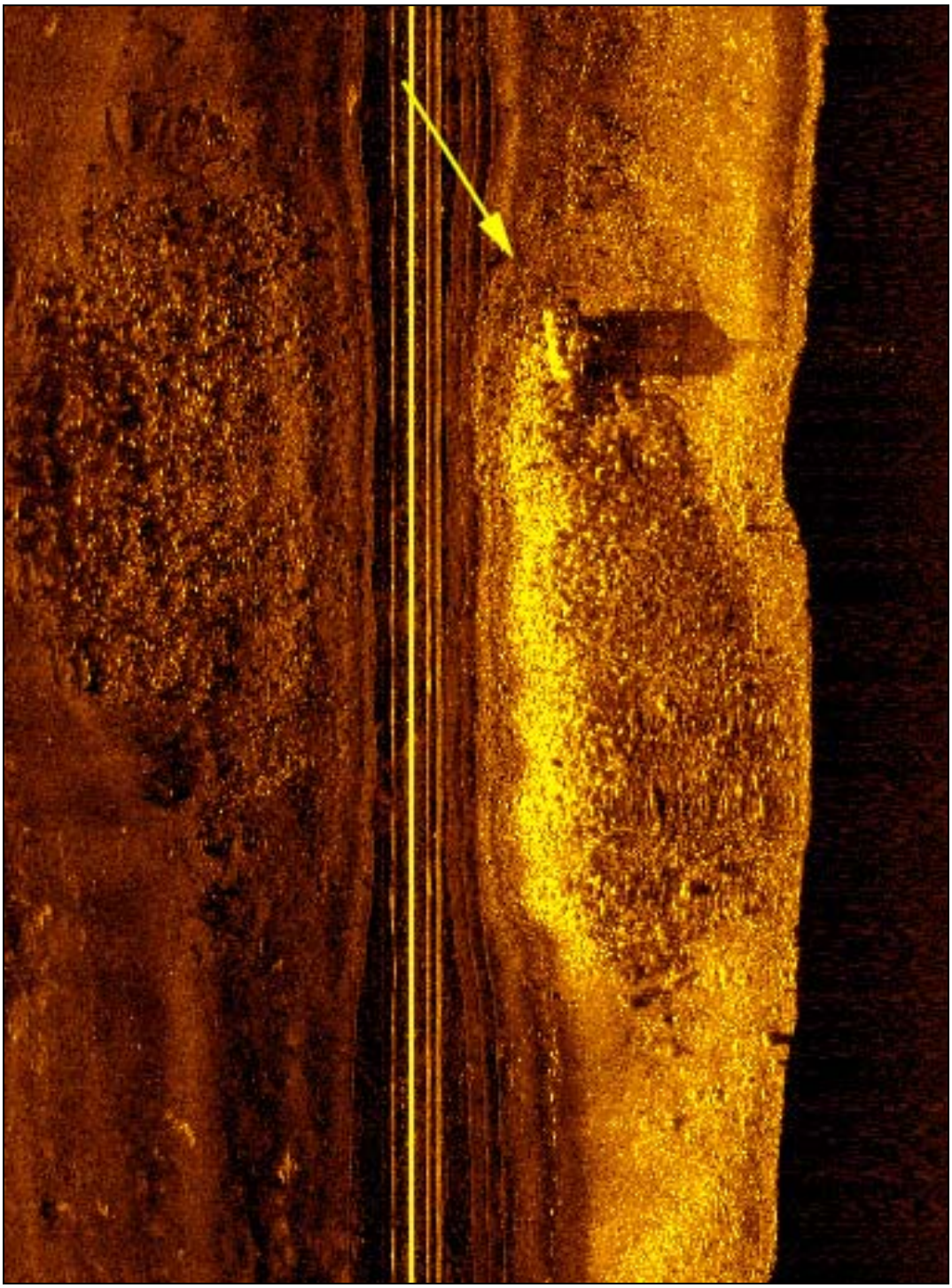


Figure 72. Sonar image of sonar target SSST-3.

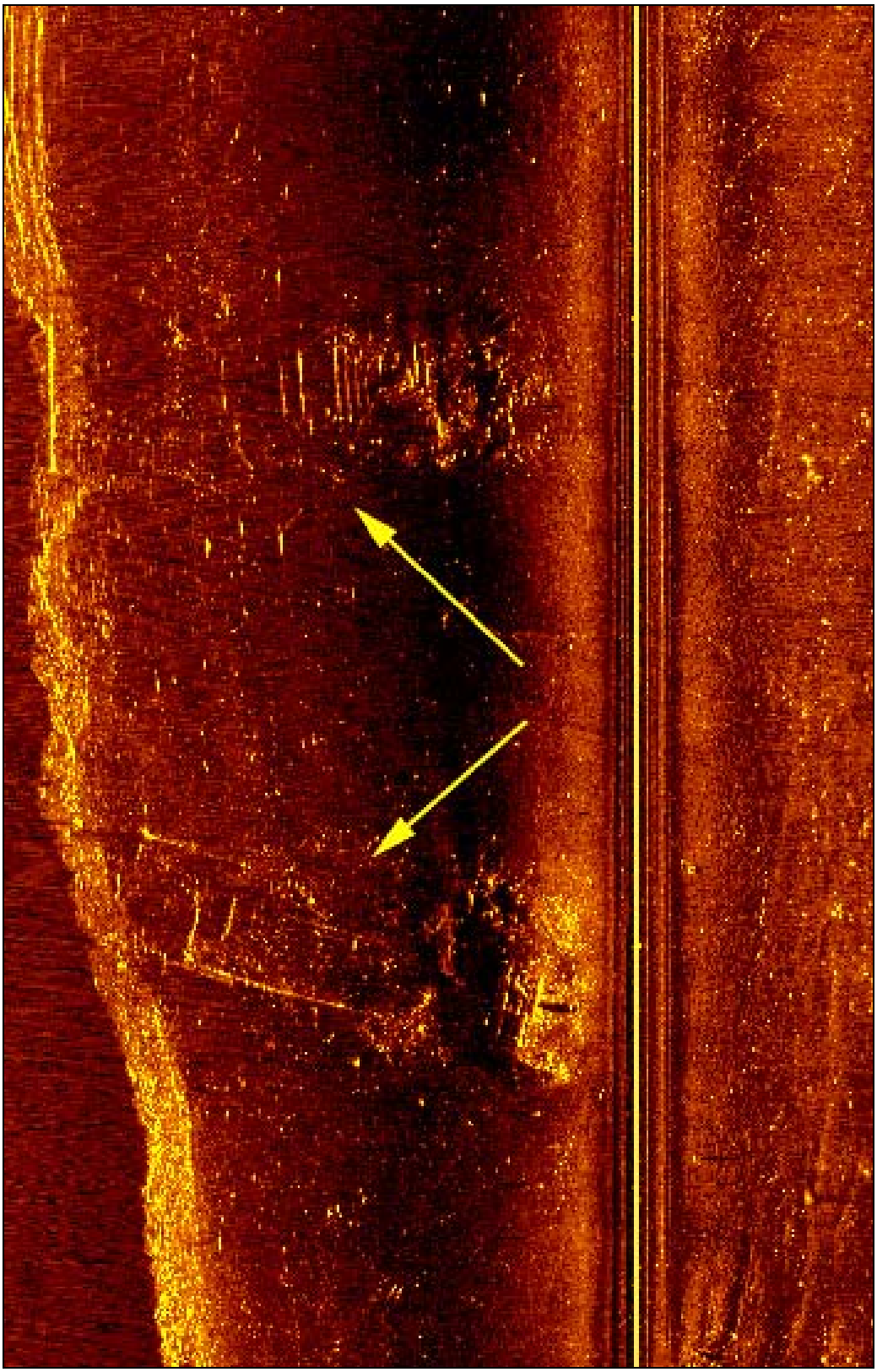


Figure 73. Sonar image of sonar targets SSST-4 (bottom) and SST-5 (top).

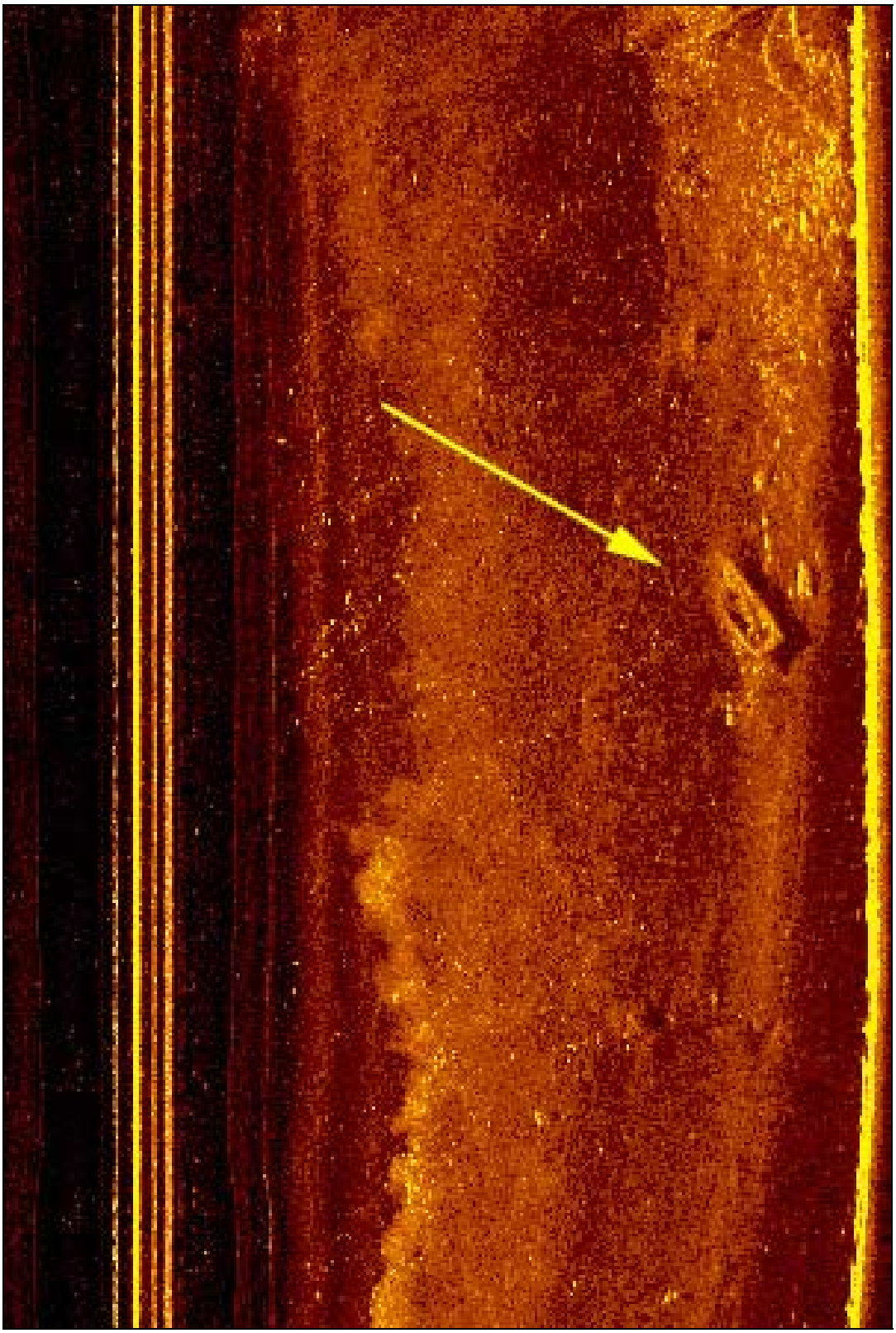


Figure 74. Sonar image of sonar target SSST-6.

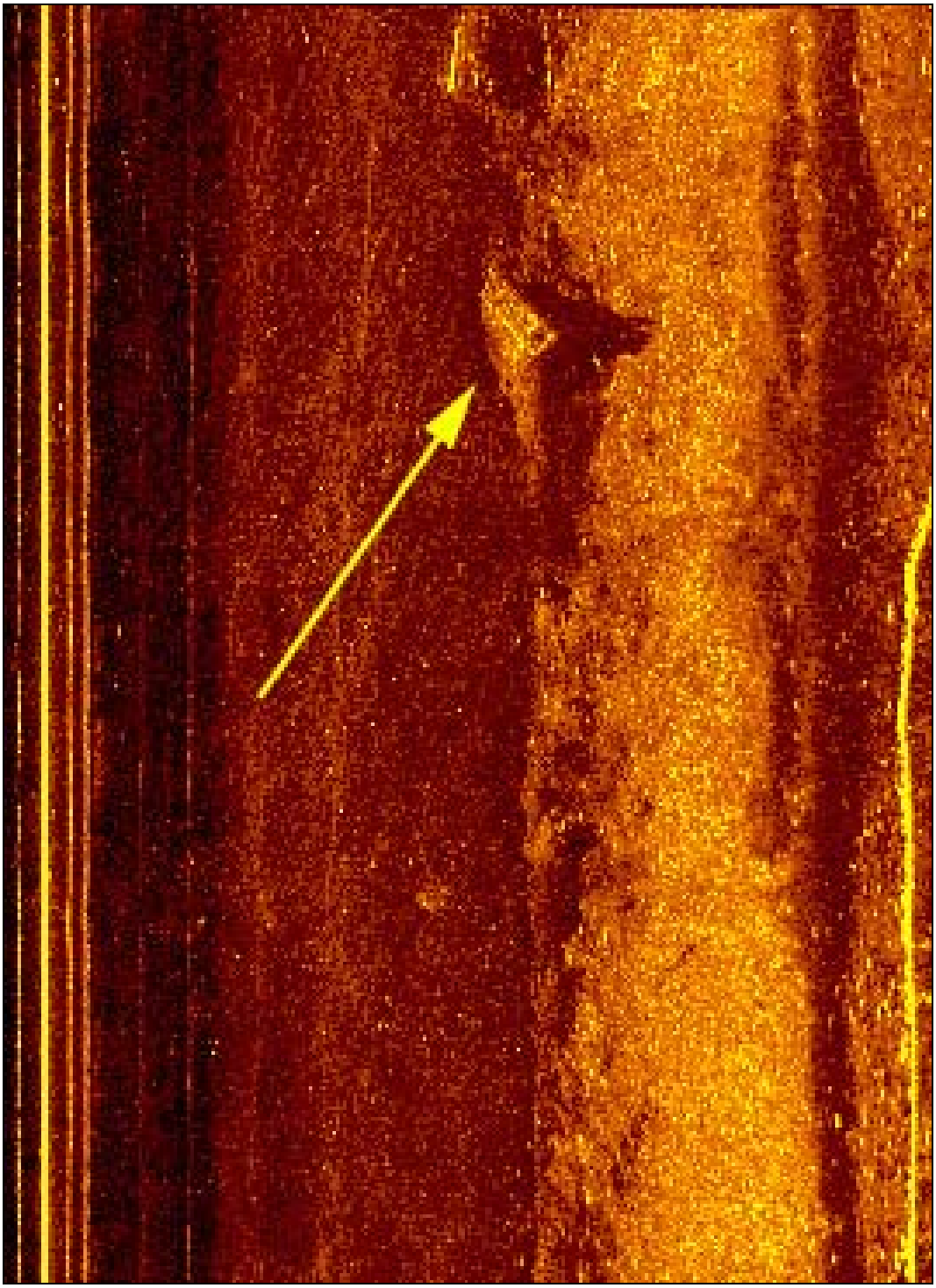


Figure 75. Sonar image of sonar target SSST-7.

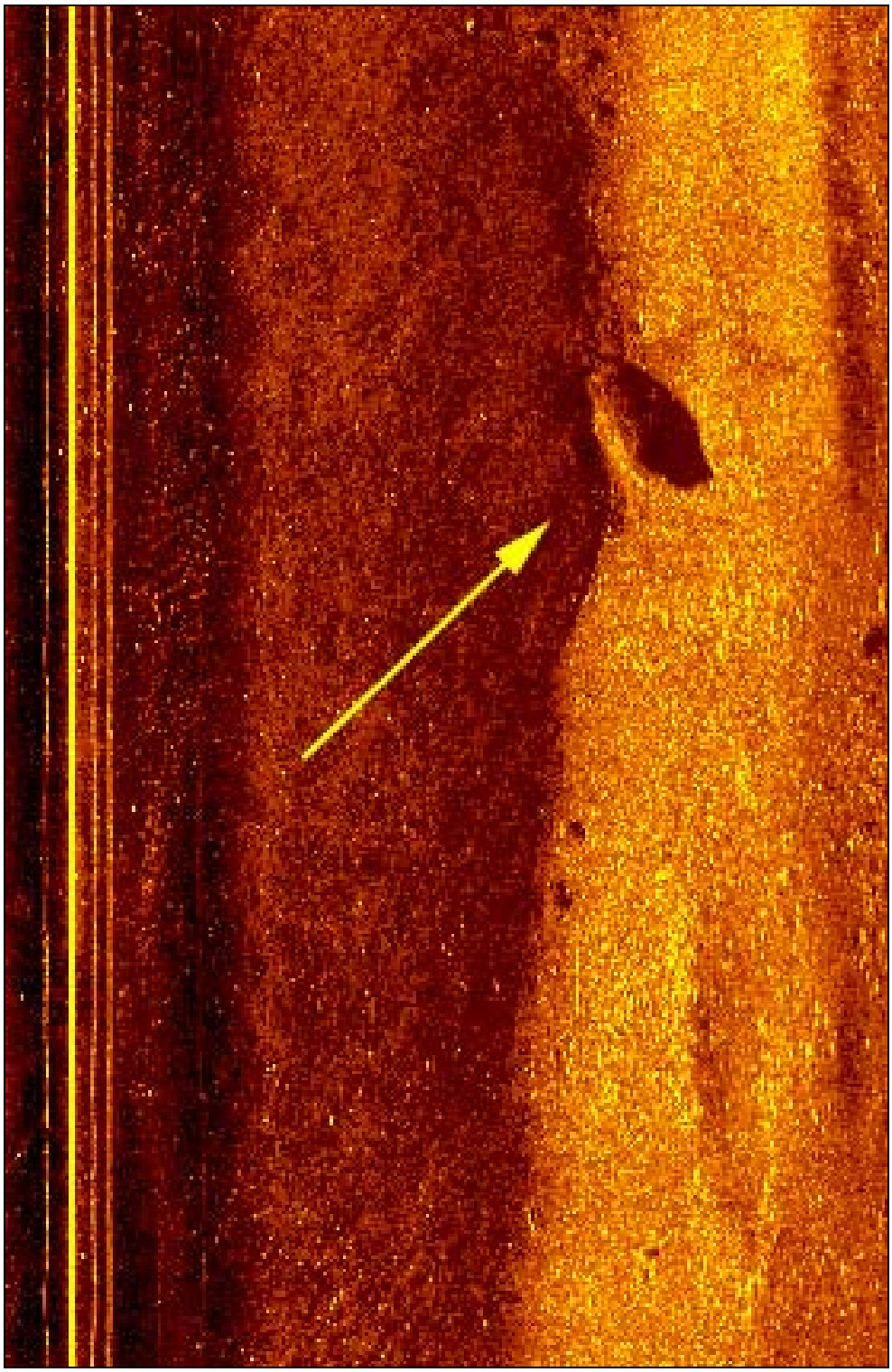


Figure 76. Sonar image of sonar target SSST-8.

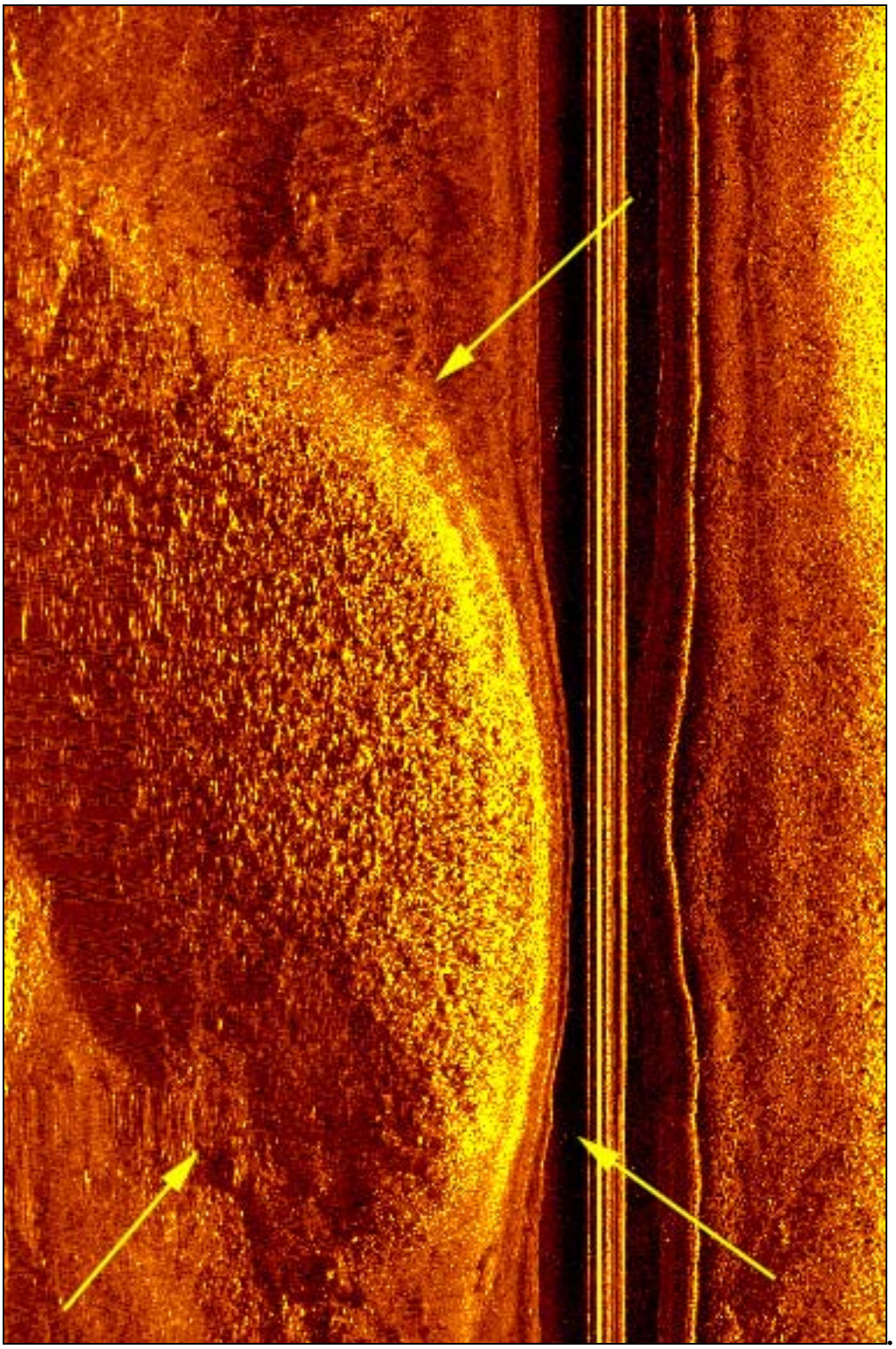


Figure 77. Sonar image of sonar target SSST-9.

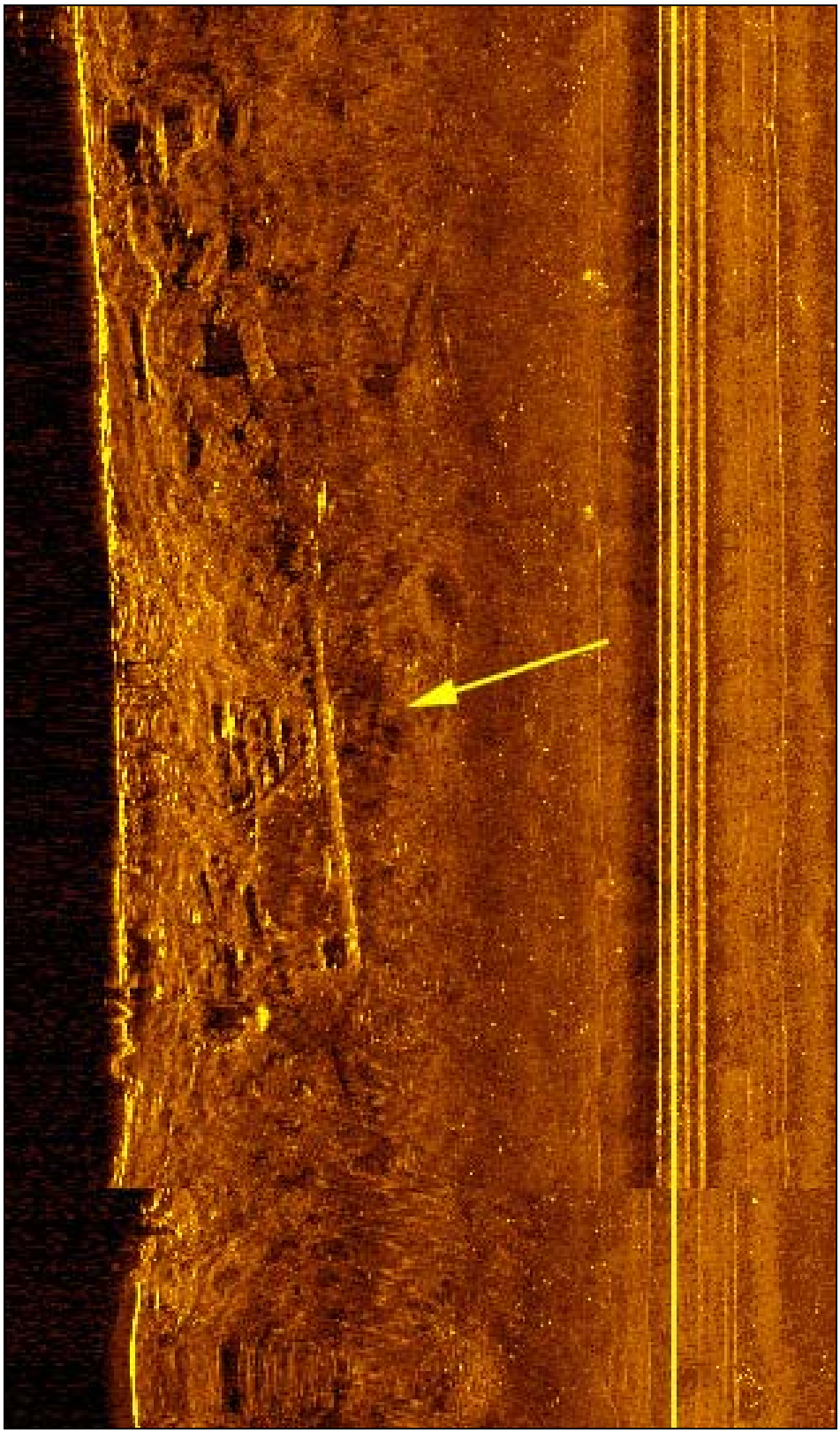


Figure 78. Sonar image of sonar target SSST-10.

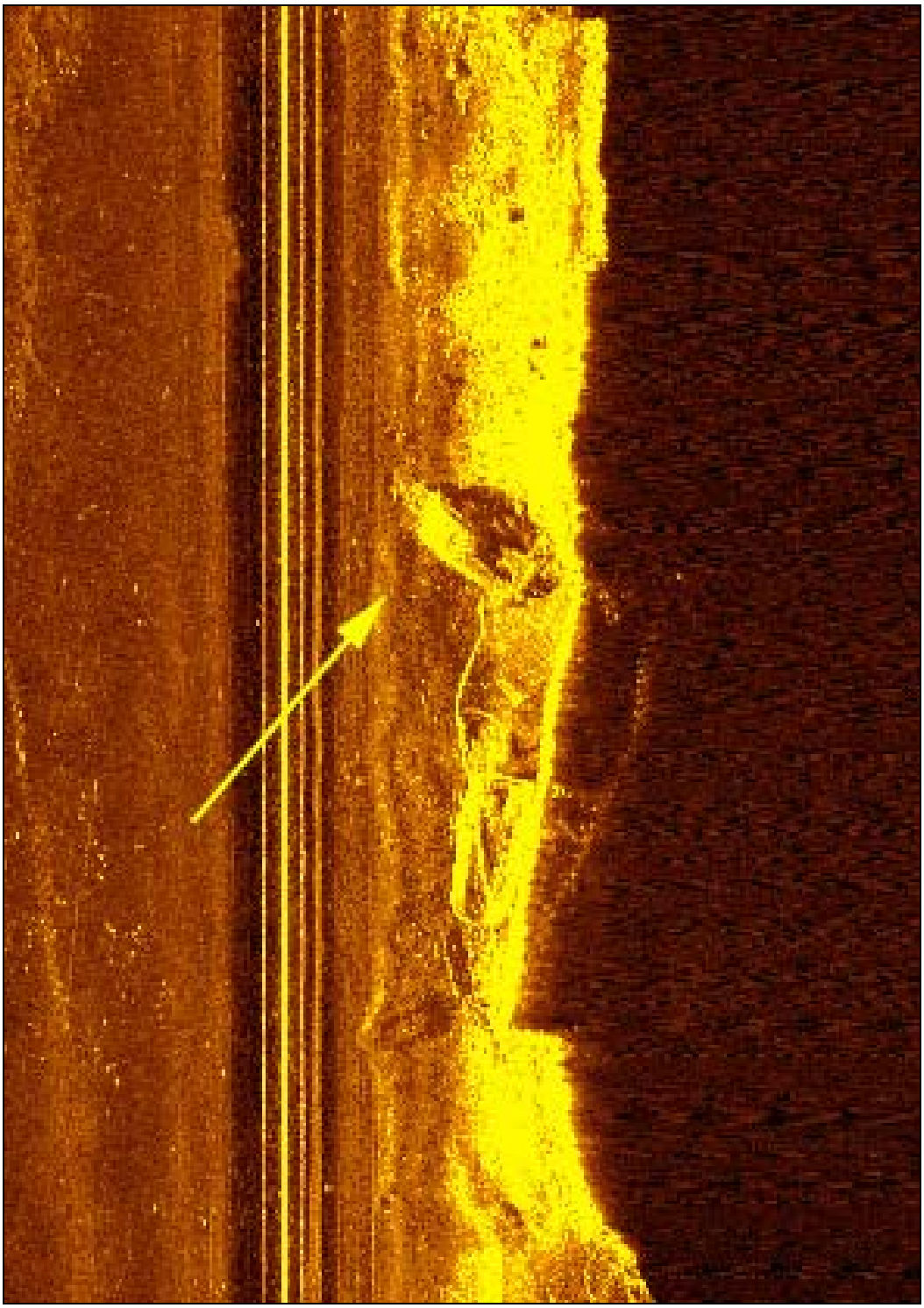


Figure 79. Sonar image of sonar target SSST-11.

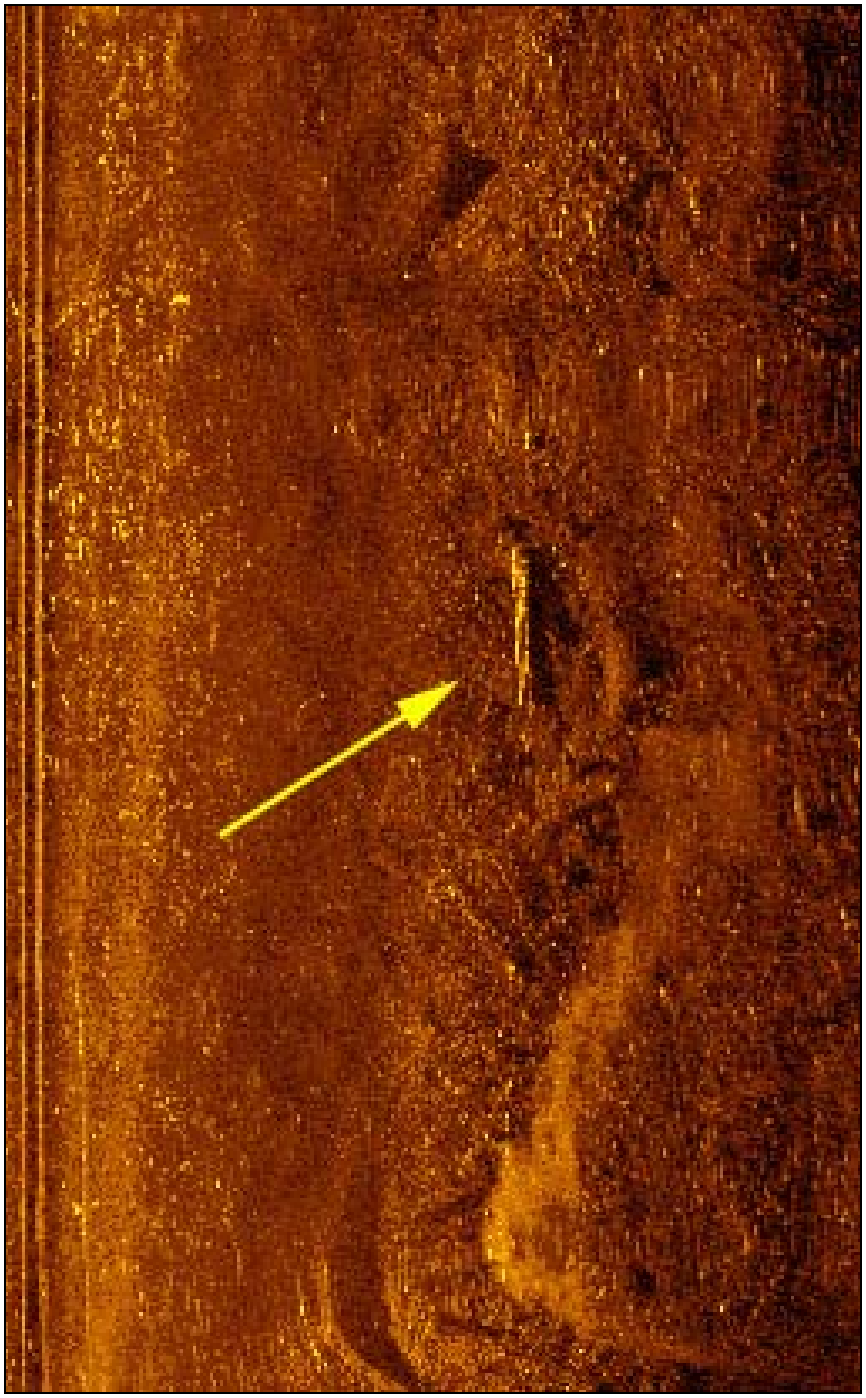


Figure 80. Sonar image of sonar target SSST-12.

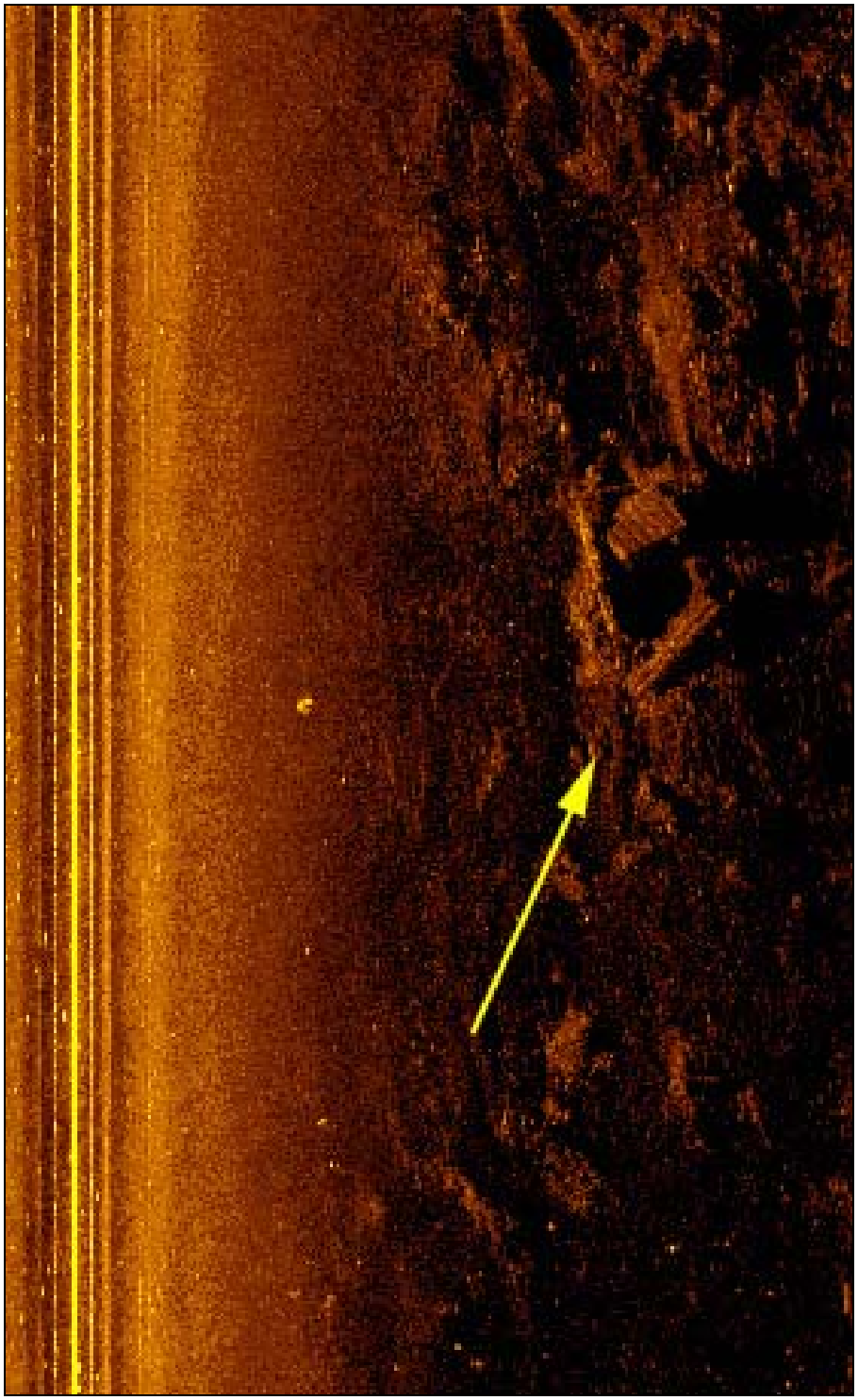


Figure 81. Sonar image of sonar target SSST-13.

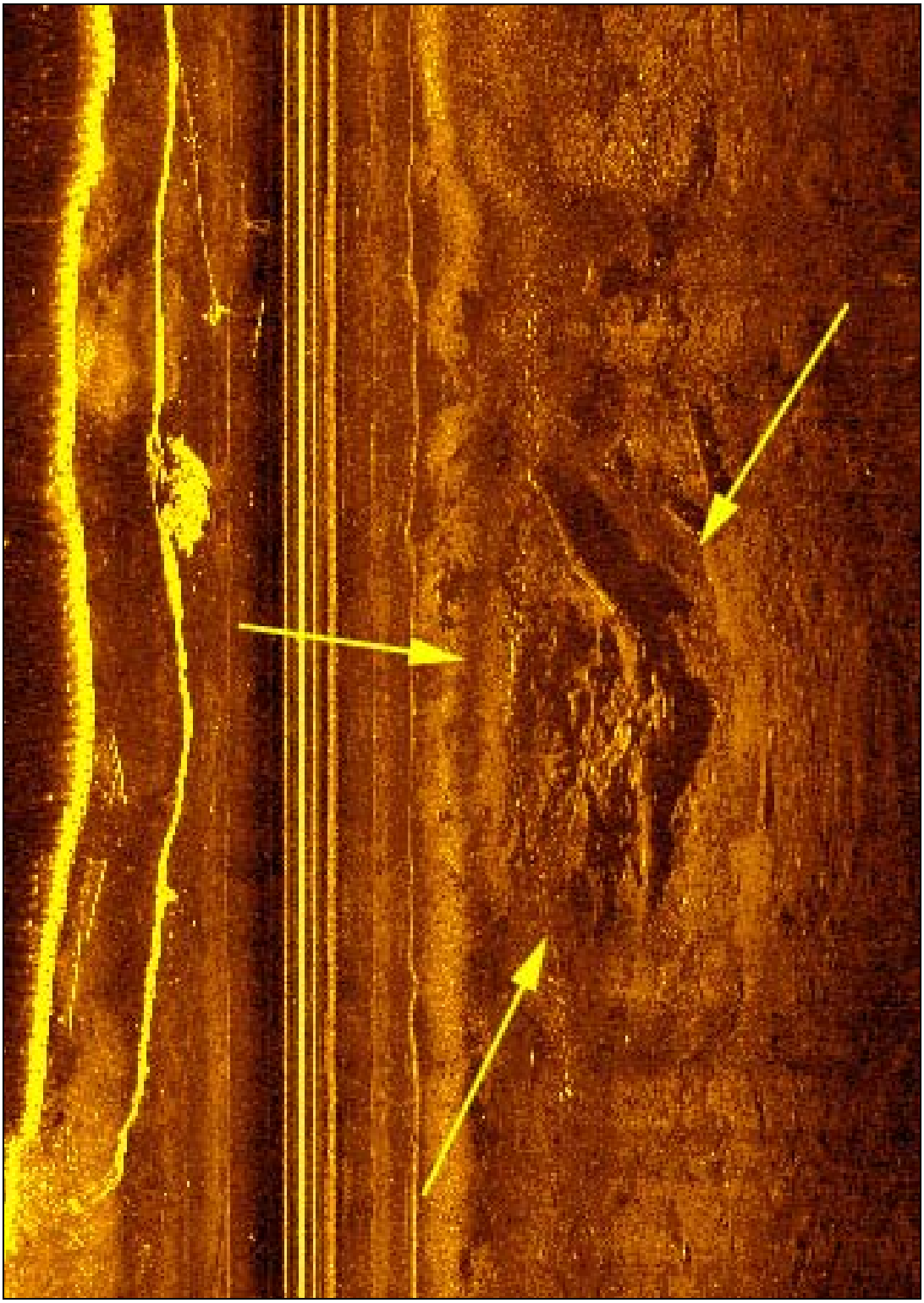


Figure 82. Sonar image of sonar target SSST-14.

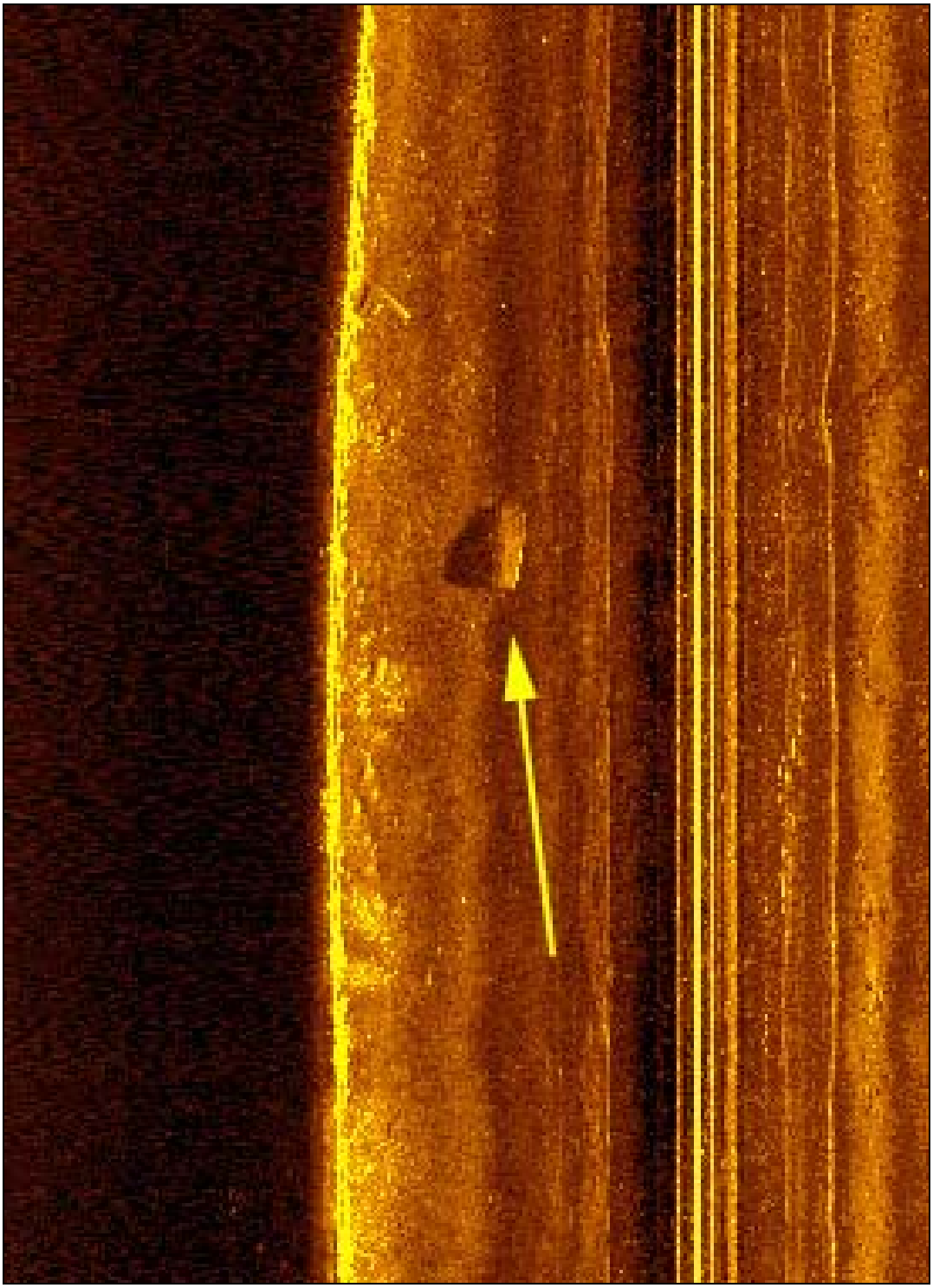


Figure 83. Sonar image of sonar target SSST-15.

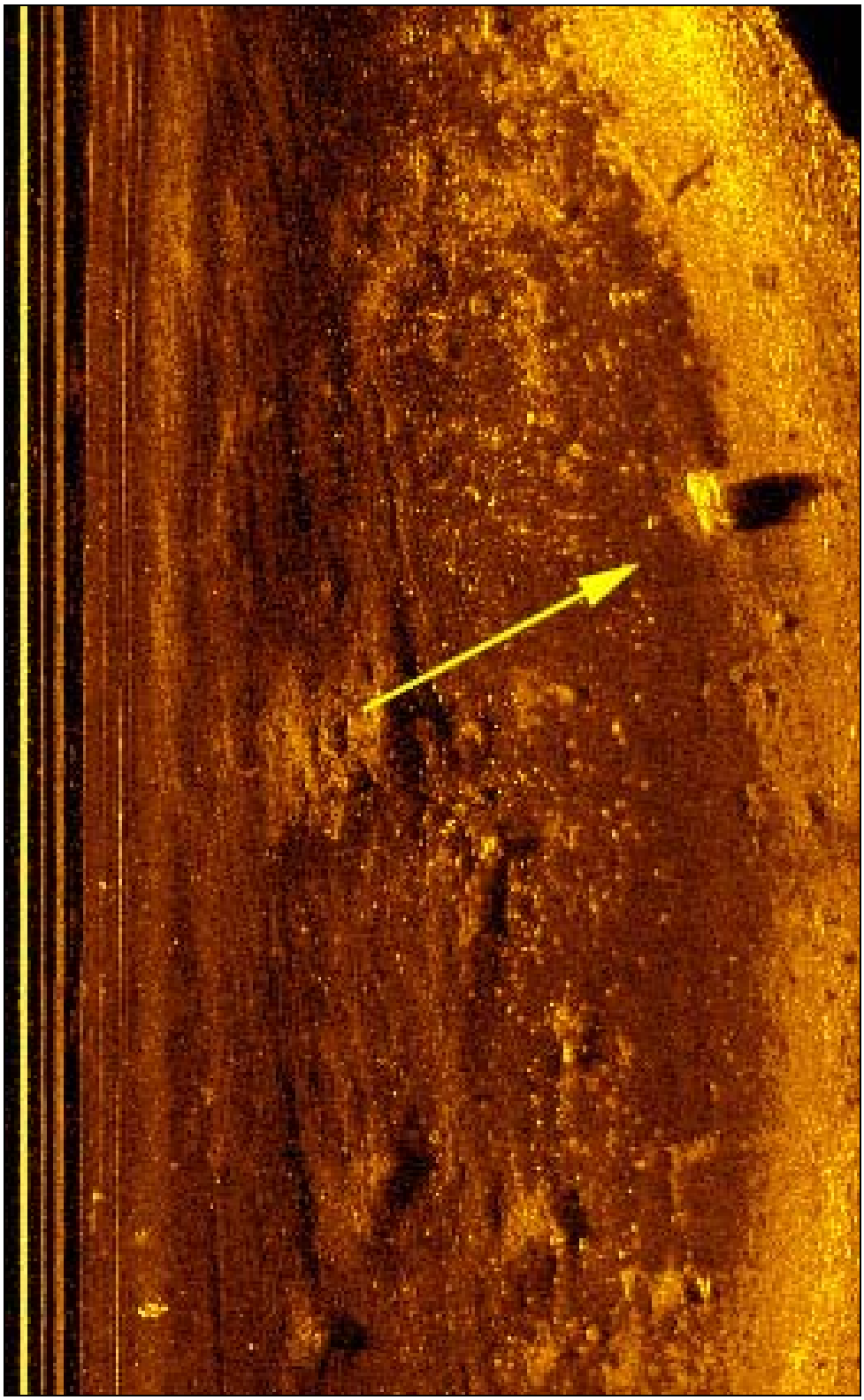


Figure 84. Sonar image of sonar target SSST-16.

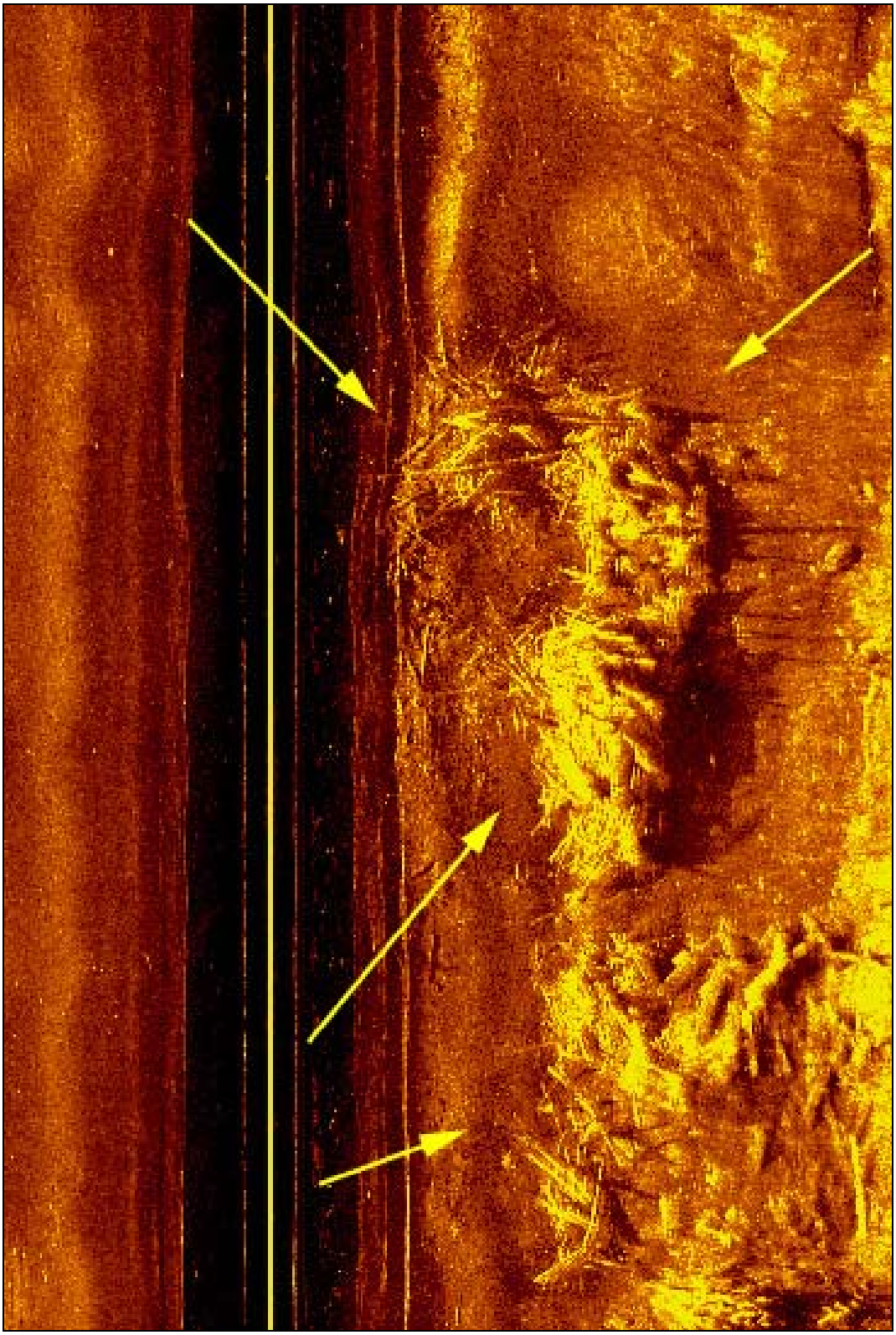


Figure 85. Sonar image of sonar target SSST-17.

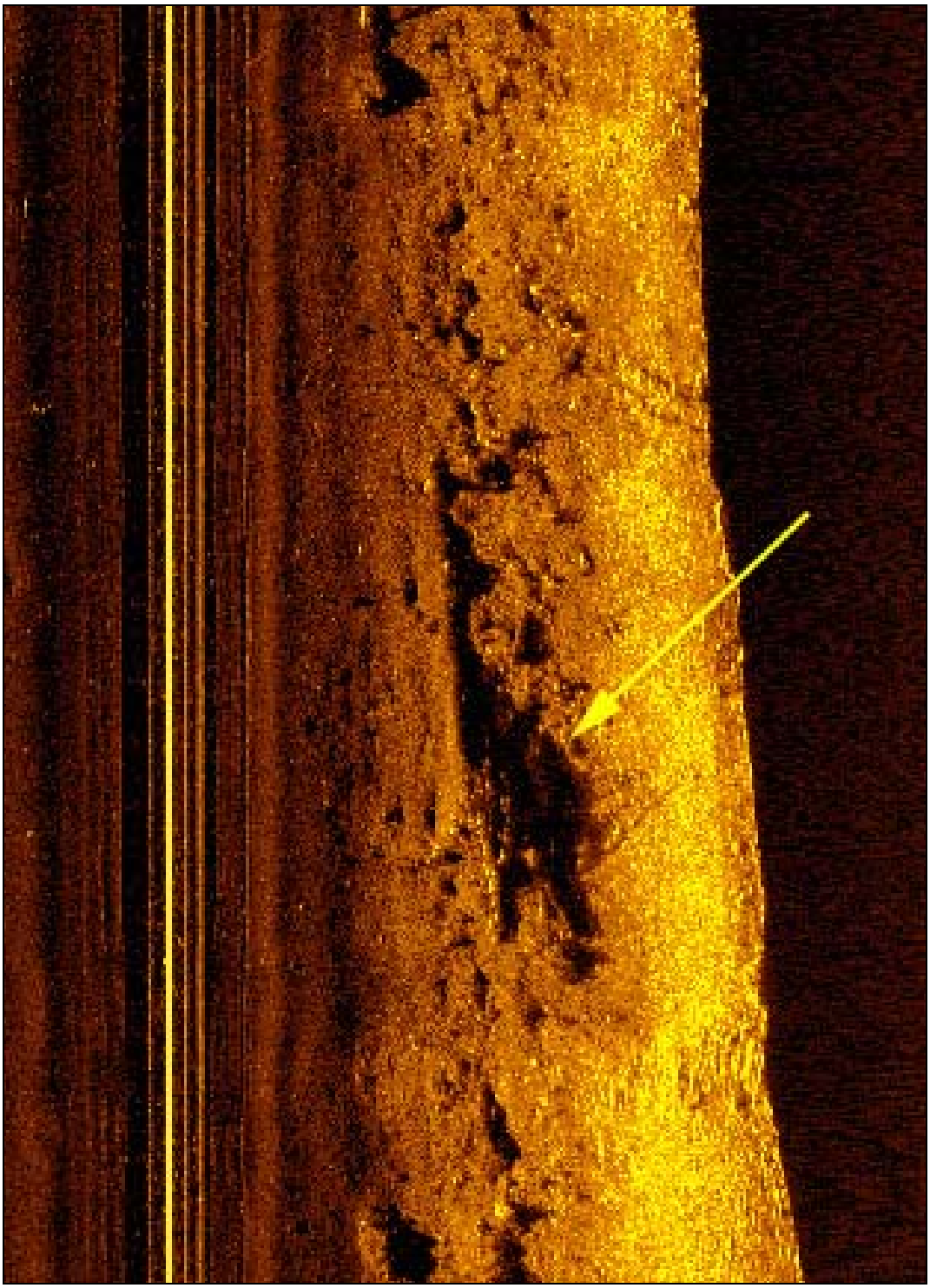


Figure 86. Sonar image of sonar target SSST-18.

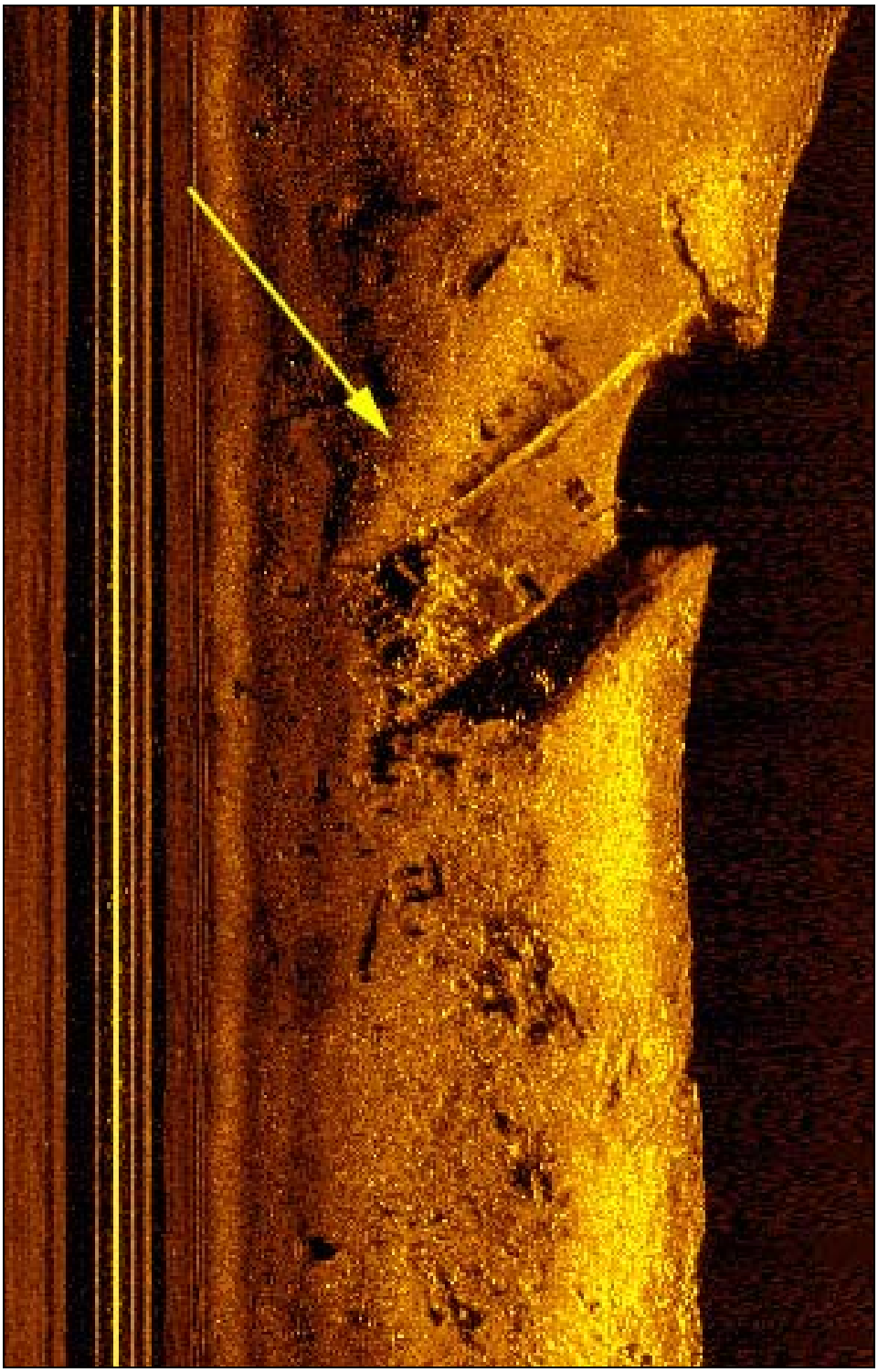


Figure 87. Sonar image of sonar target SSST-19.

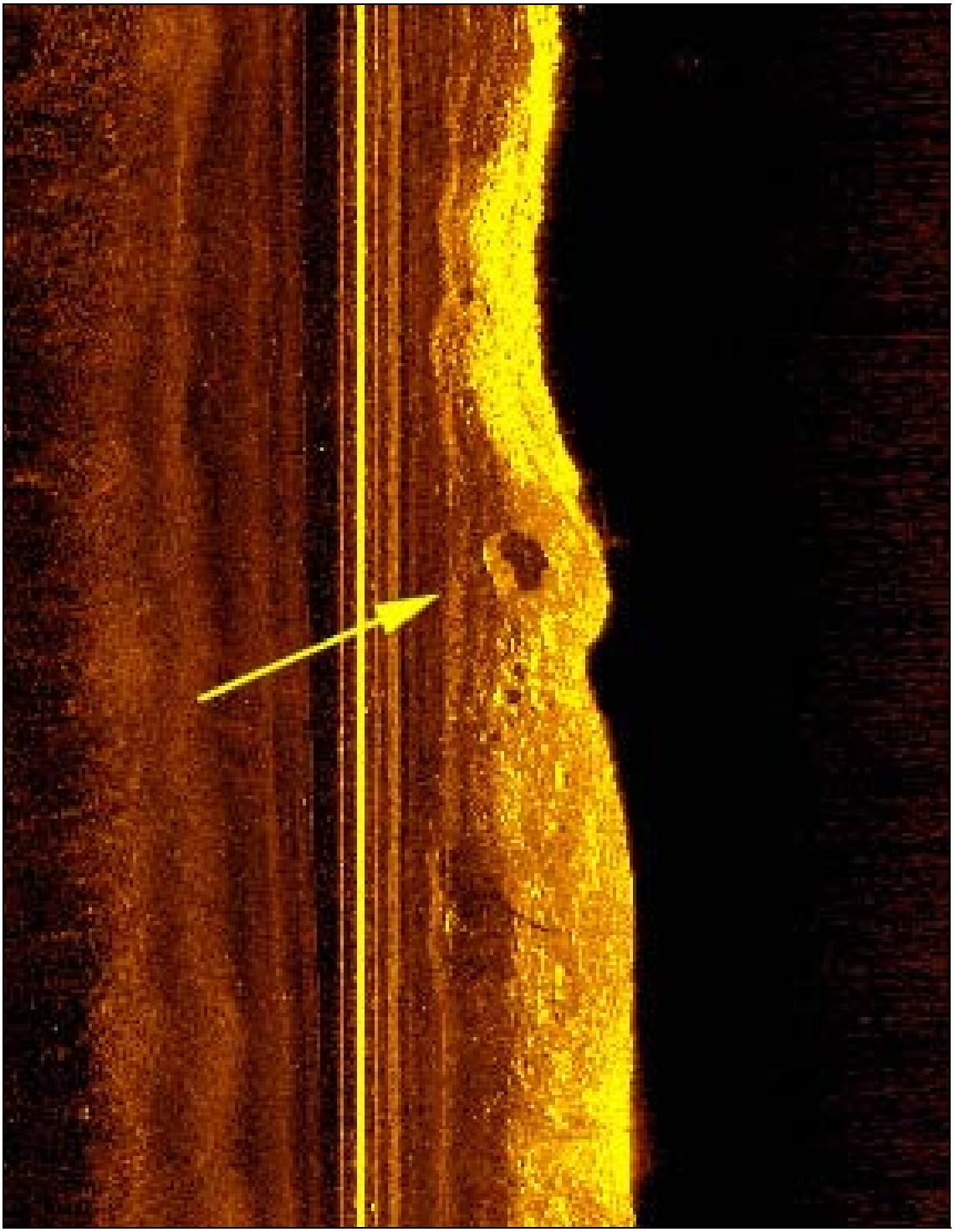


Figure 88. Sonar image of sonar target SSST-20.

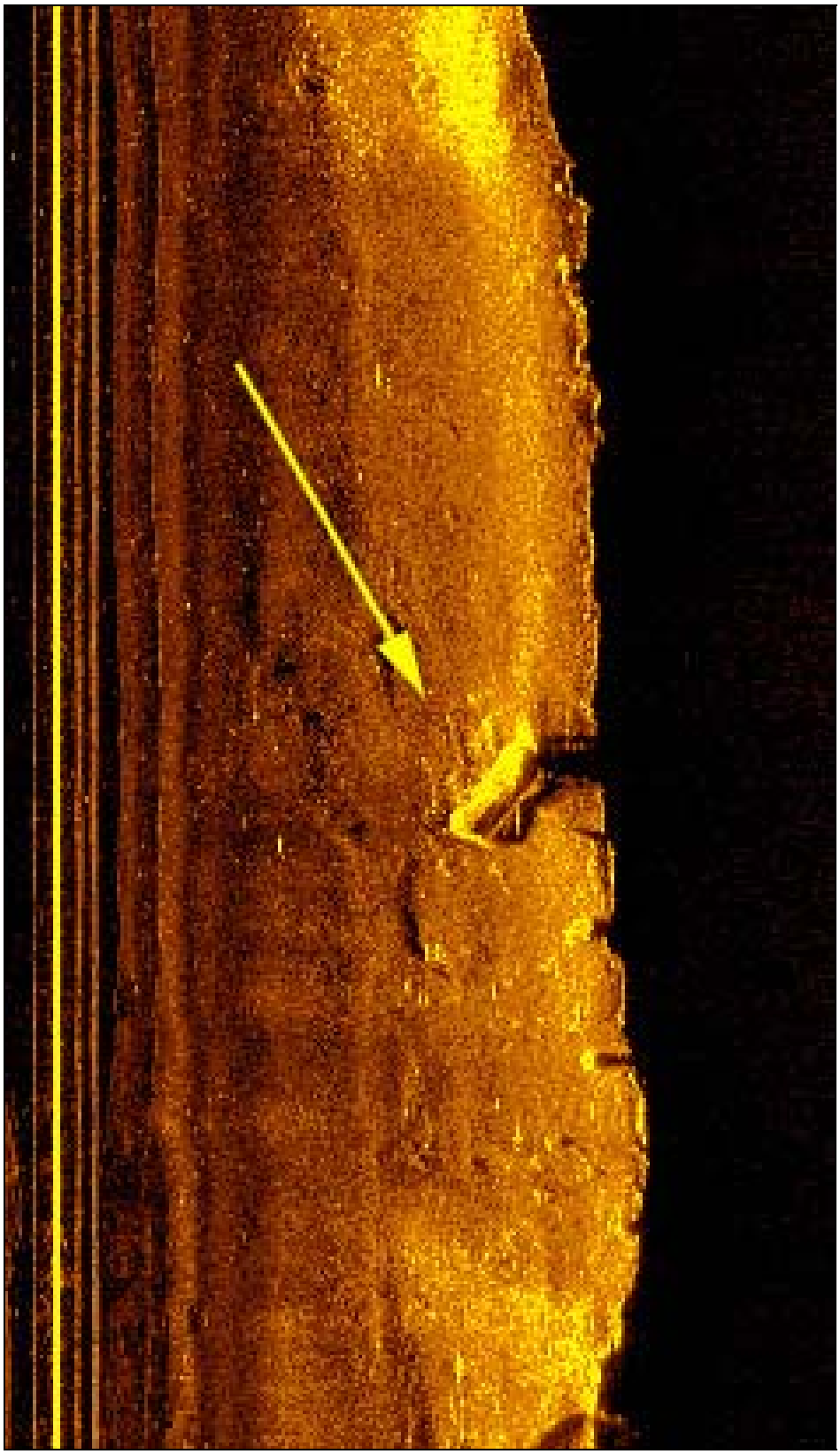


Figure 89. Sonar image of sonar target SSST-21.

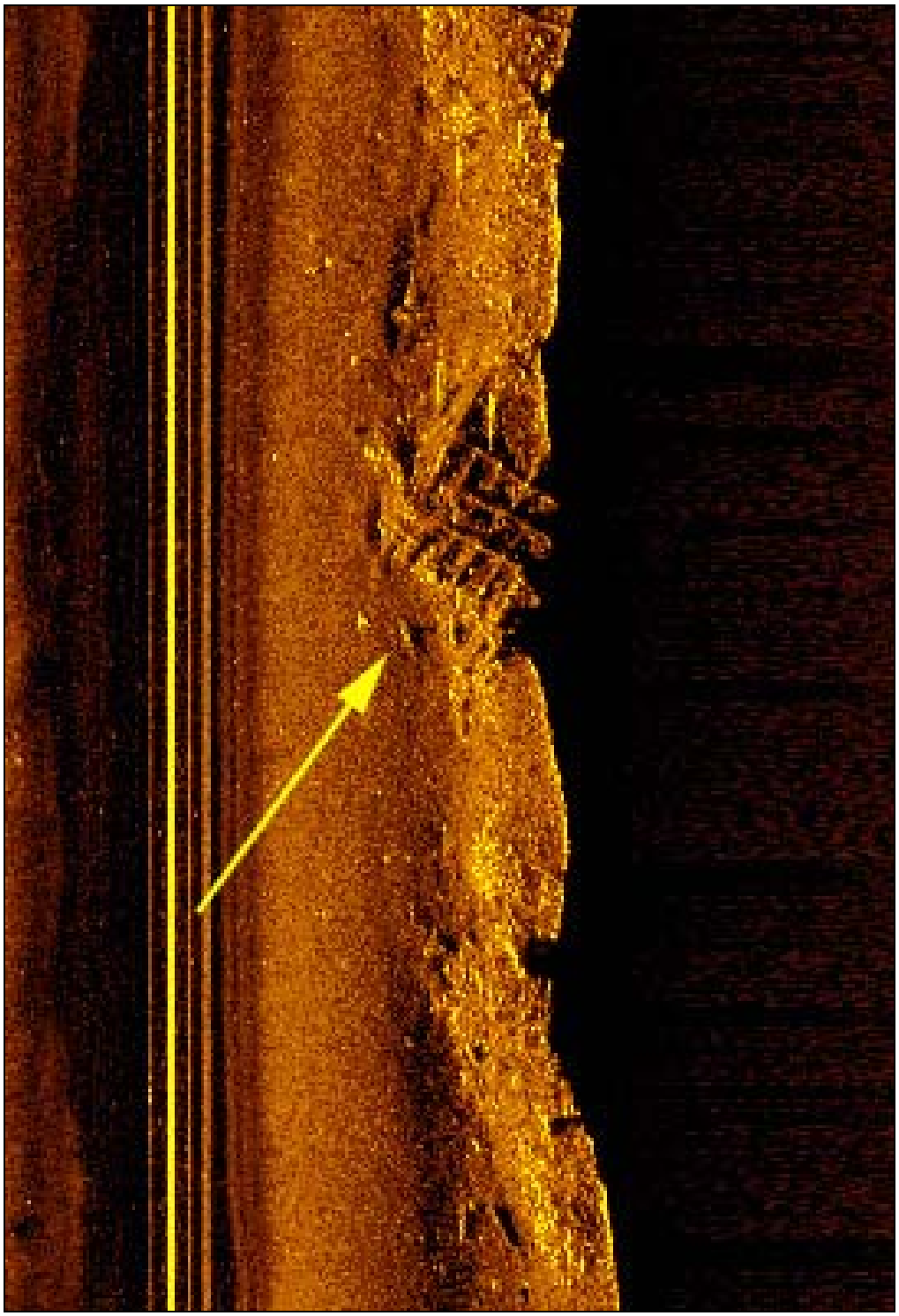


Figure 90. Sonar image of sonar target SSST-22.

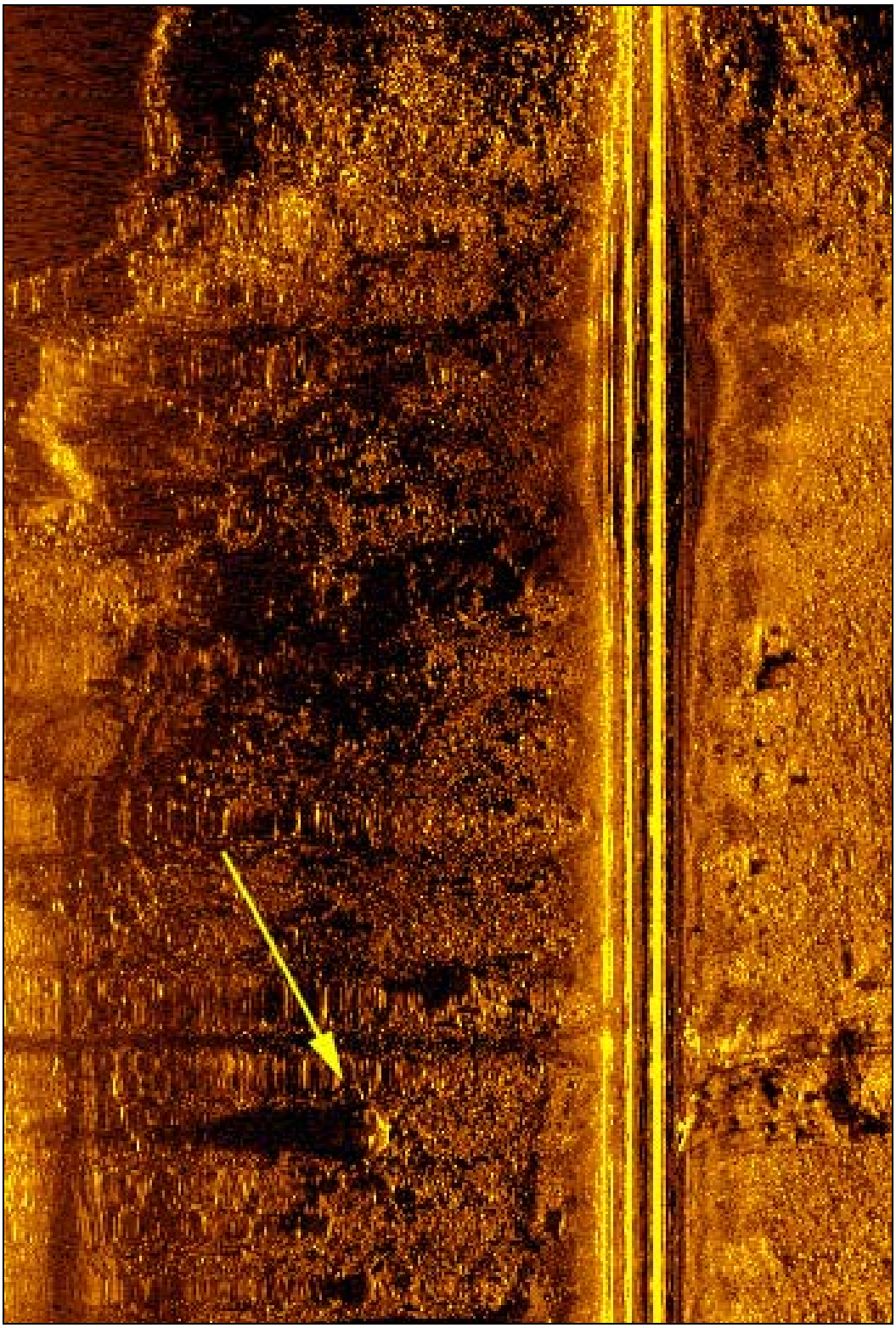


Figure 91. Sonar image of sonar target SSST-23.

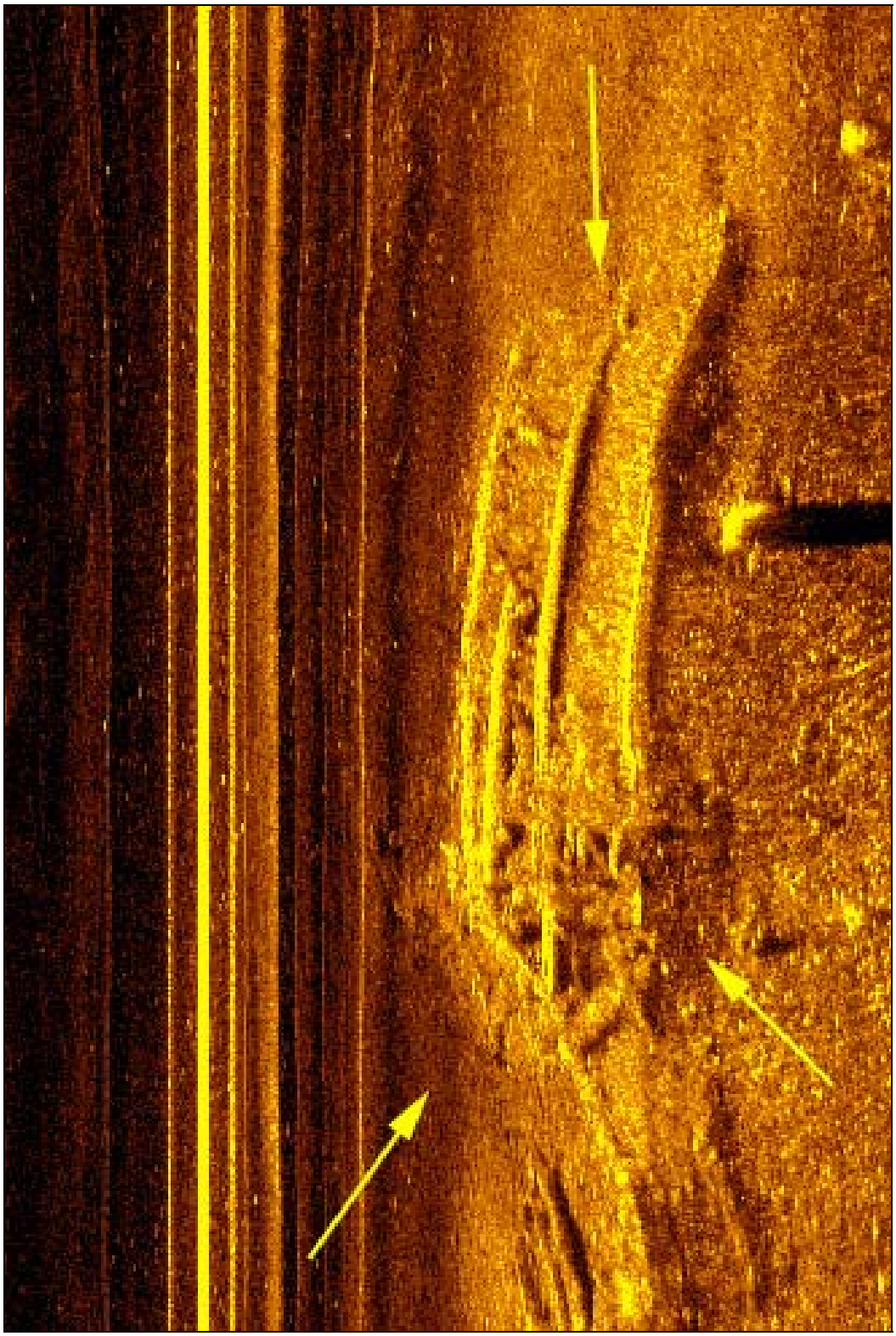


Figure 92. Sonar image of sonar target Wreck.

Figure 93. Photo of sonar target Wreck taken at extreme low tide.

2. Surficial Seabed Classification

Side scan sonar records were reviewed to determine the nature of the surficial sediments. The individual records were processed using Chesapeake Technologies SonarWebPro software to produce fully geo-referenced sonar mosaics (Figure 94). The individual records were also processed using Quester Tangent's QTC SIDEVIEW and QTC CLAMS.

An unsupervised classification technique, which forms the data into logical clusters that can then be identified based on ground truth, was used to segment and classify the sonar imagery. Raw side scan sonar imagery were processed using QTC SIDEVIEW software produced by Quester Tangent. Batch processing techniques read the data on a line by line basis and extracted meaningful features by using a series of algorithms influenced by image texture. Principal components analysis (PCA) was employed to reduce the quantity of the features without a significant reduction to the information content. Objective, automated clustering was used to define portions of the image exhibiting similar backscatter texture and intensity. The results of PCA and clustering were captured in a catalogue of bottom types. The catalogue was used to classify all the data. Approximately 155,000 classification records were generated. A total of nine acoustic classes were identified.

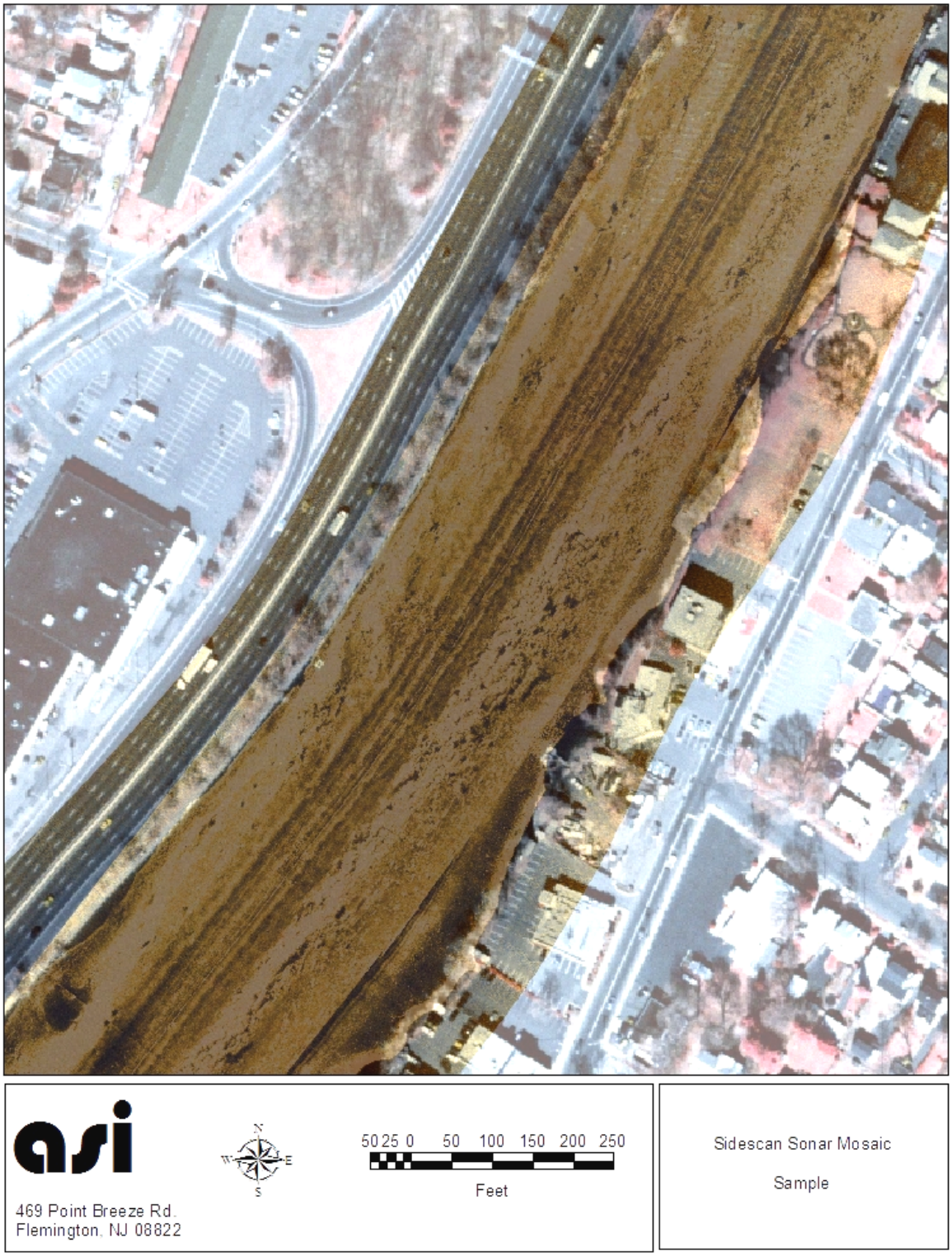


Figure 94. Sample image of side scan sonar mosaic from the GIS.

To utilize side scan sonar technology for seabed classification, software that extracts information not from the details of the vertical echo over time but from the amplitudes and variability of backscatter is required. The package used was QTC SIDEVIEW™. Backscatter changes dramatically as the sonar angle changes and it is essential to compensate the image for this accurately. QTC SIDEVIEW implements a patented process in order to properly compensate the backscatter imagery.

It is well known that the statistical characteristics of a sonar backscatter image depend on the bottom type. Even to a novice user, the texture differences between images of rocks, sand, and mud are readily apparent. Differences between silt and clay are less obvious. Statistical processing can capture many of the pertinent details of the interaction between the sound and the bottom and of its vertical relief. Multivariate statistics can then isolate those details that are rich in information about the bottom, producing features that contain the information necessary for accurate and reliable bottom classifications.

Classification of the bottom is done by an automated clustering method that adapts to the characteristics of the side scan data set. Each cluster represents a bottom type, which can be identified based on ground truth; for example, photographs, grain-size analysis, or other local data. If the bottom type is known before classification, data from the areas of known sediment type can be used to build a catalogue, which would then be used to classify subsequent or archived data. This is called supervised classification. The effectiveness of unsupervised classification in uncovering practical and valuable information from the acoustic data has been demonstrated in many projects. This clustering technology, with its classification options, forms part of QTC SIDEVIEW.

Sediment classification can be done visually, mechanically, and acoustically. All visual methods (divers, video, and photography) and mechanical methods (divers, grab samples, cores, and probes) are slow and manually intensive, thus expensive and not suited to extensive survey work. Acoustic methods, however, can cover large areas quickly as there is no need to stop the survey vessel. However, sediment classification using acoustics alone is possible only in specific and unusual situations. The power of acoustic bottom classification is the ability to apply visual or mechanical classifications over much larger areas than point data alone would allow; that is, the sediment properties obtained from the point samples can be applied with confidence over entire regions that have been mapped acoustically.

Image-based bottom classification is the segmentation of bottom sediments into discrete classes based on the characteristics of acoustic backscatter throughout a region. Segmentation is a valid and useful survey tool, even though it does not independently identify geophysical types. Dividing the bottom into classes is useful because sediment characteristics are relatively constant throughout a class and distinct from the characteristics of other classes. Therefore, the amount of ground truth that needs to be collected, visually or mechanically, is dramatically reduced. A small number of samples from each class are adequate to define the entire class. Also, if sampling locations are chosen away from class borders the samples would be known to represent a single class, not a mixture of classes. This further reduces the number of samples that have to be processed.

Careful quality control is an essential part of reliable and accurate bottom classification. With echo-sounder data, for example, the bottom picks must be accurate so that only bottom echoes are compared, not reflections from fish or artifacts. For side scan sonar data, quality backscatter imagery is necessary for accurate classification. Problems can occur however. For example, images can be smeared by excessive vessel or tow fish motion. Thus, an important processing step is display and validation, followed by filtering images to remove regions that do not meet acceptable standards.

A mask is used to exclude regions of poor quality from further processing. Data are not removed, just flagged for exclusion from subsequent processing. Important changes in sonar operating conditions are taken into consideration in this step.

Following loading the data from the Lower Passaic River survey, the tow fish altitude was digitized as this information was not provided in the raw file. During digitization, the data set was also assessed for quality. Areas that did not appear to accurately represent the bottom were masked out using QTC SIDEVIEW's manual editing tools. These areas included shoreline regions, areas of excessive motion, and man made objects present on the river bottom. All the data were then cleaned using batch processing. The water column plus a 1 meter offset were masked in all of the images. This water column offset was increased to 4 meters in the data from the uppermost river area above the 8th St Bridge in Wallington, NJ (river mile 15.3) to mask excessive motion in the towfish caused by swift currents and shallow water. Also, the data beyond a range of 45 meters were masked due to the potential for poorer quality data at long range (Figure 95).

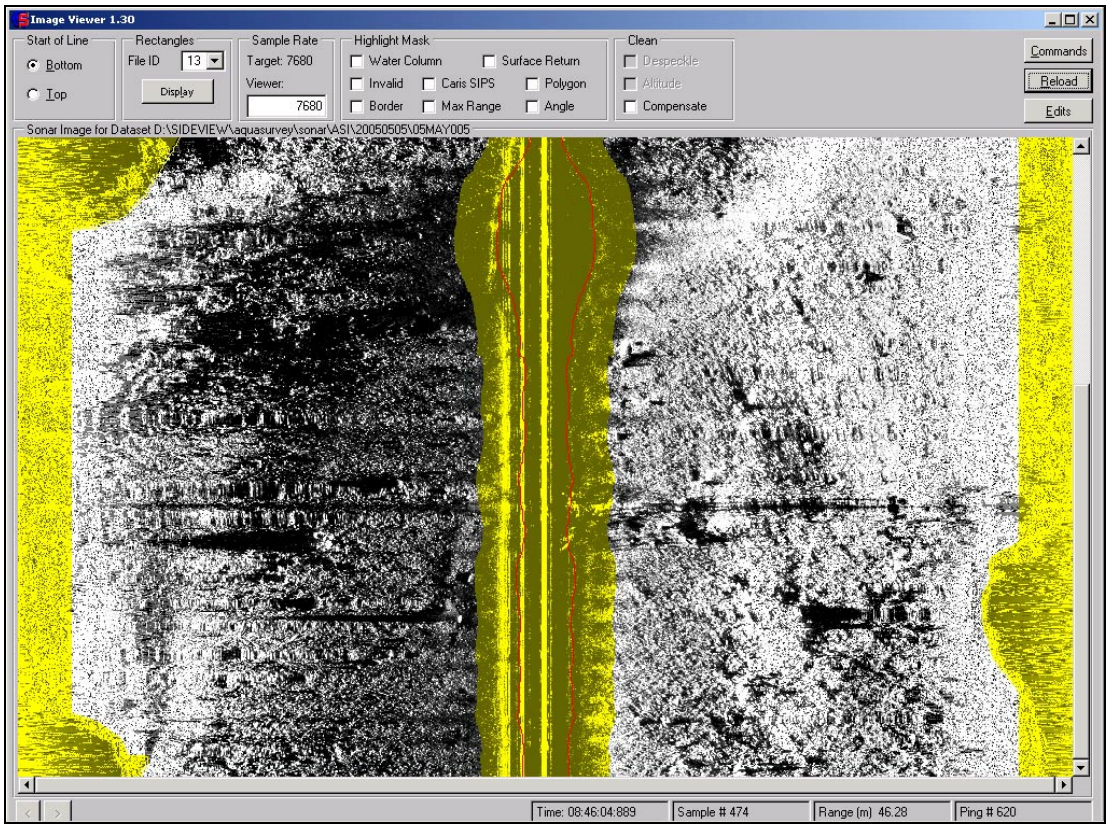


Figure 95. Motion artifacts near Nadir on an uncompensated image. Transparent yellow areas indicate masked regions. This image is from line 05MAY005.mst.

The bottom in the image was divided into rectangular patches. Through use of the mask, areas of low quality are omitted when patches are placed. For some systems, placement is influenced by insonification and sonar angles with constraints that depend on the type of the sonar system. These constraints and the user-selected patch sizing determine the number of patches per side (to port and to starboard). Changing the patch size and reprocessing the data provides for an optimization of the result for a particular scale of feature or boundary resolution. A class assignment is generated for each patch.

For the Lower Passaic River data, a rectangle size of 65 (across track) by 33 (along track) pixels was chosen. This approximates a footprint of 6 meters by 6 meters on the bottom. Figure 96 shows an example of a backscatter image with rectangles on it. Each rectangle will become a final classification point. Rectangles were only placed on areas of the image that were not masked.

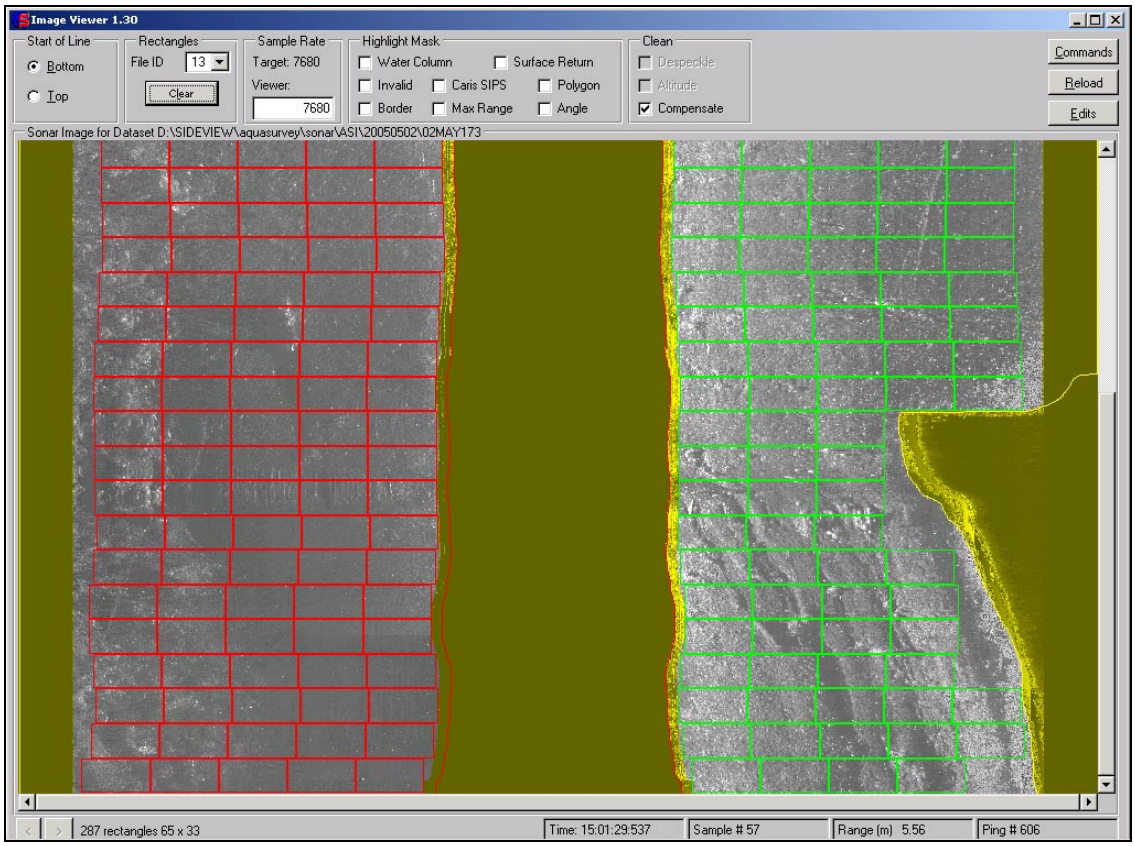


Figure 96. High quality compensated backscatter image with rectangles. Transparent yellow areas indicate masked regions. This image is from file 02may173.mst.

After the rectangles were created, the backscatter data from within each rectangle were run through the feature algorithms. The compensation process was performed at this stage. Figures 96 and 97 show the compensated and uncompensated images. Each point is now referred to as a Full Feature Vector (FFV). A second level of quality control was performed. Several individual FFVs were rejected due to erroneous position or heading typically found during sharp turns or just after emerging from under a bridge. Also, points with altitudes less than one meter were filtered. Rejected and filtered points were not carried forward for further processing by the software.

A large number of features are extracted from the backscatter amplitudes in each rectangular patch of each image. QTC SIDEVIEW is able to use many features because Principal Components Analysis, in the next processing step, will select those combinations of features best suited to each data set.

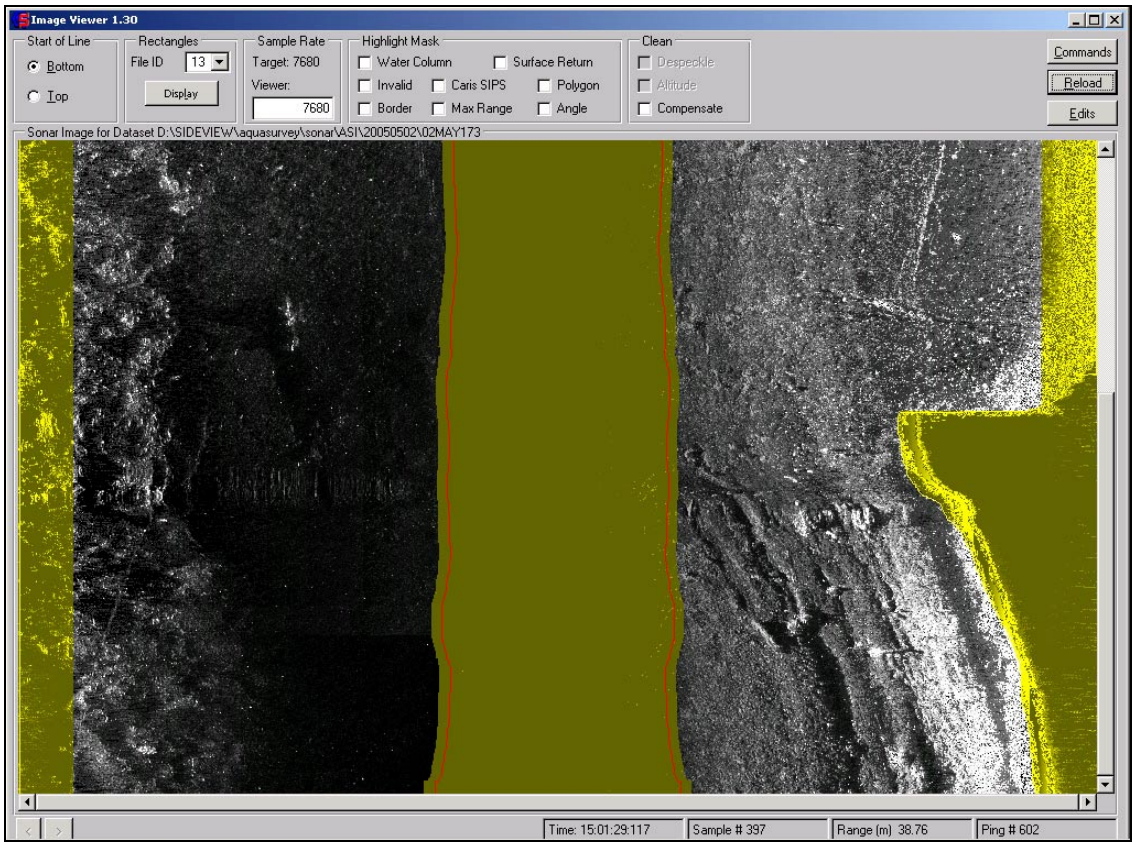


Figure 97. High quality uncompensated backscatter image. Transparent yellow areas indicate masked regions. This image is from file 02may173.mst.

For bottom classification, features are extracted from both backscatter image data and depth data using the following algorithms:

Basic Statistics: Mean, standard deviation, and higher-order moments are indicative of acoustic impedance changes and interface roughness.

Quantile and Histogram: These measure the distribution of backscatter information intensities at low resolution.

Power Spectra: Fast Fourier Transforms (FFTs) are used to find power spectra, which describe statistical characteristics on many resolution scales.

Ratios based on Power Spectra (Pace): Ratios of log-normalized power in various frequency bands provide good discrimination for classifying images.

Grey-Level Co-occurrence Matrices (Haralick): Grey-Level Co-occurrence Matrices (GLCMs) describe the amplitude changes over selected distances and directions in the image patch, and are widely used to assess texture.

These features have been selected to capture many useful aspects of the data. As QTC SIDEVIEW was developed, the selection of features was frequently examined to determine which features were providing useful discrimination and to determine if any algorithm consistently produced redundant features. One interesting result from these studies was that mean intensity was rarely the sole determining feature in the overall classification process. It is combinations of intensity and texture that seem to drive classifications.

A major strength of QTC SIDEVIEW processing is the incorporation of multivariate statistical techniques as they permit the use of many features. Experience has shown that some features are important in what might be called the standard classifications: mud, sand, gravel, and so on. Others are important for more specialized classifications such as discriminating among sand/mud mixtures. For any particular data set, PCA selects the features that are most useful for the discrimination task at hand. Features that are close to constant are largely disregarded. Redundancies, that is, correlated features, are also acceptable, but only one remains significant. What is left is a reduced feature set that compactly describes the diversity of the data set. While some features may have little diversity or be tightly correlated when used to describe one set of bottom sediments such as open continental shelf sand and gravel, they may be found to give useful discrimination in other cases, such as on deltaic sediments. Thus, the connection between features and classification adapts to the character of the data set.

For each patch of each image, the features are calculated and then arranged as a row vector containing more than 100 elements. The name given to these rows of features is Full Feature Vectors (FFVs). This information must be optimized or reduced without losing any details of the sediment. The dimension of the FFVs is reduced by multivariate statistical processing to isolate the combinations of features that are responsible for most of the diversity in the data set. In general, the top three combinations capture a very high percentage of the variance, so the rest of the combinations can be disregarded by the software. These top three combinations are called Q-values.

The result of this reduction process is contained in the reduction matrix. Any FFV can be reduced to three Q-values by matrix multiplication. The reduction matrix is part of the catalogue used for supervised classification. New FFVs, derived from any subsequent acoustic survey, can be reduced to Q-values in this way as part of the supervised classification process. Alternatively, the multivariate statistical processing can be run on any partial or complete data set to find new information.

The acoustic response - represented by Q1, Q2, and Q3 - from like bottom types will be similar. When plotted on a three-axis plot, called Q-space, points with similar values, for example from a single bottom type, form a cluster. Thus, data from three acoustically different bottom types form three clusters.

Quester Tangent's automated clustering technique produced nine acoustically distinct classes. The colors used in the plots are called Similarity Colors in which classes that are neighbors in Q-space are painted with similar colors. Each point in the maps is at the position of the centre of each rectangle. The classes were generally consistent (i.e., same class where data overlaps). Absolute ground types have not been assigned to the acoustic classes. Using ground truth information, association of acoustic class with sediment type is possible.

The resulting data file was merged with the position information to generate a geo-referenced classification data set constituting the final data product. This final Quester Tangent data set was superimposed over the sonar mosaic image. The Quester Tangent and sonar mosaic were used to better identify changes between sediment types. This combined image was used with the results from the shallow core ground-truthing (field geologist description and DESA lab results) to produce the regions constituting the final simplified surficial seabed classification shapefiles. The Quester Tangent classifications, intensity of sonar reflectors, field geologist descriptions, and DESA results were all used together in order to determine the surficial sediment at a given location. The DESA results and the field geologist descriptions were the primary sources for determining the nature of the surficial sediment material. The side scan sonar mosaic and the Quester Tangent classifications were the primary sources for determining boundaries between different materials. In cases where the sonar image and Quester Tangent classification differed from the field geologist descriptions and DESA results, the material most likely to be present based on field experience was used. In some cases, that would be the sonar classifications, where the material could not be collected using the sampling techniques employed during the ground truthing effort. In other cases the ground truthing results were used. Principally this was the case where the energy reflected back to the side scan sonar was stronger than it should have been for a certain material, primarily on slopes or when the towfish was very near the shoreline. The sonar data were used in all cases to better differentiate the borders between different materials.

The simplified surficial seabed classification showed silt as the primary sediment type, with various mixtures of silt, sand, and gravel present. A significant change occurs near the West Arlington Railroad Bridge. The riverbed downriver from this point can be described as primarily silt. Areas around bridges were found to have been scoured out and were less likely to have silt deposits. Since the shorelines along the river have been 'improved' to help control erosion, many areas were found to have rock and gravel forming the edges of the river. Above the West Arlington Railroad Bridge (river mile 8.1), the riverbed is much more varied. Primarily, the center of the channel is either sand or a silt/sand combination. Areas of silt are present, though primarily limited to the depositional areas on the inside of the bends in the river. From just below the 8th Street Bridge (river mile 15.3) in Wallington to the uppermost reach of the area surveyed, the riverbed consists primarily of sand and gravel, with large rock and boulders in certain areas. This section of the river is generally shallow with swift water flow.

asi
469 Point Breeze Rd
Flemington, NJ 08822

250 125 0 250 500 750
Feet

NJ State Plane feet NAD83

Simplified Surficial Seabed Sediment Map

Figure 98. Simplified surficial sediment map 1.

Figure 99. Simplified surficial sediment map 2.

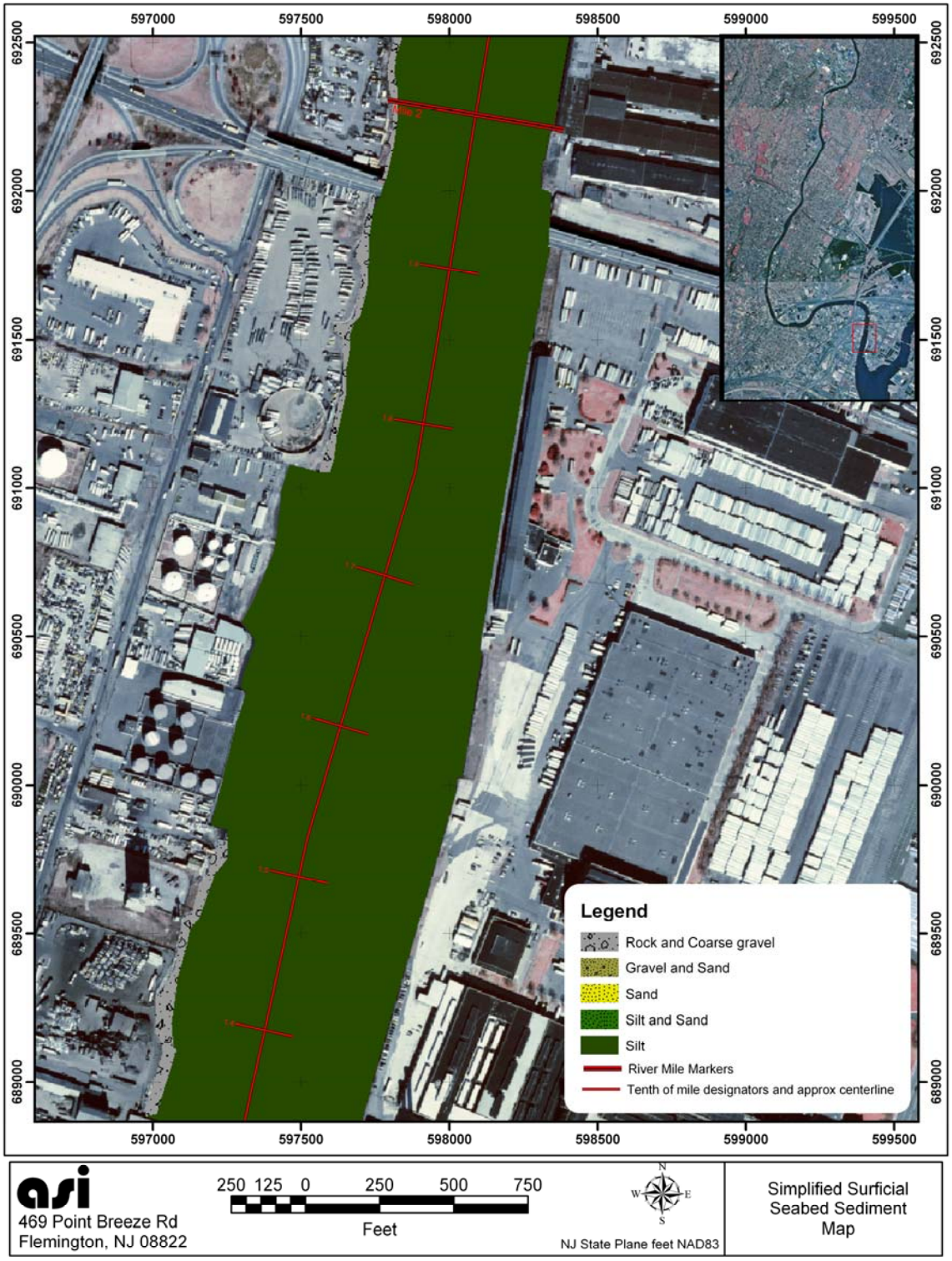


Figure 100. Simplified surficial sediment map 3.

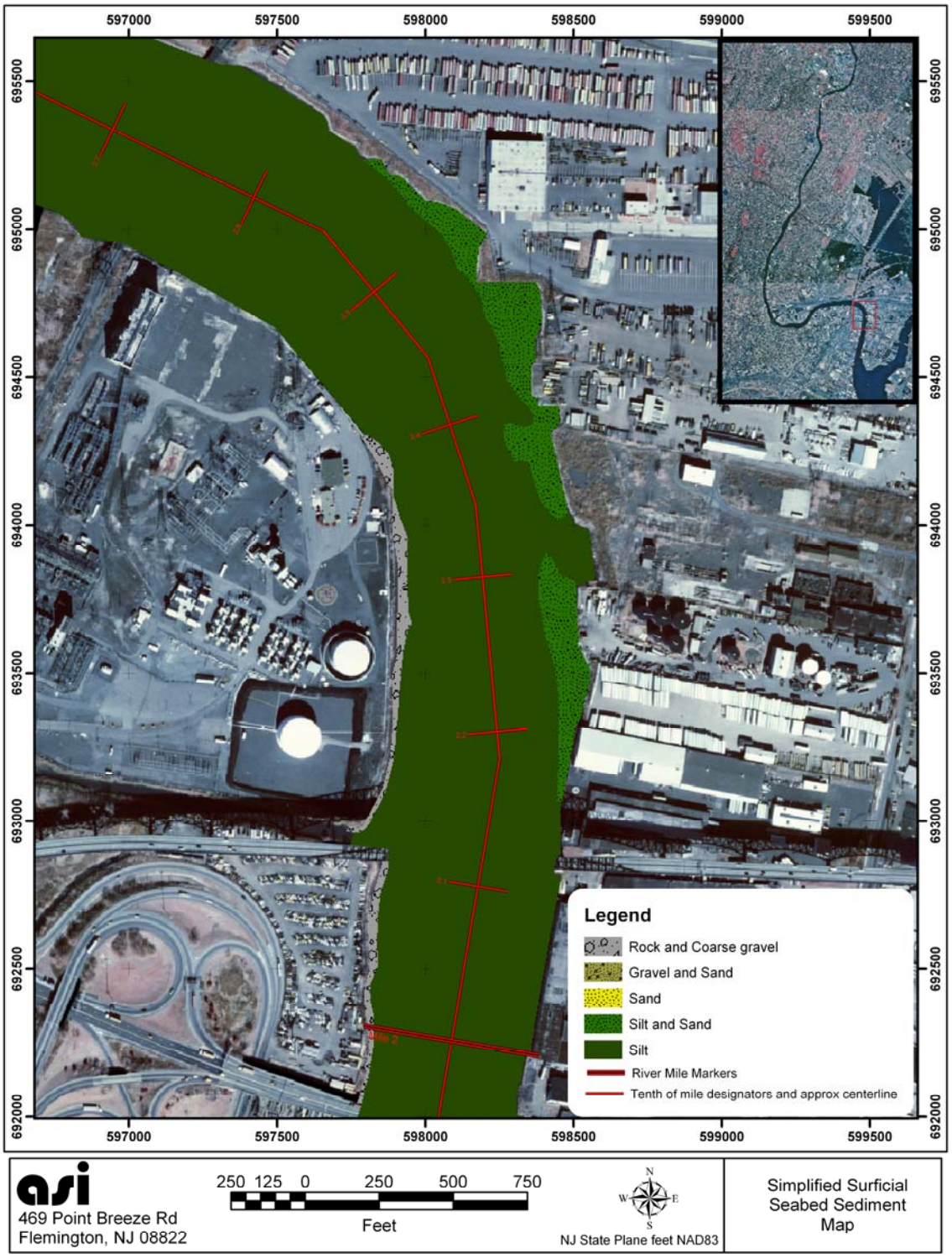


Figure 101. Simplified surficial sediment map 4.

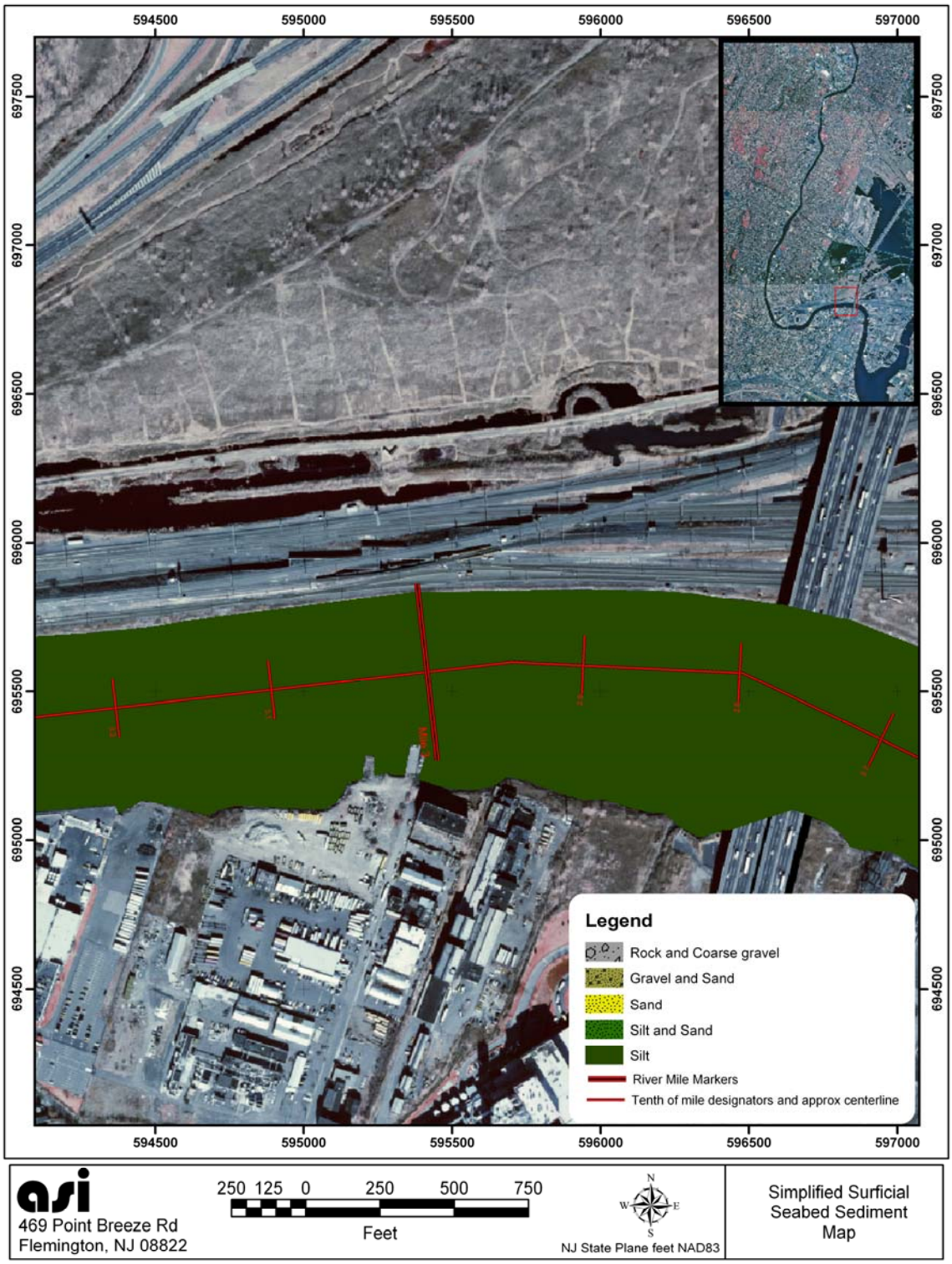


Figure 102. Simplified surficial sediment map 5.

Figure 103. Simplified surficial sediment map 6.

Figure 104. Simplified surficial sediment map 7.

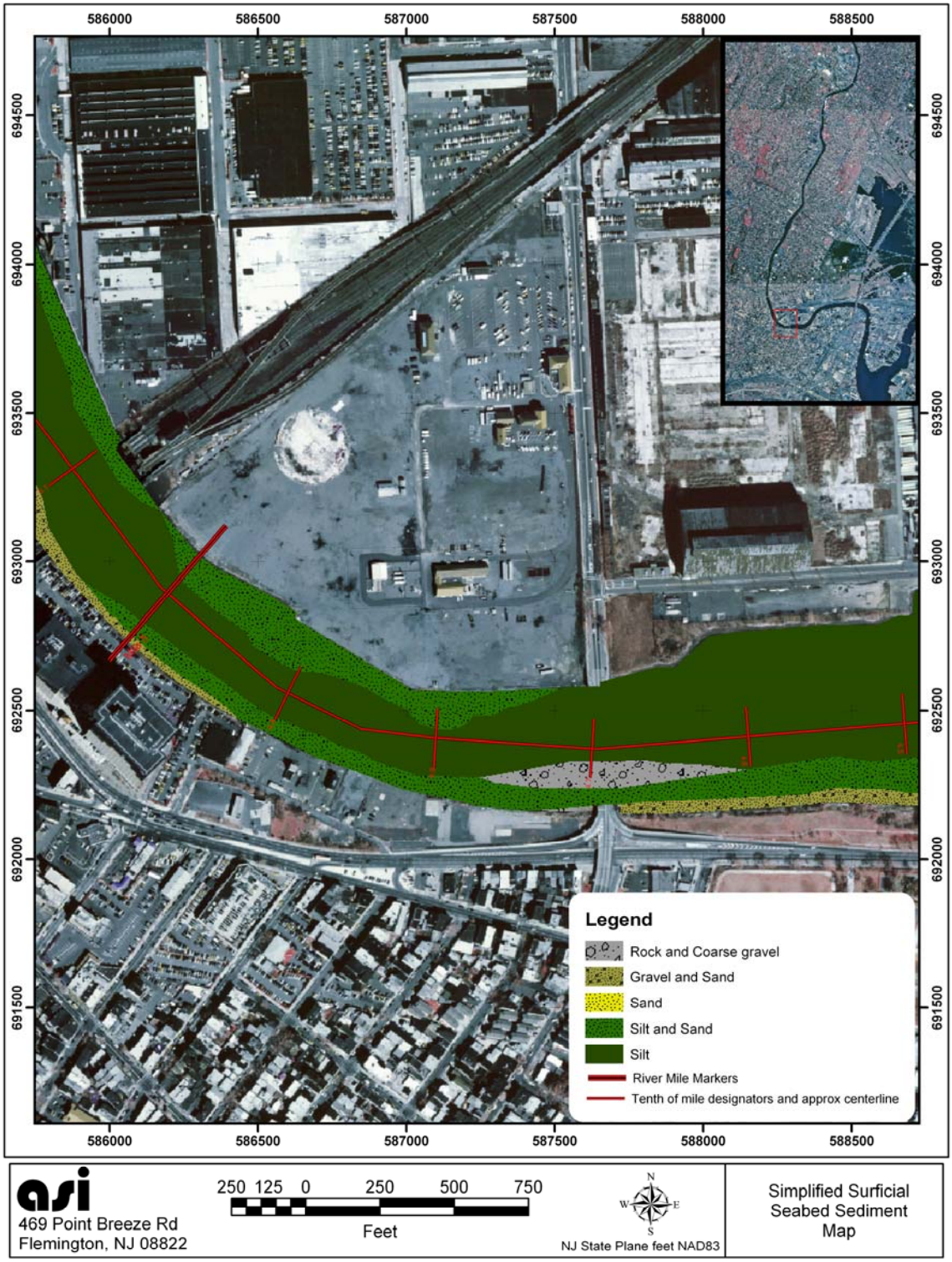


Figure 105. Simplified surficial sediment map 8.

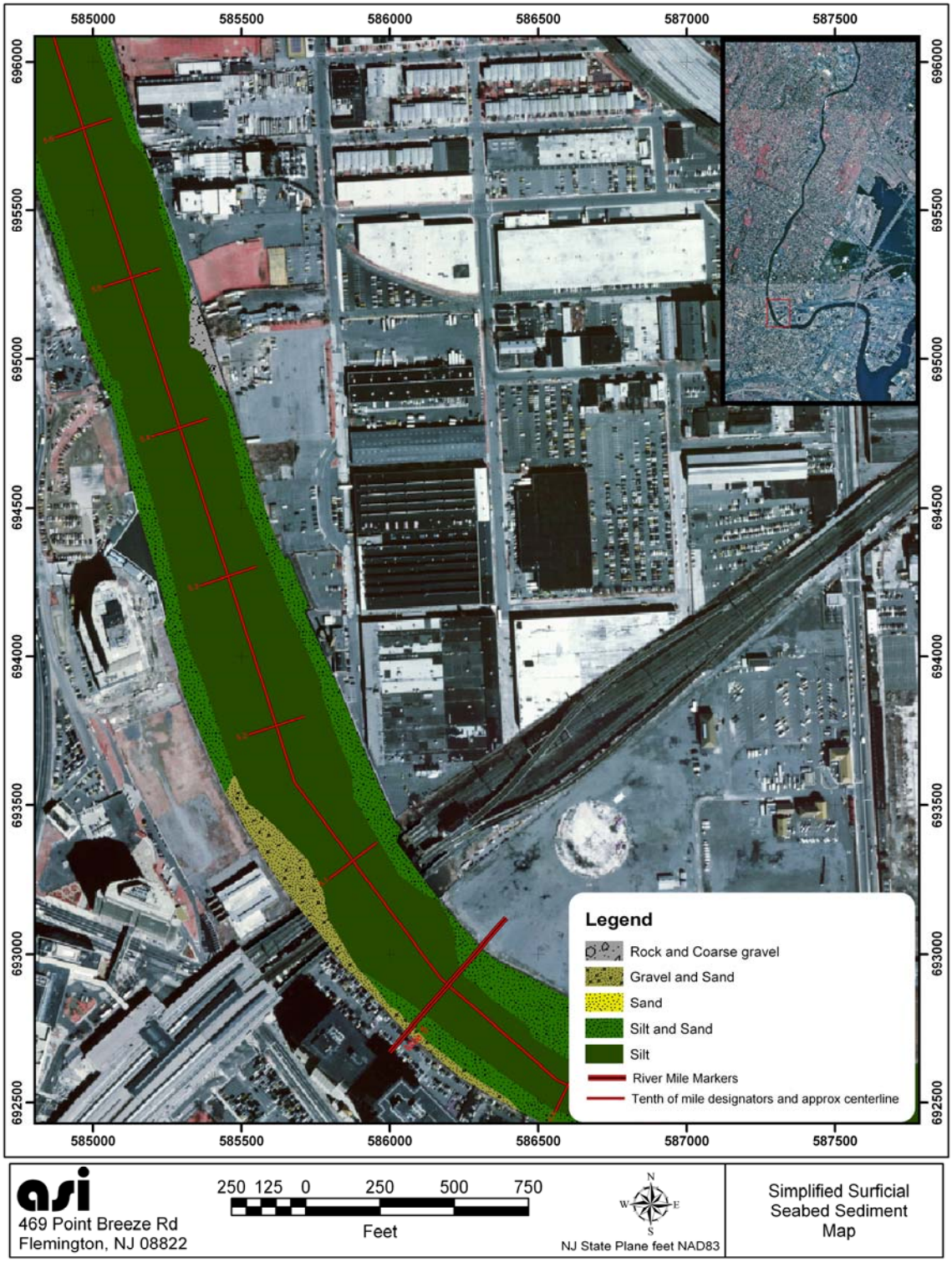


Figure 106. Simplified surficial sediment map 9.

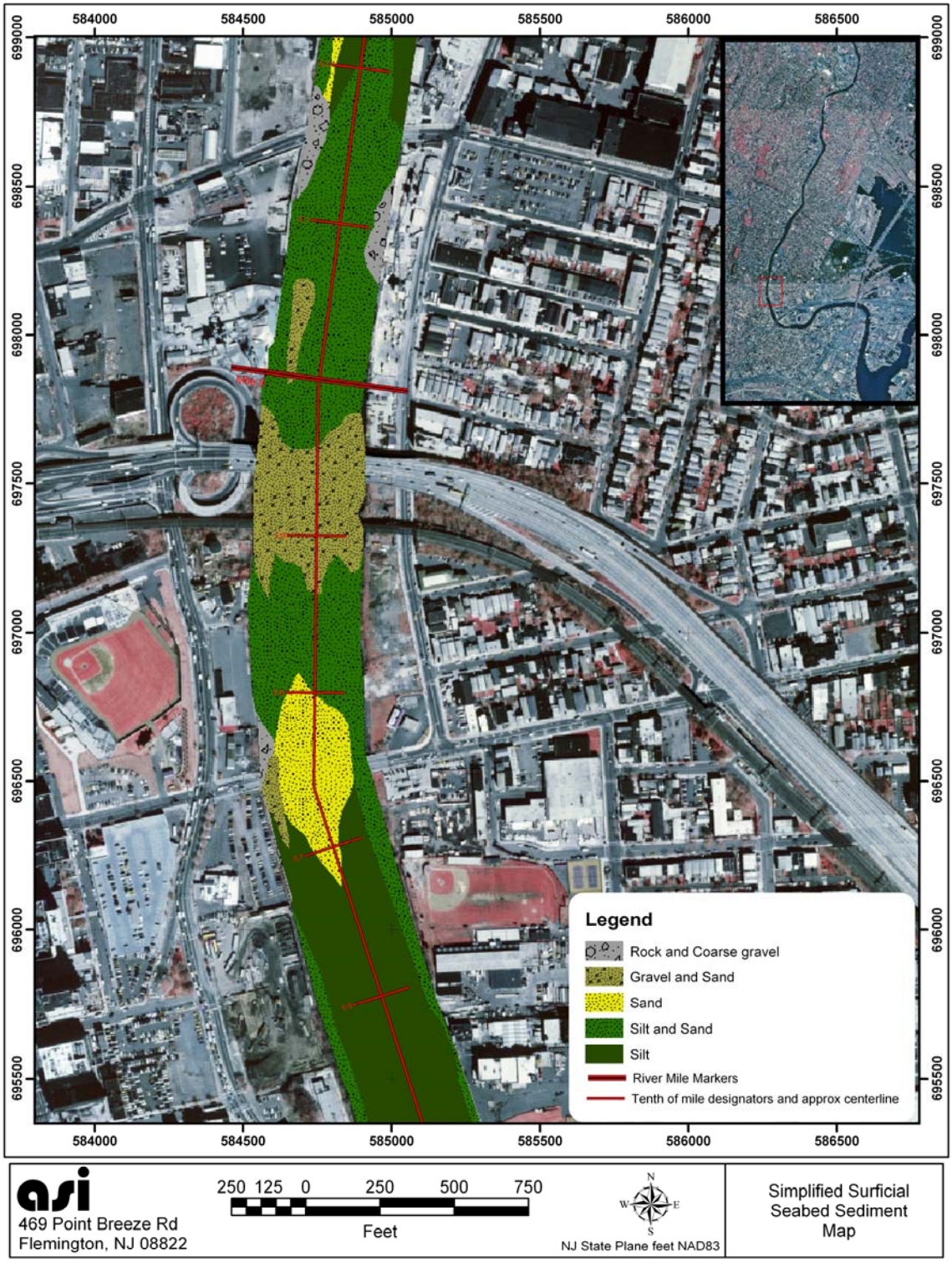


Figure 107. Simplified surficial sediment map 10.

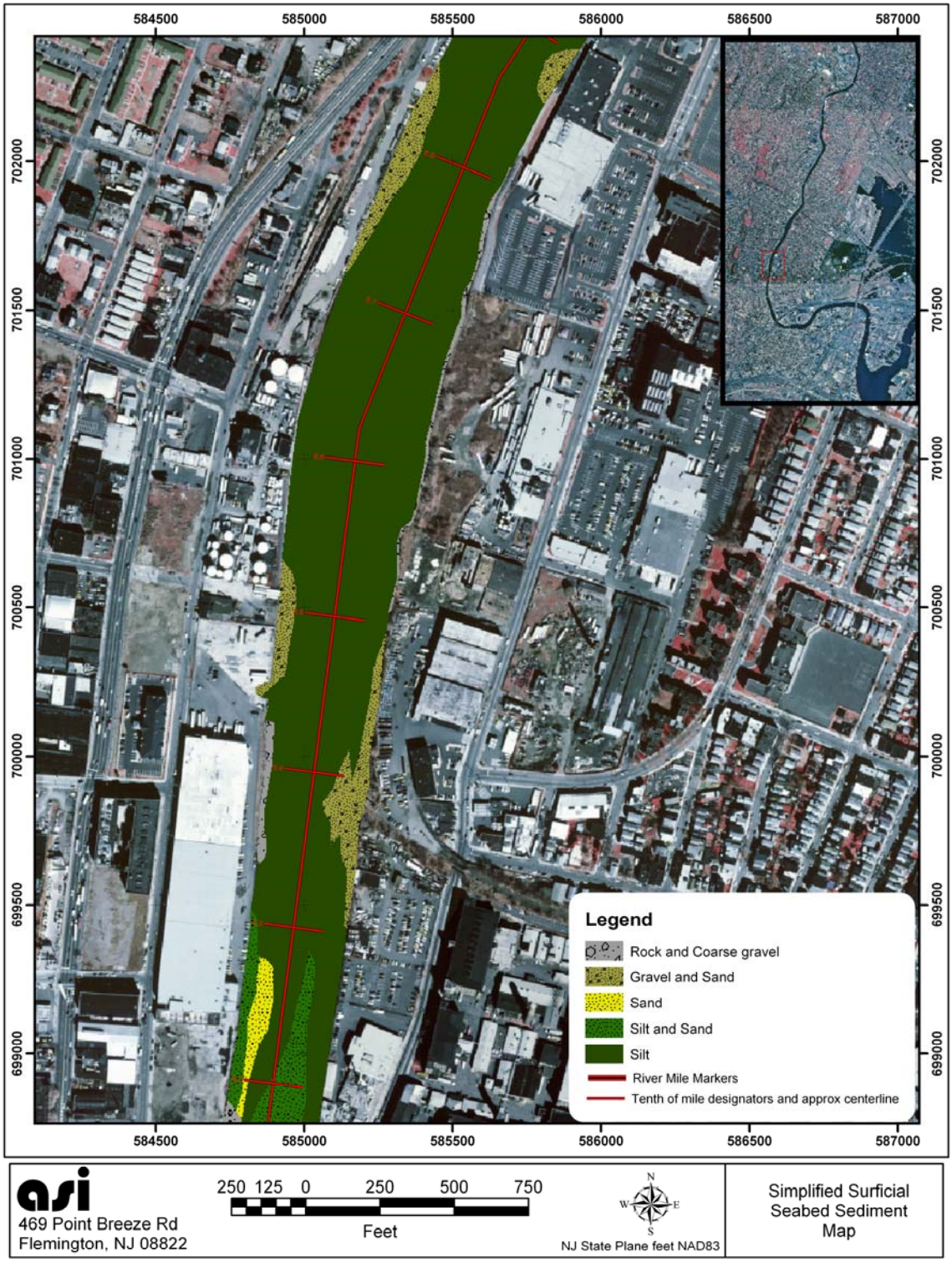


Figure 108. Simplified surficial sediment map 11.

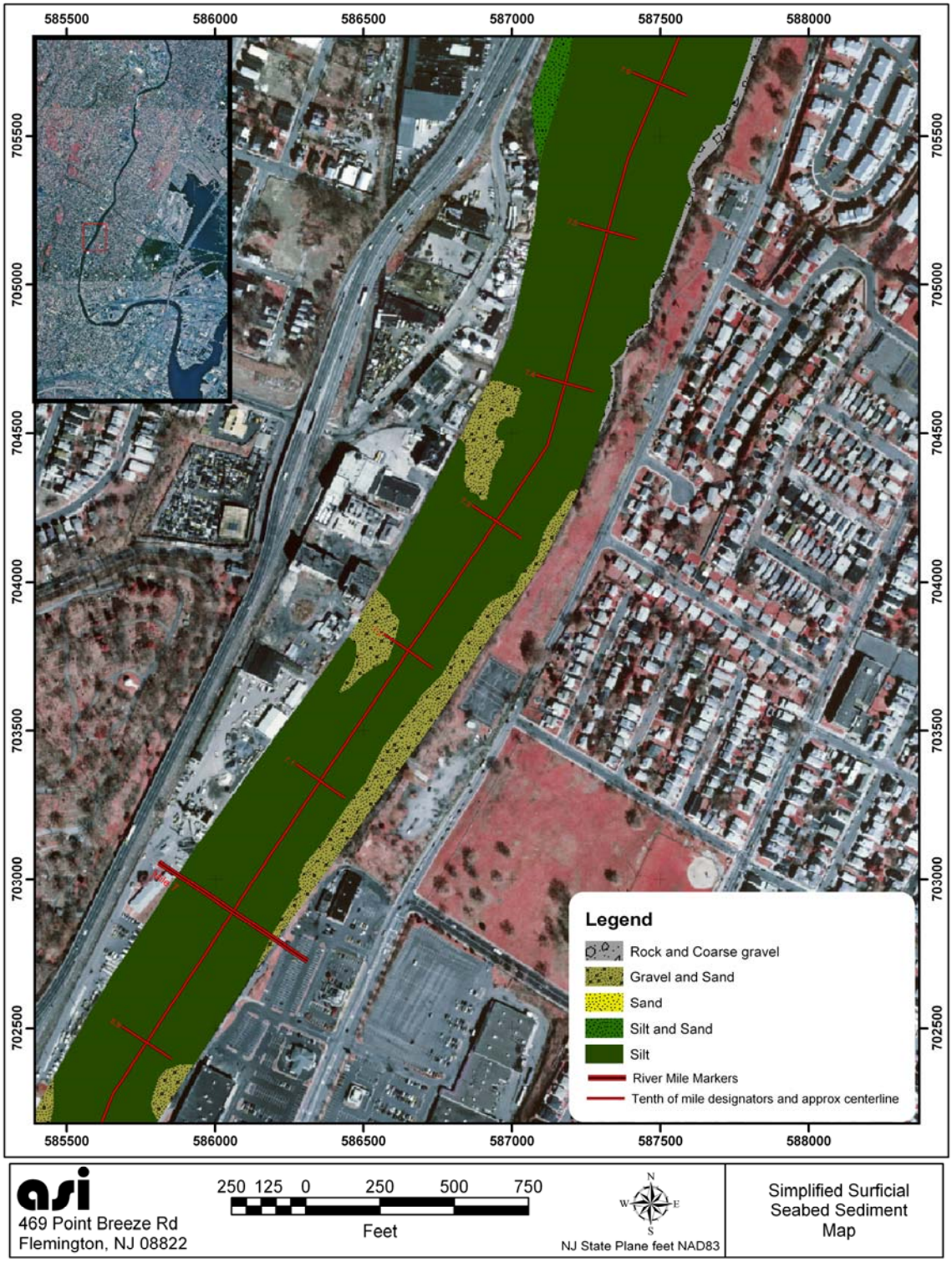


Figure 109. Simplified surficial sediment map 12.

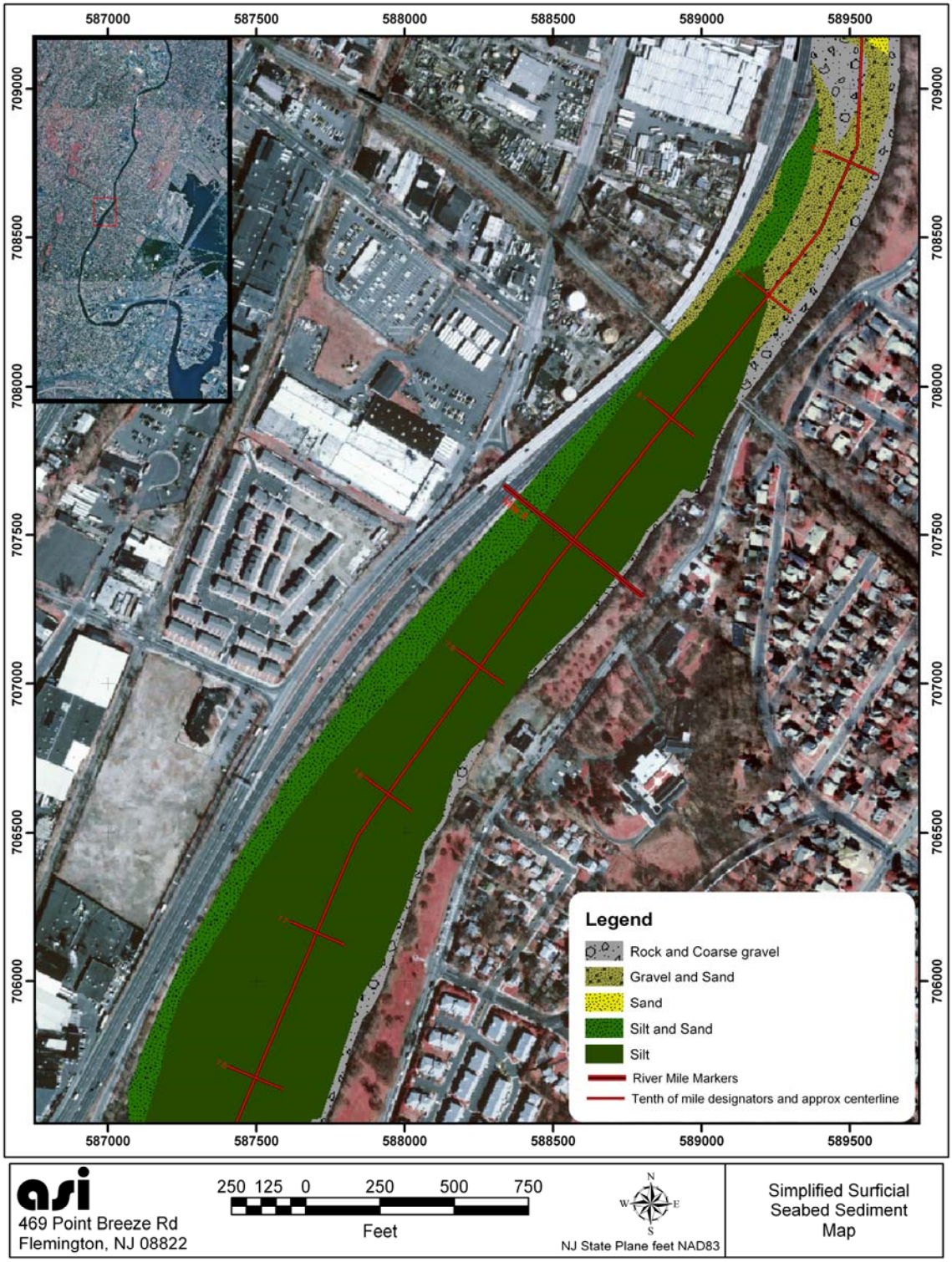


Figure 110. Simplified surficial sediment map 13.

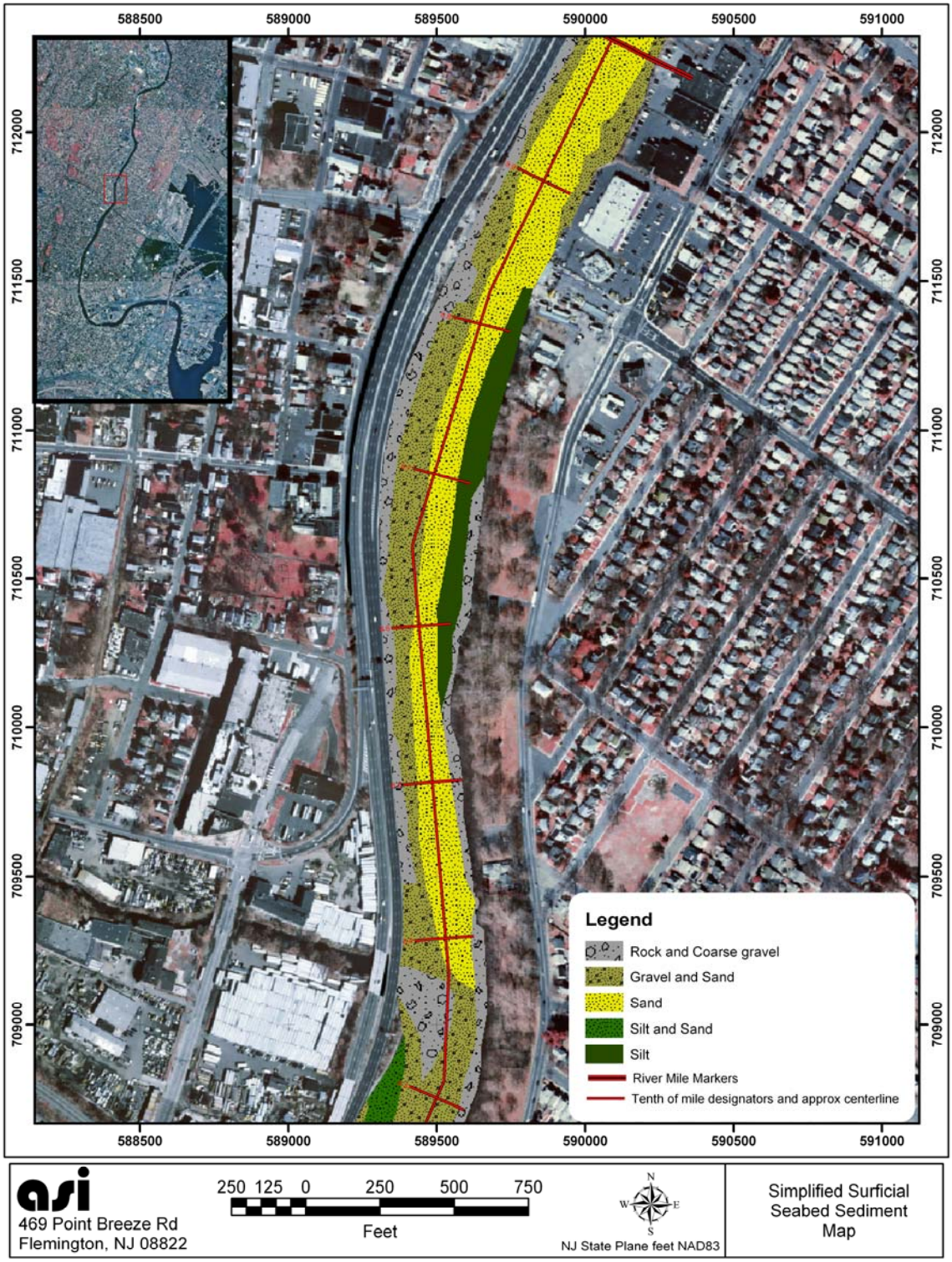


Figure 111. Simplified surficial sediment map 14.

Figure 112. Simplified surficial sediment map 15.

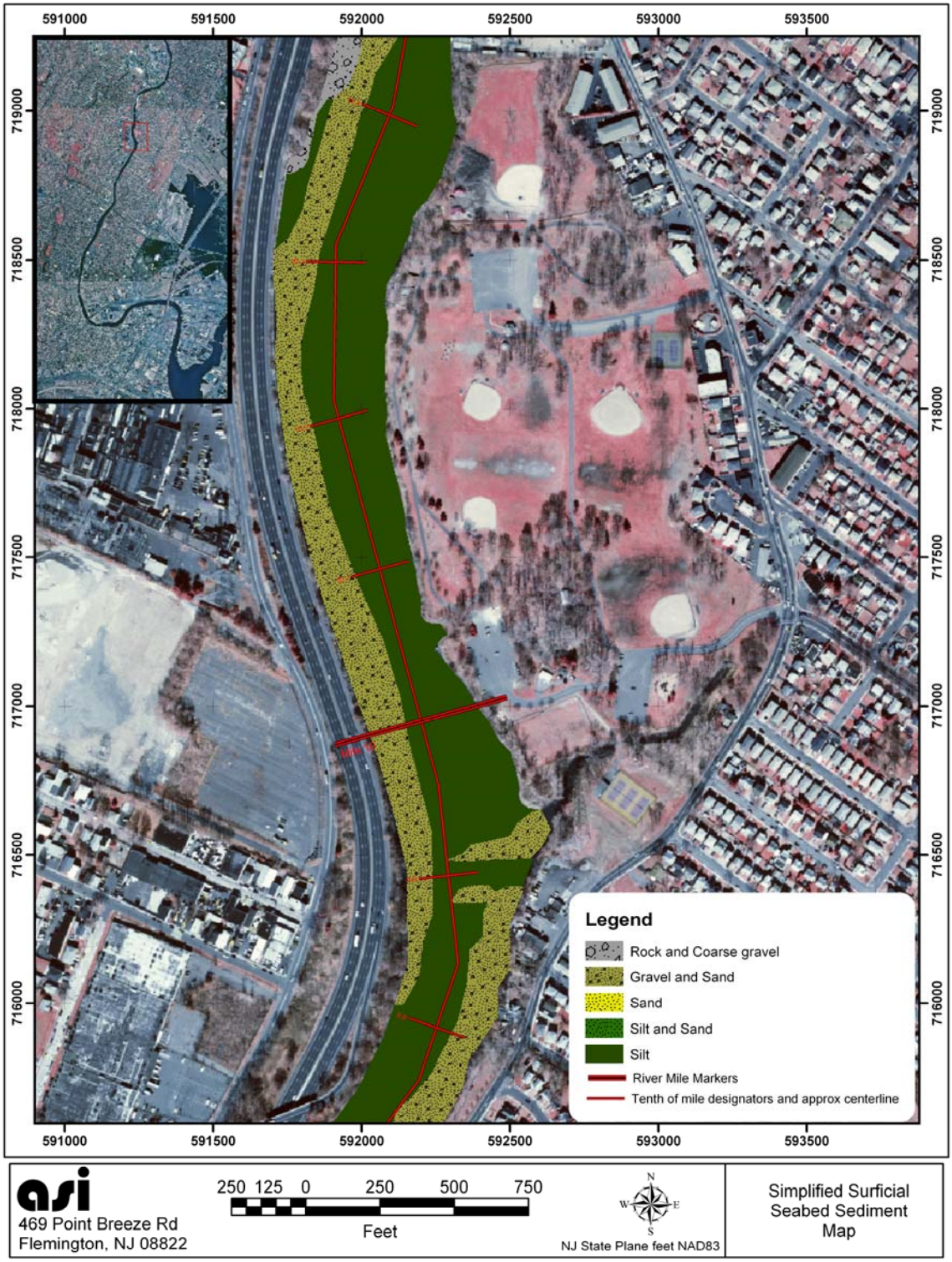


Figure 113. Simplified surficial sediment map 16.

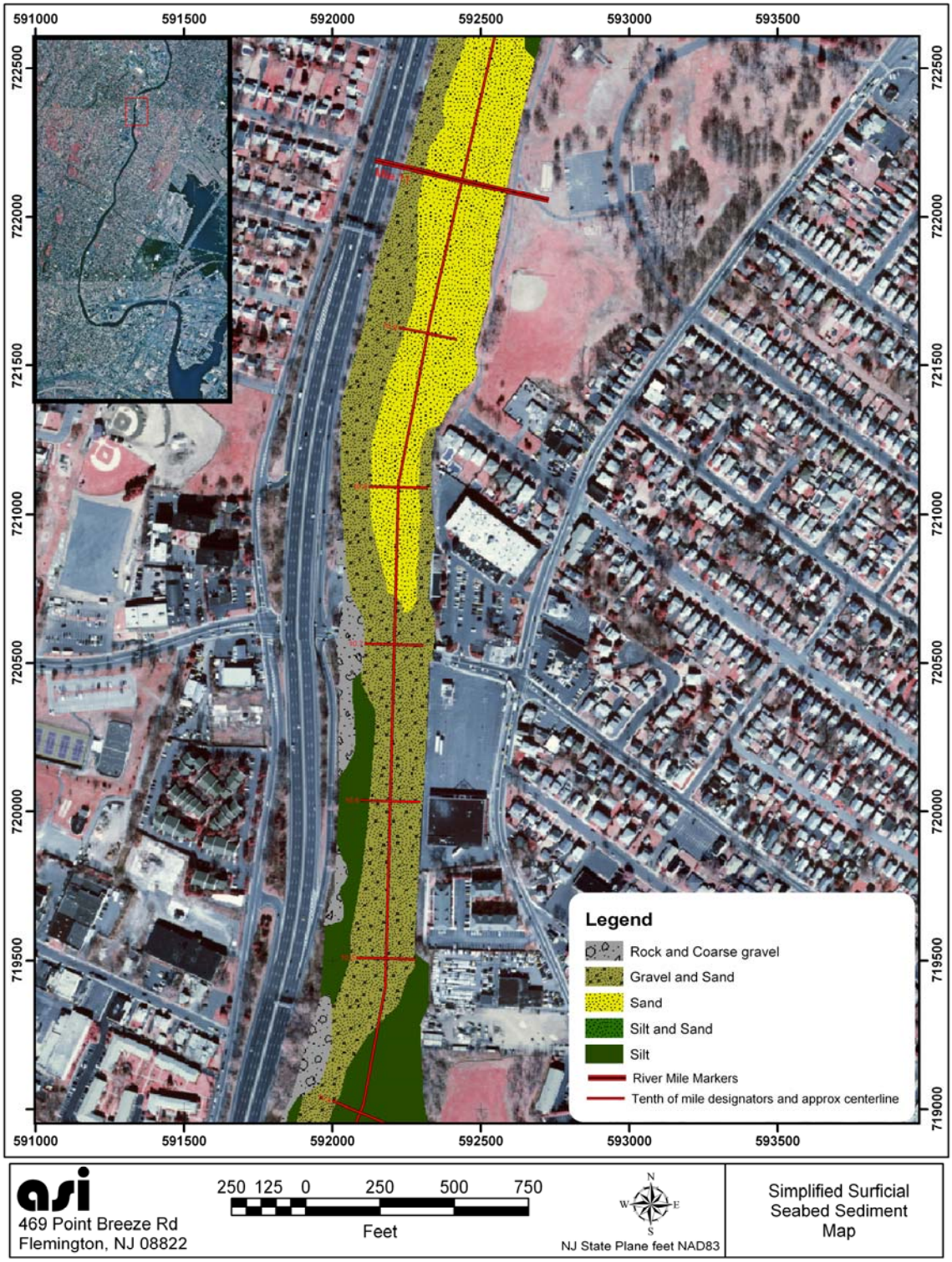


Figure 114. Simplified surficial sediment map 17.

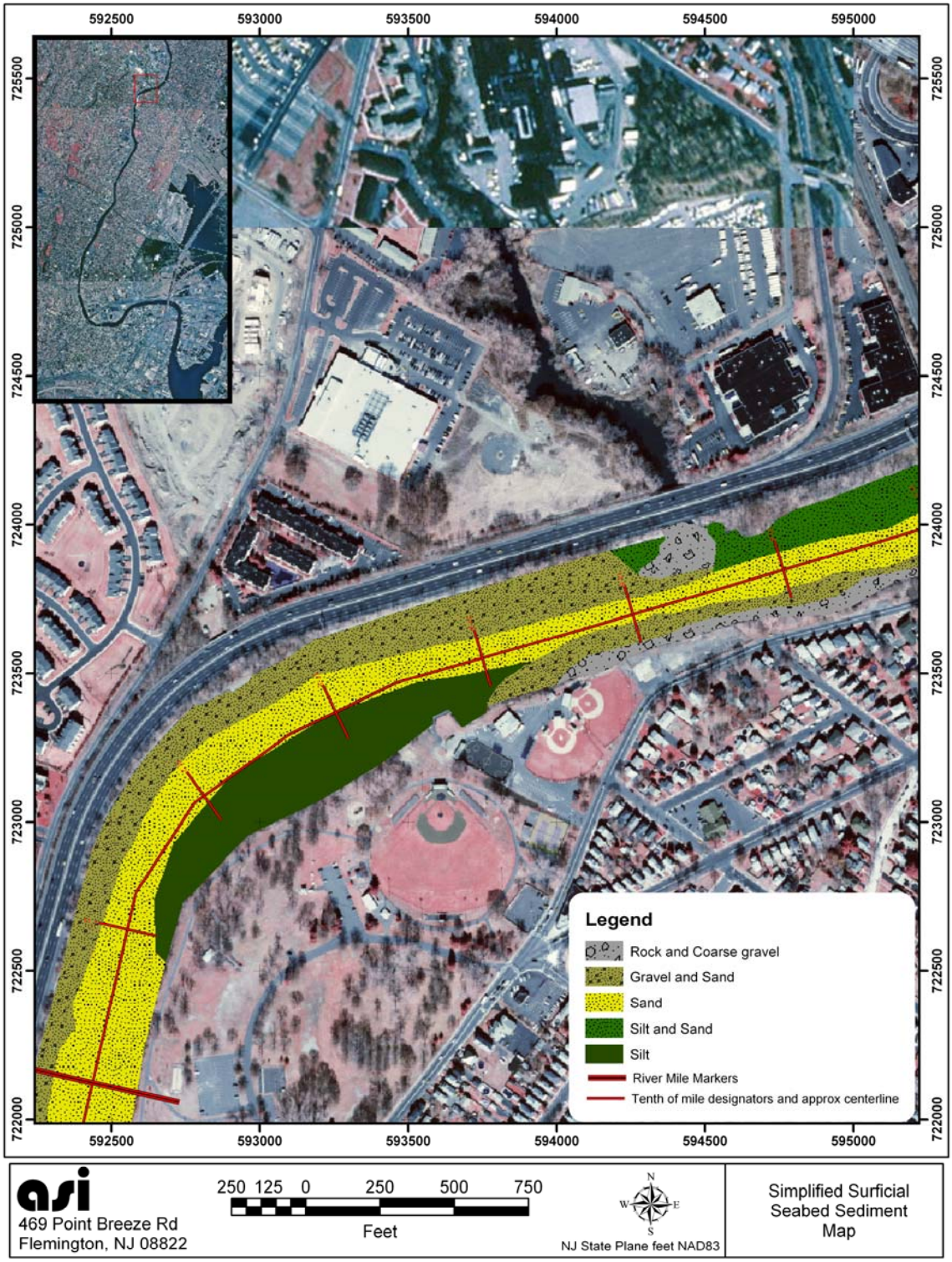


Figure 115. Simplified surficial sediment map 18.

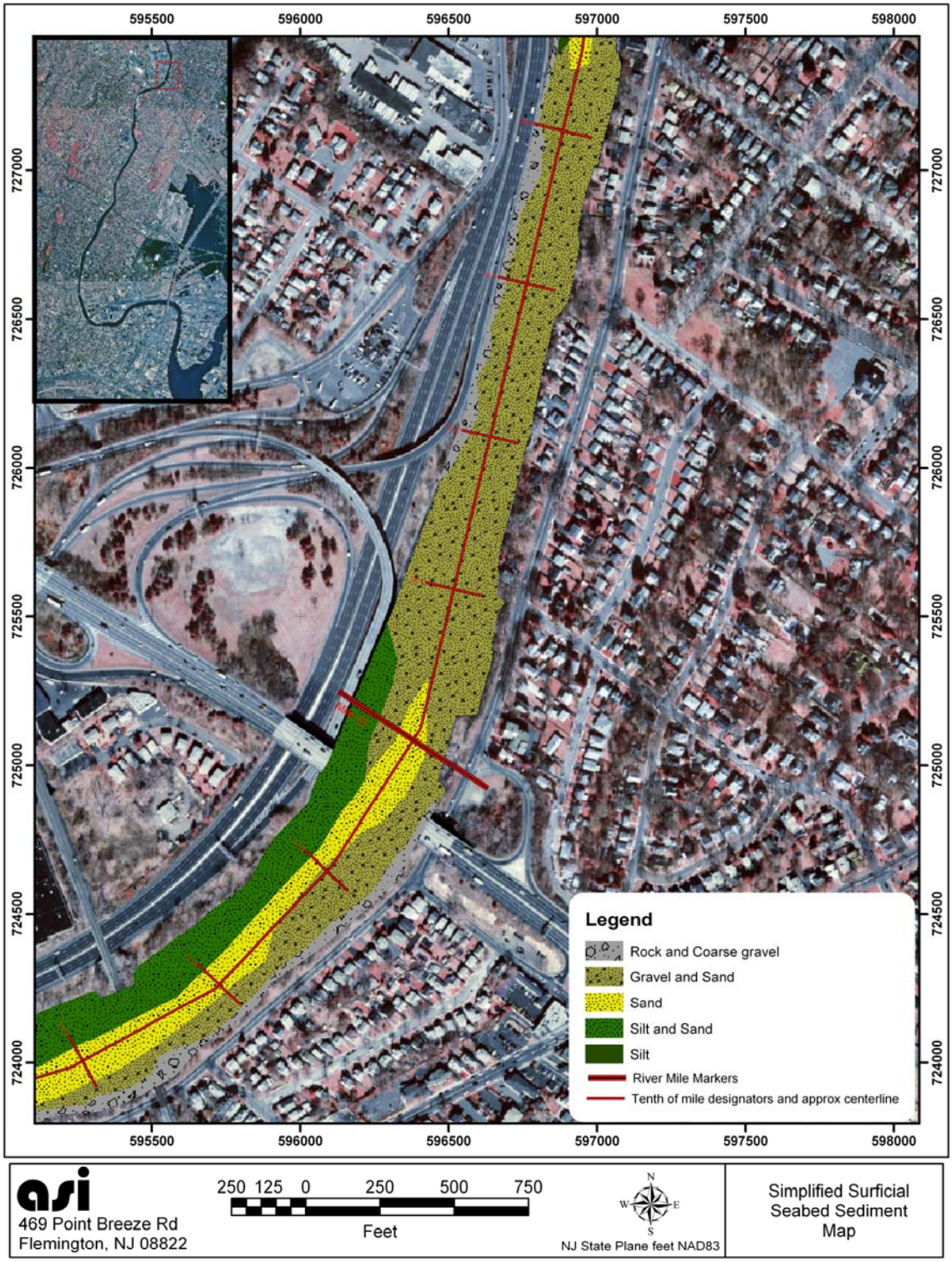


Figure 116. Simplified surficial sediment map 19.

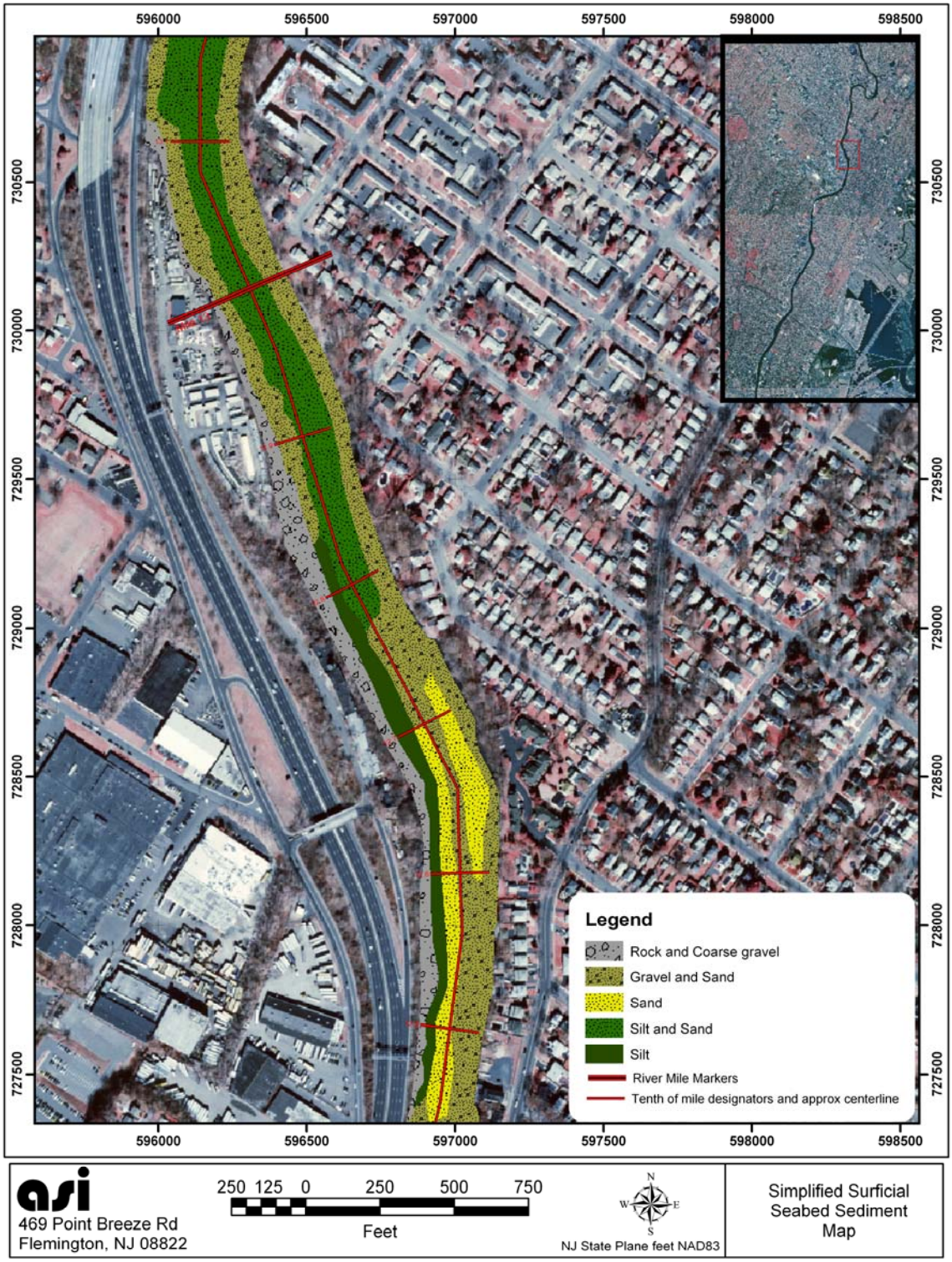


Figure 117. Simplified surficial sediment map 20.

Figure 118. Simplified surficial sediment map 21.

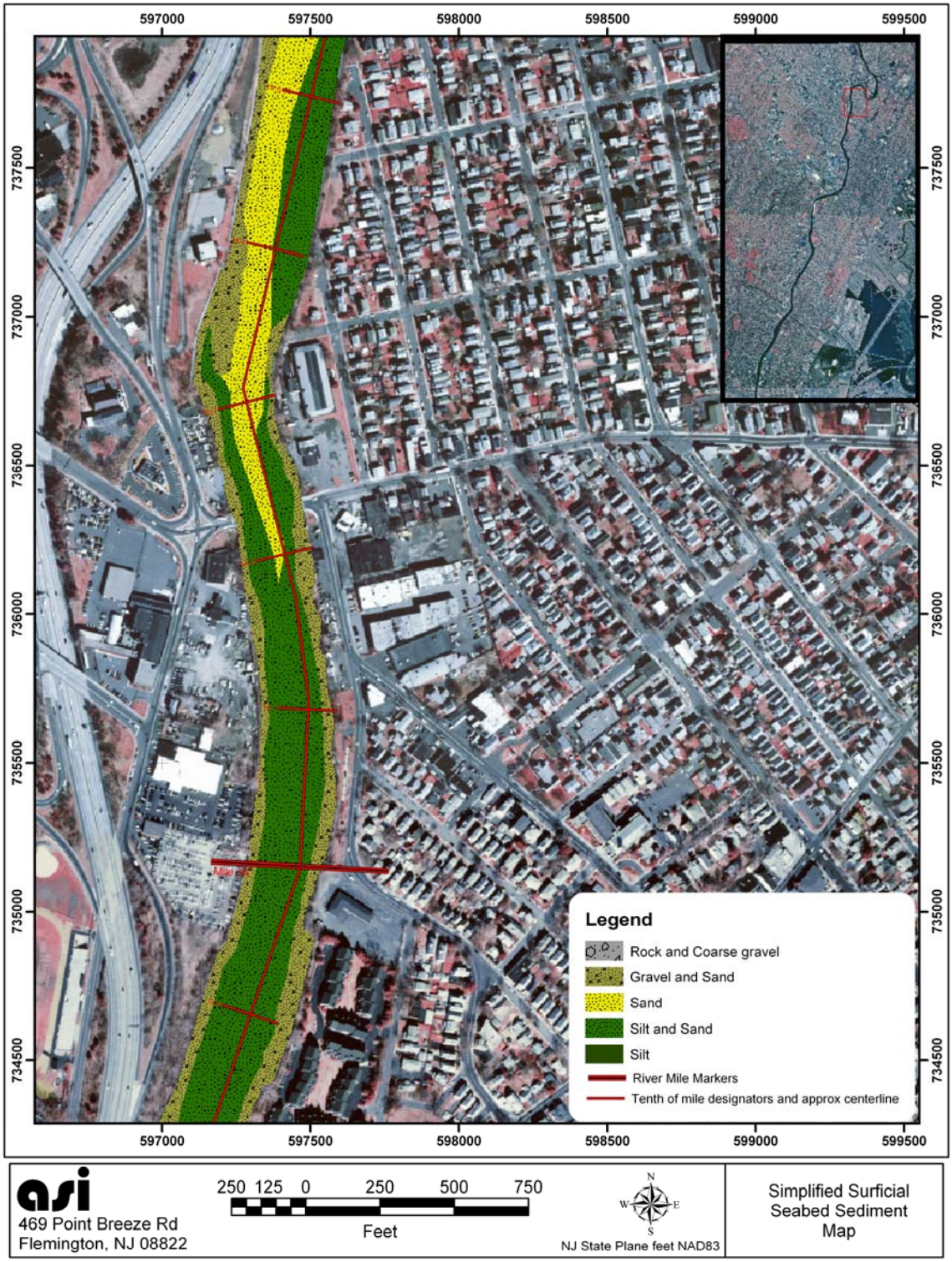


Figure 119. Simplified surficial sediment map 22.

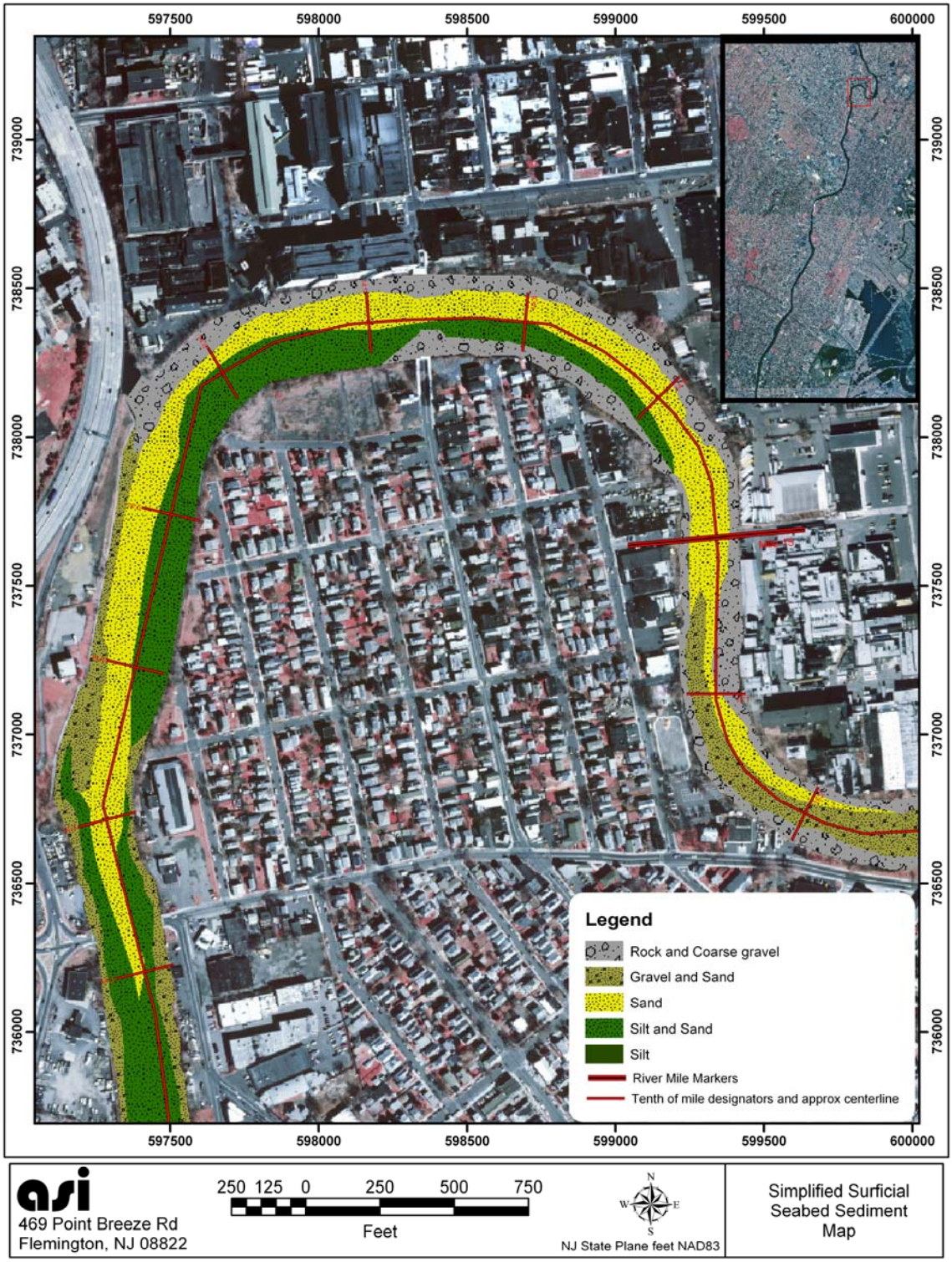


Figure 120. Simplified surficial sediment map 23.

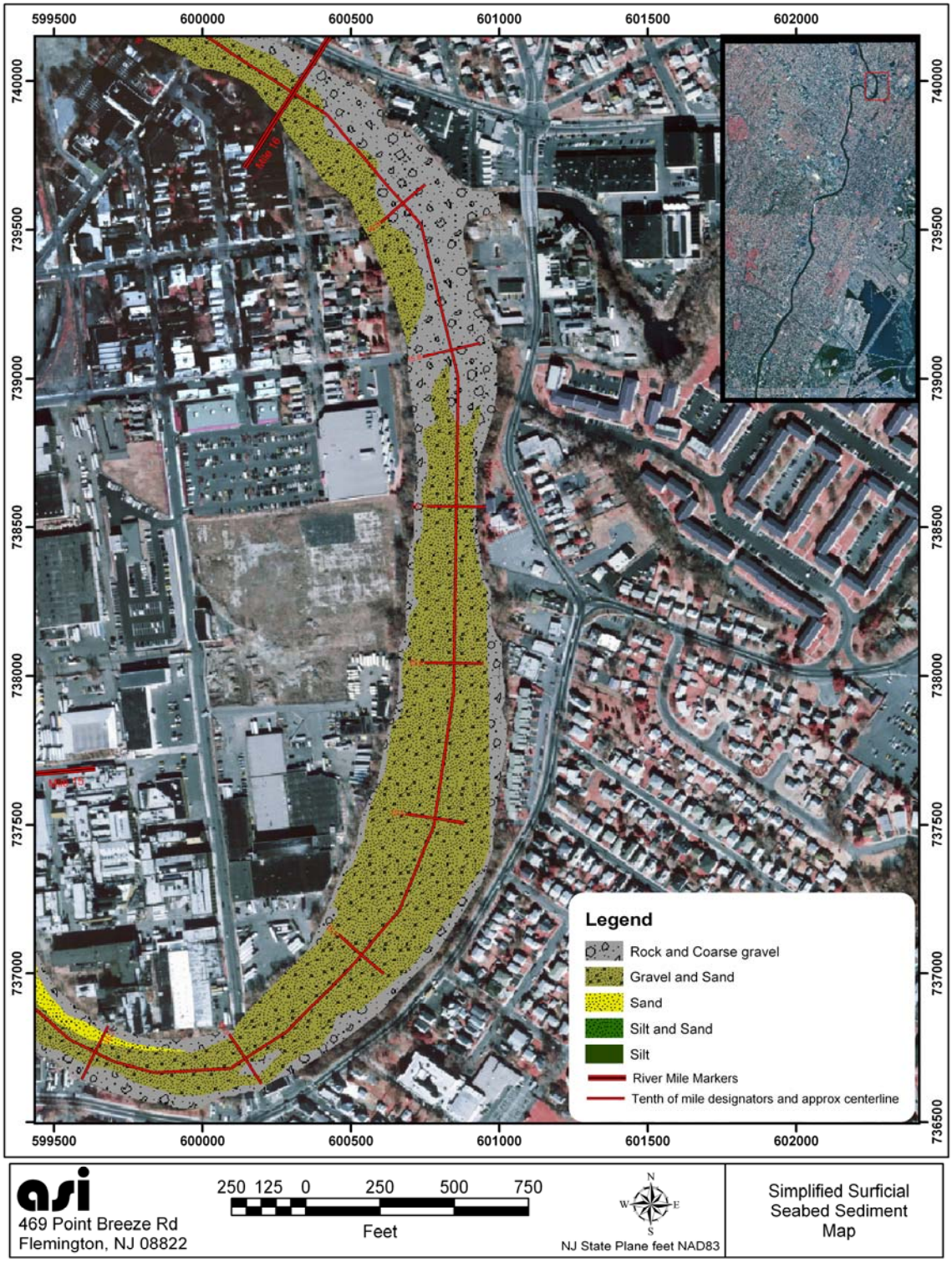


Figure 121. Simplified surficial sediment map 24.

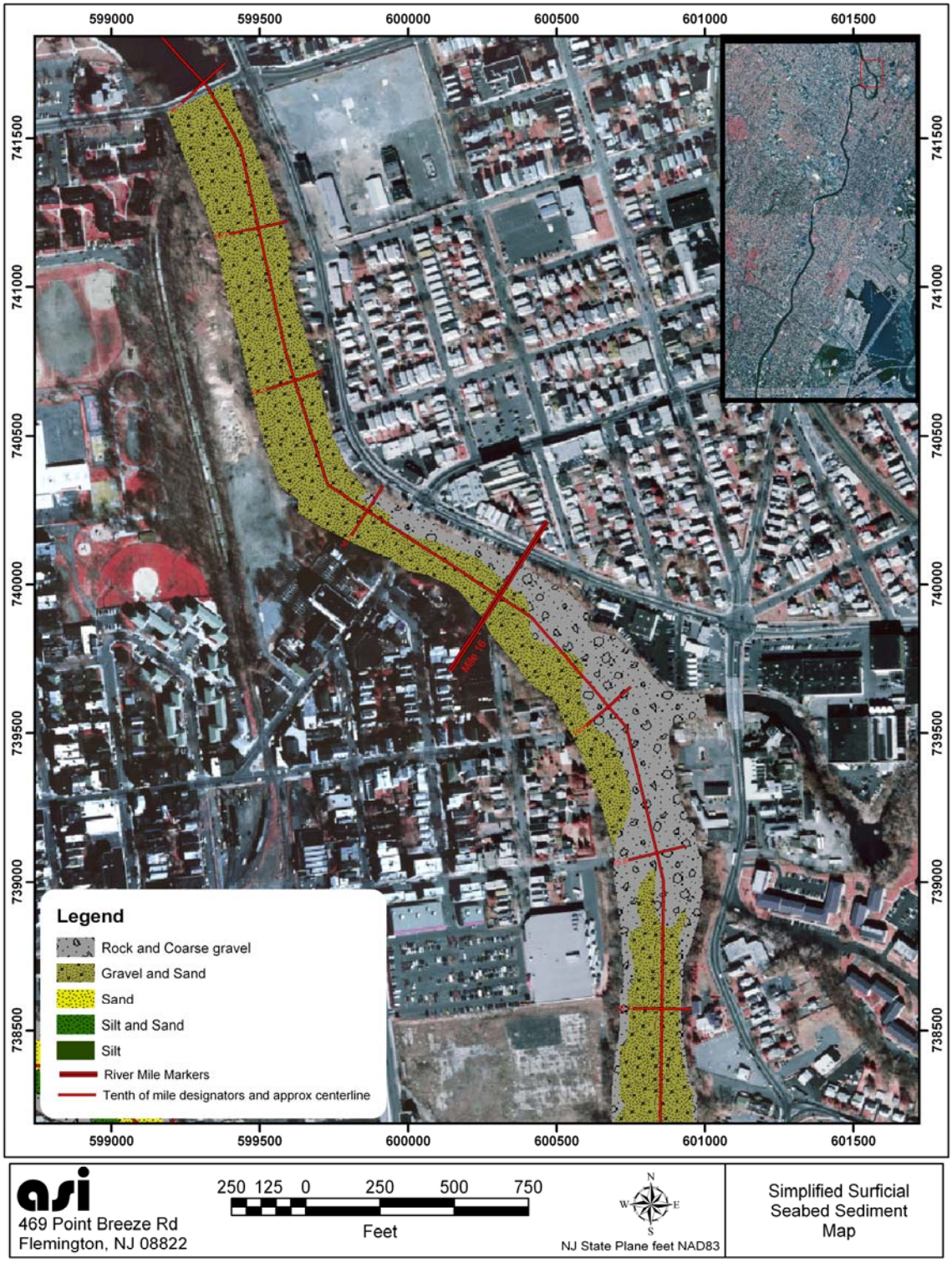


Figure 122. Simplified surficial sediment map 25.

Figure 123. Edgetech X-STAR sonar system. SB-216S towfish is shown on the left and topside amplifier, computer monitor, and digital recording system is shown on the right.

G. Sub-Bottom Profiler Survey

1. Sub-Bottom Data Collection

An Edgetech X-STAR sonar system with a SB-216S towfish (Figure 123) was used to collect the chirp sub-bottom profiling data during the survey along the Lower Passaic River. The principal objective of the survey was to collect chirp images to characterize subsurface sediments beneath the river bed and to use the chirp images to aid in the selection of sites where shallow (<3 feet) and deeper (6-20 feet) core samples could be collected.

Chirp profilers use acoustic methods to generate high-resolution (on the order of 0.5-1 foot) cross-sectional images of the marine sub-bottom to depths of up to 100 feet beneath the seafloor. These profilers transmit a wide band FM sound pulse that is linearly swept over a full spectrum frequency range (i.e., a “chirp”). The transmitted sound pulses travel through the water column and sub-bottom and are reflected when changes in acoustic impedance (equivalent to a material’s sonic velocity times its density) are encountered. Acoustic impedance changes commonly occur at boundaries between materials (e.g., interfaces between water and sediments, sediments and gas, and sediments and buried objects). The reflected sound pulses travel back to the profiler where their amplitudes, as a function of travel-time, are digitally recorded.

During the survey, the SB-216S was towed at a depth from 3 to 5 feet. It was towed approximately 6 feet aft of the navigational antenna on the port side of the research vessel Abigail. The estimation for the layback error is 1 to 2 feet. The SB-216S emitted a chirp sound pulse with a frequency range of 2-12 kHz, eight times per second. Given this sampling interval with an average speed of 2 to 3 knots, the horizontal spacing between individual pulses displayed on the chirp profiles was on the order of 0.4-0.6 feet.

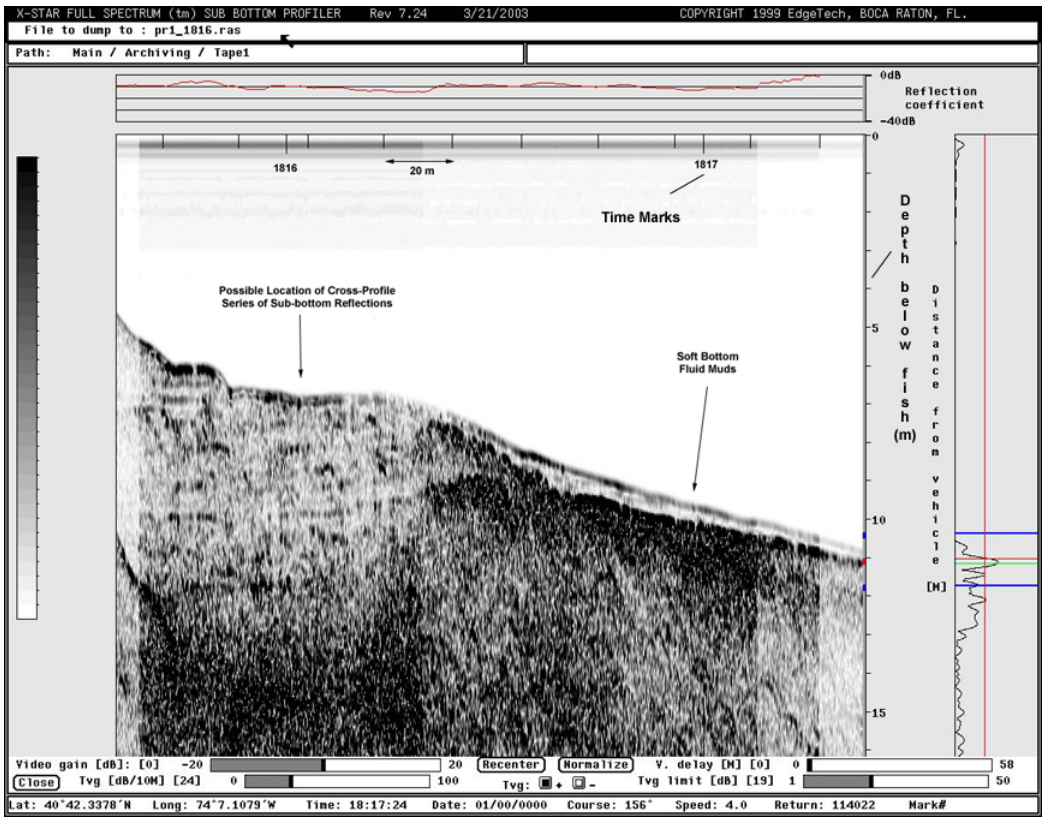


Figure 124. Example of X-STAR monitor "real-time" chirp system output. A series of reflections, as a function of depth beneath the towfish, are shown in the center. The strength of the river bottom reflection (shown along top) and sub-bottom events (shown to the right) are also displayed. Along the bottom, RTK-DGPS derived position, time, course, and speed are shown.

Geographic position (i.e., latitude and longitude) along the chirp profiles was determined with Trimble RTK-DGPS. The data from the RTK-DGPS were also used by the HYPACK Max 4.3 survey control software. Navigational data were logged at one-second intervals by the X-STAR digital recording system. The estimate of the positional accuracy of the RTK system is 1-centimeter in the horizontal and 2 centimeters in the vertical axis.

During the chirp survey, the data were observed in "real-time" on the X-STAR monitor (Figure 124). The data displayed included the reflection coefficient of the river bottom (a measure of the acoustic impedance contrast at the water/sediment interface), the relative amplitude of bottom and sub-bottom reflections, a cross-sectional image of the last ~600 chirp pulses that were recorded, as well as the current position, time, date, course and speed of the *Abigail*.

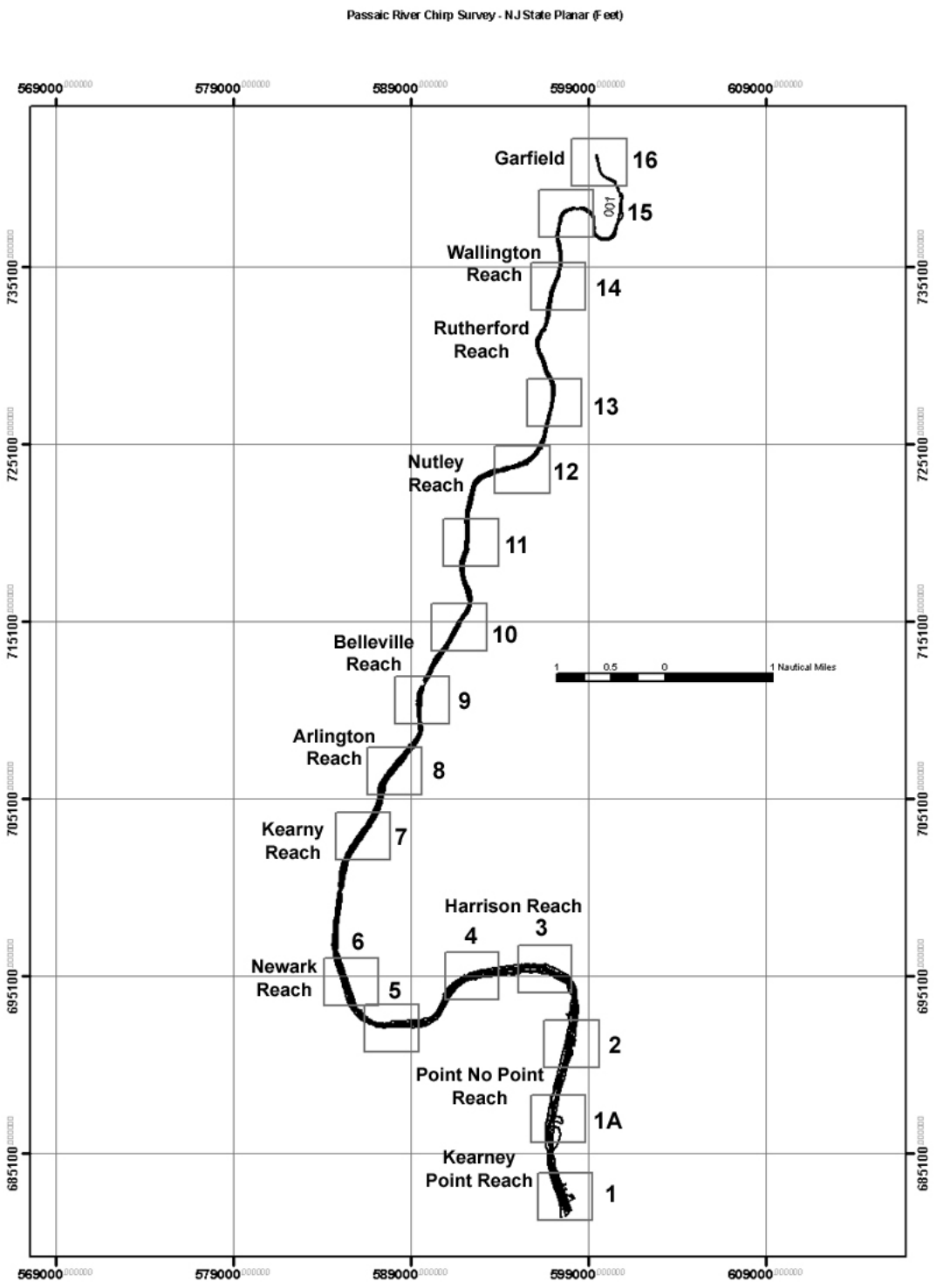


Figure 125. Tracklines of the Abigail during the chirp survey. Boxes denote approximate locations of transects where cross-river chirp profiles and deep cores (vibracores) were collected. The specific locations of the cross-river profiles and deep cores are shown in Figures 126-142.

Shown in Figure 125 are the tracklines of the *Abigail* during the chirp survey. Also shown in this figure are the general locations of the transects (1-16) where cross-river chirp profiles and deep cores (vibracores) were collected. The location of the cross-river chirp profiles were initially chosen with the objective of having a series of three closely spaced (~200-300 feet apart) profiles selected within approximately each one mile stretch of the Lower Passaic River between the Kearny Point Reach and the Garfield Reach. Within each 1 mile stretch, the positions of the cross-river profiles were chosen based on reflections observed in the along-river chirp profiles indicating the presence of sub-bottom features of interest.

2. Sub-Bottom Survey Results

Shown in Figures 126 to 142 are the locations of the chirp tracklines and deep cores that were collected in the transect areas. For transect areas 1-15, these chirp profiles include cross-river lines (Figures 126 to 141). Due to the narrow width of the river along the Garfield Reach (river mile 15.3 to 16.5), the chirp profiles shown for transect 16 are along-river lines only (Figure 142). Also shown in Figures 126 to 142 are locations within the transect areas where no penetration of chirp sub-bottom energy occurred. As discussed in further detail below, the primary causes for the lack of acoustic penetration are the presence of a layer of leafy organic matter on the river bottom and/or organic-rich silt layers in the shallow sub-surface sediments. These layers are known to have high concentrations of gas that prevents deeper penetration of the chirp acoustic signal.

Shown in Figures 143 to 160 are the chirp profiles that were collected along the deep core sites. The chirp profiles shown in Figures 143 to 160 are illustrative of the quality of the sub-bottom data that was collected along the Lower Passaic River between the Kearny Point Reach and the Garfield Reach, a distance of approximately 17 miles. Some of the sub-bottom reflections seen in these profiles can be correlated with the sediments that were described from the deep cores. All of the chirp profiles that were collected can be viewed in the supplied GIS data set.

The depths of the chirp sub-bottom reflections were calculated assuming a sound velocity of 1500 m/s. This is a typical velocity for sediments that are water-saturated, which is a reasonable assumption given the rather shallow depths of penetration. Even if velocities varied on the order of 50 m/s, as a function of the different types of sediments and their water content, the possible errors in depth estimations would vary only on the order of tenths of feet for the depth intervals over which the chirp reflections were observed.

The maximum depth of penetration of the chirp sonar of near 25 feet was limited by water depth as well as other factors. The greatest penetration depths occurred along the Kearny Point Reach in the general area of Transect #1A (see Figure 143 for example chirp profile and Figure 125 for general location of the reach). In this area, a series of chirp reflections can be correlated with alternating layers of sand, sandy-silty clay, and

clay as confirmed by deep core DC1C. Beneath the depth of refusal of this core (9.5 feet) additional chirp reflections can be seen, suggesting that these alternating layers continue to depths approaching 20 feet beneath the river bottom (Figure 143). Chirp profiles along which significant deep reflections were observed (defined as reflections occurring at depths below the river bottom of more than 6 feet and that were continuous over horizontal distances of at least 20 feet) are identified and can be viewed in the supplied GIS data set. In the GIS data, the profile lengths shown correspond to one chirp file (5,000 traces of data) covering a horizontal distance of approximately 3000 feet. This does not imply that deeper reflections are present along the length of the entire profile, but it does provide an easier way to identify areas of useful deeper sub-bottom reflections.

Additional areas along the river where depths of penetration deeper than 10 feet were observed included the area near the Arlington and Belleville Reaches (river miles 7.1 to 8.4 and 8.4 to 9.8, respectively) as seen along Transect #9 where a sub-bottom chirp reflection deepens from 6 feet beneath deep core DC9-A to over 14 feet beneath deep core DC9-B (Figure 152). Unfortunately there was no recovery from these cores, so the sediment characteristics associated with this reflection could not be determined. Along Transect #12 in the Nutley Reach, a series of deep chirp reflections (14 feet to 20 feet beneath the river bottom) are observed beneath deep cores DC12-B, DC12-C and DC12-A. In the Garfield Reach in the vicinity of deep cores DC16-B and DC16-C, a sub-bottom reflection can be traced between depths of 9 feet to nearly 15 feet along the length of the chirp profiles shown in Figures 159 and 160. Similar to the data collected along the Arlington and Belleville Reaches, in the vicinity of Transects #12 along the Nutley Reach and along the Garfield Reach deep cores did not penetrate to the depths where the chirp reflections occur (Figures 155, 159, and 160). Thus it is not possible to interpret these reflections in terms of possible changes in sediment types at these depths.

A major factor that made it difficult to observe the presence of deeper reflections in the chirp data was the relatively shallow water depths in the project area. Shallow waters exacerbate the problem of multiples in sonar data. A bottom multiple is a reflection event that is generated when the chirp sound pulse travels from the towfish to the river bottom, reflects to the air/water interface where the sound is reflected back down into the water column, it reflects again off the bottom, and then travels to the towfish. Multiples appear in the chirp profiles as events occurring at regular, deeper (i.e., greater travel time) intervals essentially paralleling the river bottom. An example of bottom multiples masking the possible presence of sub-bottom reflections is shown in Figure 144 along the eastern portion of chirp profile 1A-C. Bottom multiples can be observed in nearly all of the representative chirp figures with the exception of Figure 143 where water depths are greater than 20 feet and thus multiples would appear deeper than shown in the portion of the chirp profile that is displayed.

Another type of multiple that is observed in the chirp data is a “ghost” multiple that is created by sound energy reflecting off the river bottom, then reflecting off the towfish, and finally reflected off the river bottom again before being recorded at the towfish.

Identifying characteristics of the "ghost" multiple are that it parallels the river bottom at a height above the bottom multiple that is equivalent to the depth of the towfish and that it is most prevalent when there is little acoustic penetration into the sub-bottom. Examples of the "ghost" multiple are shown in Figures 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 155, 156, 157, and 158.

In order to confirm that "ghost" multiples, rather than reflections due to changes in sediment types in the sub-surface, were observed in the chirp profiles, analyses of the two-way travel times for reflections that could possibly be "ghost" multiples were carried out. This was done by calculating the two-way travel time along the ray path using 1,500 m/sec water velocities. In all cases in which "ghost" multiples were identified, the two-way travel times indicated depths above the bottom multiple that correlated with the depth of the towfish. In the GIS data set that accompanies this report, all of the bottom and "ghost" multiples are identified on the chirp profiles.

The depth of penetration of the chirp system was limited by gaseous materials present along the river bottom and by some of the bottom and sub-bottom sediment types. The presence of a layer of leaf organic matter along the river bottom prevented the penetration of significant sound energy into the sub-bottom. Decomposition of the leafy material produces gas which creates a very high acoustic impedance contrast and causes acoustic energy to be reflected, rather than penetrating into the sub-bottom. Where present, leaf matter was associated with a very strong bottom return and the absence of underlying sub-bottom reflection events. The presence of leaf and other near-surface debris was documented along Transect #2 in the Point No Point Reach at deep core DC2B (Figure 145). Although this deep core delineated several layers of varying sediments, there were no associated chirp sub-bottom reflections due to the lack of sound energy penetrating the bottom.

In addition to the leaf organic matter, the presence of organic-rich silt layers near the surface also limited the penetration of the chirp sound energy. Organic material, as it decays, releases gas. If the gases are trapped within the pores of the sediments they limit the deeper passage of sound waves. For example, near-surface silt layers with organic material were found at deep core DC6-B along Transect 6 in the Newark Reach (Figure 149). The bottom reflection at this location is characterized by a very high amplitude with little evidence of acoustic energy penetrating into the bottom.

Based on an analysis of the chirp data, approximately 5 percent, or 4.5 out of the 85 miles of trackline surveyed along the Lower Passaic River had no significant penetration of chirp sound energy into the sub-bottom. Areas where no sub-bottom penetration occurred in the vicinity of Transects #1A-16 are shown in Figures 126-142 and examples of lack of penetration can be seen along portions of the chirp profiles of Transects #1A, 1, 2, 3, 6, 7, 8, 9, 10, 12, 13, 14, and 15 as shown in Figures 143-146, 149-153, and 155-158, respectively. In the GIS data set that accompanies this report, the chirp tracklines where no bottom penetration occurred are delineated.

Between 70 and 75 percent of the region surveyed with the chirp system, approximately 60 out of the 85 miles of trackline along the Lower Passaic River, was characterized by penetration into the sub-bottom to depths between 1 to 9 feet. In the GIS data set that accompanies this report, all of the sub-bottom reflections, including those occurring between 1 and 9 feet are outlined on the chirp profiles. Examples of shallow chirp reflections can be seen along portions of the chirp profiles of all of the Transects #1A-15 and the chirp profiles along deep cores DC16-B and DC16 as shown in Figures 143 and 160, respectively.

As documented in the shallow and deep cores, the predominant sediment type was silt and the major variations in the sediments were the amount of silt relative to clays, sands, and gravels. This variation in the silts could be correlated with some of the chirp sub-bottom reflections that were observed.

Of the shallow (<2 feet) chirp reflection events, the occurrence of "soft" silts overlying either firmer/tighter silts or silts with fine sands was one of the most pronounced events observed. In the chirp profiles shown as examples, this can be seen in Transect #1A near deep core DC1A-A, Transect #1 along cores DC1-A and DC1-C, Transect #2 near core DC2-C, Transect #3 at cores DC3-A and DC3-C, and in the southern portion of Transect #5 (Figures 143-146, and 148). The softer silt is characterized by a low amplitude bottom reflection that is underlain by a higher amplitude return that is associated with the change in sediment type to the firmer sediments.

In other locations, chirp reflections were observed when other variations occurred in the silt layers. For example at deep core DC1C along Transect 1, a chirp reflection can be traced across the east portion of the profile that correlates with the change from overlying elastic silt with fine- to medium-sand to a poorly graded silt with sand that is observed at a depth of 9.3 feet in the core (Figure 144).

Chirp sub-bottom reflections can also be correlated with changes from silts to sands and from sands to gravels as documented by the deep cores. At deep core DC3-A along Transect #3, DC4-B along Transect #4, and at DC5-C along Transect #5, silts are underlain by sands with corresponding chirp reflections at depths of 14 feet, 2.6 feet, and 1 feet, respectively (Figures 146-148). Along Transect 8 at deep core DC8-C, a chirp reflection can be correlated with a change from overlying fine sand to underlying gravel with fine-medium sand at a depth of 2.4 feet beneath the river bottom (Figure 151).

The predominance of silts with varying amounts of sands, clays, and gravels meant that there was not a great deal of variability in acoustic impedance in the sub-bottom sediments. This in turn, limited the occurrence of high-amplitude chirp reflections that could be used to delineate significant changes in sediment types. This was further exacerbated by the fact that in this riverine environment changes in sediment types are sometimes gradational rather than discrete and thus large changes in acoustic impedance were not generated.

The variability and lack of continuity of the chirp reflections over even the relatively short distances (50 feet to 200 feet) between the deep cores along individual transects prevents the generation of geologic cross-sections based on the chirp data. The use of the chirp profiles to constrain the sub-bottom sediments beneath the river is further hampered by the fact that, with the exception of the Kearney Point Reach near Transect #1A, deeper reflection events were not penetrated by the deep cores. Thus, these reflection events cannot be "ground-truthed" by correlation with observed variations in sediments.

The utility of using the chirp sub-bottom profiles to identify sub-bottom sediments is limited. The best use of the chirp data in subsequent studies would be to use it as an identifier of variability in sub-bottom sediment type. This variability, and thus identification of the sediment layers present, would have to be independently verified by coring. In the GIS data set, areas where sub-bottom reflections of more than 6 feet and that were continuous over horizontal distances of at least 20 feet are identified. It is these reflections that mark the position of potential changes in sub-bottom sediments along the river.

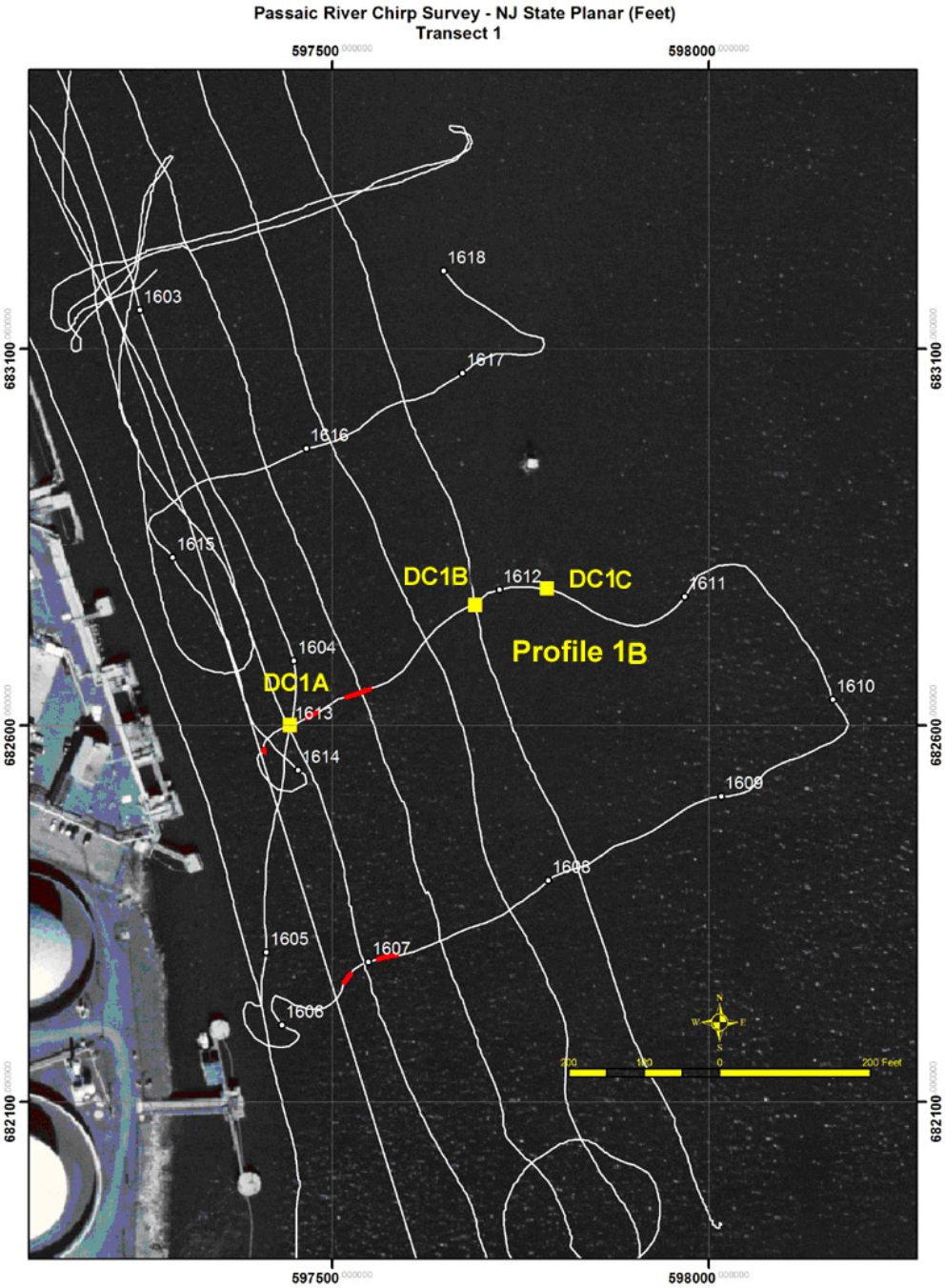


Figure 126. Location map for sub-bottom transect area 1. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

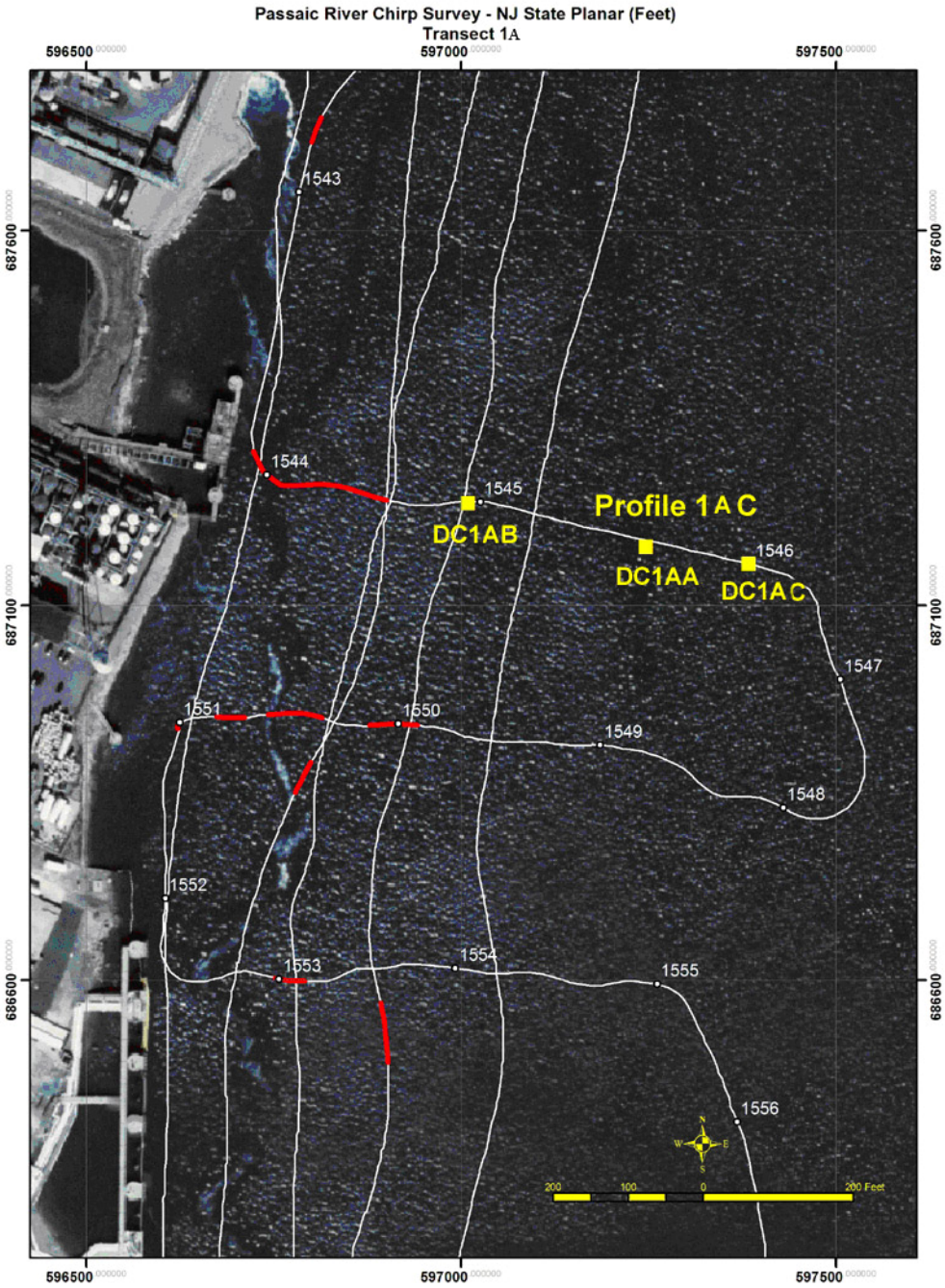


Figure 127. Location map for sub-bottom transect area 1A. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

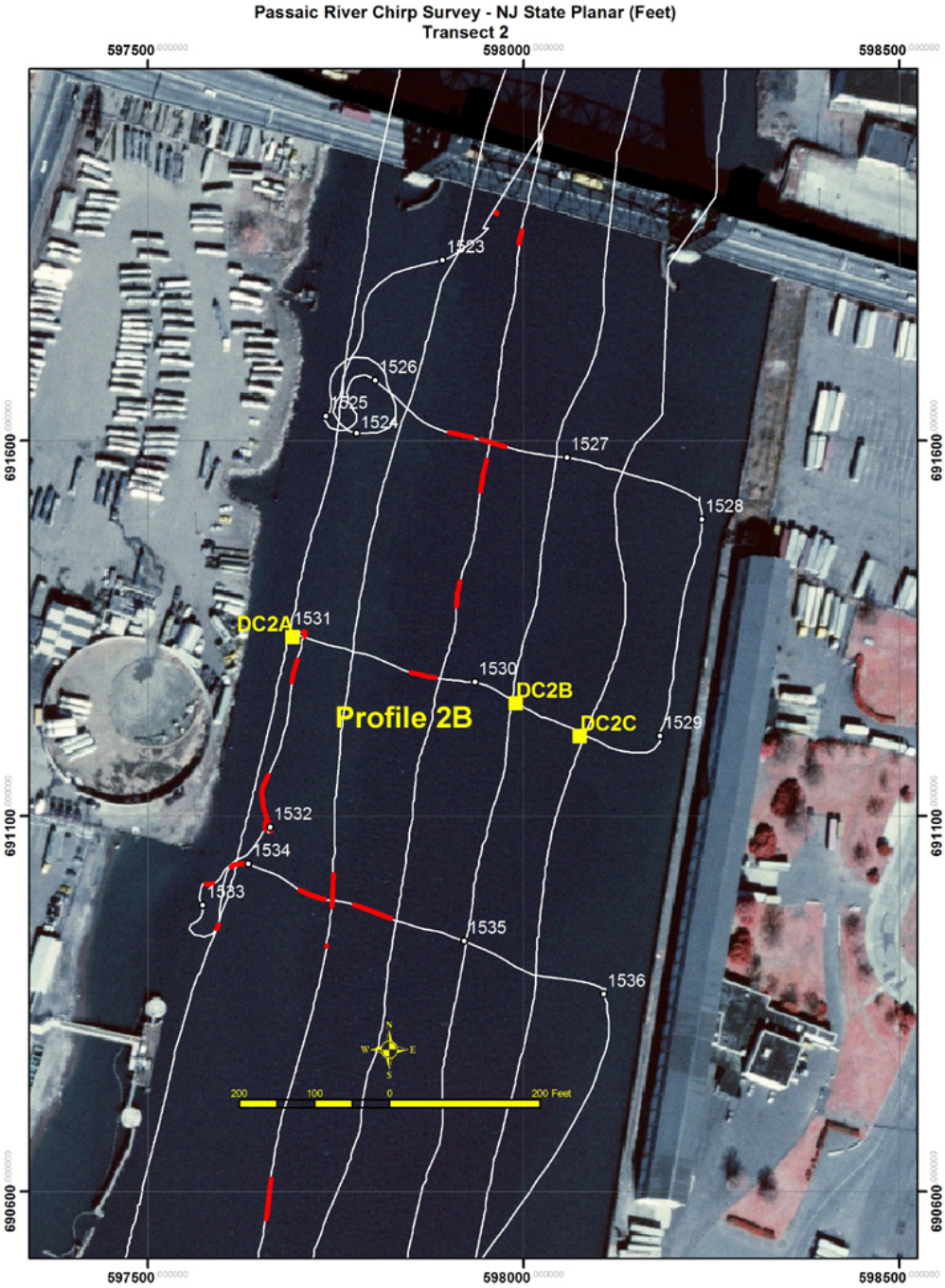


Figure 128. Location map for sub-bottom transect area 2. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

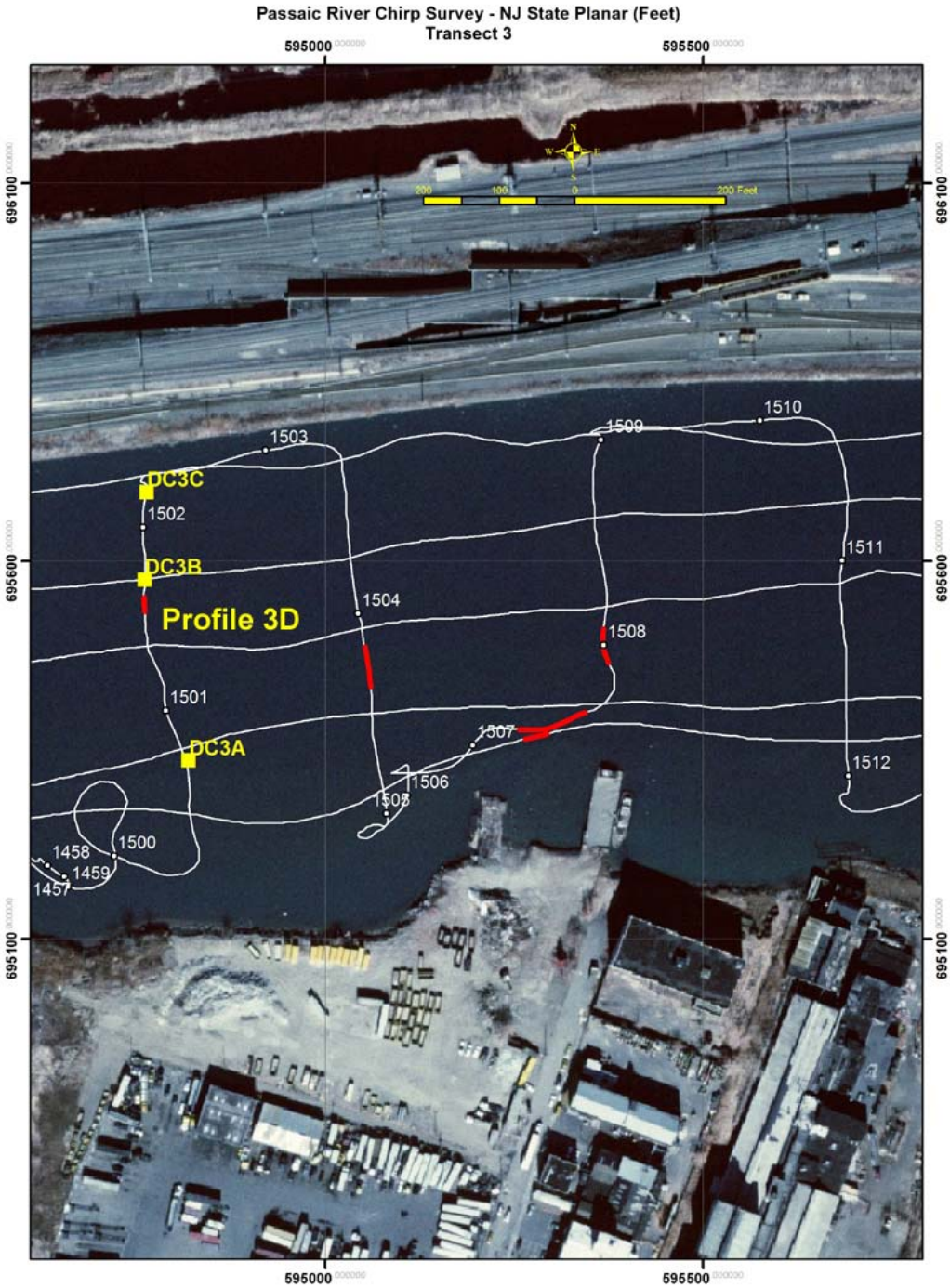


Figure 129. Location map for sub-bottom transect area 3. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

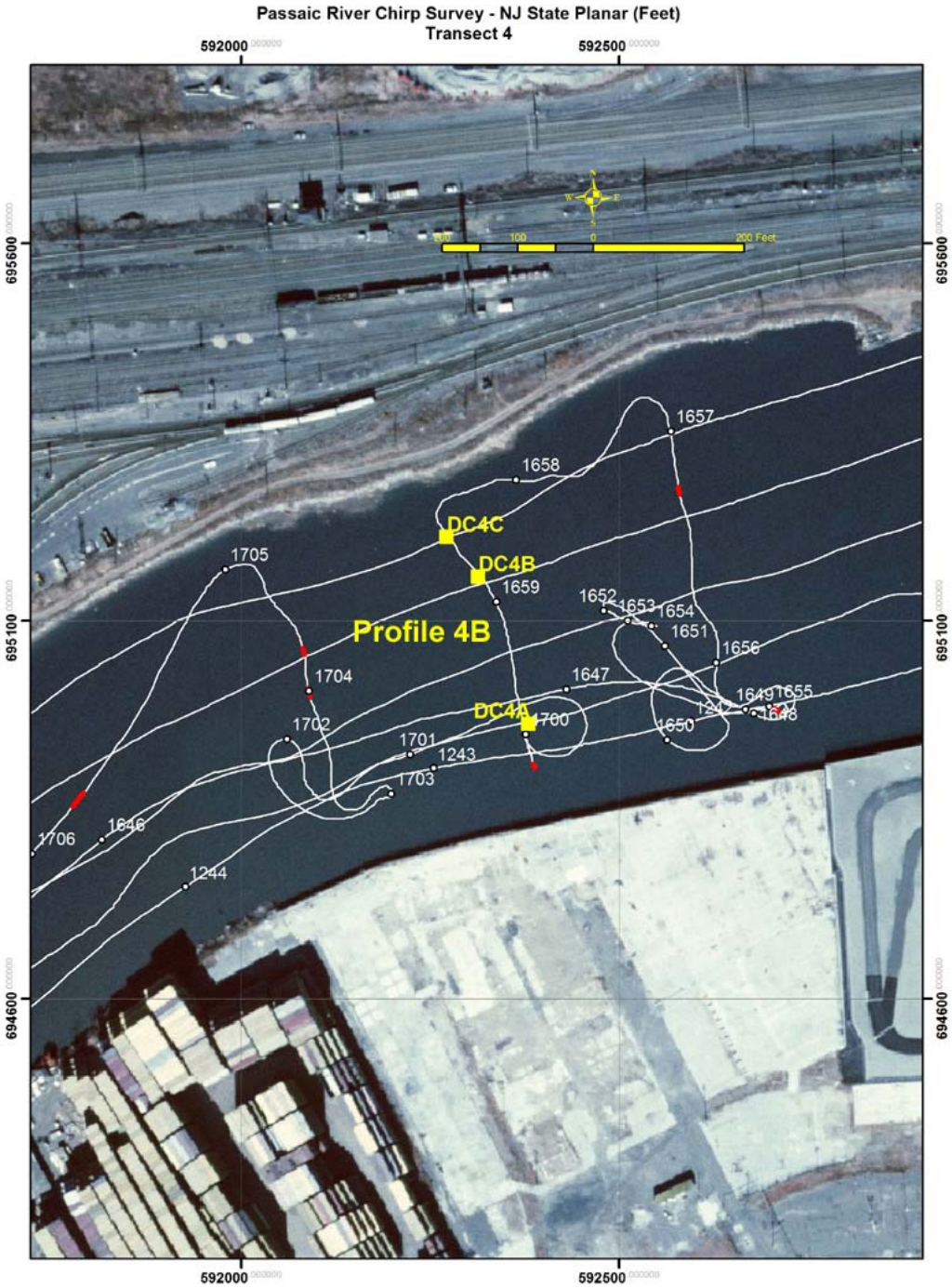


Figure 130. Location map for sub-bottom transect area 4. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

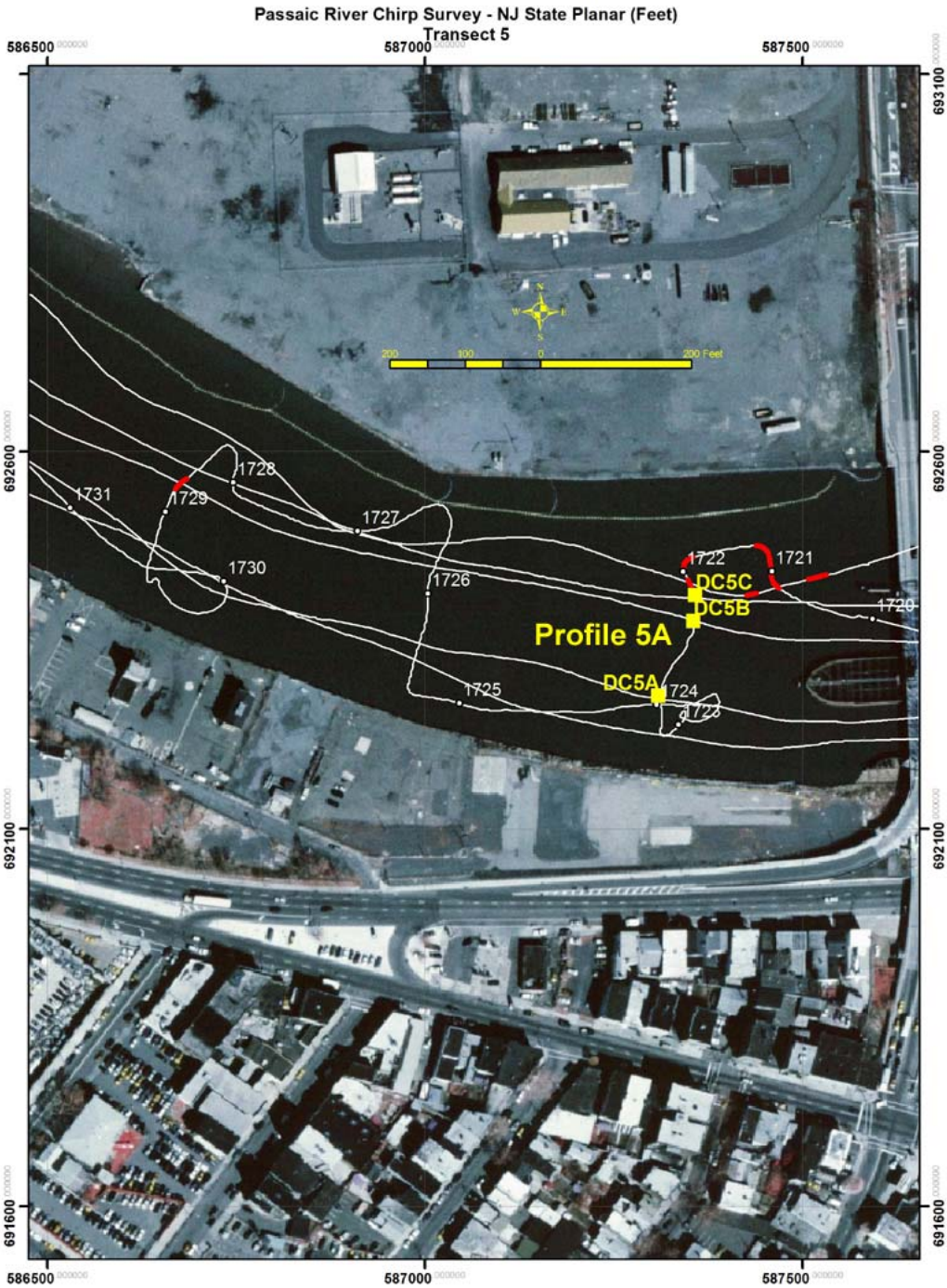


Figure 131. Location map for sub-bottom transect area 5. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

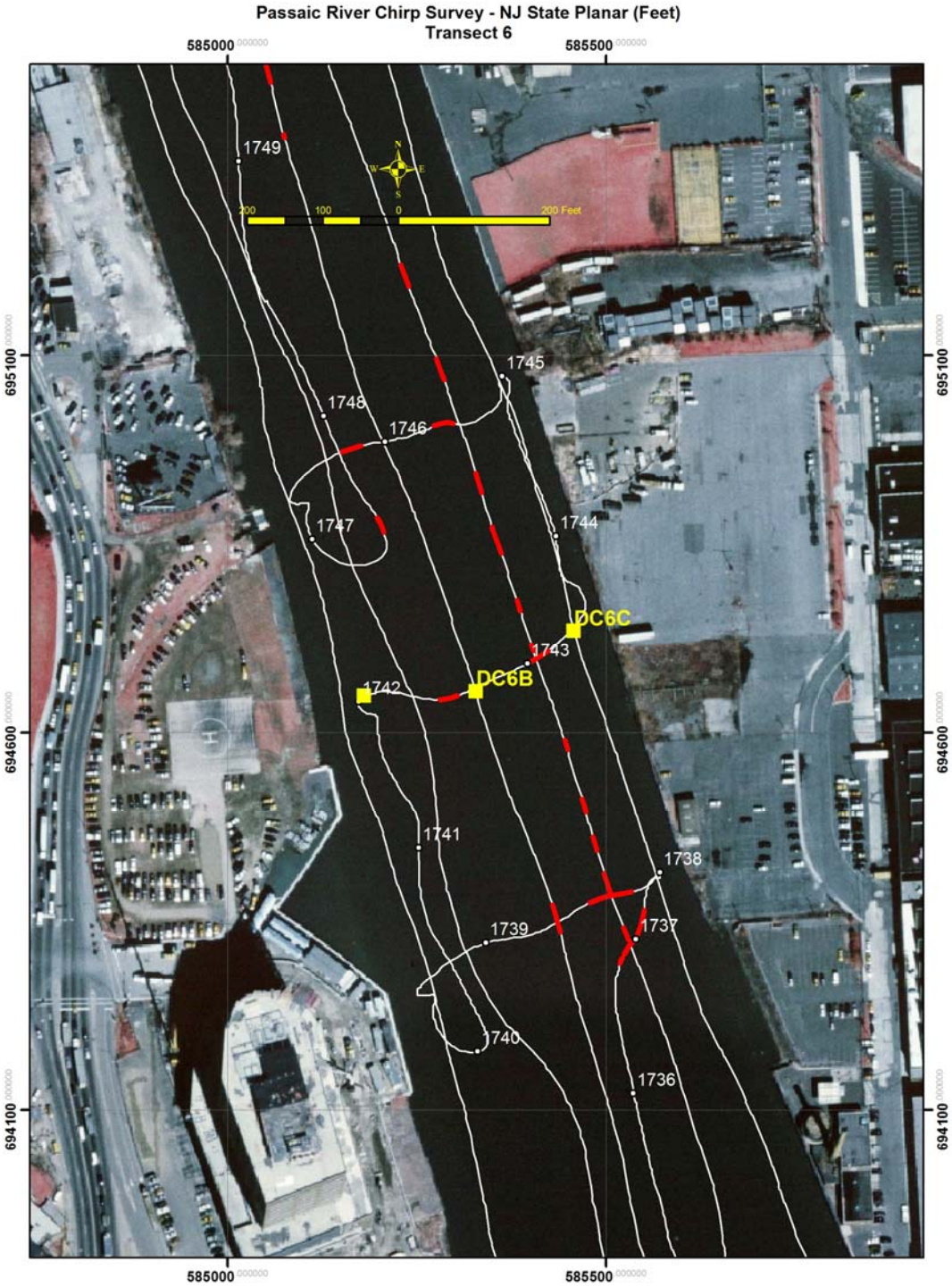


Figure 132. Location map for sub-bottom transect area 6. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

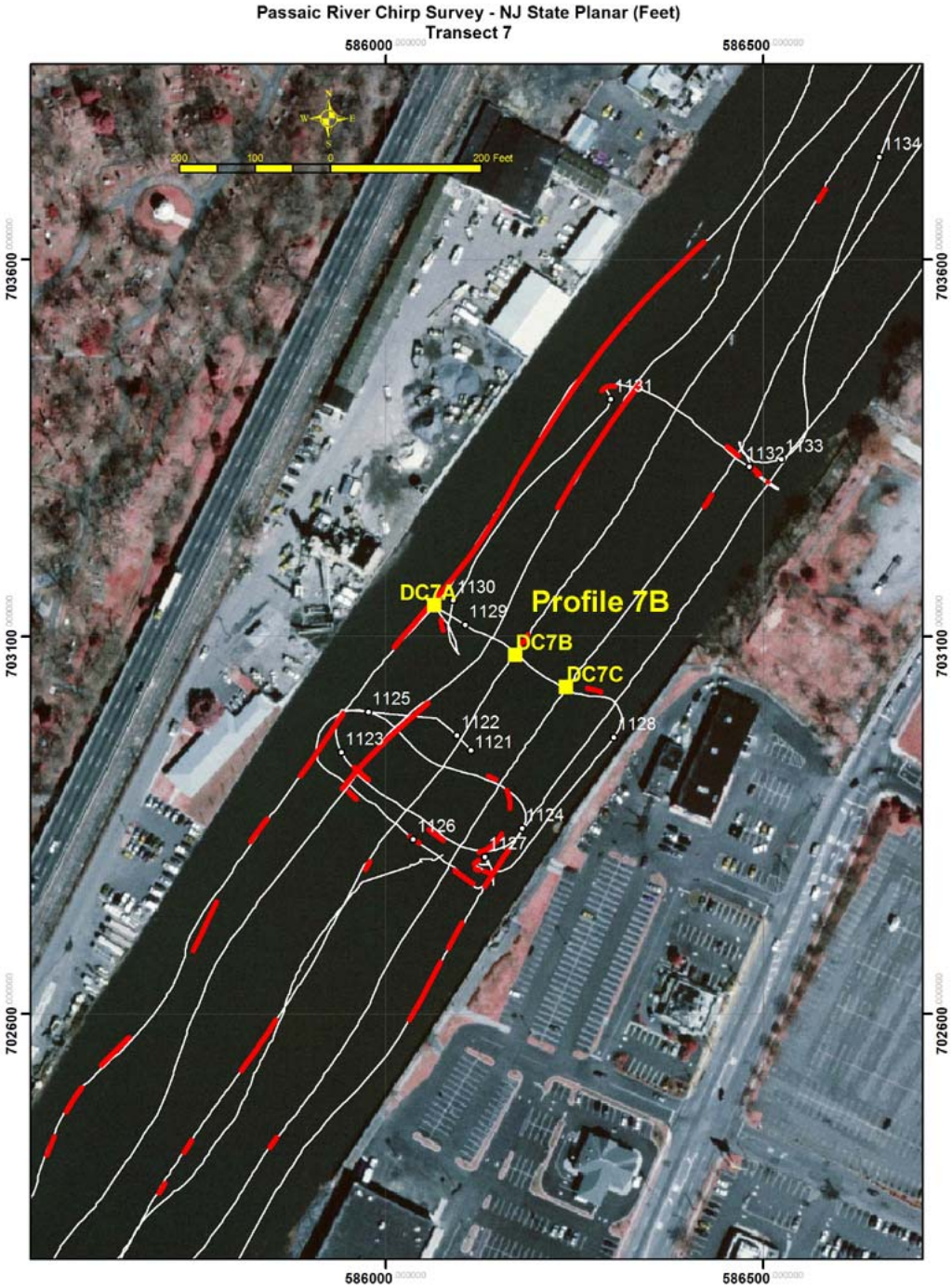


Figure 133. Location map for sub-bottom transect area 7. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

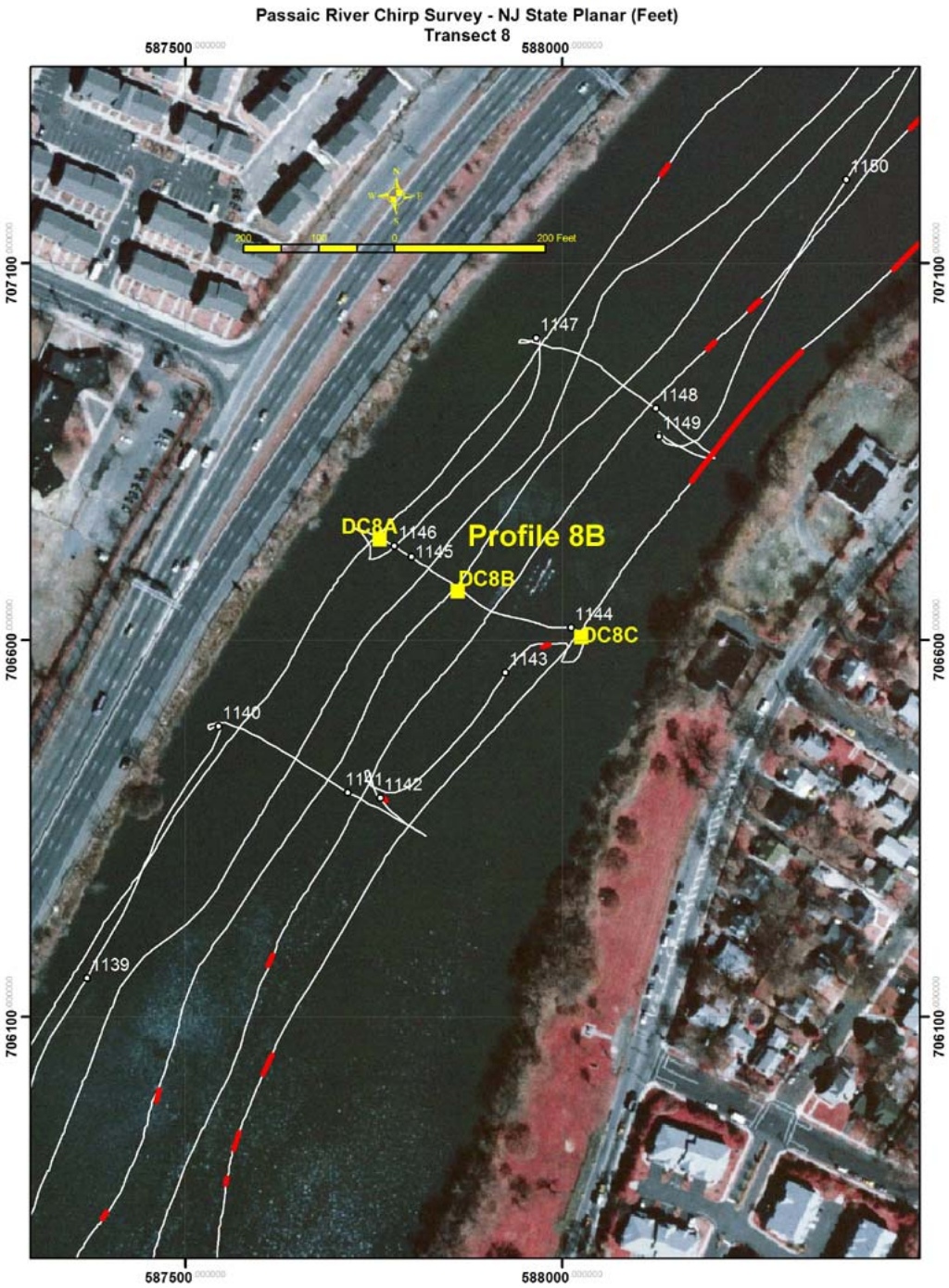


Figure 134. Location map for sub-bottom transect area 8. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

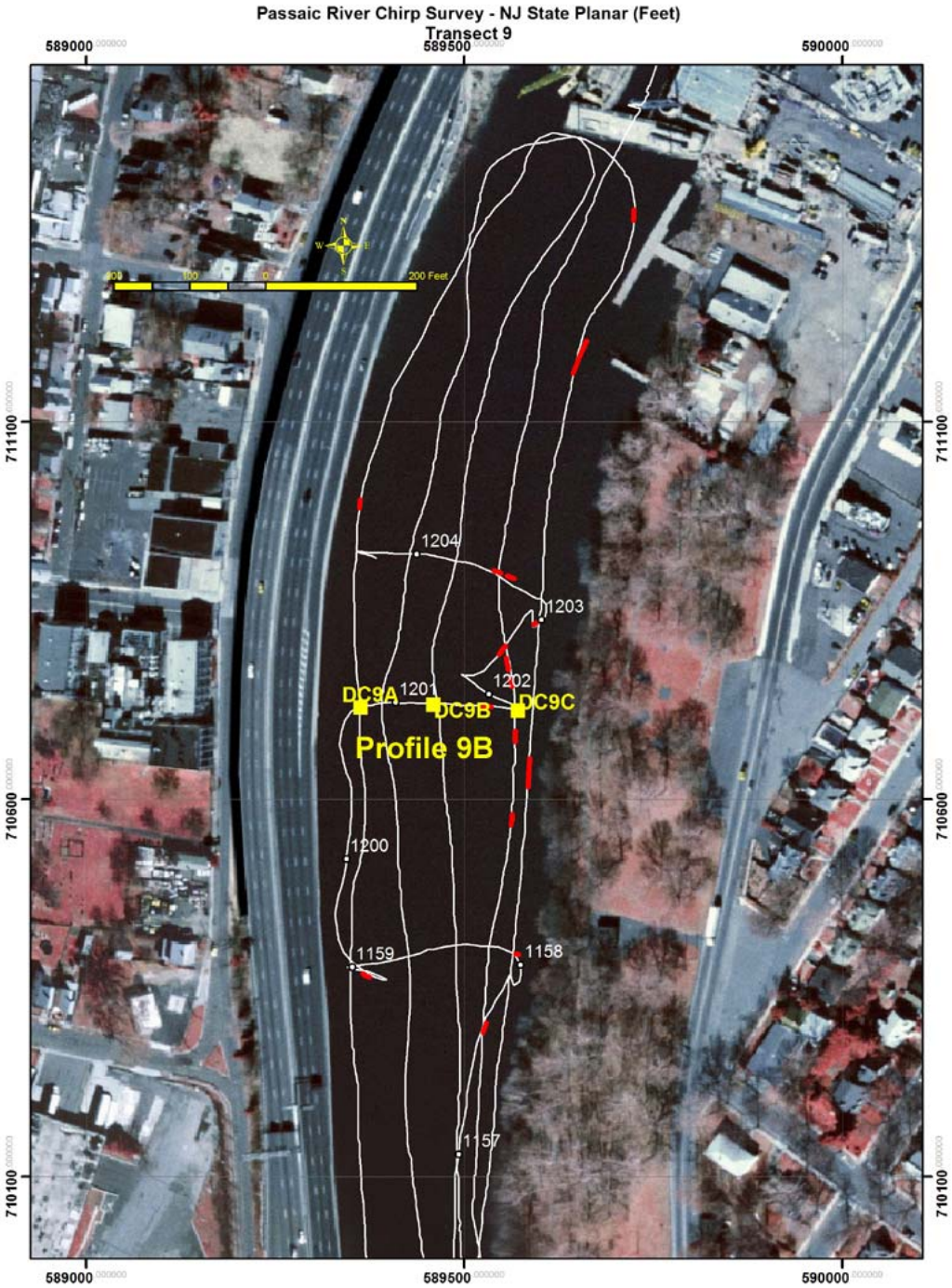


Figure 135. Location map for sub-bottom transect area 9. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

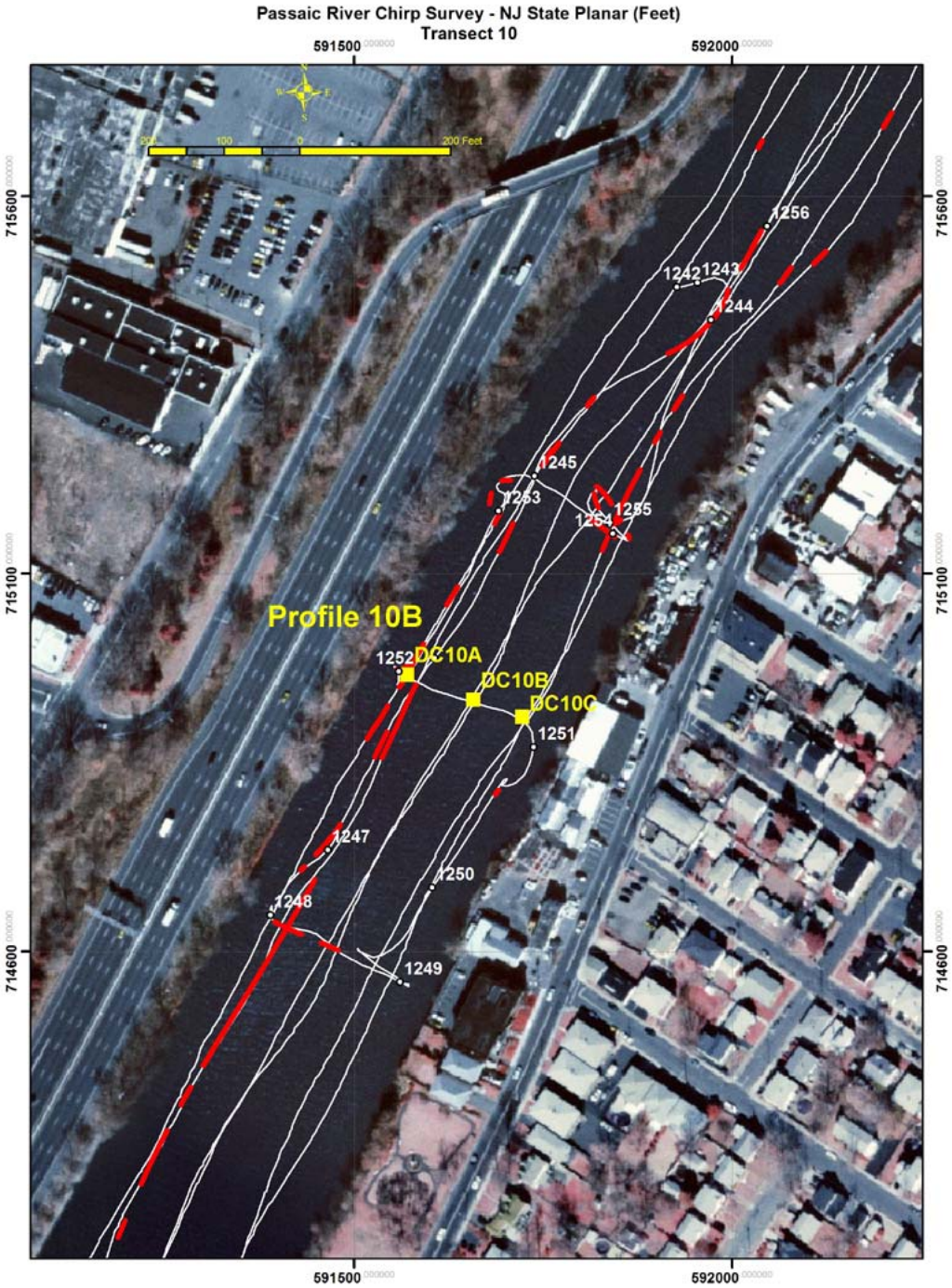


Figure 136. Location map for sub-bottom transect area 10. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

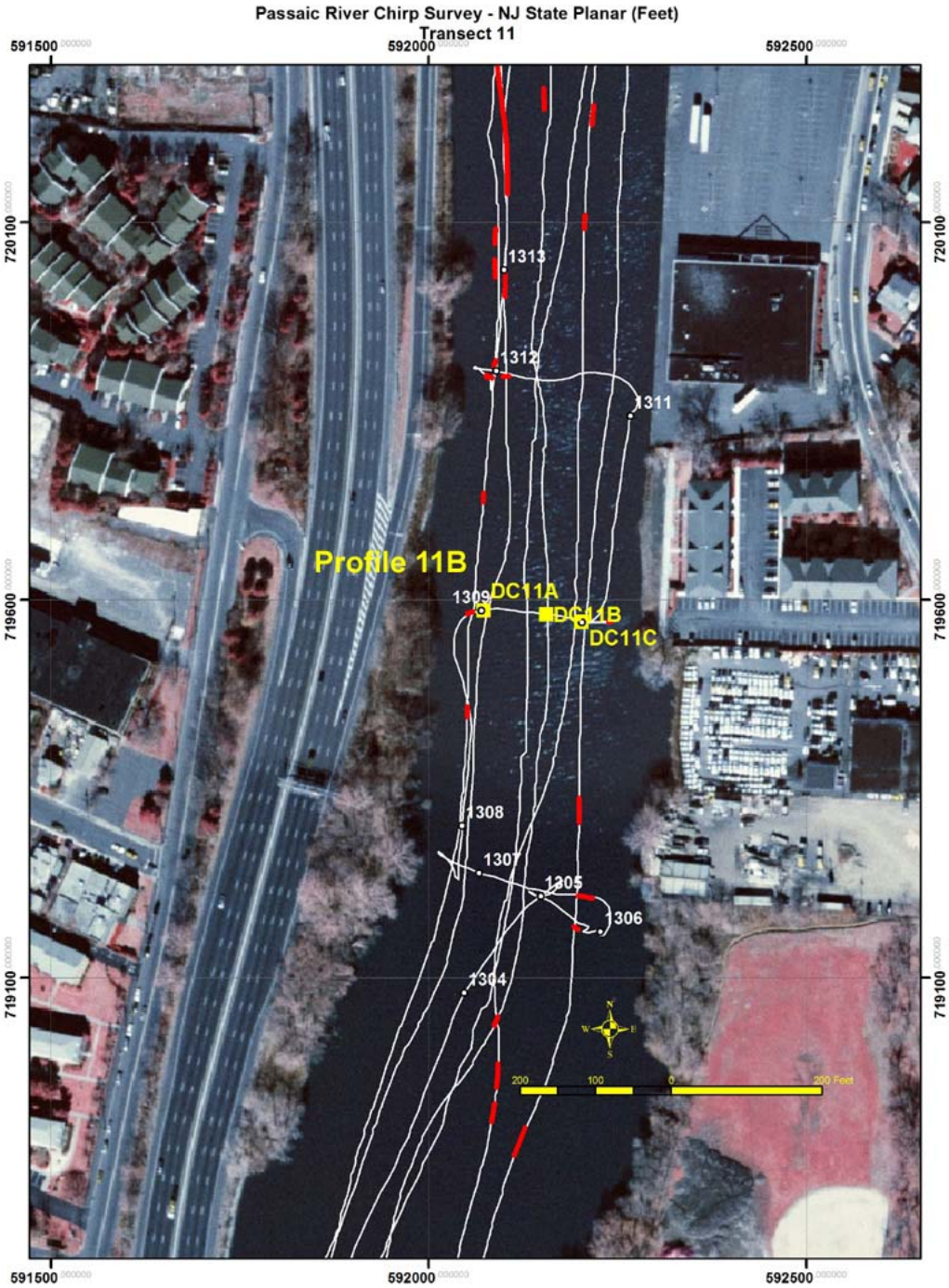


Figure 137. Location map for sub-bottom transect area 11. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

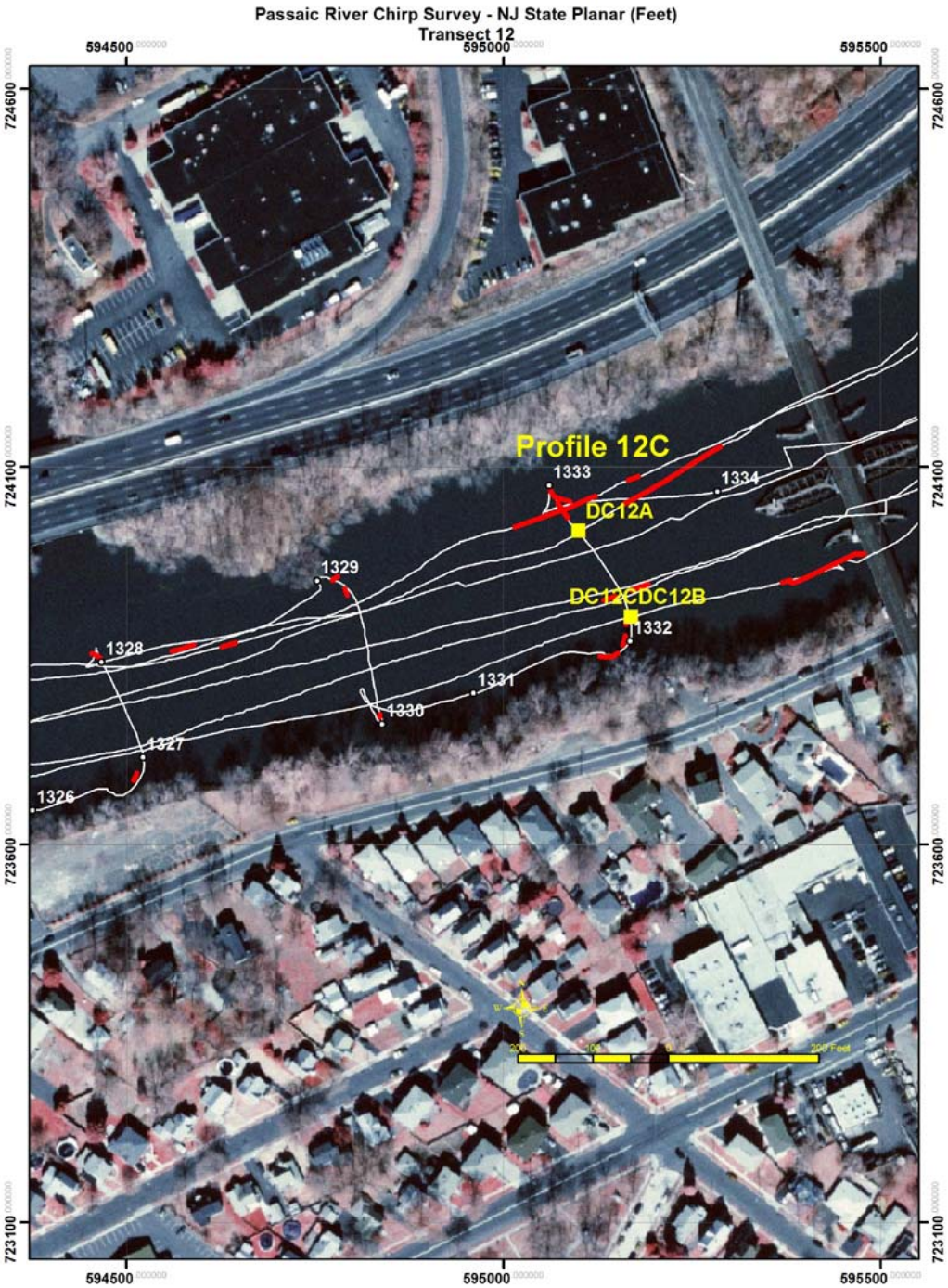


Figure 138. Location map for sub-bottom transect area 12. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

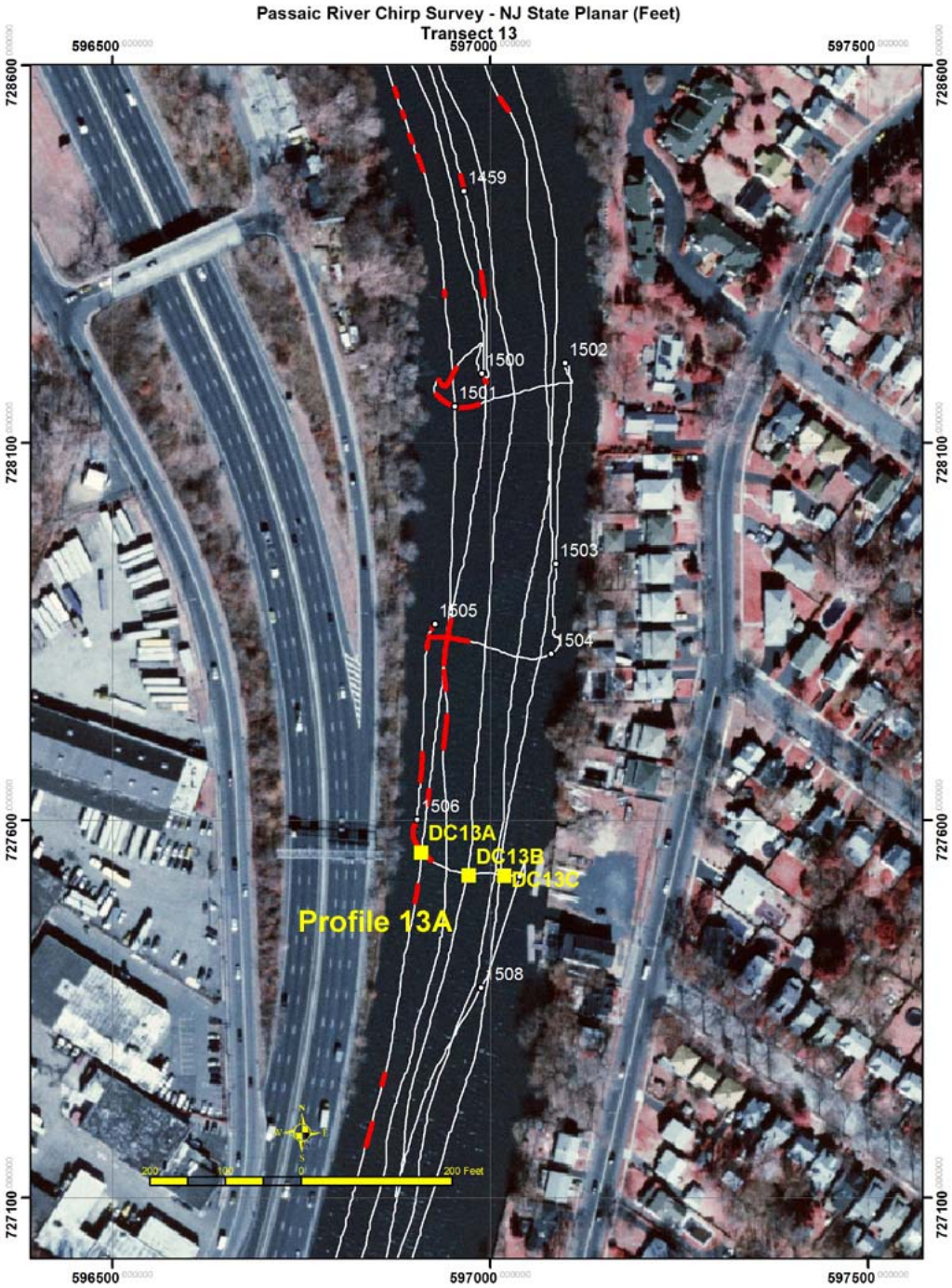


Figure 139. Location map for sub-bottom transect area 13. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

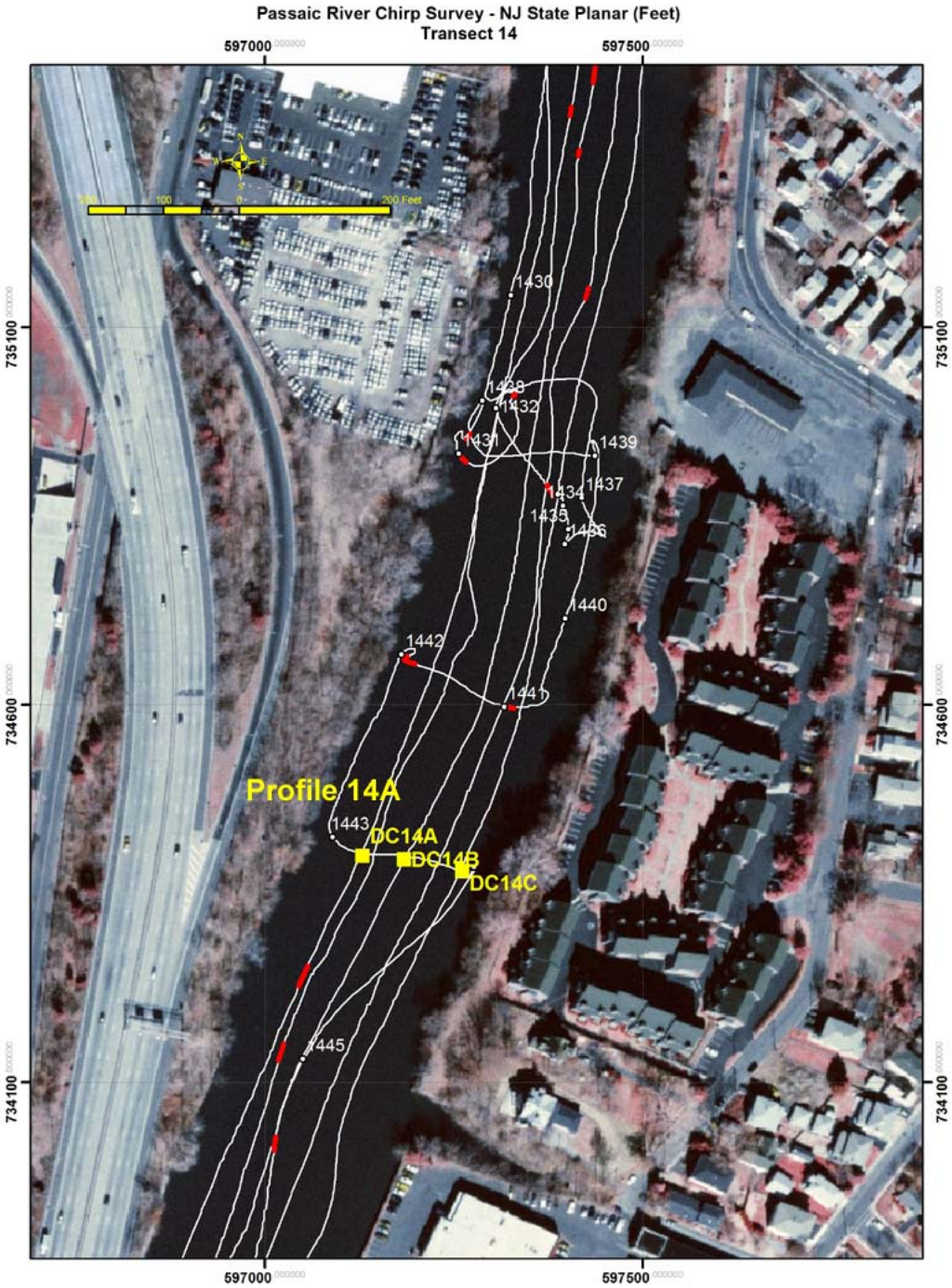


Figure 140. Location map for sub-bottom transect area 14. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

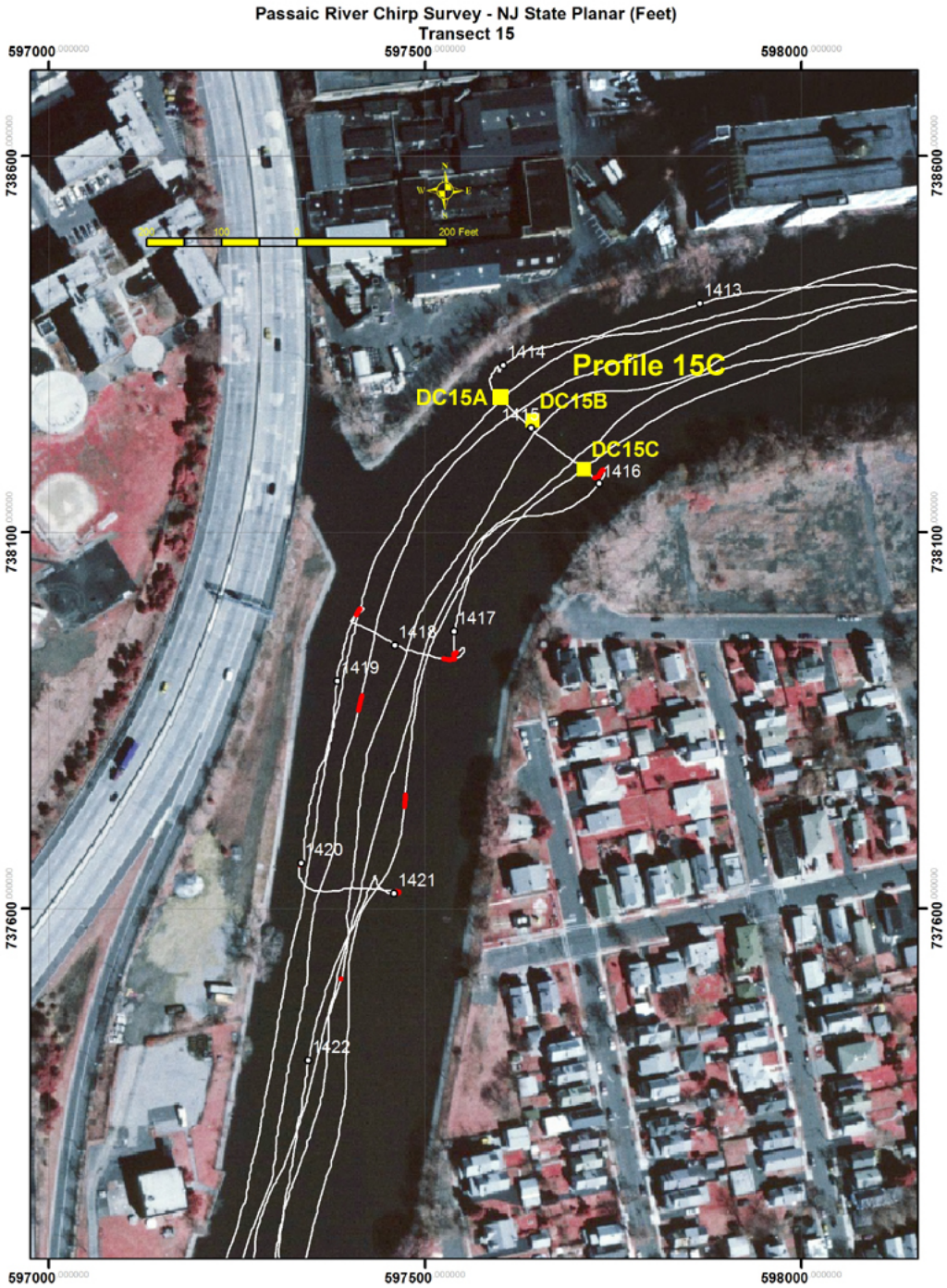


Figure 141. Location map for sub-bottom transect area 15. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

Figure 142. Location map for sub-bottom transect area 16. Coordinates are in NJ State Planar Feet. Thin white lines are chirp tracklines. Time (Greenwich Mean Time) along the cross-river tracklines are shown by small circles with labels. Locations of deep cores (vibracores) are shown by small squares with labels. Thicker red lines denote locations where no sub-bottom penetration occurred using the chirp system. General location for this transect is shown in Figure 125.

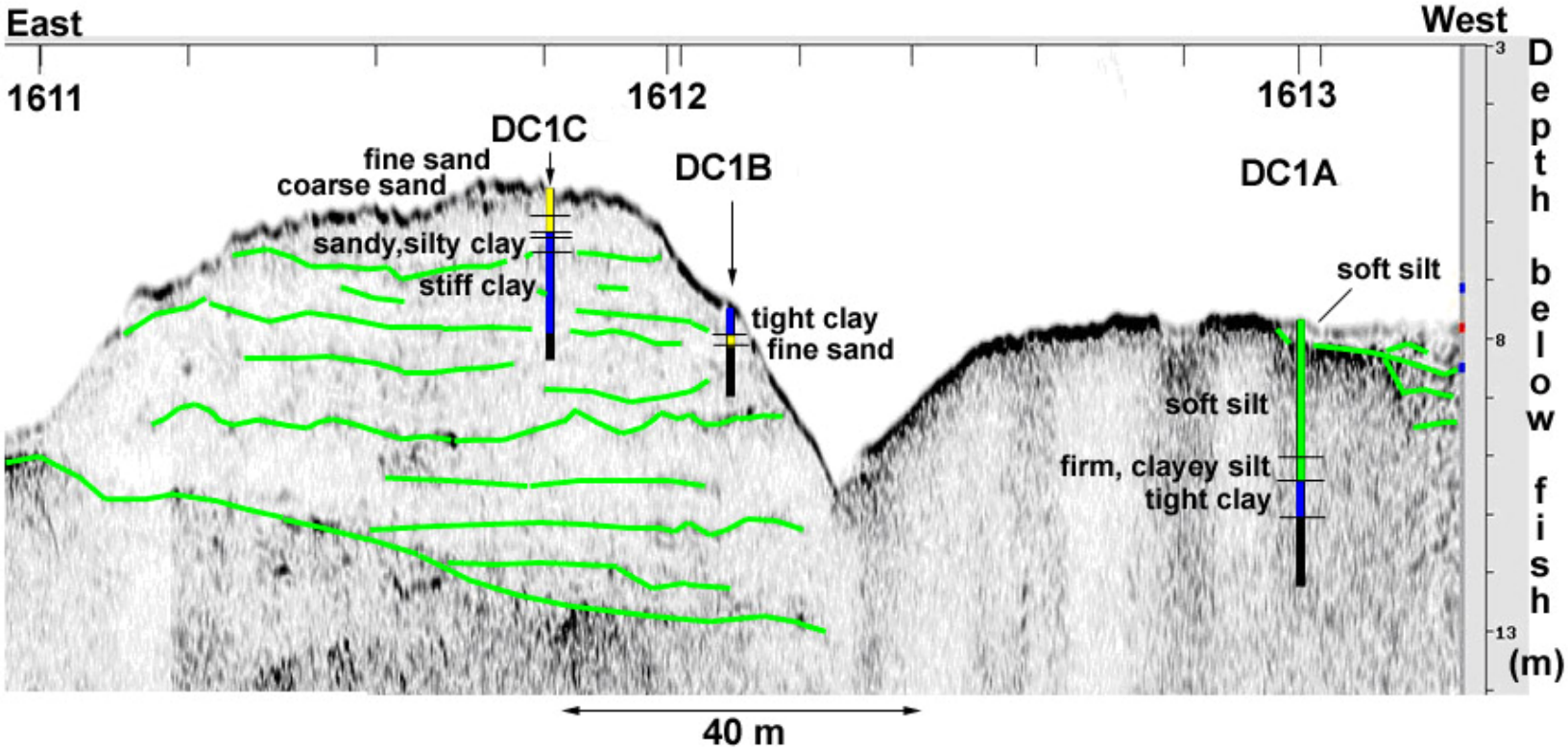


Figure 143. Chirp sub-bottom profile (Profile 1B) along Transect 1. Shown are deep cores DC1A, DC1B, and DC1C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 126. 1611 to 1613 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

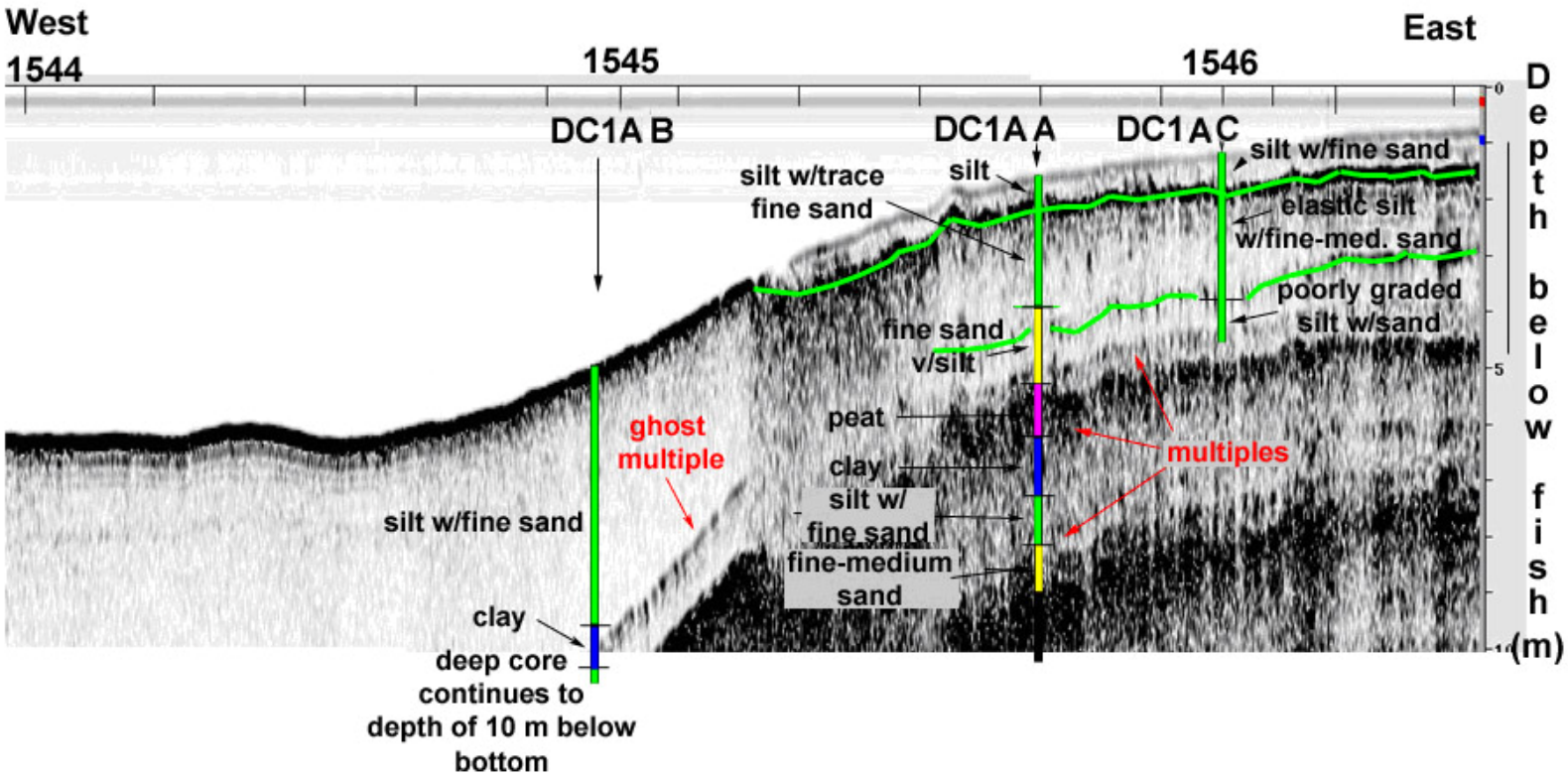


Figure 144. Chirp sub-bottom profile (Profile 1AC) along Transect 1A. Shown are deep cores DC1AA, DC1AB, and DC1AC. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 127. 1544 to 1546 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

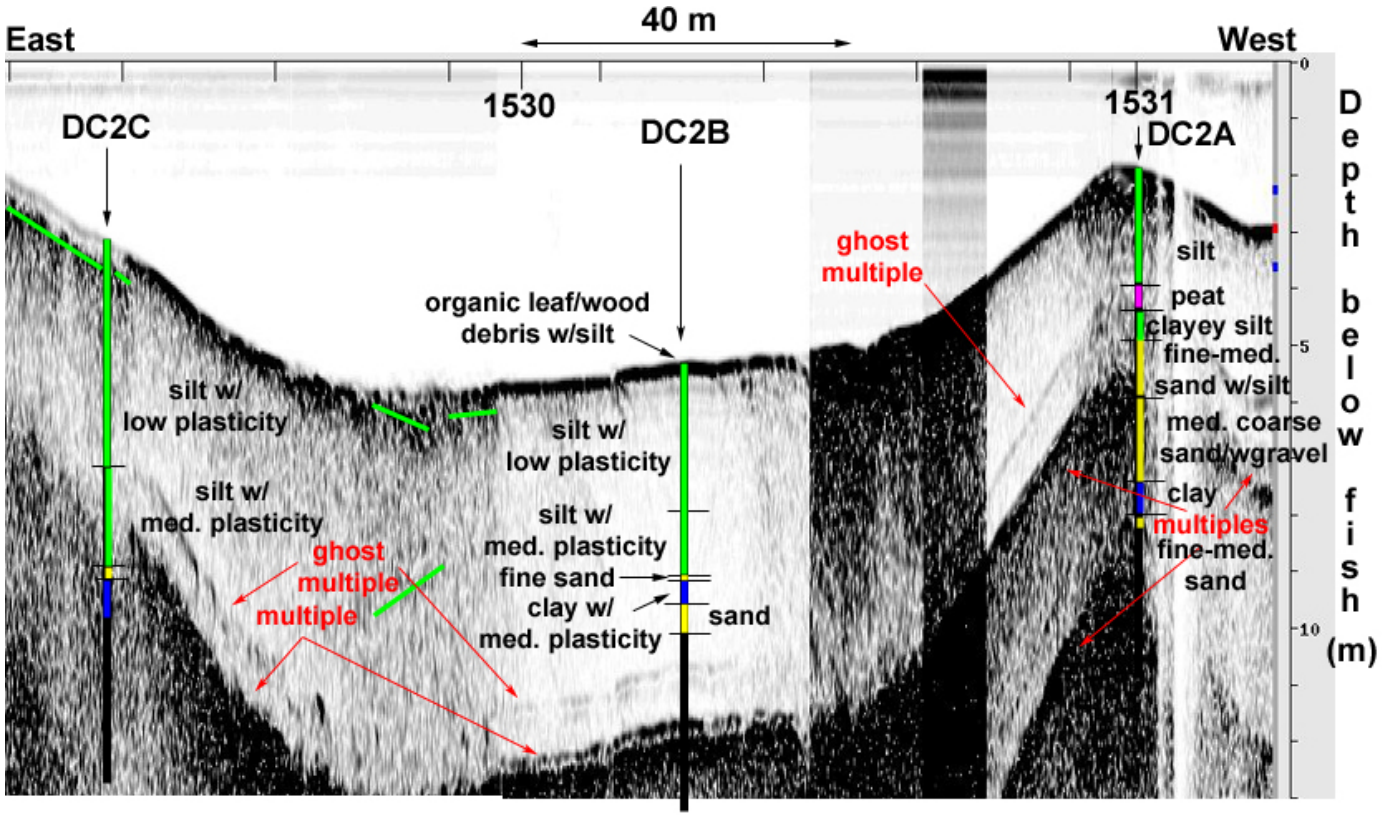


Figure 145. Chirp sub-bottom profile (Profile 2B) along Transect 2. Shown are deep cores DC2A, DC2B, and DC2C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 128. 1530 and 1531 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

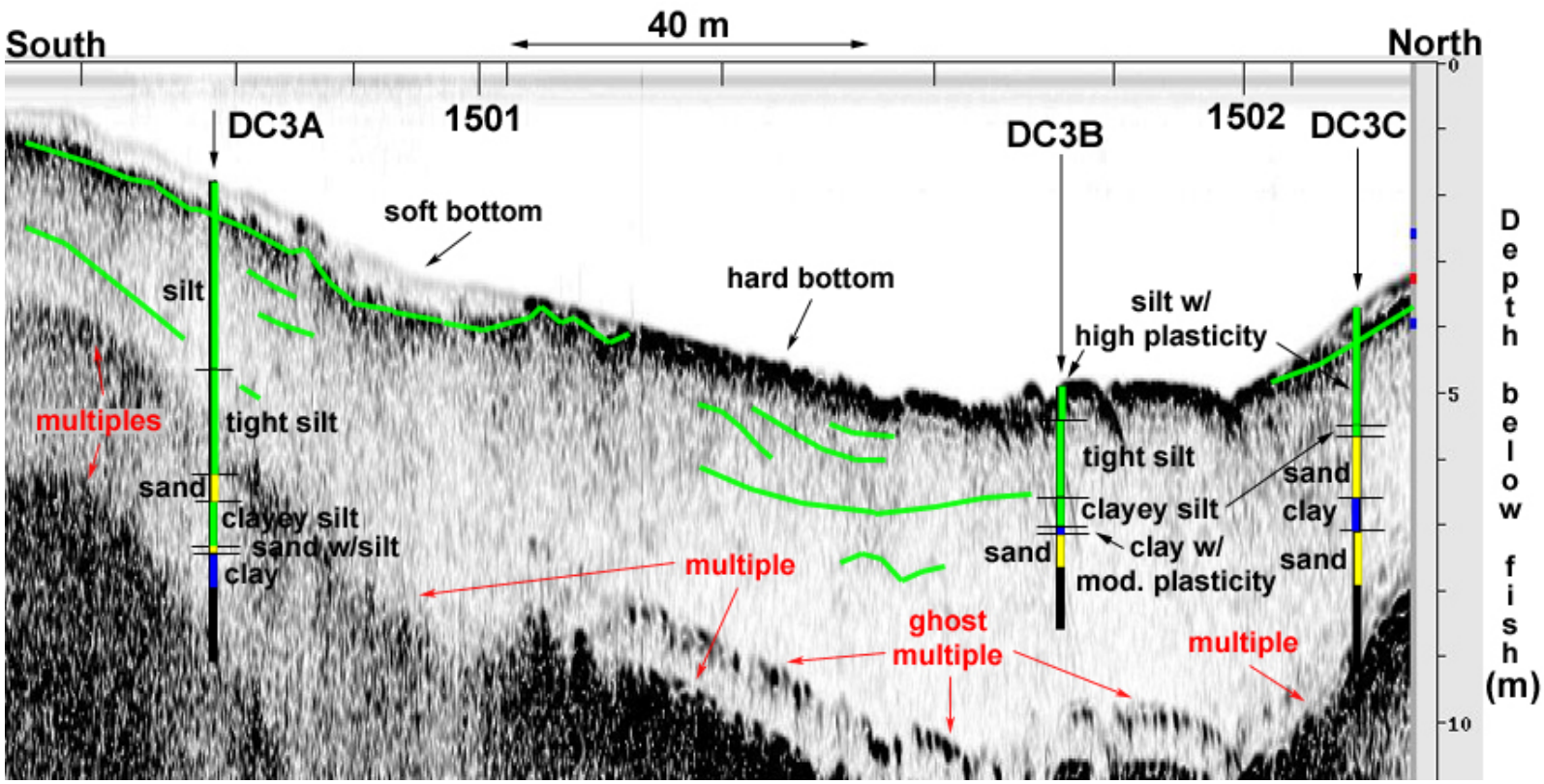


Figure 146. Chirp sub-bottom profile (Profile 3D) along Transect 3. Shown are deep cores DC3A, DC3B, and DC3C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 129. 1501 and 1502 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

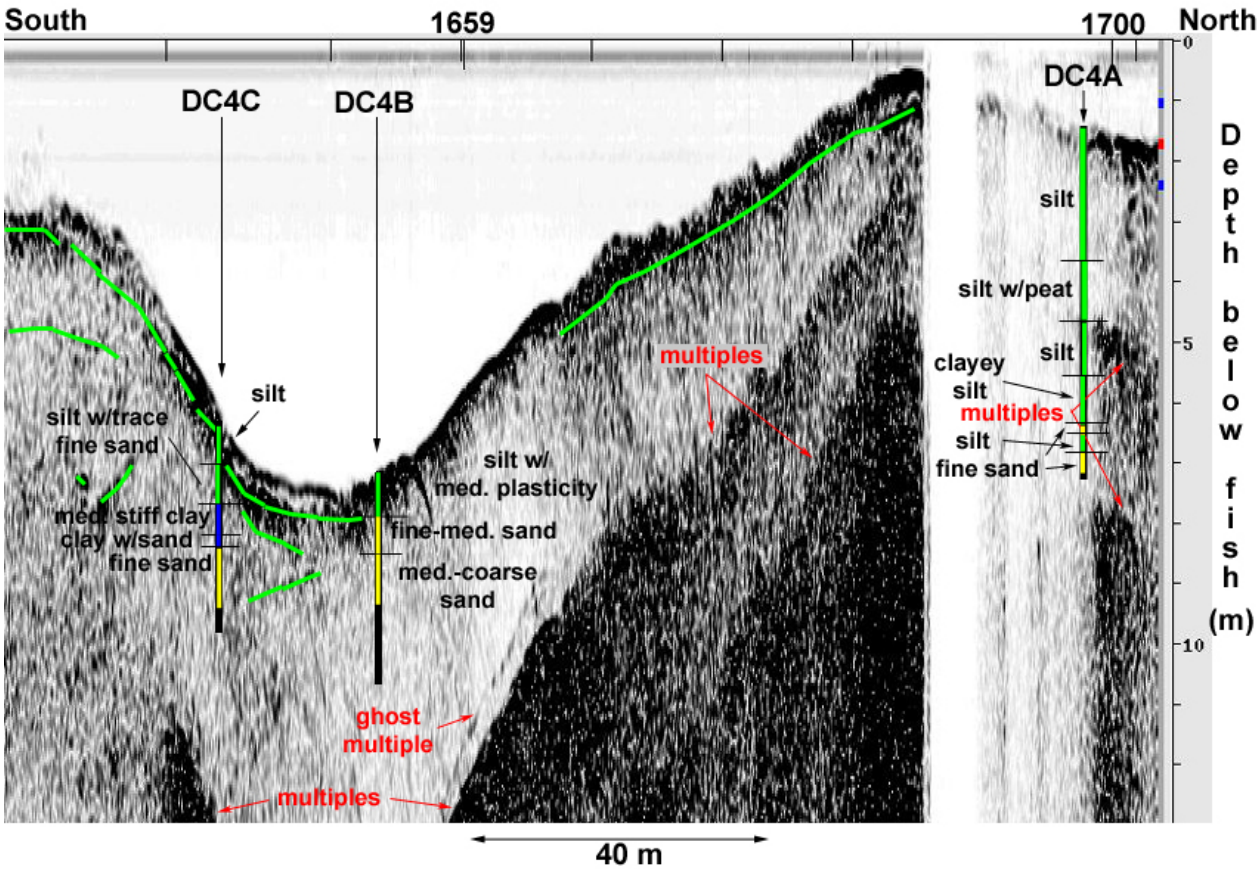


Figure 147. Chirp sub-bottom profile (Profile 4B) along Transect 4. Shown are deep cores DC4A, DC4B, and DC4C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 130. 1659 and 1700 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

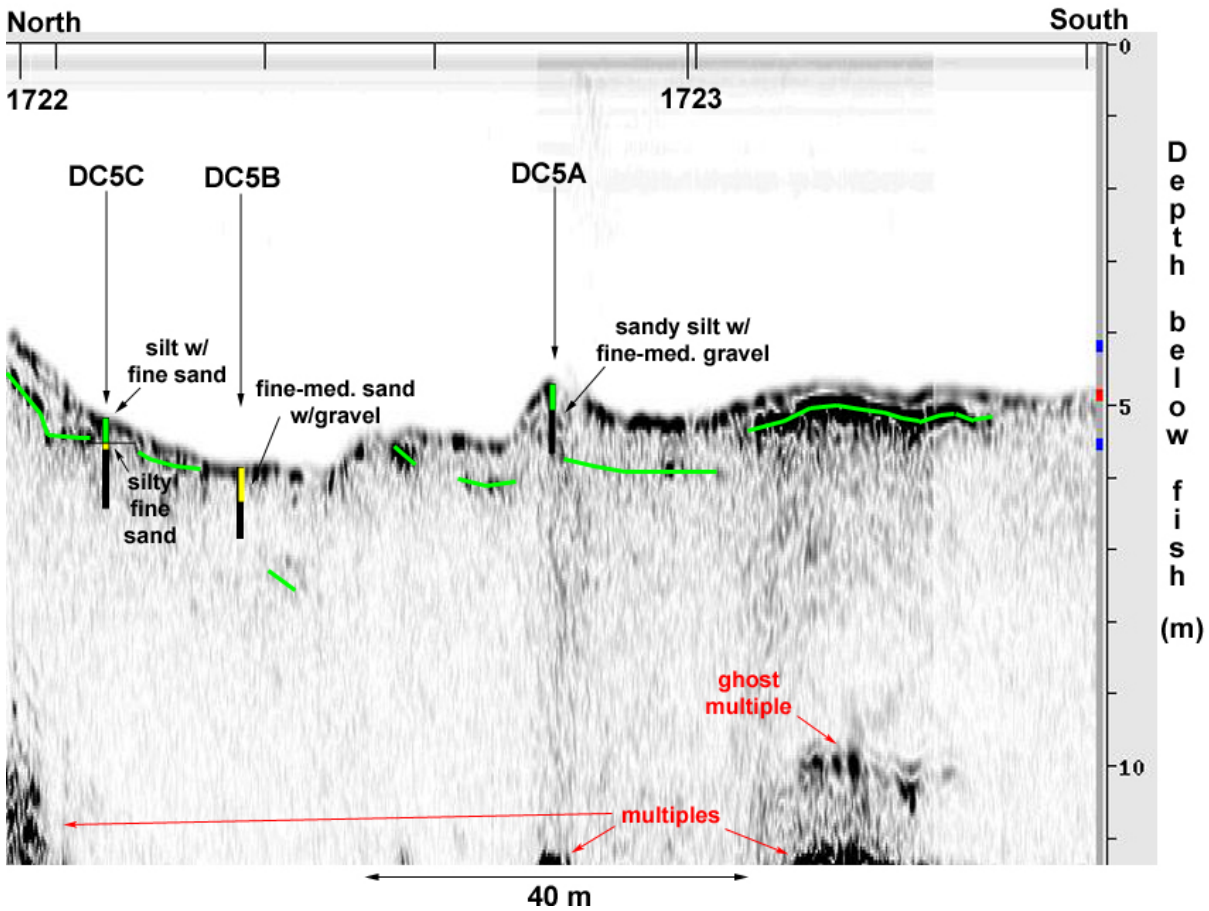


Figure 148. Chirp sub-bottom profile (Profile 5A) along Transect 5. Shown are deep cores DC5A, DC5B, and DC5C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 131. 1722 and 1723 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

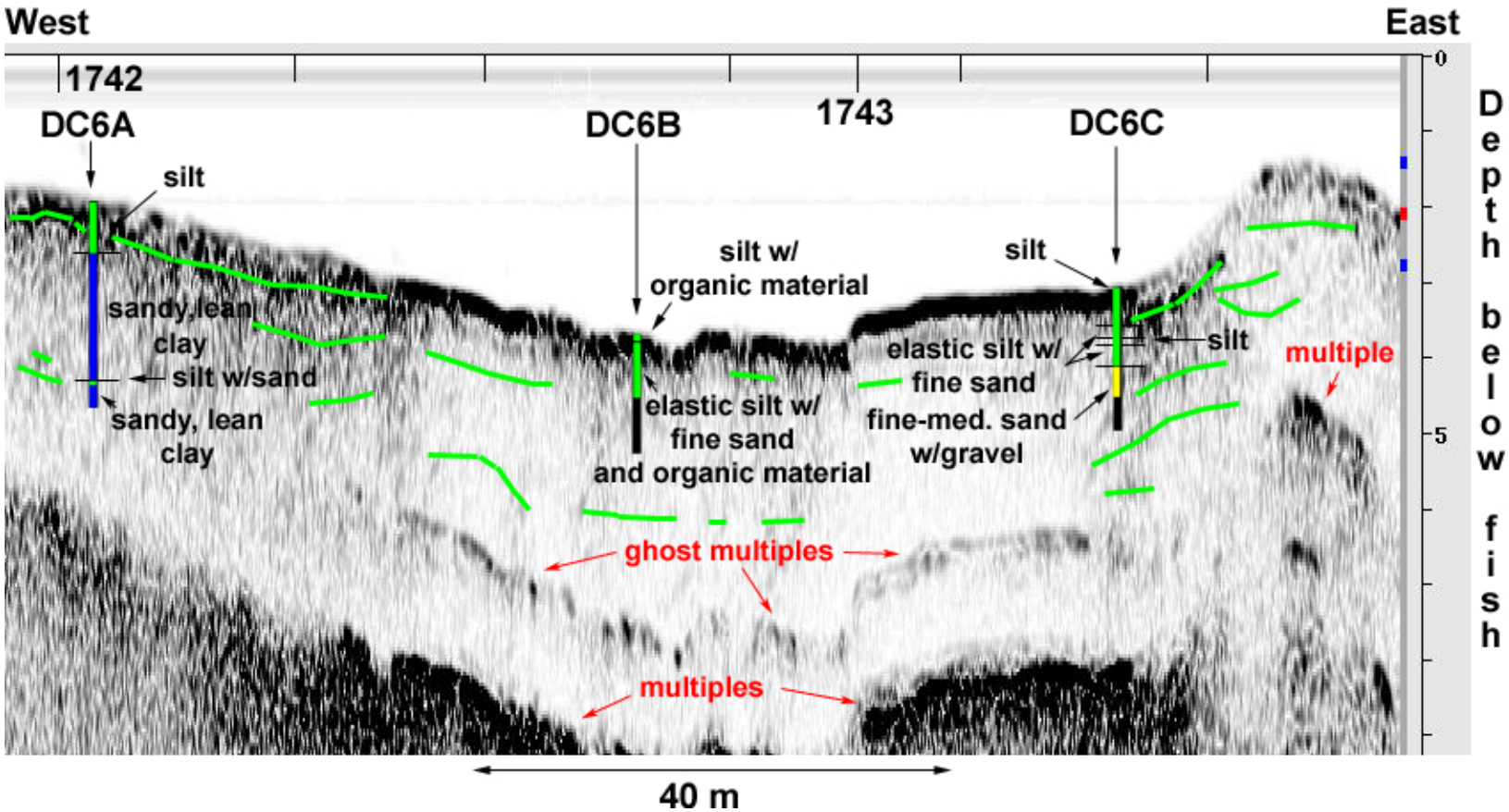


Figure 149. Chirp sub-bottom profile (Profile 6B) along Transect 6. Shown are deep cores DC6A, DC6B, and DC6C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 132. 1742 and 1743 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

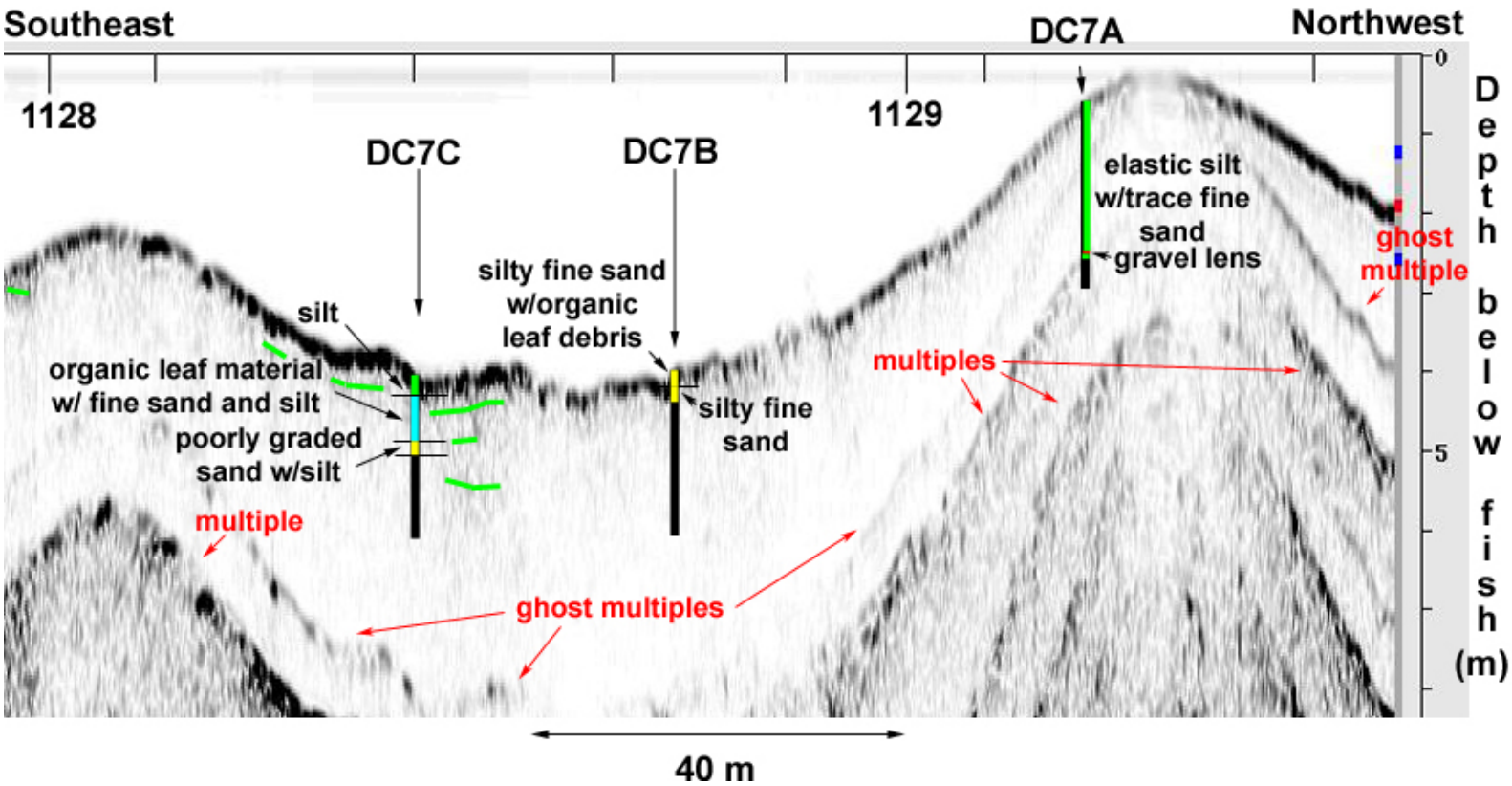


Figure 150. Chirp sub-bottom profile (Profile 7B) along Transect 7. Shown are deep cores DC7A, DC7B, and DC7C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 133. 1128 and 1129 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

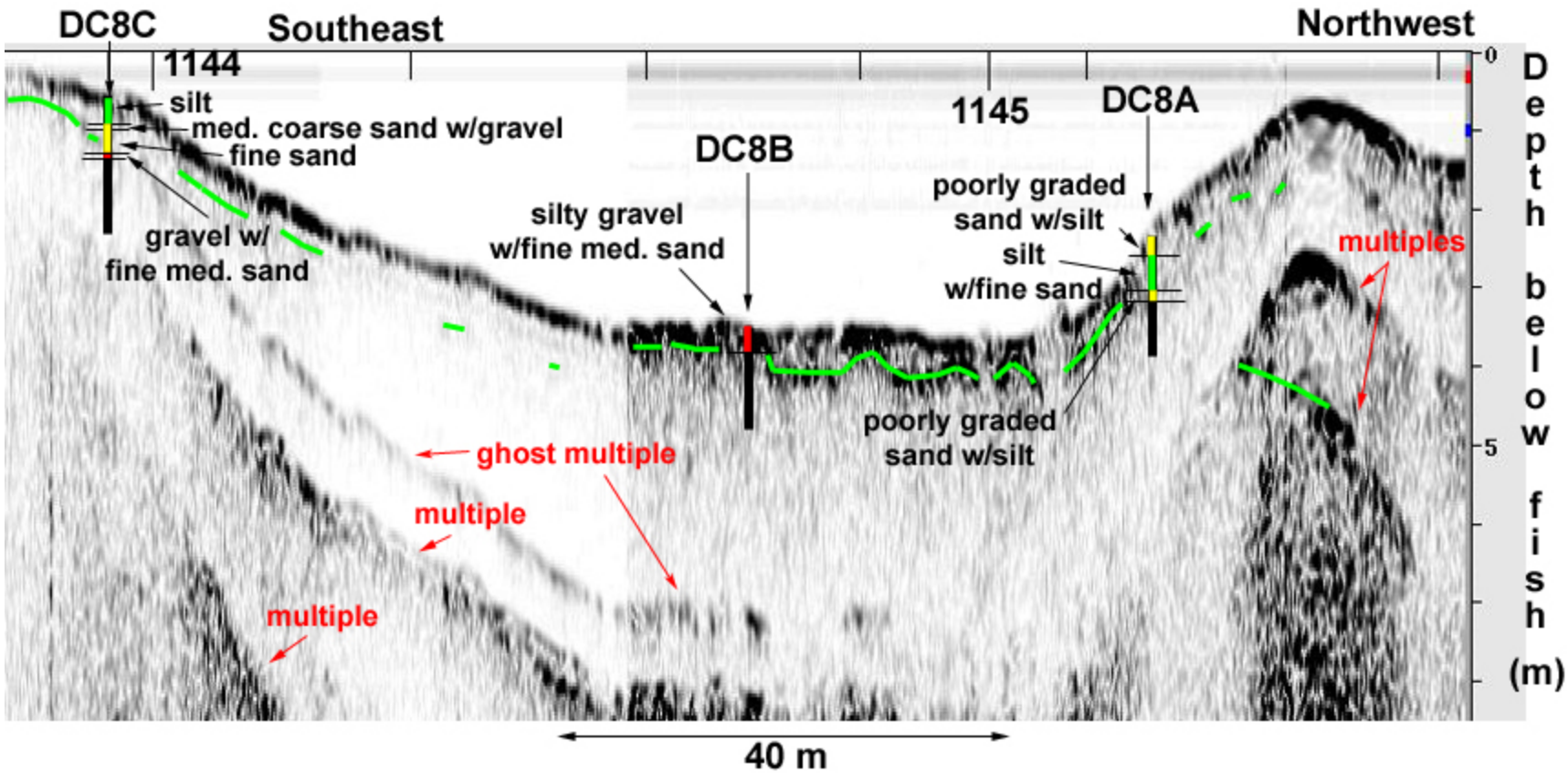


Figure 151. Chirp sub-bottom profile (Profile 8B) along Transect 8. Shown are deep cores DC8A, DC8B, and DC8C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 134. 1144 and 1145 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

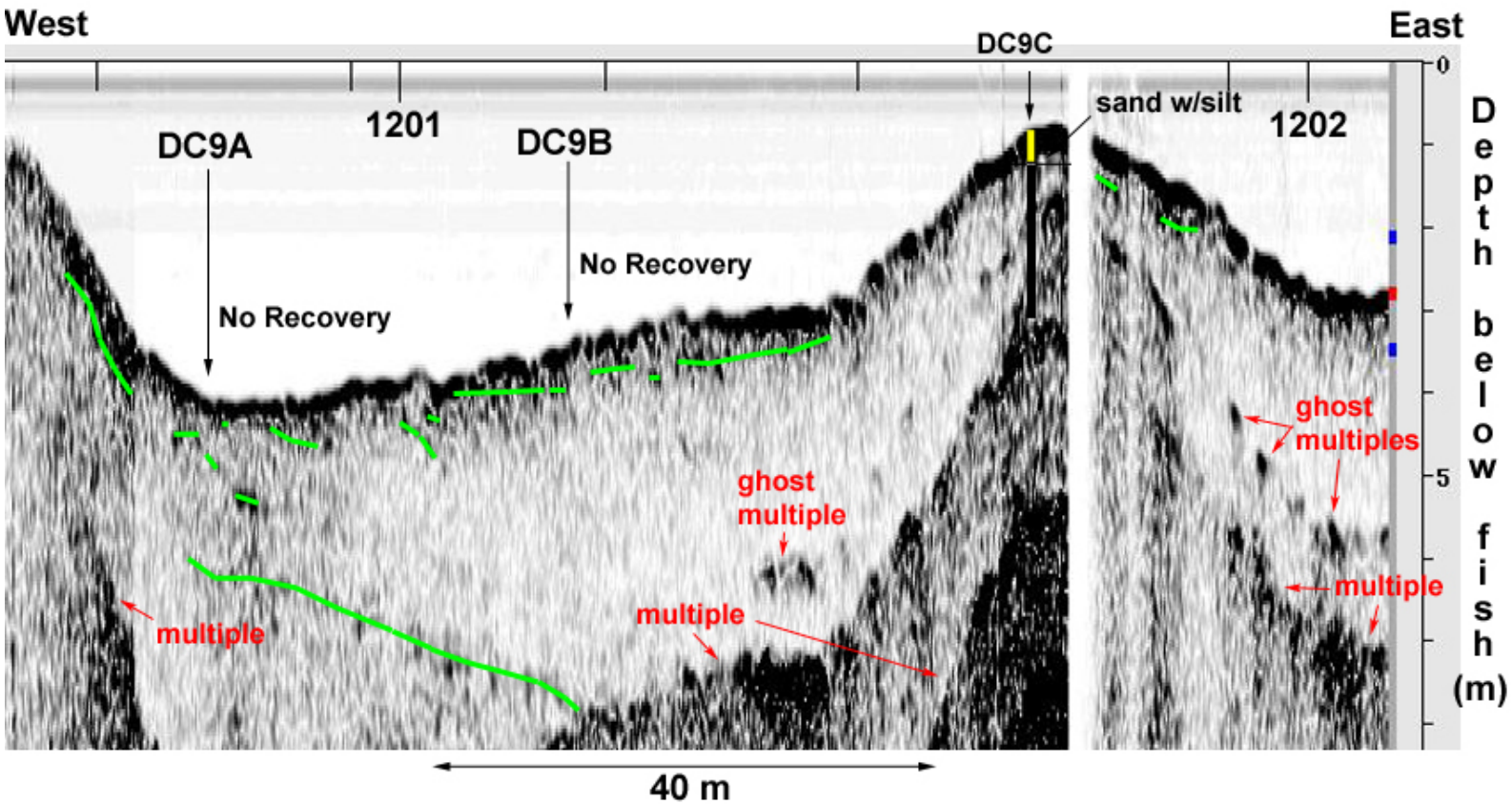


Figure 152. Chirp sub-bottom profile (Profile 9B) along Transect 9. Shown are deep cores DC9A, DC9B, and DC9C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 135. 1201 and 1202 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

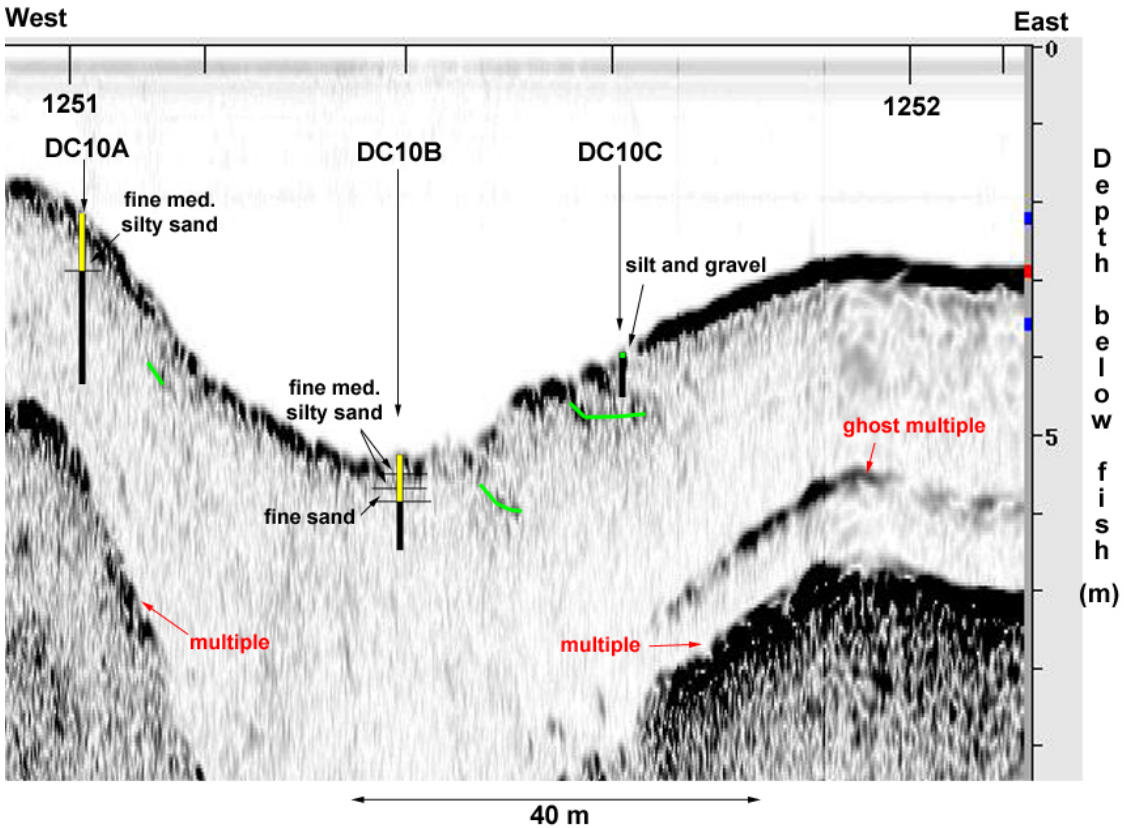


Figure 153. Chirp sub-bottom profile (Profile 10B) along Transect 10. Shown are deep cores DC10A, DC10B, and DC10C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 139. 1251 and 1252 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

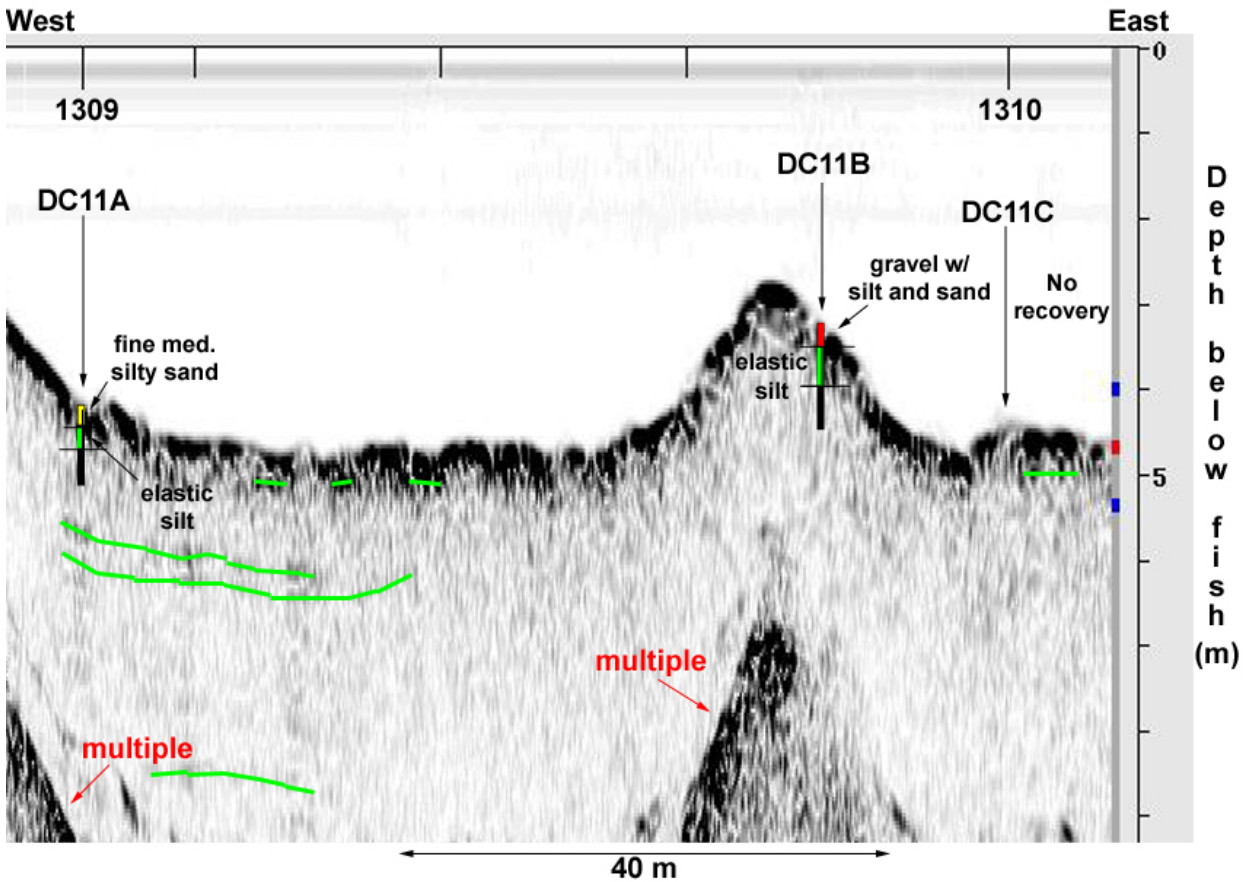


Figure 154. Chirp sub-bottom profile (Profile 11B) along Transect 11. Shown are deep cores DC11A, DC11B, and DC11C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 137. 1309 and 1310 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

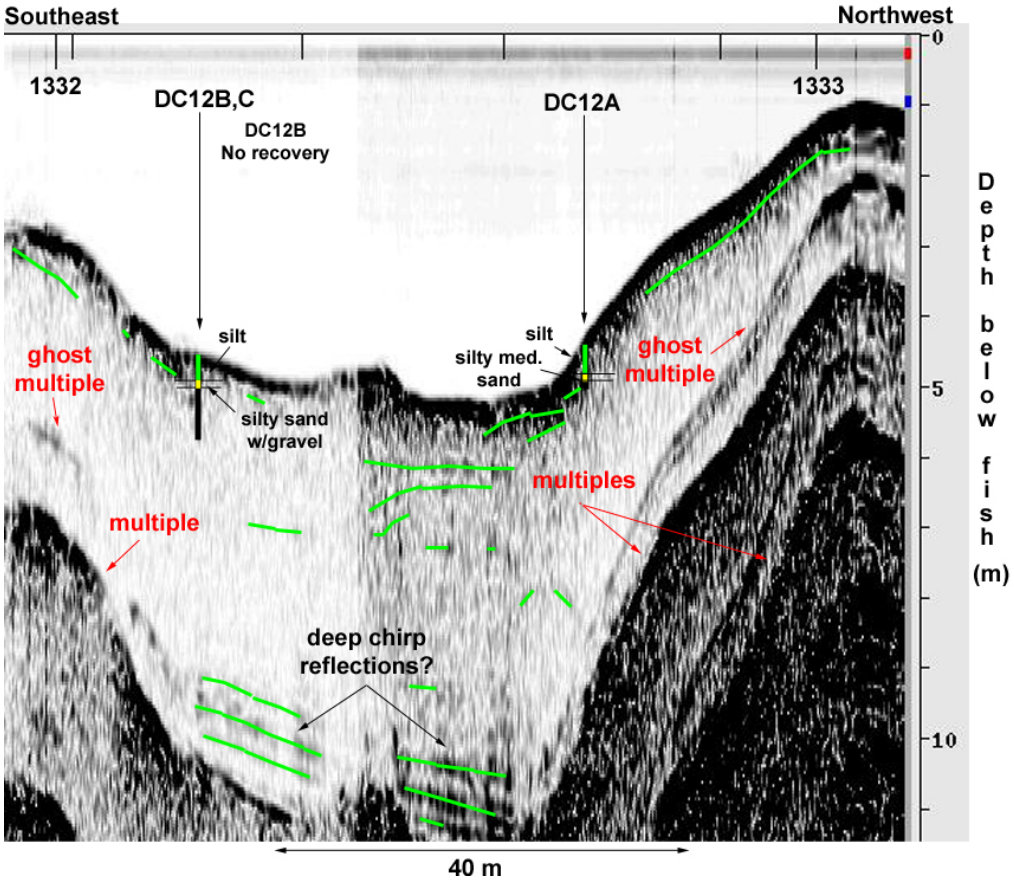


Figure 155. Chirp sub-bottom profile (Profile 12C) along Transect 12. Shown are deep cores DC12A, DC12B, and DC12C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 138. 1332 and 1333 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

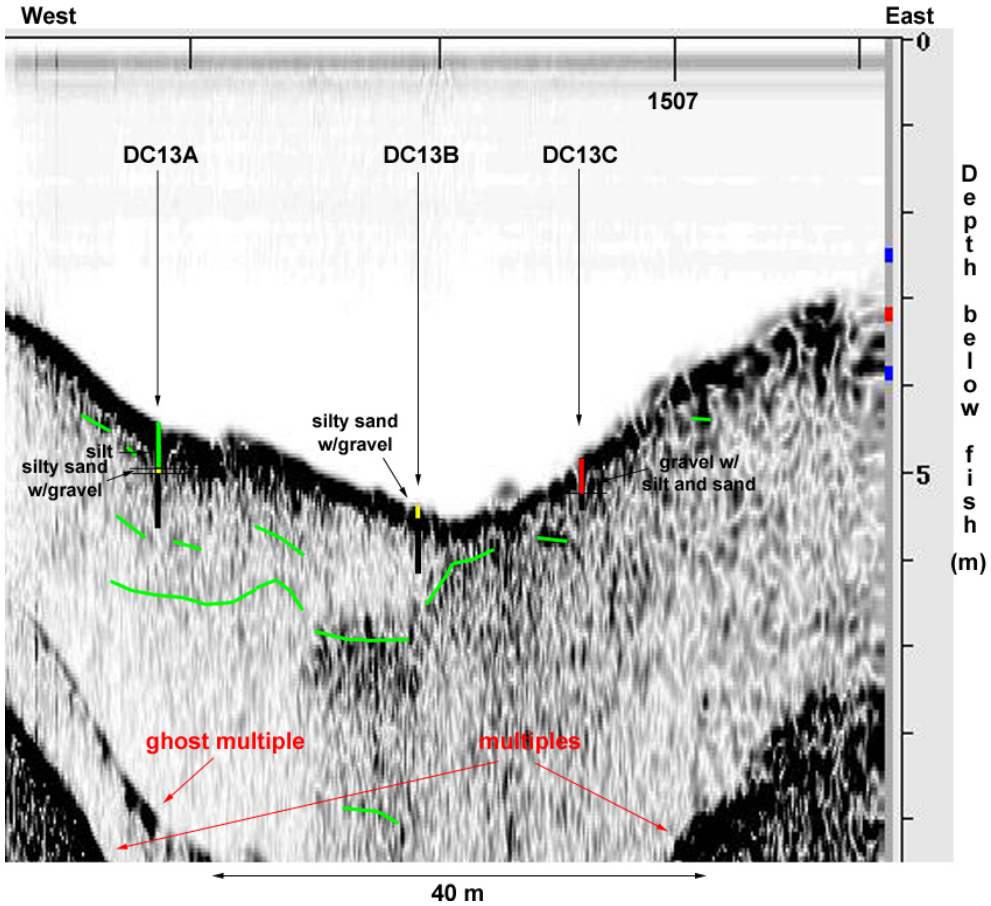


Figure 156. Chirp sub-bottom profile (Profile 13A) along Transect 13. Shown are deep cores DC13A, DC13B, and DC13C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 139. 1507 is time label for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

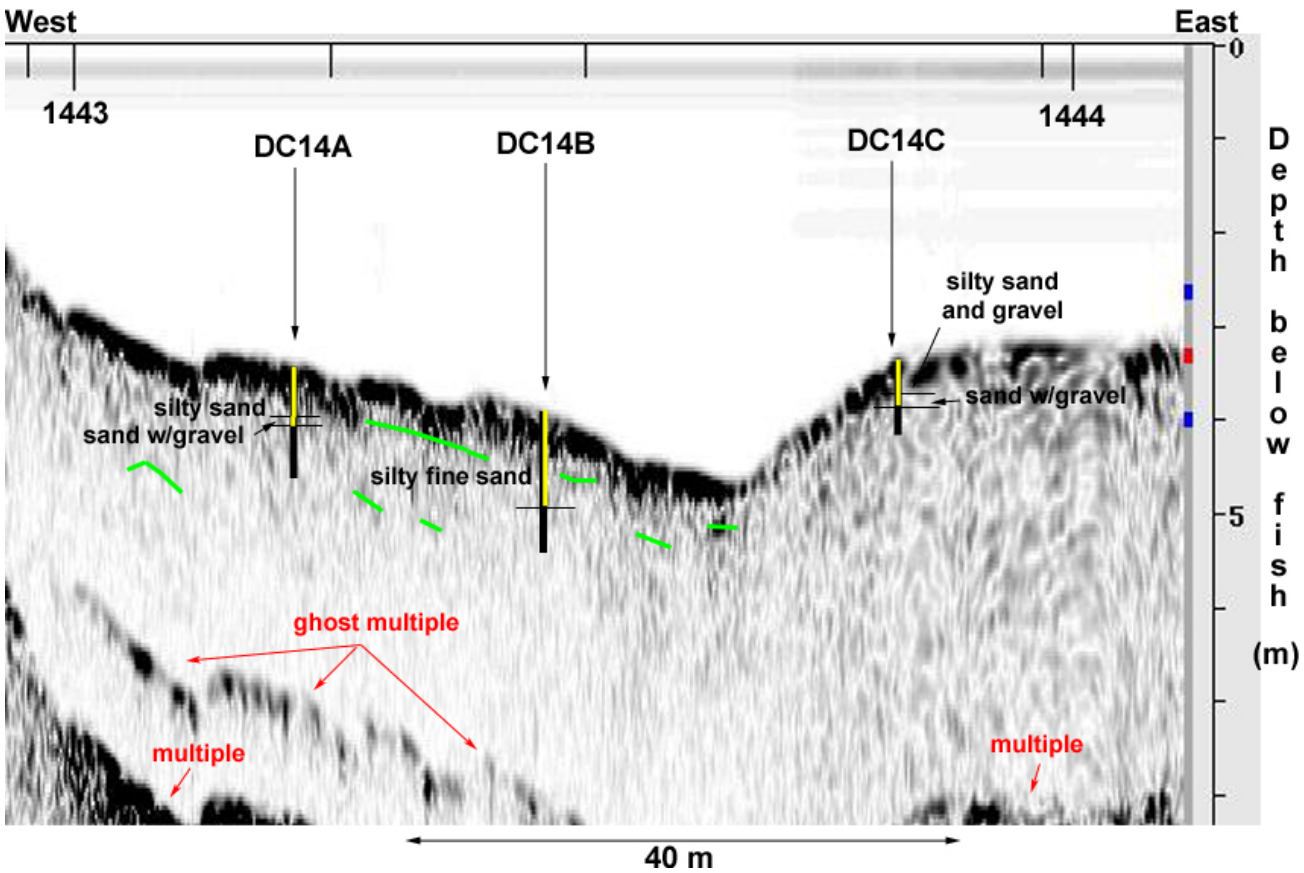


Figure 157. Chirp sub-bottom profile (Profile 14A) along Transect 14. Shown are deep cores DC14A, DC14B, and DC14C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 140. 1443 and 1444 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

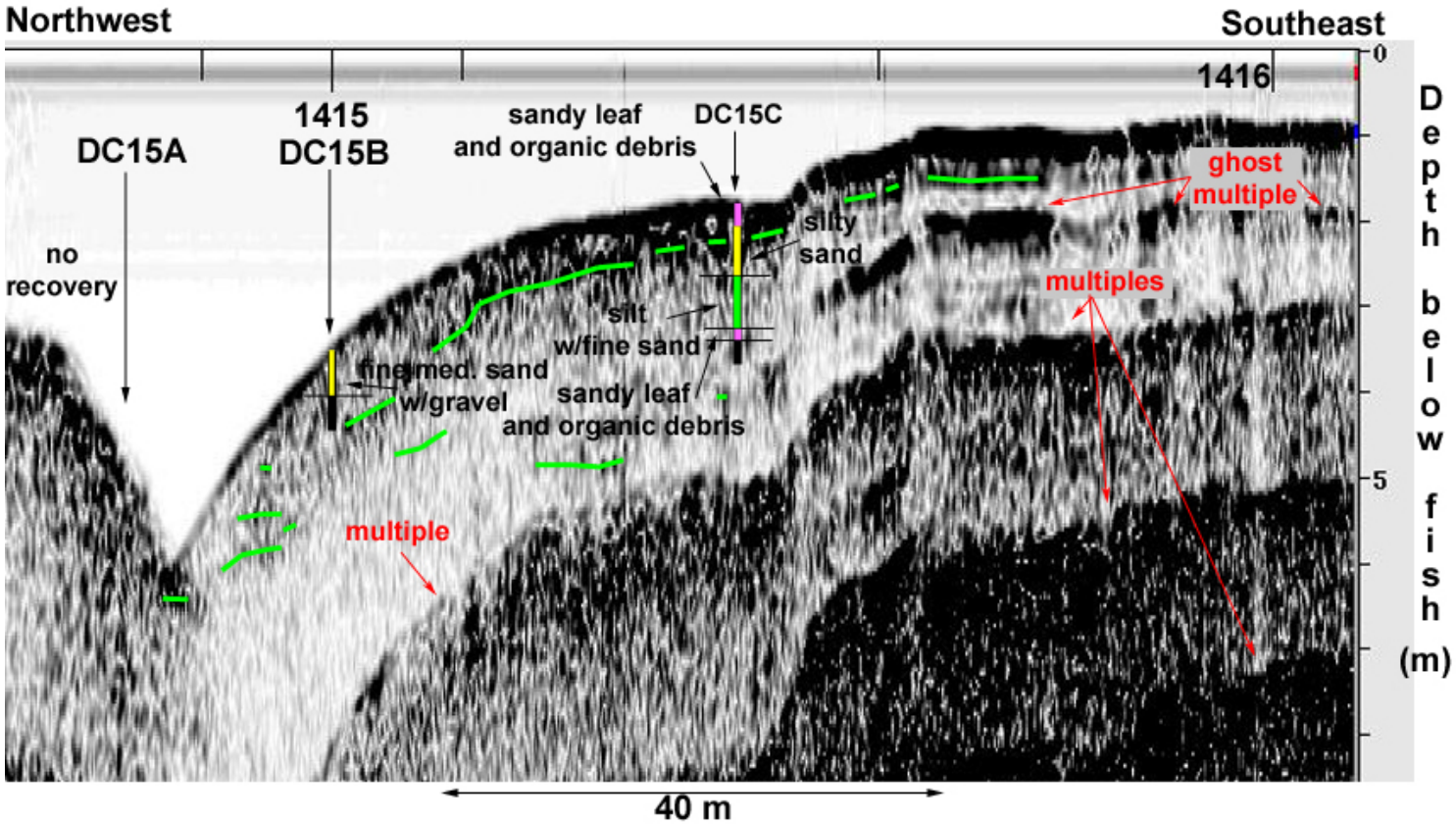


Figure 158. Chirp sub-bottom profile (Profile 15C) along Transect 15. Shown are deep cores DC15A, DC15B, and DC15C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 141. 1415 and 1416 are time labels for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

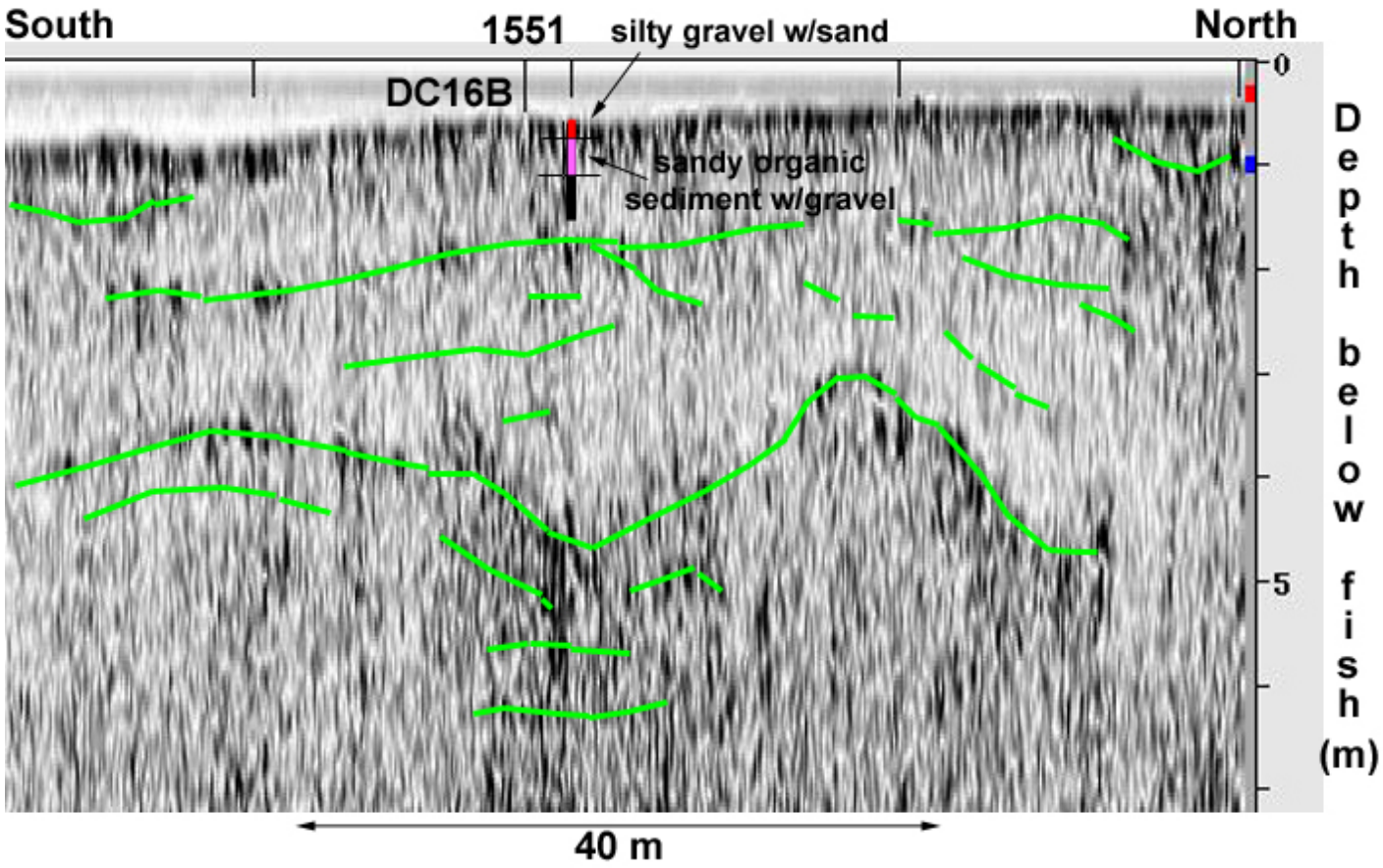


Figure 159. Chirp sub-bottom profile along deep core DC16B. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 142. 1551 is a time label for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

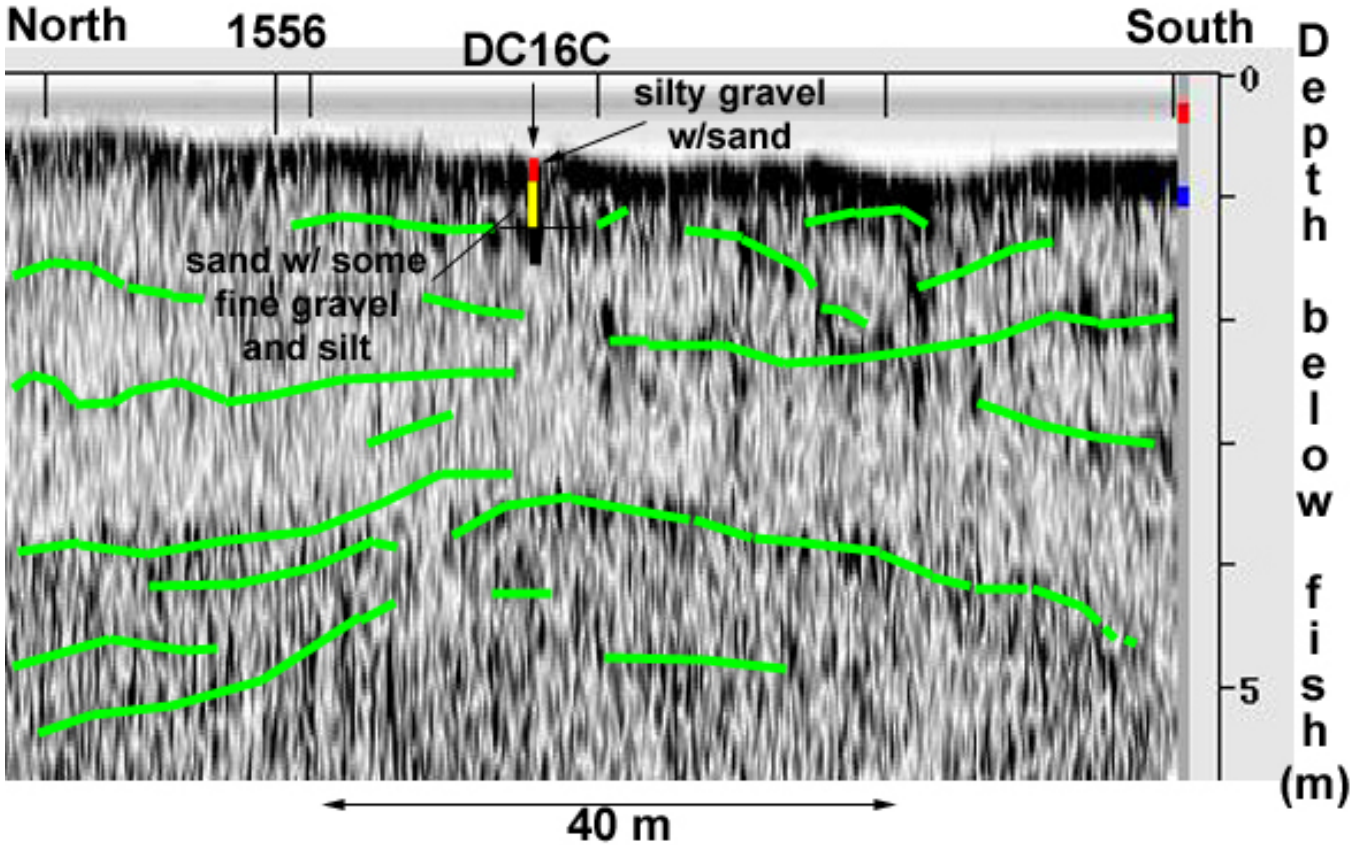


Figure 160. Chirp sub-bottom profile along deep core DC16C. Thick vertical lines indicate sediment types encountered in the cores. Colors correspond to: purple – peat, blue – clays, green – silts, yellow – sands, red – gravels, black – no recovery of sediments. Thinner green horizontal lines indicate major chirp sub-bottom reflections. Location of profile is shown in Figures 125 and 142. 1556 is a time label for the chirp trackline. Depth along chirp profile is given as meters below the chirp towfish.

IV. Project Conclusions

The gradiometer survey revealed 147 distinct magnetic anomalies, 9 of which are associated with non-car side scan sonar targets. The magnetic anomalies associated with the cars in the side scan sonar records were not included. Of those remaining 138 magnetic anomalies, 46 have magnetic signatures indicative of larger shallow objects. The remaining 92 magnetic anomalies have signatures indicative of large-deep objects or smaller shallow targets. The size of an object that can be considered a possible obstruction to future dredging operations from a mechanical standpoint depends on the dredging methodology used. Prior to future dredging operations, if any, the dredger should be consulted regarding mass of what is to be considered an obstruction to their operations. The magnetic targets to be impacted should be evaluated against this factor and the proposed dredge depth, and investigated further should they be determined to be an obstruction. Other than the magnetic anomaly associated with the potentially significant side scan sonar target, none of the targets located during the magnetometer survey were found to have images or signatures indicative of historically significant submerged cultural resources.

The side scan sonar survey identified 40 sonar targets were found that could pose a threat to future dredging operations, if dredging is deemed necessary. Of those, 16 targets with acoustic signatures similar in dimension and appearance to cars were detected. The majority of the car targets are clustered in the river in the vicinity of Newark, NJ. One car target was found considerably further upriver between the Conrail and Rutherford Ave. (Rt. 3) bridges. Though side scan sonar cannot guarantee that all of these 16 targets are automobiles, further investigation is recommended to determine the nature of the objects detected. Twenty-four other sonar targets were found that could be obstructions or pose a threat to future operations on the river. One sonar target, the remains of a vessel, should be investigated further should future project operations impact the site as it has the potential to be classified as a historically significant submerged cultural resource.

The simplified surficial seabed classification map was produced from a combined analysis of the side scan sonar mosaics, short core sampling program results, and Quester Tangent classification software. This map showed significant change occurs near the West Arlington railroad bridge. The riverbed downriver from this point can be described as primarily silt. Areas around bridges were found to have been scoured out and were less likely to have silt deposits. As the shorelines along the river have been 'improved' to help control erosion, many areas were found to have rock and gravel forming the edges of the river. Above this bridge, the riverbed is much more varied. Primarily, the center of the channel is either sand or a silt/sand combination. Areas of silt are present, though primarily limited to the depositional areas on the inside of the bends in the river. From just below the 8th Street Bridge in Wallington to the uppermost reach of the area surveyed, the riverbed consists primarily of sand and gravel, with large rock and boulders in certain areas. This section of the river is generally shallow with swift water flow.

The maximum depth of penetration of the chirp sonar was on the order of 25 feet with the greatest penetration depths occurring along the Kearny Point Reach. Additional areas along the river where depths of penetration deeper than 10 feet were observed included the area near the Arlington and Belleville Reaches. Based on an analysis of the chirp data, approximately 20 percent of the region surveyed along the Lower Passaic River had no significant penetration of chirp sound energy into the sub-bottom. Between 70 and 75 percent of the region surveyed with the chirp sonar was characterized by penetration into the sub-bottom to depths between 1 foot and 9 feet. Most of this region had penetration depths less than 6 feet. As documented in the shallow and deep cores, the predominant sediment type was silt and the major variations in the sediments were the amount of silt relative to clays, sands, and gravels. This variation in the silts could be correlated with most of the chirp sub-bottom reflections that were observed. Of the shallow (<1 foot to 2 feet) chirp reflection events, the occurrence of "soft" silts overlying either firmer/tighter silts or silts with fine sands was one of the most pronounced events observed.

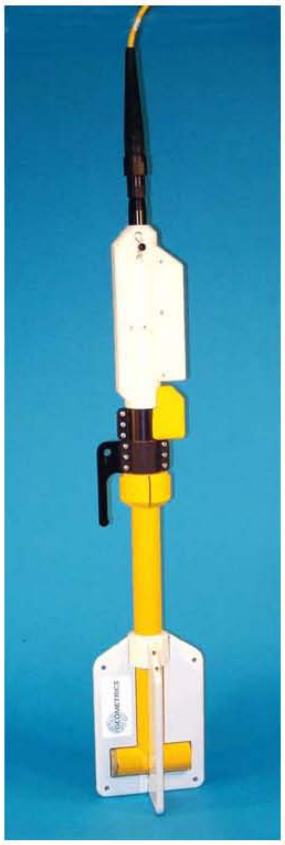
In an examination of the chirp profiles associated with the transects where the deep cores were obtained, there is a great deal of variability in the nature of the chirp reflection profiles. This variability, especially in depth of penetration and the continuity of reflection events, is in part due to the heterogeneity in the types of sediments that were observed in the cores. Although dominantly silts, the presence of organic-rich sediments (and leaf debris on the bottom) and varying amounts of gravels to graded sands, silts, and clays makes it difficult to correlate sediments from transect to transect along the various reaches of the river. This in turn affects the quality of the chirp profiles and the ability to trace individual reflection events between the transect areas, and even within a given transect area.

Appendix A

Equipment Specifications

G-882 MARINE MAGNETOMETER

- ***CESIUM VAPOR HIGH PERFORMANCE – Highest detection range and probability of detecting all sized ferrous targets***
- ***NEW STREAMLINED DESIGN FOR TOW SAFETY – Low probability of fouling in lines or rocks***
- ***NEW QUICK CONVERSION FROM NOSE TOW TO CG TOW – Simply remove a stainless steel locking pin, move tow point and reinsert. New easy carry handle built in!***
- ***NEW INTERNAL CM-221 COUNTER MODULE – Provides Flash Ram for storage of default parameters set by user***
- ***NEW ECHOSOUNDER / ALTIMETER OPTION***
- ***NEW DEPTH RATING – 4,000 psi !***
- ***HIGHEST SENSITIVITY IN THE INDUSTRY – 0.004 nT/Hz RMS with the internal CM-221 Mini-Counter***
- ***EASY PORTABILITY & HANDLING – no winch required- single man operation, 44 lbs with 200 ft cable (without weights or depressor wing)***
- ***COMBINE TWO SYSTEMS FOR INCREASED COVERAGE – Internal CM-221 Mini-Counter provides multi-sensor data concatenation allowing side by side coverage which maximizes detection of small targets and reduces noise***



G-882 with Weight Collar Depth Option

Very high resolution Cesium Vapor performance is now available has been incorporated into a low cost, small size system for professional surveys in shallow or deep water. High sensitivity and sample rates of total field measurements are maintained for all applications. The well proven Cesium sensor is combined with a unique new CM-221 Larmor counter and ruggedly packaged for small or large boat operation. Use your computer and standard printer with our MagLog Lite™ software to log, display and print GPS position and magnetic field data. Model G–882 is the lowest priced - highest performance fully operational marine mag system ever offered.

The G-882 is flexible for operation in small boat, shallow water surveys as well as deep tow applications (4,000 psi rating, telemetry over steel coax available to 10Km). Being small and lightweight (44 lbs net, no weights) it is easily deployed and operated by one man. But add several no-foul weight collars and the system can quickly weigh in at more than 100 lbs. Power may be supplied from a 24 to 30 VDC battery supply or the included 110/220 VAC power supply. The tow cable uses high strength Kevlar and it's length is standard at 200 ft (61 m) with optional cable up to 500m (no telemetry). The shipboard end of the tow cable is attached to a junction box or on-board cable for quick and simple hookup to power and output of data into any IBM PC computer. A rugged fiber-wound fiberglass housing provides selectable orientation of the sensor and therefore maintains operations throughout the world with only small limitations as to direction of survey in equatorial regions.

The G-882 Cesium magnetometer provides the same operating sensitivity and sample rates as the larger deep tow model G-880. MagLogLite™ Logging Software is offered with each magnetometer and allows recording and display of data and position with Automatic Anomaly Detection! Additional options include: MagMap2000 plotting and contouring software and post acquisition processing software MagPick™ (free from our website.)

The G-882 system is particularly well suited for the detection and mapping of all sizes of ferrous objects. This includes anchors, chains, cables, pipelines, ballast stone and other scattered shipwreck debris, munitions of all sizes, aircraft, engines and any other object with magnetic expression. Objects as small as a 5 inch screwdriver are readily detected provided that the sensor is close to the seafloor and within practical detection range.(Refer to table at right).

The design of this special marine unit is directed toward the largest number of user needs. It is not intended to meet all marine requirements such as deep tow through long cables or monitoring fish altitude. Rugged design with highest performance at lowest cost are the goals.

Typical Detection Range For Common Objects

Ship 1000 tons	0.5 to 1 nT at 800 ft (244 m)
Anchor 20 tons	0.8 to 1.25 nT at 400 ft (120 m)
Automobile	1 to 2 nT at 100 ft (30 m)
Light Aircraft	0.5 to 2 nT at 40 ft (12 m)
Pipeline (12 inch)	1 to 2 nT at 200 ft (60 m)
Pipeline (6 inch)	1 to 2 nT at 100 ft (30 m)
100 KG of iron	1 to 2 nT at 50 ft (15 m)
100 lbs of iron	0.5 to 1 nT at 30 ft (9 m)
10 lbs of iron	0.5 to 1 nT at 20 ft (6 m)
1 lb of iron	0.5 to 1 nT at 10 ft (3 m)
Screwdriver 5 inch	0.5 to 2 nT at 12 ft (4 m)
1000 lb bomb	1 to 5 nT at 100 ft (30 m)
500 lb bomb	0.5 to 5 nT at 50 ft (16 m)
Grenade	0.5 to 2 nT at 10 ft (3 m)
20 mm shell	0.5 to 2 nT at 5 ft (1.8 m)

MODEL G-882 CESIUM MARINE MAGNETOMETER SYSTEM SPECIFICATIONS

OPERATING PRINCIPLE:	Self-oscillating split-beam Cesium Vapor (non-radioactive)
OPERATING RANGE:	20,000 to 100,000 nT
OPERATING ZONES:	The earth's field vector should be at an angle greater than 6° from the sensor's equator and greater than 6° away from the sensor's long axis. Automatic hemisphere switching.
CM-221 COUNTER SENSITIVITY:	<0.004 nT/√Hz rms. Typically 0.02 nT P-P at a 0.1 second sample rate or 0.002 nT at 1 second sample rate. Up to 10 samples per second
HEADING ERROR:	±1 nT (over entire 360° spin and tumble)
ABSOLUTE ACCURACY:	<3 nT throughout range
OUTPUT:	RS-232 at 9600 Baud
MECHANICAL:	
Sensor Fish:	Body 2.75 in. (7 cm) dia., 4.5 ft (1.37 m) long with fin assembly (11 in. cross width), 40 lbs. (18 kg) Includes Sensor and Electronics and 1 main weight. Additional collar weights are 14lbs (6.4kg) each, total of 5 capable
Tow Cable:	Kevlar Reinforced multiconductor tow cable. Breaking strength 3,600 lbs, 0.48 in OD, 200 ft maximum. Weighs 17 lbs (7.7 kg) with terminations.
OPERATING TEMPERATURE:	-30°F to +122°F (-35°C to +50°C)
STORAGE TEMPERATURE:	-48°F to +158°F (-45°C to +70°C)
ALTITUDE:	Up to 30,000 ft (9,000 m)
WATER TIGHT:	O-Ring sealed for up to 9000 ft (2750 m) depth operation
POWER:	24 to 32 VDC, 0.75 amp at turn-on and 0.5 amp thereafter
ACCESSORIES:	
Standard:	CM-201 View Utility Software operation manual and ship case
Optional:	Telemetry to 10Km coax, gradiometer (longitudinal or transverse)
MagLog Lite™ Software:	Logs, displays and prints Mag and GPS data at 10 Hz sample rate. Automatic anomaly detection and single sheet Windows printer support

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE ***4/03***

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Chaoyangmenwai Dajie, Chaoyang District, Beijing, China 100020
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GEOMETRICS

FULL SPECTRUM
SUB-BOTTOM PROFILER

X-STAR

Sub-Bottom Profiler Shallow Tow System

X-STAR is a high resolution wideband Frequency Modulated (FM) sub-bottom profiler utilizing EdgeTech's proprietary FULL SPECTRUM™ CHIRP technology. The system transmits a FM pulse that is linearly swept over a full spectrum frequency range (for example 2-16 kHz for 20 milliseconds.) The acoustic return received at the hydrophones is passed through a pulse compression filter, generating high resolution images of the sub-bottom stratigraphy in oceans, lakes, and rivers.

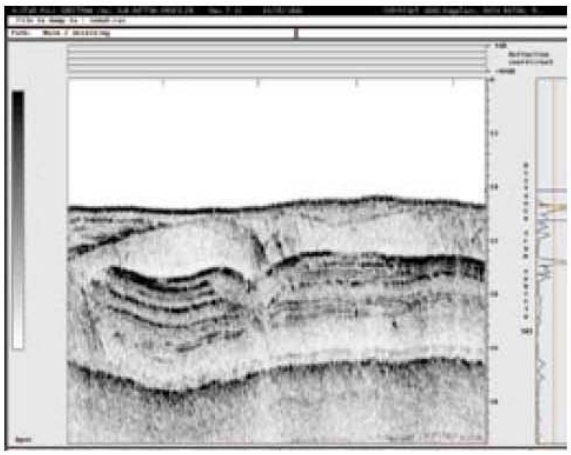
Because the FM pulse is generated by a digital to analog converter with a wide dynamic range and a transmitter with linear components, the energy, amplitude, and phase characteristics of the acoustic pulse are precisely controlled. This precision results in high repeatability and signal definition required for sediment classification.

Several stable, low drag tow vehicles are available that contain wide band transmitter arrays and sensitive line array receivers that can operate in water depths up to 300 meters. The selection of tow vehicle depends on the sub-bottom characteristics and resolution required.

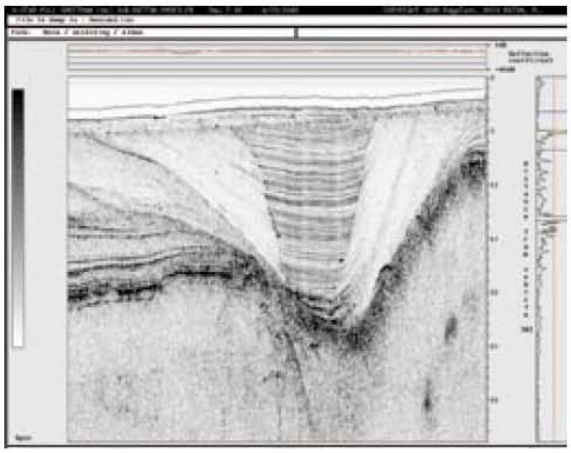
Full Spectrum Benefits

FM pulses have been used in radar for over 30 years and are sometimes called chirp or swept frequency pulses. Its application in sonar systems has come with the availability of high speed Digital Signal Processors (DSP).

Full Spectrum signal processing technology uses a proprietary matched filter to process wideband signals. This matched filter uses special amplitude and phase weighting functions for the transmitted pulse and a pulse compression filter that maximizes the Signal to Noise Ration (SNR) of the acoustic images over a wide band of operating frequencies. These X-STAR signal processing features provide a significant SNR improvement in the acoustic image generated by other impulse and chirp sonars with band limiting components that are limited in dynamic range.



Unequalled images that combine good penetration and high resolution. 20-30 dB improved SNR over conventional systems by using Full Spectrum (FM) Pulses.



• EEZ resource development • Geo-technical surveys • Hazard surveys • Environmental site investigations • Geological studies • Sediment classification • Buried object location • Search and recovery • Locate and map buried pipelines and cables • Mining and dredging surveys • Bridge and shoreline scour surveys

EdgeTech®
THE SOUND SOLUTION

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One of the outstanding aspects of Full Spectrum signal processing is the use of a broad bandwidth transmitting pulse that sweeps out over a range of frequencies. This generates a great deal of acoustic energy in the water. Instead of trying to operate with one very sharp acoustic peak pulse, like conventional CW systems, the Full Spectrum sonar spreads the transmission out over a long time duration. In addition, to the resolution improvement, the process of correlation processing achieves a signal processing gain over the background noise. To equal the typical performance of the Full Spectrum sonar pulse, conventional pulsed sonar would have to operate at a peak pulse power 100 times higher than the Full Spectrum pulse.

Normally, when using long pulses the resolution of the seabed is lost. Resolution of the seabed is regained after correlation processing the received signal. This is because the output of the correlation is a very sharp wavelet that has duration of the order of the inverse of the sweep bandwidth. Thus, the more bandwidth used, the sharper this pulse will become.

Another important feature, which enhances the ability of the Full Spectrum Sub-bottom Profiler system to classify sediments, is realized by the built-in de-convolution of the system response from the output pulse. The sonar's system impulse response is measured at the factory and is used to design a unique output pulse that will prevent the source from ringing. In addition to this, the Full Spectrum wavelet is weighted in the frequency domain to have a Gaussian like shape. As the Gaussian shaped spectrum is attenuated by the sediment, energy is lost but its bandwidth is preserved. Thus, even after being attenuated by 20 meters of sand, the Full Spectrum pulse has approximately the same resolution as a non-attenuated pulse.

The Full Spectrum Sonar side lobes are greatly reduced in the effective transducer aperture. The wide bandwidth of the sweep frequency smears the side lobes of the transducer and thus achieving a beam pattern with virtually no side lobes. The effective spatial beam width obtained after processing the Full Spectrum sub-bottom pulse is typically 20 degrees measured to the -3db points. This feature is clear when inspecting the Full Spectrum records. Since the transmitted pulse is highly repeatable and its peak amplitude is precisely known, the sediment reflective values can be estimated from the peak pulse amplitude measurements of the bottom returns.

Use different tow vehicles for desired penetration and resolution. The topside portion remains the same. The FM pulse is user selected based on the sub-bottom conditions at the survey site and the type of sub-bottom features that need to be imaged.

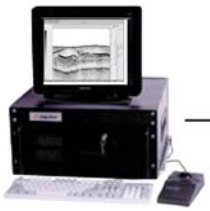
Configuration

The X-STAR sub-bottom profiler has a separate transmitter(s) constructed from wideband piston type transducers and separate acoustic receivers that are a discrete line array of PZT crystals. Separate receiving and transmitting arrays are used to preserve linearity and to allow simultaneous transmission and reception. The acoustic sensors are mounted in tow vehicles designed for profiling at ship speeds varying from 0 (drifting) to 7 knots.

X-STAR is designed for modular deployment. The heart of the system is a Signal Amplifier and Processor (Model FS-SB). It is here where the Full Spectrum signal is generated for output and filtered on reception. One of four tow vehicles may be connected. While EdgeTech supplies its own Topside Display Processor (Model TD-SB), it is also possible to interface other 3rd Party Topsides. EdgeTech has entered into agreements with several Topside Manufactures who support the EdgeTech Full Spectrum products.

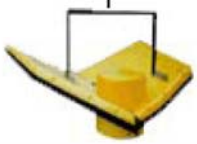
Contact EdgeTech for X-STAR systems that are available in several other deployment options; Hull Mount, Deep Towed, ROV Mounted, and AUV/UUV Mounted.

FULL SPECTRUM
SUB-BOTTOM PROFILER



Topside Processor

FS-SB Full Spectrum
Signal Processor



Towfish Model	SB-424	SB-216S	SB-0512	SB-0408
Frequency Range	4-24 kHz	2 - 16 kHz	500 Hz - 12 kHz	400 Hz - 8 kHz
Pulse Type	FM	FM	FM	FM
Standard Pulse Bandwidths / Length (other custom pulses available)	3-24 kHz / 10 ms 4-24 kHz / 10 ms 4-20 kHz / 10 ms 4-16 kHz / 10 ms	2-15 kHz / 20 ms 2-12 kHz / 20 ms 2-10 kHz / 20 ms	2-12 kHz / 20 ms 2-10 kHz / 20 ms 2-8 kHz / 40 ms 1.5-7.5 kHz / 40 ms 1-6 kHz / 40 ms 1-5 kHz / 40 ms 0.5-5 kHz / 40 ms	1.5-10 kHz / 20 ms 1-7 kHz / 40ms 1-6 kHz / 40 ms 0.7-4.5 kHz / 40 ms 0.6-3.0 kHz / 40 ms 0.4-2.4 kHz / 40 ms
Vertical Resolution	4 cm / 4-24 kHz 6 cm / 4-20 kHz 8 cm / 4-16 kHz	6 cm / 2-15 kHz 8 cm / 2-12 kHz 10 cm / 2-10 kHz	8 cm / 2-12 kHz 12 cm / 1.5–7.5 kHz 19 cm / 1- 5 kHz	9 cm / 1.5 kHz-10 kHz 15 cm / 1-6 kHz 37 cm / 0.4-2.4 kHz
Penetration (typical)				
in coarse calcareous sand	2	6	20	40
in clay	40	80	200	300
Beam Width (depends on center frequency)	16° / 4-24 kHz 19° / 4-20 kHz 23° / 4-16 kHz	17° / 2-15 kHz 20° / 2-12 kHz 24° / 2-10 kHz	16° / 2-12 kHz 24° / 1.5–7.5 kHz 32° / 1- 6 kHz	10° / 1.5 kHz-10 kHz 14° / 1-7 kHz 37° / 0.4-2.4 kHz
Transmitters	1	1	4	2
Receive Arrays	2	2	4	8
Size (centimeters)	77L x 50W x 34H	105L x 67W x 46H	210L x 134W x 46H	249 L x 214W x 91
Weight (kilograms)	22	44	186	364
Shipping weight (kg.)	82	122	288	consult factory
dimension (cm.)	L89 x W64 x H54	L115 x W79 x H59	L172 x W137 x H58	
Cable Requirements	3 shielded twisted pairs (5 used)	same	same	3 shielded twisted pairs (all used)
Max Depth (meters)	300	300	300	300
GeoStar Interface	Yes	Yes	No	No

Other System Specifications

Tow Speed	3-5 knots optimal, 7 knots maximum safe operational
MaximumTow Fish Operating Depth	300 meters (1,000 feet)
Optimum tow height	3 to 5 meters above seafloor
Calibration	Each system is acoustic tank tested to calibrate for reflection coefficient measurements

FULL SPECTRUM
SUB-BOTTOM PROFILER

FS-SB Full Spectrum Processor

Main Processor	Intel CPU with high speed PCI bus
Digital Signal Processor	TMS320
Memory	32 MB RAM
Storage	Hard drive, CD-ROM, floppy disk
Operating System	Windows® 98
I/O to Topside Processor	Ethernet
A/D	Analog Input, 16 bit resolution, 200 kHz max. sampling rate
D/A	Analog Output,16 bit resolution, 200 kHz max. sampling rate
Pulse Type	Full Spectrum (Frequency Modulated with amplitude and phase weighting)
Pulse Trigger	Internal or External
Pulse Repetition	0.5 to 12 Hz
Trigger In	TTL negative edge triggered (Middle BNC)
Trigger Out	TTL negative edge triggered. Minimum 5ms long pulse (Lower BNC)
Sampling Rate	Typically 20, 25, 40, or 50 kHz depending on the pulse upper frequency
Acoustic Power	212 dB ref 1μPa peak at center frequency of system
Input Power	120 or 220 VAC Auto Sensing
Power Amplifier	Type: Two channel, Gain: 33dB per channel, Power output: 2000 Watts peak, Power input: 110-120V/60Hz or 220-240 V/50Hz Manually Switchable
Topside Display Processors w/ Support	EdgeTech, CODA Technologies Ltd., Sea Corp., TEI Inc.
Environment	Temperature: 0 to 40°C, Humidity: 5% to 95% relative, Vibration: Normal ship environment
Enclosure	Portable steel case suitable for transit. Unit can be removed from case and mounted in a 19" rack. Size: 50W x 60D x 33H cm. (19.5x23.5x13 in), Weight: 46 kg (102 lbs.)
Shipping Containers	Size: 109L x 79W x 71H cm. (43x31x28 in), Weight: 150 kg (330 lbs.) Material: Sealed high impact polyurethane case

EdgeTech Topside Display Processor

Options	Diagnostics Kit (Video Display, Keyboard, Mouse), Spare Parts Kit, Optional Pulses
Main processor	SPARC Workstation
Operating System	UNIX
Display	17" Color Monitor
Operator Controls	A/D Gain, Two Stage TVG, Bottom Tracking, Digital Gain, Preamplifier Gain, Horizontal and Vertical Zoom, Direct Path Suppression, Swell Filter, Annotation
Video Displays	Bottom Tracking, Reflection Coefficient, Signal Amplitude, Navigation Map, Scale Lines, Track Lines
Navigation	NMEA 0183, X/Y, N/E, Navigation I/O Utility, Track lines, Event/Fix Marks, Sediment Classification Color vs. Echo Strength
Annotation	Keyboard, RS232 Port
Event Mark	Via Keyboard, Switch Closure, RS232 Port
Printer Support	EPC Models 9800, 8300, 1086, HSP-100, ODECO Model 850 & 1200F, Alden Model 9315 CTP, Ultra Model 183/200
Mass Storage	DAT
I/O Ports	Ethernet, Serial, SCSI, Parallel, Event Mark, Keyboard, Trackball, External Trigger In, Trigger Out, Heave Compensation Input
Power	105-125VAC or 210-250VAC, selectable, 47-63 Hz
Enclosure	Portable steel case suitable for transit. May be removed from cases and installed in 19-inch rack. Size: 50.3W x 50.3D x 15.3H cm. (19.8 x 19.8 x 6 in.), Weight: 32 kg (71 lbs.)
Environment	Temperature: Operating 5°C to 40°C Non-operating -40°C to 45°C. Humidity: Operating 20% to 80% relative humidity, non-condensing. Non-operating 5%-95%. Vibration: Normal ship environment.
Options	Spare Parts Kit, Replay Software, Ethernet Output of Data, Dual Mass Storage, Software Services Agreement

Specifications subject to change without notice.

EdgeTech®
THE SOUND SOLUTION

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MS750

Dual Frequency RTK Receiver for Precise Dynamic Positioning

Key features and benefits

- **20 Hz position update rate**
- **Less than 20 milliseconds position latency**
- **Centimeter-level position accuracy**
- **Front panel display & keypad for status monitoring and configuration**
- **User-defined local coordinates direct from receiver**
- **Industry standard CAN bus interface**

The MS750™ represents the highest level of accuracy and response available from a dual frequency GPS receiver. The receiver is specifically designed to allow the easy integration of reliable centimeter-level positions to any guidance or control application.

Dual Frequency RTK Receiver for Precise Dynamic Positioning

Accuracy and Response Times

Dynamic platforms, require virtually instantaneous position reports multiple times per second. The MS750 delivers positions to guidance or control loop software twenty times per second with a latency of less than 20 milliseconds. This responsiveness is matched with a horizontal accuracy of two centimeters and vertical accuracy of three centimeters. For the most precise applications, the MS750 provides one centimeter accuracy horizontally at a 5 Hz rate with a small increase in latency.

Interfacing and Configuration Ease

The MS750 is designed to plug right into your application with minimal development. An easy to-use application file interface enables the user to completely program receiver operation with a single command. Alternately, the receiver can be configured via the user-friendly built-in display and keyboard interface, or by the included Windows-based Configuration Toolbox software. Multiple configurations can be stored in the receiver as files and activated when desired. Local datum and transformation parameters may be loaded directly into the receiver. Therefore, output grid coordinates are compatible with GPS and traditional survey systems that may be in use on the same site. ASCII or Binary messages may be output through any of the three bi-directional serial ports. The receiver also includes support for the industry standard CAN (Controller Area Network) interface.

Advanced Technology

The accuracies, update rates and latencies available in the MS750 are made possible through a GPS architecture specifically designed for demanding dynamic positioning applications. Reliable operation in the most adverse environments, such as radio interference experienced at construction or mining sites, is a strict requirement. Custom designed hardware with Supertrak™ multibit GPS signal technology and Everest™ advanced multipath suppression provide superior tracking especially for weaker, low elevation satellites.

Both the RTCM format for differential GPS corrections and Trimble's published Compact Measurement Record (CMR) differential data can be received simultaneously, allowing the receiver to choose the optimum source and provide seamless navigation. Available as an option is the ability to calculate the baseline vector between two moving receivers to centimeter accuracy. The MS750 addresses a vast range of applications in the field of machine positioning, guidance and control.

Trimble

MS750

Dual Frequency RTK Receiver for Precise Dynamic Positioning

STANDARD FEATURES

- Centimeter accuracy, real-time positioning
- 20 Hz position updates
- < 20 ms position latency
- Front panel display & keypad
- User-defined local coordinates direct from receiver
- 3 serial I/O ports
- 2 CAN ports
- 1 PPS Output
- Trimble CMR Input/Output
- RTCM Input/Output
- One year hardware warranty
- Compact, easy mounting design
- Synchronized 5 Hz position updates

OPTIONS AND ACCESSORIES

- Moving Base RTK
- Rugged L1/L2 machine mount antenna
- Micro-Centered Antenna
- 5 m, 7.5 m, 10 m, 24 m & 30 m antenna cables
- Data extension cable
- Extended hardware warranty
- Firmware and Software update service

ORDERING INFORMATION

MS750 **Part Number 36577-00**

Includes MS750 receiver, Configuration Toolbox software, operating manual, power/data cable, data/1 PPS cable

PHYSICAL CHARACTERISTICS

Size	14.5cmW × 5.1cmH × 23.9cmD (5.7²W × 2.0² H × 9.4²D)
Weight	1.0 kg (2.25 lbs)
Power	12VDC/24VDC, 9 Watts

ENVIRONMENTAL CHARACTERISTICS

Operating temp	-20°C to +60°C
Storage temp	-30°C to +80°C
Humidity	MIL 810 E, Meth. 507.3 Proc III, Aggravated, 100% condensing
Vibration	MIL 810 D, Tailored Random 3gRMS Operating Random 6.2gRMS Survival
Mechanical Shock	MIL 810 D ± 40 g Operating ± 75 g Survival
EMC	
Radiated Emissions	CISPR 12
Conducted Emissions	SAE J1113/41
Radiated Immunity	ISO/DIS 13766, 30V/m
ESD	±15KV
Input Voltage Transients	ISO 7637-2

TECHNICAL SPECIFICATIONS

Tracking	9 channels L1 C/A code, L1/L2 full cycle carrier Fully operational during P-code encryption		
Signal processing	Supertrak Multibit Technology Everest Multipath Suppression		
Positioning mode	**Accuracy**[1]	**Latency**[2]	**Max Rate**
Synchronized RTK	1cm+ 2ppm Horizontal 2cm+ 2 ppm Vertical	300ms[3]	5 Hz Std
Low Latency	2cm+ 2ppm Horizontal[4] 3cm+ 2 ppm Vertical	< 20ms	20Hz
DGPS	< 1m	< 20ms	20Hz

[1] 1 sigma level
[2] At maximum output rate
[3] Dependent on data link throughput
[4] Assumes 1 second data link delay

Initialization	Automatic OTF (on-the-fly) while moving
Time required	Typically < 1 minute
Range	Up to 20 km from base for RTK
Start-up	< 90 seconds from power on to positioning < 30 seconds with recent ephemeris
Communications	3 × RS-232 ports. Baud rates up to 115,200 2 × CAN/J1939
Configuration	Via front panel display & keypad, Configuration Toolbox Software or user definable application files
Output Formats	NMEA-0183: GGK, GGA, ZDA, VTG, GST, PJT and PJK Trimble Binary Streamed Output

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YOUR LOCAL TRIMBLE OFFICE OR REPRESENTATIVE

Trimble 5700 GPS System

One receiver, many configurations, for greater flexibility and choice

The Trimble® 5700 GPS receiver is an advanced, but easy-to-use, surveying instrument that is rugged and versatile enough for any job.

Combine your 5700 with the antenna and radio that best suit your needs, and then add the Trimble controller and software of your choice for a total surveying solution. The powerful 5700 GPS system will provide all the advanced technological power and unparalleled flexibility you need to increase your efficiency and productivity in any surveying environment.

Advanced GPS receiver technology

The 5700 is a 24-channel dual-frequency RTK GPS receiver featuring the advanced Trimble Maxwell™ technology for superior tracking of GPS satellites, increased measuring speed, longer battery life through less power use, and optimal precision in tough environments. WAAS and EGNOS capability lets you perform real-time differential surveys to GIS grade without a base station.

Modular design for versatility

For topographic, boundary, or engineering surveying, clip the receiver to your belt, carry it in a comfortable backpack, or configure it with all components on a lightweight range pole. With the receiver attached to your site vehicle, you can survey a surface as fast as you can drive! For control applications, attach the receiver to a tripod...it's designed to work the way your job requires.

Full metal jacket...and lightweight

The 5700 GPS receiver boasts the toughest mechanical and waterproofing specs in the business. Its magnesium alloy case is stronger than aluminum, but also 30% lighter—the 5700 weighs just 1.4 kg (3 lb) with batteries. Whether you're collecting control points on a tripod, or scrambling down a scree slope collecting real-time kinematic data, the receiver is light enough and tough enough to carry on performing.

Fast and efficient data storage and communications

Use the receiver's CompactFlash memory to store more than 3,400 hours of continuous L1/L2 data collection at an average of 15-second intervals. Transfer data to a PC at speeds of more than 1 megabit per second through the super-fast USB port. Your choice of UHF radio modem is built in to the receiver to provide RTK communications receiving without the need for cables or extra power!

Your choice of Trimble antenna

Choose the high-accuracy Trimble GPS antenna that best suits your needs: the lightweight and portable Zephyr™ antenna for RTK roving, or the Zephyr Geodetic™ antenna for geodetic surveying.

The Zephyr Geodetic antenna offers submillimeter phase center repeatability and excellent low-elevation tracking, while the innovative design of its Trimble Stealth™ ground plane literally burns up multipath energy using technology similar to that used by stealth aircraft to hide from radar. The Zephyr Geodetic antenna thus provides unsurpassed accuracy from a portable antenna.

Key Benefits

- Industry-leading technology provides superior performance
- Flexible configurations put you in total control
- Rugged, high-performance hardware is built to last
- With the Trimble controller and software of your choice, enjoy seamless integrated surveying

Trimble.

Trimble 5700 GPS System

General

- Front panel for on/off, one-button-push data logging, CompactFlash card formatting, ephemeris and application file deletion, and restoring default controls
- LED indicators for satellite tracking, radio-link, data logging, and power monitoring
- Tripod clip or integrated base case

Performance specifications

Measurements

- Advanced Trimble Maxwell technology
- High-precision multiple correlator L1 and L2 pseudorange measurements
- Unfiltered, unsmoothed pseudorange measurement 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 <1 mm precision in a 1 Hz 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[1]

Horizontal . . . . . ±(0.25 m + 1 ppm) RMS
Vertical . . . . . ±(0.5 m + 1 ppm) RMS
WAAS differential positioning accuracy typically <5 m 3DRMS[2]

Static and FastStatic GPS surveying[1]

Horizontal . . . . . ±5 mm + 0.5 ppm RMS
Vertical . . . . . ±5 mm + 1 ppm (× baseline length) RMS

Kinematic surveying[1]

Real-time and postprocessed kinematic surveys
Horizontal . . . . . ±(10 mm + 1 ppm) (× baseline length) RMS
Vertical . . . . . ±(20 mm + 1 ppm) RMS
Initialization time . . . . . Single/Multi-base minimum 10 sec + 0.5 times baseline length in km, up to 30 km
Scalable GPS infrastructure initialization time . . . . . <30 seconds typical anywhere within coverage area
Initialization reliability[3] . . . . . typically >99.9%

Hardware

5700 GPS receiver

Physical:
Casing . . . . . Tough, lightweight, fully sealed magnesium alloy
Waterproof . . . . . Tested to IPX7 standards
Shock and vibration . . . . . Tested and meets the following environmental standards:
Shock . . . . . MIL-STD-810F to survive a 1 m (3.28 ft) drop onto concrete
Vibration . . . . . MIL-STD-810-F on each axis
Weight . . . . . With internal batteries, internal radio, internal battery charger, standard UHF antenna: 1.4 kg (3 lb)
As entire RTK rover with batteries for greater than 7 hours, less than 4 kg (8.8 lb)
Dimensions (W×H×L) . . . . . 13.5 cm × 8.5 cm × 24 cm (5.3 in × 3.4 in × 9.5 in)

Electrical:
Power . . . . . DC input 11 to 28 V DC with over voltage protection
Power consumption . . . . . 2.5 W receiver only, 3.75 W including internal radio
Battery . . . . . Greater than 10 hours data logging, or greater than 7 hours of RTK operation on two internal 2.0 Ah lithium-ion batteries
Battery weight . . . . . 0.1 kg (3.5 oz)
Battery charger . . . . . Internal with external AC power adapter; no requirement for external charger
Power output . . . . . 11.5 to 20 V DC (Port 1), 11.5 to 27.5 V DC (Port 3) on external power input
Certification . . . . . Class B Part 15 FCC certification, CE Mark approved, C-Tick approved, Canadian FCC

Environmental:
Operating temperature[4] . . . . . –40 °C to 65 °C (–40 °F to 149 °F)
Storage temperature . . . . . –40 °C to 80 °C (–40 °F to 176 °F)
Humidity . . . . . 100%, condensing

Communications and data storage:

- 2 external power ports, 2 internal battery ports, 3 RS232 serial ports
- Integrated USB for data download speeds in excess of 1 Mb per second
- External GPS antenna connector
- CompactFlash advanced lightweight and compact removable data storage. Options of 64 MB or 128 MB from Trimble
- More than 3,400 hours continuous L1+L2 logging at 15 seconds with 6 satellites typical with 128 MB card
- Fully integrated, fully sealed internal UHF radio modem option
- GSM, cellphone, and CDPD modem support
- Dual event marker input capability
- 1 Hz, 2 Hz, 5 Hz, and 10 Hz positioning and data logging
- 1 pulse per second output capability
- CMRII, CMR+, RTCM 2.*x* and 3.*x* input and output standard
- 14 NMEA outputs

Zephyr antenna

Dimensions . . . . . 16.2 cm (6.38 in) diameter × 6.2 cm (2.44 in) height
Weight . . . . . 0.55 kg (1.20 lb)
Operating temperature . . . . . –40 °C to 70 °C (–40 °F to 158 °F)
Humidity . . . . . 100% humidity proof, fully sealed
Shock and vibration . . . . . Tested and meets the following environmental standards:
Shock . . . . . MIL-STD-810-F to survive a 2 m (6.56 ft) drop onto concrete
Vibration . . . . . MIL-STD-810-F on each axis

- 4-point antenna feed for submillimeter phase center repeatability
- Integral low noise amplifier
- 50 dB antenna gain

Zephyr Geodetic antenna

Dimensions . . . . . 34.3 cm (13.5 in) diameter × 7.6 cm (3 in) height
Weight . . . . . 1.31 kg (2.88 lb)
Operating temperature . . . . . –40 °C to 70 °C (–40 °F to 158 °F)
Humidity . . . . . 100% humidity proof, fully sealed
Shock and vibration . . . . . Tested and meets the following environmental standards:
Shock . . . . . MIL-STD-810-F to survive a 2 m (6.56 ft) drop onto concrete
Vibration . . . . . MIL-STD-810-F on each axis

- 4-point antenna feed for submillimeter phase center repeatability
- Integral low noise amplifier
- 50 dB antenna gain
- Trimble Stealth ground plane for reduced multipath

1 Accuracy may be subject to conditions such as multipath, obstructions, satellite geometry, and atmospheric parameters. Always follow recommended survey practices.
2 Depends on WAAS/EGNOS system performance.
3 May be affected by atmospheric conditions, signal multipath, and satellite geometry. Initialization reliability is continuously monitored to ensure highest quality.
4 Receiver operates normally to –40 °C (–40 °F) but some office-based functions such as USB download or internal battery charging are not recommended at temperatures below freezing.

Specifications subject to change without notice.

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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

Table 1 – Magnetic Anomalies

CENTUTION$_{TM}$ Splash Proof

Marine Sonic Technology, Ltd.
5508 George Washington Memorial Highway
P.O. Box 730
White Marsh, VA 23183

AUV and ROV System

Phone: 800-447-4804 Fax: 804 – 693-6785
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.)

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.

Revised September 9, 2002

Appendix B

Side Scan Sonar Ground Truthing Logs and Lab Analysis

Location	Easting	Northing	Sample ID	Date	USCS Symbol	Color Designation	Description
GSD-001	589164.22	708505.25	GSD-001-0.0-0.5	5/2/2005	SM	5YR 3/2	Grayish brown fine sand, some silt w/ some gravel
GSD-002	589388.99	708350.71	GSD-002-0.0-0.5	5/2/2005	SM	5YR 4/1	Brownish gray fine sand and silt w/ some medium gravel
GSD-003	589253.49	708420.52	GSD-003-0.0-0.5	5/2/2005	SP	5YR 4/1	Brownish gray medium to coarse sand, some gravel
GSD-004	589201.04	708471.74	GSD-004-0.0-0.5	5/2/2005	SP	5YR 3/2	Grayish brown medium to fine sand, some silt / leaves
GSD-005	589306.57	708381.37	GSD-005-0.0-0.5	5/2/2005	GP	5YR 4/1	Brownish gray coarse grave to coarse sand
GSD-006	589363.17	711005.88	GSD-006-0.0-0.5	5/2/2005	ML	10Y 4/2	Dark gray olive silt, some coarse gravel
GSD-007	589631.04	710976.14	GSD-007-0.0-0.5	5/2/2005	ML	10Y 4/2	Dark gray olive silt
GSD-008	589502.14	710990.62	GSD-008-0.0-0.5	5/2/2005	SP	5YR 4/1	Brownish gray medium to coarse sand
GSD-009	589427.4	711000.27	GSD-009-0.0-0.5	5/2/2005	SP	5YR 3/2	Grayish brown medium to coarse sand w/ gravel
GSD-010	589568.16	710984.46	GSD-010-0.0-0.5	5/2/2005	SW	5YR 4/1	Brownish gray fine sand, trace silt
GSD-011	590542.34	713406.31	GSD-011-0.0-0.5	5/2/2005	ML	10Y 4/2	Grayish olive silt w/ coarse sand and large gravel
GSD-012	590786.35	713239.45	GSD-012-0.0-0.5	5/2/2005	ML	5YR 3/2	Grayish brown silt
GSD-013	590672.08	713347.55	GSD-013-0.0-0.5	5/2/2005	SW	5YR 4/1	Brownish gray fine sand
GSD-014	590631.54	713383.44	GSD-014-0.0-0.5	5/2/2005	SW/SM	5YR 4/2	Brownish gray fine and medium sand, some silt
GSD-015	590727.36	713307.34	GSD-015-0.0-0.5	5/2/2005	SW/SM	5YR 4/3	Brownish gray fine and medium sand, some silt
GSD-016	591952.81	715654.54	GSD-016-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt
GSD-017	592171.2	715507.47	GSD-017-0.0-0.5	5/3/2005	GP/GM	5YR 3/2	Grayish brown medium coarse gravel (gravel up to 1") and 20% silt
GSD-018	592062.07	715581.94	GSD-018-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt w/ some fine gravel
GSD-019	592015.33	715615.44	GSD-019-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown medium coarse gravel and silt
GSD-020	592117.21	715553.32	GSD-020-0.0-0.5	5/3/2005	GP	5YR 4/1	Brownish gray medium coarse gravel (up to 1"), trace medium sand
GSD-021	591730.32	718076.35	GSD-021-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt w/ coarse gravel up to 0.5"
GSD-022	592012.39	718124.55	GSD-022-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt w/ little to some fine sand
GSD-023	591876.8	718090.31	GSD-023-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt w/ little to some fine sand and some fine gravel
GSD-024	591805.15	718079.08	GSD-024-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt w/ medium fine sand trace gravel
GSD-025	591943.7	718099.19	GSD-025-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt w/ trace fine sand
GSD-026	592045.7	720720.38	GSD-026-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt w/ organic matter / trace gravel up to 1"
GSD-027	592323.95	720687.08	GSD-027-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt w/ slight organic / trace gravel
GSD-028	592214.58	720730.62	GSD-028-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown top 6" fine silt, sand and gravel, 6"-12" silt
GSD-029	592133.13	720732.58	GSD-029-0.0-0.5	5/3/2005	GW/GM	5YR 3/2	Grayish brown coarse gravel, sand w/ silt
GSD-030	592277.76	720724.53	GSD-030-0.0-0.5	5/3/2005	SW/SM	5YR 3/2	Grayish brown fine sand - silt
GSD-031	592787.6	723329.39	GSD-031-0.0-0.5	5/3/2005	SM	5YR 3/2	Grayish brown medium to fine silt-sand, some gravel up to 1"
GSD-032	592918.78	723051.73	GSD-032-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt w/ trace sand
GSD-033	592857.78	723180.16	GSD-033-0.0-0.5	5/3/2005	SP	5YR 3/2	Grayish brown fine to medium sand
GSD-034	592838.02	723243.48	GSD-034-0.0-0.5	5/3/2005	SP	5YR 3/2	Grayish brown fine to medium sand
GSD-035	592885.45	723121.45	GSD-035-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt w/ some organic / some sand
GSD-036	595495.31	724276.83	GSD-036-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt w/ some fine sand / slight gravel up to 0.5"
GSD-037	595669.77	724108.63	GSD-037-0.0-0.5	5/3/2005	SM	5YR 3/2	Grayish brown fine sand w/ large gravel (up tp 1") little to some silt
GSD-038	595587.72	724155.53	GSD-038-0.0-0.5	5/3/2005	SP	5YR 3/2	Grayish brown fine to medium sand, little fine sand
GSD-039	595559.13	724217.47	GSD-039-0.0-0.5	5/3/2005	SW	5YR 3/2	Grayish brown medium sand - silt
GSD-040	595605.66	724113.55	GSD-040-0.0-0.5	5/3/2005	GP	5YR 3/2	Grayish brown fine - medium sand coarse gravel, trace silt
GSD-041	596583.13	726215.4	GSD-041-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt fine to medium sand, trace gravel
GSD-042	596746.52	726151.45	GSD-042-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt w/ somw gravel up to 1"

Location	Easting	Northing	Sample ID	Date	USCS Symbol	Color Designation	Description
GSD-043	596660.91	726183.8	GSD-043-0.0-0.5	5/3/2005	GP	5YR 3/2	Grayish brown medium coarse gravel, trace silt
GSD-044	596627.67	726202.27	GSD-044-0.0-0.5	5/3/2005	SP	5YR 3/2	Grayish brown, top 3" fine medium sand, 3" clayey silt (10 YR 5/4)
GSD-045	596711.56	726172.88	GSD-045-0.0-0.5	5/3/2005	GW	5YR 3/2	Grayish brown medium coarse gravel, some fine sand
GSD-046	596774.15	728692.08	GSD-046-0.0-0.5	5/3/2005	MH	5YR 3/2	Grayish brown silt w/ some organic material
GSD-047	596956.9	728809.59	GSD-047-0.0-0.5	5/3/2005	MH	5YR 3/2	Grayish brown silt w/ fine sand and gravel
GSD-048	596872.39	728751.77	GSD-048-0.0-0.5	5/3/2005	SM	5YR 3/2	Grayish brown coarse sand and gravel, some trace silt
GSD-049	596833.66	728716.35	GSD-049-0.0-0.5	5/3/2005	MH	5YR 3/2	Grayish brown silt
GSD-050	596909.98	728779.42	GSD-050-0.0-0.5	5/3/2005	SW	5YR 3/2	Grayish brown fine sand, some silt w/ organicl
GSD-051	587481.55	706461.81	GSD-051-0.0-0.5	5/3/2005	MH	5YR 3/2	Grayish brown silt w/ trace gravel
GSD-052	587798.56	706255.81	GSD-052-0.0-0.5	5/3/2005	MH	5YR 3/2	Grayish brown silt w/ trace fine sand
GSD-053	587636.64	706363.36	GSD-053-0.0-0.5	5/3/2005	SP	5YR 3/2	Grayish brown fine to medium sand, some silt
GSD-054	587544.81	706407.27	GSD-054-0.0-0.5	5/3/2005	SM	5YR 3/2	Grayish brown silty fine sand
GSD-055	587707.65	706282.87	GSD-055-0.0-0.5	5/3/2005	SM	5YR 3/2	Grayish brown silty sand, some gravel
GSD-056	586604.57	703967.28	GSD-056-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt
GSD-057	586883.88	703819.71	GSD-057-0.0-0.5	5/3/2005	SP/SM	5YR 3/2	Grayish brown fine - coarse sand, gravel, little to some silt
GSD-058	586745.11	703889.7	GSD-058-0.0-0.5	5/3/2005	SP/SM	5YR 3/2	Grayish brown fine - coarse sand, some silt
GSD-059	586662.26	703939.65	GSD-059-0.0-0.5	5/3/2005	SM	5YR 3/2	Grayish brown sandy silt
GSD-060	586823.81	703872.16	GSD-060-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt
GSD-061	596121.47	731241.1	GSD-061-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt
GSD-062	596337.32	731164.74	GSD-062-0.0-0.5	5/3/2005	SW	10YR 5/4	Moderate yellowish brown coarse sand and trace gravel
GSD-063	596233.56	731210.56	GSD-063-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown fine silt, fine sand, organic matter
GSD-064	596181.14	731231.89	GSD-064-0.0-0.5	5/3/2005	ML	10YR 5/4	Moderate yellowish brown, Grayish brown fine silt - sand
GSD-065	596277.99	731184.44	GSD-065-0.0-0.5	5/3/2005	ML	5YR 3/2	Grayish brown silt, trace organics
GSD-066	596826.15	733771.9	GSD-066-0.0-0.5	5/4/2005	SW	5YR 3/2	Grayish brown silty fine sand slight coarse gravel up to 1", trace organics
GSD-067	597037.92	733696.99	GSD-067-0.0-0.5	5/4/2005	SP	5YR 3/2	Grayish brown coarse sand - silt, trace gravel
GSD-068	596941.04	733725.65	GSD-068-0.0-0.5	5/4/2005	SW	5YR 3/2	Grayish brown fine sand, some organic material
GSD-069	596892.77	733735.75	GSD-069-0.0-0.5	5/4/2005	SW/SM	5YR 3/2	Grayish brown fine sand, silt w/ trace light brown sand
GSD-070	596988.94	733709.87	GSD-070-0.0-0.5	5/4/2005	SW/SM	5YR 3/2	Grayish brown fine sand - silt, trace organic material
GSD-071	597267.82	736233.61	GSD-071-0.0-0.5	5/4/2005	SW	5YR 3/2	Grayish brown fine sand - coarse gravel (up to 1/2"), shell fragments, organic material
GSD-072	597442.96	736272.93	GSD-072-0.0-0.5	5/4/2005	SM	10YR 5/4	Moderate yellowish brown, Grayish brown silty sand, coarse gravel to 1"
GSD-073	597399.61	736189.6	GSD-073-0.0-0.5	5/4/2005	SP	5YR 3/2	Grayish brown fine to coarse sand, trace gravel, trace shell fragments
GSD-074	597322.15	736241.54	GSD-074-0.0-0.5	5/4/2005	SP	10YR 5/4	Moderate yellowish brown, Grayish brown coarse sand, gravel up to 1", slight organic
GSD-075	597410.37	736271.4	GSD-075-0.0-0.5	5/4/2005	SP	10YR 5/4	Moderate yellowish brown, Grayish brown coarse sand, gravel up to 0.5"
GSD-076	598175.27	738524.78	GSD-076-0.0-0.5	5/4/2005	ML	5YR 3/2	Grayish brown silt w/ gravel up tp 1"
GSD-077	598184.9	738345.07	GSD-077-0.0-0.5	5/4/2005	SW	5YR 3/2	Grayish brown fine sand - silt, organic material
GSD-078	598186.82	738417.91	GSD-078-0.0-0.5	5/4/2005	SP	5YR 3/2	Grayish brown fine - coarse sand, trace organics
GSD-079	598185.38	738477.6	GSD-079-0.0-0.5	5/4/2005	CL	10Y 4/2	Grayish olive - grayish brown clayey material - medium stiff (5YR 3/2)
GSD-080	598189.83	738382.5	GSD-080-0.0-0.5	5/4/2005	OL	5YR 3/2	Grayish brown fine sand, trace oragnics, wood material
GSD-081	599670.28	736782.57	GSD-081-0.0-0.5	5/4/2005	OL	5YR 3/2	Grayish brown fine sand, trace oragnics
GSD-082	599643.95	736654.07	GSD-082-0.0-0.5	5/4/2005	OL/OH	5YR 3/2	Grayish brown fine sand, trace oragnics, coarse gravel, rocks
GSD-083	599660.29	736706.87	GSD-083-0.0-0.5	5/4/2005	SP	5YR 3/2	Grayish brown coarse sand, gravel up to 1"

Location	Easting	Northing	Sample ID	Date	USCS Symbol	Color Designation	Description
GSD-084	599658.59	736755.54	GSD-084-0.0-0.5	5/4/2005	SP	5YR 3/2	Grayish brown coarse sand, gravel up to 1/2"
GSD-085	599643.9	736679.45	GSD-085-0.0-0.5	5/4/2005	GP/GC	10YR 5/4	Moderate yellowish brown, Grayish brown large rocks, gravel, clay (5YR 3/2)
GSD-086	600759.97	738634.4	GSD-086-0.0-0.5	5/4/2005	ML	5YR 3/2	Grayish brown fine silt - sand, gravel - rocks, some organics
GSD-087	600892.75	738613.86	GSD-087-0.0-0.5	5/4/2005	ML	5YR 3/2	Grayish brown fine silt - sand, gravel - rocks, some organics
GSD-088	600830.93	738613.89	GSD-088-0.0-0.5	5/4/2005	GP	5YR 3/2	Grayish brown coarse sand, gravel up to 1"
GSD-089	600805.12	738620.18	GSD-089-0.0-0.5	5/4/2005	GP	5YR 3/2	Grayish brown coarse sand, gravel up to 1"
GSD-090	600865.97	738613.1	GSD-090-0.0-0.5	5/4/2005	GP	5YR 3/2	Grayish brown coarse sand, gravel up to 1"
GSD-091	585192.09	701738.33	GSD-091-0.0-0.5	5/4/2005	ML	5YR 3/2	Grayish brown silt, slight coarse gravel
GSD-092	585492.32	701592.07	GSD-092-0.0-0.5	5/4/2005	ML	5YR 3/2	Grayish brown silt, trace organics
GSD-093	585330.5	701666.44	GSD-093-0.0-0.5	5/4/2005	ML	10Y 4/2	Grayish olive, grayish brown silt w/ some sand (5YR 3/2)
GSD-094	585256.54	701701.7	GSD-094-0.0-0.5	5/4/2005	ML	10Y 4/2	Grayish olive, grayish brown silt (5YR 3/2)
GSD-095	585410.84	701640.3	GSD-095-0.0-0.5	5/4/2005	ML	10Y 4/2	Grayish olive silt w/ fine sand and slight organic
GSD-096	584777.6	699083.49	GSD-096-0.0-0.5	5/4/2005	ML	5YR 3/2	Grayish brown silt w/ trace coarse sand
GSD-097	585061.03	699041.71	GSD-097-0.0-0.5	5/4/2005	ML	5YR 3/2	Grayish brown silt w/ slight organics
GSD-098	584917.1	699056.74	GSD-098-0.0-0.5	5/4/2005	SC	5YR 3/2	Top 3" grayish brown fine silt - sand, bottom 3" light brown clayey material (5YR 6/4)
GSD-099	584846.48	699080.97	GSD-099-0.0-0.5	5/4/2005	SP	5YR 3/2	Grayish brown coarse sand - gravel, wood fragments, organic material
GSD-100	584980.2	699057.08	GSD-100-0.0-0.5	5/4/2005	OL	5YR 3/2	Grayish brown, mostly organic wood material, slight fine silty sand
GSD-101	597175.17	683165.2	GSD-101-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive silt
GSD-102	597554.28	683324.72	GSD-102-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive silt w/ coarse sand
GSD-103	597378.6	683249.81	GSD-103-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive fluffy silt
GSD-104	597285.04	683215.71	GSD-104-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive fluffy silt
GSD-105	597494.91	683293.01	GSD-105-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive fluffy silt
GSD-106	596550.9	685791.3	GSD-106-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ coarse gravel
GSD-107	598346.51	686113.87	GSD-107-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-108	597509.89	685974.66	GSD-108-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-109	597063.72	685909.09	GSD-109-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ medium sand
GSD-110	597825.53	686078.35	GSD-110-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ a small amount of medium sand
GSD-111	596968.62	688759.47	GSD-111-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-112	597596.92	688557.86	GSD-112-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ a small amount of medium sand
GSD-113	597325.97	688665.97	GSD-113-0.0-0.5	5/5/2005	OL	10Y 4/2	Dark gray, olive mainly organic matter w/ fine silt
GSD-114	597170.74	688734.55	GSD-114-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-115	597485.55	688679.92	GSD-115-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-116	597534.58	691002.93	GSD-116-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-117	598142.04	690865.22	GSD-117-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-118	597915.18	690917.32	GSD-118-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ some organic matter
GSD-119	597754.66	690946.83	GSD-119-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-120	598033.02	690928.88	GSD-120-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-121	597998.42	693535.72	GSD-121-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-122	598511.82	693530.93	GSD-122-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ a small amount of coarse sand
GSD-123	598251.58	693531.95	GSD-123-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ fine sand and organic matter
GSD-124	598128.83	693529.44	GSD-124-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ fine sand
GSD-125	598402.62	693538.02	GSD-125-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ fine and medium sand

Location	Easting	Northing	Sample ID	Date	USCS Symbol	Color Designation	Description
GSD-126	596318.74	695290.13	GSD-126-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ some organic matter
GSD-127	596465.68	695797.58	GSD-127-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-128	596275.52	695601.8	GSD-128-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ some medium sand
GSD-129	596228.02	695451.78	GSD-129-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ some organic matter
GSD-130	596280.53	695723.72	GSD-130-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ some medium sand and organic matter
GSD-131	594134.85	695159.43	GSD-131-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-132	594092.1	695675.31	GSD-132-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt, fine gravel and coarse sand (large rock along bulkhead)
GSD-133	594118.17	695435.09	GSD-133-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive coarse gravel and coarse sand w/ silt
GSD-134	594142.61	695323.22	GSD-134-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-135	594111.65	695560.88	GSD-135-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-136	591701.67	694593.44	GSD-136-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt
GSD-137	591508.91	694856.9	GSD-137-0.0-0.5	5/5/2005	ML	10Y 4/2	Grayish olive silt clay w/ medium sand
GSD-138	591605.2	694715.16	GSD-138-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ fine sand
GSD-139	591648.68	694659.8	GSD-139-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ fine sand
GSD-140	591538.67	694809.28	GSD-140-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray, olive silt w/ some fine sand
GSD-141	590079.41	692457.78	GSD-141-0.0-0.5	5/5/2005	SP	5YR 4/1	Brownish gray well mixed coarse sand and fine gravel and coarse gravel
GSD-142	589921.98	692817.6	GSD-142-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive silt w/ some fine sand
GSD-143	590008.61	692633.08	GSD-143-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive silt w/ some fine sand
GSD-144	590023.65	692532.66	GSD-144-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive silt w/ some fine and sand - sheen
GSD-145	589968.6	692735.53	GSD-145-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive silt w/ some fine sand
GSD-146	587377.19	692191.13	GSD-146-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray well mixed silt / medium sand and gravel
GSD-147	587401.8	692485.34	GSD-147-0.0-0.5	5/5/2005	ML	10Y 4/2	Grayish olive silt
GSD-148	587380.39	692339.81	GSD-148-0.0-0.5	5/5/2005	SM	10Y 4/2	Dark Gray (oily) mixed coarse sand, fine gravel, and silt
GSD-149	587401	692266.29	GSD-149-0.0-0.5	5/5/2005	GP	5YR 4/1	Mixed color - cobbles, rock, coarse gravel and medium sand
GSD-150	587409.9	692425.72	GSD-150-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive silt w/ fine sand
GSD-151	585337.21	693920.2	GSD-151-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive silt w/ fine sand
GSD-152	585715.15	694024.09	GSD-152-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive silt w/ fine sand
GSD-153	585529.45	693972.16	GSD-153-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive fine sand w/ silt
GSD-154	585449.21	693925.47	GSD-154-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive silt w/ fine sand
GSD-155	585612.82	694001.72	GSD-155-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive silt w/ small amount of fine sand
GSD-156	584574.53	696460.56	GSD-156-0.0-0.5	5/5/2005	SW	5Y 5/6	Light brown olive medium and fine sand w/ fine gravel
GSD-157	584911.97	696513.35	GSD-157-0.0-0.5	5/5/2005	ML	10Y 4/2	Dark gray olive silt w/ medium sand and gravel
GSD-158	584781.7	696459.23	GSD-158-0.0-0.5	5/5/2005	SP	5YR 4/1	Brownish gray medium sand and fine gravel w/ coarse gravel
GSD-159	584652.47	696437	GSD-159-0.0-0.5	5/5/2005	OH	5YR 4/1	Brownish gray medium and fine sand, some coarse sand, some organic matter
GSD-160	584848.44	696495.28	GSD-160-0.0-0.5	5/5/2005	SP	5YR 4/1	Brownish gray medium and fine sand, one cooble
GSD-161	598458.48	743084.64	GSD-161-0.0-0.5	5/6/2005	ML	5Y 5/6	Light olive brown clayey silt w/ coarse gravel pieces
GSD-162	598764.41	743197.9	GSD-162--0.0-0.5	5/6/2005	OH	5YR 4/1	Brownish gray fine sand w/ some organic matter
GSD-163	598600.89	743110.64	GSD-163--0.0-0.5	5/6/2005	SP	5YR 4/1	Brownish gray medium and coarse sand, w/ multi colored sands
GSD-164	598531.98	743100.17	GSD-164-0.0-0.5	5/6/2005	GP	5YR 4/1	Brownish gray coarse gravel up tp 1" w/ coarse and medium sand
GSD-165	598707.88	743141.78	GSD-165	5/6/2005			No sample - rocky
GSD-166	599477.37	740684.83	GSD-166-0.0-0.5	5/6/2005	ML	5YR 3/2	Grayish brown silt w/ fine sand to coarse gravel
GSD-167	599669.84	740738.91	GSD-167-0.0-0.5	5/6/2005	SW	5YR 4/1	Brownish gray fine sand

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GSD-168	599578.28	740713.27	GSD-168-0.0-0.5	5/6/2005			No sample - rock and cobbles
GSD-169	599521.09	740707.83	GSD-169-0.0-0.5	5/6/2005	GP	5R 4/6	Red rocks, cobbles, and coarse gravel
GSD-170	599626.15	740727.94	GSD-170-0.0-0.5	5/6/2005	GP	10R 4/6	Reddish brown rocks cobbles and fine sand
GSD-171	600641.6	739520.93	GSD-171-0.0-0.5	5/17/2005	GP	5R 4/1	Cobble w/ Brownish Gray, coarse and medium gravel, coarse and medium sand
GSD-172	600821.03	737347.09	GSD-172-0.0-0.5	5/17/2005	SM	5YR 3/2	Grayish brown medium fine sand and fine gravel w/ some silt
GSD-173	598876.19	738331.32	GSD-173-0.0-0.5	5/17/2005	SP	5YR 4/1	Brownish gray medium and fine sand w/ fine gravel
GSD-174	598742.53	738362.91	GSD-174-0.0-0.5	5/17/2005	SM	5YR 3/2	Grayish brown medium fine sand w/ some black silt
GSD-175	597452	738113	GSD-175-0.0-0.5	5/17/2005			No sample - will not hold in core
GSD-176	597417.46	737689.17	GSD-176-0.0-0.5	5/17/2005	SW	5YR 3/2	Grayish brown fine sand - silt w/ organic
GSD-177	597150.82	736894.76	GSD-177-0.0-0.5	5/17/2005	ML	5YR 3/2	Grayish olive silt w/ fine sand
GSD-178	597287.15	736925.45	GSD-178-0.0-0.5	5/17/2005	SP	5YR 4/1	Brownish gray medium and fine sand
GSD-179	597241.59	734938.25	GSD-179-0.0-0.5	5/17/2005	SP	10Y 4/2	Grayish olive fine sandy w/ coarse gravel some organic
GSD-180	597460.01	734886.17	GSD-180-0.0-0.5	5/17/2005	SP	10Y 4/2	Grayish olive fine sandy w/ fine gravel some organic
GSD-181	597421.99	734903.29	GSD-181-0.0-0.5	5/17/2005	SC	10Y 4/2	Grayish olive medium sandy w/ fine sand some clay and medium gravel
GSD-182	597355	734900	GSD-182-0.0-0.5	5/17/2005	SW	10Y 4/2	Grayish olive fine sandy w/silt
GSD-183	597277.81	734916.57	GSD-183-0.0-0.5	5/17/2005	SW	10Y 4/2	Grayish olive fine and medium sand w/ silt
GSD-184	597246	734493	GSD-184-0.0-0.5	5/17/2005	SW	10Y 4/2	Grayish olive fine sandy w/silt
GSD-185	597246	734505	GSD-185-0.0-0.5	5/17/2005	SW	10Y 4/2	Grayish olive fine sandy w/silt
GSD-186	597025.14	733572.29	GSD-186-0.0-0.5	5/17/2005	SM	5YR 4/1	Brownish gray well mixed fine sand silt gravel cobble
GSD-187	596251.13	730060.18	GSD-187-0.0-0.5	5/17/2005	ML	10YR 5/4	Moderate yellowish brown coarse gravel w/ red clay and medium sand
GSD-188	596354.28	730111.99	GSD-188-0.0-0.5	5/17/2005	ML	10Y 4/2	Grayish olive silt w/ fine sand and organic
GSD-189	596985.03	728124.69	GSD-189-0.0-0.5	5/17/2005	SP	5YR 4/1	Brownish gray medium to carse sand with fine gravel
GSD-190	597042.48	727858.63	GSD-190-0.0-0.5	5/17/2005	SM	5YR 3/2	Grayish brown medium sandy silt w/ fine and medium gravel
GSD-191	596038.03	724744.92	GSD-191-0.0-0.5	5/17/2005	SM	5YR 3/2	Grayish brown silty fine sand
GSD-192	596118.11	724616.7	GSD-192-0.0-0.5	5/17/2005	SC	5Y 5/6	Light olive brown coarse sand, medium and fine gravel w/ tan clay
GSD-193	594667.87	723764.4	GSD-193-0.0-0.5	5/17/2005	SW	5YR 3/2	Grayish brown medium sand w/ silt organic mater
GSD-194	594583.5	723876.55	GSD-194-0.0-0.5	5/17/2005	ML	10Y 4/2	Grayish olive silt w/ coarse and fine sand, organics
GSD-195	594420.02	723826.14	GSD-195-0.0-0.5	5/17/2005	SP	5YR 4/1	Brownish gray fine/medium sand w/ medium to coarse gravel
GSD-196	594437.93	723688.9	GSD-196-0.0-0.5	5/17/2005	SP	5YR 3/2	Grayish brown medium sand w/fine to medium gravel and silt
GSD-197	592371.54	722025.84	GSD-197-0.0-0.5	5/17/2005	OL	5YR 4/1	Brownish gray fine sand w/ some organic matter
GSD-198	591951.06	718981.85	GSD-198-0.0-0.5	5/17/2005	SP	5YR 4/1	Brownish gray medium to coarse sand and fine gravel w/ organic matter
GSD-199	592113.38	718952.94	GSD-199-0.0-0.5	5/17/2005	ML	10Y 4/2	Grayish olive silt
GSD-200	592086.92	717339.33	GSD-200-0.0-0.5	5/18/2005	ML	10Y 4/2	Grayish olive fine silt - fine sand
GSD-201	592042.52	717266.54	GSD-201-0.0-0.5	5/18/2005	SW	5YR 3/2	Grayish brown sand w/ slight silt, some gravel, some organics, some rocks
GSD-202	591975.8	715407.15	GSD-202-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt
GSD-203	591693.54	714883.41	GSD-203-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silty sand w/ gravel and rocks
GSD-204	591539.99	714848.84	GSD-204-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown fine silt, sand, slight organic
GSD-205	589648.66	709097.86	GSD-205-0.0-0.5	5/18/2005	SW	5YR 4/1	Brownish gray fine sand, slight gravel, organic material and rocks up to 2"
GSD-206	589484.65	709245.08	GSD-206-0.0-0.5	5/18/2005	SW	5YR 3/2	Grayish brown fine to coarse sand, fine to coarse gravel, rocks up to 1"
GSD-207	589573.53	709318.69	GSD-207-0.0-0.5	5/18/2005	SW	5YR 3/2	Grayish brown coarse sand, trace gravel, trace organics
GSD-208	587166.36	704793.56	GSD-208-0.0-0.5	5/18/2005	SW	5YR 3/2	Grayish brown fine sand, slight silt, trace organics
GSD-209	587103.68	704819.39	GSD-209-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt, slight organics

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GSD-210	587059.07	704649.34	GSD-210-0.0-0.5	5/18/2005	SW	5YR 3/2	Grayish brown fine sand - silt, trace organics
GSD-211	586338.02	703052.57	GSD-211-0.0-0.5	5/18/2005	SW	5YR 3/2	Grayish brown top 2" fine sand, bottom silt
GSD-212	586238.23	702994.49	GSD-212-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt, trace gravel
GSD-213	585028.14	700403.27	GSD-213-0.0-0.5	5/18/2005	SW	5YR 3/2	Grayish brown fine sand - silt, slight rocks and gravel
GSD-214	584703.98	698499.43	GSD-214-0.0-0.5	5/18/2005	GW	5YR 3/2	Grayish brown mostly rocks and gravel, recovered slight silt
GSD-215	584809.66	698379.68	GSD-215-0.0-0.5	5/18/2005	SP	5YR 3/2	Grayish brown sand w/ slight silt, trace organics
GSD-216	584785.34	698178.36	GSD-216-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt w/ lots of organic material (leaves and twigs)
GSD-217	585360.27	695073.02	GSD-217-0.0-0.5	5/18/2005	GP	5YR 3/2	Grayish brown gravel and rocks up to 1", slight silt recovered
GSD-218	586148	692935	GSD-218-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt w/ slight rocks
GSD-219	586095.99	692892.4	GSD-219-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt w/ slight gravel and rocks
GSD-220	585928.4	693005.15	GSD-220-0.0-0.5	5/18/2005	SM	5YR 3/2	Grayish brown sandy silt trace grave, slight organics
GSD-221	586006.02	693063.99	GSD-221-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt
GSD-222	586081.2	693130.15	GSD-222-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt w/ slight organics
GSD-223	590475.03	692992.31	GSD-223-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt w/ organics
GSD-224	590576.34	692860.41	GSD-224-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt w/ coarse rocks up to 0.5"
GSD-225	590799.89	693268.68	GSD-225-0.0-0.5	5/18/2005	GP	5YR 3/2	Grayish brown, mostly rocks, gravel to 1" and shell fragments, slight silt and coarse sand
GSD-226	590638.78	693299.58	GSD-226-0.0-0.5	5/18/2005	SW	5YR 3/2	Grayish brown fine sand w/ trace silt and organics
GSD-227	592772.4	695435.02	GSD-227-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt
GSD-228	593226.64	695434.11	GSD-228-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt
GSD-229	597708.5	694949.68	GSD-229-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown fine sand, slight silt, organic material
GSD-230	597602.31	694826.23	GSD-230-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt w/ organic material
GSD-231	598285.84	692791.38	GSD-231-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt w/ organic material
GSD-232	597367.49	689732.39	GSD-232-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt w/ slight organics
GSD-233	597658.21	689448.6	GSD-233-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt w/ slight organics
GSD-234	597494.17	689384.54	GSD-234-0.0-0.5	5/18/2005	OL	5YR 3/2	Grayish brown, mostly twigs, leafy matter, organic material, trace silt
GSD-235	596810.69	687382.02	GSD-235-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt
GSD-236	596952.87	687308.57	GSD-236-0.0-0.5	5/18/2005	ML	5YR 3/2	Grayish brown silt, slight organics
GSD-237	589513.68	709082.6	GSD-237	5/20/2005			No sample - Rock pile too large to collect
GSD-238	599493.8	736783.27	GSD-238-0.0-0.5	5/20/2005	GP	10Y 4/2	Fine and coarse gravel and rubble, some coarse sand some olive gray clay
GSD-239	597794.93	738363.92	GSD-239-0.0-0.5	5/20/2005	SP		Multi colored coarse and medium sand and fine gravel
GSD-240	597569.87	738243.27	GSD-240-0.0-0.5	5/20/2005	SC	5Y 5/6	Light olive brown to moderate yellow brown fine sandy clay (10YR 5/4)
GSD-241	597221.15	734651.3	GSD-241-0.0-0.5	5/20/2005	SP	5Y 5/6	Light olive, brown to brownish gray fine and medium sand with some gravel and organic
GSD-242	597201.4	734268.47	GSD-242-0.0-0.5	5/20/2005	SW	5YR 4/1	Brownish gray fine sand
GSD-243	597257.71	734370.59	GSD-243-0.0-0.5	5/20/2005	SW	5YR 4/1	Brownish gray fine sand, silt w/ some fine gravel, organic
GSD-244	596578.68	732001.87	GSD-244-0.0-0.5	5/20/2005	SP	5YR 4/1	Light brownish gray fine/medium sand silt organic
GSD-245	596963.83	727518.51	GSD-245-0.0-0.5	5/20/2005	SW	5YR 4/1	Brownish gray fine sand
GSD-246	594652.7	723819.23	GSD-246-0.0-0.5	5/20/2005	SP	5YR 4/1	Brownish gray medium and coarse sand, slight organic matter
GSD-247	593311.72	723417.77	GSD-247-0.0-0.5	5/20/2005	SP	5YR 4/1	Brownish gray medium and coarse sand, organic matter
GSD-248	592215.06	721623.68	GSD-248-0.0-0.5	5/20/2005	SP		Mixed color coarse gravel to medium sand, some cobbles, some fine sand
GSD-249	592054.07	719510.36	GSD-249-0.0-0.5	5/20/2005	ML	5YR 4/1	Brownish gray silt w/ organic

Location	Easting	Northing	Sample ID	Date	USCS Symbol	Color Designation	Description
GSD-250	591865.17	717693.26	GSD-250-0.0-0.5	5/20/2005	GP		Mixed color cobble and coarse gravel to coarse sand, some silt
GSD-251	591598.79	714836.16	GSD-251-0.0-0.5	5/20/2005	ML	5YR 4/1	Light brownish gray silt w/ some fine sand, organic
GSD-252	591647.48	714903.46	GSD-252-0.0-0.5	5/20/2005	SP	5YR 4/1	Brownish gray fine and medium sand, organic
GSD-253	589553.92	709555.69	GSD-253-0.0-0.5	5/20/2005	SP	5YR 4/1	Light brownish gray medium to coarse sand, some fine sand
GSD-254	588595.96	707722.32	GSD-254-0.0-0.5	5/20/2005	ML	5YR 3/2	Grayish brown silt
GSD-255	588608.59	707309.85	GSD-255-0.0-0.5	5/20/2005	ML	10Y 4/2	Grayish olive silt
GSD-256	596937.95	685871.93	GSD-256-0.0-0.5	5/20/2005	ML	10Y 4/2	Dark grayish olive silt, slight organic
GSD-257	596832.28	685853.76	GSD-257-0.0-0.5	5/20/2005	ML	10Y 4/2	Dark grayish olive silt, w/ a lot of organic
GSD-258	596695.92	685812.23	GSD-258-0.0-0.5	5/20/2005	ML	10Y 4/2	Dark grayish olive
GSD-259	597578.78	682327.65	GSD-259-0.0-0.5	5/20/2005	ML	10Y 4/2	Dark grayish olive
GSD-260	597570.82	682378.69	GSD-260-0.0-0.5	5/20/2005	ML	10Y 4/2	Dark grayish olive
GSD-261	597847.45	682349.64	GSD-261-0.0-0.5	5/20/2005	ML	10Y 4/2	Dark grayish olive
GSD-262	597692.36	682716.43	GSD-262-0.0-0.5	5/20/2005	CL	10YR 5/4	Moderate yellowish brown dense clay
GSD-263	598028.94	691444.24	GSD-263-0.0-0.5	5/20/2005	OL	5YR 3/2	Dark grayish brown 100% organic
GSD-264	598102.73	691729.98	GSD-264-0.0-0.5	5/20/2005	ML	5YR 3/2	Dark grayish brown silt w/ 50% organics
GSD-265	594812.01	695582.7	GSD-265-0.0-0.5	5/20/2005	ML	5YR 3/2	Dark grayish brown silt w/ 50% organics
GSD-266	592167.13	695170.09	GSD-266-0.0-0.5	5/20/2005	ML	5YR 3/2	Dark grayish brown silt
GSD-267	586802.93	692495.66	GSD-267-0.0-0.5	5/20/2005	OL	10R 3/4	Dark brown 100% organic
GSD-268	586466.24	692657.12	GSD-268-0.0-0.5	5/20/2005	OH	10Y 4/2	Dark gray olive organic matter with coarse gravel
GSD-269	585342.72	694587.52	GSD-269-0.0-0.5	5/20/2005	OL	10Y 4/2	Dark grayish olive fine sand w/ organic
GSD-270	585033.4	695092.82	GSD-270-0.0-0.5	5/20/2005	ML	10Y 4/2	Dark grayish olive silt
GSD-271	584652.41	697349.53	GSD-271-0.0-0.5	5/20/2005	SP	5YR 4/1	Dark brownish gray fine and medium sand and cobbles and fine gravel
GSD-272	584673.2	697969.35	GSD-272-0.0-0.5	5/20/2005	SP	10Y 4/2	Dark grayish olive fine sandy to fine gravel mix
GSD-273	585504.04	701938.51	GSD-273-0.0-0.5	5/20/2005	ML	5YR 3/2	Dark grayish brown silt w/ organic
GSD-274	586695.21	703567.18	GSD-274-0.0-0.5	5/20/2005	ML	5YR 3/2	Dark grayish brown silt w/ surface coarse sand / fine gravel
GSD-275	586891.41	703873.24	GSD-275-0.0-0.5	5/20/2005	ML	5YR 3/2	Dark grayish brown silt w/some coarse medium sand

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-004	AG01113	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050377	708471.74	589201.04	Grayish brown medium to fine sand, some silt / leaves
GSD-004	AG01113	% VERY COURSE SAND >1 - 2 MM	2.1	%	ASTM D422-63	20050377	708471.74	589201.04	Grayish brown medium to fine sand, some silt / leaves
GSD-004	AG01113	% COARSE SAND >.5 - 1 MM	9.5	%	ASTM D422-63	20050377	708471.74	589201.04	Grayish brown medium to fine sand, some silt / leaves
GSD-004	AG01113	% MEDIUM SAND >.25 - .5 MM	41	%	ASTM D422-63	20050377	708471.74	589201.04	Grayish brown medium to fine sand, some silt / leaves
GSD-004	AG01113	% FINE SAND >.125 - .25 MM	40	%	ASTM D422-63	20050377	708471.74	589201.04	Grayish brown medium to fine sand, some silt / leaves
GSD-004	AG01113	% VERY FINE SAND >.0625 - .125 MM	3.8	%	ASTM D422-63	20050377	708471.74	589201.04	Grayish brown medium to fine sand, some silt / leaves
GSD-004	AG01113	% SILT	2.1	%	ASTM D422-63	20050377	708471.74	589201.04	Grayish brown medium to fine sand, some silt / leaves
GSD-004	AG01113	% CLAY & COLLOIDS	1.3	%	ASTM D422-63	20050377	708471.74	589201.04	Grayish brown medium to fine sand, some silt / leaves
GSD-004	AG01113	ORGANIC CARBON, TOT.	8100	mg/Kg	C-88 @60C	20050377	708471.74	589201.04	Grayish brown medium to fine sand, some silt / leaves
GSD-005	AG01114	% GRANULE & LARGER >2 MM	74	%	ASTM D422-63	20050378	708381.37	589306.57	Brownish gray coarse gravel to coarse sand
GSD-005	AG01114	% VERY COURSE SAND >1 - 2 MM	13	%	ASTM D422-63	20050378	708381.37	589306.57	Brownish gray coarse gravel to coarse sand
GSD-005	AG01114	% COARSE SAND >.5 - 1 MM	5.9	%	ASTM D422-63	20050378	708381.37	589306.57	Brownish gray coarse gravel to coarse sand
GSD-005	AG01114	% MEDIUM SAND >.25 - .5 MM	4.8	%	ASTM D422-63	20050378	708381.37	589306.57	Brownish gray coarse gravel to coarse sand
GSD-005	AG01114	% FINE SAND >.125 - .25 MM	0.8	%	ASTM D422-63	20050378	708381.37	589306.57	Brownish gray coarse gravel to coarse sand
GSD-005	AG01114	% VERY FINE SAND >.0625 - .125 MM	0.9	%	ASTM D422-63	20050378	708381.37	589306.57	Brownish gray coarse gravel to coarse sand
GSD-005	AG01114	% SILT	0.3	%	ASTM D422-63	20050378	708381.37	589306.57	Brownish gray coarse gravel to coarse sand
GSD-005	AG01114	% CLAY & COLLOIDS	0	%	ASTM D422-63	20050378	708381.37	589306.57	Brownish gray coarse gravel to coarse sand
GSD-005	AG01114	ORGANIC CARBON, TOT.	3200	mg/Kg	C-88 @60C	20050378	708381.37	589306.57	Brownish gray coarse gravel to coarse sand
GSD-007	AG01115	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050379	710976.14	589631.04	Dark gray olive silt
GSD-007	AG01115	% VERY COURSE SAND >1 - 2 MM	1.1	%	ASTM D422-63	20050379	710976.14	589631.04	Dark gray olive silt
GSD-007	AG01115	% COARSE SAND >.5 - 1 MM	1.4	%	ASTM D422-63	20050379	710976.14	589631.04	Dark gray olive silt
GSD-007	AG01115	% MEDIUM SAND >.25 - .5 MM	1.7	%	ASTM D422-63	20050379	710976.14	589631.04	Dark gray olive silt
GSD-007	AG01115	% FINE SAND >.125 - .25 MM	12	%	ASTM D422-63	20050379	710976.14	589631.04	Dark gray olive silt
GSD-007	AG01115	% VERY FINE SAND >.0625 - .125 MM	8.6	%	ASTM D422-63	20050379	710976.14	589631.04	Dark gray olive silt
GSD-007	AG01115	% SILT	70	%	ASTM D422-63	20050379	710976.14	589631.04	Dark gray olive silt
GSD-007	AG01115	% CLAY & COLLOIDS	4.9	%	ASTM D422-63	20050379	710976.14	589631.04	Dark gray olive silt
GSD-007	AG01115	ORGANIC CARBON, TOT.	67000	mg/Kg	C-88 @60C	20050379	710976.14	589631.04	Dark gray olive silt
GSD-008	AG01116	% GRANULE & LARGER >2 MM	3.3	%	ASTM D422-63	20050380	710990.62	589502.14	Brownish gray medium to coarse sand
GSD-008	AG01116	% VERY COURSE SAND >1 - 2 MM	5.6	%	ASTM D422-63	20050380	710990.62	589502.14	Brownish gray medium to coarse sand
GSD-008	AG01116	% COARSE SAND >.5 - 1 MM	23	%	ASTM D422-63	20050380	710990.62	589502.14	Brownish gray medium to coarse sand
GSD-008	AG01116	% MEDIUM SAND >.25 - .5 MM	48	%	ASTM D422-63	20050380	710990.62	589502.14	Brownish gray medium to coarse sand
GSD-008	AG01116	% FINE SAND >.125 - .25 MM	18	%	ASTM D422-63	20050380	710990.62	589502.14	Brownish gray medium to coarse sand

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-008	AG01116	% VERY FINE SAND >.0625 - .125 MM	1.2	%	ASTM D422-63	20050380	710990.62	589502.14	Brownish gray medium to coarse sand
GSD-008	AG01116	% SILT	0.8	%	ASTM D422-63	20050380	710990.62	589502.14	Brownish gray medium to coarse sand
GSD-008	AG01116	% CLAY & COLLOIDS	0.1	%	ASTM D422-63	20050380	710990.62	589502.14	Brownish gray medium to coarse sand
GSD-008	AG01116	ORGANIC CARBON, TOT.	3600	mg/Kg	C-88 @60C	20050380	710990.62	589502.14	Brownish gray medium to coarse sand
GSD-011	AG01117	% GRANULE & LARGER >2 MM	22	%	ASTM D422-63	20050381	713406.31	590542.34	Grayish olive silt w/ coarse sand and large gravel
GSD-011	AG01117	% VERY COURSE SAND >1 - 2 MM	7.3	%	ASTM D422-63	20050381	713406.31	590542.34	Grayish olive silt w/ coarse sand and large gravel
GSD-011	AG01117	% COARSE SAND >.5 - 1 MM	9.5	%	ASTM D422-63	20050381	713406.31	590542.34	Grayish olive silt w/ coarse sand and large gravel
GSD-011	AG01117	% MEDIUM SAND >.25 - .5 MM	17	%	ASTM D422-63	20050381	713406.31	590542.34	Grayish olive silt w/ coarse sand and large gravel
GSD-011	AG01117	% FINE SAND >.125 - .25 MM	17	%	ASTM D422-63	20050381	713406.31	590542.34	Grayish olive silt w/ coarse sand and large gravel
GSD-011	AG01117	% VERY FINE SAND >.0625 - .125 MM	7.9	%	ASTM D422-63	20050381	713406.31	590542.34	Grayish olive silt w/ coarse sand and large gravel
GSD-011	AG01117	% SILT	18	%	ASTM D422-63	20050381	713406.31	590542.34	Grayish olive silt w/ coarse sand and large gravel
GSD-011	AG01117	% CLAY & COLLOIDS	1.6	%	ASTM D422-63	20050381	713406.31	590542.34	Grayish olive silt w/ coarse sand and large gravel
GSD-011	AG01117	ORGANIC CARBON, TOT.	37000	mg/Kg	C-88 @60C	20050381	713406.31	590542.34	Grayish olive silt w/ coarse sand and large gravel
GSD-014	AG01118	% GRANULE & LARGER >2 MM	15	%	ASTM D422-63	20050382	713307.34	590727.36	Brownish gray fine and medium sand, some silt
GSD-014	AG01118	% VERY COURSE SAND >1 - 2 MM	9.2	%	ASTM D422-63	20050382	713307.34	590727.36	Brownish gray fine and medium sand, some silt
GSD-014	AG01118	% COARSE SAND >.5 - 1 MM	9.2	%	ASTM D422-63	20050382	713307.34	590727.36	Brownish gray fine and medium sand, some silt
GSD-014	AG01118	% MEDIUM SAND >.25 - .5 MM	12	%	ASTM D422-63	20050382	713307.34	590727.36	Brownish gray fine and medium sand, some silt
GSD-014	AG01118	% FINE SAND >.125 - .25 MM	35	%	ASTM D422-63	20050382	713307.34	590727.36	Brownish gray fine and medium sand, some silt
GSD-014	AG01118	% VERY FINE SAND >.0625 - .125 MM	13	%	ASTM D422-63	20050382	713307.34	590727.36	Brownish gray fine and medium sand, some silt
GSD-014	AG01118	% SILT	5.3	%	ASTM D422-63	20050382	713307.34	590727.36	Brownish gray fine and medium sand, some silt
GSD-014	AG01118	% CLAY & COLLOIDS	2.6	%	ASTM D422-63	20050382	713307.34	590727.36	Brownish gray fine and medium sand, some silt
GSD-014	AG01118	ORGANIC CARBON, TOT.	12000	mg/Kg	C-88 @60C	20050382	713307.34	590727.36	Brownish gray fine and medium sand, some silt
GSD-018	AG01119	% GRANULE & LARGER >2 MM	37	%	ASTM D422-63	20050397	715581.94	592062.07	Grayish brown silt w/ some fine gravel
GSD-018	AG01119	% VERY COURSE SAND >1 - 2 MM	5.1	%	ASTM D422-63	20050397	715581.94	592062.07	Grayish brown silt w/ some fine gravel
GSD-018	AG01119	% COARSE SAND >.5 - 1 MM	7.4	%	ASTM D422-63	20050397	715581.94	592062.07	Grayish brown silt w/ some fine gravel
GSD-018	AG01119	% MEDIUM SAND >.25 - .5 MM	15	%	ASTM D422-63	20050397	715581.94	592062.07	Grayish brown silt w/ some fine gravel
GSD-018	AG01119	% FINE SAND >.125 - .25 MM	8.3	%	ASTM D422-63	20050397	715581.94	592062.07	Grayish brown silt w/ some fine gravel
GSD-018	AG01119	% VERY FINE SAND >.0625 - .125 MM	5.1	%	ASTM D422-63	20050397	715581.94	592062.07	Grayish brown silt w/ some fine gravel
GSD-018	AG01119	% SILT	22	%	ASTM D422-63	20050397	715581.94	592062.07	Grayish brown silt w/ some fine gravel
GSD-018	AG01119	% CLAY & COLLOIDS	1.1	%	ASTM D422-63	20050397	715581.94	592062.07	Grayish brown silt w/ some fine gravel
GSD-018	AG01119	ORGANIC CARBON, TOT.	15000	mg/Kg	C-88 @60C	20050397	715581.94	592062.07	Grayish brown silt w/ some fine gravel
GSD-019	AG01120	% GRANULE & LARGER >2 MM	5.5	%	ASTM D422-63	20050398	715615.44	592015.33	Grayish brown medium coarse gravel and silt
GSD-019	AG01120	% VERY COURSE SAND >1 - 2 MM	3.8	%	ASTM D422-63	20050398	715615.44	592015.33	Grayish brown medium coarse gravel and silt

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-019	AG01120	% COARSE SAND >.5 - 1 MM	12	%	ASTM D422-63	20050398	715615.44	592015.33	Grayish brown medium coarse gravel and silt
GSD-019	AG01120	% MEDIUM SAND >.25 - .5 MM	30	%	ASTM D422-63	20050398	715615.44	592015.33	Grayish brown medium coarse gravel and silt
GSD-019	AG01120	% FINE SAND >.125 - .25 MM	42	%	ASTM D422-63	20050398	715615.44	592015.33	Grayish brown medium coarse gravel and silt
GSD-019	AG01120	% VERY FINE SAND >.0625 - .125 MM	3.2	%	ASTM D422-63	20050398	715615.44	592015.33	Grayish brown medium coarse gravel and silt
GSD-019	AG01120	% SILT	2	%	ASTM D422-63	20050398	715615.44	592015.33	Grayish brown medium coarse gravel and silt
GSD-019	AG01120	% CLAY & COLLOIDS	1.3	%	ASTM D422-63	20050398	715615.44	592015.33	Grayish brown medium coarse gravel and silt
GSD-019	AG01120	ORGANIC CARBON, TOT.	8900	mg/Kg	C-88 @60C	20050398	715615.44	592015.33	Grayish brown medium coarse gravel and silt
GSD-022	AG01121	% GRANULE & LARGER >2 MM	9.2	%	ASTM D422-63	20050399	718124.55	592012.39	Grayish brown silt w/ little to some fine sand
GSD-022	AG01121	% VERY COURSE SAND >1 - 2 MM	7.5	%	ASTM D422-63	20050399	718124.55	592012.39	Grayish brown silt w/ little to some fine sand
GSD-022	AG01121	% COARSE SAND >.5 - 1 MM	15	%	ASTM D422-63	20050399	718124.55	592012.39	Grayish brown silt w/ little to some fine sand
GSD-022	AG01121	% MEDIUM SAND >.25 - .5 MM	22	%	ASTM D422-63	20050399	718124.55	592012.39	Grayish brown silt w/ little to some fine sand
GSD-022	AG01121	% FINE SAND >.125 - .25 MM	17	%	ASTM D422-63	20050399	718124.55	592012.39	Grayish brown silt w/ little to some fine sand
GSD-022	AG01121	% VERY FINE SAND >.0625 - .125 MM	12	%	ASTM D422-63	20050399	718124.55	592012.39	Grayish brown silt w/ little to some fine sand
GSD-022	AG01121	% SILT	17	%	ASTM D422-63	20050399	718124.55	592012.39	Grayish brown silt w/ little to some fine sand
GSD-022	AG01121	% CLAY & COLLOIDS	0.7	%	ASTM D422-63	20050399	718124.55	592012.39	Grayish brown silt w/ little to some fine sand
GSD-022	AG01121	ORGANIC CARBON, TOT.	15000	mg/Kg	C-88 @60C	20050399	718124.55	592012.39	Grayish brown silt w/ little to some fine sand
GSD-023	AG01122	% GRANULE & LARGER >2 MM	0.5	%	ASTM D422-63	20050400	718090.31	591876.8	Grayish brown silt w/ little to some fine sand and some fine gravel
GSD-023	AG01122	% VERY COURSE SAND >1 - 2 MM	3.2	%	ASTM D422-63	20050400	718090.31	591876.8	Grayish brown silt w/ little to some fine sand and some fine gravel
GSD-023	AG01122	% COARSE SAND >.5 - 1 MM	8.1	%	ASTM D422-63	20050400	718090.31	591876.8	Grayish brown silt w/ little to some fine sand and some fine gravel
GSD-023	AG01122	% MEDIUM SAND >.25 - .5 MM	19	%	ASTM D422-63	20050400	718090.31	591876.8	Grayish brown silt w/ little to some fine sand and some fine gravel
GSD-023	AG01122	% FINE SAND >.125 - .25 MM	26	%	ASTM D422-63	20050400	718090.31	591876.8	Grayish brown silt w/ little to some fine sand and some fine gravel
GSD-023	AG01122	% VERY FINE SAND >.0625 - .125 MM	8.6	%	ASTM D422-63	20050400	718090.31	591876.8	Grayish brown silt w/ little to some fine sand and some fine gravel
GSD-023	AG01122	% SILT	32	%	ASTM D422-63	20050400	718090.31	591876.8	Grayish brown silt w/ little to some fine sand and some fine gravel
GSD-023	AG01122	% CLAY & COLLOIDS	2.7	%	ASTM D422-63	20050400	718090.31	591876.8	Grayish brown silt w/ little to some fine sand and some fine gravel

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-023	AG01122	ORGANIC CARBON, TOT.	55000	mg/Kg	C-88 @60C	20050400	718090.31	591876.8	Grayish brown silt w/ little to some fine sand and some fine gravel
GSD-027	AG01123	% GRANULE & LARGER >2 MM	8.8	%	ASTM D422-63	20050401	720687.08	592323.95	Grayish brown silt w/ slight organic / trace gravel
GSD-027	AG01123	% VERY COURSE SAND >1 - 2 MM	2.3	%	ASTM D422-63	20050401	720687.08	592323.95	Grayish brown silt w/ slight organic / trace gravel
GSD-027	AG01123	% COARSE SAND >.5 - 1 MM	2.3	%	ASTM D422-63	20050401	720687.08	592323.95	Grayish brown silt w/ slight organic / trace gravel
GSD-027	AG01123	% MEDIUM SAND >.25 - .5 MM	3.1	%	ASTM D422-63	20050401	720687.08	592323.95	Grayish brown silt w/ slight organic / trace gravel
GSD-027	AG01123	% FINE SAND >.125 - .25 MM	12	%	ASTM D422-63	20050401	720687.08	592323.95	Grayish brown silt w/ slight organic / trace gravel
GSD-027	AG01123	% VERY FINE SAND >.0625 - .125 MM	14	%	ASTM D422-63	20050401	720687.08	592323.95	Grayish brown silt w/ slight organic / trace gravel
GSD-027	AG01123	% SILT	56	%	ASTM D422-63	20050401	720687.08	592323.95	Grayish brown silt w/ slight organic / trace gravel
GSD-027	AG01123	% CLAY & COLLOIDS	2.1	%	ASTM D422-63	20050401	720687.08	592323.95	Grayish brown silt w/ slight organic / trace gravel
GSD-027	AG01123	ORGANIC CARBON, TOT.	55000	mg/Kg	C-88 @60C	20050401	720687.08	592323.95	Grayish brown silt w/ slight organic / trace gravel
GSD-028	AG01124	% GRANULE & LARGER >2 MM	12	%	ASTM D422-63	20050402	720730.62	592214.58	Grayish brown top 6" fine silt, sand and gravel, 6"-12" silt
GSD-028	AG01124	% VERY COURSE SAND >1 - 2 MM	6.9	%	ASTM D422-63	20050402	720730.62	592214.58	Grayish brown top 6" fine silt, sand and gravel, 6"-12" silt
GSD-028	AG01124	% COARSE SAND >.5 - 1 MM	9.8	%	ASTM D422-63	20050402	720730.62	592214.58	Grayish brown top 6" fine silt, sand and gravel, 6"-12" silt
GSD-028	AG01124	% MEDIUM SAND >.25 - .5 MM	44	%	ASTM D422-63	20050402	720730.62	592214.58	Grayish brown top 6" fine silt, sand and gravel, 6"-12" silt
GSD-028	AG01124	% FINE SAND >.125 - .25 MM	16	%	ASTM D422-63	20050402	720730.62	592214.58	Grayish brown top 6" fine silt, sand and gravel, 6"-12" silt
GSD-028	AG01124	% VERY FINE SAND >.0625 - .125 MM	2	%	ASTM D422-63	20050402	720730.62	592214.58	Grayish brown top 6" fine silt, sand and gravel, 6"-12" silt
GSD-028	AG01124	% SILT	9.1	%	ASTM D422-63	20050402	720730.62	592214.58	Grayish brown top 6" fine silt, sand and gravel, 6"-12" silt
GSD-028	AG01124	% CLAY & COLLOIDS	0.7	%	ASTM D422-63	20050402	720730.62	592214.58	Grayish brown top 6" fine silt, sand and gravel, 6"-12" silt
GSD-028	AG01124	ORGANIC CARBON, TOT.	8400	mg/Kg	C-88 @60C	20050402	720730.62	592214.58	Grayish brown top 6" fine silt, sand and gravel, 6"-12" silt
GSD-030	AG01125	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050403	720724.53	592277.76	Grayish brown fine sand - silt
GSD-030	AG01125	% VERY COURSE SAND >1 - 2 MM	0.4	%	ASTM D422-63	20050403	720724.53	592277.76	Grayish brown fine sand - silt
GSD-030	AG01125	% COARSE SAND >.5 - 1 MM	1.2	%	ASTM D422-63	20050403	720724.53	592277.76	Grayish brown fine sand - silt
GSD-030	AG01125	% MEDIUM SAND >.25 - .5 MM	3.3	%	ASTM D422-63	20050403	720724.53	592277.76	Grayish brown fine sand - silt
GSD-030	AG01125	% FINE SAND >.125 - .25 MM	78	%	ASTM D422-63	20050403	720724.53	592277.76	Grayish brown fine sand - silt
GSD-030	AG01125	% VERY FINE SAND >.0625 - .125 MM	12	%	ASTM D422-63	20050403	720724.53	592277.76	Grayish brown fine sand - silt
GSD-030	AG01125	% SILT	3.4	%	ASTM D422-63	20050403	720724.53	592277.76	Grayish brown fine sand - silt
GSD-030	AG01125	% CLAY & COLLOIDS	2.3	%	ASTM D422-63	20050403	720724.53	592277.76	Grayish brown fine sand - silt
GSD-030	AG01125	ORGANIC CARBON, TOT.	17000	mg/Kg	C-88 @60C	20050403	720724.53	592277.76	Grayish brown fine sand - silt
GSD-031	AG01126	% GRANULE & LARGER >2 MM	35	%	ASTM D422-63	20050404	723329.39	592787.6	Grayish brown medium to fine silt-sand, some gravel to 1"
GSD-031	AG01126	% VERY COURSE SAND >1 - 2 MM	6.2	%	ASTM D422-63	20050404	723329.39	592787.6	Grayish brown medium to fine silt-sand, some gravel to 1"
GSD-031	AG01126	% COARSE SAND >.5 - 1 MM	8.4	%	ASTM D422-63	20050404	723329.39	592787.6	Grayish brown medium to fine silt-sand, some gravel to 1"
GSD-031	AG01126	% MEDIUM SAND >.25 - .5 MM	14	%	ASTM D422-63	20050404	723329.39	592787.6	Grayish brown medium to fine silt-sand, some gravel to 1"

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-031	AG01126	% FINE SAND >.125 - .25 MM	17	%	ASTM D422-63	20050404	723329.39	592787.6	Grayish brown medium to fine silt-sand, some gravel to 1"
GSD-031	AG01126	% VERY FINE SAND >.0625 - .125 MM	9.4	%	ASTM D422-63	20050404	723329.39	592787.6	Grayish brown medium to fine silt-sand, some gravel to 1"
GSD-031	AG01126	% SILT	9.9	%	ASTM D422-63	20050404	723329.39	592787.6	Grayish brown medium to fine silt-sand, some gravel to 1"
GSD-031	AG01126	% CLAY & COLLOIDS	0	%	ASTM D422-63	20050404	723329.39	592787.6	Grayish brown medium to fine silt-sand, some gravel to 1"
GSD-031	AG01126	ORGANIC CARBON, TOT.	9700	mg/Kg	C-88 @60C	20050404	723329.39	592787.6	Grayish brown medium to fine silt-sand, some gravel to 1"
GSD-033	AG01127	% GRANULE & LARGER >2 MM	2.9	%	ASTM D422-63	20050405	723180.16	592857.78	Grayish brown fine to medium sand
GSD-033	AG01127	% VERY COURSE SAND >1 - 2 MM	5.4	%	ASTM D422-63	20050405	723180.16	592857.78	Grayish brown fine to medium sand
GSD-033	AG01127	% COARSE SAND >.5 - 1 MM	19	%	ASTM D422-63	20050405	723180.16	592857.78	Grayish brown fine to medium sand
GSD-033	AG01127	% MEDIUM SAND >.25 - .5 MM	55	%	ASTM D422-63	20050405	723180.16	592857.78	Grayish brown fine to medium sand
GSD-033	AG01127	% FINE SAND >.125 - .25 MM	13	%	ASTM D422-63	20050405	723180.16	592857.78	Grayish brown fine to medium sand
GSD-033	AG01127	% VERY FINE SAND >.0625 - .125 MM	1.8	%	ASTM D422-63	20050405	723180.16	592857.78	Grayish brown fine to medium sand
GSD-033	AG01127	% SILT	0	%	ASTM D422-63	20050405	723180.16	592857.78	Grayish brown fine to medium sand
GSD-033	AG01127	% CLAY & COLLOIDS	3	%	ASTM D422-63	20050405	723180.16	592857.78	Grayish brown fine to medium sand
GSD-033	AG01127	ORGANIC CARBON, TOT.	5100	mg/Kg	C-88 @60C	20050405	723180.16	592857.78	Grayish brown fine to medium sand
GSD-036	AG01128	% GRANULE & LARGER >2 MM	4.2	%	ASTM D422-63	20050406	724276.83	595495.31	Grayish brown silt w/ some fine sand / slight gravel to 0.5"
GSD-036	AG01128	% VERY COURSE SAND >1 - 2 MM	1.3	%	ASTM D422-63	20050406	724276.83	595495.31	Grayish brown silt w/ some fine sand / slight gravel to 0.5"
GSD-036	AG01128	% COARSE SAND >.5 - 1 MM	3.3	%	ASTM D422-63	20050406	724276.83	595495.31	Grayish brown silt w/ some fine sand / slight gravel to 0.5"
GSD-036	AG01128	% MEDIUM SAND >.25 - .5 MM	17	%	ASTM D422-63	20050406	724276.83	595495.31	Grayish brown silt w/ some fine sand / slight gravel to 0.5"
GSD-036	AG01128	% FINE SAND >.125 - .25 MM	35	%	ASTM D422-63	20050406	724276.83	595495.31	Grayish brown silt w/ some fine sand / slight gravel to 0.5"
GSD-036	AG01128	% VERY FINE SAND >.0625 - .125 MM	12	%	ASTM D422-63	20050406	724276.83	595495.31	Grayish brown silt w/ some fine sand / slight gravel to 0.5"
GSD-036	AG01128	% SILT	25	%	ASTM D422-63	20050406	724276.83	595495.31	Grayish brown silt w/ some fine sand / slight gravel to 0.5"
GSD-036	AG01128	% CLAY & COLLOIDS	2	%	ASTM D422-63	20050406	724276.83	595495.31	Grayish brown silt w/ some fine sand / slight gravel to 0.5"
GSD-036	AG01128	ORGANIC CARBON, TOT.	33000	mg/Kg	C-88 @60C	20050406	724276.83	595495.31	Grayish brown silt w/ some fine sand / slight gravel to 0.5"
GSD-038	AG01129	% GRANULE & LARGER >2 MM	52	%	ASTM D422-63	20050407	724155.53	595587.72	Grayish brown fine to medium sand, little fine sand
GSD-038	AG01129	% VERY COURSE SAND >1 - 2 MM	17	%	ASTM D422-63	20050407	724155.53	595587.72	Grayish brown fine to medium sand, little fine sand
GSD-038	AG01129	% COARSE SAND >.5 - 1 MM	12	%	ASTM D422-63	20050407	724155.53	595587.72	Grayish brown fine to medium sand, little fine sand
GSD-038	AG01129	% MEDIUM SAND >.25 - .5 MM	12	%	ASTM D422-63	20050407	724155.53	595587.72	Grayish brown fine to medium sand, little fine sand
GSD-038	AG01129	% FINE SAND >.125 - .25 MM	4.3	%	ASTM D422-63	20050407	724155.53	595587.72	Grayish brown fine to medium sand, little fine sand
GSD-038	AG01129	% VERY FINE SAND >.0625 - .125 MM	1.1	%	ASTM D422-63	20050407	724155.53	595587.72	Grayish brown fine to medium sand, little fine sand
GSD-038	AG01129	% SILT	1.1	%	ASTM D422-63	20050407	724155.53	595587.72	Grayish brown fine to medium sand, little fine sand
GSD-038	AG01129	% CLAY & COLLOIDS	0	%	ASTM D422-63	20050407	724155.53	595587.72	Grayish brown fine to medium sand, little fine sand
GSD-038	AG01129	ORGANIC CARBON, TOT.	5000	mg/Kg	C-88 @60C	20050407	724155.53	595587.72	Grayish brown fine to medium sand, little fine sand
GSD-039	AG01130	% GRANULE & LARGER >2 MM	3.4	%	ASTM D422-63	20050408	724217.47	595559.13	Grayish brown medium sand - silt

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-039	AG01130	% VERY COURSE SAND >1 - 2 MM	6.3	%	ASTM D422-63	20050408	724217.47	595559.13	Grayish brown medium sand - silt
GSD-039	AG01130	% COARSE SAND >.5 - 1 MM	24	%	ASTM D422-63	20050408	724217.47	595559.13	Grayish brown medium sand - silt
GSD-039	AG01130	% MEDIUM SAND >.25 - .5 MM	26	%	ASTM D422-63	20050408	724217.47	595559.13	Grayish brown medium sand - silt
GSD-039	AG01130	% FINE SAND >.125 - .25 MM	24	%	ASTM D422-63	20050408	724217.47	595559.13	Grayish brown medium sand - silt
GSD-039	AG01130	% VERY FINE SAND >.0625 - .125 MM	7.4	%	ASTM D422-63	20050408	724217.47	595559.13	Grayish brown medium sand - silt
GSD-039	AG01130	% SILT	8.6	%	ASTM D422-63	20050408	724217.47	595559.13	Grayish brown medium sand - silt
GSD-039	AG01130	% CLAY & COLLOIDS	0.9	%	ASTM D422-63	20050408	724217.47	595559.13	Grayish brown medium sand - silt
GSD-039	AG01130	ORGANIC CARBON, TOT.	15000	mg/Kg	C-88 @60C	20050408	724217.47	595559.13	Grayish brown medium sand - silt
GSD-041	AG01131	% GRANULE & LARGER >2 MM	16	%	ASTM D422-63	20050409	726215.4	596583.13	Grayish brown silt fine to medium sand, trace gravel
GSD-041	AG01131	% VERY COURSE SAND >1 - 2 MM	12	%	ASTM D422-63	20050409	726215.4	596583.13	Grayish brown silt fine to medium sand, trace gravel
GSD-041	AG01131	% COARSE SAND >.5 - 1 MM	11	%	ASTM D422-63	20050409	726215.4	596583.13	Grayish brown silt fine to medium sand, trace gravel
GSD-041	AG01131	% MEDIUM SAND >.25 - .5 MM	9.2	%	ASTM D422-63	20050409	726215.4	596583.13	Grayish brown silt fine to medium sand, trace gravel
GSD-041	AG01131	% FINE SAND >.125 - .25 MM	31	%	ASTM D422-63	20050409	726215.4	596583.13	Grayish brown silt fine to medium sand, trace gravel
GSD-041	AG01131	% VERY FINE SAND >.0625 - .125 MM	13	%	ASTM D422-63	20050409	726215.4	596583.13	Grayish brown silt fine to medium sand, trace gravel
GSD-041	AG01131	% SILT	8.4	%	ASTM D422-63	20050409	726215.4	596583.13	Grayish brown silt fine to medium sand, trace gravel
GSD-041	AG01131	% CLAY & COLLOIDS	1.1	%	ASTM D422-63	20050409	726215.4	596583.13	Grayish brown silt fine to medium sand, trace gravel
GSD-041	AG01131	ORGANIC CARBON, TOT.	20000	mg/Kg	C-88 @60C	20050409	726215.4	596583.13	Grayish brown silt fine to medium sand, trace gravel
GSD-044	AG01132	% GRANULE & LARGER >2 MM	8.1	%	ASTM D422-63	20050410	726202.27	596627.67	Grayish brown, top 3" fine medium sand, 3" clayey silt
GSD-044	AG01132	% VERY COURSE SAND >1 - 2 MM	8.1	%	ASTM D422-63	20050410	726202.27	596627.67	Grayish brown, top 3" fine medium sand, 3" clayey silt
GSD-044	AG01132	% COARSE SAND >.5 - 1 MM	25	%	ASTM D422-63	20050410	726202.27	596627.67	Grayish brown, top 3" fine medium sand, 3" clayey silt
GSD-044	AG01132	% MEDIUM SAND >.25 - .5 MM	36	%	ASTM D422-63	20050410	726202.27	596627.67	Grayish brown, top 3" fine medium sand, 3" clayey silt
GSD-044	AG01132	% FINE SAND >.125 - .25 MM	9.8	%	ASTM D422-63	20050410	726202.27	596627.67	Grayish brown, top 3" fine medium sand, 3" clayey silt
GSD-044	AG01132	% VERY FINE SAND >.0625 - .125 MM	1.7	%	ASTM D422-63	20050410	726202.27	596627.67	Grayish brown, top 3" fine medium sand, 3" clayey silt
GSD-044	AG01132	% SILT	12	%	ASTM D422-63	20050410	726202.27	596627.67	Grayish brown, top 3" fine medium sand, 3" clayey silt
GSD-044	AG01132	% CLAY & COLLOIDS	0	%	ASTM D422-63	20050410	726202.27	596627.67	Grayish brown, top 3" fine medium sand, 3" clayey silt
GSD-044	AG01132	ORGANIC CARBON, TOT.	8500	mg/Kg	C-88 @60C	20050410	726202.27	596627.67	Grayish brown, top 3" fine medium sand, 3" clayey silt
GSD-047	AG01133	% GRANULE & LARGER >2 MM	29	%	ASTM D422-63	20050411	728809.59	596956.9	Grayish brown silt w/ fine sand and gravel
GSD-047	AG01133	% VERY COURSE SAND >1 - 2 MM	2.2	%	ASTM D422-63	20050411	728809.59	596956.9	Grayish brown silt w/ fine sand and gravel
GSD-047	AG01133	% COARSE SAND >.5 - 1 MM	2.3	%	ASTM D422-63	20050411	728809.59	596956.9	Grayish brown silt w/ fine sand and gravel
GSD-047	AG01133	% MEDIUM SAND >.25 - .5 MM	3.1	%	ASTM D422-63	20050411	728809.59	596956.9	Grayish brown silt w/ fine sand and gravel
GSD-047	AG01133	% FINE SAND >.125 - .25 MM	24	%	ASTM D422-63	20050411	728809.59	596956.9	Grayish brown silt w/ fine sand and gravel
GSD-047	AG01133	% VERY FINE SAND >.0625 - .125 MM	21	%	ASTM D422-63	20050411	728809.59	596956.9	Grayish brown silt w/ fine sand and gravel
GSD-047	AG01133	% SILT	16	%	ASTM D422-63	20050411	728809.59	596956.9	Grayish brown silt w/ fine sand and gravel

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-047	AG01133	% CLAY & COLLOIDS	2.1	%	ASTM D422-63	20050411	728809.59	596956.9	Grayish brown silt w/ fine sand and gravel
GSD-047	AG01133	ORGANIC CARBON, TOT.	48000	mg/Kg	C-88 @60C	20050411	728809.59	596956.9	Grayish brown silt w/ fine sand and gravel
GSD-048	AG01134	% GRANULE & LARGER >2 MM	12	%	ASTM D422-63	20050412	728751.77	596872.39	Grayish brown coarse sand and gravel, some trace silt
GSD-048	AG01134	% VERY COURSE SAND >1 - 2 MM	12	%	ASTM D422-63	20050412	728751.77	596872.39	Grayish brown coarse sand and gravel, some trace silt
GSD-048	AG01134	% COARSE SAND >.5 - 1 MM	36	%	ASTM D422-63	20050412	728751.77	596872.39	Grayish brown coarse sand and gravel, some trace silt
GSD-048	AG01134	% MEDIUM SAND >.25 - .5 MM	25	%	ASTM D422-63	20050412	728751.77	596872.39	Grayish brown coarse sand and gravel, some trace silt
GSD-048	AG01134	% FINE SAND >.125 - .25 MM	10	%	ASTM D422-63	20050412	728751.77	596872.39	Grayish brown coarse sand and gravel, some trace silt
GSD-048	AG01134	% VERY FINE SAND >.0625 - .125 MM	1.8	%	ASTM D422-63	20050412	728751.77	596872.39	Grayish brown coarse sand and gravel, some trace silt
GSD-048	AG01134	% SILT	2.2	%	ASTM D422-63	20050412	728751.77	596872.39	Grayish brown coarse sand and gravel, some trace silt
GSD-048	AG01134	% CLAY & COLLOIDS	0.7	%	ASTM D422-63	20050412	728751.77	596872.39	Grayish brown coarse sand and gravel, some trace silt
GSD-048	AG01134	ORGANIC CARBON, TOT.	4600	mg/Kg	C-88 @60C	20050412	728751.77	596872.39	Grayish brown coarse sand and gravel, some trace silt
GSD-052	AG01135	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050413	706255.81	587798.56	Grayish brown silt w/ trace fine sand
GSD-052	AG01135	% VERY COURSE SAND >1 - 2 MM	6.2	%	ASTM D422-63	20050413	706255.81	587798.56	Grayish brown silt w/ trace fine sand
GSD-052	AG01135	% COARSE SAND >.5 - 1 MM	6.4	%	ASTM D422-63	20050413	706255.81	587798.56	Grayish brown silt w/ trace fine sand
GSD-052	AG01135	% MEDIUM SAND >.25 - .5 MM	6	%	ASTM D422-63	20050413	706255.81	587798.56	Grayish brown silt w/ trace fine sand
GSD-052	AG01135	% FINE SAND >.125 - .25 MM	9.4	%	ASTM D422-63	20050413	706255.81	587798.56	Grayish brown silt w/ trace fine sand
GSD-052	AG01135	% VERY FINE SAND >.0625 - .125 MM	12	%	ASTM D422-63	20050413	706255.81	587798.56	Grayish brown silt w/ trace fine sand
GSD-052	AG01135	% SILT	59	%	ASTM D422-63	20050413	706255.81	587798.56	Grayish brown silt w/ trace fine sand
GSD-052	AG01135	% CLAY & COLLOIDS	1.4	%	ASTM D422-63	20050413	706255.81	587798.56	Grayish brown silt w/ trace fine sand
GSD-052	AG01135	ORGANIC CARBON, TOT.	78000	mg/Kg	C-88 @60C	20050413	706255.81	587798.56	Grayish brown silt w/ trace fine sand
GSD-053	AG01136	% GRANULE & LARGER >2 MM	3.3	%	ASTM D422-63	20050414	706363.36	587636.64	Grayish brown fine to medium sand, some silt
GSD-053	AG01136	% VERY COURSE SAND >1 - 2 MM	5.7	%	ASTM D422-63	20050414	706363.36	587636.64	Grayish brown fine to medium sand, some silt
GSD-053	AG01136	% COARSE SAND >.5 - 1 MM	14	%	ASTM D422-63	20050414	706363.36	587636.64	Grayish brown fine to medium sand, some silt
GSD-053	AG01136	% MEDIUM SAND >.25 - .5 MM	41	%	ASTM D422-63	20050414	706363.36	587636.64	Grayish brown fine to medium sand, some silt
GSD-053	AG01136	% FINE SAND >.125 - .25 MM	25	%	ASTM D422-63	20050414	706363.36	587636.64	Grayish brown fine to medium sand, some silt
GSD-053	AG01136	% VERY FINE SAND >.0625 - .125 MM	5.3	%	ASTM D422-63	20050414	706363.36	587636.64	Grayish brown fine to medium sand, some silt
GSD-053	AG01136	% SILT	2	%	ASTM D422-63	20050414	706363.36	587636.64	Grayish brown fine to medium sand, some silt
GSD-053	AG01136	% CLAY & COLLOIDS	3.1	%	ASTM D422-63	20050414	706363.36	587636.64	Grayish brown fine to medium sand, some silt
GSD-053	AG01136	ORGANIC CARBON, TOT.	10000	mg/Kg	C-88 @60C	20050414	706363.36	587636.64	Grayish brown fine to medium sand, some silt
GSD-057	AG01137	% GRANULE & LARGER >2 MM	55	%	ASTM D422-63	20050415	703819.71	586883.88	Grayish brown fine - coarse sand, gravel, little to some silt
GSD-057	AG01137	% VERY COURSE SAND >1 - 2 MM	11	%	ASTM D422-63	20050415	703819.71	586883.88	Grayish brown fine - coarse sand, gravel, little to some silt
GSD-057	AG01137	% COARSE SAND >.5 - 1 MM	11	%	ASTM D422-63	20050415	703819.71	586883.88	Grayish brown fine - coarse sand, gravel, little to some silt
GSD-057	AG01137	% MEDIUM SAND >.25 - .5 MM	13	%	ASTM D422-63	20050415	703819.71	586883.88	Grayish brown fine - coarse sand, gravel, little to some silt

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-057	AG01137	% FINE SAND >.125 - .25 MM	5.3	%	ASTM D422-63	20050415	703819.71	586883.88	Grayish brown fine - coarse sand, gravel, little to some silt
GSD-057	AG01137	% VERY FINE SAND >.0625 - .125 MM	1.9	%	ASTM D422-63	20050415	703819.71	586883.88	Grayish brown fine - coarse sand, gravel, little to some silt
GSD-057	AG01137	% SILT	2.9	%	ASTM D422-63	20050415	703819.71	586883.88	Grayish brown fine - coarse sand, gravel, little to some silt
GSD-057	AG01137	% CLAY & COLLOIDS	0.9	%	ASTM D422-63	20050415	703819.71	586883.88	Grayish brown fine - coarse sand, gravel, little to some silt
GSD-057	AG01137	ORGANIC CARBON, TOT.	10000	mg/Kg	C-88 @60C	20050415	703819.71	586883.88	Grayish brown fine - coarse sand, gravel, little to some silt
GSD-058	AG01138	% GRANULE & LARGER >2 MM	1.2	%	ASTM D422-63	20050416	703889.7	586745.11	Grayish brown fine - coarse sand, some silt
GSD-058	AG01138	% VERY COURSE SAND >1 - 2 MM	2.2	%	ASTM D422-63	20050416	703889.7	586745.11	Grayish brown fine - coarse sand, some silt
GSD-058	AG01138	% COARSE SAND >.5 - 1 MM	4.8	%	ASTM D422-63	20050416	703889.7	586745.11	Grayish brown fine - coarse sand, some silt
GSD-058	AG01138	% MEDIUM SAND >.25 - .5 MM	33	%	ASTM D422-63	20050416	703889.7	586745.11	Grayish brown fine - coarse sand, some silt
GSD-058	AG01138	% FINE SAND >.125 - .25 MM	44	%	ASTM D422-63	20050416	703889.7	586745.11	Grayish brown fine - coarse sand, some silt
GSD-058	AG01138	% VERY FINE SAND >.0625 - .125 MM	7.6	%	ASTM D422-63	20050416	703889.7	586745.11	Grayish brown fine - coarse sand, some silt
GSD-058	AG01138	% SILT	5.6	%	ASTM D422-63	20050416	703889.7	586745.11	Grayish brown fine - coarse sand, some silt
GSD-058	AG01138	% CLAY & COLLOIDS	1.2	%	ASTM D422-63	20050416	703889.7	586745.11	Grayish brown fine - coarse sand, some silt
GSD-058	AG01138	ORGANIC CARBON, TOT.	14000	mg/Kg	C-88 @60C	20050416	703889.7	586745.11	Grayish brown fine - coarse sand, some silt
GSD-162	AG01139	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	AAD1	743197.9	598764.41	Brownish gray fine sand w/ some organic matter
GSD-162	AG01139	% VERY COURSE SAND >1 - 2 MM	1.5	%	ASTM D422-63	AAD1	743197.9	598764.41	Brownish gray fine sand w/ some organic matter
GSD-162	AG01139	% COARSE SAND >.5 - 1 MM	2.5	%	ASTM D422-63	AAD1	743197.9	598764.41	Brownish gray fine sand w/ some organic matter
GSD-162	AG01139	% MEDIUM SAND >.25 - .5 MM	9.4	%	ASTM D422-63	AAD1	743197.9	598764.41	Brownish gray fine sand w/ some organic matter
GSD-162	AG01139	% FINE SAND >.125 - .25 MM	56	%	ASTM D422-63	AAD1	743197.9	598764.41	Brownish gray fine sand w/ some organic matter
GSD-162	AG01139	% VERY FINE SAND >.0625 - .125 MM	21	%	ASTM D422-63	AAD1	743197.9	598764.41	Brownish gray fine sand w/ some organic matter
GSD-162	AG01139	% SILT	7.1	%	ASTM D422-63	AAD1	743197.9	598764.41	Brownish gray fine sand w/ some organic matter
GSD-162	AG01139	% CLAY & COLLOIDS	2.1	%	ASTM D422-63	AAD1	743197.9	598764.41	Brownish gray fine sand w/ some organic matter
GSD-162	AG01139	ORGANIC CARBON, TOT.	21000	mg/Kg	C-88 @60C	AAD1	743197.9	598764.41	Brownish gray fine sand w/ some organic matter
GSD-163	AG01140	% GRANULE & LARGER >2 MM	31	%	ASTM D422-63	AAD2	743110.64	598600.89	Brownish gray medium and coarse sand, w/ multi-colored sands
GSD-163	AG01140	% VERY COURSE SAND >1 - 2 MM	23	%	ASTM D422-63	AAD2	743110.64	598600.89	Brownish gray medium and coarse sand, w/ multi-colored sands
GSD-163	AG01140	% COARSE SAND >.5 - 1 MM	27	%	ASTM D422-63	AAD2	743110.64	598600.89	Brownish gray medium and coarse sand, w/ multi-colored sands
GSD-163	AG01140	% MEDIUM SAND >.25 - .5 MM	12	%	ASTM D422-63	AAD2	743110.64	598600.89	Brownish gray medium and coarse sand, w/ multi-colored sands
GSD-163	AG01140	% FINE SAND >.125 - .25 MM	6	%	ASTM D422-63	AAD2	743110.64	598600.89	Brownish gray medium and coarse sand, w/ multi-colored sands

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-163	AG01140	% VERY FINE SAND >.0625 - .125 MM	0.4	%	ASTM D422-63	AAD2	743110.64	598600.89	Brownish gray medium and coarse sand, w/ multi-colored sands
GSD-163	AG01140	% SILT	0.7	%	ASTM D422-63	AAD2	743110.64	598600.89	Brownish gray medium and coarse sand, w/ multi-colored sands
GSD-163	AG01140	% CLAY & COLLOIDS	0	%	ASTM D422-63	AAD2	743110.64	598600.89	Brownish gray medium and coarse sand, w/ multi-colored sands
GSD-163	AG01140	ORGANIC CARBON, TOT.	15000	mg/Kg	C-88 @60C	AAD2	743110.64	598600.89	Brownish gray medium and coarse sand, w/ multi-colored sands
GSD-166	AG01141	% GRANULE & LARGER >2 MM	39	%	ASTM D422-63	AAD3	740684.83	599477.37	Grayish brown silt w/ fine sand to coarse gravel
GSD-166	AG01141	% VERY COURSE SAND >1 - 2 MM	5.6	%	ASTM D422-63	AAD3	740684.83	599477.37	Grayish brown silt w/ fine sand to coarse gravel
GSD-166	AG01141	% COARSE SAND >.5 - 1 MM	6.5	%	ASTM D422-63	AAD3	740684.83	599477.37	Grayish brown silt w/ fine sand to coarse gravel
GSD-166	AG01141	% MEDIUM SAND >.25 - .5 MM	11	%	ASTM D422-63	AAD3	740684.83	599477.37	Grayish brown silt w/ fine sand to coarse gravel
GSD-166	AG01141	% FINE SAND >.125 - .25 MM	19	%	ASTM D422-63	AAD3	740684.83	599477.37	Grayish brown silt w/ fine sand to coarse gravel
GSD-166	AG01141	% VERY FINE SAND >.0625 - .125 MM	8	%	ASTM D422-63	AAD3	740684.83	599477.37	Grayish brown silt w/ fine sand to coarse gravel
GSD-166	AG01141	% SILT	9.7	%	ASTM D422-63	AAD3	740684.83	599477.37	Grayish brown silt w/ fine sand to coarse gravel
GSD-166	AG01141	% CLAY & COLLOIDS	0.7	%	ASTM D422-63	AAD3	740684.83	599477.37	Grayish brown silt w/ fine sand to coarse gravel
GSD-166	AG01141	ORGANIC CARBON, TOT.	62000	mg/Kg	C-88 @60C	AAD3	740684.83	599477.37	Grayish brown silt w/ fine sand to coarse gravel
GSD-167	AG01142	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	AAD4	740738.91	599669.84	Brownish gray fine sand
GSD-167	AG01142	% VERY COURSE SAND >1 - 2 MM	1	%	ASTM D422-63	AAD4	740738.91	599669.84	Brownish gray fine sand
GSD-167	AG01142	% COARSE SAND >.5 - 1 MM	1.5	%	ASTM D422-63	AAD4	740738.91	599669.84	Brownish gray fine sand
GSD-167	AG01142	% MEDIUM SAND >.25 - .5 MM	5.1	%	ASTM D422-63	AAD4	740738.91	599669.84	Brownish gray fine sand
GSD-167	AG01142	% FINE SAND >.125 - .25 MM	73	%	ASTM D422-63	AAD4	740738.91	599669.84	Brownish gray fine sand
GSD-167	AG01142	% VERY FINE SAND >.0625 - .125 MM	15	%	ASTM D422-63	AAD4	740738.91	599669.84	Brownish gray fine sand
GSD-167	AG01142	% SILT	3.1	%	ASTM D422-63	AAD4	740738.91	599669.84	Brownish gray fine sand
GSD-167	AG01142	% CLAY & COLLOIDS	1.5	%	ASTM D422-63	AAD4	740738.91	599669.84	Brownish gray fine sand
GSD-167	AG01142	ORGANIC CARBON, TOT.	14000	mg/Kg	C-88 @60C	AAD4	740738.91	599669.84	Brownish gray fine sand
GSD-061	AG01143	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050425	731241.1	596121.47	Grayish brown silt
GSD-061	AG01143	% VERY COURSE SAND >1 - 2 MM	4.9	%	ASTM D422-63	20050425	731241.1	596121.47	Grayish brown silt
GSD-061	AG01143	% COARSE SAND >.5 - 1 MM	5.5	%	ASTM D422-63	20050425	731241.1	596121.47	Grayish brown silt
GSD-061	AG01143	% MEDIUM SAND >.25 - .5 MM	4.5	%	ASTM D422-63	20050425	731241.1	596121.47	Grayish brown silt
GSD-061	AG01143	% FINE SAND >.125 - .25 MM	12	%	ASTM D422-63	20050425	731241.1	596121.47	Grayish brown silt
GSD-061	AG01143	% VERY FINE SAND >.0625 - .125 MM	10	%	ASTM D422-63	20050425	731241.1	596121.47	Grayish brown silt
GSD-061	AG01143	% SILT	62	%	ASTM D422-63	20050425	731241.1	596121.47	Grayish brown silt

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-061	AG01143	% CLAY & COLLOIDS	1.3	%	ASTM D422-63	20050425	731241.1	596121.47	Grayish brown silt
GSD-061	AG01143	ORGANIC CARBON, TOT.	61000	mg/Kg	C-88 @60C	20050425	731241.1	596121.47	Grayish brown silt
GSD-062	AG01144	% GRANULE & LARGER >2 MM	12	%	ASTM D422-63	20050426	731164.74	596337.32	Moderate yellowish brown coarse sand and trace gravel
GSD-062	AG01144	% VERY COURSE SAND >1 - 2 MM	4.5	%	ASTM D422-63	20050426	731164.74	596337.32	Moderate yellowish brown coarse sand and trace gravel
GSD-062	AG01144	% COARSE SAND >.5 - 1 MM	12	%	ASTM D422-63	20050426	731164.74	596337.32	Moderate yellowish brown coarse sand and trace gravel
GSD-062	AG01144	% MEDIUM SAND >.25 - .5 MM	29	%	ASTM D422-63	20050426	731164.74	596337.32	Moderate yellowish brown coarse sand and trace gravel
GSD-062	AG01144	% FINE SAND >.125 - .25 MM	25	%	ASTM D422-63	20050426	731164.74	596337.32	Moderate yellowish brown coarse sand and trace gravel
GSD-062	AG01144	% VERY FINE SAND >.0625 - .125 MM	9.2	%	ASTM D422-63	20050426	731164.74	596337.32	Moderate yellowish brown coarse sand and trace gravel
GSD-062	AG01144	% SILT	6.6	%	ASTM D422-63	20050426	731164.74	596337.32	Moderate yellowish brown coarse sand and trace gravel
GSD-062	AG01144	% CLAY & COLLOIDS	2.3	%	ASTM D422-63	20050426	731164.74	596337.32	Moderate yellowish brown coarse sand and trace gravel
GSD-062	AG01144	ORGANIC CARBON, TOT.	2100	mg/Kg	C-88 @60C	20050426	731164.74	596337.32	Moderate yellowish brown coarse sand and trace gravel
GSD-063	AG01145	% GRANULE & LARGER >2 MM	21	%	ASTM D422-63	20050427	731210.56	596233.56	Grayish brown fine silt, fine sand, organic matter
GSD-063	AG01145	% VERY COURSE SAND >1 - 2 MM	3.8	%	ASTM D422-63	20050427	731210.56	596233.56	Grayish brown fine silt, fine sand, organic matter
GSD-063	AG01145	% COARSE SAND >.5 - 1 MM	11	%	ASTM D422-63	20050427	731210.56	596233.56	Grayish brown fine silt, fine sand, organic matter
GSD-063	AG01145	% MEDIUM SAND >.25 - .5 MM	17	%	ASTM D422-63	20050427	731210.56	596233.56	Grayish brown fine silt, fine sand, organic matter
GSD-063	AG01145	% FINE SAND >.125 - .25 MM	39	%	ASTM D422-63	20050427	731210.56	596233.56	Grayish brown fine silt, fine sand, organic matter
GSD-063	AG01145	% VERY FINE SAND >.0625 - .125 MM	6	%	ASTM D422-63	20050427	731210.56	596233.56	Grayish brown fine silt, fine sand, organic matter
GSD-063	AG01145	% SILT	1.4	%	ASTM D422-63	20050427	731210.56	596233.56	Grayish brown fine silt, fine sand, organic matter
GSD-063	AG01145	% CLAY & COLLOIDS	1.8	%	ASTM D422-63	20050427	731210.56	596233.56	Grayish brown fine silt, fine sand, organic matter
GSD-063	AG01145	ORGANIC CARBON, TOT.	12000	mg/Kg	C-88 @60C	20050427	731210.56	596233.56	Grayish brown fine silt, fine sand, organic matter
GSD-067	AG01146	% GRANULE & LARGER >2 MM	17	%	ASTM D422-63	20050428	733696.99	597037.92	Grayish brown coarse sand - silt, trace gravel
GSD-067	AG01146	% VERY COURSE SAND >1 - 2 MM	11	%	ASTM D422-63	20050428	733696.99	597037.92	Grayish brown coarse sand - silt, trace gravel
GSD-067	AG01146	% COARSE SAND >.5 - 1 MM	26	%	ASTM D422-63	20050428	733696.99	597037.92	Grayish brown coarse sand - silt, trace gravel
GSD-067	AG01146	% MEDIUM SAND >.25 - .5 MM	27	%	ASTM D422-63	20050428	733696.99	597037.92	Grayish brown coarse sand - silt, trace gravel
GSD-067	AG01146	% FINE SAND >.125 - .25 MM	8.4	%	ASTM D422-63	20050428	733696.99	597037.92	Grayish brown coarse sand - silt, trace gravel
GSD-067	AG01146	% VERY FINE SAND >.0625 - .125 MM	1.1	%	ASTM D422-63	20050428	733696.99	597037.92	Grayish brown coarse sand - silt, trace gravel
GSD-067	AG01146	% SILT	8.1	%	ASTM D422-63	20050428	733696.99	597037.92	Grayish brown coarse sand - silt, trace gravel
GSD-067	AG01146	% CLAY & COLLOIDS	2.1	%	ASTM D422-63	20050428	733696.99	597037.92	Grayish brown coarse sand - silt, trace gravel
GSD-067	AG01146	ORGANIC CARBON, TOT.	16000	mg/Kg	C-88 @60C	20050428	733696.99	597037.92	Grayish brown coarse sand - silt, trace gravel
GSD-068	AG01147	% GRANULE & LARGER >2 MM	1.6	%	ASTM D422-63	20050429	733725.65	596941.04	Grayish brown fine sand, some organic material
GSD-068	AG01147	% VERY COURSE SAND >1 - 2 MM	2.9	%	ASTM D422-63	20050429	733725.65	596941.04	Grayish brown fine sand, some organic material
GSD-068	AG01147	% COARSE SAND >.5 - 1 MM	3.8	%	ASTM D422-63	20050429	733725.65	596941.04	Grayish brown fine sand, some organic material
GSD-068	AG01147	% MEDIUM SAND >.25 - .5 MM	15	%	ASTM D422-63	20050429	733725.65	596941.04	Grayish brown fine sand, some organic material

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-068	AG01147	% FINE SAND >.125 - .25 MM	57	%	ASTM D422-63	20050429	733725.65	596941.04	Grayish brown fine sand, some organic material
GSD-068	AG01147	% VERY FINE SAND >.0625 - .125 MM	7.7	%	ASTM D422-63	20050429	733725.65	596941.04	Grayish brown fine sand, some organic material
GSD-068	AG01147	% SILT	8.1	%	ASTM D422-63	20050429	733725.65	596941.04	Grayish brown fine sand, some organic material
GSD-068	AG01147	% CLAY & COLLOIDS	4	%	ASTM D422-63	20050429	733725.65	596941.04	Grayish brown fine sand, some organic material
GSD-068	AG01147	ORGANIC CARBON, TOT.	25000	mg/Kg	C-88 @60C	20050429	733725.65	596941.04	Grayish brown fine sand, some organic material
GSD-069	AG01148	% GRANULE & LARGER >2 MM	0.2	%	ASTM D422-63	20050430	733735.75	596892.77	Grayish brown fine sand, silt w/ trace light brown sand
GSD-069	AG01148	% VERY COURSE SAND >1 - 2 MM	1.5	%	ASTM D422-63	20050430	733735.75	596892.77	Grayish brown fine sand, silt w/ trace light brown sand
GSD-069	AG01148	% COARSE SAND >.5 - 1 MM	3	%	ASTM D422-63	20050430	733735.75	596892.77	Grayish brown fine sand, silt w/ trace light brown sand
GSD-069	AG01148	% MEDIUM SAND >.25 - .5 MM	8.9	%	ASTM D422-63	20050430	733735.75	596892.77	Grayish brown fine sand, silt w/ trace light brown sand
GSD-069	AG01148	% FINE SAND >.125 - .25 MM	35	%	ASTM D422-63	20050430	733735.75	596892.77	Grayish brown fine sand, silt w/ trace light brown sand
GSD-069	AG01148	% VERY FINE SAND >.0625 - .125 MM	16	%	ASTM D422-63	20050430	733735.75	596892.77	Grayish brown fine sand, silt w/ trace light brown sand
GSD-069	AG01148	% SILT	32	%	ASTM D422-63	20050430	733735.75	596892.77	Grayish brown fine sand, silt w/ trace light brown sand
GSD-069	AG01148	% CLAY & COLLOIDS	2.4	%	ASTM D422-63	20050430	733735.75	596892.77	Grayish brown fine sand, silt w/ trace light brown sand
GSD-069	AG01148	ORGANIC CARBON, TOT.	35000	mg/Kg	C-88 @60C	20050430	733735.75	596892.77	Grayish brown fine sand, silt w/ trace light brown sand
GSD-072	AG01149	% GRANULE & LARGER >2 MM	45	%	ASTM D422-63	20050431	736272.93	597442.96	Moderate yellowish brown, Grayish brown silty sand, coarse gravel up to 1"
GSD-072	AG01149	% VERY COURSE SAND >1 - 2 MM	5.6	%	ASTM D422-63	20050431	736272.93	597442.96	Moderate yellowish brown, Grayish brown silty sand, coarse gravel up to 1"
GSD-072	AG01149	% COARSE SAND >.5 - 1 MM	6	%	ASTM D422-63	20050431	736272.93	597442.96	Moderate yellowish brown, Grayish brown silty sand, coarse gravel up to 1"
GSD-072	AG01149	% MEDIUM SAND >.25 - .5 MM	8.5	%	ASTM D422-63	20050431	736272.93	597442.96	Moderate yellowish brown, Grayish brown silty sand, coarse gravel up to 1"
GSD-072	AG01149	% FINE SAND >.125 - .25 MM	12	%	ASTM D422-63	20050431	736272.93	597442.96	Moderate yellowish brown, Grayish brown silty sand, coarse gravel up to 1"
GSD-072	AG01149	% VERY FINE SAND >.0625 - .125 MM	5.9	%	ASTM D422-63	20050431	736272.93	597442.96	Moderate yellowish brown, Grayish brown silty sand, coarse gravel up to 1"
GSD-072	AG01149	% SILT	15	%	ASTM D422-63	20050431	736272.93	597442.96	Moderate yellowish brown, Grayish brown silty sand, coarse gravel up to 1"
GSD-072	AG01149	% CLAY & COLLOIDS	1.3	%	ASTM D422-63	20050431	736272.93	597442.96	Moderate yellowish brown, Grayish brown silty sand, coarse gravel up to 1"
GSD-072	AG01149	ORGANIC CARBON, TOT.	28000	mg/Kg	C-88 @60C	20050431	736272.93	597442.96	Moderate yellowish brown, Grayish brown silty sand, coarse gravel up to 1"

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-073	AG01150	% GRANULE & LARGER >2 MM	1.5	%	ASTM D422-63	20050432	736189.6	597399.61	Grayish brown fine to coarse sand, trace gravel, trace shell fragments
GSD-073	AG01150	% VERY COURSE SAND >1 - 2 MM	3.7	%	ASTM D422-63	20050432	736189.6	597399.61	Grayish brown fine to coarse sand, trace gravel, trace shell fragments
GSD-073	AG01150	% COARSE SAND >.5 - 1 MM	41	%	ASTM D422-63	20050432	736189.6	597399.61	Grayish brown fine to coarse sand, trace gravel, trace shell fragments
GSD-073	AG01150	% MEDIUM SAND >.25 - .5 MM	38	%	ASTM D422-63	20050432	736189.6	597399.61	Grayish brown fine to coarse sand, trace gravel, trace shell fragments
GSD-073	AG01150	% FINE SAND >.125 - .25 MM	10	%	ASTM D422-63	20050432	736189.6	597399.61	Grayish brown fine to coarse sand, trace gravel, trace shell fragments
GSD-073	AG01150	% VERY FINE SAND >.0625 - .125 MM	2.1	%	ASTM D422-63	20050432	736189.6	597399.61	Grayish brown fine to coarse sand, trace gravel, trace shell fragments
GSD-073	AG01150	% SILT	3	%	ASTM D422-63	20050432	736189.6	597399.61	Grayish brown fine to coarse sand, trace gravel, trace shell fragments
GSD-073	AG01150	% CLAY & COLLOIDS	0	%	ASTM D422-63	20050432	736189.6	597399.61	Grayish brown fine to coarse sand, trace gravel, trace shell fragments
GSD-073	AG01150	ORGANIC CARBON, TOT.	3600	mg/Kg	C-88 @60C	20050432	736189.6	597399.61	Grayish brown fine to coarse sand, trace gravel, trace shell fragments
GSD-076	AG01151	% GRANULE & LARGER >2 MM	34	%	ASTM D422-63	20050433	738524.78	598175.27	Grayish brown silt w/ gravel up to 1"
GSD-076	AG01151	% VERY COURSE SAND >1 - 2 MM	4.5	%	ASTM D422-63	20050433	738524.78	598175.27	Grayish brown silt w/ gravel up to 1"
GSD-076	AG01151	% COARSE SAND >.5 - 1 MM	4.6	%	ASTM D422-63	20050433	738524.78	598175.27	Grayish brown silt w/ gravel up to 1"
GSD-076	AG01151	% MEDIUM SAND >.25 - .5 MM	11	%	ASTM D422-63	20050433	738524.78	598175.27	Grayish brown silt w/ gravel up to 1"
GSD-076	AG01151	% FINE SAND >.125 - .25 MM	12	%	ASTM D422-63	20050433	738524.78	598175.27	Grayish brown silt w/ gravel up to 1"
GSD-076	AG01151	% VERY FINE SAND >.0625 - .125 MM	9	%	ASTM D422-63	20050433	738524.78	598175.27	Grayish brown silt w/ gravel up to 1"
GSD-076	AG01151	% SILT	23	%	ASTM D422-63	20050433	738524.78	598175.27	Grayish brown silt w/ gravel up to 1"
GSD-076	AG01151	% CLAY & COLLOIDS	1.8	%	ASTM D422-63	20050433	738524.78	598175.27	Grayish brown silt w/ gravel up to 1"
GSD-076	AG01151	ORGANIC CARBON, TOT.	46000	mg/Kg	C-88 @60C	20050433	738524.78	598175.27	Grayish brown silt w/ gravel up to 1"
GSD-077	AG01152	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050434	738345.07	598184.9	Grayish brown fine sand - silt, organic material
GSD-077	AG01152	% VERY COURSE SAND >1 - 2 MM	2.3	%	ASTM D422-63	20050434	738345.07	598184.9	Grayish brown fine sand - silt, organic material
GSD-077	AG01152	% COARSE SAND >.5 - 1 MM	5.1	%	ASTM D422-63	20050434	738345.07	598184.9	Grayish brown fine sand - silt, organic material
GSD-077	AG01152	% MEDIUM SAND >.25 - .5 MM	54	%	ASTM D422-63	20050434	738345.07	598184.9	Grayish brown fine sand - silt, organic material
GSD-077	AG01152	% FINE SAND >.125 - .25 MM	29	%	ASTM D422-63	20050434	738345.07	598184.9	Grayish brown fine sand - silt, organic material
GSD-077	AG01152	% VERY FINE SAND >.0625 - .125 MM	4.6	%	ASTM D422-63	20050434	738345.07	598184.9	Grayish brown fine sand - silt, organic material

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-077	AG01152	% SILT	2.4	%	ASTM D422-63	20050434	738345.07	598184.9	Grayish brown fine sand - silt, organic material
GSD-077	AG01152	% CLAY & COLLOIDS	2.2	%	ASTM D422-63	20050434	738345.07	598184.9	Grayish brown fine sand - silt, organic material
GSD-077	AG01152	ORGANIC CARBON, TOT.	9500	mg/Kg	C-88 @60C	20050434	738345.07	598184.9	Grayish brown fine sand - silt, organic material
GSD-078	AG01153	% GRANULE & LARGER >2 MM	2.4	%	ASTM D422-63	20050435	738417.91	598186.82	Grayish brown fine - coarse sand, trace organics
GSD-078	AG01153	% VERY COURSE SAND >1 - 2 MM	8.3	%	ASTM D422-63	20050435	738417.91	598186.82	Grayish brown fine - coarse sand, trace organics
GSD-078	AG01153	% COARSE SAND >.5 - 1 MM	39	%	ASTM D422-63	20050435	738417.91	598186.82	Grayish brown fine - coarse sand, trace organics
GSD-078	AG01153	% MEDIUM SAND >.25 - .5 MM	44	%	ASTM D422-63	20050435	738417.91	598186.82	Grayish brown fine - coarse sand, trace organics
GSD-078	AG01153	% FINE SAND >.125 - .25 MM	4.7	%	ASTM D422-63	20050435	738417.91	598186.82	Grayish brown fine - coarse sand, trace organics
GSD-078	AG01153	% VERY FINE SAND >.0625 - .125 MM	0.5	%	ASTM D422-63	20050435	738417.91	598186.82	Grayish brown fine - coarse sand, trace organics
GSD-078	AG01153	% SILT	1.1	%	ASTM D422-63	20050435	738417.91	598186.82	Grayish brown fine - coarse sand, trace organics
GSD-078	AG01153	% CLAY & COLLOIDS	0	%	ASTM D422-63	20050435	738417.91	598186.82	Grayish brown fine - coarse sand, trace organics
GSD-078	AG01153	ORGANIC CARBON, TOT.	1700	mg/Kg	C-88 @60C	20050435	738417.91	598186.82	Grayish brown fine - coarse sand, trace organics
GSD-079	AG01154	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050436	738477.6	598185.38	Olive gray - grayish brown clayey material - medium stiff
GSD-079	AG01154	% VERY COURSE SAND >1 - 2 MM	0.2	%	ASTM D422-63	20050436	738477.6	598185.38	Olive gray - grayish brown clayey material - medium stiff
GSD-079	AG01154	% COARSE SAND >.5 - 1 MM	0.2	%	ASTM D422-63	20050436	738477.6	598185.38	Olive gray - grayish brown clayey material - medium stiff
GSD-079	AG01154	% MEDIUM SAND >.25 - .5 MM	0.2	%	ASTM D422-63	20050436	738477.6	598185.38	Olive gray - grayish brown clayey material - medium stiff
GSD-079	AG01154	% FINE SAND >.125 - .25 MM	0.2	%	ASTM D422-63	20050436	738477.6	598185.38	Olive gray - grayish brown clayey material - medium stiff
GSD-079	AG01154	% VERY FINE SAND >.0625 - .125 MM	0.9	%	ASTM D422-63	20050436	738477.6	598185.38	Olive gray - grayish brown clayey material - medium stiff
GSD-079	AG01154	% SILT	61	%	ASTM D422-63	20050436	738477.6	598185.38	Olive gray - grayish brown clayey material - medium stiff
GSD-079	AG01154	% CLAY & COLLOIDS	37	%	ASTM D422-63	20050436	738477.6	598185.38	Olive gray - grayish brown clayey material - medium stiff
GSD-079	AG01154	ORGANIC CARBON, TOT.	1600	mg/Kg	C-88 @60C	20050436	738477.6	598185.38	Olive gray - grayish brown clayey material - medium stiff
GSD-081	AG01155	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050437	736782.57	599670.28	Grayish brown fine sand, trace organics
GSD-081	AG01155	% VERY COURSE SAND >1 - 2 MM	0.8	%	ASTM D422-63	20050437	736782.57	599670.28	Grayish brown fine sand, trace organics
GSD-081	AG01155	% COARSE SAND >.5 - 1 MM	3.2	%	ASTM D422-63	20050437	736782.57	599670.28	Grayish brown fine sand, trace organics
GSD-081	AG01155	% MEDIUM SAND >.25 - .5 MM	42	%	ASTM D422-63	20050437	736782.57	599670.28	Grayish brown fine sand, trace organics
GSD-081	AG01155	% FINE SAND >.125 - .25 MM	46	%	ASTM D422-63	20050437	736782.57	599670.28	Grayish brown fine sand, trace organics
GSD-081	AG01155	% VERY FINE SAND >.0625 - .125 MM	4.9	%	ASTM D422-63	20050437	736782.57	599670.28	Grayish brown fine sand, trace organics
GSD-081	AG01155	% SILT	1.6	%	ASTM D422-63	20050437	736782.57	599670.28	Grayish brown fine sand, trace organics
GSD-081	AG01155	% CLAY & COLLOIDS	1.4	%	ASTM D422-63	20050437	736782.57	599670.28	Grayish brown fine sand, trace organics
GSD-081	AG01155	ORGANIC CARBON, TOT.	9500	mg/Kg	C-88 @60C	20050437	736782.57	599670.28	Grayish brown fine sand, trace organics
GSD-084	AG01156	% GRANULE & LARGER >2 MM	40	%	ASTM D422-63	20050438	736755.54	599658.59	Grayish brown coarse sand, gravel up to 1/2"
GSD-084	AG01156	% VERY COURSE SAND >1 - 2 MM	26	%	ASTM D422-63	20050438	736755.54	599658.59	Grayish brown coarse sand, gravel up to 1/2"
GSD-084	AG01156	% COARSE SAND >.5 - 1 MM	23	%	ASTM D422-63	20050438	736755.54	599658.59	Grayish brown coarse sand, gravel up to 1/2"

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-084	AG01156	% MEDIUM SAND >.25 - .5 MM	7.9	%	ASTM D422-63	20050438	736755.54	599658.59	Grayish brown coarse sand, gravel up to 1/2"
GSD-084	AG01156	% FINE SAND >.125 - .25 MM	2.5	%	ASTM D422-63	20050438	736755.54	599658.59	Grayish brown coarse sand, gravel up to 1/2"
GSD-084	AG01156	% VERY FINE SAND >.0625 - .125 MM	0.3	%	ASTM D422-63	20050438	736755.54	599658.59	Grayish brown coarse sand, gravel up to 1/2"
GSD-084	AG01156	% SILT	0.7	%	ASTM D422-63	20050438	736755.54	599658.59	Grayish brown coarse sand, gravel up to 1/2"
GSD-084	AG01156	% CLAY & COLLOIDS	0.1	%	ASTM D422-63	20050438	736755.54	599658.59	Grayish brown coarse sand, gravel up to 1/2"
GSD-084	AG01156	ORGANIC CARBON, TOT.	3200	mg/Kg	C-88 @60C	20050438	736755.54	599658.59	Grayish brown coarse sand, gravel up to 1/2"
GSD-086	AG01157	% GRANULE & LARGER >2 MM	35	%	ASTM D422-63	20050439	738634.4	600759.97	Grayish brown fine silt - sand, gravel - rocks, some organics
GSD-086	AG01157	% VERY COURSE SAND >1 - 2 MM	3.5	%	ASTM D422-63	20050439	738634.4	600759.97	Grayish brown fine silt - sand, gravel - rocks, some organics
GSD-086	AG01157	% COARSE SAND >.5 - 1 MM	3.6	%	ASTM D422-63	20050439	738634.4	600759.97	Grayish brown fine silt - sand, gravel - rocks, some organics
GSD-086	AG01157	% MEDIUM SAND >.25 - .5 MM	16	%	ASTM D422-63	20050439	738634.4	600759.97	Grayish brown fine silt - sand, gravel - rocks, some organics
GSD-086	AG01157	% FINE SAND >.125 - .25 MM	28	%	ASTM D422-63	20050439	738634.4	600759.97	Grayish brown fine silt - sand, gravel - rocks, some organics
GSD-086	AG01157	% VERY FINE SAND >.0625 - .125 MM	5.8	%	ASTM D422-63	20050439	738634.4	600759.97	Grayish brown fine silt - sand, gravel - rocks, some organics
GSD-086	AG01157	% SILT	6.7	%	ASTM D422-63	20050439	738634.4	600759.97	Grayish brown fine silt - sand, gravel - rocks, some organics
GSD-086	AG01157	% CLAY & COLLOIDS	0.7	%	ASTM D422-63	20050439	738634.4	600759.97	Grayish brown fine silt - sand, gravel - rocks, some organics
GSD-086	AG01157	ORGANIC CARBON, TOT.	17000	mg/Kg	C-88 @60C	20050439	738634.4	600759.97	Grayish brown fine silt - sand, gravel - rocks, some organics
GSD-088	AG01158	% GRANULE & LARGER >2 MM	26	%	ASTM D422-63	20050440	738613.89	600830.93	Grayish brown coarse sand, gravel up to 1"
GSD-088	AG01158	% VERY COURSE SAND >1 - 2 MM	13	%	ASTM D422-63	20050440	738613.89	600830.93	Grayish brown coarse sand, gravel up to 1"
GSD-088	AG01158	% COARSE SAND >.5 - 1 MM	27	%	ASTM D422-63	20050440	738613.89	600830.93	Grayish brown coarse sand, gravel up to 1"
GSD-088	AG01158	% MEDIUM SAND >.25 - .5 MM	28	%	ASTM D422-63	20050440	738613.89	600830.93	Grayish brown coarse sand, gravel up to 1"
GSD-088	AG01158	% FINE SAND >.125 - .25 MM	5.9	%	ASTM D422-63	20050440	738613.89	600830.93	Grayish brown coarse sand, gravel up to 1"
GSD-088	AG01158	% VERY FINE SAND >.0625 - .125 MM	0.7	%	ASTM D422-63	20050440	738613.89	600830.93	Grayish brown coarse sand, gravel up to 1"
GSD-088	AG01158	% SILT	0	%	ASTM D422-63	20050440	738613.89	600830.93	Grayish brown coarse sand, gravel up to 1"
GSD-088	AG01158	% CLAY & COLLOIDS	0.9	%	ASTM D422-63	20050440	738613.89	600830.93	Grayish brown coarse sand, gravel up to 1"
GSD-088	AG01158	ORGANIC CARBON, TOT.	6100	mg/Kg	C-88 @60C	20050440	738613.89	600830.93	Grayish brown coarse sand, gravel up to 1"
GSD-091	AG01159	% GRANULE & LARGER >2 MM	15	%	ASTM D422-63	20050441	701738.33	585192.09	Grayish brown silt, slight coarse gravel
GSD-091	AG01159	% VERY COURSE SAND >1 - 2 MM	5.9	%	ASTM D422-63	20050441	701738.33	585192.09	Grayish brown silt, slight coarse gravel
GSD-091	AG01159	% COARSE SAND >.5 - 1 MM	5.2	%	ASTM D422-63	20050441	701738.33	585192.09	Grayish brown silt, slight coarse gravel
GSD-091	AG01159	% MEDIUM SAND >.25 - .5 MM	4.4	%	ASTM D422-63	20050441	701738.33	585192.09	Grayish brown silt, slight coarse gravel
GSD-091	AG01159	% FINE SAND >.125 - .25 MM	4.4	%	ASTM D422-63	20050441	701738.33	585192.09	Grayish brown silt, slight coarse gravel
GSD-091	AG01159	% VERY FINE SAND >.0625 - .125 MM	5.8	%	ASTM D422-63	20050441	701738.33	585192.09	Grayish brown silt, slight coarse gravel
GSD-091	AG01159	% SILT	56	%	ASTM D422-63	20050441	701738.33	585192.09	Grayish brown silt, slight coarse gravel
GSD-091	AG01159	% CLAY & COLLOIDS	2.9	%	ASTM D422-63	20050441	701738.33	585192.09	Grayish brown silt, slight coarse gravel
GSD-091	AG01159	ORGANIC CARBON, TOT.	83000	mg/Kg	C-88 @60C	20050441	701738.33	585192.09	Grayish brown silt, slight coarse gravel

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-093	AG01160	% GRANULE & LARGER >2 MM	1.2	%	ASTM D422-63	20050442	701666.44	585330.5	Grayish olive, grayish brown silt w/ some sand
GSD-093	AG01160	% VERY COURSE SAND >1 - 2 MM	6.1	%	ASTM D422-63	20050442	701666.44	585330.5	Grayish olive, grayish brown silt w/ some sand
GSD-093	AG01160	% COARSE SAND >.5 - 1 MM	9.3	%	ASTM D422-63	20050442	701666.44	585330.5	Grayish olive, grayish brown silt w/ some sand
GSD-093	AG01160	% MEDIUM SAND >.25 - .5 MM	9.7	%	ASTM D422-63	20050442	701666.44	585330.5	Grayish olive, grayish brown silt w/ some sand
GSD-093	AG01160	% FINE SAND >.125 - .25 MM	17	%	ASTM D422-63	20050442	701666.44	585330.5	Grayish olive, grayish brown silt w/ some sand
GSD-093	AG01160	% VERY FINE SAND >.0625 - .125 MM	9.9	%	ASTM D422-63	20050442	701666.44	585330.5	Grayish olive, grayish brown silt w/ some sand
GSD-093	AG01160	% SILT	47	%	ASTM D422-63	20050442	701666.44	585330.5	Grayish olive, grayish brown silt w/ some sand
GSD-093	AG01160	% CLAY & COLLOIDS	0.4	%	ASTM D422-63	20050442	701666.44	585330.5	Grayish olive, grayish brown silt w/ some sand
GSD-093	AG01160	ORGANIC CARBON, TOT.	75000	mg/Kg	C-88 @60C	20050442	701666.44	585330.5	Grayish olive, grayish brown silt w/ some sand
GSD-095	AG01161	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050443	701640.3	585410.84	Grayish olive silt w/ fine sand and slight organic
GSD-095	AG01161	% VERY COURSE SAND >1 - 2 MM	1.3	%	ASTM D422-63	20050443	701640.3	585410.84	Grayish olive silt w/ fine sand and slight organic
GSD-095	AG01161	% COARSE SAND >.5 - 1 MM	2.1	%	ASTM D422-63	20050443	701640.3	585410.84	Grayish olive silt w/ fine sand and slight organic
GSD-095	AG01161	% MEDIUM SAND >.25 - .5 MM	5.3	%	ASTM D422-63	20050443	701640.3	585410.84	Grayish olive silt w/ fine sand and slight organic
GSD-095	AG01161	% FINE SAND >.125 - .25 MM	42	%	ASTM D422-63	20050443	701640.3	585410.84	Grayish olive silt w/ fine sand and slight organic
GSD-095	AG01161	% VERY FINE SAND >.0625 - .125 MM	19	%	ASTM D422-63	20050443	701640.3	585410.84	Grayish olive silt w/ fine sand and slight organic
GSD-095	AG01161	% SILT	27	%	ASTM D422-63	20050443	701640.3	585410.84	Grayish olive silt w/ fine sand and slight organic
GSD-095	AG01161	% CLAY & COLLOIDS	3.2	%	ASTM D422-63	20050443	701640.3	585410.84	Grayish olive silt w/ fine sand and slight organic
GSD-095	AG01161	ORGANIC CARBON, TOT.	46000	mg/Kg	C-88 @60C	20050443	701640.3	585410.84	Grayish olive silt w/ fine sand and slight organic
GSD-096	AG01162	% GRANULE & LARGER >2 MM	6.5	%	ASTM D422-63	20050444	699083.49	584777.6	Grayish brown silt w/ trace coarse sand
GSD-096	AG01162	% VERY COURSE SAND >1 - 2 MM	7.2	%	ASTM D422-63	20050444	699083.49	584777.6	Grayish brown silt w/ trace coarse sand
GSD-096	AG01162	% COARSE SAND >.5 - 1 MM	7.9	%	ASTM D422-63	20050444	699083.49	584777.6	Grayish brown silt w/ trace coarse sand
GSD-096	AG01162	% MEDIUM SAND >.25 - .5 MM	9.4	%	ASTM D422-63	20050444	699083.49	584777.6	Grayish brown silt w/ trace coarse sand
GSD-096	AG01162	% FINE SAND >.125 - .25 MM	11	%	ASTM D422-63	20050444	699083.49	584777.6	Grayish brown silt w/ trace coarse sand
GSD-096	AG01162	% VERY FINE SAND >.0625 - .125 MM	10	%	ASTM D422-63	20050444	699083.49	584777.6	Grayish brown silt w/ trace coarse sand
GSD-096	AG01162	% SILT	45	%	ASTM D422-63	20050444	699083.49	584777.6	Grayish brown silt w/ trace coarse sand
GSD-096	AG01162	% CLAY & COLLOIDS	3.3	%	ASTM D422-63	20050444	699083.49	584777.6	Grayish brown silt w/ trace coarse sand
GSD-096	AG01162	ORGANIC CARBON, TOT.	62000	mg/Kg	C-88 @60C	20050444	699083.49	584777.6	Grayish brown silt w/ trace coarse sand
GSD-098	AG01163	% GRANULE & LARGER >2 MM	23	%	ASTM D422-63	20050445	699056.74	584917.1	Top 3" grayish brown fine silt - sand, bottom 3" light brown clayey material
GSD-098	AG01163	% VERY COURSE SAND >1 - 2 MM	12	%	ASTM D422-63	20050445	699056.74	584917.1	Top 3" grayish brown fine silt - sand, bottom 3" light brown clayey material
GSD-098	AG01163	% COARSE SAND >.5 - 1 MM	15	%	ASTM D422-63	20050445	699056.74	584917.1	Top 3" grayish brown fine silt - sand, bottom 3" light brown clayey material

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-098	AG01163	% MEDIUM SAND >.25 - .5 MM	14	%	ASTM D422-63	20050445	699056.74	584917.1	Top 3" grayish brown fine silt - sand, bottom 3" light brown clayey material
GSD-098	AG01163	% FINE SAND >.125 - .25 MM	17	%	ASTM D422-63	20050445	699056.74	584917.1	Top 3" grayish brown fine silt - sand, bottom 3" light brown clayey material
GSD-098	AG01163	% VERY FINE SAND >.0625 - .125 MM	5.6	%	ASTM D422-63	20050445	699056.74	584917.1	Top 3" grayish brown fine silt - sand, bottom 3" light brown clayey material
GSD-098	AG01163	% SILT	12	%	ASTM D422-63	20050445	699056.74	584917.1	Top 3" grayish brown fine silt - sand, bottom 3" light brown clayey material
GSD-098	AG01163	% CLAY & COLLOIDS	1.5	%	ASTM D422-63	20050445	699056.74	584917.1	Top 3" grayish brown fine silt - sand, bottom 3" light brown clayey material
GSD-098	AG01163	ORGANIC CARBON, TOT.	12000	mg/Kg	C-88 @60C	20050445	699056.74	584917.1	Top 3" grayish brown fine silt - sand, bottom 3" light brown clayey material
GSD-101	AG01164	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050447	683165.2	597175.17	Dark gray silt
GSD-101	AG01164	% VERY COURSE SAND >1 - 2 MM	0.2	%	ASTM D422-63	20050447	683165.2	597175.17	Dark gray silt
GSD-101	AG01164	% COARSE SAND >.5 - 1 MM	0.3	%	ASTM D422-63	20050447	683165.2	597175.17	Dark gray silt
GSD-101	AG01164	% MEDIUM SAND >.25 - .5 MM	0.3	%	ASTM D422-63	20050447	683165.2	597175.17	Dark gray silt
GSD-101	AG01164	% FINE SAND >.125 - .25 MM	0.3	%	ASTM D422-63	20050447	683165.2	597175.17	Dark gray silt
GSD-101	AG01164	% VERY FINE SAND >.0625 - .125 MM	2.4	%	ASTM D422-63	20050447	683165.2	597175.17	Dark gray silt
GSD-101	AG01164	% SILT	89	%	ASTM D422-63	20050447	683165.2	597175.17	Dark gray silt
GSD-101	AG01164	% CLAY & COLLOIDS	7.9	%	ASTM D422-63	20050447	683165.2	597175.17	Dark gray silt
GSD-101	AG01164	ORGANIC CARBON, TOT.	35000	mg/Kg	C-88 @60C	20050447	683165.2	597175.17	Dark gray silt
GSD-103	AG01165	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050448	683249.81	597378.6	Dark gray fluffy silt
GSD-103	AG01165	% VERY COURSE SAND >1 - 2 MM	0.1	%	ASTM D422-63	20050448	683249.81	597378.6	Dark gray fluffy silt
GSD-103	AG01165	% COARSE SAND >.5 - 1 MM	0	%	ASTM D422-63	20050448	683249.81	597378.6	Dark gray fluffy silt
GSD-103	AG01165	% MEDIUM SAND >.25 - .5 MM	0.2	%	ASTM D422-63	20050448	683249.81	597378.6	Dark gray fluffy silt
GSD-103	AG01165	% FINE SAND >.125 - .25 MM	0.3	%	ASTM D422-63	20050448	683249.81	597378.6	Dark gray fluffy silt
GSD-103	AG01165	% VERY FINE SAND >.0625 - .125 MM	2	%	ASTM D422-63	20050448	683249.81	597378.6	Dark gray fluffy silt
GSD-103	AG01165	% SILT	82	%	ASTM D422-63	20050448	683249.81	597378.6	Dark gray fluffy silt
GSD-103	AG01165	% CLAY & COLLOIDS	15	%	ASTM D422-63	20050448	683249.81	597378.6	Dark gray fluffy silt
GSD-103	AG01165	ORGANIC CARBON, TOT.	73000	mg/Kg	C-88 @60C	20050448	683249.81	597378.6	Dark gray fluffy silt
GSD-106	AG01166	% GRANULE & LARGER >2 MM	61	%	ASTM D422-63	20050449	685791.3	596550.9	Dark gray, olive silt w/ coarse gravel
GSD-106	AG01166	% VERY COURSE SAND >1 - 2 MM	5	%	ASTM D422-63	20050449	685791.3	596550.9	Dark gray, olive silt w/ coarse gravel
GSD-106	AG01166	% COARSE SAND >.5 - 1 MM	4.2	%	ASTM D422-63	20050449	685791.3	596550.9	Dark gray, olive silt w/ coarse gravel

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-106	AG01166	% MEDIUM SAND >.25 - .5 MM	4.4	%	ASTM D422-63	20050449	685791.3	596550.9	Dark gray, olive silt w/ coarse gravel
GSD-106	AG01166	% FINE SAND >.125 - .25 MM	2.4	%	ASTM D422-63	20050449	685791.3	596550.9	Dark gray, olive silt w/ coarse gravel
GSD-106	AG01166	% VERY FINE SAND >.0625 - .125 MM	1.2	%	ASTM D422-63	20050449	685791.3	596550.9	Dark gray, olive silt w/ coarse gravel
GSD-106	AG01166	% SILT	18	%	ASTM D422-63	20050449	685791.3	596550.9	Dark gray, olive silt w/ coarse gravel
GSD-106	AG01166	% CLAY & COLLOIDS	4	%	ASTM D422-63	20050449	685791.3	596550.9	Dark gray, olive silt w/ coarse gravel
GSD-106	AG01166	ORGANIC CARBON, TOT.	46000	mg/Kg	C-88 @60C	20050449	685791.3	596550.9	Dark gray, olive silt w/ coarse gravel
GSD-108	AG01167	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050450	685974.66	597509.89	Dark gray, olive silt
GSD-108	AG01167	% VERY COURSE SAND >1 - 2 MM	0.2	%	ASTM D422-63	20050450	685974.66	597509.89	Dark gray, olive silt
GSD-108	AG01167	% COARSE SAND >.5 - 1 MM	1	%	ASTM D422-63	20050450	685974.66	597509.89	Dark gray, olive silt
GSD-108	AG01167	% MEDIUM SAND >.25 - .5 MM	2.1	%	ASTM D422-63	20050450	685974.66	597509.89	Dark gray, olive silt
GSD-108	AG01167	% FINE SAND >.125 - .25 MM	8.8	%	ASTM D422-63	20050450	685974.66	597509.89	Dark gray, olive silt
GSD-108	AG01167	% VERY FINE SAND >.0625 - .125 MM	9.5	%	ASTM D422-63	20050450	685974.66	597509.89	Dark gray, olive silt
GSD-108	AG01167	% SILT	69	%	ASTM D422-63	20050450	685974.66	597509.89	Dark gray, olive silt
GSD-108	AG01167	% CLAY & COLLOIDS	9.5	%	ASTM D422-63	20050450	685974.66	597509.89	Dark gray, olive silt
GSD-108	AG01167	ORGANIC CARBON, TOT.	36000	mg/Kg	C-88 @60C	20050450	685974.66	597509.89	Dark gray, olive silt
GSD-111	AG01168	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050451	688759.47	596968.62	Dark gray, olive silt
GSD-111	AG01168	% VERY COURSE SAND >1 - 2 MM	2.1	%	ASTM D422-63	20050451	688759.47	596968.62	Dark gray, olive silt
GSD-111	AG01168	% COARSE SAND >.5 - 1 MM	2.7	%	ASTM D422-63	20050451	688759.47	596968.62	Dark gray, olive silt
GSD-111	AG01168	% MEDIUM SAND >.25 - .5 MM	2.1	%	ASTM D422-63	20050451	688759.47	596968.62	Dark gray, olive silt
GSD-111	AG01168	% FINE SAND >.125 - .25 MM	2	%	ASTM D422-63	20050451	688759.47	596968.62	Dark gray, olive silt
GSD-111	AG01168	% VERY FINE SAND >.0625 - .125 MM	1.7	%	ASTM D422-63	20050451	688759.47	596968.62	Dark gray, olive silt
GSD-111	AG01168	% SILT	81	%	ASTM D422-63	20050451	688759.47	596968.62	Dark gray, olive silt
GSD-111	AG01168	% CLAY & COLLOIDS	8.7	%	ASTM D422-63	20050451	688759.47	596968.62	Dark gray, olive silt
GSD-111	AG01168	ORGANIC CARBON, TOT.	47000	mg/Kg	C-88 @60C	20050451	688759.47	596968.62	Dark gray, olive silt
GSD-114	AG01169	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050452	688734.55	597170.74	Dark gray, olive silt
GSD-114	AG01169	% VERY COURSE SAND >1 - 2 MM	0.4	%	ASTM D422-63	20050452	688734.55	597170.74	Dark gray, olive silt
GSD-114	AG01169	% COARSE SAND >.5 - 1 MM	0.9	%	ASTM D422-63	20050452	688734.55	597170.74	Dark gray, olive silt
GSD-114	AG01169	% MEDIUM SAND >.25 - .5 MM	0.8	%	ASTM D422-63	20050452	688734.55	597170.74	Dark gray, olive silt
GSD-114	AG01169	% FINE SAND >.125 - .25 MM	1.1	%	ASTM D422-63	20050452	688734.55	597170.74	Dark gray, olive silt
GSD-114	AG01169	% VERY FINE SAND >.0625 - .125 MM	3.9	%	ASTM D422-63	20050452	688734.55	597170.74	Dark gray, olive silt
GSD-114	AG01169	% SILT	85	%	ASTM D422-63	20050452	688734.55	597170.74	Dark gray, olive silt
GSD-114	AG01169	% CLAY & COLLOIDS	8.1	%	ASTM D422-63	20050452	688734.55	597170.74	Dark gray, olive silt
GSD-114	AG01169	ORGANIC CARBON, TOT.	79000	mg/Kg	C-88 @60C	20050452	688734.55	597170.74	Dark gray, olive silt

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-116	AG01170	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050453	691002.93	597534.58	Dark gray, olive silt
GSD-116	AG01170	% VERY COURSE SAND >1 - 2 MM	0.4	%	ASTM D422-63	20050453	691002.93	597534.58	Dark gray, olive silt
GSD-116	AG01170	% COARSE SAND >.5 - 1 MM	0.9	%	ASTM D422-63	20050453	691002.93	597534.58	Dark gray, olive silt
GSD-116	AG01170	% MEDIUM SAND >.25 - .5 MM	0.8	%	ASTM D422-63	20050453	691002.93	597534.58	Dark gray, olive silt
GSD-116	AG01170	% FINE SAND >.125 - .25 MM	1	%	ASTM D422-63	20050453	691002.93	597534.58	Dark gray, olive silt
GSD-116	AG01170	% VERY FINE SAND >.0625 - .125 MM	3.6	%	ASTM D422-63	20050453	691002.93	597534.58	Dark gray, olive silt
GSD-116	AG01170	% SILT	86	%	ASTM D422-63	20050453	691002.93	597534.58	Dark gray, olive silt
GSD-116	AG01170	% CLAY & COLLOIDS	7.3	%	ASTM D422-63	20050453	691002.93	597534.58	Dark gray, olive silt
GSD-116	AG01170	ORGANIC CARBON, TOT.	63000	mg/Kg	C-88 @60C	20050453	691002.93	597534.58	Dark gray, olive silt
GSD-119	AG01171	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050454	690946.83	597754.66	Dark gray, olive silt
GSD-119	AG01171	% VERY COURSE SAND >1 - 2 MM	1.7	%	ASTM D422-63	20050454	690946.83	597754.66	Dark gray, olive silt
GSD-119	AG01171	% COARSE SAND >.5 - 1 MM	2.7	%	ASTM D422-63	20050454	690946.83	597754.66	Dark gray, olive silt
GSD-119	AG01171	% MEDIUM SAND >.25 - .5 MM	3	%	ASTM D422-63	20050454	690946.83	597754.66	Dark gray, olive silt
GSD-119	AG01171	% FINE SAND >.125 - .25 MM	8.4	%	ASTM D422-63	20050454	690946.83	597754.66	Dark gray, olive silt
GSD-119	AG01171	% VERY FINE SAND >.0625 - .125 MM	5.1	%	ASTM D422-63	20050454	690946.83	597754.66	Dark gray, olive silt
GSD-119	AG01171	% SILT	75	%	ASTM D422-63	20050454	690946.83	597754.66	Dark gray, olive silt
GSD-119	AG01171	% CLAY & COLLOIDS	4.3	%	ASTM D422-63	20050454	690946.83	597754.66	Dark gray, olive silt
GSD-119	AG01171	ORGANIC CARBON, TOT.	67000	mg/Kg	C-88 @60C	20050454	690946.83	597754.66	Dark gray, olive silt
GSD-122	AG01172	% GRANULE & LARGER >2 MM	2.3	%	ASTM D422-63	20050455	693530.93	598511.82	Dark gray, olive silt w/ a small amount of coarse sand
GSD-122	AG01172	% VERY COURSE SAND >1 - 2 MM	3.7	%	ASTM D422-63	20050455	693530.93	598511.82	Dark gray, olive silt w/ a small amount of coarse sand
GSD-122	AG01172	% COARSE SAND >.5 - 1 MM	3.3	%	ASTM D422-63	20050455	693530.93	598511.82	Dark gray, olive silt w/ a small amount of coarse sand
GSD-122	AG01172	% MEDIUM SAND >.25 - .5 MM	4.3	%	ASTM D422-63	20050455	693530.93	598511.82	Dark gray, olive silt w/ a small amount of coarse sand
GSD-122	AG01172	% FINE SAND >.125 - .25 MM	5.9	%	ASTM D422-63	20050455	693530.93	598511.82	Dark gray, olive silt w/ a small amount of coarse sand
GSD-122	AG01172	% VERY FINE SAND >.0625 - .125 MM	6.2	%	ASTM D422-63	20050455	693530.93	598511.82	Dark gray, olive silt w/ a small amount of coarse sand
GSD-122	AG01172	% SILT	70	%	ASTM D422-63	20050455	693530.93	598511.82	Dark gray, olive silt w/ a small amount of coarse sand
GSD-122	AG01172	% CLAY & COLLOIDS	4.3	%	ASTM D422-63	20050455	693530.93	598511.82	Dark gray, olive silt w/ a small amount of coarse sand
GSD-122	AG01172	ORGANIC CARBON, TOT.	53000	mg/Kg	C-88 @60C	20050455	693530.93	598511.82	Dark gray, olive silt w/ a small amount of coarse sand
GSD-124	AG01173	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050456	693529.44	598128.83	Dark gray, olive silt w/ fine sand
GSD-124	AG01173	% VERY COURSE SAND >1 - 2 MM	0.4	%	ASTM D422-63	20050456	693529.44	598128.83	Dark gray, olive silt w/ fine sand
GSD-124	AG01173	% COARSE SAND >.5 - 1 MM	0.7	%	ASTM D422-63	20050456	693529.44	598128.83	Dark gray, olive silt w/ fine sand
GSD-124	AG01173	% MEDIUM SAND >.25 - .5 MM	1.8	%	ASTM D422-63	20050456	693529.44	598128.83	Dark gray, olive silt w/ fine sand
GSD-124	AG01173	% FINE SAND >.125 - .25 MM	4.5	%	ASTM D422-63	20050456	693529.44	598128.83	Dark gray, olive silt w/ fine sand
GSD-124	AG01173	% VERY FINE SAND >.0625 - .125 MM	43	%	ASTM D422-63	20050456	693529.44	598128.83	Dark gray, olive silt w/ fine sand

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-124	AG01173	% SILT	48	%	ASTM D422-63	20050456	693529.44	598128.83	Dark gray, olive silt w/ fine sand
GSD-124	AG01173	% CLAY & COLLOIDS	1.7	%	ASTM D422-63	20050456	693529.44	598128.83	Dark gray, olive silt w/ fine sand
GSD-124	AG01173	ORGANIC CARBON, TOT.	38000	mg/Kg	C-88 @60C	20050456	693529.44	598128.83	Dark gray, olive silt w/ fine sand
GSD-126	AG01174	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050457	695290.13	596318.74	Dark gray, olive silt w/ some organic matter
GSD-126	AG01174	% VERY COURSE SAND >1 - 2 MM	0.8	%	ASTM D422-63	20050457	695290.13	596318.74	Dark gray, olive silt w/ some organic matter
GSD-126	AG01174	% COARSE SAND >.5 - 1 MM	1.3	%	ASTM D422-63	20050457	695290.13	596318.74	Dark gray, olive silt w/ some organic matter
GSD-126	AG01174	% MEDIUM SAND >.25 - .5 MM	2.2	%	ASTM D422-63	20050457	695290.13	596318.74	Dark gray, olive silt w/ some organic matter
GSD-126	AG01174	% FINE SAND >.125 - .25 MM	4.4	%	ASTM D422-63	20050457	695290.13	596318.74	Dark gray, olive silt w/ some organic matter
GSD-126	AG01174	% VERY FINE SAND >.0625 - .125 MM	15	%	ASTM D422-63	20050457	695290.13	596318.74	Dark gray, olive silt w/ some organic matter
GSD-126	AG01174	% SILT	69	%	ASTM D422-63	20050457	695290.13	596318.74	Dark gray, olive silt w/ some organic matter
GSD-126	AG01174	% CLAY & COLLOIDS	7.7	%	ASTM D422-63	20050457	695290.13	596318.74	Dark gray, olive silt w/ some organic matter
GSD-126	AG01174	ORGANIC CARBON, TOT.	70000	mg/Kg	C-88 @60C	20050457	695290.13	596318.74	Dark gray, olive silt w/ some organic matter
GSD-128	AG01175	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050458	695601.8	596275.52	Dark gray, olive silt w/ some medium sand
GSD-128	AG01175	% VERY COURSE SAND >1 - 2 MM	1.1	%	ASTM D422-63	20050458	695601.8	596275.52	Dark gray, olive silt w/ some medium sand
GSD-128	AG01175	% COARSE SAND >.5 - 1 MM	4.9	%	ASTM D422-63	20050458	695601.8	596275.52	Dark gray, olive silt w/ some medium sand
GSD-128	AG01175	% MEDIUM SAND >.25 - .5 MM	4.5	%	ASTM D422-63	20050458	695601.8	596275.52	Dark gray, olive silt w/ some medium sand
GSD-128	AG01175	% FINE SAND >.125 - .25 MM	8.1	%	ASTM D422-63	20050458	695601.8	596275.52	Dark gray, olive silt w/ some medium sand
GSD-128	AG01175	% VERY FINE SAND >.0625 - .125 MM	7.7	%	ASTM D422-63	20050458	695601.8	596275.52	Dark gray, olive silt w/ some medium sand
GSD-128	AG01175	% SILT	66	%	ASTM D422-63	20050458	695601.8	596275.52	Dark gray, olive silt w/ some medium sand
GSD-128	AG01175	% CLAY & COLLOIDS	7.5	%	ASTM D422-63	20050458	695601.8	596275.52	Dark gray, olive silt w/ some medium sand
GSD-128	AG01175	ORGANIC CARBON, TOT.	45000	mg/Kg	C-88 @60C	20050458	695601.8	596275.52	Dark gray, olive silt w/ some medium sand
GSD-132	AG01176	% GRANULE & LARGER >2 MM	30	%	ASTM D422-63	20050459	695675.31	594092.1	Dark gray, olive silt, fine gravel and coarse sand (large rock along bulkhead)
GSD-132	AG01176	% VERY COURSE SAND >1 - 2 MM	7.2	%	ASTM D422-63	20050459	695675.31	594092.1	Dark gray, olive silt, fine gravel and coarse sand (large rock along bulkhead)
GSD-132	AG01176	% COARSE SAND >.5 - 1 MM	8.7	%	ASTM D422-63	20050459	695675.31	594092.1	Dark gray, olive silt, fine gravel and coarse sand (large rock along bulkhead)
GSD-132	AG01176	% MEDIUM SAND >.25 - .5 MM	10	%	ASTM D422-63	20050459	695675.31	594092.1	Dark gray, olive silt, fine gravel and coarse sand (large rock along bulkhead)
GSD-132	AG01176	% FINE SAND >.125 - .25 MM	8.3	%	ASTM D422-63	20050459	695675.31	594092.1	Dark gray, olive silt, fine gravel and coarse sand (large rock along bulkhead)
GSD-132	AG01176	% VERY FINE SAND >.0625 - .125 MM	6.5	%	ASTM D422-63	20050459	695675.31	594092.1	Dark gray, olive silt, fine gravel and coarse sand (large rock along bulkhead)

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-132	AG01176	% SILT	29	%	ASTM D422-63	20050459	695675.31	594092.1	Dark gray, olive silt, fine gravel and coarse sand (large rock along bulkhead)
GSD-132	AG01176	% CLAY & COLLOIDS	0.3	%	ASTM D422-63	20050459	695675.31	594092.1	Dark gray, olive silt, fine gravel and coarse sand (large rock along bulkhead)
GSD-132	AG01176	ORGANIC CARBON, TOT.	41000	mg/Kg	C-88 @60C	20050459	695675.31	594092.1	Dark gray, olive silt, fine gravel and coarse sand (large rock along bulkhead)
GSD-134	AG01177	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050460	695323.22	594142.61	Dark gray, olive silt
GSD-134	AG01177	% VERY COURSE SAND >1 - 2 MM	1.4	%	ASTM D422-63	20050460	695323.22	594142.61	Dark gray, olive silt
GSD-134	AG01177	% COARSE SAND >.5 - 1 MM	5.1	%	ASTM D422-63	20050460	695323.22	594142.61	Dark gray, olive silt
GSD-134	AG01177	% MEDIUM SAND >.25 - .5 MM	3.8	%	ASTM D422-63	20050460	695323.22	594142.61	Dark gray, olive silt
GSD-134	AG01177	% FINE SAND >.125 - .25 MM	5.1	%	ASTM D422-63	20050460	695323.22	594142.61	Dark gray, olive silt
GSD-134	AG01177	% VERY FINE SAND >.0625 - .125 MM	14	%	ASTM D422-63	20050460	695323.22	594142.61	Dark gray, olive silt
GSD-134	AG01177	% SILT	64	%	ASTM D422-63	20050460	695323.22	594142.61	Dark gray, olive silt
GSD-134	AG01177	% CLAY & COLLOIDS	6.3	%	ASTM D422-63	20050460	695323.22	594142.61	Dark gray, olive silt
GSD-134	AG01177	ORGANIC CARBON, TOT.	49000	mg/Kg	C-88 @60C	20050460	695323.22	594142.61	Dark gray, olive silt
GSD-136	AG01178	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050461	694593.44	591701.67	Dark gray, olive silt
GSD-136	AG01178	% VERY COURSE SAND >1 - 2 MM	0.1	%	ASTM D422-63	20050461	694593.44	591701.67	Dark gray, olive silt
GSD-136	AG01178	% COARSE SAND >.5 - 1 MM	4.5	%	ASTM D422-63	20050461	694593.44	591701.67	Dark gray, olive silt
GSD-136	AG01178	% MEDIUM SAND >.25 - .5 MM	4.3	%	ASTM D422-63	20050461	694593.44	591701.67	Dark gray, olive silt
GSD-136	AG01178	% FINE SAND >.125 - .25 MM	4.3	%	ASTM D422-63	20050461	694593.44	591701.67	Dark gray, olive silt
GSD-136	AG01178	% VERY FINE SAND >.0625 - .125 MM	9.7	%	ASTM D422-63	20050461	694593.44	591701.67	Dark gray, olive silt
GSD-136	AG01178	% SILT	68	%	ASTM D422-63	20050461	694593.44	591701.67	Dark gray, olive silt
GSD-136	AG01178	% CLAY & COLLOIDS	9	%	ASTM D422-63	20050461	694593.44	591701.67	Dark gray, olive silt
GSD-136	AG01178	ORGANIC CARBON, TOT.	55000	mg/Kg	C-88 @60C	20050461	694593.44	591701.67	Dark gray, olive silt
GSD-138	AG01179	% GRANULE & LARGER >2 MM	1.5	%	ASTM D422-63	20050462	694715.16	591605.2	Dark gray, olive silt w/ fine sand
GSD-138	AG01179	% VERY COURSE SAND >1 - 2 MM	3.1	%	ASTM D422-63	20050462	694715.16	591605.2	Dark gray, olive silt w/ fine sand
GSD-138	AG01179	% COARSE SAND >.5 - 1 MM	7.2	%	ASTM D422-63	20050462	694715.16	591605.2	Dark gray, olive silt w/ fine sand
GSD-138	AG01179	% MEDIUM SAND >.25 - .5 MM	13	%	ASTM D422-63	20050462	694715.16	591605.2	Dark gray, olive silt w/ fine sand
GSD-138	AG01179	% FINE SAND >.125 - .25 MM	19	%	ASTM D422-63	20050462	694715.16	591605.2	Dark gray, olive silt w/ fine sand
GSD-138	AG01179	% VERY FINE SAND >.0625 - .125 MM	9.9	%	ASTM D422-63	20050462	694715.16	591605.2	Dark gray, olive silt w/ fine sand
GSD-138	AG01179	% SILT	46	%	ASTM D422-63	20050462	694715.16	591605.2	Dark gray, olive silt w/ fine sand
GSD-138	AG01179	% CLAY & COLLOIDS	1.2	%	ASTM D422-63	20050462	694715.16	591605.2	Dark gray, olive silt w/ fine sand
GSD-138	AG01179	ORGANIC CARBON, TOT.	47000	mg/Kg	C-88 @60C	20050462	694715.16	591605.2	Dark gray, olive silt w/ fine sand

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-171	AG01405	% GRANULE & LARGER >2 MM	78	%	ASTM D422-63	20050605	739520.93	600641.6	Cobble w/ Brownish Gray, coarse and medium gravel, coarse and medium sand
GSD-171	AG01405	% VERY COURSE SAND >1 - 2 MM	8.4	%	ASTM D422-63	20050605	739520.93	600641.6	Cobble w/ Brownish Gray, coarse and medium gravel, coarse and medium sand
GSD-171	AG01405	% COARSE SAND >.5 - 1 MM	5.6	%	ASTM D422-63	20050605	739520.93	600641.6	Cobble w/ Brownish Gray, coarse and medium gravel, coarse and medium sand
GSD-171	AG01405	% MEDIUM SAND >.25 - .5 MM	2.5	%	ASTM D422-63	20050605	739520.93	600641.6	Cobble w/ Brownish Gray, coarse and medium gravel, coarse and medium sand
GSD-171	AG01405	% FINE SAND >.125 - .25 MM	3.4	%	ASTM D422-63	20050605	739520.93	600641.6	Cobble w/ Brownish Gray, coarse and medium gravel, coarse and medium sand
GSD-171	AG01405	% VERY FINE SAND >.0625 - .125 MM	0.8	%	ASTM D422-63	20050605	739520.93	600641.6	Cobble w/ Brownish Gray, coarse and medium gravel, coarse and medium sand
GSD-171	AG01405	% SILT	0.8	%	ASTM D422-63	20050605	739520.93	600641.6	Cobble w/ Brownish Gray, coarse and medium gravel, coarse and medium sand
GSD-171	AG01405	% CLAY & COLLOIDS	0.1	%	ASTM D422-63	20050605	739520.93	600641.6	Cobble w/ Brownish Gray, coarse and medium gravel, coarse and medium sand
GSD-171	AG01405	ORGANIC CARBON, TOT.	8400	mg/Kg	C-88 @60C	20050605	739520.93	600641.6	Cobble w/ Brownish Gray, coarse and medium gravel, coarse and medium sand
GSD-172	AG01406	% GRANULE & LARGER >2 MM	34	%	ASTM D422-63	20050606	737347.09	600821.03	Grayish brown medium fine sand and fine gravel w/ some silt
GSD-172	AG01406	% VERY COURSE SAND >1 - 2 MM	11	%	ASTM D422-63	20050606	737347.09	600821.03	Grayish brown medium fine sand and fine gravel w/ some silt
GSD-172	AG01406	% COARSE SAND >.5 - 1 MM	13	%	ASTM D422-63	20050606	737347.09	600821.03	Grayish brown medium fine sand and fine gravel w/ some silt
GSD-172	AG01406	% MEDIUM SAND >.25 - .5 MM	18	%	ASTM D422-63	20050606	737347.09	600821.03	Grayish brown medium fine sand and fine gravel w/ some silt
GSD-172	AG01406	% FINE SAND >.125 - .25 MM	15	%	ASTM D422-63	20050606	737347.09	600821.03	Grayish brown medium fine sand and fine gravel w/ some silt
GSD-172	AG01406	% VERY FINE SAND >.0625 - .125 MM	4.6	%	ASTM D422-63	20050606	737347.09	600821.03	Grayish brown medium fine sand and fine gravel w/ some silt
GSD-172	AG01406	% SILT	3.3	%	ASTM D422-63	20050606	737347.09	600821.03	Grayish brown medium fine sand and fine gravel w/ some silt
GSD-172	AG01406	% CLAY & COLLOIDS	0.5	%	ASTM D422-63	20050606	737347.09	600821.03	Grayish brown medium fine sand and fine gravel w/ some silt
GSD-172	AG01406	ORGANIC CARBON, TOT.	6400	mg/Kg	C-88 @60C	20050606	737347.09	600821.03	Grayish brown medium fine sand and fine gravel w/ some silt
GSD-176	AG01407	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050607	737689.17	597417.46	Grayish brown fine sand - silt w/ organic
GSD-176	AG01407	% VERY COURSE SAND >1 - 2 MM	1.6	%	ASTM D422-63	20050607	737689.17	597417.46	Grayish brown fine sand - silt w/ organic

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-176	AG01407	% COARSE SAND >.5 - 1 MM	2.6	%	ASTM D422-63	20050607	737689.17	597417.46	Grayish brown fine sand - silt w/ organic
GSD-176	AG01407	% MEDIUM SAND >.25 - .5 MM	12	%	ASTM D422-63	20050607	737689.17	597417.46	Grayish brown fine sand - silt w/ organic
GSD-176	AG01407	% FINE SAND >.125 - .25 MM	48	%	ASTM D422-63	20050607	737689.17	597417.46	Grayish brown fine sand - silt w/ organic
GSD-176	AG01407	% VERY FINE SAND >.0625 - .125 MM	17	%	ASTM D422-63	20050607	737689.17	597417.46	Grayish brown fine sand - silt w/ organic
GSD-176	AG01407	% SILT	16	%	ASTM D422-63	20050607	737689.17	597417.46	Grayish brown fine sand - silt w/ organic
GSD-176	AG01407	% CLAY & COLLOIDS	1.8	%	ASTM D422-63	20050607	737689.17	597417.46	Grayish brown fine sand - silt w/ organic
GSD-176	AG01407	ORGANIC CARBON, TOT.	25000	mg/Kg	C-88 @60C	20050607	737689.17	597417.46	Grayish brown fine sand - silt w/ organic
GSD-180	AG01408	% GRANULE & LARGER >2 MM	21	%	ASTM D422-63	20050608	734886.17	597460.01	Grayish olive fine sandy w/ fine gravel some organic
GSD-180	AG01408	% VERY COURSE SAND >1 - 2 MM	8.8	%	ASTM D422-63	20050608	734886.17	597460.01	Grayish olive fine sandy w/ fine gravel some organic
GSD-180	AG01408	% COARSE SAND >.5 - 1 MM	16	%	ASTM D422-63	20050608	734886.17	597460.01	Grayish olive fine sandy w/ fine gravel some organic
GSD-180	AG01408	% MEDIUM SAND >.25 - .5 MM	18	%	ASTM D422-63	20050608	734886.17	597460.01	Grayish olive fine sandy w/ fine gravel some organic
GSD-180	AG01408	% FINE SAND >.125 - .25 MM	20	%	ASTM D422-63	20050608	734886.17	597460.01	Grayish olive fine sandy w/ fine gravel some organic
GSD-180	AG01408	% VERY FINE SAND >.0625 - .125 MM	11	%	ASTM D422-63	20050608	734886.17	597460.01	Grayish olive fine sandy w/ fine gravel some organic
GSD-180	AG01408	% SILT	5	%	ASTM D422-63	20050608	734886.17	597460.01	Grayish olive fine sandy w/ fine gravel some organic
GSD-180	AG01408	% CLAY & COLLOIDS	0.9	%	ASTM D422-63	20050608	734886.17	597460.01	Grayish olive fine sandy w/ fine gravel some organic
GSD-180	AG01408	ORGANIC CARBON, TOT.	13000	mg/Kg	C-88 @60C	20050608	734886.17	597460.01	Grayish olive fine sandy w/ fine gravel some organic
GSD-185	AG01409	% GRANULE & LARGER >2 MM	0.8	%	ASTM D422-63	20050609	734505	597246	Grayish olive fine sandy w/silt
GSD-185	AG01409	% VERY COURSE SAND >1 - 2 MM	1.4	%	ASTM D422-63	20050609	734505	597246	Grayish olive fine sandy w/silt
GSD-185	AG01409	% COARSE SAND >.5 - 1 MM	3	%	ASTM D422-63	20050609	734505	597246	Grayish olive fine sandy w/silt
GSD-185	AG01409	% MEDIUM SAND >.25 - .5 MM	36	%	ASTM D422-63	20050609	734505	597246	Grayish olive fine sandy w/silt
GSD-185	AG01409	% FINE SAND >.125 - .25 MM	55	%	ASTM D422-63	20050609	734505	597246	Grayish olive fine sandy w/silt
GSD-185	AG01409	% VERY FINE SAND >.0625 - .125 MM	2.4	%	ASTM D422-63	20050609	734505	597246	Grayish olive fine sandy w/silt
GSD-185	AG01409	% SILT	1.9	%	ASTM D422-63	20050609	734505	597246	Grayish olive fine sandy w/silt
GSD-185	AG01409	% CLAY & COLLOIDS	0	%	ASTM D422-63	20050609	734505	597246	Grayish olive fine sandy w/silt
GSD-185	AG01409	ORGANIC CARBON, TOT.	7000	mg/Kg	C-88 @60C	20050609	734505	597246	Grayish olive fine sandy w/silt
GSD-189	AG01410	% GRANULE & LARGER >2 MM	27	%	ASTM D422-63	20050610	728124.69	596985.03	Brownish gray medium to coarse sand with fine gravel
GSD-189	AG01410	% VERY COURSE SAND >1 - 2 MM	15	%	ASTM D422-63	20050610	728124.69	596985.03	Brownish gray medium to coarse sand with fine gravel
GSD-189	AG01410	% COARSE SAND >.5 - 1 MM	23	%	ASTM D422-63	20050610	728124.69	596985.03	Brownish gray medium to coarse sand with fine gravel
GSD-189	AG01410	% MEDIUM SAND >.25 - .5 MM	25	%	ASTM D422-63	20050610	728124.69	596985.03	Brownish gray medium to coarse sand with fine gravel
GSD-189	AG01410	% FINE SAND >.125 - .25 MM	7.9	%	ASTM D422-63	20050610	728124.69	596985.03	Brownish gray medium to coarse sand with fine gravel
GSD-189	AG01410	% VERY FINE SAND >.0625 - .125 MM	0.7	%	ASTM D422-63	20050610	728124.69	596985.03	Brownish gray medium to coarse sand with fine gravel
GSD-189	AG01410	% SILT	0.5	%	ASTM D422-63	20050610	728124.69	596985.03	Brownish gray medium to coarse sand with fine gravel
GSD-189	AG01410	% CLAY & COLLOIDS	0.4	%	ASTM D422-63	20050610	728124.69	596985.03	Brownish gray medium to coarse sand with fine gravel

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-189	AG01410	ORGANIC CARBON, TOT.	5600	mg/Kg	C-88 @60C	20050610	728124.69	596985.03	Brownish gray medium to coarse sand with fine gravel
GSD-193	AG01411	% GRANULE & LARGER >2 MM	16	%	ASTM D422-63	20050611	723764.4	594667.87	Grayish brown medium sand w/ silt organic matter
GSD-193	AG01411	% VERY COURSE SAND >1 - 2 MM	5.6	%	ASTM D422-63	20050611	723764.4	594667.87	Grayish brown medium sand w/ silt organic matter
GSD-193	AG01411	% COARSE SAND >.5 - 1 MM	14	%	ASTM D422-63	20050611	723764.4	594667.87	Grayish brown medium sand w/ silt organic matter
GSD-193	AG01411	% MEDIUM SAND >.25 - .5 MM	30	%	ASTM D422-63	20050611	723764.4	594667.87	Grayish brown medium sand w/ silt organic matter
GSD-193	AG01411	% FINE SAND >.125 - .25 MM	14	%	ASTM D422-63	20050611	723764.4	594667.87	Grayish brown medium sand w/ silt organic matter
GSD-193	AG01411	% VERY FINE SAND >.0625 - .125 MM	7.5	%	ASTM D422-63	20050611	723764.4	594667.87	Grayish brown medium sand w/ silt organic matter
GSD-193	AG01411	% SILT	13	%	ASTM D422-63	20050611	723764.4	594667.87	Grayish brown medium sand w/ silt organic matter
GSD-193	AG01411	% CLAY & COLLOIDS	0	%	ASTM D422-63	20050611	723764.4	594667.87	Grayish brown medium sand w/ silt organic matter
GSD-193	AG01411	ORGANIC CARBON, TOT.	7400	mg/Kg	C-88 @60C	20050611	723764.4	594667.87	Grayish brown medium sand w/ silt organic matter
GSD-197	AG01412	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050612	722025.84	592371.54	Brownish gray fine sand w/ some organic matter
GSD-197	AG01412	% VERY COURSE SAND >1 - 2 MM	0.3	%	ASTM D422-63	20050612	722025.84	592371.54	Brownish gray fine sand w/ some organic matter
GSD-197	AG01412	% COARSE SAND >.5 - 1 MM	1.6	%	ASTM D422-63	20050612	722025.84	592371.54	Brownish gray fine sand w/ some organic matter
GSD-197	AG01412	% MEDIUM SAND >.25 - .5 MM	60	%	ASTM D422-63	20050612	722025.84	592371.54	Brownish gray fine sand w/ some organic matter
GSD-197	AG01412	% FINE SAND >.125 - .25 MM	36	%	ASTM D422-63	20050612	722025.84	592371.54	Brownish gray fine sand w/ some organic matter
GSD-197	AG01412	% VERY FINE SAND >.0625 - .125 MM	1.3	%	ASTM D422-63	20050612	722025.84	592371.54	Brownish gray fine sand w/ some organic matter
GSD-197	AG01412	% SILT	1.2	%	ASTM D422-63	20050612	722025.84	592371.54	Brownish gray fine sand w/ some organic matter
GSD-197	AG01412	% CLAY & COLLOIDS	0	%	ASTM D422-63	20050612	722025.84	592371.54	Brownish gray fine sand w/ some organic matter
GSD-197	AG01412	ORGANIC CARBON, TOT.	2500	mg/Kg	C-88 @60C	20050612	722025.84	592371.54	Brownish gray fine sand w/ some organic matter
GSD-182	AG01413	% GRANULE & LARGER >2 MM	0.2	%	ASTM D422-63	20050613	734900	597355	Grayish olive fine sand w/silt
GSD-182	AG01413	% VERY COURSE SAND >1 - 2 MM	1.2	%	ASTM D422-63	20050613	734900	597355	Grayish olive fine sand w/silt
GSD-182	AG01413	% COARSE SAND >.5 - 1 MM	2.7	%	ASTM D422-63	20050613	734900	597355	Grayish olive fine sand w/silt
GSD-182	AG01413	% MEDIUM SAND >.25 - .5 MM	29	%	ASTM D422-63	20050613	734900	597355	Grayish olive fine sand w/silt
GSD-182	AG01413	% FINE SAND >.125 - .25 MM	53	%	ASTM D422-63	20050613	734900	597355	Grayish olive fine sand w/silt
GSD-182	AG01413	% VERY FINE SAND >.0625 - .125 MM	4.8	%	ASTM D422-63	20050613	734900	597355	Grayish olive fine sand w/silt
GSD-182	AG01413	% SILT	8.7	%	ASTM D422-63	20050613	734900	597355	Grayish olive fine sand w/silt
GSD-182	AG01413	% CLAY & COLLOIDS	1.1	%	ASTM D422-63	20050613	734900	597355	Grayish olive fine sand w/silt
GSD-182	AG01413	ORGANIC CARBON, TOT.	9200	mg/Kg	C-88 @60C	20050613	734900	597355	Grayish olive fine sand w/silt
GSD-200	AG01414	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050627	717339.33	592086.92	Grayish olive fine silt - fine sand
GSD-200	AG01414	% VERY COURSE SAND >1 - 2 MM	0.1	%	ASTM D422-63	20050627	717339.33	592086.92	Grayish olive fine silt - fine sand
GSD-200	AG01414	% COARSE SAND >.5 - 1 MM	0.4	%	ASTM D422-63	20050627	717339.33	592086.92	Grayish olive fine silt - fine sand
GSD-200	AG01414	% MEDIUM SAND >.25 - .5 MM	1.6	%	ASTM D422-63	20050627	717339.33	592086.92	Grayish olive fine silt - fine sand
GSD-200	AG01414	% FINE SAND >.125 - .25 MM	66	%	ASTM D422-63	20050627	717339.33	592086.92	Grayish olive fine silt - fine sand

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-200	AG01414	% VERY FINE SAND >.0625 - .125 MM	17	%	ASTM D422-63	20050627	717339.33	592086.92	Grayish olive fine silt - fine sand
GSD-200	AG01414	% SILT	13	%	ASTM D422-63	20050627	717339.33	592086.92	Grayish olive fine silt - fine sand
GSD-200	AG01414	% CLAY & COLLOIDS	2.3	%	ASTM D422-63	20050627	717339.33	592086.92	Grayish olive fine silt - fine sand
GSD-200	AG01414	ORGANIC CARBON, TOT.	13000	mg/Kg	C-88 @60C	20050627	717339.33	592086.92	Grayish olive fine silt - fine sand
GSD-207	AG01415	% GRANULE & LARGER >2 MM	5.7	%	ASTM D422-63	20050628	709318.69	589573.53	Grayish brown coarse sand, trace gravel, trace organics
GSD-207	AG01415	% VERY COURSE SAND >1 - 2 MM	17	%	ASTM D422-63	20050628	709318.69	589573.53	Grayish brown coarse sand, trace gravel, trace organics
GSD-207	AG01415	% COARSE SAND >.5 - 1 MM	51	%	ASTM D422-63	20050628	709318.69	589573.53	Grayish brown coarse sand, trace gravel, trace organics
GSD-207	AG01415	% MEDIUM SAND >.25 - .5 MM	25	%	ASTM D422-63	20050628	709318.69	589573.53	Grayish brown coarse sand, trace gravel, trace organics
GSD-207	AG01415	% FINE SAND >.125 - .25 MM	0.7	%	ASTM D422-63	20050628	709318.69	589573.53	Grayish brown coarse sand, trace gravel, trace organics
GSD-207	AG01415	% VERY FINE SAND >.0625 - .125 MM	0.3	%	ASTM D422-63	20050628	709318.69	589573.53	Grayish brown coarse sand, trace gravel, trace organics
GSD-207	AG01415	% SILT	0.8	%	ASTM D422-63	20050628	709318.69	589573.53	Grayish brown coarse sand, trace gravel, trace organics
GSD-207	AG01415	% CLAY & COLLOIDS	0	%	ASTM D422-63	20050628	709318.69	589573.53	Grayish brown coarse sand, trace gravel, trace organics
GSD-207	AG01415	ORGANIC CARBON, TOT.	1300	mg/Kg	C-88 @60C	20050628	709318.69	589573.53	Grayish brown coarse sand, trace gravel, trace organics
GSD-209	AG01416	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050629	704819.39	587103.68	Grayish brown silt, slight organics
GSD-209	AG01416	% VERY COURSE SAND >1 - 2 MM	0	%	ASTM D422-63	20050629	704819.39	587103.68	Grayish brown silt, slight organics
GSD-209	AG01416	% COARSE SAND >.5 - 1 MM	1	%	ASTM D422-63	20050629	704819.39	587103.68	Grayish brown silt, slight organics
GSD-209	AG01416	% MEDIUM SAND >.25 - .5 MM	2.8	%	ASTM D422-63	20050629	704819.39	587103.68	Grayish brown silt, slight organics
GSD-209	AG01416	% FINE SAND >.125 - .25 MM	3.6	%	ASTM D422-63	20050629	704819.39	587103.68	Grayish brown silt, slight organics
GSD-209	AG01416	% VERY FINE SAND >.0625 - .125 MM	8.5	%	ASTM D422-63	20050629	704819.39	587103.68	Grayish brown silt, slight organics
GSD-209	AG01416	% SILT	74	%	ASTM D422-63	20050629	704819.39	587103.68	Grayish brown silt, slight organics
GSD-209	AG01416	% CLAY & COLLOIDS	10	%	ASTM D422-63	20050629	704819.39	587103.68	Grayish brown silt, slight organics
GSD-209	AG01416	ORGANIC CARBON, TOT.	65000	mg/Kg	C-88 @60C	20050629	704819.39	587103.68	Grayish brown silt, slight organics
GSD-211	AG01417	% GRANULE & LARGER >2 MM	6.6	%	ASTM D422-63	20050630	703052.57	586338.02	Grayish brown top 2" fine sand, bottom silt
GSD-211	AG01417	% VERY COURSE SAND >1 - 2 MM	2.9	%	ASTM D422-63	20050630	703052.57	586338.02	Grayish brown top 2" fine sand, bottom silt
GSD-211	AG01417	% COARSE SAND >.5 - 1 MM	8.2	%	ASTM D422-63	20050630	703052.57	586338.02	Grayish brown top 2" fine sand, bottom silt
GSD-211	AG01417	% MEDIUM SAND >.25 - .5 MM	18	%	ASTM D422-63	20050630	703052.57	586338.02	Grayish brown top 2" fine sand, bottom silt
GSD-211	AG01417	% FINE SAND >.125 - .25 MM	17	%	ASTM D422-63	20050630	703052.57	586338.02	Grayish brown top 2" fine sand, bottom silt
GSD-211	AG01417	% VERY FINE SAND >.0625 - .125 MM	12	%	ASTM D422-63	20050630	703052.57	586338.02	Grayish brown top 2" fine sand, bottom silt
GSD-211	AG01417	% SILT	34	%	ASTM D422-63	20050630	703052.57	586338.02	Grayish brown top 2" fine sand, bottom silt
GSD-211	AG01417	% CLAY & COLLOIDS	1.2	%	ASTM D422-63	20050630	703052.57	586338.02	Grayish brown top 2" fine sand, bottom silt
GSD-211	AG01417	ORGANIC CARBON, TOT.	52000	mg/Kg	C-88 @60C	20050630	703052.57	586338.02	Grayish brown top 2" fine sand, bottom silt
GSD-215	AG01418	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050631	698379.68	584809.66	Grayish brown sand w/ slight silt, trace organics
GSD-215	AG01418	% VERY COURSE SAND >1 - 2 MM	0.6	%	ASTM D422-63	20050631	698379.68	584809.66	Grayish brown sand w/ slight silt, trace organics

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-215	AG01418	% COARSE SAND >.5 - 1 MM	16	%	ASTM D422-63	20050631	698379.68	584809.66	Grayish brown sand w/ slight silt, trace organics
GSD-215	AG01418	% MEDIUM SAND >.25 - .5 MM	51	%	ASTM D422-63	20050631	698379.68	584809.66	Grayish brown sand w/ slight silt, trace organics
GSD-215	AG01418	% FINE SAND >.125 - .25 MM	22	%	ASTM D422-63	20050631	698379.68	584809.66	Grayish brown sand w/ slight silt, trace organics
GSD-215	AG01418	% VERY FINE SAND >.0625 - .125 MM	7.2	%	ASTM D422-63	20050631	698379.68	584809.66	Grayish brown sand w/ slight silt, trace organics
GSD-215	AG01418	% SILT	2.9	%	ASTM D422-63	20050631	698379.68	584809.66	Grayish brown sand w/ slight silt, trace organics
GSD-215	AG01418	% CLAY & COLLOIDS	0.5	%	ASTM D422-63	20050631	698379.68	584809.66	Grayish brown sand w/ slight silt, trace organics
GSD-215	AG01418	ORGANIC CARBON, TOT.	5900	mg/Kg	C-88 @60C	20050631	698379.68	584809.66	Grayish brown sand w/ slight silt, trace organics
GSD-219	AG01419	% GRANULE & LARGER >2 MM	8.2	%	ASTM D422-63	20050632	692892.4	586095.99	Grayish brown silt w/ slight gravel and rocks
GSD-219	AG01419	% VERY COURSE SAND >1 - 2 MM	7	%	ASTM D422-63	20050632	692892.4	586095.99	Grayish brown silt w/ slight gravel and rocks
GSD-219	AG01419	% COARSE SAND >.5 - 1 MM	12	%	ASTM D422-63	20050632	692892.4	586095.99	Grayish brown silt w/ slight gravel and rocks
GSD-219	AG01419	% MEDIUM SAND >.25 - .5 MM	18	%	ASTM D422-63	20050632	692892.4	586095.99	Grayish brown silt w/ slight gravel and rocks
GSD-219	AG01419	% FINE SAND >.125 - .25 MM	15	%	ASTM D422-63	20050632	692892.4	586095.99	Grayish brown silt w/ slight gravel and rocks
GSD-219	AG01419	% VERY FINE SAND >.0625 - .125 MM	7.6	%	ASTM D422-63	20050632	692892.4	586095.99	Grayish brown silt w/ slight gravel and rocks
GSD-219	AG01419	% SILT	28	%	ASTM D422-63	20050632	692892.4	586095.99	Grayish brown silt w/ slight gravel and rocks
GSD-219	AG01419	% CLAY & COLLOIDS	4.6	%	ASTM D422-63	20050632	692892.4	586095.99	Grayish brown silt w/ slight gravel and rocks
GSD-219	AG01419	ORGANIC CARBON, TOT.	35000	mg/Kg	C-88 @60C	20050632	692892.4	586095.99	Grayish brown silt w/ slight gravel and rocks
GSD-222	AG01420	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050633	693130.15	586081.2	Grayish brown silt w/ slight organics
GSD-222	AG01420	% VERY COURSE SAND >1 - 2 MM	0.3	%	ASTM D422-63	20050633	693130.15	586081.2	Grayish brown silt w/ slight organics
GSD-222	AG01420	% COARSE SAND >.5 - 1 MM	1.2	%	ASTM D422-63	20050633	693130.15	586081.2	Grayish brown silt w/ slight organics
GSD-222	AG01420	% MEDIUM SAND >.25 - .5 MM	3	%	ASTM D422-63	20050633	693130.15	586081.2	Grayish brown silt w/ slight organics
GSD-222	AG01420	% FINE SAND >.125 - .25 MM	22	%	ASTM D422-63	20050633	693130.15	586081.2	Grayish brown silt w/ slight organics
GSD-222	AG01420	% VERY FINE SAND >.0625 - .125 MM	26	%	ASTM D422-63	20050633	693130.15	586081.2	Grayish brown silt w/ slight organics
GSD-222	AG01420	% SILT	43	%	ASTM D422-63	20050633	693130.15	586081.2	Grayish brown silt w/ slight organics
GSD-222	AG01420	% CLAY & COLLOIDS	5.1	%	ASTM D422-63	20050633	693130.15	586081.2	Grayish brown silt w/ slight organics
GSD-222	AG01420	ORGANIC CARBON, TOT.	53000	mg/Kg	C-88 @60C	20050633	693130.15	586081.2	Grayish brown silt w/ slight organics
GSD-226	AG01421	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050634	693299.58	590638.78	Grayish brown fine sand w/ trace silt and organics
GSD-226	AG01421	% VERY COURSE SAND >1 - 2 MM	0.1	%	ASTM D422-63	20050634	693299.58	590638.78	Grayish brown fine sand w/ trace silt and organics
GSD-226	AG01421	% COARSE SAND >.5 - 1 MM	0.4	%	ASTM D422-63	20050634	693299.58	590638.78	Grayish brown fine sand w/ trace silt and organics
GSD-226	AG01421	% MEDIUM SAND >.25 - .5 MM	2	%	ASTM D422-63	20050634	693299.58	590638.78	Grayish brown fine sand w/ trace silt and organics
GSD-226	AG01421	% FINE SAND >.125 - .25 MM	60	%	ASTM D422-63	20050634	693299.58	590638.78	Grayish brown fine sand w/ trace silt and organics
GSD-226	AG01421	% VERY FINE SAND >.0625 - .125 MM	34	%	ASTM D422-63	20050634	693299.58	590638.78	Grayish brown fine sand w/ trace silt and organics
GSD-226	AG01421	% SILT	1.5	%	ASTM D422-63	20050634	693299.58	590638.78	Grayish brown fine sand w/ trace silt and organics
GSD-226	AG01421	% CLAY & COLLOIDS	2.3	%	ASTM D422-63	20050634	693299.58	590638.78	Grayish brown fine sand w/ trace silt and organics

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-226	AG01421	ORGANIC CARBON, TOT.	14000	mg/Kg	C-88 @60C	20050634	693299.58	590638.78	Grayish brown fine sand w/ trace silt and organics
GSD-232	AG01422	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050635	689732.39	597367.49	Grayish brown silt w/ slight organics
GSD-232	AG01422	% VERY COURSE SAND >1 - 2 MM	1.3	%	ASTM D422-63	20050635	689732.39	597367.49	Grayish brown silt w/ slight organics
GSD-232	AG01422	% COARSE SAND >.5 - 1 MM	3.6	%	ASTM D422-63	20050635	689732.39	597367.49	Grayish brown silt w/ slight organics
GSD-232	AG01422	% MEDIUM SAND >.25 - .5 MM	2.7	%	ASTM D422-63	20050635	689732.39	597367.49	Grayish brown silt w/ slight organics
GSD-232	AG01422	% FINE SAND >.125 - .25 MM	3.2	%	ASTM D422-63	20050635	689732.39	597367.49	Grayish brown silt w/ slight organics
GSD-232	AG01422	% VERY FINE SAND >.0625 - .125 MM	17	%	ASTM D422-63	20050635	689732.39	597367.49	Grayish brown silt w/ slight organics
GSD-232	AG01422	% SILT	70	%	ASTM D422-63	20050635	689732.39	597367.49	Grayish brown silt w/ slight organics
GSD-232	AG01422	% CLAY & COLLOIDS	2.3	%	ASTM D422-63	20050635	689732.39	597367.49	Grayish brown silt w/ slight organics
GSD-232	AG01422	ORGANIC CARBON, TOT.	62000	mg/Kg	C-88 @60C	20050635	689732.39	597367.49	Grayish brown silt w/ slight organics
GSD-239	AG01423	ORGANIC CARBON, TOT.	39000	mg/Kg	C-88 @60C	20050650	738363.92	597794.93	Multi-colored coarse and medium sand and fine gravel
GSD-241	AG01424	% GRANULE & LARGER >2 MM	7.1	%	ASTM D422-63	20050651	734651.3	597221.15	Light olive, brown to brownish gray fine and medium sand with some gravel and organic
GSD-241	AG01424	% VERY COURSE SAND >1 - 2 MM	6.8	%	ASTM D422-63	20050651	734651.3	597221.15	Light olive, brown to brownish gray fine and medium sand with some gravel and organic
GSD-241	AG01424	% COARSE SAND >.5 - 1 MM	21	%	ASTM D422-63	20050651	734651.3	597221.15	Light olive, brown to brownish gray fine and medium sand with some gravel and organic
GSD-241	AG01424	% MEDIUM SAND >.25 - .5 MM	53	%	ASTM D422-63	20050651	734651.3	597221.15	Light olive, brown to brownish gray fine and medium sand with some gravel and organic
GSD-241	AG01424	% FINE SAND >.125 - .25 MM	8.5	%	ASTM D422-63	20050651	734651.3	597221.15	Light olive, brown to brownish gray fine and medium sand with some gravel and organic
GSD-241	AG01424	% VERY FINE SAND >.0625 - .125 MM	0.8	%	ASTM D422-63	20050651	734651.3	597221.15	Light olive, brown to brownish gray fine and medium sand with some gravel and organic
GSD-241	AG01424	% SILT	2.6	%	ASTM D422-63	20050651	734651.3	597221.15	Light olive, brown to brownish gray fine and medium sand with some gravel and organic
GSD-241	AG01424	% CLAY & COLLOIDS	0	%	ASTM D422-63	20050651	734651.3	597221.15	Light olive, brown to brownish gray fine and medium sand with some gravel and organic
GSD-241	AG01424	ORGANIC CARBON, TOT.	25000	mg/Kg	C-88 @60C	20050651	734651.3	597221.15	Light olive, brown to brownish gray fine and medium sand with some gravel and organic
GSD-243	AG01425	% GRANULE & LARGER >2 MM	32	%	ASTM D422-63	20050652	734370.59	597257.71	Brownish gray fine sand, silt w/ some fine gravel, organic
GSD-243	AG01425	% VERY COURSE SAND >1 - 2 MM	7	%	ASTM D422-63	20050652	734370.59	597257.71	Brownish gray fine sand, silt w/ some fine gravel, organic
GSD-243	AG01425	% COARSE SAND >.5 - 1 MM	8.7	%	ASTM D422-63	20050652	734370.59	597257.71	Brownish gray fine sand, silt w/ some fine gravel, organic
GSD-243	AG01425	% MEDIUM SAND >.25 - .5 MM	15	%	ASTM D422-63	20050652	734370.59	597257.71	Brownish gray fine sand, silt w/ some fine gravel, organic

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-243	AG01425	% FINE SAND >.125 - .25 MM	24	%	ASTM D422-63	20050652	734370.59	597257.71	Brownish gray fine sand, silt w/ some fine gravel, organic
GSD-243	AG01425	% VERY FINE SAND >.0625 - .125 MM	6.4	%	ASTM D422-63	20050652	734370.59	597257.71	Brownish gray fine sand, silt w/ some fine gravel, organic
GSD-243	AG01425	% SILT	4.4	%	ASTM D422-63	20050652	734370.59	597257.71	Brownish gray fine sand, silt w/ some fine gravel, organic
GSD-243	AG01425	% CLAY & COLLOIDS	2.8	%	ASTM D422-63	20050652	734370.59	597257.71	Brownish gray fine sand, silt w/ some fine gravel, organic
GSD-243	AG01425	ORGANIC CARBON, TOT.	17000	mg/Kg	C-88 @60C	20050652	734370.59	597257.71	Brownish gray fine sand, silt w/ some fine gravel, organic
GSD-247	AG01426	% GRANULE & LARGER >2 MM	24	%	ASTM D422-63	20050653	723417.77	593311.72	Brownish gray medium and coarse sand, organic matter
GSD-247	AG01426	% VERY COURSE SAND >1 - 2 MM	32	%	ASTM D422-63	20050653	723417.77	593311.72	Brownish gray medium and coarse sand, organic matter
GSD-247	AG01426	% COARSE SAND >.5 - 1 MM	32	%	ASTM D422-63	20050653	723417.77	593311.72	Brownish gray medium and coarse sand, organic matter
GSD-247	AG01426	% MEDIUM SAND >.25 - .5 MM	9.7	%	ASTM D422-63	20050653	723417.77	593311.72	Brownish gray medium and coarse sand, organic matter
GSD-247	AG01426	% FINE SAND >.125 - .25 MM	1.2	%	ASTM D422-63	20050653	723417.77	593311.72	Brownish gray medium and coarse sand, organic matter
GSD-247	AG01426	% VERY FINE SAND >.0625 - .125 MM	0.5	%	ASTM D422-63	20050653	723417.77	593311.72	Brownish gray medium and coarse sand, organic matter
GSD-247	AG01426	% SILT	0	%	ASTM D422-63	20050653	723417.77	593311.72	Brownish gray medium and coarse sand, organic matter
GSD-247	AG01426	% CLAY & COLLOIDS	1.5	%	ASTM D422-63	20050653	723417.77	593311.72	Brownish gray medium and coarse sand, organic matter
GSD-247	AG01426	ORGANIC CARBON, TOT.	27000	mg/Kg	C-88 @60C	20050653	723417.77	593311.72	Brownish gray medium and coarse sand, organic matter
GSD-252	AG01427	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050654	714903.46	591647.48	Brownish gray fine and medium sand, organic
GSD-252	AG01427	% VERY COURSE SAND >1 - 2 MM	1.4	%	ASTM D422-63	20050654	714903.46	591647.48	Brownish gray fine and medium sand, organic
GSD-252	AG01427	% COARSE SAND >.5 - 1 MM	3.6	%	ASTM D422-63	20050654	714903.46	591647.48	Brownish gray fine and medium sand, organic
GSD-252	AG01427	% MEDIUM SAND >.25 - .5 MM	20	%	ASTM D422-63	20050654	714903.46	591647.48	Brownish gray fine and medium sand, organic
GSD-252	AG01427	% FINE SAND >.125 - .25 MM	37	%	ASTM D422-63	20050654	714903.46	591647.48	Brownish gray fine and medium sand, organic
GSD-252	AG01427	% VERY FINE SAND >.0625 - .125 MM	7.6	%	ASTM D422-63	20050654	714903.46	591647.48	Brownish gray fine and medium sand, organic
GSD-252	AG01427	% SILT	24	%	ASTM D422-63	20050654	714903.46	591647.48	Brownish gray fine and medium sand, organic
GSD-252	AG01427	% CLAY & COLLOIDS	5.8	%	ASTM D422-63	20050654	714903.46	591647.48	Brownish gray fine and medium sand, organic
GSD-252	AG01427	ORGANIC CARBON, TOT.	39000	mg/Kg	C-88 @60C	20050654	714903.46	591647.48	Brownish gray fine and medium sand, organic
GSD-254	AG01428	% GRANULE & LARGER >2 MM	1.5	%	ASTM D422-63	20050655	707722.32	588595.96	Grayish brown silt
GSD-254	AG01428	% VERY COURSE SAND >1 - 2 MM	2.1	%	ASTM D422-63	20050655	707722.32	588595.96	Grayish brown silt
GSD-254	AG01428	% COARSE SAND >.5 - 1 MM	4.2	%	ASTM D422-63	20050655	707722.32	588595.96	Grayish brown silt
GSD-254	AG01428	% MEDIUM SAND >.25 - .5 MM	5.3	%	ASTM D422-63	20050655	707722.32	588595.96	Grayish brown silt
GSD-254	AG01428	% FINE SAND >.125 - .25 MM	15	%	ASTM D422-63	20050655	707722.32	588595.96	Grayish brown silt
GSD-254	AG01428	% VERY FINE SAND >.0625 - .125 MM	21	%	ASTM D422-63	20050655	707722.32	588595.96	Grayish brown silt
GSD-254	AG01428	% SILT	46	%	ASTM D422-63	20050655	707722.32	588595.96	Grayish brown silt
GSD-254	AG01428	% CLAY & COLLOIDS	3.9	%	ASTM D422-63	20050655	707722.32	588595.96	Grayish brown silt
GSD-254	AG01428	ORGANIC CARBON, TOT.	40000	mg/Kg	C-88 @60C	20050655	707722.32	588595.96	Grayish brown silt
GSD-258	AG01429	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050656	685812.23	596695.92	Dark grayish olive

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-258	AG01429	% VERY COURSE SAND >1 - 2 MM	0.2	%	ASTM D422-63	20050656	685812.23	596695.92	Dark grayish olive
GSD-258	AG01429	% COARSE SAND >.5 - 1 MM	1.3	%	ASTM D422-63	20050656	685812.23	596695.92	Dark grayish olive
GSD-258	AG01429	% MEDIUM SAND >.25 - .5 MM	1.5	%	ASTM D422-63	20050656	685812.23	596695.92	Dark grayish olive
GSD-258	AG01429	% FINE SAND >.125 - .25 MM	2.2	%	ASTM D422-63	20050656	685812.23	596695.92	Dark grayish olive
GSD-258	AG01429	% VERY FINE SAND >.0625 - .125 MM	20	%	ASTM D422-63	20050656	685812.23	596695.92	Dark grayish olive
GSD-258	AG01429	% SILT	65	%	ASTM D422-63	20050656	685812.23	596695.92	Dark grayish olive
GSD-258	AG01429	% CLAY & COLLOIDS	10	%	ASTM D422-63	20050656	685812.23	596695.92	Dark grayish olive
GSD-258	AG01429	ORGANIC CARBON, TOT.	47000	mg/Kg	C-88 @60C	20050656	685812.23	596695.92	Dark grayish olive
GSD-262	AG01430	% GRANULE & LARGER >2 MM	1.4	%	ASTM D422-63	20050657	682716.43	597692.36	Moderate yellowish brown dense clay
GSD-262	AG01430	% VERY COURSE SAND >1 - 2 MM	1.7	%	ASTM D422-63	20050657	682716.43	597692.36	Moderate yellowish brown dense clay
GSD-262	AG01430	% COARSE SAND >.5 - 1 MM	3.5	%	ASTM D422-63	20050657	682716.43	597692.36	Moderate yellowish brown dense clay
GSD-262	AG01430	% MEDIUM SAND >.25 - .5 MM	4.1	%	ASTM D422-63	20050657	682716.43	597692.36	Moderate yellowish brown dense clay
GSD-262	AG01430	% FINE SAND >.125 - .25 MM	3.2	%	ASTM D422-63	20050657	682716.43	597692.36	Moderate yellowish brown dense clay
GSD-262	AG01430	% VERY FINE SAND >.0625 - .125 MM	4.3	%	ASTM D422-63	20050657	682716.43	597692.36	Moderate yellowish brown dense clay
GSD-262	AG01430	% SILT	54	%	ASTM D422-63	20050657	682716.43	597692.36	Moderate yellowish brown dense clay
GSD-262	AG01430	% CLAY & COLLOIDS	28	%	ASTM D422-63	20050657	682716.43	597692.36	Moderate yellowish brown dense clay
GSD-262	AG01430	ORGANIC CARBON, TOT.	2400	mg/Kg	C-88 @60C	20050657	682716.43	597692.36	Moderate yellowish brown dense clay
GSD-266	AG01431	% GRANULE & LARGER >2 MM	1.9	%	ASTM D422-63	20050658	695170.09	592167.13	Dark grayish brown silt
GSD-266	AG01431	% VERY COURSE SAND >1 - 2 MM	1.4	%	ASTM D422-63	20050658	695170.09	592167.13	Dark grayish brown silt
GSD-266	AG01431	% COARSE SAND >.5 - 1 MM	8	%	ASTM D422-63	20050658	695170.09	592167.13	Dark grayish brown silt
GSD-266	AG01431	% MEDIUM SAND >.25 - .5 MM	6.4	%	ASTM D422-63	20050658	695170.09	592167.13	Dark grayish brown silt
GSD-266	AG01431	% FINE SAND >.125 - .25 MM	3.4	%	ASTM D422-63	20050658	695170.09	592167.13	Dark grayish brown silt
GSD-266	AG01431	% VERY FINE SAND >.0625 - .125 MM	5.1	%	ASTM D422-63	20050658	695170.09	592167.13	Dark grayish brown silt
GSD-266	AG01431	% SILT	67	%	ASTM D422-63	20050658	695170.09	592167.13	Dark grayish brown silt
GSD-266	AG01431	% CLAY & COLLOIDS	7.1	%	ASTM D422-63	20050658	695170.09	592167.13	Dark grayish brown silt
GSD-266	AG01431	ORGANIC CARBON, TOT.	46000	mg/Kg	C-88 @60C	20050658	695170.09	592167.13	Dark grayish brown silt
GSD-270	AG01432	% GRANULE & LARGER >2 MM	0	%	ASTM D422-63	20050659	695092.82	585033.4	Dark grayish olive silt
GSD-270	AG01432	% VERY COURSE SAND >1 - 2 MM	0.9	%	ASTM D422-63	20050659	695092.82	585033.4	Dark grayish olive silt
GSD-270	AG01432	% COARSE SAND >.5 - 1 MM	3	%	ASTM D422-63	20050659	695092.82	585033.4	Dark grayish olive silt
GSD-270	AG01432	% MEDIUM SAND >.25 - .5 MM	4.1	%	ASTM D422-63	20050659	695092.82	585033.4	Dark grayish olive silt
GSD-270	AG01432	% FINE SAND >.125 - .25 MM	6.6	%	ASTM D422-63	20050659	695092.82	585033.4	Dark grayish olive silt
GSD-270	AG01432	% VERY FINE SAND >.0625 - .125 MM	21	%	ASTM D422-63	20050659	695092.82	585033.4	Dark grayish olive silt
GSD-270	AG01432	% SILT	57	%	ASTM D422-63	20050659	695092.82	585033.4	Dark grayish olive silt

GSD Number	Sample ID	Analyte Name	Result	Units	Analysis or Reference	Station ID	Northing	Easting	Notes
GSD-270	AG01432	% CLAY & COLLOIDS	7.6	%	ASTM D422-63	20050659	695092.82	585033.4	Dark grayish olive silt
GSD-270	AG01432	ORGANIC CARBON, TOT.	43000	mg/Kg	C-88 @60C	20050659	695092.82	585033.4	Dark grayish olive silt
GSD-273	AG01433	% GRANULE & LARGER >2 MM	1	%	ASTM D422-63	20050660	701938.51	585504.04	Dark grayish brown silt w/ organic
GSD-273	AG01433	% VERY COURSE SAND >1 - 2 MM	0.8	%	ASTM D422-63	20050660	701938.51	585504.04	Dark grayish brown silt w/ organic
GSD-273	AG01433	% COARSE SAND >.5 - 1 MM	2.9	%	ASTM D422-63	20050660	701938.51	585504.04	Dark grayish brown silt w/ organic
GSD-273	AG01433	% MEDIUM SAND >.25 - .5 MM	6.7	%	ASTM D422-63	20050660	701938.51	585504.04	Dark grayish brown silt w/ organic
GSD-273	AG01433	% FINE SAND >.125 - .25 MM	50	%	ASTM D422-63	20050660	701938.51	585504.04	Dark grayish brown silt w/ organic
GSD-273	AG01433	% VERY FINE SAND >.0625 - .125 MM	16	%	ASTM D422-63	20050660	701938.51	585504.04	Dark grayish brown silt w/ organic
GSD-273	AG01433	% SILT	17	%	ASTM D422-63	20050660	701938.51	585504.04	Dark grayish brown silt w/ organic
GSD-273	AG01433	% CLAY & COLLOIDS	5.3	%	ASTM D422-63	20050660	701938.51	585504.04	Dark grayish brown silt w/ organic
GSD-273	AG01433	ORGANIC CARBON, TOT.	75000	mg/Kg	C-88 @60C	20050660	701938.51	585504.04	Dark grayish brown silt w/ organic

Appendix C

Comparison of Surficial Sediment Classification Sources

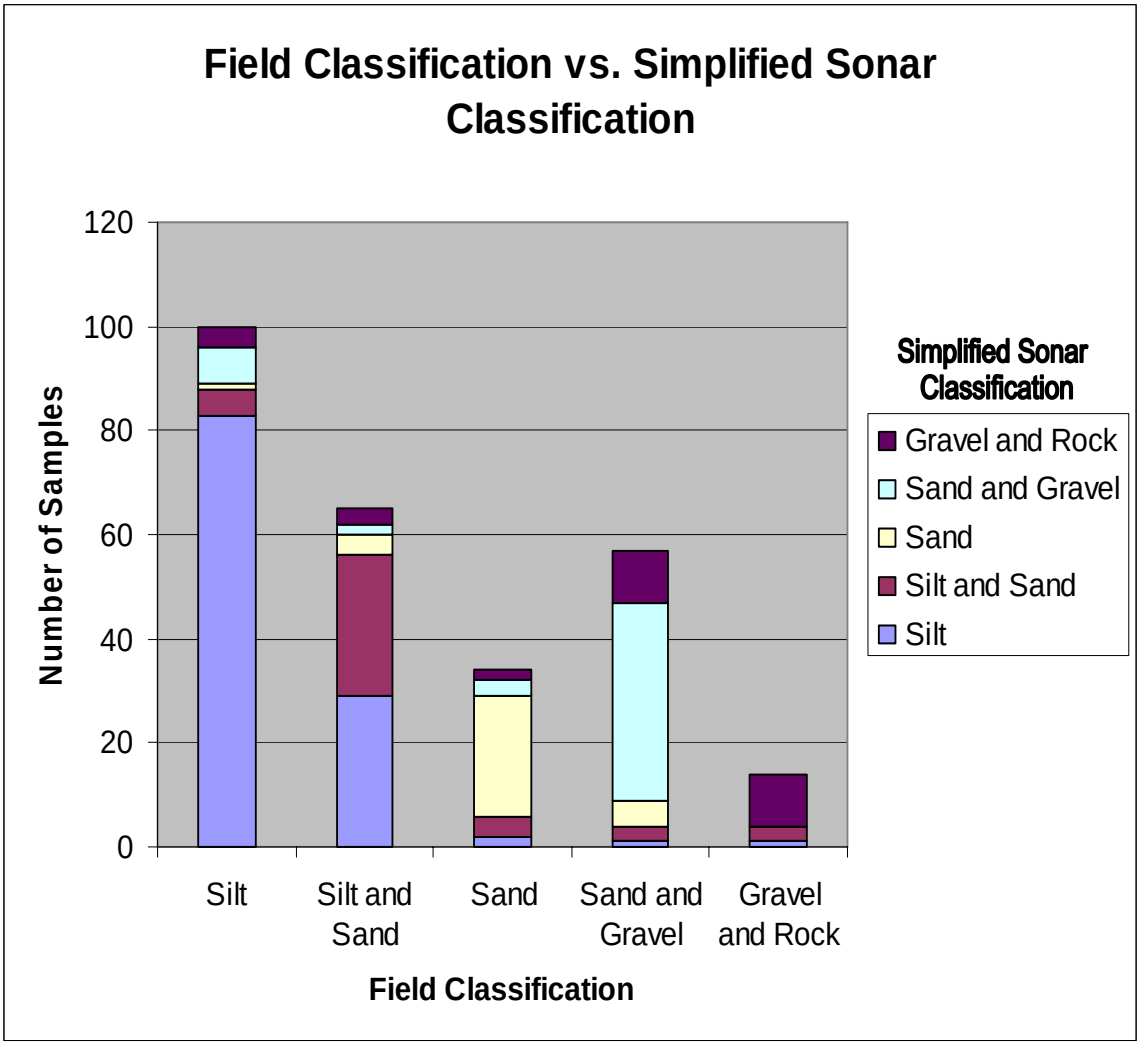
Comparison of Surficial Sediment Classification Sources

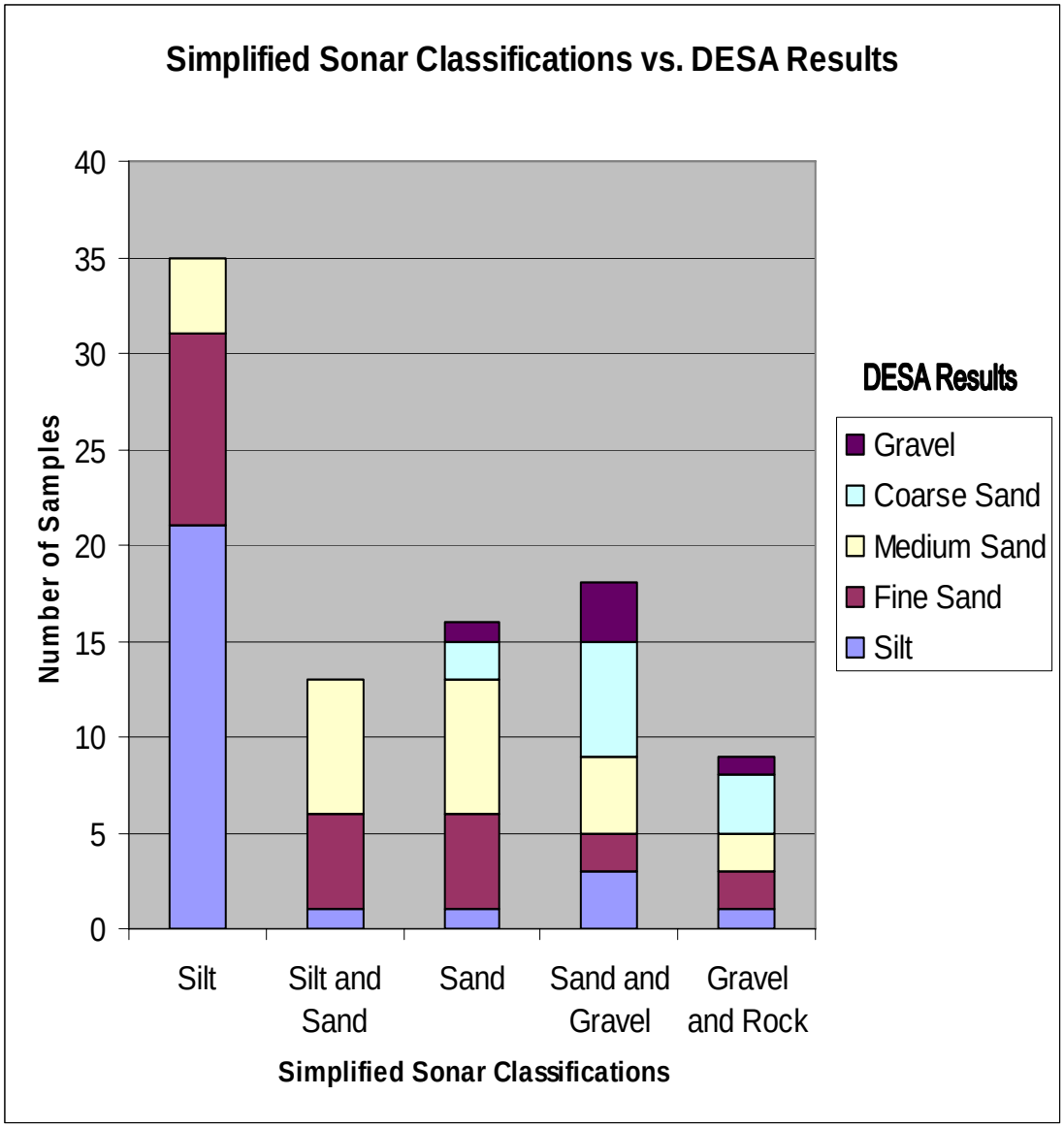
The results from the DESA grain size analysis, field geologist characterization, and simplified sonar classifications were compared at the short core sampling locations to determine statistically how similar the results are between the different analytical sources to gain confidence in the results.

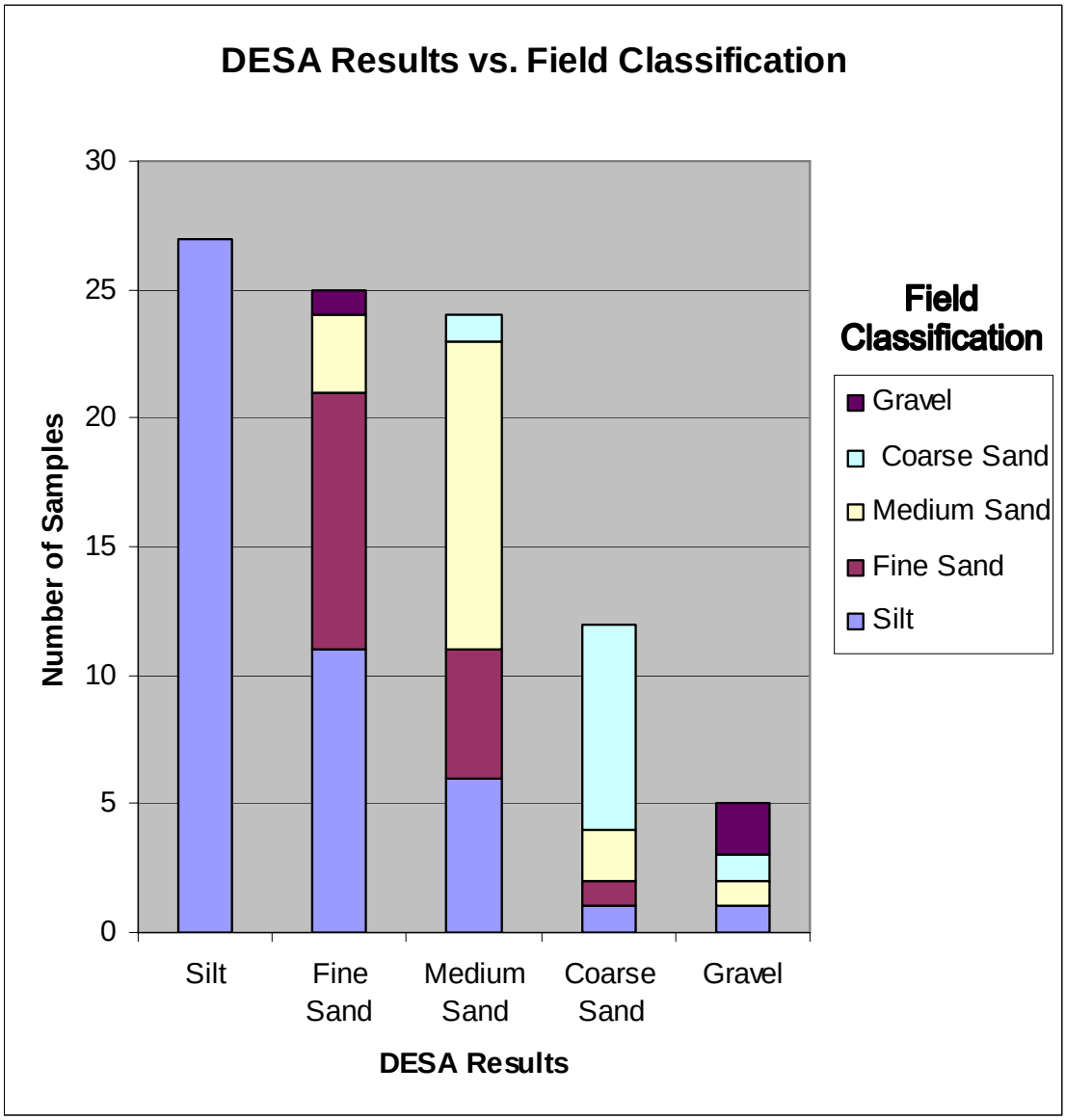
The DESA results were classified into one of five categories based on the median statistical value in the results (silt, fine sand, medium sand, coarse sand, gravel). The field geologist classification results were separated into these same five categories as closely as possible for comparison to the DESA results. The simplified sonar classifications were separated into the five categories used in the GIS (silt, silt and sand, sand, sand and gravel, gravel and rock). The field geologist classifications results were also separated into these same five categories as closely as possible for comparison to the simplified sonar classification results.

In the Lower Passaic River, shoreline improvements and other activities have disturbed the riverbed and deposited non-native materials. In order to designate a single classification to the DESA laboratory results, the mathematical median of the grain size results was used as the single designation for that sample. The basic underlying assumption in comparing the field geologist characterizations and simplified sonar classifications with the DESA results is that the median value in the DESA results is also the dominant material, which it is not in almost 25 percent of the comparisons. There are cases where the DESA results dominant fractions are gravel and silt, the field classification was gravel and silt, but the statistical median value was medium sand (eg. GSD-018). Though the statistical comparison would indicate that the field classification does not match the DESA analysis, it clearly does. There are also cases where the dominant fraction is silt, yet the statistical median is fine sand (eg. GSD-023).

The sampling methodology (narrow push core) worked fine for some sediment types, however where the dominant material was larger than the diameter of the push core, the sample taken is not a true representation of the material present. If the material was rock, the push core collected samples between the rocks and found silt, sand, and/or gravel.


Field Classification vs. Simplified Sonar Classification
Number of Samples
120
100
80
60
40
20
0
Silt
Silt and Sand
Sand
Sand and Gravel
Gravel and Rock
Field Classification
Simplified Sonar Classification
Gravel and Rock
Sand and Gravel
Sand
Silt and Sand
Silt


Simplified Sonar Classifications vs. DESA Results
Number of Samples
40
35
30
25
20
15
10
5
0
Silt
Silt and Sand
Sand
Sand and Gravel
Gravel and Rock
Simplified Sonar Classifications
DESA Results
Gravel
Coarse Sand
Medium Sand
Fine Sand
Silt


DESA Results vs. Field Classification
30
25
20
15
10
5
0
Number of Samples
Silt
Fine Sand
Medium Sand
Coarse Sand
Gravel
DESA Results
Field Classification
Gravel
Coarse Sand
Medium Sand
Fine Sand
Silt

Appendix D

Sub-Bottom Profiler Ground Truthing Logs and Lab Analysis

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

1A

Time: 1240

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/10/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 0**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Hazy and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 -92"			0 -92"	Soft Silt w/Medium Plasticity	ML	Very Dark Gray (5YR 3/1)
							Sample # 36 (77 - 92")
2	92 - 110"			92 - 110"	Firm Clayey Silt	CL/ML	Black (5YR 2.5/1)
3	110 - 131"			110 - 131"	Tight Clay	CL	Reddish Brown (5YR 5/3)
					Refusal @ 184" (15.2-ft.)		East: 597443.4 North: 682601.0 Core Barrel Advanced: 184" Recovery: 131"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-01A	20050760		6/30/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-01A	20050760		6/30/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	0.00%	%
DC-01A	20050760		6/30/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	57.36%	%
DC-01A	20050760		6/30/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	42.64%	%
DC-01A	20050760		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	49.3	%
DC-01A	20050760		6/30/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-01A	20050760		6/30/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-01A	20050760		6/30/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-01A	20050760		6/30/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-01A	20050760		6/30/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-01A	20050760		6/30/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	100.00%	%
DC-01A	20050760		6/30/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	99.93%	%
DC-01A	20050760		6/30/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	99.87%	%
DC-01A	20050760		6/30/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	99.74%	%
DC-01A	20050760		6/30/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	98.39%	%
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.028197	mm
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.018650	mm
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.011219	mm
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008150	mm
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.005974	mm
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003076	mm
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001321	mm
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	87.50%	%
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	77.08%	%
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	66.67%	%
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	59.38%	%
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	48.96%	%
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	33.33%	%
DC-01A	20050760		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	22.92%	%
DC-01A	20050760		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	78.97	%
DC-01A	20050760		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	42.88	%
DC-01A	20050760		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	36.09	%
DC-01A	20050760		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	79.26	%
DC-01A	20050760		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	42.88	%
DC-01A	20050760		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density	0.704	%
DC-01A	20050760		6/17/2005	EPA 9060	TOC	TOC	Total Organic Carbon	35,498	ppm
DC-01A	20050760		6/17/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	3.55	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

1B

Time: 1258

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/13/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 0**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Hazy and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0 -22"						0 -22"	Very Tight Clay	CL	Reddish Brown (5YR 5/3)
										Sample # 37 (0 - 22")
2	22 - 28"						22 - 28"	Well Graded Fine Sand	SW	Reddish Brown (5YR 5/3)
								Refusal @ 60"		East: 597689.4 North: 682760.2 Core Barrel Advanced: 60" Recovery: 28"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-01B	20050764		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-01B	20050764		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	0.00%	%
DC-01B	20050764		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	54.33%	%
DC-01B	20050764		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	45.67%	%
DC-01B	20050764		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	18.6	%
DC-01B	20050764		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-01B	20050764		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-01B	20050764		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-01B	20050764		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-01B	20050764		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-01B	20050764		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.97%	%
DC-01B	20050764		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	99.85%	%
DC-01B	20050764		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	99.63%	%
DC-01B	20050764		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	99.26%	%
DC-01B	20050764		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	97.89%	%
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.027257	mm
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.018000	mm
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.010860	mm
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.007965	mm
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.005848	mm
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003027	mm
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001313	mm
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	90.91%	%
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	81.82%	%
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	71.72%	%
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	62.63%	%
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	52.53%	%
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	36.36%	%
DC-01B	20050764		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	23.23%	%
DC-01B	20050764		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	25.50	%
DC-01B	20050764		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	17.16	%
DC-01B	20050764		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	8.34	%
DC-01B	20050764		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	26.50	%
DC-01B	20050764		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	17.16	%
DC-01B	20050764		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density	1.333	%
DC-01B	20050764		6/17/2005	EPA 9060	TOC	TOC	Total Organic Carbon	1,296	ppm
DC-01B	20050764		6/17/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.13	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

1C

Time: 1335

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/13/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 0**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Hazy and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 -21"			0 - 21"	Poorly Graded Fine - Medium Sand w/Silt and Gravel (~25% Fines / <15% Fine Gravel(	SP	Very Dark Gray (5YR 3/1)
2	21 - 27"			21 - 27"	Poorly Graded Coarse Sand w/Fine - Medium Gravel (~20% Gravel)	SP	Gray (5YR 5/1)
							Sample # 38 (21 - 28")
3	27 - 32"			27 - 32"	Sandy Clay (<15% Sand)	CL	Gray (5YR 5/1)
4	32 - 46"			32 - 46"	Silty Clay	ML	Dark Reddish Brown (10YR 3/4)
5	46 - 96"			46 - 96"	Stiff Clay w/Low Plasticity	CL	Dark Reddish Brown (10YR 3/4)
					Refusal @ 114"		East: 597785.3 North: 682782.2 Core Barrel Advanced: 114" Recovery: 96"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-01C	20050765		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	30.44%	%
DC-01C	20050765		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	58.69%	%
DC-01C	20050765		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	6.28%	%
DC-01C	20050765		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	4.59%	%
DC-01C	20050765		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	11.8	%
DC-01C	20050765		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-01C	20050765		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-01C	20050765		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	97.13%	%
DC-01C	20050765		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	87.10%	%
DC-01C	20050765		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	69.56%	%
DC-01C	20050765		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	56.61%	%
DC-01C	20050765		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	43.06%	%
DC-01C	20050765		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	36.21%	%
DC-01C	20050765		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	32.78%	%
DC-01C	20050765		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	29.55%	%
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.035975	mm
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023078	mm
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013324	mm
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009474	mm
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006736	mm
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003318	mm
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001383	mm
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	16.00%	%
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	11.00%	%
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	11.00%	%
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	9.00%	%
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	7.00%	%
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	5.00%	%
DC-01C	20050765		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	5.00%	%
DC-01C	20050765		7/21/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-01C	20050765		7/21/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-01C	20050765		7/21/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-01C	20050765		7/21/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-01C	20050765		7/21/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-01C	20050765		7/21/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density	1.720	%
DC-01C	20050765		6/17/2005	EPA 9060	TOC	TOC	Total Organic Carbon	4,250	ppm
DC-01C	20050765		6/17/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.43	%

<1> Sample did not exhibit plastic qualities due to the amount of sand and gravel present.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

1A-A

Time: 1654

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/13/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 1**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0 - 32"						0 - 32"	Silt	ML	Very Dark Gray (7.5YR 3/3)
2	32 - 36"						32 - 36"	Silt w/Fine Sand (~20% Fine Sand)	ML	Very Dark Gray (7.5YR 3/3)
3	36 - 89"						36 - 89"	Silt w/Trace Amount of Fine Sand (>5% Fine Sand)	ML	Olive Borwn (2.5YR 4/3)
4	89 - 149"						89 - 149"	Poorly Graded Fine Sand w/Silt (>15% Fines)	SP	Olive Borwn (2.5YR 4/3)
5	149 - 173"						149 - 173"	Peat	OL	Very Dark Gray (7.5YR 3/3)
6	173 - 209"						173 - 209"	Clay	CL	Moderate Reddish Brown (10YR 4/6)
7	209 - 240"						209 - 240"	Silt w/Fine Sand (~20% Fine Sand)	ML	Moderate Reddish Brown (10YR 4/6)
8	240 - 271"						240 - 271"	Well Graded Fine-Medium Sand	SW	Moderate Yellowish Brown (10YR 5/4)
										Sample # 32 (245 - 265")
								Refusal @ 348" (29-ft.)		East: 597245.9 North: 687178.1 Core Barrel Advanced: 348" Recovery: 276"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-01A-A	20050761		6/30/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-01A-A	20050761		6/30/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	0.00%	%
DC-01A-A	20050761		6/30/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	64.87%	%
DC-01A-A	20050761		6/30/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	35.13%	%
DC-01A-A	20050761		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	57.7	%
DC-01A-A	20050761		6/30/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-01A-A	20050761		6/30/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-01A-A	20050761		6/30/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-01A-A	20050761		6/30/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-01A-A	20050761		6/30/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-01A-A	20050761		6/30/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.97%	%
DC-01A-A	20050761		6/30/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	99.91%	%
DC-01A-A	20050761		6/30/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	99.85%	%
DC-01A-A	20050761		6/30/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	99.73%	%
DC-01A-A	20050761		6/30/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	98.25%	%
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.027932	mm
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.018650	mm
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.011352	mm
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008360	mm
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006219	mm
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003162	mm
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001345	mm
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	90.53%	%
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	77.89%	%
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	64.21%	%
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	52.63%	%
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	36.84%	%
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	24.21%	%
DC-01A-A	20050761		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	16.84%	%
DC-01A-A	20050761		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	77.59	%
DC-01A-A	20050761		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	45.21	%
DC-01A-A	20050761		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	32.38	%
DC-01A-A	20050761		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	78.17	%
DC-01A-A	20050761		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	45.21	%
DC-01A-A	20050761		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.545	
DC-01A-A	20050761		6/17/2005	EPA 9060	TOC	TOC	Total Organic Carbon	40,086	ppm
DC-01A-A	20050761		6/17/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	4.01	%

<1> Sample did not exhibit plastic qualities due to the amount of sand content.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

1A-B

Time: 1514

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/13/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 1**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0 - 186"						0 - 15.5'	Elastic Silt w/Fine-Medium Sand (~ 10% Sand)	MH	Dark Gray (7.5YR 4/2)
2	186 - 216"						15.5 - 18'	Clay w/Medium Plasticity	CL	Grayish Brown (5YR 3/2)
3	216 - 236"						18 - 19.75'	Poorly Graded Silt w/Sand (>15% Fine Sand)	SW	Brownish Gray (5YR 4/1)
										Sample # 31 (18-19.5')
4	236 - 264"						19.75 - 22'	Clay w/Medium Plasticity	CL	Grayish Brown (5YR 3/2)
5	264 - 366"						22 - 30.5'	Clay w/High Plasticity	CH	Grayish Brown (5YR 3/2)
								Refusal @ 396" (33-ft.)		East: 597009.3 North: 687235.9 Core Barrel Advanced: 396" Recovery: 366"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-01A-B	20050762		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-01A-B	20050762		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	76.25%	%
DC-01A-B	20050762		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	15.13%	%
DC-01A-B	20050762		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	8.63%	%
DC-01A-B	20050762		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	20.0	%
DC-01A-B	20050762		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-01A-B	20050762		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-01A-B	20050762		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-01A-B	20050762		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-01A-B	20050762		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-01A-B	20050762		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	100.00%	%
DC-01A-B	20050762		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	99.99%	%
DC-01A-B	20050762		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	99.93%	%
DC-01A-B	20050762		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	93.82%	%
DC-01A-B	20050762		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	51.10%	%
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.034818	mm
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.022818	mm
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013324	mm
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009474	mm
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006736	mm
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003300	mm
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001379	mm
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	28.28%	%
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	16.16%	%
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	12.12%	%
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	10.10%	%
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	8.08%	%
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	8.08%	%
DC-01A-B	20050762		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	7.07%	%
DC-01A-B	20050762		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-01A-B	20050762		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-01A-B	20050762		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-01A-B	20050762		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-01A-B	20050762		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-01A-B	20050762		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.352	
DC-01A-B	20050762		6/17/2005	EPA 9060	TOC	TOC	Total Organic Carbon	497	ppm
DC-01A-B	20050762		6/17/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.05	%

<1> Sample did not exhibit plastic qualities due to the amount of fine sand content.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

1A-C

Time: 1306

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/9/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 1**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0 - 45"						0 - 45"	Silt w/Fine Sand (<15% Fine Sand)	ML	Medium Bluish Gray (5YR 5/1)
2	45 - 111"						45 - 111"	Elastic Silt w/Fine-Medium Sand (~ 10% Sand)	MH	Medium Bluish Gray (5YR 5/1)
										Sample # 30 (60 - 77")
3	111 - 127"						111 - 127"	Poorly Graded Silt w/Sand (>15% Fine Sand)	SW	Dark Gray (7.5YR 4/2)
								Refusal @ 127"		
										East: 597382.6 North: 687155.0
										Core Barrel Advanced: 144" Recovery: 127"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-01A-C	20050763		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	1.12%	%
DC-01A-C	20050763		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	93.76%	%
DC-01A-C	20050763		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	1.04%	%
DC-01A-C	20050763		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	4.08%	%
DC-01A-C	20050763		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	14.7	%
DC-01A-C	20050763		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-01A-C	20050763		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-01A-C	20050763		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-01A-C	20050763		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	99.88%	%
DC-01A-C	20050763		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	98.88%	%
DC-01A-C	20050763		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	93.90%	%
DC-01A-C	20050763		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	72.24%	%
DC-01A-C	20050763		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	41.07%	%
DC-01A-C	20050763		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	35.48%	%
DC-01A-C	20050763		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	33.61%	%
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.037197	mm
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023526	mm
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013583	mm
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009630	mm
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006810	mm
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003336	mm
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001390	mm
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	5.00%	%
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	5.00%	%
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	5.00%	%
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	4.00%	%
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	4.00%	%
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	4.00%	%
DC-01A-C	20050763		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	4.00%	%
DC-01A-C	20050763		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-01A-C	20050763		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-01A-C	20050763		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-01A-C	20050763		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-01A-C	20050763		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-01A-C	20050763		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.549	
DC-01A-C	20050763		6/17/2005	EPA 9060	TOC	TOC	Total Organic Carbon	1,136	ppm
DC-01A-C	20050763		6/17/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.11	%

<1> Sample did not exhibit plastic qualities due to insufficient sample passing through #40 sieve.

* Location DC-01A-C was sampled on 9 June and 13 June 2005. The analysis was done on the sample from 13 June 2005.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:
2A
Time: 0840

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/14/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 2**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Hazy and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0 - 80"						0 - 80"	Silt	ML	Black (5YR 2.5/1)
2	80 -96"						80 - 96"	Peat	OL	Brownish Gray (5YR 4/1)
3	96 - 111"						96 - 111"	Clayey Silt	ML	Reddish Gray (5YR 5/2)
4	111 - 121"						111 - 121"	Poorly Graded Fine - Medium Sand w/Silt (~20% Fines)	SP	Medium Bluish Gray (5B 5/1)
5	121 - 152"						121 - 152"	Very Loose Fine-Medium Sand w/Silt (>15% Fines)	SP	Medium Bluish Gray (5B 5/1)
										Sample # 35 (121 - 140")
6	152 - 203"						152 - 203"	Medium-Coarse Sand w/Gravel (<20% Fine Gravel)	SW/SP	Moderate Yellowish Brown (10YR 5/4)
7	203 - 226"						203 - 226"	Clay w/Medium Plasticity and Silt Lenses	CH	Dark Reddish Brown (10R 3/4)
8	226 - 231"						226 - 231"	Fine - Medium Well Graded Sand/Silt (<15% Fines)	SW	Dark Reddish Brown (10R 3/4)
								Refusal @ 360" (30-ft.)		East: 597693.0 North: 691338.9 Core Barrel Advanced: 360" Recovery: 231"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-02A	20050767		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-02A	20050767		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	82.59%	%
DC-02A	20050767		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	9.56%	%
DC-02A	20050767		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	7.86%	%
DC-02A	20050767		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	18.0	%
DC-02A	20050767		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-02A	20050767		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-02A	20050767		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-02A	20050767		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-02A	20050767		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-02A	20050767		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.64%	%
DC-02A	20050767		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	97.40%	%
DC-02A	20050767		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	88.48%	%
DC-02A	20050767		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	64.38%	%
DC-02A	20050767		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	46.03%	%
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.035559	mm
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023013	mm
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013324	mm
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009474	mm
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006736	mm
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003300	mm
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001375	mm
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	20.20%	%
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	12.12%	%
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	11.11%	%
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	9.09%	%
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	7.07%	%
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	7.07%	%
DC-02A	20050767		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	7.07%	%
DC-02A	20050767		7/21/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-02A	20050767		7/21/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-02A	20050767		7/21/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-02A	20050767		7/21/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-02A	20050767		7/21/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-02A	20050767		7/21/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.466	
DC-02A	20050767		6/17/2005	EPA 9060	TOC	TOC	Total Organic Carbon	1,471	ppm
DC-02A	20050767		6/17/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.15	%

<1> Sample did not exhibit plastic qualities due to the amount of fine sand content.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

2B

Time: 0940

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/14/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 2**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Hazy and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 - 27"			0-27"	Organic Leaf and Wood Debris w/Silt	OL	Very Dark Gray (7.5YR 3/3)
2	27 - 107"			27 - 107"	Silt w/Low Plasticity	ML	Very Dark Gray (7.5YR 3/3)
							Sample # 33 (80 - 92")
3	107 - 149"			107 - 149"	Silt w/Medium Plasticity	ML	Dark Reddish Brown (5YR 4/2)
4	149 - 154"			149 - 154"	Well Graded Fine Sand	SW	Moderate Reddish Brown (10YR 4/6)
5	154 - 163"			154 - 163"	Clay w/Medium Plasticity	CL	Dark Reddish Brown (10YR 3/4)
6	163 - 186"			163 - 186"	Well Graded Fine Sand	SW	Moderate Reddish Brown (10YR 4/6)
					Refusal @ 312" (26-ft.)		East: 597989.5 North: 691250.8 Core Barrel Advanced: 312" Recovery: 186"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-02B	20050768		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-02B	20050768		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	0.00%	%
DC-02B	20050768		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	64.62%	%
DC-02B	20050768		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	35.38%	%
DC-02B	20050768		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	60.1	%
DC-02B	20050768		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-02B	20050768		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-02B	20050768		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-02B	20050768		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-02B	20050768		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-02B	20050768		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.98%	%
DC-02B	20050768		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	99.79%	%
DC-02B	20050768		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	99.61%	%
DC-02B	20050768		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	99.42%	%
DC-02B	20050768		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	98.79%	%
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.027932	mm
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.018409	mm
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.011175	mm
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008240	mm
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006199	mm
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003180	mm
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001345	mm
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	90.43%	%
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	80.85%	%
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	68.09%	%
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	56.38%	%
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	37.23%	%
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	21.28%	%
DC-02B	20050768		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	15.96%	%
DC-02B	20050768		7/21/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	119.12	%
DC-02B	20050768		7/21/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	53.82	%
DC-02B	20050768		7/21/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	65.30	%
DC-02B	20050768		7/21/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	119.67	%
DC-02B	20050768		7/21/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	53.82	%
DC-02B	20050768		7/21/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.546	
DC-02B	20050768		6/17/2005	EPA 9060	TOC	TOC	Total Organic Carbon	63,705	ppm
DC-02B	20050768		6/17/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	6.37	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

2C

Time: 1019

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/14/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 2**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Hazy and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0 - 156"						0-156"	Silt w/Low Plasticity	ML	Very Dark Gray (7.5YR 3/3)
2	156 - 225"						156 - 225"	Silt w/Medium Plasticity	ML	Very Dark Gray (7.5YR 3/3)
3	225 - 232"						225 - 232"	Well Graded Fine - Medium Sand	SW	Moderate Reddish Brown (10YR 4/6)
4	232 - 228"						232 - 228"	Clay w/Medium Plasticity	CL	Dark Reddish Brown (10YR 3/4)
										Sample # 34 (232 - 250")
								Refusal @ 384" (32-ft.)		East: 598074.7 North: 691206.7 Core Barrel Advanced: 384" Recovery: 228"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-02C	20050769		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.46%	%
DC-02C	20050769		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	0.00%	%
DC-02C	20050769		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	63.92%	%
DC-02C	20050769		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	35.62%	%
DC-02C	20050769		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	21.0	%
DC-02C	20050769		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-02C	20050769		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-02C	20050769		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-02C	20050769		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	99.82%	%
DC-02C	20050769		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	99.54%	%
DC-02C	20050769		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	98.87%	%
DC-02C	20050769		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	97.66%	%
DC-02C	20050769		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	96.59%	%
DC-02C	20050769		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	94.94%	%
DC-02C	20050769		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	93.83%	%
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.026843	mm
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.018000	mm
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.011308	mm
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008419	mm
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006158	mm
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003133	mm
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001329	mm
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	93.94%	%
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	81.82%	%
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	61.62%	%
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	47.47%	%
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	37.37%	%
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	25.25%	%
DC-02C	20050769		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	19.19%	%
DC-02C	20050769		7/21/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	25.59	%
DC-02C	20050769		7/21/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	18.37	%
DC-02C	20050769		7/21/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	7.22	%
DC-02C	20050769		7/21/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	26.33	%
DC-02C	20050769		7/21/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	18.37	%
DC-02C	20050769		7/21/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.528	
DC-02C	20050769		6/17/2005	EPA 9060	TOC	TOC	Total Organic Carbon	1,298	ppm
DC-02C	20050769		6/17/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.13	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

3A

Time: 1238

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/16/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 3**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Hazy and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 - 111"			0 - 111"	Silt w/High Plasticity	MH	Black (5YR 2.5/1)
2	111 - 173"			111 - 173"	Tight Silt	ML	Very Dark Gray (2.5YR 3/3) Very Strong Chemical Odor
3	173 - 179"			179 - 179"	Poorly Graded Medium Sand/Cobbles (Cobbles ~2-inch dia.)	SP	Dark Reddish Brown (2.5YR 3/3)
4	179 - 192"			179 - 192"	Well Graded Medium Sand	SW	Dark Reddish Brown (2.5YR 3/3)
5	192 - 214"			192 - 214"	Clayey Silt	ML	Dark Reddish Brown (2.5YR 3/3)
6	214 - 221"			214 - 221"	Poorly Graded Fine - Medium Sand w/Silt (<20% Fines)	SW	**Sample # 41 (200-212")** Dark Reddish Brown (2.5YR 3/3)
7	221 - 235"			221 - 235"	Clay	CL	Dark Reddish Brown (2.5YR 3/3)
					Refusal @ 288" (24-ft.)		East: 594819.5 North: 695336.1 Core Barrel Advanced: 288" Recovery: 235"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-03A	20050774		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-03A	20050774		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	59.41%	%
DC-03A	20050774		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	30.57%	%
DC-03A	20050774		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	10.02%	%
DC-03A	20050774		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	17.8	%
DC-03A	20050774		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-03A	20050774		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-03A	20050774		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-03A	20050774		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-03A	20050774		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-03A	20050774		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.78%	%
DC-03A	20050774		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	99.45%	%
DC-03A	20050774		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	97.94%	%
DC-03A	20050774		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	88.31%	%
DC-03A	20050774		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	68.58%	%
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.033062	mm
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.022021	mm
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013022	mm
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009316	mm
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006662	mm
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003300	mm
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001383	mm
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	43.43%	%
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	27.27%	%
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	19.19%	%
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	15.15%	%
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	11.11%	%
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	7.07%	%
DC-03A	20050774		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	5.05%	%
DC-03A	20050774		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-03A	20050774		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-03A	20050774		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-03A	20050774		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-03A	20050774		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-03A	20050774		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.565	
DC-03A	20050774		6/20/2005	EPA 9060	TOC	TOC	Total Organic Carbon	315	ppm
DC-03A	20050774		6/20/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.03	%

<1> Sample did not exhibit plastic qualities due to the amount of fine sand content.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

3B

Time: 1205

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/16/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 3**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Hazy and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0 - 21"						0 - 21"	Silt w/High Plasticity	MH	Black (5YR 2.5/1)
2	21 - 66"						21 - 66"	Tight Silt	ML	Very Dark Gray (2.5YR 3/3)
3	66 - 79"						66 - 79"	Clayey Silt	ML	Very Dark Gray (2.5YR 3/3)
										Sample # 40 (68 - 79")
4	79 - 87"						79 - 87"	Clay w/Moderate Plasticity	CL	Dark Reddish Brown (2.5YR 3/3)
5	87 - 94"						87 - 94"	Moderately Graded Fine Sand w/Silt (<20% Fines)	SW/SP	Dark Reddish Brown (2.5YR 3/3)
6	94 - 103"						94 - 103"	Well Graded Fine Sand	SW	
								Refusal @ 144" (12-ft.)		East: 594761.3 North: 695575.6 Core Barrel Advanced: 144" Recovery: 103"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-03B	20050775		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.97%	%
DC-03B	20050775		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	2.20%	%
DC-03B	20050775		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	65.00%	%
DC-03B	20050775		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	31.83%	%
DC-03B	20050775		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	45.4	%
DC-03B	20050775		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-03B	20050775		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-03B	20050775		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-03B	20050775		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	99.19%	%
DC-03B	20050775		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	99.03%	%
DC-03B	20050775		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	98.55%	%
DC-03B	20050775		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	97.05%	%
DC-03B	20050775		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	95.65%	%
DC-03B	20050775		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	94.36%	%
DC-03B	20050775		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	91.73%	%
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.028850	mm
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.019124	mm
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.011568	mm
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008419	mm
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006158	mm
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003152	mm
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001360	mm
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	82.11%	%
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	70.53%	%
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	57.89%	%
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	49.47%	%
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	38.95%	%
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	24.21%	%
DC-03B	20050775		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	11.58%	%
DC-03B	20050775		7/21/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	79.33	%
DC-03B	20050775		7/21/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	44.49	%
DC-03B	20050775		7/21/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	34.85	%
DC-03B	20050775		7/21/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	78.56	%
DC-03B	20050775		7/21/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	44.49	%
DC-03B	20050775		7/21/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.744	
DC-03B	20050775		6/20/2005	EPA 9060	TOC	TOC	Total Organic Carbon	62,380	ppm
DC-03B	20050775		6/20/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	6.24	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

3C

Time: 1127

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/16/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 3**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Hazy and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0 - 65"						0 - 65"	Silt w/High Plasticity	MH	Black (5YR 2.5/1)
2	65 - 74"						65 - 74"	Clayey Silt	ML	Dark Reddish Brown (2.5YR 3/3)
3	74 - 79"						74 - 79"	Clayey Sand	SW	Dark Reddish Brown (2.5YR 3/3)
4	79-106"						79-106"	Well Graded Fine Sand	SW	Dark Reddish Brown (2.5YR 3/3)
										Sample # 39 (82 - 96")
5	106-131"						106-131"	Tight Silty Clay	ML	Dark Reddish Brown (2.5YR 3/3)
6	131-164"						131-164"	Moderately Graded Fine Sand w/Silt (<20% Fines)	SW/SP	Dark Reddish Brown **(2.5YR 3/3)**
								Refusal @ 216" (18-ft.)		East: 594763.9 North: 695691.3 Core Barrel Advanced: 216" Recovery: 164"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-03C	20050776		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-03C	20050776		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	89.33%	%
DC-03C	20050776		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	8.75%	%
DC-03C	20050776		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	1.93%	%
DC-03C	20050776		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	19.5	%
DC-03C	20050776		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-03C	20050776		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-03C	20050776		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-03C	20050776		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-03C	20050776		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-03C	20050776		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.98%	%
DC-03C	20050776		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	99.91%	%
DC-03C	20050776		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	99.60%	%
DC-03C	20050776		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	93.93%	%
DC-03C	20050776		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	39.69%	%
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.036182	mm
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023462	mm
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013583	mm
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009630	mm
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006810	mm
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003354	mm
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001397	mm
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	14.00%	%
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	5.00%	%
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	4.00%	%
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	3.00%	%
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	3.00%	%
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	1.00%	%
DC-03C	20050776		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	1.00%	%
DC-03C	20050776		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-03C	20050776		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-03C	20050776		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-03C	20050776		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-03C	20050776		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-03C	20050776		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.525	
DC-03C	20050776		6/21/2005	EPA 9060	TOC	TOC	Total Organic Carbon	1,557	ppm
DC-03C	20050776		6/21/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.16	%

<1> Sample did not exhibit plastic qualities due to the amount of fine sand content.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:
4A
Time: 1525

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/16/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 4**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Hazy and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 - 87"			0 - 87"	Silt	ML	Black (5YR 2.5/1)
2	87 - 129"			87" - 129"	Silt w/Medium Plasticity and Peat	ML	Black (5YR 2.5/1)
3	129 - 164"			129 - 164"	Silt	ML	Very Dark Gray (5YR 3/1)
4	164 - 192"			164 - 192"	Clayey Silt w/High Plasticity	ML	Very Dark Gray (5YR 3/1)
5	192 - 197"			192 - 197"	Well Graded Fine Sand	SW	Moderate Red (5R 4/6)
6	197 - 204"			197 - 204"	Silt w/Medium Plasticity	ML	Black (5YR 2.5/1)
							Sample #44 (197 - 204")
7	204 - 227"			204 - 227"	Well Graded Fine Sand	SW	Moderate Red (5R 4/6)
					Refusal @ 234" (19.5-ft.)		East: 592379.8 North: 694964.3 Core Barrel Advanced: 234" Recovery: 227"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-04A	20050771		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	3.84%	%
DC-04A	20050771		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	43.20%	%
DC-04A	20050771		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	37.07%	%
DC-04A	20050771		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	15.89%	%
DC-04A	20050771		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	34.4	%
DC-04A	20050771		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-04A	20050771		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-04A	20050771		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-04A	20050771		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	98.77%	%
DC-04A	20050771		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	96.16%	%
DC-04A	20050771		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	94.31%	%
DC-04A	20050771		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	87.91%	%
DC-04A	20050771		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	78.53%	%
DC-04A	20050771		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	72.13%	%
DC-04A	20050771		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	66.15%	%
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.031915	mm
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.020910	mm
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.012397	mm
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008962	mm
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006434	mm
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003227	mm
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001360	mm
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	50.52%	%
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	40.21%	%
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	31.96%	%
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	24.74%	%
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	19.59%	%
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	11.34%	%
DC-04A	20050771		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	7.22%	%
DC-04A	20050771		7/21/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	56.19	%
DC-04A	20050771		7/21/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	34.97	%
DC-04A	20050771		7/21/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	21.22	%
DC-04A	20050771		7/21/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	56.49	%
DC-04A	20050771		7/21/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	34.97	%
DC-04A	20050771		7/21/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.021	
DC-04A	20050771		6/20/2005	EPA 9060	TOC	TOC	Total Organic Carbon	56,361	ppm
DC-04A	20050771		6/20/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	5.64	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING: **4B**

Time: 1405

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/16/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 4**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Hazy and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 - 31"			0 - 31"	Silt w/Medium Plasticity	ML	Black (5YR 2.5/1) Sheen and Strong Odor
2	31 - 48"			31 - 48"	Poorly Graded Fine - Medium Sand w/Fine Gravel (<15% Fine Gravel)	SP	Brownish Gray (5YR 4/1)
3	48 - 80"			48 - 80"	Poorly Graded Medium - Coarse Sand w/Some Large Cobbles (>3-inch dia.)	SP	Brownish Gray (5YR 4/1) **Sample #43 (48 - 80")**
					Refusal @ 144" (12-ft.)		
							East: 592313.7 North: 695159.0 Core Barrel Advanced: 144" Recovery: 80"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-04B	20050772		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	58.18%	%
DC-04B	20050772		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	40.13%	%
DC-04B	20050772		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	0.00%	%
DC-04B	20050772		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	1.69%	%
DC-04B	20050772		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	16.2	%
DC-04B	20050772		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	59.96%	%
DC-04B	20050772		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	59.96%	%
DC-04B	20050772		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	48.53%	%
DC-04B	20050772		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	44.22%	%
DC-04B	20050772		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	41.82%	%
DC-04B	20050772		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	34.49%	%
DC-04B	20050772		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	22.23%	%
DC-04B	20050772		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	15.87%	%
DC-04B	20050772		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	14.74%	%
DC-04B	20050772		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	14.31%	%
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.037097	mm
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023462	mm
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013546	mm
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009578	mm
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006773	mm
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003318	mm
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001383	mm
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	1.01%	%
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	1.01%	%
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	1.01%	%
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	1.01%	%
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	1.01%	%
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	1.01%	%
DC-04B	20050772		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	1.01%	%
DC-04B	20050772		7/21/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-04B	20050772		7/21/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-04B	20050772		7/21/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-04B	20050772		7/21/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-04B	20050772		7/21/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-04B	20050772		7/21/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.632	
DC-04B	20050772		6/20/2005	EPA 9060	TOC	TOC	Total Organic Carbon	647	ppm
DC-04B	20050772		6/20/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.06	%

<1> Sample did not exhibit plastic qualities due to the amount of sand and gravel present.

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-04B-Dup	20050772D		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	11.80%	%
DC-04B-Dup	20050772D		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	87.31%	%
DC-04B-Dup	20050772D		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	0.00%	%
DC-04B-Dup	20050772D		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	0.89%	%
DC-04B-Dup	20050772D		N/A	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	N/A	%
DC-04B-Dup	20050772D		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-04B-Dup	20050772D		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-04B-Dup	20050772D		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-04B-Dup	20050772D		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-04B-Dup	20050772D		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	88.20%	%
DC-04B-Dup	20050772D		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	69.94%	%
DC-04B-Dup	20050772D		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	44.03%	%
DC-04B-Dup	20050772D		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	32.68%	%
DC-04B-Dup	20050772D		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	30.72%	%
DC-04B-Dup	20050772D		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	29.95%	%
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.037097	mm
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023462	mm
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013546	mm
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009578	mm
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006773	mm
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003318	mm
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001383	mm
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	1.01%	%
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	1.01%	%
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	1.01%	%
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	1.01%	%
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	1.01%	%
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	1.01%	%
DC-04B-Dup	20050772D		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	1.01%	%
DC-04B-Dup	20050772D		7/21/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-04B-Dup	20050772D		7/21/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-04B-Dup	20050772D		7/21/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-04B-Dup	20050772D		7/21/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-04B-Dup	20050772D		7/21/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-04B-Dup	20050772D		N/A	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	N/A	
DC-04B-Dup	20050772D		N/A	EPA 9060	TOC	TOC	Total Organic Carbon	N/A	ppm
DC-04B-Dup	20050772D		N/A	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	N/A	%

<1> Sample did not exhibit plastic qualities due to the amount of fine sand content.

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-04B-Trp	20050772T		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	18.52%	%
DC-04B-Trp	20050772T		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	80.39%	%
DC-04B-Trp	20050772T		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	0.54%	%
DC-04B-Trp	20050772T		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	0.55%	%
DC-04B-Trp	20050772T		N/A	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	N/A	%
DC-04B-Trp	20050772T		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-04B-Trp	20050772T		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-04B-Trp	20050772T		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-04B-Trp	20050772T		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-04B-Trp	20050772T		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	81.48%	%
DC-04B-Trp	20050772T		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	68.41%	%
DC-04B-Trp	20050772T		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	43.97%	%
DC-04B-Trp	20050772T		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	30.82%	%
DC-04B-Trp	20050772T		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	28.55%	%
DC-04B-Trp	20050772T		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	27.73%	%
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.037097	mm
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023462	mm
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013546	mm
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009578	mm
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006773	mm
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003318	mm
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001386	mm
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	1.01%	%
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	1.01%	%
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	1.01%	%
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	1.01%	%
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	1.01%	%
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	1.01%	%
DC-04B-Trp	20050772T		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	0.00%	%
DC-04B-Trp	20050772T		7/21/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-04B-Trp	20050772T		7/21/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-04B-Trp	20050772T		7/21/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-04B-Trp	20050772T		7/21/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-04B-Trp	20050772T		7/21/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-04B-Trp	20050772T		N/A	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	N/A	
DC-04B-Trp	20050772T		N/A	EPA 9060	TOC	TOC	Total Organic Carbon	N/A	ppm
DC-04B-Trp	20050772T		N/A	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	N/A	%

<1> Sample did not exhibit plastic qualities due to the amount of fine sand content.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING: 4C

Time: 1317

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/16/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 4**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Hazy and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 - 28"			0 - 28"	Silt	ML	Black (5YR 2.5/1)
2	28 - 57"			28 - 57"	Silt w/Trace Fine Sand. Medium Plasticity (<10% Fine Sand)	ML	Black (5YR 2.5/1)
3	57 - 74"			57 - 74"	Medium Stiff Clay	CL	Dark Reddish Brown (10R 3/4)
4	74 - 79"			74 - 79"	Gravelly Clay w/Fine - Medium Sand (>15% Fine Gravel and Sand)	CL	Dark Reddish Brown (10R 3/4)
5	79 - 88"			79 - 88"	Clay w/Fine Sand (~15% Fine Sand)	CL	Grayish Brown (5YR 3/2)
6	88 - 126"			88 - 126"	Well Graded Fine Sand w/Clay Nodules	SW/SC	Dark Reddish Brown (10R 3/4)
							Sample #42 (96 - 108")
					Refusal @ 144" (12-ft.)		East: 592272.0 North: 695211.2 Core Barrel Advanced: 144" Recovery: 126"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-04C	20050773		7/1/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-04C	20050773		7/1/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	86.27%	%
DC-04C	20050773		7/1/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	10.51%	%
DC-04C	20050773		7/1/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	3.22%	%
DC-04C	20050773		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	17.4	%
DC-04C	20050773		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-04C	20050773		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-04C	20050773		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-04C	20050773		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-04C	20050773		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-04C	20050773		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.82%	%
DC-04C	20050773		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	99.24%	%
DC-04C	20050773		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	90.18%	%
DC-04C	20050773		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	62.92%	%
DC-04C	20050773		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	44.11%	%
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.036079	mm
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023207	mm
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013509	mm
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009578	mm
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006791	mm
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003336	mm
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001397	mm
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	15.15%	%
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	9.09%	%
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	6.06%	%
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	5.05%	%
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	4.04%	%
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	3.03%	%
DC-04C	20050773		6/25/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	1.01%	%
DC-04C	20050773		7/21/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-04C	20050773		7/21/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-04C	20050773		7/21/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-04C	20050773		7/21/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-04C	20050773		7/21/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-04C	20050773		7/21/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.456	
DC-04C	20050773		6/20/2005	EPA 9060	TOC	TOC	Total Organic Carbon	279	ppm
DC-04C	20050773		6/20/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.03	%

<1> Sample did not exhibit plastic qualities due to the amount of fine sand content.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING: **5A**

Time: 1147

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/9/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 5**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 - 3"			0 - 3"	Elastic Silt w/Fine Sand (<15% Fine Sand)	MH	Very Dark Brown/Black (7.5YR 3/2)
2	3 - 10"			3 - 10"	Sandy Silt w/Fine - Medium Gravel (>15% Gravel)	ML	Brownish Gray (5YR 4/1) Inadequate Recovery for Sample Collection
					Refusal @ 36"		
							East: 587308.8 North: 692276.9 Core Barrel Advanced: 36" Recovery: 10"

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING: **5B**

Time: 1237

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/9/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 5**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 - 14"			0 - 14"	Poorly Graded Fine - Medium Sand w/Gravel (<20% Fine Gravel	SP	Very Dark Brown/Black (7.5YR 3/2)
							Sample # 26 (0-14")
					Refusal @ 36"		
							East: 587355.2 North: 692375.7
							Core Barrel Advanced: 36" Recovery: 14"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-05B	20050755		6/30/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	11.45%	%
DC-05B	20050755		6/30/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	80.77%	%
DC-05B	20050755		6/30/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	4.52%	%
DC-05B	20050755		6/30/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	3.26%	%
DC-05B	20050755		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	20.5	%
DC-05B	20050755		6/30/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-05B	20050755		6/30/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-05B	20050755		6/30/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-05B	20050755		6/30/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	98.02%	%
DC-05B	20050755		6/30/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	88.55%	%
DC-05B	20050755		6/30/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	77.09%	%
DC-05B	20050755		6/30/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	49.37%	%
DC-05B	20050755		6/30/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	36.09%	%
DC-05B	20050755		6/30/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	33.21%	%
DC-05B	20050755		6/30/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	31.61%	%
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.036896	mm
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023462	mm
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013546	mm
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009578	mm
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006773	mm
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003354	mm
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001397	mm
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	8.00%	%
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	6.00%	%
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	6.00%	%
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	6.00%	%
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	6.00%	%
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	2.00%	%
DC-05B	20050755		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	2.00%	%
DC-05B	20050755		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-05B	20050755		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-05B	20050755		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-05B	20050755		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-05B	20050755		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-05B	20050755		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.618	
DC-05B	20050755		6/16/2005	EPA 9060	TOC	TOC	Total Organic Carbon	3,591	ppm
DC-05B	20050755		6/16/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.36	%

<1> Sample did not exhibit plastic qualities due to fine sand and gravel content.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING: **5C**

Time: 1457

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/8/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 5**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 - 14"			0 - 14"	Silt w/Fine Sand (<15% Fine Sand)	ML	Very Dark Brown/Black (7.5YR 3/2)
2	14 - 16"			14 - 16"	Silty Fine Sand (>25% Fine Sand)	ML	Very Dark Brown/Black (7.5YR 3/2)
							Sample # 25A (0 - 14")
							Sample # 25B (14 - 16")
					Refusal @ 48"		
							East: 587357.7 North: 692410.0
							Core Barrel Advanced: 48" Recovery: 16"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-05C	20050754A		6/30/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-05C	20050754A		6/30/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	10.80%	%
DC-05C	20050754A		6/30/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	56.23%	%
DC-05C	20050754A		6/30/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	32.98%	%
DC-05C	20050754A		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	66.4	%
DC-05C	20050754A		6/30/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-05C	20050754A		6/30/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-05C	20050754A		6/30/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-05C	20050754A		6/30/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-05C	20050754A		6/30/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-05C	20050754A		6/30/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.83%	%
DC-05C	20050754A		6/30/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	99.11%	%
DC-05C	20050754A		6/30/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	96.96%	%
DC-05C	20050754A		6/30/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	94.29%	%
DC-05C	20050754A		6/30/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	90.79%	%
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.029235	mm
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.019279	mm
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.011568	mm
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008419	mm
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006158	mm
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003143	mm
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001345	mm
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	76.00%	%
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	66.00%	%
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	56.00%	%
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	48.00%	%
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	38.00%	%
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	25.00%	%
DC-05C	20050754A		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	16.00%	%
DC-05C	20050754A		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	93.06	%
DC-05C	20050754A		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	57.53	%
DC-05C	20050754A		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	35.53	%
DC-05C	20050754A		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	90.82	%
DC-05C	20050754A		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	57.53	%
DC-05C	20050754A		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.393	
DC-05C	20050754A		6/15/2005	EPA 9060	TOC	TOC	Total Organic Carbon	72,576	ppm
DC-05C	20050754A		6/15/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	7.26	%

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-05C	20050754B		6/30/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-05C	20050754B		6/30/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	89.57%	%
DC-05C	20050754B		6/30/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	4.59%	%
DC-05C	20050754B		6/30/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	5.84%	%
DC-05C	20050754B		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	25.3	%
DC-05C	20050754B		6/30/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-05C	20050754B		6/30/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-05C	20050754B		6/30/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-05C	20050754B		6/30/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-05C	20050754B		6/30/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-05C	20050754B		6/30/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.67%	%
DC-05C	20050754B		6/30/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	96.52%	%
DC-05C	20050754B		6/30/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	73.72%	%
DC-05C	20050754B		6/30/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	51.37%	%
DC-05C	20050754B		6/30/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	38.99%	%
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.036693	mm
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023335	mm
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013472	mm
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009526	mm
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006773	mm
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003318	mm
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001390	mm
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	10.00%	%
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	8.00%	%
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	8.00%	%
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	8.00%	%
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	6.00%	%
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	6.00%	%
DC-05C	20050754B		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	4.00%	%
DC-05C	20050754B		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-05C	20050754B		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-05C	20050754B		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-05C	20050754B		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-05C	20050754B		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-05C	20050754B		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	I.S.	
DC-05C	20050754B		6/16/2005	EPA 9060	TOC	TOC	Total Organic Carbon	11,078	ppm
DC-05C	20050754B		6/16/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	1.11	%

<1> Sample did not exhibit plastic qualities due to the amount of sand content.
I.S. = Insufficient sample

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:
6A
Time: 1153

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/10/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 6**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	**Depth**	**Rec**	**Blows per 6"**				
1	0 - 30"			0 - 30"	Silt	ML	Very Dark Brown/Black (7.5YR 3/2)
2	30 - 89"			30 - 89"	Sandy Lean Clay (~ 20% Fine Sand)	CL	Very Dark Brown/Black (7.5YR 3/2)
3	89 - 91"			89 - 91"	Poorly Graded Silt w/Sand (>15% Fine Sand)	SW	Dark Gray (7.5YR 4/2)
4	91 - 104"			91 - 104"	Sandy Lean Clay (~ 20% Fine Sand)	CL	Dark Gray (7.5YR 4/2)
							Sample # 29 (91 - 104")
					Refusal @ 108"		
							East: 585180.4 North: 694649.6
							Core Barrel Advanced: 108" Recovery: 104"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-06A	20050756		6/30/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	1.83%	%
DC-06A	20050756		6/30/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	42.83%	%
DC-06A	20050756		6/30/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	38.22%	%
DC-06A	20050756		6/30/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	17.12%	%
DC-06A	20050756		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	43.7	%
DC-06A	20050756		6/30/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-06A	20050756		6/30/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-06A	20050756		6/30/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-06A	20050756		6/30/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-06A	20050756		6/30/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	98.17%	%
DC-06A	20050756		6/30/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	95.89%	%
DC-06A	20050756		6/30/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	90.45%	%
DC-06A	20050756		6/30/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	82.46%	%
DC-06A	20050756		6/30/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	74.56%	%
DC-06A	20050756		6/30/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	66.58%	%
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.032379	mm
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.021193	mm
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.012556	mm
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009045	mm
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006511	mm
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003255	mm
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001379	mm
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	51.55%	%
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	41.24%	%
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	32.99%	%
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	26.80%	%
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	20.62%	%
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	13.40%	%
DC-06A	20050756		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	7.22%	%
DC-06A	20050756		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	53.85	%
DC-06A	20050756		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	41.55	%
DC-06A	20050756		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	12.31	%
DC-06A	20050756		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	54.28	%
DC-06A	20050756		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	41.55	%
DC-06A	20050756		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.767	
DC-06A	20050756		6/16/2005	EPA 9060	TOC	TOC	Total Organic Carbon	104,605	ppm
DC-06A	20050756		6/16/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	10.46	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:
6B
Time: 1127

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/10/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 6**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0 - 17"						0 - 17"	Silt w/Organic Material	ML	Very Dark Brown/Black (7.5YR 3/2)
2	17 - 44"						17 - 44"	Elastic Silt w/Fine Sand and Organic Material (<15% Fine Sand) (<10% Organic Material)	MH	Very Dark Brown/Black (7.5YR 3/2)
										Sample # 28 (24 - 40")
								Refusal @ 65"		
										East: 585328.2 North: 694655.3
										Core Barrel Advanced: 65" Recovery: 44"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-06B	20050757		6/30/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-06B	20050757		6/30/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	7.49%	%
DC-06B	20050757		6/30/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	60.53%	%
DC-06B	20050757		6/30/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	31.98%	%
DC-06B	20050757		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	58.4	%
DC-06B	20050757		6/30/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-06B	20050757		6/30/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-06B	20050757		6/30/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-06B	20050757		6/30/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-06B	20050757		6/30/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-06B	20050757		6/30/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.78%	%
DC-06B	20050757		6/30/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	99.30%	%
DC-06B	20050757		6/30/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	98.33%	%
DC-06B	20050757		6/30/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	95.33%	%
DC-06B	20050757		6/30/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	91.62%	%
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.029489	mm
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.019433	mm
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.011611	mm
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008478	mm
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006199	mm
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003171	mm
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001356	mm
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	77.89%	%
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	67.37%	%
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	57.89%	%
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	48.42%	%
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	37.89%	%
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	23.16%	%
DC-06B	20050757		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	13.68%	%
DC-06B	20050757		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	94.07	%
DC-06B	20050757		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	57.00	%
DC-06B	20050757		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	37.07	%
DC-06B	20050757		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	94.30	%
DC-06B	20050757		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	57.00	%
DC-06B	20050757		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.548	
DC-06B	20050757		6/16/2005	EPA 9060	TOC	TOC	Total Organic Carbon	84,881	ppm
DC-06B	20050757		6/16/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	8.49	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:
6C
Time: 1034

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/10/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 6**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 - 20"			0 - 20"	Silt	ML	Very Dark Brown/Black (7.5YR 3/2)
2	20 - 29"			20 - 29"	Elastic Silt w/Fine Sand (<15% Fine Sand)	MH	Very Dark Brown/Black (7.5YR 3/2)
3	29 - 33"			29 - 33"	Silt	ML	Very Dark Brown/Black (7.5YR 3/2)
4	33 - 40"			33 - 40"	Elastic Silt w/Fine Sand (<15% Fine Sand)	MH	Very Dark Brown/Black (7.5YR 3/2)
5	40 - 53"			40 - 53"	Poorly Graded Fine-Medium Sand w/Gravel (<15% Fine Gravel)	SP	Medium Bluish Gray (5B 5/1)
							Sample # 27 (40 - 53")
					Refusal @ 72"		
							East: 585457.2 North: 694735.5
							Core Barrel Advanced: 72" Recovery: 53"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-06C	20050758		6/30/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	41.83%	%
DC-06C	20050758		6/30/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	50.41%	%
DC-06C	20050758		6/30/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	4.34%	%
DC-06C	20050758		6/30/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	3.42%	%
DC-06C	20050758		6/24/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	15.8	%
DC-06C	20050758		6/30/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-06C	20050758		6/30/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-06C	20050758		6/30/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	93.06%	%
DC-06C	20050758		6/30/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	86.93%	%
DC-06C	20050758		6/30/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	58.17%	%
DC-06C	20050758		6/30/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	49.09%	%
DC-06C	20050758		6/30/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	38.05%	%
DC-06C	20050758		6/30/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	29.55%	%
DC-06C	20050758		6/30/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	25.82%	%
DC-06C	20050758		6/30/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	23.83%	%
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.036285	mm
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023207	mm
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013472	mm
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009526	mm
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006773	mm
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003318	mm
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001390	mm
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	14.00%	%
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	10.00%	%
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	8.00%	%
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	8.00%	%
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	6.00%	%
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	6.00%	%
DC-06C	20050758		6/22/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	4.00%	%
DC-06C	20050758		7/20/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-06C	20050758		7/20/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-06C	20050758		7/20/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-06C	20050758		7/20/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-06C	20050758		7/20/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-06C	20050758		7/20/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.767	
DC-06C	20050758		6/16/2005	EPA 9060	TOC	TOC	Total Organic Carbon	13,947	ppm
DC-06C	20050758		6/16/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	1.39	%

<1> Sample did not exhibit plastic qualities due to the amount of sand content.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:
7A
Time: 1340

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/8/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 7**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 - 80"			0 - 80"	Elastic Silt w/Trace Fine Sand Gravel Lens @ 76 - 78" (<10% Fine Sand)	MH	Very Dark Brown/Black (7.5YR 3/2) **Sample # 24 (60 - 80")**
					Refusal @ 96"		
							East: 586064.3 North: 703141.8 Core Barrel Advanced: 96" Recovery: 80"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-07A	20050750		6/30/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	45.15%	%
DC-07A	20050750		6/30/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	15.38%	%
DC-07A	20050750		6/30/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	25.89%	%
DC-07A	20050750		6/30/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	13.57%	%
DC-07A	20050750		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	43.9	%
DC-07A	20050750		6/30/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-07A	20050750		6/30/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	89.93%	%
DC-07A	20050750		6/30/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	85.50%	%
DC-07A	20050750		6/30/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	74.38%	%
DC-07A	20050750		6/30/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	54.85%	%
DC-07A	20050750		6/30/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	53.22%	%
DC-07A	20050750		6/30/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	49.42%	%
DC-07A	20050750		6/30/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	46.76%	%
DC-07A	20050750		6/30/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	44.48%	%
DC-07A	20050750		6/30/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	41.31%	%
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.030967	mm
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.020185	mm
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.012154	mm
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008709	mm
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006278	mm
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003319	mm
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001360	mm
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	62.50%	%
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	54.17%	%
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	41.67%	%
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	37.50%	%
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	31.25%	%
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	18.75%	%
DC-07A	20050750		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	10.42%	%
DC-07A	20050750		7/15/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	80.23	%
DC-07A	20050750		7/15/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	45.87	%
DC-07A	20050750		7/15/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	34.36	%
DC-07A	20050750		7/15/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	80.72	%
DC-07A	20050750		7/15/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	45.87	%
DC-07A	20050750		7/15/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.932	
DC-07A	20050750		6/14/2005	EPA 9060	TOC	TOC	Total Organic Carbon	67,130	ppm
DC-07A	20050750		6/14/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	6.71	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:
7B
Time: 1315

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/8/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 7**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 - 12"			0 - 12"	Silty Fine Sand w/ Organic Leaf Debris (<25% Fine Sand)	ML	Very Dark Brown/Black (7.5YR 3/2)
2	12 - 25"			12 - 25"	Silty Fine Sand (>25% Fine Sand)	ML	Very Dark Brown/Black (7.5YR 3/2)
							Sample # 23 (12 - 25")
					Refusal @ 84"		
							East: 586172.0 North: 703075.6
							Core Barrel Advanced: 84" Recovery: 25"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-07B	20050751		6/30/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	23.38%	%
DC-07B	20050751		6/30/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	62.46%	%
DC-07B	20050751		6/30/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	8.20%	%
DC-07B	20050751		6/30/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	5.96%	%
DC-07B	20050751		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	28.1	%
DC-07B	20050751		6/30/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-07B	20050751		6/30/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	90.48%	%
DC-07B	20050751		6/30/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	88.98%	%
DC-07B	20050751		6/30/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	86.53%	%
DC-07B	20050751		6/30/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	76.62%	%
DC-07B	20050751		6/30/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	75.48%	%
DC-07B	20050751		6/30/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	73.50%	%
DC-07B	20050751		6/30/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	69.30%	%
DC-07B	20050751		6/30/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	51.88%	%
DC-07B	20050751		6/30/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	33.10%	%
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.036079	mm
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.022948	mm
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013324	mm
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009422	mm
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006699	mm
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003318	mm
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001390	mm
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	16.33%	%
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	14.29%	%
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	12.24%	%
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	12.24%	%
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	10.20%	%
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	6.12%	%
DC-07B	20050751		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	4.08%	%
DC-07B	20050751		7/15/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-07B	20050751		7/15/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-07B	20050751		7/15/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-07B	20050751		7/15/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-07B	20050751		7/15/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-07B	20050751		7/15/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.152	
DC-07B	20050751		6/15/2005	EPA 9060	TOC	TOC	Total Organic Carbon	33,138	ppm
DC-07B	20050751		6/15/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	3.31	%

<1> Sample did not exhibit plastic qualities due to the amount of sand content.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:
7C
Time: 1245

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/8/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 7**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0 - 14"						0 - 14"	Silt	ML	Brownish Gray (5YR 4/1)
2	14 - 32"						14 - 32"	Organic Leaf Material/Soil w/Fine Sand and Silt	OL/OH	Brownish Gray (5YR 4/1) **Sample # 22 (14 - 32")**
3	32 - 40"						32 - 40"	Poorly Graded Sand w/Silt (>25% Fines)	SP/SM	Dark Reddish Gray (10R 3/1)
								Refusal @ 84"		
										East: 586238.9 North: 703033.3 Core Barrel Advanced: 84" Recovery: 40"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-07C	20050752		6/30/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	18.88%	%
DC-07C	20050752		6/30/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	44.92%	%
DC-07C	20050752		6/30/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	22.45%	%
DC-07C	20050752		6/30/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	13.75%	%
DC-07C	20050752		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	54.6	%
DC-07C	20050752		6/30/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-07C	20050752		6/30/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-07C	20050752		6/30/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-07C	20050752		6/30/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	97.78%	%
DC-07C	20050752		6/30/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	81.12%	%
DC-07C	20050752		6/30/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	78.94%	%
DC-07C	20050752		6/30/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	71.04%	%
DC-07C	20050752		6/30/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	64.60%	%
DC-07C	20050752		6/30/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	56.86%	%
DC-07C	20050752		6/30/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	49.47%	%
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.033509	mm
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.021748	mm
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.012792	mm
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009100	mm
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006549	mm
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003264	mm
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001367	mm
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	42.11%	%
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	33.68%	%
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	27.37%	%
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	25.26%	%
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	18.95%	%
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	12.63%	%
DC-07C	20050752		6/16/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	10.53%	%
DC-07C	20050752		7/15/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	61.38	%
DC-07C	20050752		7/15/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	58.70	%
DC-07C	20050752		7/15/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	2.68	%
DC-07C	20050752		7/15/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	70.06	%
DC-07C	20050752		7/15/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	58.70	%
DC-07C	20050752		7/15/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.527	
DC-07C	20050752		6/15/2005	EPA 9060	TOC	TOC	Total Organic Carbon	81,691	ppm
DC-07C	20050752		6/15/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	8.17	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

8A

Time: 1050

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/8/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 8**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-9"						0-9"	Poorly Graded Sand w/Silt (>15% Fines)	SM	Grayish Brown (5YR 3/2) **Sample # 19 (0-9")**
2	9-27"						9-27"	Silt w/Fine Sand (<15% Sand)	ML	Very Dark Gray (5YR 3/1)
3	27-32"						27-32"	Poorly Graded Sand w/Silt (>15% Fines)	SM	Grayish Brown (5YR 3/2)
								Refusal @ 60"		East: 587757.7 North: 706734.1 Core Barrel Advanced: 60" Recovery: 32"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-08A	20050747		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	7.43%	%
DC-08A	20050747		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	44.51%	%
DC-08A	20050747		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	32.37%	%
DC-08A	20050747		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	15.69%	%
DC-08A	20050747		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	36.3	%
DC-08A	20050747		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-08A	20050747		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-08A	20050747		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-08A	20050747		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	98.74%	%
DC-08A	20050747		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	92.57%	%
DC-08A	20050747		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	90.13%	%
DC-08A	20050747		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	83.44%	%
DC-08A	20050747		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	75.17%	%
DC-08A	20050747		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	70.90%	%
DC-08A	20050747		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	64.19%	%
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.032836	mm
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.021333	mm
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.012635	mm
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009100	mm
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006511	mm
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003264	mm
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001375	mm
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	47.42%	%
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	39.18%	%
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	30.93%	%
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	24.74%	%
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	20.62%	%
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	12.37%	%
DC-08A	20050747		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	8.25%	%
DC-08A	20050747		7/15/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	47.14	%
DC-08A	20050747		7/15/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	34.19	%
DC-08A	20050747		7/15/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	12.95	%
DC-08A	20050747		7/15/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	46.54	%
DC-08A	20050747		7/15/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	34.19	%
DC-08A	20050747		7/15/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.036	
DC-08A	20050747		6/14/2005	EPA 9060	TOC	TOC	Total Organic Carbon	50,729	ppm
DC-08A	20050747		6/14/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	5.07	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

8B

Time: 1120

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/8/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 8**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	**Depth**	**Rec**	**Blows per 6"**				
1	0 - 12"			0 - 12"	Silty Gravel w/Fine - Medium Sand (>15% Fines)	GM	Grayish Brown (5YR 3/2) **Sample # 20 (0-12")**
					Refusal @ 48"		East: 587861.3 North: 706664.9 Core Barrel Advanced: 48" Recovery: 12"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-08B	20050748		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	10.79%	%
DC-08B	20050748		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	79.52%	%
DC-08B	20050748		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	6.53%	%
DC-08B	20050748		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	3.15%	%
DC-08B	20050748		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	21.2	%
DC-08B	20050748		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-08B	20050748		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-08B	20050748		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	97.72%	%
DC-08B	20050748		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	96.12%	%
DC-08B	20050748		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	89.21%	%
DC-08B	20050748		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	86.86%	%
DC-08B	20050748		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	72.76%	%
DC-08B	20050748		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	48.73%	%
DC-08B	20050748		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	37.08%	%
DC-08B	20050748		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	32.39%	%
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.032148	mm
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.021193	mm
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.012556	mm
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008990	mm
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006473	mm
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003245	mm
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001367	mm
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	53.61%	%
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	41.24%	%
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	32.99%	%
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	28.87%	%
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	22.68%	%
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	14.43%	%
DC-08B	20050748		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	10.31%	%
DC-08B	20050748		7/15/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-08B	20050748		7/15/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-08B	20050748		7/15/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-08B	20050748		7/15/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-08B	20050748		7/15/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-08B	20050748		7/15/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.390	
DC-08B	20050748		6/14/2005	EPA 9060	TOC	TOC	Total Organic Carbon	9,731	ppm
DC-08B	20050748		6/14/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.973	%

<1> Sample did not exhibit plastic qualities due to amount of sand present.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

8C

Time: 1210

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/8/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 8**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"				
1	0 - 14"			0 - 14"	Silt	ML	Black (7.5YR 2/0)
2	14 - 17"			14 - 17"	Poorly Graded Medium - Coarse Sand w/Gravel (<5% Fines)	SP	Dark Reddish Brown (10YR 3/4)
3	17 - 29"			17 - 29"	Well Graded Fine Sand (<10% Fines)	SW	Grayish Brown (5YR 3/2) **Sample #21 (17 - 29")**
4	29 - 32"			29 - 32"	Poorly graded gravel w/Fine-Medium Sand (<15% Sand)	GP	Dark Reddish Brown (10YR 3/4)
					Refusal @ 72"		
							East: 588025.5 North: 706604.2 Core Barrel Advanced: 72" Recovery: 32"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-08C	20050749		6/30/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	5.78%	%
DC-08C	20050749		6/30/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	82.31%	%
DC-08C	20050749		6/30/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	6.74%	%
DC-08C	20050749		6/30/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	5.17%	%
DC-08C	20050749		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	25.3	%
DC-08C	20050749		7/1/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-08C	20050749		7/1/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-08C	20050749		7/1/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-08C	20050749		7/1/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	98.30%	%
DC-08C	20050749		7/1/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	94.22%	%
DC-08C	20050749		7/1/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	92.86%	%
DC-08C	20050749		7/1/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	88.54%	%
DC-08C	20050749		7/1/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	62.26%	%
DC-08C	20050749		7/1/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	43.79%	%
DC-08C	20050749		7/1/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	36.97%	%
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.036285	mm
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023078	mm
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013398	mm
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009474	mm
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006736	mm
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003318	mm
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001383	mm
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	12.12%	%
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	10.10%	%
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	8.08%	%
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	8.08%	%
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	6.06%	%
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	4.04%	%
DC-08C	20050749		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	4.04%	%
DC-08C	20050749		7/15/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-08C	20050749		7/15/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-08C	20050749		7/15/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-08C	20050749		7/15/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-08C	20050749		7/15/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-08C	20050749		7/15/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.338	
DC-08C	20050749		6/14/2005	EPA 9060	TOC	TOC	Total Organic Carbon	8,703	ppm
DC-08C	20050749		6/14/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.87	%

<1> Sample did not exhibit plastic qualities due to amount of sand present.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

9A

Time: 0835

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/8/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 9**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION							Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"							
								No Recovery After 3 Attempts		East: 589362.8 North: 710721.7 Core Barrel Advanced: 0 Recovery: 0

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

9B

Time: 0920

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/8/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 9**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION							Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"							
								No Recovery After 3 Attempts		
										East: 589459.1 North: 710725.3 Core Barrel Advanced: 0 Recovery: 0

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

9C

Time: 1018

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/8/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 9**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-16"						0-16"	Poorly Graded Sand w/Silt (>15% Fines)	SM	Very Dark Gray (5YR 3/1)
										Sample # 18 (0-16")
								Refusal @ 84"		
										East: 589571.3 North: 710717.5
										Core Barrel Advanced: 84" Recovery: 16"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-09C	20050746		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	2.41%	%
DC-09C	20050746		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	72.55%	%
DC-09C	20050746		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	16.91%	%
DC-09C	20050746		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	8.13%	%
DC-09C	20050746		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	39.3	%
DC-09C	20050746		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-09C	20050746		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-09C	20050746		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-09C	20050746		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	98.95%	%
DC-09C	20050746		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	97.59%	%
DC-09C	20050746		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	96.56%	%
DC-09C	20050746		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	93.45%	%
DC-09C	20050746		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	84.57%	%
DC-09C	20050746		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	61.13%	%
DC-09C	20050746		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	46.76%	%
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.035031	mm
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.022556	mm
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013099	mm
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009369	mm
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006662	mm
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003300	mm
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001383	mm
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	24.49%	%
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	18.37%	%
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	16.33%	%
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	12.24%	%
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	10.20%	%
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	6.12%	%
DC-09C	20050746		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	4.08%	%
DC-09C	20050746		7/15/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-09C	20050746		7/15/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-09C	20050746		7/15/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-09C	20050746		7/15/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-09C	20050746		7/15/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-09C	20050746		7/15/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.011	
DC-09C	20050746		6/14/2005	EPA 9060	TOC	TOC	Total Organic Carbon	20,075	ppm
DC-09C	20050746		6/14/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	2.01	%

<1> Sample did not exhibit plastic qualities due to amount of sand present.

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.23%	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	75.08%	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	15.63%	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	9.06%	%
DC-09C-Dup	20050746-Dup		N/A	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	N/A	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	99.77%	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	98.80%	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	95.56%	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	86.86%	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	63.13%	%
DC-09C-Dup	20050746-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	46.70%	%
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.035031	mm
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.022556	mm
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013174	mm
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009316	mm
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006662	mm
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003300	mm
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001375	mm
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	24.49%	%
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	18.37%	%
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	14.29%	%
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	14.29%	%
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	10.20%	%
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	6.12%	%
DC-09C-Dup	20050746-Dup		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	6.12%	%
DC-09C-Dup	20050746-Dup		N/A	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	N/A	%
DC-09C-Dup	20050746-Dup		N/A	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	N/A	%
DC-09C-Dup	20050746-Dup		N/A	ASTMD4318	Atterberg Limits	PI	Plasticity Index	N/A	%
DC-09C-Dup	20050746-Dup		N/A	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	N/A	%
DC-09C-Dup	20050746-Dup		N/A	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	N/A	%
DC-09C-Dup	20050746-Dup		N/A	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	N/A	
DC-09C-Dup	20050746-Dup		N/A	EPA 9060	TOC	TOC	Total Organic Carbon	N/A	ppm
DC-09C-Dup	20050746-Dup		N/A	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	N/A	%

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.89%	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	73.66%	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	16.19%	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	9.26%	%
DC-09C-Trp	20050746-Trp		N/A	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	N/A	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	99.11%	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	98.36%	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	95.25%	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	86.19%	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	62.37%	%
DC-09C-Trp	20050746-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	47.85%	%
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.035031	mm
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.022423	mm
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013174	mm
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009316	mm
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006643	mm
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003300	mm
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001375	mm
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	24.49%	%
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	20.41%	%
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	14.29%	%
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	14.29%	%
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	11.22%	%
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	6.12%	%
DC-09C-Trp	20050746-Trp		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	6.12%	%
DC-09C-Trp	20050746-Trp		N/A	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	N/A	%
DC-09C-Trp	20050746-Trp		N/A	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	N/A	%
DC-09C-Trp	20050746-Trp		N/A	ASTMD4318	Atterberg Limits	PI	Plasticity Index	N/A	%
DC-09C-Trp	20050746-Trp		N/A	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	N/A	%
DC-09C-Trp	20050746-Trp		N/A	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	N/A	%
DC-09C-Trp	20050746-Trp		N/A	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	N/A	
DC-09C-Trp	20050746-Trp		N/A	EPA 9060	TOC	TOC	Total Organic Carbon	N/A	ppm
DC-09C-Trp	20050746-Trp		N/A	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	N/A	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

10A

Time: 1115

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/7/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 10**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-28"						0-28"	Fine-Medium Silty Sand	SM	Medium Bluish Gray (5B 5/1) **Sample #16 (15-25")**
								Refusal @ 84"		East: 591570.2 North: 714966.6 Core Barrel Advanced: 84" Recovery: 28"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-10A	20050744		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-10A	20050744		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	43.23%	%
DC-10A	20050744		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	37.39%	%
DC-10A	20050744		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	19.38%	%
DC-10A	20050744		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	44.6	%
DC-10A	20050744		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-10A	20050744		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-10A	20050744		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-10A	20050744		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-10A	20050744		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-10A	20050744		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.92%	%
DC-10A	20050744		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	99.46%	%
DC-10A	20050744		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	97.66%	%
DC-10A	20050744		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	87.93%	%
DC-10A	20050744		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	71.93%	%
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.032148	mm
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.021193	mm
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.012556	mm
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008990	mm
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006473	mm
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003245	mm
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001367	mm
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	53.61%	%
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	41.24%	%
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	32.99%	%
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	28.87%	%
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	22.68%	%
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	14.43%	%
DC-10A	20050744		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	10.31%	%
DC-10A	20050744		7/15/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	54.49	%
DC-10A	20050744		7/15/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	38.84	%
DC-10A	20050744		7/15/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	15.66	%
DC-10A	20050744		7/15/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	56.22	%
DC-10A	20050744		7/15/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	38.84	%
DC-10A	20050744		7/15/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.790	
DC-10A	20050744		6/13/2005	EPA 9060	TOC	TOC	Total Organic Carbon	49,962	ppm
DC-10A	20050744		6/13/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	5.00	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

10B

Time: 1140

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/7/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 10**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-7"						0-7"	Fine-Medium Silty Sand	SM	Medium Bluish Gray (5B 5/1)
2	7-15"						7-15"	Fine-Medium Silty Sand	SM	Dark Reddish Brown (10YR 3/4)
3	15-24"						15-24"	Well Graded Fine Sand	SW	Dark Reddish Brown (10YR 3/4)
										Sample #17 (15-24")
								Refusal @ 48"		
										East: 591658.0 North: 714933.4
										Core Barrel Advanced: 48" Recovery: 24"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-10B	20050745		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.83%	%
DC-10B	20050745		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	93.47%	%
DC-10B	20050745		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	3.22%	%
DC-10B	20050745		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	2.47%	%
DC-10B	20050745		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	22.3	%
DC-10B	20050745		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-10B	20050745		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-10B	20050745		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-10B	20050745		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	99.59%	%
DC-10B	20050745		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	99.17%	%
DC-10B	20050745		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	98.44%	%
DC-10B	20050745		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	83.61%	%
DC-10B	20050745		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	41.25%	%
DC-10B	20050745		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	33.47%	%
DC-10B	20050745		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	30.95%	%
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.037097	mm
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023589	mm
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013619	mm
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009630	mm
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006846	mm
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003354	mm
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001397	mm
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	6.00%	%
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	4.00%	%
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	4.00%	%
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	4.00%	%
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	2.00%	%
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	2.00%	%
DC-10B	20050745		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	2.00%	%
DC-10B	20050745		7/15/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-10B	20050745		7/15/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-10B	20050745		7/15/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-10B	20050745		7/15/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-10B	20050745		7/15/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-10B	20050745		7/15/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.730	
DC-10B	20050745		6/13/2005	EPA 9060	TOC	TOC	Total Organic Carbon	375	ppm
DC-10B	20050745		6/13/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.04	%

<1> Sample did not exhibit plastic qualities due to the amount of sand content.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

10C

Time: 1220

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/7/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 10**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-3"						0-3"	Poorly Graded w/Silt and Gravel	SP	Medium Bluish Gray (5B 5/1)
										No sample collection due to inadequate revovery volume
								Refusal @ 24"		
										East: 591722.7 North: 714910.8 Core Barrel Advanced: 24" Recovery: 3"

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

11A

Time: 1030

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/7/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 11**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-8"						0-8"	Fine-Medium Silty Sand	SM	Medium Bluish Gray (5B 5/1)
2	8-16"						8-16"	Elastic Silt (<15% Fine Sand)	MH	Dark Reddish Brown (10YR 3/4) **Sample #15 (8-16")**
								Refusal @ 36"		
										East: 592072.8 North: 719586.0 Core Barrel Advanced: 36" Recovery: 16"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-11A	20050741		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	5.58%	%
DC-11A	20050741		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	0.00%	%
DC-11A	20050741		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	53.35%	%
DC-11A	20050741		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	41.08%	%
DC-11A	20050741		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	25.0	%
DC-11A	20050741		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-11A	20050741		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-11A	20050741		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-11A	20050741		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	97.09%	%
DC-11A	20050741		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	94.42%	%
DC-11A	20050741		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	92.96%	%
DC-11A	20050741		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	91.10%	%
DC-11A	20050741		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	90.00%	%
DC-11A	20050741		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	89.31%	%
DC-11A	20050741		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	88.51%	%
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.027393	mm
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.018328	mm
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.011041	mm
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008119	mm
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.005912	mm
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003066	mm
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001321	mm
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	91.84%	%
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	79.59%	%
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	69.39%	%
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	59.18%	%
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	51.02%	%
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	33.67%	%
DC-11A	20050741		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	22.45%	%
DC-11A	20050741		7/14/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	29.09	%
DC-11A	20050741		7/14/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	18.18	%
DC-11A	20050741		7/14/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	10.91	%
DC-11A	20050741		7/14/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	30.43	%
DC-11A	20050741		7/14/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	18.18	%
DC-11A	20050741		7/14/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.435	
DC-11A	20050741		6/9/2005	EPA 9060	TOC	TOC	Total Organic Carbon	842	ppm
DC-11A	20050741		6/9/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.08	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

11B

Time: 0950

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/7/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 11**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-12"						0-12"	Poorly Graded Gravel w/Silt and Sand (<15% Fines)	GP-GM	Grayish Brown (5YR 3/2) **Sample #13 (0-12")**
2	12-30"						12-30"	Elastic Silt (<15% Fine Sand)	MH	Dark Reddish Brown (10YR 3/4) **Sample #14 (18-30")**
								Refusal @ 48"		
										East: 592155.5 North: 719580.9 Core Barrel Advanced: 48" Recovery: 30"

Sample 13

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-11B	20050742		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	9.56%	%
DC-11B	20050742		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	74.95%	%
DC-11B	20050742		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	9.08%	%
DC-11B	20050742		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	6.41%	%
DC-11B	20050742		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	28.9	%
DC-11B	20050742		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-11B	20050742		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-11B	20050742		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	98.16%	%
DC-11B	20050742		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	97.00%	%
DC-11B	20050742		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	90.44%	%
DC-11B	20050742		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	84.32%	%
DC-11B	20050742		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	73.99%	%
DC-11B	20050742		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	57.06%	%
DC-11B	20050742		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	42.39%	%
DC-11B	20050742		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	38.11%	%
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.036079	mm
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023078	mm
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013324	mm
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009474	mm
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006736	mm
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003318	mm
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001390	mm
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	16.33%	%
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	12.24%	%
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	12.24%	%
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	10.20%	%
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	8.16%	%
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	6.12%	%
DC-11B	20050742		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	4.08%	%
DC-11B	20050742		7/15/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-11B	20050742		7/15/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-11B	20050742		7/15/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-11B	20050742		7/15/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-11B	20050742		7/15/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-11B	20050742		7/15/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.131	
DC-11B	20050742		6/9/2005	EPA 9060	TOC	TOC	Total Organic Carbon	33899.3	ppm
DC-11B	20050742		6/9/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	3.39	%

<1> Sample did not exhibit plastic qualities due to the sand/gravel content.

Sample 14

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-11B-2	20050743		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.30%	%
DC-11B-2	20050743		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	0.00%	%
DC-11B-2	20050743		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	67.29%	%
DC-11B-2	20050743		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	32.41%	%
DC-11B-2	20050743		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	23.6	%
DC-11B-2	20050743		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-11B-2	20050743		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-11B-2	20050743		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-11B-2	20050743		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-11B-2	20050743		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	99.70%	%
DC-11B-2	20050743		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.37%	%
DC-11B-2	20050743		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	98.63%	%
DC-11B-2	20050743		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	97.64%	%
DC-11B-2	20050743		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	96.95%	%
DC-11B-2	20050743		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	96.50%	%
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.026843	mm
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.018000	mm
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.011308	mm
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008419	mm
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006239	mm
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003190	mm
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001356	mm
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	95.92%	%
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	83.67%	%
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	63.27%	%
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	48.98%	%
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	34.69%	%
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	20.41%	%
DC-11B-2	20050743		6/15/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	13.27%	%
DC-11B-2	20050743		7/15/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	26.09	%
DC-11B-2	20050743		7/15/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	18.39	%
DC-11B-2	20050743		7/15/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	7.70	%
DC-11B-2	20050743		7/15/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	27.00	%
DC-11B-2	20050743		7/15/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	18.39	%
DC-11B-2	20050743		7/15/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.472	
DC-11B-2	20050743		6/9/2005	EPA 9060	TOC	TOC	Total Organic Carbon	996.1	ppm
DC-11B-2	20050743		6/9/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.10	%

Sample 13

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	4.57%	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	78.69%	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	9.94%	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	6.80%	%
DC-11B-1-Dup	20050742-Dup		N/A	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	N/A	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	95.43%	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	90.37%	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	79.85%	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	60.86%	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	45.34%	%
DC-11B-1-Dup	20050742-Dup		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	40.58%	%
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.036079	mm
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023013	mm
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013324	mm
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009474	mm
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006736	mm
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003318	mm
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001390	mm
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	16.33%	%
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	13.27%	%
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	12.24%	%
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	10.20%	%
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	8.16%	%
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	6.12%	%
DC-11B-1-Dup	20050742-Dup		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	4.08%	%
DC-11B-1-Dup	20050742-Dup		N/A	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	N/A	%
DC-11B-1-Dup	20050742-Dup		N/A	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	N/A	%
DC-11B-1-Dup	20050742-Dup		N/A	ASTMD4318	Atterberg Limits	PI	Plasticity Index	N/A	%
DC-11B-1-Dup	20050742-Dup		N/A	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	N/A	%
DC-11B-1-Dup	20050742-Dup		N/A	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	N/A	%
DC-11B-1-Dup	20050742-Dup		N/A	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	N/A	
DC-11B-1-Dup	20050742-Dup		N/A	EPA 9060	TOC	TOC	Total Organic Carbon	N/A	ppm
DC-11B-1-Dup	20050742-Dup		N/A	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	N/A	%

Sample 13

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	6.15%	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	75.84%	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	10.38%	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	7.62%	%
DC-11B-1-Trp	20050742-Trp		N/A	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	N/A	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	93.85%	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	88.68%	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	78.31%	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	59.54%	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	44.78%	%
DC-11B-1-Trp	20050742-Trp		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	40.39%	%
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.035975	mm
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.022948	mm
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013287	mm
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009422	mm
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006699	mm
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003309	mm
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001390	mm
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	17.35%	%
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	14.29%	%
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	13.27%	%
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	12.24%	%
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	10.20%	%
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	7.14%	%
DC-11B-1-Trp	20050742-Trp		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	4.08%	%
DC-11B-1-Trp	20050742-Trp		N/A	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	N/A	%
DC-11B-1-Trp	20050742-Trp		N/A	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	N/A	%
DC-11B-1-Trp	20050742-Trp		N/A	ASTMD4318	Atterberg Limits	PI	Plasticity Index	N/A	%
DC-11B-1-Trp	20050742-Trp		N/A	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	N/A	%
DC-11B-1-Trp	20050742-Trp		N/A	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	N/A	%
DC-11B-1-Trp	20050742-Trp		N/A	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	N/A	
DC-11B-1-Trp	20050742-Trp		N/A	EPA 9060	TOC	TOC	Total Organic Carbon	N/A	ppm
DC-11B-1-Trp	20050742-Trp		N/A	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	N/A	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

11C

Time: 0855

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/7/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 11**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION							Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"							
								No Recovery After 3 Attempts		
										East: 592202.6 North: 719571.5 Core Barrel Advanced: 0 Recovery: 0

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

12A

Time: 1455

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/6/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 12**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-15"						0-15"	Silt	ML	Brownish Gray (5YR 4/1) **Sample#12 (0-15")**
2	15-18"						15-18"	Silty Medium Sand (<25% Fines)	SM	Brownish Gray (5YR 4/1)
								Refusal @ 24"		
										East: 595099.1 North: 724015.8 Core Barrel Advanced: 24" Recovery: 18"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-12A	20050740		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.97%	%
DC-12A	20050740		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	28.76%	%
DC-12A	20050740		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	44.44%	%
DC-12A	20050740		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	25.83%	%
DC-12A	20050740		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	61.7	%
DC-12A	20050740		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-12A	20050740		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-12A	20050740		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-12A	20050740		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	99.21%	%
DC-12A	20050740		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	99.03%	%
DC-12A	20050740		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	98.30%	%
DC-12A	20050740		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	95.57%	%
DC-12A	20050740		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	85.00%	%
DC-12A	20050740		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	77.26%	%
DC-12A	20050740		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	71.95%	%
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.031445	mm
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.020478	mm
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.012072	mm
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008738	mm
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006318	mm
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003208	mm
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001360	mm
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	61.05%	%
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	52.63%	%
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	46.32%	%
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	38.95%	%
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	31.58%	%
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	18.95%	%
DC-12A	20050740		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	12.63%	%
DC-12A	20050740		7/13/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	97.22	%
DC-12A	20050740		7/13/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	60.29	%
DC-12A	20050740		7/13/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	36.93	%
DC-12A	20050740		7/13/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	97.97	%
DC-12A	20050740		7/13/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	60.29	%
DC-12A	20050740		7/13/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.498	
DC-12A	20050740		6/9/2005	EPA 9060	TOC	TOC	Total Organic Carbon	55,126	ppm
DC-12A	20050740		6/9/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	5.51	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

12B

Time: 1415

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/6/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 12**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	Depth	Rec	Blows per 6"				Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
								No Recovery After 3 Attampts		
										East: 595151.6 North: 723939.5 Core Barrel Advanced: 0 Recovery:

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

12C

Time: 1322

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/6/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 12**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-15"						0-15"	Silt	ML	Brownish Gray (5YR 4/1)
										Sanple#10 (0-15")
2	15-18"						15-18"	Silty Sand w/Gravel	SM	Brownish Gray (5YR 4/1)
								Refusal @ 48"		
										East: 595168.6 North: 723902.5
										Core Barrel Advanced: 48" Recovery: 18"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-12C	20050734		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.51%	%
DC-12C	20050734		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	30.92%	%
DC-12C	20050734		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	43.76%	%
DC-12C	20050734		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	24.81%	%
DC-12C	20050734		6/29/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	50.0	%
DC-12C	20050734		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-12C	20050734		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-12C	20050734		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-12C	20050734		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	99.49%	%
DC-12C	20050734		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	99.49%	%
DC-12C	20050734		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.28%	%
DC-12C	20050734		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	93.01%	%
DC-12C	20050734		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	84.01%	%
DC-12C	20050734		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	79.85%	%
DC-12C	20050734		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	76.33%	%
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.031445	mm
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.020405	mm
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.012154	mm
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008823	mm
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006396	mm
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003218	mm
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001364	mm
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	62.50%	%
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	55.21%	%
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	45.83%	%
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	37.50%	%
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	29.17%	%
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	19.79%	%
DC-12C	20050734		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	13.54%	%
DC-12C	20050734		7/13/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	68.06	%
DC-12C	20050734		7/13/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	46.10	%
DC-12C	20050734		7/13/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	21.96	%
DC-12C	20050734		7/13/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	67.69	%
DC-12C	20050734		7/13/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	46.10	%
DC-12C	20050734		7/13/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.711	
DC-12C	20050734		6/8/2005	EPA 9060	TOC	TOC	Total Organic Carbon	148,776	ppm
DC-12C	20050734		6/8/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	14.88	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

13A

Time: 1247

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/6/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 13**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-20"						0-20"	Silt	ML	Grayish Olive (10YR 4/2)
										Sanple#9 (12-20")
2	20-22"						20-22"	Silty Sand w/Gravel	SM	Grayish Olive (10YR 4/2)
								Refusal @ 48"		
										East: 596908.4 North: 727557.6
										Core Barrel Advanced: 48" Recovery: 22"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-13A	20050735		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.15%	%
DC-13A	20050735		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	27.46%	%
DC-13A	20050735		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	44.96%	%
DC-13A	20050735		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	27.43%	%
DC-13A	20050735		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	58.5	%
DC-13A	20050735		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-13A	20050735		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-13A	20050735		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-13A	20050735		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-13A	20050735		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	99.85%	%
DC-13A	20050735		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.70%	%
DC-13A	20050735		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	98.71%	%
DC-13A	20050735		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	96.65%	%
DC-13A	20050735		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	87.89%	%
DC-13A	20050735		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	75.33%	%
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.030967	mm
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.020478	mm
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.012072	mm
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.008709	mm
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006318	mm
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003190	mm
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001352	mm
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	65.26%	%
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	52.63%	%
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	46.32%	%
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	40.00%	%
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	31.58%	%
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	21.05%	%
DC-13A	20050735		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	14.74%	%
DC-13A	20050735		7/13/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	77.23	%
DC-13A	20050735		7/13/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	49.24	%
DC-13A	20050735		7/13/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	27.99	%
DC-13A	20050735		7/13/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	77.50	%
DC-13A	20050735		7/13/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	49.24	%
DC-13A	20050735		7/13/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.567	
DC-13A	20050735		6/8/2005	EPA 9060	TOC	TOC	Total Organic Carbon	67,493	ppm
DC-13A	20050735		6/8/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	6.75	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

13B

Time: 1210

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/6/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 13**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-5"						0-5"	Silty Sand w/Gravel	SM	Grayish Olive (10YR 4/2) Inadequate recovery for sample collection. Three attempts made at recovery.
								Refusal @ 30"		
										East: 596971.4 North: 727527.3 Core Barrel Advanced: 30" Recovery: 5"

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

13C

Time: 1130

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/6/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 13**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-14"						0-14"	Poorly Graded Gravel w/Silt and Sand (>15% Fines)	GM	Grayish Olive (10YR 4/2) **Sample #8 (0-14")**
								Refusal @ 24"		
										East: 597018.1 North: 727526.7 Core Barrel Advanced: 24" Recovery: 14"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-13C	20050736		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	41.24%	%
DC-13C	20050736		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	59.48%	%
DC-13C	20050736		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	11.07%	%
DC-13C	20050736		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	6.10%	%
DC-13C	20050736		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	11.6	%
DC-13C	20050736		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	96.86%	%
DC-13C	20050736		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	88.85%	%
DC-13C	20050736		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	81.01%	%
DC-13C	20050736		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	71.33%	%
DC-13C	20050736		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	58.76%	%
DC-13C	20050736		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	54.89%	%
DC-13C	20050736		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	48.58%	%
DC-13C	20050736		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	41.12%	%
DC-13C	20050736		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	35.68%	%
DC-13C	20050736		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	31.18%	%
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.034387	mm
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.022556	mm
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013174	mm
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009369	mm
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006699	mm
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003300	mm
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001375	mm
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	32.32%	%
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	20.20%	%
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	16.16%	%
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	14.14%	%
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	10.10%	%
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	8.08%	%
DC-13C	20050736		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	8.08%	%
DC-13C	20050736		7/13/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-13C	20050736		7/13/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-13C	20050736		7/13/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-13C	20050736		7/13/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-13C	20050736		7/13/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-13C	20050736		7/13/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.966	
DC-13C	20050736		6/8/2005	EPA 9060	TOC	TOC	Total Organic Carbon	5,435	ppm
DC-13C	20050736		6/8/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.54	%

<1> Sample did not exhibit plastic qualities due to fine sand content passing #40 sieve.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

14A

Time: 1055

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/6/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 14**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-18"						0-18"	Silty Sand	SM	Grayish Olive (10YR 4/2)
										Sample #7 (0-18")
2	18-22"						18-22"	Poorly Graded Sand w/Gravel	SP	Grayish Olive (10YR 4/2)
								Refusal @ 48"		
										East: 597129.7 North: 734400.6
										Core Barrel Advanced: 48" Recovery: 22"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-14A	20050737		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	3.63%	%
DC-14A	20050737		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	70.41%	%
DC-14A	20050737		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	14.70%	%
DC-14A	20050737		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	11.26%	%
DC-14A	20050737		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	38.7	%
DC-14A	20050737		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-14A	20050737		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-14A	20050737		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-14A	20050737		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	99.61%	%
DC-14A	20050737		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	96.37%	%
DC-14A	20050737		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	94.12%	%
DC-14A	20050737		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	87.32%	%
DC-14A	20050737		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	66.44%	%
DC-14A	20050737		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	49.66%	%
DC-14A	20050737		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	46.06%	%
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.035031	mm
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.022556	mm
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013136	mm
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009342	mm
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006625	mm
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003291	mm
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001375	mm
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	26.53%	%
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	20.41%	%
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	17.35%	%
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	15.31%	%
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	14.29%	%
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	9.18%	%
DC-14A	20050737		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	8.16%	%
DC-14A	20050737		7/13/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-14A	20050737		7/13/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-14A	20050737		7/13/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-14A	20050737		7/13/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-14A	20050737		7/13/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-14A	20050737		7/13/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.991	
DC-14A	20050737		6/8/2005	EPA 9060	TOC	TOC	Total Organic Carbon	61,061	ppm
DC-14A	20050737		6/8/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	6.11	%

<1> Sample did not exhibit plastic qualities due to fine sand content passing #40 sieve.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

14B

Time: 1040

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/6/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 14**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-38"						0-38"	Silty Fine Sand	SM	Grayish Olive (10YR 4/2) **Sample #6 (12-24")**
								Refusal @ 60"		
										East: 597184.5 North: 734396.0 Core Barrel Advanced: 60" Recovery: 38"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-14B	20050738		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	2.38%	%
DC-14B	20050738		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	63.25%	%
DC-14B	20050738		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	20.95%	%
DC-14B	20050738		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	13.42%	%
DC-14B	20050738		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	38.4	%
DC-14B	20050738		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-14B	20050738		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-14B	20050738		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-14B	20050738		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	99.57%	%
DC-14B	20050738		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	97.62%	%
DC-14B	20050738		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	95.86%	%
DC-14B	20050738		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	89.02%	%
DC-14B	20050738		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	74.71%	%
DC-14B	20050738		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	58.56%	%
DC-14B	20050738		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	52.91%	%
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.034279	mm
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.022156	mm
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013022	mm
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009235	mm
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006587	mm
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003273	mm
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001375	mm
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	34.02%	%
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	26.80%	%
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	20.62%	%
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	19.59%	%
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	16.49%	%
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	11.34%	%
DC-14B	20050738		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	8.25%	%
DC-14B	20050738		7/13/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	44.96	%
DC-14B	20050738		7/13/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	35.15	%
DC-14B	20050738		7/13/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	9.81	%
DC-14B	20050738		7/13/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	45.37	%
DC-14B	20050738		7/13/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	35.15	%
DC-14B	20050738		7/13/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.965	
DC-14B	20050738		6/8/2005	EPA 9060	TOC	TOC	Total Organic Carbon	54,293	ppm
DC-14B	20050738		6/8/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	5.43	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

14C

Time: 0927

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/6/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 14**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-11"						0-11"	Silty Sand and Gravel	SM	Brownish Gray (5YR 4/1)
2	11-18"						11-18"	Poorly Graded Sand with Gravel Lump of Silt Found @ 16"	SP	Grayish Brown (5YR 3/2) **Sample #5 (11-18")**
								Refusal @ 30"		
										East: 597261.4 North: 734380.2 Core Barrel Advanced: 30" Recovery: 18"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-14C	20050739		6/29/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	52.17%	%
DC-14C	20050739		6/29/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	45.04%	%
DC-14C	20050739		6/29/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	1.27%	%
DC-14C	20050739		6/29/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	1.51%	%
DC-14C	20050739		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	11.2	%
DC-14C	20050739		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	93.66%	%
DC-14C	20050739		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	82.02%	%
DC-14C	20050739		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	71.75%	%
DC-14C	20050739		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	57.57%	%
DC-14C	20050739		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	47.83%	%
DC-14C	20050739		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	31.55%	%
DC-14C	20050739		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	22.97%	%
DC-14C	20050739		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	18.15%	%
DC-14C	20050739		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	17.01%	%
DC-14C	20050739		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	16.48%	%
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.037197	mm
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023513	mm
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013619	mm
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009630	mm
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006810	mm
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003345	mm
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001397	mm
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	5.05%	%
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	5.25%	%
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	4.04%	%
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	4.04%	%
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	4.04%	%
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	3.03%	%
DC-14C	20050739		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	2.02%	%
DC-14C	20050739		7/13/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-14C	20050739		7/13/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-14C	20050739		7/13/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-14C	20050739		7/13/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-14C	20050739		7/13/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-14C	20050739		7/13/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.648	
DC-14C	20050739		6/8/2005	EPA 9060	TOC	TOC	Total Organic Carbon	1,030	ppm
DC-14C	20050739		6/8/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.10	%

<1> Sample did not exhibit plastic qualities due to amount of gravel and sand present.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

15A

Time: 1230

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/3/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 15**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION							Depth	SOIL DESCRIPTION	USCS Lithology	REMARKS
No.	Depth	Rec	Blows per 6"							
								No Recovery After 3 Attempts		
										East: 597601.9 North: 738275.2 Core Barrel Advanced: 12" Recovery: 0

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

15B

Time: 1420

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/3/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 15**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-21"						0-21"	Poorly Graded Fine-Medium Sand w/Gravel	SP	Brownish Gray (5YR 4/1) **Sample #3 (6-20")**
								Refusal @ 36"		
										East: 597642.7 North: 738248.7 Core Barrel Advanced: 36" Recovery: 21"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-15B	20050730		6/24/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	61.87%	%
DC-15B	20050730		6/24/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	35.83%	%
DC-15B	20050730		6/24/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	0.40%	%
DC-15B	20050730		6/24/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	1.90%	%
DC-15B	20050730		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	11.5	%
DC-15B	20050730		6/27/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-15B	20050730		6/27/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	95.32%	%
DC-15B	20050730		6/27/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	81.42%	%
DC-15B	20050730		6/27/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	67.00%	%
DC-15B	20050730		6/27/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	38.13%	%
DC-15B	20050730		6/27/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	17.98%	%
DC-15B	20050730		6/27/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	14.53%	%
DC-15B	20050730		6/27/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	13.44%	%
DC-15B	20050730		6/27/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	12.41%	%
DC-15B	20050730		6/27/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	11.90%	%
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.037197	mm
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023652	mm
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013655	mm
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009656	mm
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006828	mm
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003345	mm
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001394	mm
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	11.11%	%
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	8.08%	%
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	8.08%	%
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	7.07%	%
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	6.06%	%
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	6.06%	%
DC-15B	20050730		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	6.06%	%
DC-15B	20050730		7/12/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-15B	20050730		7/12/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-15B	20050730		7/12/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-15B	20050730		7/12/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-15B	20050730		7/12/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-15B	20050730		7/12/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	1.369	
DC-15B	20050730		6/7/2005	EPA 9060	TOC	TOC	Total Organic Carbon	8417.6	ppm
DC-15B	20050730		6/7/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.84	%

<1> Sample did not exhibit plastic qualities due to amount of gravel and sand present.

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

15C

Time: 1320

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/3/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 15**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-6"						0-6"	Sandy Leaf and Organic Debris	OL	Grayish Brown (5YR 3/2)
2	6-36"						6-36"	Poorly Graded Silty Sand	SM	Grayish Brown (5YR 3/2)
3	36-52"						36-52"	Silt with Fine Sand (<15% Sand)	ML	Very Dark Brown (7.5 YR 2/2) **Sample #4 (32-40")**
4	52-58"						52-58"	Sandy Leaf and Organic Debris	OL	Grayish Brown (5YR 3/2)
								Refusal @ 72"		
										East: 597711.3 North: 738184.1 Core Barrel Advanced: 72" Recovery: 58"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-15C	20050731		6/24/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	0.00%	%
DC-15C	20050731		6/24/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	59.48%	%
DC-15C	20050731		6/24/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	23.23%	%
DC-15C	20050731		6/24/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	17.29%	%
DC-15C	20050731		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	40.9	%
DC-15C	20050731		6/29/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-15C	20050731		6/29/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-15C	20050731		6/29/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	100.00%	%
DC-15C	20050731		6/29/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	100.00%	%
DC-15C	20050731		6/29/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	100.00%	%
DC-15C	20050731		6/29/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	99.78%	%
DC-15C	20050731		6/29/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	99.13%	%
DC-15C	20050731		6/29/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	95.84%	%
DC-15C	20050731		6/29/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	77.60%	%
DC-15C	20050731		6/29/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	58.12%	%
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.033731	mm
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.022021	mm
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.012946	mm
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009235	mm
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006587	mm
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003255	mm
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001367	mm
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	41.24%	%
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	30.93%	%
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	24.74%	%
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	21.65%	%
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	18.56%	%
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	15.46%	%
DC-15C	20050731		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	12.37%	%
DC-15C	20050731		7/12/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	36.54	%
DC-15C	20050731		7/12/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	30.37	%
DC-15C	20050731		7/12/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	6.17	%
DC-15C	20050731		7/12/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	39.51	%
DC-15C	20050731		7/12/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	30.37	%
DC-15C	20050731		7/12/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	0.867	
DC-15C	20050731		6/7/2005	EPA 9060	TOC	TOC	Total Organic Carbon	56,909	ppm
DC-15C	20050731		6/7/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	5.69	%

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

16A

Time: 1030

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/3/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 16**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-6"						0-6'	Poorly Graded Gravel w/Silt and Fine Sand (~25% Fines)	GP	Large Dia. Gravel up to 3"
2	6-22"						6-18"	Clayey Gravel w/Fine-Medium Sand	GC	Inadequate Recovery Volume for Sample Collection.
								Refusal @ 36"		
										East: 599490.3 North: 740870.3
										Core Barrel Advanced: 36" Recovery: 18"

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

16B

Time: 1125

PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/3/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 16**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
1	0-6"						0-6'	Silty Gravel w/Sand, poorly Sorted (<15% Fines)	GM	Medium Bluish Gray (5B 5/1)
2	6-22"						6-22"	Sandy Organic Sediment w/Gravel (~20% Gravel)	OH	Brownish/Gray (5YR 4/1) **Sample #2 (6-22")**
								Refusal @ 36"		
										East: 599552.7 North: 740883.7
										Core Barrel Advanced: 36" Recovery: 22"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-16B	20050728		6/24/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	3.28%	%
DC-16B	20050728		6/24/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	60.67%	%
DC-16B	20050728		6/24/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	22.12%	%
DC-16B	20050728		6/24/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	13.93%	%
DC-16B	20050728		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	17.0	%
DC-16B	20050728		6/27/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-16B	20050728		6/27/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	100.00%	%
DC-16B	20050728		6/27/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	99.50%	%
DC-16B	20050728		6/27/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	98.08%	%
DC-16B	20050728		6/27/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	96.72%	%
DC-16B	20050728		6/27/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	95.29%	%
DC-16B	20050728		6/27/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	93.14%	%
DC-16B	20050728		6/27/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	91.39%	%
DC-16B	20050728		6/27/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	89.52%	%
DC-16B	20050728		6/27/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	70.51%	%
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.033286	mm
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.022356	mm
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013136	mm
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009369	mm
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006662	mm
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003273	mm
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001367	mm
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	44.44%	%
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	25.25%	%
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	19.19%	%
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	16.16%	%
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	14.14%	%
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	13.13%	%
DC-16B	20050728		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	12.12%	%
DC-16B	20050728		7/11/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-16B	20050728		7/11/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-16B	20050728		7/11/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-16B	20050728		7/11/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-16B	20050728		7/11/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-16B	20050728		7/11/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	I.S.	
DC-16B	20050728		6/7/2005	EPA 9060	TOC	TOC	Total Organic Carbon	576.2	ppm
DC-16B	20050728		6/7/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.06	%

<1> Sample did not exhibit plastic qualities due to fine sand content passing #40 sieve.
I.S. = Insufficient Sample

MALCOLM PIRNIE, INC.

17-17 ROUTE 208 NORTH, FAIRLAWN, NEW JERSEY 07410

BORING:

16C

Time: 1104

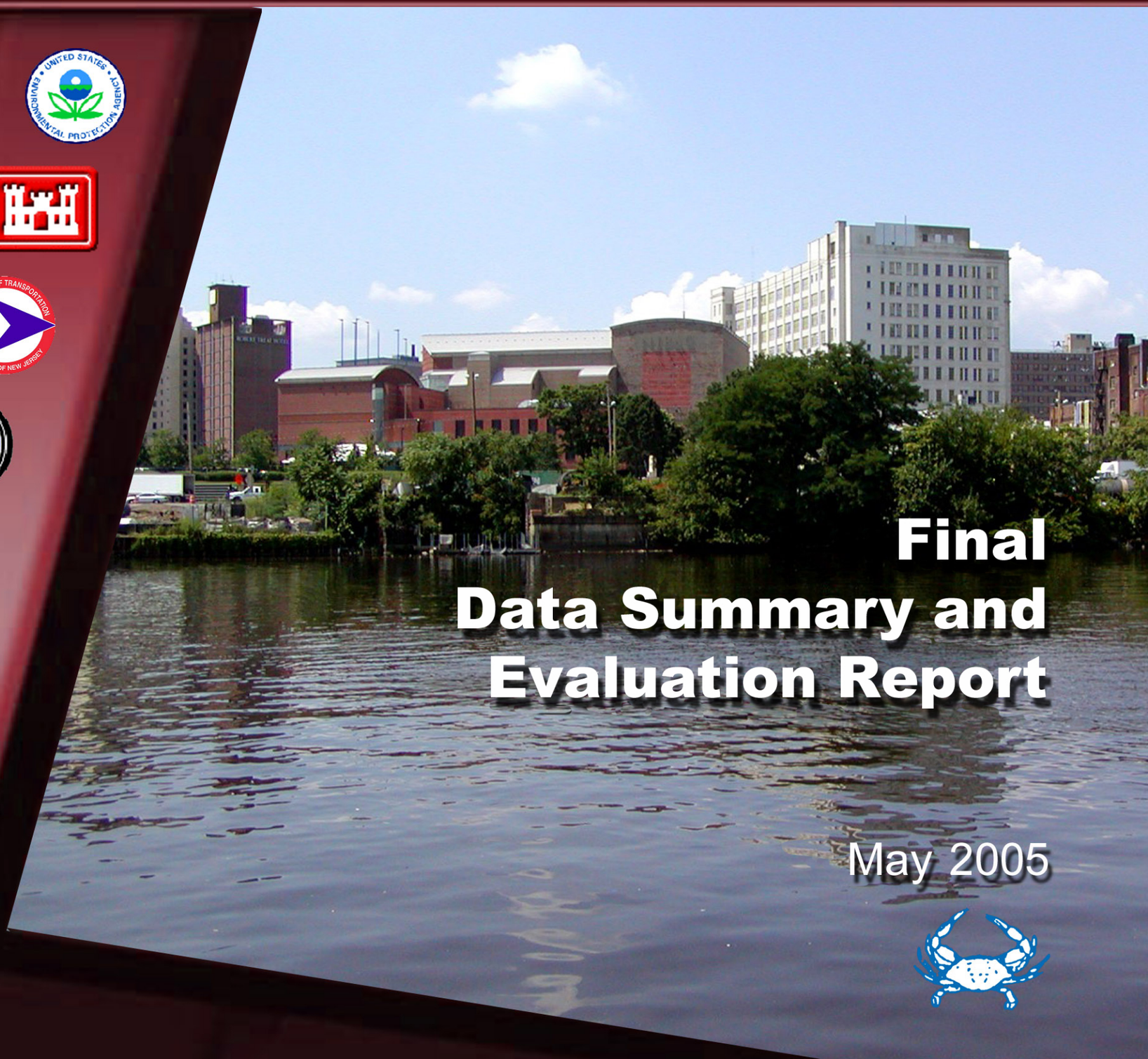
PROJECT NAME:	**Lower Passaic River Geotechnical**	**DATE:**	**6/3/2005**
JOB NUMBER:	**3473007**	**LOCATION:**	**Mile 16**
DRILLING FIRM:	**Aqua-Survey, Inc.**	**WEATHER:**	**Clear and Hot**
DRILLING METHOD:	**Vibracore**	**ELEVATION:**	**N/A**
DRILLER:	**Mark Padover**	**DATUM:**	**NAD83**
HELPER:		**HYDROGEOLOGIST:**	**D. Auld**

SAMPLE INFORMATION										
No.	**Depth**	**Rec**	**Blows per 6"**				**Depth**	**SOIL DESCRIPTION**	**USCS Lithology**	**REMARKS**
							0-6"	Silty Gravel w/Sand (<15% fines)	GM	Brownish/Gray (5YR 4/1)
1	0-6"									
2	6-22"						6-22"	Poorly Graded Sand w/Some Fine Gravel and Silt	SP	Brownish/Gray (5YR 4/1) **Sample #1 (6-22")**
								Refusal @ 30"		
										East: 599585.0 North: 740892.3
										Core Barrel Advanced: 30" Recovery: 22"

Sample ID	Lab Sample ID	SDG	Analysis_Date	Analysis Method	Analysis Method Description	Cas No/Param_Code	Description	Results	Units
DC-16C	20050729		6/24/2005	ASTMD422	Particle Size Analysis	%_GRAVEL	%_GRAVEL	68.73%	%
DC-16C	20050729		6/24/2005	ASTMD422	Particle Size Analysis	%_SAND	%_SAND	28.08%	%
DC-16C	20050729		6/24/2005	ASTMD422	Particle Size Analysis	%_SILT	%_SILT	1.18%	%
DC-16C	20050729		6/24/2005	ASTMD422	Particle Size Analysis	%_CLAY	%_CLAY	2.01%	%
DC-16C	20050729		6/17/2005	ASTMD2974	Moisture Content	%_MOISTURE	%_MOISTURE	11.4	%
DC-16C	20050729		6/27/2005	ASTMC136	Sieve Analysis	SA_1in	% passing 1"	100.00%	%
DC-16C	20050729		6/27/2005	ASTMC136	Sieve Analysis	SA_3/4in	% passing 3/4"	76.81%	%
DC-16C	20050729		6/27/2005	ASTMC136	Sieve Analysis	SA_3/8in	% passing 3/8"	43.11%	%
DC-16C	20050729		6/27/2005	ASTMC136	Sieve Analysis	SA_4	% passing #4	34.12%	%
DC-16C	20050729		6/27/2005	ASTMC136	Sieve Analysis	SA_10	% passing #10	31.27%	%
DC-16C	20050729		6/27/2005	ASTMC136	Sieve Analysis	SA_20	% passing #20	26.58%	%
DC-16C	20050729		6/27/2005	ASTMC136	Sieve Analysis	SA_40	% passing #40	19.51%	%
DC-16C	20050729		6/27/2005	ASTMC136	Sieve Analysis	SA_60	% passing #60	15.44%	%
DC-16C	20050729		6/27/2005	ASTMC136	Sieve Analysis	SA_100	% passing #100	13.32%	%
DC-16C	20050729		6/27/2005	ASTMC136	Sieve Analysis	SA_200	% passing #200	12.11%	%
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS2min	Largest diameter of particle in suspension at 2 minutes	0.036794	mm
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS5min	Largest diameter of particle in suspension at 5 minutes	0.023462	mm
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS15min	Largest diameter of particle in suspension at 15 minutes	0.013546	mm
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS30min	Largest diameter of particle in suspension at 30 minutes	0.009604	mm
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS60min	Largest diameter of particle in suspension at 60 minutes	0.006810	mm
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS250miin	Largest diameter of particle in suspension at 250 minutes	0.003336	mm
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_LDIS1440min	Largest diameter of particle in suspension at 1440 minutes	0.001390	mm
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat2min	% finer than diameter calculated at 2 minutes	11.11%	%
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat5min	% finer than diameter calculated at 5 minutes	8.08%	%
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat15min	% finer than diameter calculated at 15 minutes	8.08%	%
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat30min	% finer than diameter calculated at 30 minutes	7.07%	%
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat60min	% finer than diameter calculated at 60 minutes	6.06%	%
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat250min	% finer than diameter calculated at 250 minutes	6.06%	%
DC-16C	20050729		6/14/2005	ASTMD422	Hydrometer Analysis	HA_%FTDat1440min	% finer than diameter calculated at 1440 minutes	6.06%	%
DC-16C	20050729		7/12/2005	ASTMD4318	Atterberg Limits	AL_LL%M	Liquid Limit	<1>	%
DC-16C	20050729		7/12/2005	ASTMD4318	Atterberg Limits	AL_PL%M	Plastic Limit	<1>	%
DC-16C	20050729		7/12/2005	ASTMD4318	Atterberg Limits	PI	Plasticity Index	<1>	%
DC-16C	20050729		7/12/2005	ASTMD4318	Atterberg Limits	AL_LLMC	Liquid Limit Moisture Content	<1>	%
DC-16C	20050729		7/12/2005	ASTMD4318	Atterberg Limits	AL_PLMC	Plastic Limit Moisture Content	<1>	%
DC-16C	20050729		7/12/2005	ASTMD4531	Bulk Density	BULK_DEN	Bulk Density in grams/milliliter, dry recovery	I.S.	
DC-16C	20050729		6/7/2005	EPA 9060	TOC	TOC	Total Organic Carbon	1,729	ppm
DC-16C	20050729		6/7/2005	EPA 9060	% TOC	TOC_%DW	% Total Organic Carbon of dry weight	0.17	%

<1> Sample did not exhibit plastic qualities due to amount of gravel and sand present.
I.S. = Insufficient Sample

Lower Passaic River Restoration Project



Final Data Summary and Evaluation Report

May 2005

Lower Passaic River Restoration Project

Final Data Summary and Evaluation Report

May 2005

PREPARED BY:
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FOR:
New Jersey Department of Transportation
Office of Maritime Resources
Contract No. 2001-NJMR02

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LOWER PASSAIC RIVER RESTORATION PROJECT
DATA SUMMARY AND EVALUATION REPORT

FINAL

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1.0 INTRODUCTION

1.1 INTRODUCTION AND PURPOSE

This Data Summary and Evaluation Report for the Sediment Coring Pilot Project for the Lower Passaic River Restoration Project has 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 as described in the Project Plans for Geophysical Surveys and Sediment Coring (TAMS/ET and MPI, 2004a) was to conduct a hydrographic survey, side scan sonar survey, and sediment coring in order to perform a detailed characterization of the Pilot Study Survey 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 September 2005. Concurrent with this investigation, the Institute of Marine and Coastal Sciences at Rutgers University and the Water Resources Division of the United States Geological Survey are collecting data to support the hydrodynamic modeling for the Passaic River. Separate Project Plans that describe the sampling, monitoring, and other activities to be conducted during the environmental dredging pilot study are being prepared by TAMS/ET and MPI. Hydrodynamic modeling in support of the dredging pilot study was conducted by TAMS/ET and modeling results are presented in the Environmental Dredging Pilot Study Hydrodynamic Modeling Report (ET, 2005). A Dredging Technology Review Report has been prepared by TAMS/ET and MPI (TAMS/ET and MPI, 2004b). Technical specifications, plans, and the NJDOT bid package for procurement of the dredging contractor have also been prepared by TAMS/ET and MPI (May 2005).

The objective of the dredging demonstration project is to study dredging productivity and sediment resuspension for the Lower Passaic River. Evaluating the feasibility 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. Dredging residuals will not be monitored or evaluated as part of this pilot study. 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 treated to meet applicable criteria 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 have prepared separate work plans that describe these efforts.

The hydrographic survey was conducted 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 side scan sonar survey was conducted to characterize the texture of the sediments and to identify any debris in the Pilot Study Survey Area. The work area for these surveys encompassed 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 identified a 1.5-acre work area (referred to as the Potential Dredging Area) for the collection of sediment cores in conjunction with NJDOT-OMR, United States Environmental Protection Agency (USEPA), and United States Army Corps of Engineers (USACE).

The sediment coring was conducted to establish a representative chemical and geotechnical characterization of the sediments in the upper four feet of the Passaic River bed in the Potential Dredging Area. All of this information is being utilized to support the objectives of the combined dredging and sediment decontamination demonstration project.

The data summarized in this report was generated in accordance with the Project Plans for Geophysical Surveys and Sediment Coring, which included a Work Plan, a Quality Assurance Project Plan (QAPP), and a Health and Safety Plan (HASP) (TAMS/ET and MPI, June 2004).

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.

1.2 STUDY AREA AND BACKGROUND

The Passaic River drains a 935 square mile watershed located in northern New Jersey and southern New York states (Figure 1-1). 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 1-2). 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, PCBs, PAHs, metals, pesticides and other contaminants. The Harrison Reach of the river was selected as the location for the dredging pilot study. The rationale for the selection of this location was presented in the Work Plan (TAMS/ET and MPI, 2004a) and is not repeated here.

Lower Passaic River sediments are contaminated with a variety of hazardous and toxic substances including dioxins, 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 River (NJDEP and NJDHSS, 2004).

The Harrison Reach of the Lower Passaic River is the general study area for the pilot-scale dredging program being planned for September 2005 (Figure 1-3). 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 two miles from the NJ Turnpike Bridge to the Jackson Street Bridge that connects Harrison with Newark. The Pilot Study Survey 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 (Figure 1-3). 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 is expected to occur in the portion of the Harrison Reach that is aligned east-west.

According to the Remedial Investigation/Feasibility Study (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 combined sewer overflow (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 (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 (2004) noted significant shoaling. According to Ianuzzi et al. (2002), the most recent dredging event in the Harrison Reach between the Point-No-Point Conrail Bridge and the Jackson Street Bridge was performed in 1937 to the project depth of 20 feet. Sediment surface cross sections within the Pilot Study Survey Area generated by TAMS/ET from the current investigation are provided in this report.

1.3 REPORT ORGANIZATION

This Data Summary and Evaluation Report is organized as follows:

- Section 1 presents an Introduction, including a site history, site description and physical characteristics;

- Section 2 presents a summary and description of the field sampling effort, including field-generated data;
- Section 3 presents the geophysical survey data;
- Section 4 presents a summary of the analytical data;
- Section 5 presents a summary of conclusions and recommendations;
- Section 6 presents the references.
- In addition three appendices are attached
    - Appendix A includes the sediment coring logs
    - Appendix B includes the two geophysical survey reports generated by ASI.
    - Appendix C includes some of the photographs taken during the field sampling effort.

II

2.0 SEDIMENT CORING AND SAMPLING

The field sampling activities were conducted to characterize sediments in the Potential Dredging Area (Figure 2-1) for the Environmental Dredging Demonstration and Sediment Decontamination Technology Demonstration – Treatability Study. The objective of the study is to develop a comprehensive, watershed-based plan for the remediation and restoration of the Lower Passaic River, shown in Figure 1-2.

The Potential Dredging Area, where the sediment sampling was conducted, is located in the Harrison Reach area of the Lower Passaic River (Figure 2-1). This reach was selected based on several factors, including the river configuration, nature and concentration of contaminants, volume of contaminated sediments, access characteristics, and river velocity. The selected reach is also relatively light in river traffic, which will allow work to be completed unhindered.

Sediment core sampling was conducted using vibratory coring techniques. The work was performed from July 12 through July 14, 2004. Personnel from ASI advanced and retrieved the core samples, with oversight from NJDOT-OMR and MPI. Core processing and sediment sample management activities were performed by MPI and TAMS/ET, with assistance from NJDOT-OMR and USEPA.

Docking and river access was provided by Passaic Valley Sewage Commission (PVSC), and transport and sampling vessels were provided by PVSC and ASI. PVSC personnel escorted personnel from a security checkpoint to and from their dock at the beginning and end of each day. The R/V Robert E. Hayes, an ASI lift barge vessel, served as the base of operations for the field activities. For the first two days of sampling, the R/V Robert E. Hayes was stationed downriver east of the NJ Turnpike Bridge and the Point-No-Point Conrail Bridge, and left in place overnight. On the third day, the R/V Robert E. Hayes was moved back to the PVSC facility and docked during field operations for core processing.

Weather conditions during the field activities ranged from rainy and windy to hot and sunny. On July 12, 2004, the weather conditions consisted of heavy rain and moderate wind in the morning, with both decreasing in the afternoon and evening. On July 13, 2004, conditions were uniformly cloudy throughout the day and evening with light rain and wind. On July 14, 2004, conditions were very sunny and warm though the morning (77º F and climbing at 1000 hours) and the early afternoon, with cooler temperatures, thunderstorms, and high winds moving in during the afternoon.

2.1 HEALTH AND SAFETY PROCEDURES

Health and safety procedures required for core collection and processing, including personal protective equipment (PPE) and air monitoring, were defined in the Project Plans for Geophysical Surveys and Sediment Coring (TAMS/ET and MPI, 2004). Implementation of the procedures is summarized below.

2.1.1 Sampling Activities

Personal Protective Equipment (PPE) required for the subcontractor personnel aboard the ASI coring vessel consisted of:

- Tyvek coveralls or waterproof, washable gear (e.g., rain gear)
- Nitrile gloves
- Personal flotation device (PFD)
- Steel-toe boots
- Hard hat
- Safety glasses

The MPI scientist conducting oversight on the ASI coring vessel used OSHA Level D protection (above equipment, without the Tyvek coveralls), since oversight was conducted without handling the actual cores. No air monitoring was conducted aboard the sampling vessel since only closed core tubes were retrieved and handled (exposed sediment in the work area was limited to residuals clinging to the outside of the retrieved core barrel).

2.1.2 Processing Activities

PPE employed by MPI and TAMS/ET personnel segmenting cores consisted of:

- Tyvek suit and/or rain gear
- Hard hat w/face shield
- Heavy duty rubber outer gloves
- Nitrile inner gloves
- Steel-toe rubber boots
- PFD

Core segmentation staff changed Tyvek suits if they became too wet or soiled. PPE employed by MPI and TAMS/ET personnel performing core section classification, sample homogenization, and sample management included:

- Tyvek suit
- Steel toe rubber boots or steel-toe boots with boot covers
- Nitrile gloves (double layer)
- Safety glasses
- PFD

Staff conducting decontamination of sampling and processing equipment used the same PPE as those performing core section homogenization and classification.

Air monitoring was conducted in the field using a HNU Systems PI-101 Photoionization Detector (PID), MiniRae PID, and a Jerome Mercury Vapor Analyzer. Table 2-1 provides information on air monitoring instrument daily calibration and results. The function of the HNU

PIDs was compromised by high humidity during the intermittent to heavy rains on July 12 and 13; therefore, the Site Safety Officer (SSO) requested a replacement instrument (MiniRAE PID) less sensitive to humidity. The MiniRAE was transported to PVSC by MPI personnel and delivered to the R/V Robert E. Hayes by the crew of the PVSC vessel.

On the morning of July 14, when ambient temperatures rose above 70º F, the SSO initiated heat stress monitoring of field personnel wearing Tyvek coveralls. Measurements were collected approximately hourly using a digital thermometer (oral measurements). The SSO requested specific staff to take a rest break/drink fluids if oral temperature increases were detected. The SSO also decided, based on the proximity of the R/V Robert E. Hayes to the PVSC dock on July 14, to not require core processing personnel to wear PFDs under their Tyvek suits to alleviate heat stress (the MPI Corporate Health and Safety Manager was consulted and concurred). A large tarp was also raised using the crane of the vessel to shield personnel from the sun.

2.2 SAMPLE COLLECTION

The procedures for core collection were defined in the Project Plans (TAMS/ET and MPI, 2004a).

Core collection was performed by ASI personnel, with oversight from MPI staff. Sampling was originally to be conducted using a single ASI core sampling vessel (pontoon boat), but engine failure experienced early on July 12 required the pontoon boat to be tied to another vessel for propulsion. The core vessel engine failure resulted in a delay in the initiation of sampling activities until mid-afternoon on July 12 (pending arrival of the second vessel). Because of rain during sampling activities, the computer and differential global positioning system (DGPS) equipment (other than the antenna) were kept in the sheltered area of the “propulsion” vessel. The antenna was also located on the propulsion vessel, directly above the vibracore apparatus.

Oversight log forms were filled out for each core collected. The log forms include the actual sampling coordinates, sample number, water depth, tide stage, approximate sediment description, time of core collection, time of vibracore initialization, penetration depth, recovery, and other pertinent observations (including weather) for each core/location. Copies of the log forms are included in Appendix A.

2.2.1 Procedure

The sampling vessel was equipped with a global positioning system accurate to 1 meter or less horizontally. Data were reported in horizontal datum NAD 83 and NJ State Plane coordinate system, and national geodetic vertical datum (NGVD) 1929. See Table 2-2 for the target coordinates of each sampling area. The target accuracy for coring location measurements was 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

Achievement of a horizontal position within three feet of the target was extremely difficult for several reasons. The windy conditions and attachment of the sampling vessel to the propulsion vessel made maneuvering, positioning, and stabilization of the sampling vessel difficult. In addition, the DGPS antenna was located on the propulsion vessel, adding another challenge to achieving an actual horizontal position within thee feet of the target location. The majority of the cores were collected within a recorded horizontal distance of ten feet from the target. The target and actual core locations are shown on Figure 2-2. As noted on the figure, the actual location of one sample (A2) is slightly outside the limits of the planned sampling area.

Location was confirmed through examination of the site map, bathymetric survey, and landmarks. At the time of sampling, locations were recorded to an anticipated accuracy of about ± 1 m using real-time kinematic (RTK) DGPS. The DGPS antenna was mounted directly above the vibracore apparatus, so no correction (offset) was required. See Table 2-2 for the final coordinates and offset information.

A clean, new, clear plastic coring tube liner and core catcher were mounted within a clean core barrel on the vibracore apparatus, as per the manufacturer's directions. Care was taken to seat the tube properly in the vibracore head, and that the check valve had a tight seal. The liner and the barrel were 8 feet in length.

The vibracore unit was then lowered until the bottom of the core barrel reached the river bottom and engaged. The tube was advanced through the sediment until refusal, or to the maximum penetration allowed by the 8-foot length of the core barrel. The vibracore unit was then disengaged and extracted from the bottom slowly by the lift cable, keeping it in a vertical orientation. Penetration depth was confirmed by visually inspecting the core barrel for a mud line.

Excess sediment was washed off the core barrel as the tube was raised out of the water, after the mud line was observed. When the bottom of the core was within reach, a safety hook and line were attached to the core catcher, and the core liner was removed from the core barrel.

The bottom of the core catcher was capped, and both the cap and core catcher were taped to the plastic tube after the core had been brought on board and the rivets removed to free the core catcher assembly from the core barrel. The top of the core was then capped, taped, and the core tube lashed vertically to the railing of the propulsion vessel for transport to the R/V Robert E. Hayes, while maintaining the retrieved core in a vertical orientation. Cores were delivered to the processing facility in groups of one to four cores within two hours of collection. The core was then examined for gaps, and the recovery (differenced between core penetration depth and length of sediment in the recovered core tube) was measured. Recovery measurements (recorded to the nearest half inch) are included in the coring logs provided in Appendix A.

The recovery was determined by measuring the distance from the bottom of the core to the sediment-water interface ("mud-line") inside the tube. The core catcher length (approximately 2 inches) was included in the core recovery value. If at least 36 inches of material was collected, and the core recovery was 60 percent or greater, the core was retained for processing.

If less than 36 inches of material was recovered, the recovery was less than 60 percent, or gaps greater than 2 inches were present in the core, the core was considered unusable and another attempt made within 3 to 5 feet from the initial location. (Due to the tidal nature of the Harrison Reach of the Passaic River, the direction of the second attempt relative to the first cannot be accurately characterized as "upstream" or "downstream".) Excess sediments from cores with unacceptable recovery were collected using a 5-gallon bucket.

Cores were brought to the R/V Robert E. Hayes for processing in groups of three or four, and custody was relinquished to the processing crews. All cores were kept vertical from the time of collection through segmentation.

2.2.2 Locations and Location Design

The sampling area (Potential Dredging Area) was defined as a rectangle 100 yards long by 75 yards wide. The area was divided into 15 rectangular sampling cells, each 20 yards long by 25 yards wide. The 15 sampling cells were organized into five transects (A through E) with three samples in each transect. See Figure 2-1 for a schematic representation of the sampling grid. One sediment core was collected within each grid cell.

2.2.3 Summary of Samples Collected

A total of 17 cores were collected for processing on the R/V Robert E. Hayes: 15 original samples, and two duplicate cores. Two additional cores (for a total of 19 cores collected) were provided to Montclair State University (Monclair, NJ) researchers. One original sample core (B3) was re-collected when the first core was lost overboard during transfer to the processing area.

2.3 SAMPLE PROCESSING

The procedures and requirements for sample processing were defined in the Project Plans (TAMS/ET and MPI, 2004), with the exception of those defined for composite sample collection.

Core processing activities were performed on the deck of the R/V Robert E. Hayes. The locations of the sampling area and the processing vessel are shown on Figure 2-3. Personnel from MPI cut the cores into 1-foot long segments, and personnel from TAMS/ET, MPI, and the NJDOT-OMR prepared sample jars, described, processed, and packed the samples for delivery to the laboratory. Sediment samples were collected and submitted for the following analyses:

- Polychlorinated biphenyls (PCBs; aroclors and congeners)
- Target Compound List (TCL) volatile organic compounds (VOCs)
- TCL semivolatile organic compounds (SVOCs)
- TCL pesticides
- Herbicides (2,4-D and 2,4,5-T)
- Target Analyte List (TAL) metals (23 metals)

- Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDDs/PCDFs)
- Total organic carbon (TOC)
- Specific gravity
- Bulk density
- Grain size
- Moisture content

2.3.1 Core Processing Procedure

After being relinquished by the ASI sampling personnel (i.e., transfer of custody from Mr. Jim Nichols of ASI to the TAMS/MPI field team), cores were staged by lashing them vertically to the rail of the R/V Robert E. Hayes. Sediments suspended in the water at the top of each core tube were allowed to settle prior to processing. Once the majority of the fines had settled, the stratigraphy was described and recorded by field personnel, making note of any separations. Core logging was performed by an experienced geologist. (Field logging of the cores is summarized in Table 2-3.) The top cap was removed from the core, and the location of the sediment/water interface within the core tube was verified using a decontaminated probe inserted into the core. Excess water was then drained out through a hole drilled an inch or two above the water/sediment interface, taking care to minimize the loss of or disturbance to the sediment/nepheloid layer (the particle-rich layer at the sediment-water interface). The excess tubing was also removed using a reciprocating saw. The core tube and sediment recovery were then measured, and the core was weighed.

The segmentation scheme for the cores consisted of cutting each core into 1-foot segments. The 1-foot intervals were measured and marked on the outside of the core prior to beginning cutting. Sectioning began at the top of the core. A reciprocating saw was used to cut through the core tubing, and a decontaminated, stainless steel plate was pushed through behind the saw blade to separate and lift the core section from the rest of the core. The small amount of shavings generated from cutting the core liner fell into a waste bucket placed below the core tube.

On July 13, core collection outpaced core processing activities. Cores C1, D1, D2, and D3 were not segmented at the end of the work day. To preserve the core samples overnight, each of the cores was cut into 0-36 inch and 36-end depth segments, capped and taped, labeled with core ID, depths, and orientation information (permanent marker on the plastic core tube and caps), and stored in “core coolers” filled with cube ice. Approximately one inch of sediment was lost from C1 and D1 during sectioning, when the bottom cap had to be placed on the 0-36 inch segment. Loss of sediment was minimized from D2 and D3 by using the handle of a decontaminated spoon to assist in attaching the bottom cap quickly. On the following morning (July 14), it was observed that 0.25 to 0.5 inches of settlement had occurred in the 0-36 inch segments, measuring from markings placed on the side of the core tubes after they were placed in the core cooler the previous night. Specific data on each core’s settlement and segment length was provided to the processing crew by the personnel responsible for segmentation.

The section was then transferred to a (tared) stainless steel bowl, with the sediments still within the length of plastic tubing, and weighed. (Typical weight of a 12-inch length of the sampling

tube was determined by weighing two empty tube sections 11.62 and 12.75 inches in length. Where the tube was different than 12 inches in length, it is noted in the remarks column of Table 2-4 and the weight calculated accordingly.) The bulk density data (including the raw data such as length and weight of the segments as determined in the field) calculated from these field measurements are shown on Table 2-4. Once weighed, the sediment was extruded into a stainless steel bowl, and a description of the physical characteristics was recorded in the field notes. Sediment texture was identified using the Burmister classification system (ASTM, 1970), and segments were examined for changes in characteristics as the core was extruded from the tubing. Any changes in characteristics and the approximate lengths of the different strata were recorded in the field notes.

Once extruded but prior to homogenization, three samples were taken (using EnCore samplers) from the sediment, from three separate areas of the section, to obtain a representative sample for volatile organic compound (VOC) analysis. The remainder of the section was then homogenized and subsampled into laboratory containers for the other analyses required. Additional material from each discrete interval was retained in the stainless steel mixing bowl and covered with aluminum foil for later creation of composite samples (described in the following paragraph). The 0-1 foot, 1-2 foot and 2-3 foot sections were sampled for immediate analysis, while the 3-4 foot core section was subsampled and archived for possible future analysis (based on review of the data from the 0-3 ft sample data). The archived samples were shipped to the analytical laboratory (STL), with instructions to freeze the samples. The archived samples were held at STL until a determination was made (in late October 2004) to analyze the samples; at which time STL thawed the samples, composited and homogenized aliquots according TAMS' direction, and shipped the aliquots to the laboratories conducting the analyses.

Composite samples were also created for each transect (A through E) sampled. One subsample was collected from the 0-1 foot, 1-2 foot and 2-3 foot horizon in each of the three cores in a transect (e.g., A1, A2, and A3). The three subsamples from each depth were combined and homogenized to create a composite sample representing that particular depth horizon and transect. The composite was created using an equal mass of sediment from each core. The total subsample/composite sample weight was selected based in the amount of sediment required for the laboratory analyses.

In accordance with the QAPP (TAMS/MPI, 2004), the bottom two inches of the 3-4 foot sample were discarded from all cores due to the coring-induced mixing that frequently occurs in this layer.

Field sample IDs are tied to the sample location and depth. The horizontal position is designated by the transect (A through E) and the row (1, 2, or 3). The depth interval of the sample is indicated by the two-digit number following the sample location; for example, A1-23 is the sample from the 2 to 3-ft depth interval at location A1. Samples with a "C" suffix are composites of more than one cell.

2.3.2 Decontamination Procedure

The decontamination procedure for non-dedicated equipment consisted of the following steps:

- Rinse with river water to remove excess mud and particulates
- Scrub surface of equipment with laboratory detergent
- Rinse with potable water
- Rinse with deionized water

Decontamination was performed on all non-dedicated equipment, including bowls, spoons, core catchers, saw blades, and metal plates. Core catchers were wrapped in aluminum foil after decontamination was complete pending use in core collection activities the next day. (Core catchers were decontaminated on the larger boat, the R/V Robert E. Hayes; as a result, the coring logs [Appendix A], which were prepared on the smaller boat, have the note 'No Boat Decon.' In a few cases, the aluminum foil in which the core catchers were wrapped was damaged, and the core catchers were decontaminated again.) New (dedicated) core tube liner sections shipped from the vendor and stored with covers over the ends to prevent contamination; the core liners were inspected for cleanliness prior to use but were not subject to additional field decontamination prior to use (as trace level contaminants were not of concern). The used core tube liners were decontaminated after use, prior to disposal as solid waste.

2.3.3 Sample Handling and Transport

Sample jars were labeled with the sample ID, the date collected, the time collected, and the analyses required. The label was then covered with clear, acetate tape.

Once the sample jars were filled, signed custody seals (at least one) were applied to each jar across the neck so any tampering would be apparent. Custody seals were not placed on the EnCore samples. The samples were sealed in the pouch provided with the sampling unit. The sample jars and EnCore sample pouches were then placed in re-sealable food storage bags, and placed in coolers with ice for transport to the analytical laboratory. Sufficient ice was used to maintain a temperature of $4^{o}C \pm 2^{o}C$ during transport. Custody seals were also applied to the coolers.

Samples were sent to three laboratories participating in the USEPA Contract Laboratory Program (CLP). Shipping documentation was prepared in accordance with USEPA CLP requirements. Samples were also sent to the USEPA Region 2 Division of Environmental Science and Assessment (DESA) laboratory in Edison, NJ, and to the STL-Knoxville, TN and STL-Burlington, VT laboratories. Shipping documentation for transport to the DESA laboratory was prepared in accordance with CLP requirements, with the exception that USEPA Regional Sample Coordination Center/Sample Management Office (RSCC/SMO) reporting was not required. Shipping documentation for samples sent to STL laboratories included a chain-of-custody form rather than the Forms II Lite documentation required by the CLP program.

Although it was intended to ship samples on the day of collection, the logistics of the project (such as the time at which the core samples arrived on shore, and the time necessary to process the cores into samples for shipment), the samples were generally shipped to the laboratories on the morning after the cores were collected. Samples collected on the first day (July 12) were not shipped until July 14; however, the samples were maintained under custody and on ice in coolers prior to shipment.

2.4 DEVIATIONS FROM APPROVED PROJECT PLANS

Sampling activities were conducted based on site-specific Project Plans (TAMS/ET and MPI, 2004a). Deviations from the Project Plans are summarized below.

2.4.1 Quality Assurance Project Plan

2.4.1.1 Core Collection

The majority of the core collection steps were conducted in accordance with the procedures set forth in the Project Plans. One deviation was associated with the capping step. The cores were not capped below the water's surface upon retrieval, as defined by the procedure. The use of core catcher and nose cone, which was riveted to the core barrel, prevented capping of the core tube below the water's surface. A safety line was attached to the bottom of the core catcher, and the catcher was held in place via upward force on the safety line by one sampler while the rivets were removed and the bottom of the core capped.

A second deviation from the defined procedure was associated with measurement of the core recovery. The recovery was not measured by insertion of a decontaminated yardstick into the top of the tube and resting on the sediment (performed later aboard the R/V Robert E. Hayes). Instead, recovery was determined by visually locating the sediment-water interface and measuring from the bottom of the cap to the observed interface.

2.4.1.2 Core Processing

The core processing activities were conducted in general accordance with the requirements set forth in the Project Plans. The only deviations observed were associated with the decontamination procedure. Although the QAPP stated that all sampling equipment would be decontaminated prior to use, the dedicated, single-use core liners were not decontaminated prior to use, as the liners were new and clean as received. (The core liners were decontaminated after use, prior to disposal as solid waste.) Also, the decontamination procedure in the QAPP specified that an acetone rinse would be performed on stainless steel equipment used in core processing. The decontamination activities performed in the field did not include an acetone rinse. Sample processing equipment was washed with alconox and then rinsed with river and tap water and then given a final rinse with deionized (DI) water.

2.4.1.3 Sample Shipment

Although it was intended to ship samples on the day of collection, the logistics of the project (such as the time at which the core samples arrived on shore, and the time necessary to process the cores into samples for shipment), the samples were generally shipped to the laboratories on the morning after the cores were collected. Samples collected on the first day (July 12) were not shipped until July 14; however, the samples were maintained under custody and on ice (at approximately 4° C) in coolers prior to shipment.

2.4.2 Health and Safety Plan

2.4.2.1 Core Collection

The core collection activities were conducted in general accordance with the requirements set forth in the site-specific HASP (TAMS/ET and MPI, 2004a).

2.4.2.2 Core Processing

The majority of core processing activities were conducted in accordance with the requirements set forth in the site-specific HASP. The only deviations were the result of decisions made on-site by the SSO based on the weather conditions.

The first deviation from the HASP was associated with personnel monitoring. The HASP governing the project included a requirement for cold stress monitoring. The field activities were conducted in July 2004, and the ambient temperature did not fall into a range that required cold stress monitoring. However, high temperatures for part of the day on July 14 indicated potential concern for heat stress. The SSO monitored for heat stress during the time when the temperature was a concern, a procedure that was not outlined in the plan.

The SSO also decided that due to the potential for heat stress, the processing personnel did not need wear a PFD under the full Tyvek suit, in an effort to encourage cooling of the body. The decision also took into account the location and layout of the processing area, and the proximity of the boat to the PVSC dock on that day.

III

3.0 GEOPHYSICAL SURVEYS

The geophysical surveys were performed under subcontract to TAMS/ET by ASI in the Pilot Study Survey Area of the Lower Passaic River within the Harrison Reach. These surveys included a hydrographic survey, a side scan sonar survey, a magnetometer survey and a sub-bottom profiler survey. The hydrographic and the side scan sonar surveys were conducted in March 2004, and the magnetometer and the sub-bottom profiler surveys were conducted in November 2004 using the R/V Delaware, a 21-ft survey vessel. The vessel was equipped with a real-time kinematic (RTK) system for positioning. Hypack Max survey management software was used for survey control and ship track recording. An Innerspace Model 455 survey grade fathometer was used to collect the water depth data. The RTK system used was a Trimble 5700. Detailed geophysical survey reports, including equipment specifications as well as the data generated by the surveys, are provided in Appendix B. A brief description of the geophysical surveys is given in this section of the Data Summary and Evaluation Report. The geophysical surveys were conducted along a 1,000-ft stretch in the Harrison Reach between the Jackson Street Bridge and the New Jersey Turnpike Bridge. This 1,000-ft bank-to-bank area is designated as the Pilot Study Survey Area. The results of the bathymetric and side scan sonar surveys were used to define the potential Dredging Area (a smaller area of about 225 ft by 300 ft, approximately 1.5 acres) for sediment core collection.

Sub-bottom profiler and magnetometer surveys were conducted in November 2004 in an attempt to identify objects buried beneath the surface of the sediment that may pose hazards to the dredging operation in the proposed Pilot Study Survey Area. The decision to conduct these surveys was made after the Project Plans (TAMS/ET and MPI, 2004) had been implemented. The magnetometer survey revealed 12 distinct magnetic anomalies as well as significant levels of background geologic interference. Of the 12 targets identified by the magnetometer survey, only two could be correlated with reflections in the sub-bottom profiles. In addition to these two targets, two potential targets, not detected in the magnetometer survey, were detected by the sub-bottom profiler. Images of the magnetic signatures as well as the four targets observed on the sub-bottom profiles are shown in Appendix B2. None of the targets located were found to have signatures indicative of historically significant submerged cultural resources. Because all of the materials generating the targets are buried below the surface of the sediment, it is impossible to positively identify them using remote sensing equipment. Whether the targets identified are a concern for the future dredging operations cannot be determined. Should the potential exist for the dredging equipment to be damaged by the targets, further investigation may be necessary to determine the nature and depth of burial of the material generating the anomaly. This could be accomplished using jet probing to delineate the size and shape of the object as well as its depth of burial.

3.1 HYDROGRAPHIC SURVEY

The hydrographic survey encompassed the entire river bottom to the MLW line along each shoreline. The survey work area extended for 1000 feet along the river from bank to bank. The survey was conducted using 25-ft lanes and single beam acoustical survey techniques to acquire depth soundings. Horizontal position of the depth soundings was obtained using a differential

global positioning system (DGPS) with RTK correction applied to the data. The survey was conducted in horizontal datum NAD 83 and NJ State Plane coordinates and vertical datum NGVD 1929 and the bathymetry was plotted using the USACE MLW (the plane of MLW is 2.4 feet below NGVD 1929).

The survey drawings show shoreline features in the vicinity of the site that were available on NJDOT geo-referenced base maps. The geo-referenced shoreline features are shown for 1000 ft along the riverbank. The features shown are 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.

For the Pilot Study Survey Area, TAMS/ET used the data from the March 2004 survey conducted by ASI and November 2004 survey conducted by USACE and compared it with data from previous hydrographic surveys conducted by Tierra Solutions Inc. (TSI) in March/April 1995, November 1996, May 1997, June 1999, and August 2001.

Figure 3-1 is a plane view of eleven transects across the width of the river in the Pilot Study Survey Area. On this figure, Transect 5 passes through sampling grid cells A1, A2, and A3. Transect 6 intersects sampling grid cells C1, C2, and C3 and Transect 7 intersects sampling grid cells E1, E2, and E3. Figures 3-2 through 3-12 show sediment surface cross sections for each of the 11 transects. Sediment surface profiles for the March 2004 and November 2004 surveys are compared with previous surveys conducted by TSI on these 11 figures. Figures 3-13 through 3-18 present plan views of the bathymetry in the Pilot Study Survey Area for each of the ASI and TSI hydrographic surveys identified above.

3.2 SIDE SCAN SONAR SURVEY

A side scan sonar survey was conducted in the same 1000-ft section of the river where the hydrographic survey was performed. This survey was conducted using a Marine Sonic System running at 600 kiloHertz (kHz) frequency. RTK was used for positioning and Hypack Max survey management software was used for survey control and ship track recording. This survey was conducted by running lines parallel to the shoreline spaced 50 ft apart. Thirteen lines were run resulting in greater than 150 percent coverage.

A mosaic of the riverbed in the study area was created, accompanied by annotation of individual objects in a target file. The individual survey maps were plotted on Mylar and presented on the same scale to enable them to be combined using overlays. This enables the data to be layered together forming a composite picture of the project area. The sonar mosaic was plotted on bright white paper, as the image was nearly opaque and lost significant details when plotted on Mylar.

As part of the side scan sonar survey, sediment samples at 30 locations were to be selected from the top 2 inches for ground-truth purposes to help characterize the side scan sonar results. However, samples were collected at only 12 locations and an experienced senior field geologist classified the sediment samples. Due to similarities in the sediment type from these twelve samples, it was not necessary to collect more samples for ground-truth purposes. The sampling

locations were selected in the field, based on the side scan sonar images and the need to verify signal/sediment types.

3.3 MAGNETOMETER SURVEY

3.3.1 Magnetometer Data Collection

A magnetometer survey was conducted in order to detect the presence of buried ferrous debris. The magnetometer survey also complemented and aided in the interpretation of the side scan sonar survey results, gathered from a survey in the spring of 2004, regarding debris and potentially significant historic submerged cultural resources. The survey methodology was designed to provide data indicating the position, and relative size of ferrous targets in the survey area, as well as archaeological data essential for complying with the National Historic Preservation Act of 1966, as amended, through 1992 (36 CFR 800, Protection of Historic Properties) and the Abandoned Shipwreck Act of 1987 (Abandoned Shipwreck Act Guidelines, National Park Service, Federal Register, Vol. 55, No. 3, December 4, 1990, pages 50116-50145).

A Geometrics G-882 marine cesium magnetometer system magnetometer capable of ± 0.01-gamma resolution was used to conduct the survey. Survey lines were run at 25-ft intervals to provide complete coverage of the survey area. Data was recorded at 0.5-second intervals and electronically paired with positioning data from a RTK DGPS using an onboard computer running Hypack Max 4.3 survey software.

Analysis of the magnetic data was initially carried out as it is generated to provide reliable target identification and assessment. Significant magnetic anomalies were marked as targets during the survey and were re-surveyed using the magnetometer to better determine the size and characteristics of the anomaly.

Post-processing of the data involved examining each survey line individually and annotating anomalies detected. Using contouring software, magnetic data generated during the survey was contour plotted at 10-gamma intervals for analysis and accurate location of the material generating each magnetic anomaly as well as determining the presence of clusters of targets. Magnetic targets were isolated and analyzed in accordance with intensity, duration, aerial extent and signature characteristics.

Data generated by the remote sensing equipment was used to support an assessment of each magnetic signature. Analysis of each target signature included consideration of magnetic characteristics previously demonstrated to be reliable indicators of historically significant submerged cultural resources. Assessment of each target includes recommendations for additional investigation to determine the exact nature of the cultural material generating the signature and its potential National Register significance. All targets are listed and described and a map has been produced that shows their location within the project area (see Appendix B2 and Figure 3-19).

3.3.2 Magnetometer Results

A Geometrics G-882 marine cesium magnetometer system was used for the magnetometer survey. During the survey, the sensor was towed at a depth of 1 to 5 ft and approximately 40 ft behind the survey vessel to ensure the sensor was not detecting the vessel itself. The magnetometer survey revealed 12 distinct magnetic anomalies as well as significant levels of background geologic interference. The location of each of the magnetic anomalies was checked on the side scan sonar mosaic and no targets were duplicated in the two surveys. A detailed description of each magnetic signature is given in Appendix B2.

3.4 SUB-BOTTOM PROFILER SURVEY

3.4.1 Sub-Bottom Profiler Data Collection

An Edgetech X-STAR sonar system with a SB-216S towfish was used to collect the chirp sub-bottom profiler data during the survey. The principal objective of the survey was to collect chirp images along lines that had been previously surveyed with a magnetometer.

Chirp profilers use acoustic methods to generate high-resolution (on the order of 0.5 to 1 ft) cross-sectional images of the marine sub-bottom to depths of up to 100 ft beneath the seafloor. These profilers transmit a wide band FM sound pulse that is linearly swept over a full spectrum frequency range (i.e., a “chirp”). The transmitted sound pulses travel through the water column and sub-bottom and are reflected when changes in acoustic impedance (equivalent to a material’s sonic velocity times its density) are encountered. Acoustic impedance changes commonly occur at boundaries between materials (e.g., interfaces between water and sediments, sediments and gas, and sediments and buried objects). The reflected sound pulses travel back to the profiler where their amplitudes, as a function of travel-time, are digitally recorded.

During the survey, the SB-216S was towed at a depth between 3 and 6 ft. It was towed approximately 6 ft aft of the navigational antenna on the port side of the ASI vessel R/V Delaware. The SB-216S emitted a chirp sound pulse with a frequency range of 2-15 kHz, eight times per second. Given this sampling interval with an average speed of 1 to 2 knots, the horizontal spacing between individual pulses displayed on the chirp profiles was on the order of 0.2 to 0.5 ft.

Geographic position (i.e., latitude and longitude) along the chirp profiles was determined with Trimble RTK Positioning System (Model # 5700). The data from the RTK were also used by the HYPACK helm guidance and position recording software. These navigational data were logged at one-second intervals by HYPACK and the X-STAR digital recording system

To correct the navigational data to the position of the SB-216S, its layback (distance aft of the navigational antenna) was estimated during the survey while at the average towing speed of 1-2 knots. This distance of about 6 ft was used to correct the SB-216S position relative to the navigation data. The navigational data for the targets identified in the earlier magnetometer survey and their corresponding positions along the chirp profiles are presented in tabular form in Appendix B2 along with one potential target identified in the chirp data that was not associated

with a magnetic anomaly. Along the chirp profiles, the position of the magnetometer targets were identified as either the closest profile position to the target (i.e., in the case that the target was not associated with reflections in the chirp data) or the central geographic co-ordinates of the chirp reflections that corresponded with a target. For the targets associated with chirp reflections, the positional information (i.e., WGS84 latitude and longitude as logged by the RTK system) was calculated from the Edgetech data screen during playback. These points were then translated into NAD83 New Jersey State Plane eastings and northings in feet. The estimate of the positional accuracy of the RTK system is 1 to 3 cm. The estimation for the layback error is 1 to 2 ft. Adding the two potential errors generates an error estimate of 1 to 2 ft in the definition of the geographic location of the identified targets

During the survey, the data were observed in "real-time" on the X-STAR monitor. The data displayed included the reflection coefficient of the river bottom (a measure of the acoustic impedance contrast at the water/sediment interface), the relative amplitude of bottom and sub-bottom reflections, a cross-sectional image of the last ~600 chirp pulses that were recorded, as well as the current position, time, date, course and speed of the R/V Delaware.

3.4.2 Sub-Bottom Profiler Results

As illustrated in Appendix B2, three major types of bottom sediments were encountered during the chirp survey. In shallower water depths along the edges of the channel of the Passaic River, a soft bottom characterized by fluid muds at the sediment water interface with underlying organic fine-grained sediments was imaged by the chirp system. The underlying fine-grained sediments were associated with a high-amplitude chirp reflection most likely due to gas contained within these sediments. Along the slopes of the channel, gassy silt and clay organic-rich sediments were present. The presence of gas, most likely produced by the decay of organic material within the sediments reduces the penetration of the chirp acoustic signals. In the deepest portions of the river along the channel, well-consolidated silt and clay sediments with gas produced a high amplitude reflection at the sediment/water interface. This strong reflection reduced the amount of chirp energy that could penetrate further into the subsurface.

The presence of gaseous sediments and well-consolidated sediments along the river bottom prevented the penetration of acoustic signals deeper into the sub-bottom and thus limited the effectiveness of the chirp system during the survey. Although the chirp system acoustic signal was able to penetrate in a few areas and image a few targets, overall the sediments present in the survey area severely limited the acoustic imaging efforts. Due to these gaseous sediments, only two targets identified during the magnetometer survey were partially imaged by the sub-bottom system. Two other targets were recorded setting the total number of observed target at four (see Appendix B). Of the two targets that were not associated with magnetic signals, one was observed at the surface (identified as potential target – surface) and was characterized by a high-amplitude, rather square-shaped reflection. The second target (identified as potential target – sub-surface) was characterized by reflections that ranged in depth from 3 to 10 ft beneath the surface.

3.5 PROBLEMS ENCOUNTERED

The problem encountered with the magnetic remote sensing survey was the significant amount of geologic background noise encountered in the survey area. This results in magnetometer records that are more difficult to interpret and very small targets may be obscured. Though these objects would not be of significant size in relation to the dredging operations, they may be important from a submerged cultural resources standpoint. In order to minimize the effects of geologic interference, ASI recommended that future magnetic surveys in this area be conducted using a gradiometer rather than a magnetometer.

In terms of using chirp acoustic methods to image targets as identified by the magnetic survey, there were two major problems that the river bottom presented in the survey. First, the acoustic reflection coefficient at the bottom surface in the area of the well-consolidated silt/clay sediments is high. This limited the amount of acoustic energy that penetrated deeper into the sub-bottom. Second, in areas of fine-grained silts and clays, there were high amplitude returns from the river bottom. Both of these bottom types were associated with the presence of organic-rich gaseous sediments in a layer that was mostly unbroken in the survey area. These muds, which may contain significant amounts of organically produced gas, created situations in which little acoustic energy traveled below these sediments. Due to these two conditions, the chirp system was unable to get significant penetration into the sub-bottom. This limited the effectiveness of the system to image targets in the sub-surface. In general, the chirp signal was able to penetrate approximately 10 ft into the sediment, which is deep enough for the proposed dredging activities (upper three feet).

As authorized by NJDOT-OMR, during the week of May 2, 2005, ASI conducted a gradiometer survey in the Pilot Study Survey Area. Preliminary results from this gradiometer survey did not identify any targets that would potentially interfere with the proposed pilot study dredging activities.

IV

4.0 CHEMICAL ANALYSIS OF SEDIMENTS

The procedures for collecting, handling and segmenting the sediment cores were provided in Section B2.4 of the QAPP (TAMS/ET and MPI, 2004a), and as summarized in Section 2 of this report. Homogenized sediment samples from the core segments were analyzed for parameters listed in QAPP Table B-2, and as summarized in Table 4-1 herein. (Samples for VOC analysis were grab samples and not homogenized.) In addition to chemical analyses, Atterberg limits, grain size, bulk density and moisture content were determined for each core segment.

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, identified as T-17) were collected and submitted for analysis for a limited suite of parameters requested by sediment decontamination technology vendors, as shown on QAPP Tables B-2 and B-3. To obtain the approximately 60 gallons of sediment that was used by the vendors for sediment decontamination bench tests, equal amounts of sediment from the upper six inches (and not the top two feet as stated in the Project Plans) within each of the 15 grid cells were collected by USEPA personnel using a ponar dredge.

4.1 FIELD SAMPLE CUSTODY

As described in Section 2, upon collection of an acceptable sediment core, the core was capped, sealed and labeled. The capped cores were maintained in a vertical position aboard the sampling vessel, until they were submitted to the field processing facility (the R/V Robert E. Hayes) and cut into segments, as described in Section 2.3 of this report.

The primary objective of sample custody procedures was 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.

The field log transfer of the sediment cores terminated with the transfer of the sediment cores to the processing laboratory where sample custody began, including initiation (preparation) of the formal chain-of-custody forms. (Combined traffic report/chain-of-custody [TR/COC] forms were used for samples submitted to the CLP laboratory.) Custody for samples collected from sediment sample core processing was maintained by the field personnel collecting the samples. The field personnel documented each sample transfer and maintained custody of samples until they were shipped or delivered by courier to the laboratory or archived or disposed.

The necessary samples containers were provided by STL to TAMS/ET and MPI personnel. Sample containers for all analyses, decontaminated in accordance with USEPA specifications (USEPA, 1980), were procured (purchased) from STL (including samples containers for analyses that were performed by CLP or USEPA laboratories).

A field chain-of-custody record (combined TR/COC for CLP laboratory shipments) accompanied the samples to their destination. These forms were sealed in a plastic bag to protect them against moisture. A temperature blank, consisting of a bottle filled with distilled or tap water, was submitted with each sample cooler, which was monitored at the laboratory to verify

that samples requiring temperature preservation arrived within 4° ±2° C, as required. The shipping coolers were sealed utilizing custody seals and initialed by the field personnel. Sample coolers were delivered to the analytical laboratory by overnight delivery service (e.g., FedEx) at the end of each day's sample processing activities (due to its proximity, TAMS/ET personnel hand-delivered samples to the USEPA Region 2 DESA laboratory in Edison, NJ); exceptions are discussed in Section 2.3.3.

4.1.1 Shipping Documentation – CLP Laboratories

Samples were shipped to a single CLP laboratory (Mitkem) for routine organics analysis (VOCs and pesticides/aroclors). Required documentation included the following:

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

- Labels – one on each bottle. Provided by TAMS/ET, 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 TAMS/ET.

Sample tags are not required by USEPA Region 2 and therefore were not used. Also, CLP protocol specifies that the site name not appear on any of the documentation provided to the CLP laboratories.

4.1.2 Shipping Documentation – USEPA Region 2 DESA Laboratory

Shipping documentation was the same as for the CLP Laboratories; except that RSCC/SMO reporting was not required. Due to the proximity of the USEPA Region 2 laboratory to the site, samples were hand-delivered by project personnel to the EPA laboratory in Edison, NJ.

4.1.3 Shipping Documentation – Commercial Laboratory (STL)

Samples for all other analyses were shipped to STL-Burlington, VT and STL-Knoxville, TN. By prior arrangement, STL-Burlington VT accepted the responsibility of re-shipping the samples to other laboratory subcontractors (e.g., ATC and RJ Lee for some specialized treatability study analyses) for analytical work, which was not being performed at STL's locations. The documentation is as follows:

- Labels – one on each bottle. Provided by STL.

- Chain of custody form. One per cooler/shipping container. Provided by STL.

- Custody Seals – two per cooler/shipping container; on outside of cooler. Provided by STL or TAMS/ET.

4.1.4 Laboratory Receipt and Custody

Once samples were received at the laboratory, the field chain-of-custody form was completed and signed by the individual Laboratory Sample Custodian. The Laboratory Sample Custodian checked the sample bottle labels against the corresponding information listed on the field chain-of-custody records and noted any discrepancies. Additionally, the laboratory sample receipt personnel noted any damaged or missing sample containers. Laboratory personnel communicated any discrepancies in sample identifications, sample analysis information, any indication that samples were missing upon receipt at the laboratory, or any indication that samples not received at the correct pH or temperature (4° ± 2° C) to the QA Program Manager and Field Team Leader within 24 hours so that appropriate corrective action could be determined and implemented. For samples sent to CLP laboratories, the SOW required that the laboratory contact the USEPA SMO if the shipment temperature exceeds 10° C. No instances of coolers or samples arriving at the laboratories outside of the allowable temperature range were noted.

Completed field and laboratory chain-of-custody records were provided in the laboratory analysis data package as part of the required deliverable report.

Samples were stored in secure, limited access areas in an environment that maintains any required temperature preservation noted in Table B-2 of the QAPP. Samples for most analyses were required to be refrigerated at a temperature of 4° ± 2° C. However, the archived core samples (from the 3-4 ft interval) were frozen and stored frozen until October 29, 2004, when it was determined which archive samples would be analyzed, and how archive composites would be generated. In addition, samples for PCB congener and PCDD/PCDF analysis were frozen at the laboratory and maintained at -10° C; the holding time clock stopped during the time that these samples (or extracts) were frozen. The temperature of the refrigerators or freezers used to store samples was monitored by the project laboratories according to their internal standard operating procedures. Samples that did not require temperature preservation (some geotechnical parameters) were stored at room temperature.

4.1.5 Extract and Sample Archive Procedures

Sample extracts were held (frozen at ≤-10°C) at the laboratory until the final data reports have been validated (if applicable) and approved. In addition, core segments from intervals not initially designated for PCB congener and PCDD/PCDF analysis were archived for possible subsequent analysis at a later date (after review of the initially-generated data). With the analysis of the archived 3-4 ft core segments, there is no longer any sediment (or sediment extracts) remaining from samples collected for the sediment coring program.

Archived samples were stored frozen in a clean, controlled manner at a temperature of ≤ -10° C. Daily temperature measurements were taken and recorded at the storage location using a

calibrated thermometer to document proper temperature preservation. A label identical to that placed on the original sample was used to identify the archived samples.

4.1.6 Quality Control Requirements

Data Quality Objectives (DQOs) for this project were established in the QAPP to provide a high degree of confidence in the data obtained.

4.1.6.1 Field Quality Assurance/Quality Control (QA/QC) Samples

QA/QC samples were collected in the field to allow evaluation of data quality. Field QA/QC samples included equipment blanks, duplicate samples, matrix spike samples and matrix spike duplicate samples. The types and frequency of QA/QC samples planned for each parameter are summarized in QAPP 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; field 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 were prepared by processing a sample of laboratory grade analyte-free water (provided by STL) in the same manner that environmental samples including placement in new core sample tubing, removal, mixing, and placing in containers. Equipment blanks were collected at a frequency of one per each group of 20 coring locations for each analytical parameter; as such, one equipment blank was collected for the 15 coring locations.

Field blank contamination was addressed during data quality review, as noted in the parameter-specific discussion below (Sections 4.2.1 through 4.2.8).

Field Duplicates

Field duplicates are collected and analyzed to demonstrate the precision of sampling and analytical processes. Field duplicates were collected 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 consisted of two aliquots from the same segment of a sediment core (after homogenization). Therefore, three duplicate pairs were collected for most parameters (i.e., those for which 46 environmental samples were collected, as noted on Table 4-1). The samples and associated duplicate sample IDs are listed below. One additional field duplicate was submitted for the composite samples analyzed by STL.

Sample ID	Duplicate ID	Analytical Parameters
C3-01	C53-01	VOCs, SVOCs, Pesticides/PCBs, Herbicides, Metals, TOC, Geotechnical
C3-12	C53-12	VOCs, SVOCs, Pesticides/PCBs, Herbicides, Metals, TOC, Geotechnical
C3-23	C53-23	VOCs, SVOCs, Pesticides/PCBs, Herbicides, Metals, TOC, Geotechnical
E23C	523C	PCBs (Aroclors and Congeners); Dioxins/Furans

Meaningful analysis of a duplicate sample requires that detectable concentrations of the analytes are present in samples. Precision, expressed as the relative percent difference (RPD) between two results, is 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. Field duplicate data are discussed with the appropriate analytical parameter discussion (Sections 4.2.1 through 4.2.8, below) and are summarized on Table 4-11.

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.

4.2 CHEMICAL ANALYSIS PROCEDURES

The chemical analyses specified for sediment samples include TCL volatile organic compounds, TCL semivolatile organic compounds (base-neutral fraction; polynuclear aromatic hydrocarbon [PAH] compounds only), TCL pesticides, PCBs (as aroclors and PCB congeners); herbicides; polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans (PCDD/PCDFs), target analyte list (TAL) metals; and total organic carbon (TOC). Geotechnical analyses included solids and moisture content; Atterberg limits (plasticity index and liquid and plastic limit; specific gravity; and grain size. Bulk density was measured in the field, as noted in Section 2, above. The specific methods used are shown on Table 4-1.

The 16 samples analyzed for PCB congeners and PCDD/PCDFs represent complete vertical profiles (i.e., the 0-1, 1-2, and 2-3 foot interval composites) generated from each of the five rows [A, B, C, D, and E]; see Figure 2-1. 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 near-surface sediment]), plus one composite of the 60 gallons of material submitted for vendor treatability studies (identified as sample T-17). To associate the PCB aroclor data with the congener data, splits of all the samples analyzed for congeners were also analyzed for Aroclors.

The following laboratories provided analytical services for this project:

USEPA Region 2 Division of Environmental Science and Assessment (DESA) Laboratory – semivolatile organics; metals; total organic carbon; and grain size data. The DESA laboratory also provided the pesticide/PCB analysis of the archived 3-4 ft core sections, as well as the PAH fraction (the SVOC analyte list was modified for these samples, as discussed below).

USEPA Contract Laboratory Program Laboratory (Mitkem) – Volatile organics and pesticides/PCBs (samples submitted July 2004; archived 3-4 ft samples were not analyzed for VOCs and were analyzed for pesticides/PCBs by the DESA laboratory).

Commercial laboratories (STL contracted by TAMS/ET under NJDOT-OMR contract) performed the herbicide analyses, PCB congener analysis (and aroclor analysis of splits of the samples analyzed for congeners), PCDD/PCDFs, and vendor-requested and geotechnical analyses (except grain size).

Several vendors participating in the sediment decontamination study requested that specific analyses be performed. These analyses were performed on a limited subset of the samples collected (about 11 analyses for each method). Based on vendor requests, these samples were 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 consisted of one composite of the bulk material (60 gallon treatability study sample), and 10 composites from the sediment cores. The 10 sediment core composites were five each from the 0-1 and 1-2 ft intervals; and each was a composite of three locations making up a single row (e.g., the 0-1 ft sample from cells A1, A2, and A3 was one of the 10 composites).

4.2.1 Volatile Organics

Analysis for volatile organics compounds (VOCs) was performed in accordance with CLP OLM04.3, Exhibit D, Analytical Methods for Volatiles, through the USEPA CLP by Mitkem. VOCs were only infrequently detected, and most of the detections were for analytes that are typically sampling or analytical artifacts (acetone, detected in 24 samples, and 2-butanone, detected in two samples). Target VOCs detected included chlorobenzene (detected in nine of 46 samples at a maximum concentration of 12 µg/kg), 1,4-dichlorbenzene (detected in two samples and the field duplicate at a maximum concentration of 9 µg/kg), methylcyclohexane (detected in three samples at a maximum concentration of 9 µg/kg), and BTEX-related compounds (benzene – detected in two samples at a maximum concentration of 8 µg/kg, xylenes – detected in four samples and the duplicate at a maximum concentration of 11 µg/kg, and isopropyl benzene-detected in two samples and the duplicate at a maximum concentration of 8 µg/kg; toluene and ethylbenzene were not detected). A summary of the VOC data is provided on Table 4-2.

The VOC data were validated by USEPA (Edison, NJ) and are therefore considered final. Non-detect data for one sample (E3-12; EPA ID B1FG2) were rejected (unusable). The remainder of the VOC data is usable.

4.2.2 Semivolatile Organics Analysis

Analysis for semivolatile organic compounds (SVOCs) was performed by CLP OLM04.3, Exhibit D, Analytical Methods for Semivolatiles. Although the QAPP only specified analysis and reporting of PAH compounds; base-neutral fraction only, SVOC analysis of the 50 samples analyzed initially (45 discrete samples from the 0-1, 1-2, and 2-3 ft intervals; three field duplicates; one vendor composite [T-17], and one equipment blank) analysis was performed for the full suite of CLP SVOCs. Later analysis of the archived core samples (3 – 4 ft interval) was for an expanded list of PAH compounds (24 compounds, as opposed to the 17 reported for the CLP method); but did not include any other SVOC compounds (e.g., no phenols or phthalates were reported).

The total PAH data summary is shown on Table 4-3A (CLP PAH list and expanded PAH list), and are illustrated on Figures 4-1 and 4-7. PAHs were detected in 25 of the 46 environmental samples (including the vendor composite T-17) from the 0-1, 1-2, and 2-3 ft intervals analyzed for CLP VOCs. Six of the 17 PAH compounds were detected infrequently (in two or less samples) in the 0-3 ft interval (see Table 4-3B): naphthalene, 2-methyl naphthalene, acenaphthylene, acenaphthene, fluorene, and dibenzo(a,h)anthracene. Bis(2-ethylhexyl)phthalate (BEHP) was detected in all 49 sediment samples (although not in the equipment blank). Although BEHP was not detected in field or laboratory blanks specifically associated with the Passaic River Pilot Study core samples, BEHP is a common laboratory contaminant and its detection may be an artifact of the sampling/analytical process. Target SVOCs other than PAH compounds and BEHP were detected infrequently and were limited to di-n-butyl phthalate (detected in four samples), di-n-octyl phthalate (three samples), caprolactam (three samples), butyl benzyl phthalate (two samples), and 4-methylphenol (detected in one sample). Non-target compounds (unknowns or tentatively identified compounds [TICs]) were detected in 34 of the 49 sediment samples; the number of unknowns ranged from one to six compounds in the samples in which they were detected, at total estimated concentrations ranging from 8,600 to 400,100 µg/kg (in B1-23).

PAHs were detected in all eight of the archived (3-4 ft) cores, as shown on Table 4-3C. Unlike the samples from the 0-3 ft interval samples, almost all the PAH compounds were detected in each of the eight 3-4 ft interval archived cores. Seven additional PAH compounds were analyzed for these cores: 1-methlynaphthalene; biphenyl; 2,6-dimethylnaphthalene; 2,3,5-trimethylnaphthalene; 1-methyl phenanthrene; perylene; and benzo(e)pyrene. The sum of the concentrations of these seven additional PAH compounds averaged about 13 percent of the total PAH concentration (sum of the 24 PAHs detected) for these samples; and this fraction was very consistent (the average was 13.3 percent, with a relative standard deviation of only 4.2 percent; see Table 4-3C).

Precision of the field duplicate pairs for PAHs was not particularly good (see Tables 4-11A, 11B, and 11C). In one pair (C3-01/C53-01) no PAH compounds were detected in either the sample or the duplicate, indicating acceptable qualitative precision. In another of the duplicate pairs (C3-23/C53-23), the RPD for the total PAH concentration was 39 percent; the RPD for the two PAH compounds detected in both analyses was less than 20 percent. The major factor in the higher

RPD for total PAHs is that phenanthrene was detected in the duplicate but not in the sample. Total PAH precision was poor for the third duplicate pair (RPD of 138 percent), as the total PAH concentration in the duplicate (96,100 µg/kg) was more than five times greater than that in the sample (17,700 µg/kg). Again, most of the difference between the results was due to the fact that seven different PAH compounds were detected in the duplicate, as opposed to only two PAH compounds in the original sample. No apparent reason is evident for this discrepancy. Based on review of the field duplicate data for other parameters, it does not appear likely that sample heterogeneity is the cause (as the field duplicate precision for other analytical parameters was generally good). It is possible that the discrepancy may be a result of sample mis-labeling or mis-identification in the field or laboratory.

SVOC and PAH data generated by the USEPA Region 2 DESA laboratory are considered EPA-validated and are therefore considered final.

4.2.3 Pesticide/PCB Data

Extraction and analytical procedure for pesticides and PCBs as aroclors was performed using CLP OLM04.3, Exhibit D, Analytical Methods for Pesticides/Aroclors. The analyses of the discrete interval samples were performed through the USEPA CLP by Mitkem Laboratories. Eight archive core samples were analyzed for pesticides and PCBs by the USEPA Region 2 DESA laboratory. In addition, splits of the 16 samples analyzed for PCB congeners (see 4.2.4, below) were also analyzed for PCB aroclors by the same laboratory performing the congener analysis (i.e., STL-Knoxville). Pesticide/PCB analysis was performed concurrently (i.e., as part of the same analysis) but the data are discussed separately below.

Several of the samples analyzed by Mitkem for pesticides/PCBs were re-analyzed at a dilution (-DL suffix), although the reported data from the undiluted analyses were not flagged "E" (indicating that one or more analytes exceeded the calibration range). Based on conversation with the laboratory (B. Dodge, pers comm., 2/4/05), the dilutions were performed due to problems (e.g., interferences resulting in poor chromatography) with the initial (undiluted) analysis, and the quantitation from the dilution analysis is considered more reliable. In these samples, the –DL results, which is consistently a higher value, has been used. (The exception to this is that if an analyte was detected in the original analysis, but not in the -DL analysis, the detected result from the initial analysis has been used.)

Pesticide Data

A subset of the pesticide data (total DDT; the sum of the detected concentrations of 4,4,-DDD, 4,4'-DDE, and 4,4'-DDT) is presented in Table 4-4, and is illustrated on Figures 4-2 and 4-8. The CLP pesticide and aroclor (PCB) data have been validated by USEPA Region 2 personnel and therefore are considered final data. The archived (3-4 ft interval) core samples were analyzed by the USEPA Region 2 DESA laboratory and are considered EPA-validated.

The case narrative for the DESA pesticide data noted that pesticide analytes 4,4'-DDD and endosulfan II co-elute on the confirmation column. As a result, confirmation of 4,4'-DDD is not possible and the results are qualified by DESA as "N", indicating tentative identification.

There are apparent differences between the data sets from the CLP laboratory (Mitkem) and DESA. 4,4'-DDT was not reported as detected in any of the eight DESA results from the 3-4 ft interval cores; although DDT was detected in 35 of the analyses (all but one of the valid [not rejected] data points) generated by Mitkem.

Target pesticides were not detected in field (rinsate) blanks associated with these samples. Field duplicate precision of the DDT and related constituents was generally good, as the RPDs were generally less than 40 percent (as shown on Tables 4-11A through 4-11C). The one exception is 4,4'-DDT in C3-12; the RPD was 121 percent (280 µg/kg in the duplicate, as opposed to 69 µg/kg in the initial analysis). Part of the discrepancy in this sample is that some of dilution results for the initial analysis were rejected; therefore the 69 µg/kg value is from the initial analysis; whereas the 280 µg/kg in the duplicate was generated from a dilution run.

PCB (Aroclor) Analysis

PCB data from the initial 45 samples and the vendor composite were generated by Mitkem. The 3-4 ft archive core PCB data were generated by DESA. In addition, STL generated PCB data on composites corresponding to samples also analyzed for congeners; the STL data have not been validated and are therefore considered preliminary. The PCB data from all three laboratories are summarized on Table 4-5, and are illustrated on Figures 4-3 and 4-10.

PCBs were not detected in rinsate blanks associated with these samples. Precision of the Aroclor analyses, as the RPDs for total PCBs ranged from 0.7 to 6.9 percent, and the RPDs for individual Aroclors ranged from 0 to 22 percent (Tables 4-11A through 4-11C) for samples analyzed through CLP (i.e., by Mitkem). Precision for the one duplicate pair analyzed by STL was also good, as the Aroclor and total PCB RPDs ranged from 10 to 16 percent (Table 4-11D).

There are differences among the PCB (Aroclor) data sets generated by the three laboratories both qualitatively (in the identification of which Aroclors are present in samples) and quantitatively (the total PCB concentration, calculated as the sum of all detected Aroclors).

4.2.4 PCB Congeners

Analysis for PCB congeners was performed by EPA Method 1668A, Determination of PCB Congeners in Sediment by Gas Chromatography/Mass Spectrometry by a commercial laboratory, STL-Knoxville. The initial set of 16 analyses included a vertically integrated row composite (combining the 0-1, 1-2, and 2-3 ft intervals) from each of the 15 grid points (e.g., A1, A2, etc), as well as the vendor composite T-17. Subsequently, five row composites (row A, row B, etc.) were analyzed from the archived 3-4 ft interval samples, for a total of 21 samples. (The field duplicate pair data are considered a single sample for this summary.) The PCB congener data, along with the corresponding samples analyzed for Aroclors, are shown on Table 4-6 and illustrated on Figure 4-9.

The correlation between total PCBs as Aroclors determined by USEPA Method 8082 and the sum of detected PCB congeners is good; as shown on Table 4-6, the RPD between the two

results for comparable samples was less than 20 percent in 17 of the 21 sample pairs analyzed, with the worst precision between the methods only slightly over 50 percent RPD (50.6 percent for E01C). There is no evidence of bias of one method relative to the other, as the median ratio of the sum of congeners to sum of Aroclors was 1.00.

One field duplicate pair was analyzed for PCB congeners (E23C/E523C); agreement was good as the total PCBs (sum of detected congeners) RPD was 6.7 percent, as shown on Table 4-11D.

PCB congener data should be considered preliminary, as the congener data have not been validated.

4.2.5 Herbicides

Herbicides analysis was performed by STL using their standard operating procedures (SOPs) for Extraction by USEPA SW-846 Method 3550 (ultrasonic) and analysis USEPA SW-846 Method 8151A. The QAPP only specified the reporting and analysis of 2,4-D and 2,4,5-T. Herbicide data are shown on Table 4-7.

Herbicides were detected only infrequently. 2,4-D was detected in only five samples (including one of the field duplicate analyses) at a maximum concentration of 750 µg/kg, and 2,4,5-T was detected in only three samples at a maximum concentration of 67 µg/kg. Herbicides were not detected in any of the eight archive (3-4 ft interval) samples.

Three field duplicate pairs were analyzed for herbicides. In one pair, no herbicides were detected in the sample or the duplicate. In the other two pairs, 2,4-D was detected in either the sample or the duplicate, but not in both; the RPD is therefore not calculable for these two pairs. The reporting limit for 2,4-D ranged from 190 to 250 µg/kg for these pairs; as the detected values (260 and 320 µg/kg) were less than two times the reporting limit, the precision is acceptable based on the absolute difference between the two results.

The herbicide data have not been validated and should therefore be considered preliminary.

4.2.6 Dioxins/Furans

PCDD/PCDF analysis was performed by EPA Method 1613B for Analysis of Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs). The laboratory-reported "Total TCDD" and isomer-specific 2,3,7,8-TCDD results are shown on Table 4-8. Total TCDD data for Transect 6 are shown on Figure 4-4 are illustrated in plan view for the potential dredging area on Figure 4-11.

These data have not been validated and should be considered preliminary. Review of the case narratives and lab-reported QA/QC indicates that surrogate and internal standard recoveries were low (below acceptance limits) in a number of samples. The impact of this non-conformance is not known at this time. One field duplicate pair was analyzed (see Table 4-11D); precision was fair (RPD were between 50 and 100 percent for Total TCDD and 2,3,7,8-TCDD).

As of the date of this report, discussions are ongoing within the project team to find and allocate the resources to perform formal validation of the PCDD/PCDF data.

4.2.7 Metals Analysis

Target analyte list metals analysis (23 metals; no cyanide) was performed by the EPA Region 2 DESA laboratory (SOP C-110, Cold Vapor, for mercury; SOP C-109, ICP-AES, for the other 22 metals). Data for selected metals (mercury and lead) are summarized on Table 4-9. Mercury data for Transect 6 are illustrated on Figure 4-5, and lead data on Figure 4-6. Mercury and Lead data are shown in plan view for the potential dredging area on Figures 4-12 and 4-13, respectively. The data show a generally increasing trend of concentration with depth for both mercury and lead, as shown below.

Depth interval	Median Hg Value (mg/kg)	Median Pb Value (mg/kg)
0 – 1 ft (16 samples	2.2	290
1 – 2 ft (16 samples)	4.3	440
2 – 3 ft (16 samples)	4.7	620
3 – 4 ft (8 samples)	6.9	600

Analytical precision for metals is very good (RPDs almost all less than 20 percent, and most less than 10 percent), as shown on Tables 4-11A, 4-11B, and 4-11C. Antimony was not detected in any of the initial set of 46 samples analyzed by DESA (at reporting limits between 12 and 18 mg/kg) but antimony was detected in all eight of the archived core samples at an average concentration of about 5.4 mg/kg, due to improved detection limits when the archived samples were analyzed. These data (metals analyses by DESA) are considered USEPA-validated and final.

4.2.8 Total Organic Carbon

Total organic carbon analysis was requested to performed by Lloyd Kahn (USEPA Region 2; 1988). All TOC analyses (initial 46 samples, plus the eight archive core samples were analyzed by the USEPA Region 2 DESA laboratory; the cited method is EPA SOP-88, combustion and infrared detection. TOC data are shown on Table 4-10. The data are consistent and show little variability among the results, regardless of depth. TOC concentrations average about 53,000 mg/kg (5.3 percent) with a standard deviation of only about 6,600 mg/kg.

Three field duplicate pairs were analyzed for TOC and the precision was good, ranging from about 2 percent to 17 percent for the three pairs.

4.3 GEOTECHNICAL CHARACTERIZATION

Sediment samples collected during the sediment characterization program were analyzed for geotechnical parameters to characterize the physical properties of the sediment. Geotechnical analysis was performed for the following parameters:

Parameter	Method
Solids Content	STL SOP IN 623
Moisture Content	ASTM D2216
Atterberg Limits (Liquid and Plastic Limits, Plasticity Index)	ASTM D4318
Specific Gravity	ASTM D854-01
Grain Size (sieve and hydrometer as appropriate)	ASTM D422 and D1140

As provided for in the QAPP, bulk density analysis was performed in the field by weighing measured lengths of the core; the ASTM analysis (D4531) was not performed.

Solids, moisture, Atterberg Limits, and specific gravity data are summarized on Table 4-12. The grain size data are summarized on Table 4-13, and are illustrated on Figure 4-14. A brief discussion of the geotechnical data (which have not been subject to formal validation or data quality review) is presented below.

4.3.1 Percent Solids and Moisture Content

Percent solids data were generated by STL using an in-house SOP, which consists basically of weighing an aliquot of the sample (typically about 10 g), drying the sample (typically overnight) at approximately 105º C, and then re-weighing. The percent solids are reported as the dry weight of solids divided by the initial (wet) weight of the sample. The average solids content of the 45 samples (excluding the T-17 composite) was 42.5 percent. As would be expected, the average percent solids increased with depth; with solids content averaging 36.6 percent for the 0-1 ft interval; 43.0 percent for the 1-2 ft interval; and 48.0 percent for the 2-3 ft interval (15 discrete samples for each interval).

STL also reported "Moisture Content" by ASTM method D2216. This method typically uses a larger sample mass; and the data are reported as the ratio of moisture (loss on drying) to the dry solids. As a result, a reported moisture content of greater than 100 percent is possible. (For example, if a 100g sediment sample consists of 58 g water and 42 g dry solids, this would be reported as 58/42*100 percent – 138 percent moisture – by ASTM D2216).

Although the results reported as "Percent Solids" (IN623) and "Moisture Content" (ASTM D2216) varied for individual samples, overall the results were in good agreement. Using the reporting convention for the ASTM method, the average 'moisture content' for the samples analyzed by the STL SOP would be 135.3 percent (calculated as [(100-42.5)/42.5 *100 percent), in good agreement with the average of the ASTM D2216 results, which averaged 134.3 percent.

4.3.2 Atterberg Limits

STL analyzed and reported the liquid limit (LL), plasticity index (PI), and plastic limit (PL) by ASTM D4318; the data are summarized on Table 4-12. Liquid limit values ranged from 50 to 116, with an average LL of 71.2 and a median of 66. Plastic limits ranged from 34 to 56 ("0" was reported for two samples, B1-01 and B3-12; these are not considered usable values and are not included in the table or calculations), with an average of 44.2 and a median of 43. Plasticity index results ranged from 11 to 63, with an average of 27.3 and median of 24 for the 43 discrete

samples for which data were reported. (STL reported "NP" – not performed – for B1-01 and B3-12.)

4.3.3 Specific Gravity

STL analyzed and reported the specific gravity by ASTM D854; the data are summarized on Table 4-12. Specific gravity results ranged from 2.06 to 2.56, with an average of 2.35 and a median of 2.34. Interestingly, the two lowest values reported, 2.06 and 2.16, are from the first two samples analyzed by STL (A1-01 and A1-12); the minimum value from the subsequent 43 samples is 2.21.

It should be noted that the specific gravity results (ASTM D854) are not directly comparable to the bulk density values determined from weight the core sections in the field. The specific gravity (ASTM D854) is the density of the dry solids, not the wet sample. An estimate of the expected bulk density can be calculated from the specific gravity results, however, as follows:

Bulk Density = (fraction dry solids * specific gravity dry solids) + (fraction water * 1.0 [assumed specific gravity of water])

Therefore, calculated average bulk density = (.425*2.35) + (.575*1.0) = 1.57. This value is higher than the measured average bulk density of about 1.33.

4.3.4 Grain Size

Grain size data were generated by ASTM D422 (sieve and hydrometer) are summarized on Table 4-13 and are shown on Figure 4-14. All grain size analyses were conducted by the USEPA Region II DESA laboratory.

For the 0-1, 1-2, and 2-3 ft intervals (each of which is characterized by 14 to 15 samples), the grain size distribution was typically (i.e., averaged) about 26 to 31 percent for sand, 61 to 66 percent for silt, and 6 to 8 percent for clay. Larger particles (greater than 2 mm) were not present at significant levels (more than 0.2 percent) except in one sample (5.5 percent in B1-23). The grain distribution for the 3-4 ft interval was somewhat different, with less than 10 percent sand, and about 84 percent silt. However, this interval is characterized by only seven samples; and the analysis was conducted on archived cores, at a later date than the analysis of the 0-3 ft interval samples. In the 3-4 ft interval, the clay content (6.7 percent) and larger particles (not present) were similar to the 0-3 ft interval.

V

5.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 SUMMARY

The work as described in the project plans was successfully completed and included the execution of the geophysical surveys and the collection and analysis of environmental samples as detailed in this report and summarized below.

5.1.1 Geophysical Surveys

Geophysical surveys were conducted within the specified section of the Harrison Reach of the Passaic River by a subcontractor, ASI.

A hydrographic survey was performed on a 1000-ft long stretch of the river, from bank to bank, using 25-ft wide lanes. Drawings generated from the survey show features in the vicinity of the site on the river bottom.

A side scan sonar survey was conducted on the same 1000-ft stretch of river as the hydrographic survey. The side scan sonar survey was performed by running lines parallel to the shoreline on a 50-ft spacing. A mosaic of the riverbed in the study area was created. As part of the side scan sonar survey, it was planned to collect 30 surface sediment samples for correlation of the side scan results with the actual subsurface conditions. However, only 12 samples were actually collected; these were characterized in the field by an experienced senior field geologist based on the side scan images and the need to verify the sediment types associated with signal types. Due to similarities in the sediment type from these 12 samples, it was not necessary to collect more samples for ground-truth purposes.

Subsequent to the completion of the hydrographic and side scan sonar surveys, a magnetometer survey and a sub-bottom profiler survey were also performed by ASI. These surveys were conducted to detect buried ferrous and non-ferrous objects not detected in the side scan sonar survey, and also aided in the interpretation of the side scan sonar results. These surveys provided information on debris (e.g., the relative size and position of buried objects) as well as archaeological data (potentially significant historic submerged cultural resources) for compliance with the National Historic Preservation Act and the Abandoned Shipwreck Act. ASI recommended further investigation of the sediments in the Pilot Study Survey Area using a gradiometer (see Section E in Appendix B2). As authorized by NJDOT-OMR, during the week of May 2, 2005, ASI conducted a gradiometer survey in the Pilot Study Survey Area. Preliminary results from this gradiometer survey did not identify any targets that would potentially interfere with the proposed pilot study dredging activities.

5.1.2 Sample Collection

The sediment coring and sampling program was conducted from July 12 through July 14, 2004. Cores with adequate recovery were collected from all 15 grid locations as designated in the Work Plan (TAMS/ET, 2004). Cores were transferred intact to the R/V Robert E. Hayes processing facility, where cores were sliced into 1-ft sections (0-1, 1-2, 2-3, and 3-4 ft intervals);

weighed (for bulk density determinations); homogenized, subsampled, and shipped to the designated laboratories. As specified in the plans, 45 discrete samples (plus QC samples) were generated, one from each of the three 1-ft intervals (between 0-3 ft) for each of the 15 grid locations; one additional sample from the 3-4 ft interval was also collected at each grid location. The 3-4 ft interval samples were shipped to the STL-VT but were 'archived' – stored frozen at the laboratory pending further instructions regarding compositing and analysis of these archive samples. In late October 2004, the project team decided to have the archived samples analyzed; and at that point STL prepared and shipped the archive samples to the laboratories performing the analyses.

In addition to the discrete samples summarized above, several composites were generated for different purposes. One bulk drum sample (designated as T-17) was obtained by USEPA personnel for use in treatability studies by potential sediment decontamination technology vendors; this sample was collected through material obtained by surface grabs (roughly the top six inches of sediment) using a petite ponar dredge sampler. Other vertical and horizontal composites were generated for the same analytical parameters (PCB congeners, PCDD/PCDFs) as described in Section 2. In general, the sampling program was successful in obtaining sufficient material to perform all the planned analyses.

5.1.3 Sample Analysis

The analytical program was implemented with a high degree of consistency with the program outlined in the QAPP (TAMS, 2004); very few omissions or changes were made during the execution of the analytical program. The bullets immediately below summarize the program; the results were discussed in Section 4 and summarized below in Section 5.2.2.

- Volatile Organic Compounds. VOC data (Table 4-2) were only generated for the 45 discrete samples from the 0-3 ft intervals, and the vendor composite (the archived cores were not analyzed for VOCs). Analysis was conducted through the CLP and the data were validated by USEPA Region 2 personnel.

- Semivolatile Organic Compounds. SVOC data for the discrete samples from the 0-3 ft interval (Table 4-3B) were analyzed for the CLP target compound list SVOC analytes (including 17 PAH compounds). These analyses were conducted through the CLP and the data were validated by USEPA Region 2 personnel. In addition, eight archive cores (3-4 ft interval) were analyzed for 24 PAH compounds (including seven PAH compounds not the CLP SVOC TCL list) by the DESA laboratory in Edison, NJ (Table 4-3C); these data are considered EPA-validated and fully usable as reported.

- Pesticides. Pesticide data were generated for the 45 discrete 0-3 ft interval cores by the CLP laboratory; usable data was generated for most of the DDT-related constituents (see Table 4-4). However, data were rejected (unusable) for one DDD, one DDE, and 11 DDT results. In some cases a result was rejected in the diluted but not the initial analysis, or the reverse; in these cases a usable value was obtained even though one of the results was rejected. In addition, eight archive 3-4 ft interval cores were analyzed for pesticides by

the USEPA DESA laboratory; these data are considered EPA-validated and fully usable as reported.

- PCBs (Aroclors). PCB data were generated for the 0-3 ft interval cores by the CLP laboratory, and eight archive 3-4 ft interval cores were analyzed for PCBs by the USEPA DESA laboratory. In addition, 15 'row' composites for each depth interval from 0-3 ft were generated (e.g., a composite of A1-01, A2-01, and A3-01) and analyzed by STL. STL also analyzed five row composites from the 3-4 ft interval, to correspond with samples also analyzed for PCB congeners. The CLP Aroclor data were validated by USEPA Region 2 personnel; and the DESA laboratory data are considered EPA-validated and fully usable as reported. The STL PCB aroclor data have not been subject to formal data quality review. The PCB (Aroclor) data are shown on Table 4-5.

- PCB congeners. STL analyzed 20 row composites for PCB congeners (five rows from each of the four depth intervals from 0-4 ft); for comparability, each of these row composites was also analyzed for PCBs as Aroclors. The vendor composite, T-17, was also analyzed for PCB congeners. Although these data have not been formally validated, the comparability of the total PCB values from the congener method to the STL Aroclor data was very good (see Table 4-6), and no significant bias was noted.

- Herbicides. STL performed the herbicide analysis on the 45 discrete cores from the 0-3 ft intervals and on eight archived core samples from the 3-4 ft interval. The herbicide data, shown on Table 4-7, have not been validated and should be considered preliminary.

- PCDD/PCDFs. PCDD/PCDFs (dioxins/furans) analysis (by EPA method 1613B) was conducted by STL on the same 20 samples, plus one field duplicate and the vendor composite, as were analyzed for PCB congeners. As these data have not yet been validated, the toxicity equivalence (TEQ) has not been calculated or presented, and these data should be considered preliminary. Data for 2,3,7,8-TCDD and total TCDDs are shown on Table 4-8. 2,3,7,8-TCDD typically made up at least 65 percent (up to 100 percent) of the total TCDD concentration. 2,3,7,8-TCDD concentrations in the 0-3 ft core section (excluding vendor composite T-17) ranged from 220 ng/kg to 3400 ng/kg. The 2,3,7,8-TCDD concentrations in the 3-4 ft cores were generally (but not always) higher, ranging from 1400 to 2500 ng/kg.

- Metals. Analysis for metals was conducted on all 45 of the discrete samples from 0-3 ft and eight archive (3-4) ft samples by the USEPA Region 2 DESA laboratory. As such, these data are considered EPA-validated and fully usable as reported. Analysis was conducted for the 23 target analyte list metals. Data for mercury and lead are shown on Table 4-9.

- Total Organic Carbon. TOC analysis (L. Kahn Method) was performed on all 45 of the discrete samples from 0-3 ft and eight archive (3-4) ft samples by the USEPA Region 2 DESA laboratory, as shown on Table 4-10. As such, these data are considered EPA-validated and fully usable as reported.

- Geotechnical data. Laboratory geotechnical analyses included percent solids, moisture content, Atterberg limits (liquid limit, plastic limit, and plasticity index), and specific gravity (these data are tabulated in this report); and grain size. Geotechnical analyses were performed on the 45 discrete core sections from the 0-3 ft interval, and on seven to eight archive core samples from the 3-4 ft interval. All grain size analyses were performed by the USEPA Region 2 DESA laboratory. The remaining geotechnical analyses were performed by STL. The geotechnical data are summarized on Table 4-12 (moisture content, Atterberg limits, and specific gravity) and Table 4-13 (grain size). Bulk density analysis was performed in the field on each 1-ft core section from all four depth intervals (see Table 2-4).

5.2 CONCLUSIONS

5.2.1 Geophysical Surveys

The sediment surface cross sections and bathymetry plots within the Pilot Study Survey Area were presented in Section 3 of this report. The March 2004 hydrographic survey conducted by ASI and November 2004 hydrographic survey conducted by USACE shows that a considerable amount of deposition and erosion has taken place since the March/April 1995 hydrographic surveys were conducted by TSI (especially in the deepest portion of the channel). Lesser amounts of sediment have deposited closer to the shoreline. The deepest portion of the channel is closer to the northern bank of the river. From this location the sediment surface slopes more gently towards the southern shoreline.

The side scan sonar survey identified three areas and seven targets within the Pilot Study Survey Area. These are shown in Appendix B1. Area 1 spans the entire length of the surveyed area and indicated debris including tires, rocks, poles, and other objects projecting approximately 20 ft into the river from the north side of the survey. Area 2 also spans the entire length of the surveyed area and was identified as parallel lines in the sediment extending between 100 and 200 ft off the wall along the north side of the survey. These lines are probably shallow ridges caused by barges touching the bottom or dragging ropes or chains while transiting the area. Area 3 lies in the southwest portion of the survey area and consists of scattered debris over an approximately 30-ft wide area extending 500 ft eastwards from the western edge of the survey area about 90 ft from the southern shoreline. Target 1 appears to be a 15 foot tree projecting three feet into the water column. Targets 2 and 3 are approximately 26 and 37-ft long pilings laying on the surface. Target 4 is an approximately 1420 square foot area of probable differential bottom composition that is probably organic debris. Target 5 is a propeller mark extending approximately 78 ft to the southwest. Target 6 is an approximately 250 SF area of probable differential bottom composition that is probably organic debris. Target 7 is a propeller mark extending approximately 36 ft to the southeast.

The magnetometer survey revealed 12 distinct magnetic anomalies as well as significant levels of background geologic interference. Of those 12 targets identified in the magnetometer survey, only two could be correlated with the reflections in the sub-bottom profiles. In addition, two potential targets, not detected in the magnetometer survey, were imaged by the chirp system. None of the targets located were found to have signatures indicative of historically sensitive

cultural resources. These surveys were not able to determine whether the targets identified would pose a hazard to the dredging pilot study. These surveys and targets are described further in Appendix B2.

5.2.2 Analytical

Overall, the data met the DQOs established for the project (QAPP, TAMS/ET and MPI 2004a). As noted above, sufficient sediment was obtained so that all the planned analyses could be conducted.

Volatile organic compounds. VOC data were fully usable. VOC concentrations detected were low (not detected, or less than 12 µg/kg). VOC data were only generated for the samples from the 0-3 ft intervals (the archived cores were not analyzed for VOCs). VOCs were detected in only 12 of the 45 discrete samples. Chlorobenzene was the most frequently detected VOC, reported in eight samples at a maximum concentration of 12 µg/kg.

Semivolatile organic compounds. The discrete samples from the 0-3 ft interval were analyzed by the USEPA Region 2 DESA laboratory for the CLP target compound list SVOC analytes. SVOC compounds other than phthalates and the 17 target PAHs were generally not detected. The SVOC data typically show that the lowest total PAH concentrations are lowest in the near-surface (0-1 ft interval) samples (with PAHs detected in only four of the 15 discrete samples from this interval), with the highest concentrations and the highest frequency of detection (14 of 15 samples) in the 2-3 ft interval. Subsequent to the analysis of the 0-3 ft core samples, eight archive cores from the 3-4 ft interval were analyzed for 24 PAH compounds (not the CLP SVOC TCL list) by the DESA laboratory in Edison, NJ; while PAH compounds were detected in all eight of the 3-4 ft interval cores, concentrations reported were generally lower than those in the 2-3 ft core sections analyzed earlier by DESA.

Pesticides. Pesticide data were generated for the 0-3 ft interval cores by the CLP laboratory, and eight archive 3-4 ft interval cores were analyzed for pesticides by the USEPA DESA laboratory. 4,4'-DDT and related compounds (4,4'-DDD and 4,4'-DDE) were detected in all the samples analyzed by both CLP and DESA. Usable data was generated for most of the DDT-related constituents; however, data were rejected (unusable) for one DDD, one DDE, and 11 DDT results. (In some cases a result was rejected in the diluted but not the initial analysis, or the reverse; in these cases a usable value was obtained even though one of the results was rejected). A trend of increasing concentration with depth is less obvious in the samples from 0-3 ft analyzed by Mitkem. DDD, DDE, and DDT were each detected in at least 80 percent of the valid sample results. Total DDT (sum of valid detections of DDD, DDE, and DDT) ranged from 50 µg/kg to 1100 µg/kg; in some cases the total may be biased low due to rejection of one (or in one sample, two) of the three analytes. A different pattern was evident in the DESA pesticide results. DDD and DDE were each detected in all eight analyses, but DDT was detected in none of the eight 3-4 ft cores. The total DDT concentrations in the 3-4 ft archived core samples, calculated from the DESA data (representing the sum of detections of DDD and DDE, as DDT was not detected), were fairly consistent, ranging from 30 to 48 µg/kg, and in all cases lower than the total DDT result calculated from the Mitkem data.

PCBs (Aroclors). PCB data were generated for the 0-3 ft interval cores by the CLP laboratory, and eight archive 3-4 ft interval cores were analyzed for PCBs by the USEPA DESA laboratory. In addition, 15 'row' composites for each depth interval from 0-3 ft were generated (e.g., A01C is a composite of A1-01, A2-01, and A3-01) and analyzed by STL. STL also analyzed five row composites from the 3-4 ft interval (e.g., A34C), to correspond with samples also analyzed for PCB congeners.

PCB results varied by laboratory. PCBs were detected in 30 of the 48 samples analyzed by Mitkem (45 discrete environmental samples plus three field duplicates); in samples in which PCBs were detected, the total PCB concentration ranged from 230 µg/kg to 3800 µg/kg. Aroclor 1254 was the PCB most often reported (in 28 samples), with less frequent detection of Aroclor 1242 (10 samples) and 1260 (one sample). In the 0-3 ft interval row composites analyzed by STL, total PCB concentrations were higher (ranging from 1220 µg/kg to 7400 µg/kg); and Aroclors 1248 and 1254 were reported as present in all of these samples. No other Aroclors were reported present by STL. In the eight archive 3-4 ft samples analyzed by DESA, Aroclor 1248 was the only Aroclor reported, at concentrations ranging from 380 to 780 µg/kg. STL data for five row composites from the same depth interval (although not from identical material analyzed by DESA) indicated PCB concentrations higher than those reported by DESA, typically by a factor of greater than 10, ranging from 8400 to 12,200 µg/kg. Two Aroclors were reported in each of the five 3-4 ft row composites analyzed by STL: Aroclor 1248 in all five samples, and Aroclor 1254 in four, with Aroclor 1260 reported in the other sample.

PCB congeners. STL analyzed 20 row composites for PCB congeners (five rows from each of the four depth intervals from 0-4 ft); for comparability, each of these row composites was also analyzed for PCBs as Aroclors. The vendor composite, T-17, was also analyzed for PCB congeners. Overall the comparability of the total PCB values from the two methods was very good, and no significant bias was noted. Overall, the total PCB congener concentration average was greater than the sum of Aroclors value by about 7 percent, and the median total congener concentration was greater than the sum of Aroclor median by less than 3 percent.

Herbicides. STL performed the herbicide analysis on the 45 discrete cores from the 0-3 ft intervals and on eight archived core samples from the 3-4 ft interval. Only 2,4-D and 2,4,5-T were target analytes in this analysis. Herbicides were detected infrequently. 2,4-D was detected in four samples (plus in one duplicate), at concentrations ranging from 260 to 750 µg/kg, and 2,4,5-T in three samples at concentrations ranging from 40 to 67 µg/kg. No herbicides were detected in any of the 3-4 ft interval samples, nor in the 0-1 ft interval samples. The herbicide data have not been validated and should be considered preliminary.

PCDD/PCDFs. STL conducted PCDD/PCDFs analysis on the same 20 samples, plus one field duplicate and the vendor composite, as were analyzed for PCB congeners. As these data have not yet been validated, the toxicity equivalence (TEQ) has not been calculated or presented, and these data should be considered preliminary. Total TCDD and 2,3,7,8-TCDD data were tabulated; both were detected in all samples analyzed by were not detected in the field blank. These data do show a general trend of increasing concentration with depth, although there are exceptions in individual cores.

Metals. Analysis was conducted on all 45 of the discrete samples from 0-3 ft and eight archive (3-4) ft samples by the USEPA DESA laboratory. As such, these data are considered EPA-validated and fully usable as reported. Analysis was conducted for the 23 target analyte list metals, although the discussion focuses on mercury and lead. Mercury was detected in every sample analyzed, at concentrations ranging from 1.4 to 12 mg/kg. Lead was also detected in every sample analyzed, at concentrations ranging from 210 to 1100 mg/kg. For both mercury and lead, there is a general trend of increasing concentration with depth. Field duplicate precision was good, and no TAL metals were detected in the field blank.

Total organic carbon. TOC analysis (L Kahn Method) was performed on all 45 of the discrete samples from 0-3 ft and eight archive (3-4) ft samples by the USEPA DESA laboratory. As such, these data are considered EPA-validated and fully usable as reported. TOC values ranged from 46,000 mg/kg (4.6 percent) to 81,000 mg/kg (8.1 percent). There was no discernible trend of TOC concentration with depth. Field duplicate precision was good.

Geotechnical data. Geotechnical analyses included percent solids, moisture content, Atterberg limits (liquid limit, plastic limit, and plasticity index), and specific gravity (these data are tabulated in this report); grain size (shown on Figure 4-14); and bulk density analysis, performed in the field and shown on Table 2-4. Geotechnical data were not subject to formal data quality review.

Percent solids data and moisture content (ASTM D2216) data are in good agreement, after accounting for the different data reporting conventions of the two methods. These data show the expected trend of increased solids content with depth. The average solids content is 36.6 percent in the 0-1 ft interval, 43 percent in the 0-2 ft interval, and 48 percent in the 2-3 ft interval. Solids results reported by different laboratories on the samples from the same interval are in good agreement, generally agreeing to within ± 4 percent.

Atterberg limits results were reported for liquid limit, plastic limit, and plasticity index. For two samples (B1-01 and B3-12), the plasticity index and limit were not performed or no usable value was reported. Liquid limit values ranged from 50 to 116, with an average LL of 71.2 and a median of 66. Plastic limits ranged from 34 to 56 with an average of 44.2 and a median of 43. Plasticity index results ranged from 11 to 63, with an average of 27.3 and median of 24 for the 43 discrete samples for which data were reported.

Specific gravity analyses were performed by ASTM D854. Specific gravity values (density of dry solids) ranged from 2.06 to 2.56, with an average of 2.35 and a median of 2.34.

Grain size data are shown on Figure 4-14. Grain size analysis was conducted on 43 of the 45 discrete samples from the 0-3 ft interval (no data are available for the 0-1 ft interval from C3 and E2), and eight archive 3-4 ft interval samples. Silt is the predominant grain size fraction, typically representing 70 to 80 percent of the sample; it is the dominant fraction in all but one of the samples analyzed. The sand fraction was highly variable, ranging from 5 percent to a maximum of 50 percent. The clay fraction was generally low, with a maximum value of less than 10 percent.

5.3 RECOMMENDATIONS

5.3.1 Geophysical

In order to minimize the effects of geologic interference, ASI recommended that future magnetic surveys in this area be conducted using a gradiometer, rather than a magnetometer. As authorized by NJDOT-OMR, ASI conducted a gradiometer survey in the Pilot Study Survey Area during the week of May 2, 2005. Preliminary results from this gradiometer survey did not identify any targets that would potentially interfere with the proposed pilot study dredging activities.

5.3.2 Analytical

Based on the review and evaluation of the procedures used and the results of the sediment coring program described herein, the following recommendations are presented.

- Formal data quality review (e.g., validation) should be conducted for the chemical parameters that is not 'EPA-validated' upon release nor was validated subsequent to generation. Of especial significance is the PCDD/PCDF (dioxin/furan) data, for which the laboratory case narratives have indicated that there were some problems with surrogate recoveries. (Validation of the PCDD/PCDF data is planned, pending allocation of the necessary resources.) Other chemical data that have not been formally reviewed to date include the herbicide data and PCB congener data.

- Review of the samples analyze for PAH constituents only, in which seven more PAH compounds were reported than in the samples analyzed for the 17 PAH constituents reported in the typical SVOC analysis, shows that these additional seven PAH compounds comprise a consistent fraction of the total PAH concentration. Therefore, analysis for the additional PAH constituents is not necessary for samples in which data for the individual additional compounds is not needed.

- Data comparability would be enhanced by use of a single laboratory for all analyses of the same or similar parameter. Review of the PCB (Aroclor) results generated for this study suggests that there is variability both in the identification and quantitation of Aroclors reported among the three different laboratories that performed this analysis. There also seems to be similar variability between pesticide results reported by the CLP laboratory and the USEPA Region II DESA laboratory.

- Comparability of PAH data between the 0-3 ft core samples and the 3-4 ft archived cores is uncertain at best, as the 3-4 ft cores show an anomalous decrease in total PAH concentrations, relative to both the median and average concentrations in the 2-3 ft interval (a trend of increasing, rather than decreasing, concentration with depth would be expected). Although both sets of samples (0-3, and 3-4 ft intervals) were analyzed by the DESA laboratory, the fact that different analytes were reported (full CLP SVOCs for the 0-3 ft interval; and 24 PAH compounds only for the 3-4 ft interval archived core samples analyzed later) suggest that there may have been different analytical methods employed for the two sets of samples. It cannot be determined at this time if the possible method

difference may account for the apparent anomaly. A single method should be specified for future work to minimize potential comparability problems arising from the use of different analytical methods.

- Agreement between total PCB as Aroclor results and total PCBs as sum of detected congener results were in good agreement for split samples analyzed by the same laboratory. Therefore, it is likely that the less costly PCB Aroclor method provides adequate quantitation of PCBs for sample data for which further information regarding the PCB constituents is not needed.

- General agreement was good between percent solids (using a simple drying and weighing method) and moisture content data reported by ASTM D2216. This agreement suggests that moisture analysis by ASTM D2216 is probably redundant and is not necessary for future sampling events.

VI

6.0 REFERENCES

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Tables

TABLE 2-1
Air Monitoring Calibration and Results Summary
Passaic River Pilot Study Core Sampling July 2004

Date	Time	Hg Vapor Reading (mg/m^3)	PID Reading (ppm)	Notes
July 12, 2004	1345	Calibration check prior to start of sampling. Muhammad Akbar reports that both instruments were calibrated and zeroed this morning and the information is recorded in his field notes. Sticker on Jerome Mercury Vapor Monitor S/N 431-3016 indicates next calibration due 10/22/2004 (Arizona Instrument LLC). HNu PI-101 calibration check performed using 53 ppm isobutylene in air mixture (Specialty Gases Lot 00-091389-7) and span set at 5.76 for 53 ppm reading.		
	1615	0	0	Encore sampling of A-3/0-1
	1622	0.007 0 0	NR	Homogenization of A-3/0-1. Initial reading of 0.007 mg/m^3 Hg vapor followed by instrument prompt for re-zero. Successive measurements non-detect.
	1640	0	0	Homogenization of A-3/1-2
	1700	0.004 0 0	NR	Successive readings with Hg vapor monitor fail to confirm initial detection.
	1745	NR	NR	Malfunction of Jerome Hg vapor monitor – could be associated with steady rain/excessive moisture.
July 13, 2004	1025	Jerome Mercury Vapor Monitor activated (instrument regenerated during night of 7/12/2004). Instrument sampling properly; ambient reading in work area of 0 mg/m^3.		
	1200	Both HNU PI-101s are inoperable, likely due to rain and humidity. Equipment facility contacted to deliver MiniRAE PID to the site for VOC air monitoring.		
	1200	0	NA	Sediment sample homogenization.
	1245	0.006 0	NA	Encore sampling of B-2/0-1. Jerome Hg vapor monitor consistently records an initial detection that is not verified by immediately subsequent readings.
	1325	0.005 0 0	NA	Hg vapor reading in waste sediment bucket also collected – 0 mg/m^3.
	1515	0	NA	Multiple non-detect Hg vapor readings collected during processing of samples from cores C-3 and C-3D.

Date	Time	Hg Vapor Reading (mg/m^3)	PID Reading (ppm)	Notes
	1535	MiniRAE s/n 102818 delivered and calibrated to 100 ppm isobutylene in air (Pine Environmental Services Lot 66767); acceptable calibration reading of 99.5 ppm obtained.		
	1620	0	0	Processing core B-3 and USEPA homogenizing ponar grab sediment samples. MiniRAE monitoring of various stations in work area fails to detect volatile organics.
July 14, 2004	1030	MiniRAE s/n 102818 calibrated to 100 ppm isobutylene in air (Pine Environmental Services Lot 66767); acceptable calibration reading of 99.5 ppm obtained. Ambient reading of 0.4 ppm detected in work area.		
	1100	NA	0	Processing core C-1. Jerome Mercury Vapor meter non-functional.
	1200-1520	NA	0	No VOCs detected during periodic checks/no audible alarm from MiniRAE during processing of cores D-2, D-3, E-1, E-2, and E-3.

Key
NR = Not Recorded
NA = Not Available
VOC = volatile organic compounds

TABLE 2-2
Actual Sample Collection Location and Offset from Target Coordinates

Sample/Point ID	Target Coordinates		Actual Coordinates		Offset (ft)
	Easting	Northing	Easting	Northing	
A1	594251.09	695470.75	594252.49	695472.20	2.02
B1	594310.94	695477.84	594315.31	695481.70	5.83
C1	594369.89	695485.46	594376.25	695485.26	6.36
D1	594430.67	695494.40	594428.80	695478.70	15.81
E1	594489.89	695500.60	594493.50	695497.48	4.77
A2	594258.30	695395.66	594201.30	695390.89	57.19
B2	594317.94	695402.90	594325.60	695405.20	8.00
C2	594377.87	695411.34	594379.10	695410.08	1.76
D2	594439.01	695418.53	594440.30	695404.60	13.99
D2 DUP	594439.01	695418.53	594439.14	695405.90	12.63
E2	594498.99	695426.19	594506.35	695423.50	7.84
A3	594269.59	695322.89	594259.82	695322.20	9.79
B3	594326.41	695329.16	594324.08	695332.10	3.75
C3	594385.88	695335.84	594386.43	695329.55	6.32
C3 DUP	594385.88	695335.84	594386.35	695329.32	6.54
D3	594445.83	695344.44	594443.79	695346.31	2.77
E3	594506.71	695352.38	594505.50	695356.60	4.39

TABLE 2-3
SEDIMENT DESCRIPTION
PASSAIC RIVER JULY 2004 CORE SAMPLES

SAMPLE	SEDIMENT DESCRIPTION
A1-01	Brownish black SILT, some fine Sand, trace Clay.
A1-12	Brownish gray and black SILT, trace Clay and fine Sand.
A1-23	Brownish gray SILT, little fine Sand, trace Clay, slight odor.
A1-34	Black SILT, little Clay, trace fine Sand, slight odor.
A2-01	Brownish gray and black SILT, little fine Sand, trace Clay.
A2-12	Brownish black SILT, some fine Sand, trace Clay.
A2-23	Brownish black SILT, some fine Sand, trace Clay.
A2-34	Dark gray and brown SILT, trace fine Sand and Clay.
A3-01	Brownish black SILT, and fine SAND, trace Clay.
A3-12	Brownish black SILT, some fine Sand, trace Clay.
A3-23	Brownish gray SILT, little fine Sand and Clay.
A3-34	Brownish gray and black SILT, little fine Sand, trace Clay.
B1-01	Brownish black SILT, some fine Sand, little Clay.
B1-12	Brownish gray SILT, some fine Sand, little Clay.
B1-23	Brownish black SILT, some fine Sand, trace Clay, slight odor.
B1-34	Brownish black SILT, little fine Sand, trace Clay, slight odor.
B2-01	Brownish black SILT, some fine Sand, little Clay.
B2-12	Brownish black SILT, some fine Sand, little Clay, slight odor.
B2-23	Brownish black SILT, some fine Sand, little Clay, slight odor.
B2-34	Brownish black SILT, little fine Sand and Clay, strong odor.
B3-01	Brownish black SILT, little fine Sand, trace Clay.
B3-12	Brownish black SILT, some fine Sand, trace Clay.
B3-23	Brownish black SILT, some fine Sand, trace Clay, slight odor.
B3-34	Brownish black SILT, trace fine Sand and Clay.
C1-01	Brownish gray SILT, little fine Sand, trace Clay.
C1-12	Brownish gray SILT, trace fine Sand and Clay.
C1-23	Brownish black SILT, little fine Sand, trace Clay.
C1-34	Brownish gray SILT, trace fine Sand and Clay.
C2-01	Brownish gray SILT, some fine Sand, trace Clay.
C2-12	Brownish gray to black SILT, and fine SAND, trace Clay.
C2-23	Brownish black SILT, some fine Sand, trace Clay.
C2-34	Brownish gray to black SILT, trace fine Sand and Clay.
C3-01	Brownish black SILT, trace fine Sand and Clay.
C3-12	Brownish black SILT, trace fine Sand and Clay.
C3-23	Brownish black SILT, trace fine Sand and Clay, strong odor.
C3-34	Brownish black SILT, little fine Sand and Clay, strong odor.
D1-01	Brownish gray to black SILT, little fine Sand, trace Clay.
D1-12	Brownish black SILT, little fine Sand, trace Clay.
D1-23	Brownish black SILT, little fine Sand, trace Clay.
D1-34	Brownish gray SILT, trace fine Sand and Clay.
D2-01	Brownish gray SILT, little fine Sand and Clay.
D2-12	Brownish gray to black SILT, some fine Sand, trace Clay.
D2-23	Brownish gray SILT, little fine Sand, trace Clay.
D2-34	Brownish gray to black SILT, trace fine Sand and Clay.
D3-01	Brownish black SILT, some fine Sand, trace Clay.
D3-12	Brownish black SILT, some fine Sand, trace Clay.
D3-23	Brownish black SILT, and fine SAND, trace Clay.
D3-34	Brownish gray to black SILT, little fine Sand, trace Clay.
E1-01	Brownish black SILT, some fine Sand, trace Clay.
E1-12	Brownish black SILT, some fine Sand, trace Clay, slight odor.
E1-23	Brownish black SILT, some fine Sand, trace Clay.
E1-34	Brownish gray to black SILT, little fine Sand, trace Clay, slight odor.
E2-01	Brownish black SILT, some fine Sand, trace Clay.
E2-12	Brownish black SILT, and fine SAND, trace Clay.
E2-23	Brownish black SILT, some fine Sand, trace Clay.
E2-34	Brownish black SILT, little fine Sand, trace Clay.
E3-01	Brownish black SILT, some fine Sand, trace Clay.
E3-12	Brownish black SILT, some fine Sand, trace Clay.
E3-23	Brownish black SILT, some fine Sand, trace Clay.
E3-34	Brownish black SILT, little fine Sand, trace Clay.

Descriptions logged in the field by [ET] geologist as cores were extruded (July, 2004)

TABLE 2-4
BULK DENSITY CALCULATIONS
PILOT STUDY CORES COLLECTED JULY 2004

BULK DENSITY DATA FOR ALL CORE SECTIONS

Sample ID	Tube Radius (cm)	Tube Length (cm)	Tube Vol (cm^3)	Gross Wt (g)	Tare (Bowl) Wt (g)	Empty Tube Wt (g)	Sediment Wt (net) (g)	Bulk Density (g/cm^3)	Bulk Density (lb/ft^3)	Remarks
A1-01	4.445	30.48	1892.19	2834.3	353.3	232.8	2248.3	1.19	74.2	Tube 17.5", 4" slurry
A1-12	4.445	30.48	1892.19	2861.0	339.7	159.6	2361.7	1.25	77.9	
A1-23	4.445	30.48	1892.19	2766.6	367.6	159.6	2239.4	1.18	73.9	
A2-01	4.445	30.48	1892.19	2696.1	305.2	159.6	2231.3	1.18	73.6	1" slurry
A2-12	4.445	30.48	1892.19	2970.0	286.6	159.6	2523.8	1.33	83.3	
A2-23	4.445	30.48	1892.19	3052.9	276.0	159.6	2617.3	1.38	86.4	
A2-34	4.445	30.48	1892.19	2927.8	290.9	159.6	2477.3	1.31	81.7	
A3-01	4.445	30.48	1892.19	2844.5	375.6	159.6	2309.3	1.22	76.2	
A3-12	4.445	30.48	1892.19	3023.9	321.8	159.6	2542.5	1.34	83.9	
A3-23	4.445	30.48	1892.19	3037.7	342.8	159.6	2535.3	1.34	83.6	
A3-34	4.445	30.48	1892.19	2773.9	312.6	159.6	2301.7	1.22	75.9	
B1-01	4.445	30.48	1892.19	2957.1	335.1	159.6	2462.4	1.30	81.2	
B1-12	4.445	30.48	1892.19	2930.0	324.5	159.6	2445.9	1.29	80.7	
B1-23	4.445	30.48	1892.19	2997.9	300.1	159.6	2538.2	1.34	83.7	
B1-34	4.445	30.48	1892.19	3041.7	267.0	159.6	2615.1	1.38	86.3	
B2-01	4.445	30.48	1892.19	2830.9	268.5	186.2	2376.2	1.26	78.4	Tube 14"
B2-12	4.445	30.48	1892.19	2899.9	270.0	159.6	2470.3	1.31	81.5	
B2-23	4.445	30.48	1892.19	2875.0	301.6	159.6	2413.8	1.28	79.6	
B2-34	4.445	30.48	1892.19	2968.8	271.1	159.6	2538.1	1.34	83.7	
B3-01	4.445	30.48	1892.19	2832.1	301.6	159.6	2370.9	1.25	78.2	
B3-12	4.445	30.48	1892.19	2956.6	268.5	159.6	2528.5	1.34	83.4	
B3-23	4.445	30.48	1892.19	3168.9	329.6	159.6	2679.7	1.42	88.4	
B3-34	4.445	30.48	1892.19	3188.7	361.3	159.6	2667.8	1.41	88.0	
C1-01	4.445	30.48	1892.19	2921.7	400.0	172.9	2348.8	1.24	77.5	Tube 13"
C1-12	4.445	30.48	1892.19	3204.1	378.6	159.6	2665.9	1.41	88.0	
C1-23	4.445	27.94	1734.51	2929.5	386.2	146.3	2397.0	1.38	86.3	
C1-34	4.445	30.48	1892.19	3040.1	400.0	159.6	2480.5	1.31	81.8	
C2-01	4.445	30.48	1892.19	2861.2	400.2	179.6	2281.5	1.21	75.3	Tube 13.5"
C2-12	4.445	30.48	1892.19	3149.0	356.4	159.6	2633.0	1.39	86.9	
C2-23	4.445	30.48	1892.19	3088.0	389.4	159.6	2539.0	1.34	83.8	
C2-34	4.445	30.48	1892.19	3072.5	360.1	159.6	2552.8	1.35	84.2	
C3-01	4.445	30.48	1892.19	2735.9	249.4	172.9	2313.6	1.22	76.3	Tube 13"
C3-12	4.445	30.48	1892.19	2939.8	278.6	159.6	2501.6	1.32	82.5	
C3-23	4.445	30.48	1892.19	3007.4	265.6	159.6	2582.2	1.36	85.2	
C3-34	4.445	30.48	1892.19	2834.0	286.3	159.6	2388.1	1.26	78.8	
D1-01	4.445	30.48	1892.19	2843.5	287.6	202.8	2353.1	1.24	77.6	Tube 15.25"
D1-12	4.445	30.48	1892.19	2966.9	276.0	159.6	2531.3	1.34	83.5	
D1-23	4.445	30.48	1892.19	3032.5	262.6	159.6	2610.3	1.38	86.1	
D1-34	4.445	30.48	1892.19	3017.8	333.4	159.6	2524.8	1.33	83.3	
D2-01	4.445	30.48	1892.19	2898.8	342.8	199.5	2356.5	1.25	77.7	Tube 15"
D2-12	4.445	30.48	1892.19	3071.0	375.6	159.6	2535.8	1.34	83.7	
D2-23	4.445	29.85	1852.77	3002.4	339.7	156.3	2506.4	1.35	84.5	
D2-34	4.445	30.48	1892.19	2917.6	321.8	159.6	2436.2	1.29	80.4	
D3-01	4.445	30.48	1892.19	3032.9	389.4	212.8	2430.7	1.28	80.2	Tube 16"
D3-12	4.445	30.48	1892.19	2987.6	360.1	159.6	2467.9	1.30	81.4	
D3-23	4.445	29.85	1852.77	2780.3	265.6	159.6	2355.1	1.27	79.4	
D3-34	4.445	30.48	1892.19	2878.0	301.6	159.6	2416.8	1.28	79.7	
E1-01	4.445	30.48	1892.19	2932.9	376.3	172.9	2383.7	1.26	78.6	Tube 13"
E1-12	4.445	30.48	1892.19	2919.9	330.1	159.6	2430.2	1.28	80.2	
E1-23	4.445	30.48	1892.19	2926.3	387.4	159.6	2379.3	1.26	78.5	
E1-34	4.445	30.48	1892.19	3085.1	395.8	159.6	2529.7	1.34	83.5	
E2-01	4.445	30.48	1892.19	2880.5	404.0	206.2	2270.4	1.20	74.9	Tube 15.5"
E2-12	4.445	30.48	1892.19	3030.3	431.6	159.6	2439.1	1.29	80.5	
E2-23	4.445	30.48	1892.19	3140.9	388.0	159.6	2593.3	1.37	85.6	
E2-34	4.445	30.48	1892.19	3156.0	377.9	159.6	2618.5	1.38	86.4	
E3-01	4.445	30.48	1892.19	2671.8	375.6	159.6	2136.6	1.13	70.5	
E3-12	4.445	30.48	1892.19	3067.0	392.1	159.6	2515.3	1.33	83.0	
E3-23	4.445	30.48	1892.19	3004.3	369.9	159.6	2474.8	1.31	81.7	
E3-34	4.445	30.48	1892.19	3210.0	393.6	159.6	2656.8	1.40	87.7	
Average	4.445	30.42	1888.18	2960.6	335.6	165.1	2459.9	1.30	81.3	Average for 59 cores
Median	4.445	30.48	1892.1897	2957.1	339.7	159.6	2470.3	1.31	81.7	Median for 59 cores

Tube radius not measured on each core; based on standard specification for tubing used.
Tube length based on calculation assuming 12-inch segment unless noted otherwise in remarks.

TABLE 2-4
BULK DENSITY CALCULATIONS
Passaic River Pilot Study Core Samples July 2004

BULK DENSITY DATA FOR 0-1 FT INTERVAL CORE SECTIONS ONLY

Sample ID	Tube Radius (cm)	Length (cm)	Tube Vol (cm^3)	Gross Wt (g)	Tare (Bowl) Wt (g)	Empty Tube Wt (g)	Sediment Wt (net) (g)	Density (g/cm^3)	Density (lb/ft^3)	Remarks
A1-01	4.445	30.48	1892.19	2834.3	353.3	232.8	2248.3	1.19	74.2	Tube 17.5", 4" slurry
A2-01	4.445	30.48	1892.19	2696.1	305.2	159.6	2231.3	1.18	73.6	1" slurry
A3-01	4.445	30.48	1892.19	2844.5	375.6	159.6	2309.3	1.22	76.2	
B1-01	4.445	30.48	1892.19	2957.1	335.1	159.6	2462.4	1.30	81.2	
B2-01	4.445	30.48	1892.19	2830.9	268.5	186.2	2376.2	1.26	78.4	Tube 14"
B3-01	4.445	30.48	1892.19	2832.1	301.6	159.6	2370.9	1.25	78.2	
C1-01	4.445	30.48	1892.19	2921.7	400.0	172.9	2348.8	1.24	77.5	Tube 13"
C2-01	4.445	30.48	1892.19	2861.2	400.2	179.6	2281.5	1.21	75.3	Tube 13.5"
C3-01	4.445	30.48	1892.19	2735.9	249.4	172.9	2313.6	1.22	76.3	Tube 13"
D1-01	4.445	30.48	1892.19	2843.5	287.6	202.8	2353.1	1.24	77.6	Tube 15.25"
D2-01	4.445	30.48	1892.19	2898.8	342.8	199.5	2356.5	1.25	77.7	Tube 15"
D3-01	4.445	30.48	1892.19	3032.9	389.4	212.8	2430.7	1.28	80.2	Tube 16"
E1-01	4.445	30.48	1892.19	2932.9	376.3	172.9	2383.7	1.26	78.6	Tube 13"
E2-01	4.445	30.48	1892.19	2880.5	404.0	206.2	2270.4	1.20	74.9	Tube 15.5"
E3-01	4.445	30.48	1892.19	2671.8	375.6	159.6	2136.6	1.13	70.5	
Average	4.445	30.48	1892.19	2851.6	344.3	182.4	2324.9	1.23	76.7	Average for 15 0-1 ft
Median	4.445	30.48	1892.19	2844.5	353.3	172.9	2348.8	1.24	77.5	Median for 15 0-1 ft

Tube radius not measured on each core; based on standard specification for tubing used.
Tube length based on calculation assuming 12-inch segment unless noted otherwise in remarks.

TABLE 2-4
BULK DENSITY CALCULATIONS
Passaic River Pilot Study Core Samples July 2004

BULK DENSITY DATA FOR 1-2 FT INTERVAL CORE SECTIONS ONLY

Sample ID	Tube Radius (cm)	Tube Length (cm)	Tube Vol (cm^3)	Gross Wt (g)	Tare (Bowl) Wt (g)	Empty Tube Wt (g)	Sediment Wt (net) (g)	Bulk Density (g/cm^3)	Bulk Density (lb/ft^3)	Remarks
A1-12	4.445	30.48	1892.19	2861.0	339.7	159.6	2361.7	1.25	77.9	
A2-12	4.445	30.48	1892.19	2970.0	286.6	159.6	2523.8	1.33	83.3	
A3-12	4.445	30.48	1892.19	3023.9	321.8	159.6	2542.5	1.34	83.9	
B1-12	4.445	30.48	1892.19	2930.0	324.5	159.6	2445.9	1.29	80.7	
B2-12	4.445	30.48	1892.19	2899.9	270.0	159.6	2470.3	1.31	81.5	
B3-12	4.445	30.48	1892.19	2956.6	268.5	159.6	2528.5	1.34	83.4	
C1-12	4.445	30.48	1892.19	3204.1	378.6	159.6	2665.9	1.41	88.0	
C2-12	4.445	30.48	1892.19	3149.0	356.4	159.6	2633.0	1.39	86.9	
C3-12	4.445	30.48	1892.19	2939.8	278.6	159.6	2501.6	1.32	82.5	
D1-12	4.445	30.48	1892.19	2966.9	276.0	159.6	2531.3	1.34	83.5	
D2-12	4.445	30.48	1892.19	3071.0	375.6	159.6	2535.8	1.34	83.7	
D3-12	4.445	30.48	1892.19	2987.6	360.1	159.6	2467.9	1.30	81.4	
E1-12	4.445	30.48	1892.19	2919.9	330.1	159.6	2430.2	1.28	80.2	
E2-12	4.445	30.48	1892.19	3030.3	431.6	159.6	2439.1	1.29	80.5	
E3-12	4.445	30.48	1892.19	3067.0	392.1	159.6	2515.3	1.33	83.0	
Average	4.445	30.48	1892.19	2998.5	332.7	159.6	2506.2	1.32	82.7	Average for 15 1-2 ft
Median	4.445	30.48	1892.19	2970.0	330.1	159.6	2515.3	1.33	83.0	Median for 15 1-2 ft

Tube radius not measured on each core; based on standard specification for tubing used.
Tube length based on calculation assuming 12-inch segment unless noted otherwise in remarks.

TABLE 2-4
BULK DENSITY CALCULATIONS
Passaic River Pilot Study Core Samples July 2004

BULK DENSITY DATA FOR 2-3 FT INTERVAL CORE SECTIONS ONLY

Sample ID	Radius (cm)	Length (cm)	Tube Vol (cm^3)	Gross Wt (g)	(Bowl) Wt (g)	Empty Tube Wt (g)	Sediment Wt (net) (g)	Density (g/cm^3)	Density (lb/ft^3)	Remarks
A1-23	4.445	30.48	1892.19	2766.6	367.6	159.6	2239.4	1.18	73.9	
A2-23	4.445	30.48	1892.19	3052.9	276.0	159.6	2617.3	1.38	86.4	
A3-23	4.445	30.48	1892.19	3037.7	342.8	159.6	2535.3	1.34	83.6	
B1-23	4.445	30.48	1892.19	2997.9	300.1	159.6	2538.2	1.34	83.7	
B2-23	4.445	30.48	1892.19	2875.0	301.6	159.6	2413.8	1.28	79.6	
B3-23	4.445	30.48	1892.19	3168.9	329.6	159.6	2679.7	1.42	88.4	
C1-23	4.445	27.94	1734.51	2929.5	386.2	146.3	2397.0	1.38	86.3	
C2-23	4.445	30.48	1892.19	3088.0	389.4	159.6	2539.0	1.34	83.8	
C3-23	4.445	30.48	1892.19	3007.4	265.6	159.6	2582.2	1.36	85.2	
D1-23	4.445	30.48	1892.19	3032.5	262.6	159.6	2610.3	1.38	86.1	
D2-23	4.445	29.85	1852.77	3002.4	339.7	156.3	2506.4	1.35	84.5	
D3-23	4.445	29.85	1852.77	2780.3	265.6	159.6	2355.1	1.27	79.4	
E1-23	4.445	30.48	1892.19	2926.3	387.4	159.6	2379.3	1.26	78.5	
E2-23	4.445	30.48	1892.19	3140.9	388.0	159.6	2593.3	1.37	85.6	
E3-23	4.445	30.48	1892.19	3004.3	369.9	159.6	2474.8	1.31	81.7	
Average	4.445	30.23	1876.42	2987.4	331.5	158.5	2497.4	1.33	83.1	Average for 15 2-3 ft
Median	4.445	30.48	1892.19	3004.3	339.7	159.6	2535.3	1.34	83.8	Median for 15 2-3 ft

Tube radius not measured on each core; based on standard specification for tubing used.
Tube length based on calculation assuming 12-inch segment unless noted otherwise in remarks.

TABLE 2-4
BULK DENSITY CALCULATIONS
Passaic River Pilot Study Core Samples July 2004

BULK DENSITY DATA FOR 3-4 FT INTERVAL CORE SECTIONS ONLY

Sample ID	Tube Radius (cm)	Tube Length (cm)	Tube Vol (cm^3)	Gross Wt (g)	Tare (Bowl) Wt (g)	Empty Tube Wt (g)	Sediment Wt (net) (g)	Bulk Density (g/cm^3)	Bulk Density (lb/ft^3)	Remarks
A2-34	4.445	30.48	1892.19	2927.8	290.9	159.6	2477.3	1.31	81.7	
A3-34	4.445	30.48	1892.19	2773.9	312.6	159.6	2301.7	1.22	75.9	
B1-34	4.445	30.48	1892.19	3041.7	267.0	159.6	2615.1	1.38	86.3	
B2-34	4.445	30.48	1892.19	2968.8	271.1	159.6	2538.1	1.34	83.7	
B3-34	4.445	30.48	1892.19	3188.7	361.3	159.6	2667.8	1.41	88.0	
C1-34	4.445	30.48	1892.19	3040.1	400.0	159.6	2480.5	1.31	81.8	
C2-34	4.445	30.48	1892.19	3072.5	360.1	159.6	2552.8	1.35	84.2	
C3-34	4.445	30.48	1892.19	2834.0	286.3	159.6	2388.1	1.26	78.8	
D1-34	4.445	30.48	1892.19	3017.8	333.4	159.6	2524.8	1.33	83.3	
D2-34	4.445	30.48	1892.19	2917.6	321.8	159.6	2436.2	1.29	80.4	
D3-34	4.445	30.48	1892.19	2878.0	301.6	159.6	2416.8	1.28	79.7	
E1-34	4.445	30.48	1892.19	3085.1	395.8	159.6	2529.7	1.34	83.5	
E2-34	4.445	30.48	1892.19	3156.0	377.9	159.6	2618.5	1.38	86.4	
E3-34	4.445	30.48	1892.19	3210.0	393.6	159.6	2656.8	1.40	87.7	
Average	4.445	30.48	1892.19	3008.0	333.8	159.6	2514.6	1.33	83.0	Average for 14 3-4 ft
Median	4.445	30.48	1892.19	3028.95	327.6	159.6	2527.25	1.34	83.4	Median for 14 3-4 ft

Tube radius not measured on each core; based on standard specification for tubing used.
Tube length based on calculation assuming 12-inch segment unless noted otherwise in remarks.
No data available for A1-34 (sample not retained in core tube)

TABLE 4-1
SAMPLE AND ANALYSIS SUMMARY
Passaic River Pilot Study July 2004 Core Samples

Sediment Characterization			Analytical Quantity		
Chemical Analyses	Laboratory	Analytical Method [1]	Planned [2]	Actual [2]	Comment
Volatile Organics	CLP (Mitkem)	OLM04.3, Part D-VOA (EnCore)	46	46	45 discrete 1-ft interval samples plus vendor composite
Semivolatile Organics	EPA 2 (DESA)	OLM04.3, Part D-SVOA	46	46	Data reported for 17 PAH compounds
Polynuclear aromatic hydrocarbons	EPA 2 (DESA)	EPA SOP C-90 (GC/MS)	Contingency	8	Archive 3-4 ft interval cores; reported 24 PAH cmpds only
Pesticides/Aroclors	CLP (Mitkem)	OLM04.3, Part D-Pest	46	46	
Pesticides/Aroclors	EPA-2 DESA	EPA SOP C-91 (GC/ECD)	Contingency	8	Archive cores (3-4 ft composites)
Herbicides (2,4-D and 2,4,5-T only)	STL-Vt	SW-846 3550/8151	46	46	
PCBs - Aroclors	STL (Vt or Tn)	SW-846 3550/8082	16	21	Paired with samples for congener analysis (0-3; 3-4; vendor composite)
PCBs - Congeners (Full suite [209])	STL-Tn	EPA 1668A	16	21	15 vertical composities (0-3 ft) plus vendor composite; plus five archive (3-4 ft) composites
PCDD/PCDFs	STL-Tn	USEPA 1613B	16	21	15 vertical composities (0-3 ft) plus vendor composite
Total Organic Carbon	EPA 2 (DESA)	EPA SOP C-88 (Combustion/IR)	46	54	Inlcudes 8 archived cores
TAL Metals (no cyanide)	EPA 2 (DESA)	EPA SOP C-109 (ICP), C-110 (CV-Hg)	46	54	Inlcudes 8 archived cores
Geotechnical Analyses					
Grain Size Distribution (Sieve/Hydrometer)	EPA 2 (DESA)	ASTM D422/1140 (EPA SOP 8.3)	46	54	Inlcudes 8 archived cores
Moisture Content of Soil and Rock	STL-Vt	ASTM D2216	46	46	0-3 ft cores only
Bulk Density of Peat	STL-Vt	ASTM D 4531[3]	46	0	Determined in field
Atterberg (liquid/plastic) Limits	STL-Vt	ASTM D 4318	46	46	0-3 ft cores only
Specific Gravity	STL-Vt	ASTM D 854	46	46	0-3 ft cores only
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	11		Not evaluated in this report
pH	STL -Vt	SW-846 9045	11		Not evaluated in this report
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)	11		Not evaluated in this report

NOTES

1 DESA Laboratory methods cite only their in-house method numbers; method listed is method requested.
2 Quantity is environmental samples only (excluded duplicates and blanks)
3 Bulk Density was 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 Mitkem, as assigned by USEPA from pool of USEPA CLP Labs.

TABLE 4-2
Volatile Organic Contaminant Data
Passaic River Pilot STudy July 2004 Core Samples

TAMS ID	EPA ID	Date Collected	SDG	Benzene	Xylenes	Isopropyl-benzene	Methylcyclo hexane	Chloro-benzene	1,4-DCB	Comment
A1-01	B1FB9	7/12/2004	BIFJ9	7						
A1-12	B1FC0	7/12/2004	BIFJ9							
A1-23	B1FC1	7/12/2004	BIFJ9							
A2-01	B1FC2	7/12/2004	BIFJ9							
A2-12	B1FC3	7/12/2004	BIFJ9							
A2-23	B1FC4	7/12/2004	BIFJ9		8	3			4	
A3-01	B1FC5	7/12/2004	BIFJ9							
A3-12	B1FC6	7/12/2004	BIFJ9		4		5	4		
A3-23	B1FC7	7/12/2004	BIFJ9	8	11	3	3			
B1-01	B1FC8	7/13/2004	BIFJ8							
B1-12	B1FC9	7/13/2004	BIFJ8							
B1-23	B1FD0	7/13/2004	BIFJ8							
B2-01	B1FD1	7/13/2004	BIFJ8							
B2-12	B1FD2	7/13/2004	BIFJ8							
B2-23	B1FD3	7/13/2004	BIFJ8							
B3-01	B1FD4	7/13/2004	BIFJ8							
B3-12	B1FD5	7/13/2004	BIFJ8							
B3-23	B1FD6	7/13/2004	BIFJ8							
C2-01	B1FE0	7/13/2004	BIFJ8							
C2-12	B1FE1	7/13/2004	BIFJ8							
C2-23	B1FE2	7/13/2004	BIFJ8							
C3-01	B1FE3	7/13/2004	BIFJ9							
C3-12	B1FE4	7/13/2004	BIFJ9							
C3-23	B1FE5	7/13/2004	BIFJ9		9				9	
C53-23	B1FG4	7/13/2004	BIFJ9		5	5		10	6	Duplicate of C3-23
C5312	B1FG5	7/13/2004	BIFJ9							Duplicate of C3-12
C5301	B1FG6	7/13/2004	BIFJ9							Duplicate of C3-01
T17	B1FG7	7/13/2004	BIFJ8							
C1-01	B1FD7	7/13/2004	BIFJ8							
C1-12	B1FD8	7/13/2004	BIFJ8							
C1-23	B1FD9	7/13/2004	BIFJ8							
D1-01	B1FE6	7/13/2004	BIFJ9							
D1-12	B1FE7	7/13/2004	BIFJ9							
D1-23	B1FE8	7/13/2004	BIFJ9							
D2-01	B1FE9	7/13/2004	BIFJ8							

TABLE 4-2
Volatile Organic Contaminant Data
Passaic River Pilot STudy July 2004 Core Samples

TAMS ID	EPA ID	Date Collected	SDG	Benzene	Xylenes	Isopropyl-benzene	Methylcyclo hexane	Chloro-benzene	1,4-DCB	Comment
D2-12	B1FF0	7/13/2004	BIFJ8							
D2-23	B1FF1	7/13/2004	BIFJ8							
D3-01	B1FF2	7/13/2004	BIFJ8							
D3-12	B1FF3	7/13/2004	BIFJ8							
D3-23	B1FF4	7/13/2004	BIFJ8							
E1-01	B1FF5	7/14/2004	B1FK0					9		
E1-12	B1FF6	7/14/2004	B1FK0					8		
E1-23	B1FF7	7/14/2004	B1FK0					6		
E2-01	B1FF8	7/14/2004	B1FK0					6		
E2-12	B1FF9	7/14/2004	B1FK0							
E2-23	B1FG0	7/14/2004	B1FK0					3		
E3-01	B1FG1	7/14/2004	B1FK0							
E3-12	B1FG2	7/13/2004	B1FK0	R	R	R	R	12	R	Non-detects rejected
E3-23	B1FG3	7/13/2004	B1FK0							
			Number of Detections	2	5	3	2	8	3	

All VOC data are in ug/kg.
Blank spaces indicate analyte was not detected
R = Rejected (unusable) data point.
SDG = Sample Delivery Group
1,4-DCB = 1,4-Dichlorobenzene

All detections are estimated (flagged "J").
Analysis by CLP laboratory (Mitkem) and validated by USEPA Region 2.

TABLE 4-3A
Total PAH Concentration Data Summary
Passaic River Pilot Study July 2004 Core Samples

Field Sample ID	CLP Sample ID	Total PAH Result	Units
Discrete Core Slices (0-1, 1-2, and 2-3 ft intervals)			
A1-01	B1FB9	ND	ug/kg
A1-12	B1FC0	ND	ug/kg
A1-23	B1FC1	15,500	ug/kg
A2-01	B1FC2	ND	ug/kg
A2-12	B1FC3	ND	ug/kg
A2-23	B1FC4	28,900	ug/kg
A3-01	B1FC5	ND	ug/kg
A3-12	B1FC6	17,700	ug/kg
A3-23	B1FC7	49,600	ug/kg
B1-01	B1FC8	33,900	ug/kg
B1-12	B1FC9	37,200	ug/kg
B1-23	B1FD0	45,900	ug/kg
B2-01	B1FD1	33,000	ug/kg
B2-12	B1FD2	28,150	ug/kg
B2-23	B1FD3	22,000	ug/kg
B3-01	B1FD4	ND	ug/kg
B3-12	B1FD5	18,900	ug/kg
B3-23	B1FD6	27,900	ug/kg
C1-01	B1FD7	ND	ug/kg
C1-12	B1FD8	ND	ug/kg
C1-23	B1FD9	17,000	ug/kg
C2-01	B1FE0	ND	ug/kg
C2-12	B1FE1	27,400	ug/kg
C2-23	B1FE2	34,200	ug/kg
C3-01	B1FE3	ND	ug/kg
C3-12	B1FE4	17,700	ug/kg
C3-23	B1FE5	19,200	ug/kg
C53-01 (Dup C3-01)	B1FG6	ND	ug/kg
C53-12 (Dup C3-12)	B1FG5	96,100	ug/kg
C53-23 (Dup C3-23)	B1FG4	28,500	ug/kg
D1-01	B1FE6	35,820	ug/kg
D1-12	B1FE7	15,200	ug/kg
D1-23	B1FE8	17,700	ug/kg
D2-01	B1FE9	ND	ug/kg
D2-12	B1FF0	ND	ug/kg
D2-23	B1FF1	21,000	ug/kg
D3-01	B1FF2	ND	ug/kg
D3-12	B1FF3	ND	ug/kg
D3-23	B1FF4	ND	ug/kg
E1-01	B1FF5	ND	ug/kg
E1-12	B1FF6	ND	ug/kg
E1-23	B1FF7	66,500	ug/kg
E2-01	B1FF8	ND	ug/kg
E2-12	B1FF9	ND	ug/kg
E2-23	B1FG0	47,300	ug/kg
E3-01	B1FG1	ND	ug/kg
E3-12	B1FG2	40,210	ug/kg
E3-23	B1FG3	36,000	ug/kg
Treatability Study - Vendor Composite			
T17 (vendor comp)	B1FG7	0	ug/kg

TABLE 4-3A
Total PAH Concentration Data Summary
Passaic River Pilot Study July 2004 Core Samples

Field Sample ID	CLP Sample ID	Total PAH Result	Units
Archive (3-4 ft interval) Sample Data *			
A134	AF06254	7,765	ug/kg
A334	AF06255	11,927	ug/kg
B234	AF06256	7,312	ug/kg
C134	AF06257	8,383	ug/kg
C334	AF06258	10,900	ug/kg
D234	AF06259	8,270	ug/kg
E134	AF06260	7,362	ug/kg
E334	AF06261	12,240	ug/kg

Samples from 0-3 ft cores analyzed for 17 PAHs. See Table 4-3B.
* 3-4 ft core data are reported for 24 PAH compounds. See Table 4-3C.
0-1, 1-2, 2-3 and Treatability study composite analyzed 2004.
3-4 ft Archive Samples data reported 2005.
DESA data are considered EPA validated.

TABLE 4-3B
INDIVIDUAL PAH DATA FROM 0-3 FT CORES

Analyte Name	A1-01	A1-12	A1-23	A2-01	A2-12	A2-23	A3-01	A3-12	A3-23
	B1FB9	B1FC0	B1FC1	B1FC2	B1FC3	B1FC4	B1FC5	B1FC6	B1FC7
1-Methylnaphthalene	U	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U	U	U
Anthracene	U	U	U	U	U	U	U	U	U
Benzo(a)anthracene	U	U	U	U	U	U	U	U	U
Benzo(a)pyrene	U	U	U	U	U	U	U	U	U
Benzo(b)fluoranthene	U	U	U	U	U	U	U	U	U
Benzo(g,h,i)perylene	U	U	U	U	U	U	U	U	U
Benzo(k)fluoranthene	U	U	U	U	U	U	U	U	U
Chrysene	U	U	U	U	U	U	U	U	7,600
Dibenzo(a,h)Anthracene	U	U	U	U	U	U	U	U	U
Fluoranthene	U	U	7,600	U	U	11,000	U	8,600	15,000
Fluorene	U	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)pyrene	U	U	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U	U	U
Phenanthrene	U	U	U	U	U	6,900	U	U	12,000
Pyrene	U	U	7,900	U	U	11,000	U	9,100	15,000
Sum of 17 Standard PAHs	0		15500	0	0	28900	0	17700	49600

All data in ug/kg
U = Not detected
K = Estimated value
Analyses by USEPA
DESA Laboratory

TABLE 4-3B
INDIVIDUAL PAH DATA FROM 0-3 FT CORES

Analyte Name	B1-01 B1FC8	B1-12 B1FC9	B1-23 B1FD0	B2-01 B1FD1	B2-12 B1FD2	B2-23 B1FD3	B3-01 B1FD4	B3-12 B1FD5	B3-23 B1FD6
1-Methylnaphthalene	U	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U	U	U
Acenaphthylene	U	1,000	U	U	U	U	U	U	U
Anthracene	U	1,300	2,300	U	970	U	U	U	U
Benzo(a)anthracene	2,900	3,000	3,700	3,200	2,700	U	U	U	U
Benzo(a)pyrene	3,600	3,800	3,200	3,200	2,400	U	U	U	U
Benzo(b)fluoranthene	5,100	4,600	4,700	4,900	3,600	U	U	U	U
Benzo(g,h,i)perylene	1,800	1,800	1,200	1,200	880	U	U	U	U
Benzo(k)fluoranthene	1,700	1,500	1,600	1,700	1,200	U	U	U	U
Chrysene	3,800	3,400	4,300	4,100	3,300	U	U	U	U
Dibenzo(a,h)Anthracene	U	U	U	0 U	U	U	U	U	U
Fluoranthene	6,200	5,700	8,100	5,500	4,700	11,000	U	9,100	10,000
Fluorene	U	U	970	0 U	U	U	U	U	U
Indeno(1,2,3-cd)pyrene	2,000	2,000	1,400	1,400	1,000	U	U	U	U
Naphthalene	U	U	730	0 U	U	U	U	U	U
Phenanthrene	2,500	2,400	4,200	2,200	2,100	U	U	U	6,900
Pyrene	6,300	6,700	9,500	5,600	5,300	11,000	U	9,800	11,000
Sum of 17 Standard PAHs	33900	37200	45900	33,000	28150	22000	0	18900	27900

All data in ug/kg
U = Not detected
K = Estimated value
Analyses by USEPA
DESA Laboratory

TABLE 4-3B
INDIVIDUAL PAH DATA FROM 0-3 FT CORES

Analyte Name	C1-01 B1FD7	C1-12 B1FD8	C1-23 B1FD9	C2-01 B1FE0	C2-12 B1FE1	C2-23 B1FE2	C3-01 B1FE3	C53-01 B1FG6
1-Methylnaphthalene	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U	U
Anthracene	U	U	U	U	U	U	U	U
Benzo(a)anthracene	U	U	U	U	U	U	U	U
Benzo(a)pyrene	U	U	U	U	U	U	U	U
Benzo(b)fluoranthene	U	U	U	U	U	U	U	U
Benzo(g,h,i)perylene	U	U	U	U	U	U	U	U
Benzo(k)fluoranthene	U	U	U	U	U	U	U	U
Chrysene	U	U	U	U	7,400	U	U	U
Dibenzo(a,h)Anthracene	U	U	U	U	U	U	U	U
Fluoranthene	U	U	8,300	U	10,000	13,000	U	U
Fluorene	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)pyrene	U	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U	U
Phenanthrene	U	U	U	U	U	8,200	U	U
Pyrene	U	U	8,700	U	10,000	13,000	U	U
Sum of 17 Standard PAHs	0	0	17000	0	27400	34200	0	0

All data in ug/kg
U = Not detected
K = Estimated value
Analyses by USEPA
DESA Laboratory

TABLE 4-3B
INDIVIDUAL PAH DATA FROM 0-3 FT CORES

Analyte Name	C3-12 B1FE4	C53-12 B1FG5	C3-23 B1FE5	C53-23 B1FG4	D1-01 B1FE6	D1-12 B1FE7	D1-23 B1FE8	D2-01 B1FE9
1-Methylnaphthalene	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U	U
Anthracene	U	12,000	U	U	1,300	U	U	U
Benzo(a)anthracene	U	11,000	U	U	3,400	U	U	U
Benzo(a)pyrene	U	9,100	U	U	2,900	U	U	U
Benzo(b)fluoranthene	U	12,000	U	U	4,200	U	U	U
Benzo(g,h,i)perylene	U	U	U	U	920	U	U	U
Benzo(k)fluoranthene	U	U	U	U	1,500	U	U	U
Chrysene	U	27,000	U	U	4,800 K	U	U	U
Dibenzo(a,h)Anthracene	U	U	U	U	0 U	U	U	U
Fluoranthene	8,500	12,000	9,300	11,000	6,300	7,300	8,600	U
Fluorene	U	U	U	U	0 U	U	U	U
Indeno(1,2,3-cd)pyrene	U	U	U	U	1,100	U	U	U
Naphthalene	U	U	U	U	0 U	U	U	U
Phenanthrene	U	U	U	6,500	3,100	U	U	U
Pyrene	9,200	13,000	9,900	11,000	6,300	7,900	9,100	U
Sum of 17 Standard PAHs	17700	96100	19200	28500	35820	15200	17700	0

All data in ug/kg
U = Not detected
K = Estimated value
Analyses by USEPA
DESA Laboratory

TABLE 4-3B
INDIVIDUAL PAH DATA FROM 0-3 FT CORES

Analyte Name	D2-12 B1FF0	D2-23 B1FF1	D3-01 B1FF2	D3-12 B1FF3	D3-23 B1FF4	E1-01 B1FF5	E1-12 B1FF6	E1-23 B1FF7
1-Methylnaphthalene	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U	U
Anthracene	U	U	U	U	U	U	U	U
Benzo(a)anthracene	U	U	U	U	U	U	U	8,600
Benzo(a)pyrene	U	U	U	U	U	U	U	U
Benzo(b)fluoranthene	U	U	U	U	U	U	U	8,200
Benzo(g,h,i)perylene	U	U	U	U	U	U	U	U
Benzo(k)fluoranthene	U	U	U	U	U	U	U	U
Chrysene	U	U	U	U	U	U	U	12,000
Dibenzo(a,h)Anthracene	U	U	U	U	U	U	U	U
Fluoranthene	U	10,000	U	U	U	U	U	14,000
Fluorene	U	U	U	U	U	U	U	U
Indeno(1,2,3-cd)pyrene	U	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U	U
Phenanthrene	U	U	U	U	U	U	U	8,700
Pyrene	U	11,000	U	U	U	U	U	15,000
Sum of 17 Standard PAHs	0	21000	0	0	0	0	0	66500

All data in ug/kg
U = Not detected
K = Estimated value
Analyses by USEPA
DESA Laboratory

TABLE 4-3B
INDIVIDUAL PAH DATA FROM 0-3 FT CORES

Analyte Name	E2-01 B1FF8	E2-12 B1FF9	E2-23 B1FG0	E3-01 B1FG1	E3-12 B1FG2	E3-23 B1FG3
1-Methylnaphthalene	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	880	U
Anthracene	U	U	U	U	1,800	U
Benzo(a)anthracene	U	U	7,900	U	5,100	U
Benzo(a)pyrene	U	U	U	U	3,000	U
Benzo(b)fluoranthene	U	U	7,400	U	4,500	U
Benzo(g,h,i)perylene	U	U	U	U	930	U
Benzo(k)fluoranthene	U	U	U	U	1,600	U
Chrysene	U	U	11,000	U	6,200 K	U
Dibenzo(a,h)Anthracene	U	U	U	U	U	U
Fluoranthene	U	U	10,000	U	6,000	13,000
Fluorene	U	U	U	U	U	U
Indeno(1,2,3-cd)pyrene	U	U	U	U	1,000	U
Naphthalene	U	U	U	U	U	U
Phenanthrene	U	U	U	U	2,800	10,000
Pyrene	U	U	11,000	U	6,400	13,000
Sum of 17 Standard PAHs	0	0	47300	0	40210	36000

All data in ug/kg
U = Not detected
K = Estimated value
Analyses by USEPA
DESA Laboratory

TABLE 4-3C
INDIVIDUAL PAH DATA FROM 3-4 FT ARCHIVE CORES

PAH Analyte	A1-34 AF06254	A3-34 AF06255	B2-34 AF06256	C1-34 AF06257	C3-34 AF06258	D2-34 AF06259	E1-34 AF06260	E3-34 AF06261	
1-Methylnaphthalene	78	100	71	83	110	--- U	88	120	
Acenaphthene	98	110	74	76	120	90	75	170	
Acenaphthylene	81	210	110	120	180	150	120	240	
Anthracene	190	270	160	180	250	200	160	330	
Benzo(a)anthracene	440	780	480	580	750	600	500	930	
Benzo(a)pyrene	520	950	560	630	820	620	550	940	
Benzo(b)fluoranthene	650	1,100	710	850	1,100	840	740	1,100	
Benzo(g,h,i)perylene	280	430	250	260	310	230	190	290	
Benzo(k)fluoranthene	220	380	240	300	340	310	240	390	
Chrysene	560	950	590	730	940	760	660	1,100	
Dibenzo(a,h)Anthracene	82	130	80	84	100	--- U	66	110	
Fluoranthene	1,200	1,600	960	1,100	1,400	1,100	950	1,600	
Fluorene	130	160	94	100	160	120	100	190	
Indeno(1,2,3-cd)pyrene	310	500	300	320	390	290	240	370	
Naphthalene	170	210	130	140	220	130	140	180	
Phenanthrene	610	800	510	540	770	590	530	1,000	
Pyrene	1,100	1,600	980	1,100	1,400	1,100	950	1,600	
Sum of 17 Standard PAHs	6,719	10,280	6,299	7,193	9,360	7,130	6,299	10,660	7,162
1-Methylphenanthrene	92	170	100	95	160	150	98	210	
2,3,5-Trimethylnaphthalene	150	170	94	100	150	100	110	160	
2,6-Dimethylnaphthalene	110	150	92	130	150	100	110	150	
2-Methylnaphthalene	96	150	99	120	150	110	120	160	
Benzo(e)pyrene	420	720	440	520	640	520	440	680	
Biphenyl	48	67	48	55	90	--- U	45	--- U	
Perylene	130	220	140	170	200	160	140	220	
Sum of 7 additional PAHs	1046	1647	1013	1190	1540	1140	1063	1580	
Sum of 24 Detected PAHs	**7,765**	**11,927**	**7,312**	**8,383**	**10,900**	**8,270**	**7,362**	**12,240**	
Ratio of 7 add'l to 24 PAH	0.135	0.138	0.139	0.142	0.141	0.138	0.144	0.129	

Data in ug/kg.
U - Not detected
Archived core analyses performed by USEPA Region 2 DESA laboratory and are considered EPA-validated (final).

TABLE 4-4
DDD, DDE, and DDT Concentration Data
Passaic River Pilot Study Samples July 2004

TAMS ID	EPA ID	Date Collected	SDG	PESTICIDES 4,4'-DDD	4,4'-DDE	4,4'-DDT	DDTs Detected	Units	Comment
A1-01	B1FB9	7/12/2004	BIFJ9	20 J	23 J	17 JN	60	ug/kg	
A1-12	B1FC0	7/12/2004	BIFJ9	23 J	40 J	R R	63	ug/kg	Partial rejection
A1-23	B1FC1	7/12/2004	BIFJ9	17 J	40 J	R R	57	ug/kg	Partial rejection
A2-01	B1FC2	7/12/2004	BIFJ9	37 DJ	34 DJ	590 DJ	661	ug/kg	
A2-12	B1FC3	7/12/2004	BIFJ9	20 J	57 J	R R	77	ug/kg	Partial rejection
A2-23	B1FC4	7/12/2004	BIFJ9	52 J	84 J	25 JN	161	ug/kg	
A3-01	B1FC5	7/12/2004	BIFJ9	19 J	19 J	21 JN	59	ug/kg	
A3-12	B1FC6	7/12/2004	BIFJ9	13 J	35 J	21 JN	69	ug/kg	
A3-23	B1FC7	7/12/2004	BIFJ9	42 DJ	54 DJ	35 DJ	131	ug/kg	
B1-01	B1FC8	7/13/2004	BIFJ8	14 J	34 J	23 JN	71	ug/kg	
B1-12	B1FC9	7/13/2004	BIFJ8	18 DJ	32 DJ	28 JN	78	ug/kg	
B1-23	B1FD0	7/13/2004	BIFJ8	75 DU	51 DJ	75 DJ	126	ug/kg	Undiluted Rejected
B2-01	B1FD1	7/13/2004	BIFJ8	100 DUJ	31 DJ	32 DJ	63	ug/kg	Undiluted Rejected
B2-12	B1FD2	7/13/2004	BIFJ8	17 J	57 J	R R	74	ug/kg	Partial rejection
B2-23	B1FD3	7/13/2004	BIFJ8	72 DUJ	R R	56 JN	56	ug/kg	Partial rejection
B3-01	B1FD4	7/13/2004	BIFJ8	89 DUJ	53 J	65 JN	118	ug/kg	Undiluted Rejected
B3-12	B1FD5	7/13/2004	BIFJ8	76 DUJ	56 DJ	190 JN	246	ug/kg	
B3-23	B1FD6	7/13/2004	BIFJ8	67 J	65	80 J	212	ug/kg	
C1-01	B1FD7	7/13/2004	BIFJ8	31 DJ	29 DJ	94 UJ	60	ug/kg	Undiluted Rejected
C1-12	B1FD8	7/13/2004	BIFJ8	27 DJ	47 DJ	80 DUJ	74	ug/kg	Undiluted Rejected
C1-23	B1FD9	7/13/2004	BIFJ8	72 DUJ	69 J	72 DUJ	141	ug/kg	Partial rejection
C2-01	B1FE0	7/13/2004	BIFJ8	100 DUJ	36 DJ	100 DUJ	136	ug/kg	Undiluted Rejected
C2-12	B1FE1	7/13/2004	B1FJ9	R R	50	R R	50	ug/kg	Partial rejection
C2-23	B1FE2	7/13/2004	B1FJ9	69 DJ	130 DJ	140 DJ	339	ug/kg	
C3-01	B1FE3	7/13/2004	BIFJ9	29 J	32 J	28 JN	89	ug/kg	
C3-12	B1FE4	7/13/2004	BIFJ9	44 DJ	90 J	69 JN	203	ug/kg	
C3-23	B1FE5	7/13/2004	BIFJ9	60 DJ	93 DJ	23 JN	176	ug/kg	
C53-23	B1FG4	7/13/2004	BIFJ9	50 DJ	88 DJ	21 JN	159	ug/kg	Duplicate C3-23
C5312	B1FG5	7/13/2004	BIFJ9	58 DJ	71 DJ	280 DJ	409	ug/kg	Duplicate C3-12
C5301	B1FG6	7/13/2004	BIFJ9	35 J	48 J	R R	83	ug/kg	Partial rejection; Dup C3-01
T-17	B1FG7	7/13/2004	B1FJ9	28 J	31 J	120 J	179	ug/kg	
D1-01	B1FE6	7/13/2004	BIFJ9	21 J	27 J	19 JN	67	ug/kg	
D1-12	B1FE7	7/13/2004	B1FJ8	68 DUJ	46 DJ	68 DUJ	46	ug/kg	Undiluted Rejected
D1-23	B1FE8	7/13/2004	B1FJ8	53 J	76 J	44 J	173	ug/kg	

TABLE 4-4
DDD, DDE, and DDT Concentration Data
Passaic River Pilot Study Samples July 2004

TAMS ID	EPA ID	Date Collected	SDG	PESTICIDES 4,4'-DDD	4,4'-DDE	4,4'-DDT	DDTs Detected	Units	Comment
D2-01	B1FE9	7/13/2004	BIFJ8	24 J	24 DJ	41 DJ	89	ug/kg	Partial rejection
D2-12	B1FF0	7/13/2004	BIFJ8	27 J	64 J	R R	91	ug/kg	Partial rejection
D2-23	B1FF1	7/13/2004	BIFJ8	48 J	76 J	47 J	171	ug/kg	
D3-01	B1FF2	7/13/2004	BIFJ8	35 J	43 J	53 JN	131	ug/kg	
D3-12	B1FF3	7/13/2004	B1FJ9	24 J	56 J	R R	80	ug/kg	Partial rejection
D3-23	B1FF4	7/13/2004	B1FJ8	19 DJ	140 DJ	220 DJ	379	ug/kg	
E1-01	B1FF5	7/14/2004	B1FK0	32 J	28 J	43 J	103	ug/kg	
E1-12	B1FF6	7/14/2004	B1FK0	37 J	84 J	R R	121	ug/kg	Partial rejection
E1-23	B1FF7	7/14/2004	B1FK0	30 J	29 J	68 J	127	ug/kg	
E2-01	B1FF8	7/14/2004	B1FK0	87 DUJ	87 DUJ	1100 DJ	1100	ug/kg	Undilute ND Rejected
E2-12	B1FF9	7/14/2004	B1FK0	39 J	90 J	81 JN	210	ug/kg	
E2-23	B1FG0	7/14/2004	B1FK0	61 J	72 J	34 JN	167	ug/kg	
E3-01	B1FG1	7/14/2004	B1FK0	33 J	29 J	52 J	114	ug/kg	
E3-12	B1FG2	7/14/2004	B1FK0	29 J	68 JN	R R	97	ug/kg	Partial rejection
E3-23	B1FG3	7/14/2004	B1FK0	6.6 U	53 JN	R R	53	ug/kg	Partial rejection
			Number of Detections	38	47	35	49		
	Archive Core Samples (3-4 ft interval) Analyzed by DESA								
A134	AF06254	11/2/2004	4110003	23 NJ	16	U	39	ug/kg	
A334	AF06255	11/2/2004	4110003	19 NJ	26	U	45	ug/kg	
B234	AF06256	11/2/2004	4110003	12 NJ	18	U	30	ug/kg	
C134	AF06257	11/2/2004	4110003	12 NJ	22	U	34	ug/kg	
C334	AF06258	11/2/2004	4110003	22 NJ	26	U	48	ug/kg	
D234	AF06259	11/2/2004	4110003	15 NJ	24	U	39	ug/kg	
E134	AF06260	11/2/2004	4110003	11 NJ	23 K	U	34	ug/kg	
E334	AF06261	11/2/2004	4110003	14 NJ	16	U	30	ug/kg	

Archive core samples analyzed by USEPA Region 2 DESA laboratory and data are considered EPA-validated
0-3 ft interval cores analyzed by CLP (Mitkem); data validated by USEPA Region 2
U = Not detected
J, K = Estimated
N = Presumptive evidence of analyte; not all qualitative identification criteria met
D = results from dilution analysis
R = Rejected datum; no usable information about presence or absence of analyte

TABLE 4-5
PCBs as Aroclors Data Summary
Passaic River Pilot Study Core Samples July 2004

TAMS/MPI Field ID	EPA ID	Date Collected	SDG	Arcolor Data							Total PCBs Detected	Comment
				1016	1221	1232	1242	1248	1254	1260		
A1-01	B1FB9	7/12/2004	BIFJ9						230		230	
A1-12	B1FC0	7/12/2004	BIFJ9						380		380	
A1-23	B1FC1	7/12/2004	BIFJ9						310		310	
A2-01	B1FC2	7/12/2004	BIFJ9						470		470	DIL
A2-12	B1FC3	7/12/2004	BIFJ9						410		410	
A2-23	B1FC4	7/12/2004	BIFJ9				2100		950		3050	
A3-01	B1FC5	7/12/2004	BIFJ9						270		270	
A3-12	B1FC6	7/12/2004	BIFJ9				680		290		970	
A3-23	B1FC7	7/12/2004	BIFJ9				1600		880		2480	DIL
B1-01	B1FC8	7/13/2004	BIFJ8									ND
B1-12	B1FC9	7/13/2004	BIFJ8									ND
B1-23	B1FD0	7/13/2004	BIFJ8									ND
B2-01	B1FD1	7/13/2004	BIFJ8									ND
B2-12	B1FD2	7/13/2004	BIFJ8				830				830	
B2-23	B1FD3	7/13/2004	BIFJ8									ND
B3-01	B1FD4	7/13/2004	BIFJ8									ND
B3-12	B1FD5	7/13/2004	BIFJ8									ND
B3-23	B1FD6	7/13/2004	BIFJ8									ND
C1-01	B1FD7	7/13/2004	BIFJ8									ND
C1-12	B1FD8	7/13/2004	BIFJ8									ND
C1-23	B1FD9	7/13/2004	BIFJ8									ND
C2-01	B1FE0	7/13/2004	BIFJ8									ND
C2-12	B1FE1	7/13/2004	BIFJ8						500		500	
C2-23	B1FE2	7/13/2004	BIFJ8				3400		1700		5100	DIL
C3-01	B1FE3	7/13/2004	BIFJ9						360	87	447	
C3-12	B1FE4	7/13/2004	BIFJ9				1800		1000		2800	DIL
C3-23	B1FE5	7/13/2004	BIFJ9				2600		1200		3800	DIL
C53-23	B1FG4	7/13/2004	BIFJ9				2400		1300		3700	DIL
C5312	B1FG5	7/13/2004	BIFJ9				1800		1200		3000	DIL
C5301	B1FG6	7/13/2004	BIFJ9						450		450	
D1-01	B1FE6	7/13/2004	BIFJ9						290		290	
D1-12	B1FE7	7/13/2004	BIFJ9									ND
D1-23	B1FE8	7/13/2004	BIFJ9									ND
D2-01	B1FE9	7/13/2004	BIFJ8									ND
D2-12	B1FF0	7/13/2004	BIFJ8									ND

TABLE 4-5
PCBs as Aroclors Data Summary
Passaic River Pilot Study Core Samples July 2004

TAMS/MPI Field ID	EPA ID	Date Collected	SDG	Arcolor Data 1016	1221	1232	1242	1248	1254	1260	Total PCBs Detected	Comment
D2-23	B1FF1	7/13/2004	BIFJ8				1600				1600	
D3-01	B1FF2	7/13/2004	BIFJ8									ND
D3-12	B1FF3	7/13/2004	BIFJ8						480		480	
D3-23	B1FF4	7/13/2004	BIFJ8									ND
E1-01	B1FF5	7/14/2004	B1FK0						310		310	
E1-12	B1FF6	7/14/2004	B1FK0						620		620	
E1-23	B1FF7	7/14/2004	B1FK0						320		320	
E2-01	B1FF8	7/14/2004	B1FK0									ND
E2-12	B1FF9	7/14/2004	B1FK0						680		680	
E2-23	B1FG0	7/14/2004	B1FK0						810		810	
E3-01	B1FG1	7/14/2004	B1FK0						340		340	
E3-12	B1FG2	7/14/2004	B1FK0						480		480	
E3-23	B1FG3	7/14/2004	B1FK0						420		420	
T-17	B1FG7	7/13/2004	BIFJ8						430		430	
		Number of Detections		0	0	0	10	0	28	1	30	
Archive Core Samples (3-4 ft interval) Analyzed by DESA												
A134	AF06254	11/2/2004	4110003					380			380	
A334	AF06255	11/2/2004	4110003					780			780	
B234	AF06256	11/2/2004	4110003					490			490	
C134	AF06257	11/2/2004	4110003					530			530	
C334	AF06258	11/2/2004	4110003					730			730	
D234	AF06259	11/2/2004	4110003					630			630	
E134	AF06260	11/2/2004	4110003					460			460	
E334	AF06261	11/2/2004	4110003					400			400	
Row Composites - STL analyses												
A01C	A01C	7/12/2004	H4G150114					890	690		1580	
A12C	A12C	7/12/2004	H4G150114					2500	1300		3800	
A23C	A23C	7/12/2004	H4G150114					4000	2100		6100	
B01C	B01C	7/13/2004	H4G150114					1200	720		1920	
B12C	B12C	7/13/2004	H4G150114					2400	1300		3700	
B23C	B23C	7/13/2004	H4G150114					4700	2400		7100	
C01C	C01C	7/13/2004	H4G150114					1100	770		1870	
C12C	C12C	7/13/2004	H4G150114					2300	1200		3500	
C23C	C23C	7/13/2004	H4G150114					4800	2500		7300	
D01C	D01C	7/13/2004	H4G150114					1100	710		1810	

TABLE 4-5
PCBs as Aroclors Data Summary
Passaic River Pilot Study Core Samples July 2004

TAMS/MPI Field ID	EPA ID	Date Collected	SDG	Arcolor Data							Total PCBs Detected	Comment
				1016	1221	1232	1242	1248	1254	1260		
D12C	D12C	7/13/2004	H4G150114					2200	1200		3400	
D23C	D23C	7/13/2004	H4G150114					4800	2600		7400	
E01C	E01C	7/14/2004	H4G160116					580	520		1100	
E12C	E12C	7/14/2004	H4G160116					1400	930		2330	
E23C	E23C	7/14/2004	H4G160116					3100	2000		5100	
E523C	E523C	7/14/2004	H4G160116					2800	1700		4500	Dup E23C
T17	T17	7/13/2004	H4G160116					660	560		1220	
STL - 3-4 ft Interval Composites												
A134C	A134C	10/29/2004	H4K020194					7100		5100	12200	
B134C	B134C	10/29/2004	H4K020194					6400	3900		10300	
C134C	C134C	10/29/2004	H4K020194					5200	3200		8400	
D134C	D134C	10/29/2004	H4K020194					5500	3200		8700	
E134C	E134C	10/29/2004	H4K020194					5300	3100		8400	

All data in ug/kg dry wt basis
Blank space indicates analyte not detected
ND = Not detected
DIL = result from dilution analysis
CLP (Mitkem) data are validated
USEPA DESA data are considered EPA validated
STL data not validated and should be considered preliminary

TABLE 4-6
Total PCBs as Sum of Detected Congener Data
Passaic River Pilot Study July 2004Cores

FIELD ID (TAMS/MPI)	Total Detected Congeners	Congener Units [1]	Total Aroclor	Aroclor Units	RPD	Ratio Cong: Aroclor
A01C	1453	ug/kg	1580	ug/kg	8.4%	0.92
A12C	3535	ug/kg	3800	ug/kg	7.2%	0.93
A23C	5511	ug/kg	6100	ug/kg	10.1%	0.90
B01C	1995	ug/kg	1920	ug/kg	3.9%	1.04
B12C	3651	ug/kg	3700	ug/kg	1.3%	0.99
B23C	6917	ug/kg	7100	ug/kg	2.6%	0.97
C01C	1590	ug/kg	1870	ug/kg	16.2%	0.85
C12C	3939	ug/kg	3500	ug/kg	11.8%	1.13
C23C	7262	ug/kg	7300	ug/kg	0.5%	0.99
D01C	1654	ug/kg	1810	ug/kg	9.0%	0.91
D12C	3915	ug/kg	3400	ug/kg	14.1%	1.15
D23C	7826	ug/kg	7400	ug/kg	5.6%	1.06
E01C	1846	ug/kg	1100	ug/kg	50.6%	1.68
E12C	3139	ug/kg	2330	ug/kg	29.6%	1.35
E23C	7192	ug/kg	5100	ug/kg	34.0%	1.41
E523C (duplicate)	7695	ug/kg	4500	ug/kg	52.4%	1.71
E23C Avg *	7443	ug/kg	4800	ug/kg	43.2%	1.55
T17	963	ug/kg	1220	ug/kg	23.5%	0.79
Row A 3-4 ft	10674	ug/kg	12200	ug/kg	13.3%	0.87
Row B 3-4 ft	10305	ug/kg	10300	ug/kg	0.0%	1.00
Row C 3-4 ft	9696	ug/kg	8400	ug/kg	14.3%	1.15
Row D 3-4 ft	10697	ug/kg	8700	ug/kg	20.6%	1.23
Row E 3-4 ft	8916	ug/kg	8400	ug/kg	6.0%	1.06
Median [2]	3939	ug/kg	3800	ug/kg	10.1%	1.00
Average [2]	5378	ug/kg	5092	ug/kg	13.9%	1.073

Notes
1 Lab-reported as ng/g. Converted to ug/kg for consistency.
2 Statistics (median and average) calculated using the average of E23C and E523C (E23C Avg).
Aroclor analysis of Row composites (3-4 ft interval) by USEPA DESA laboratory.
All other aroclor anlayses by CLP laboratory (Mitkem).
PCB congener data (sum of detected congeners) by STL, Knoxville.

TABLE 4-7
Herbicides (2,4-D and 2,4,5-T) Data
Passaic River Pilot Study July 2004 Core Samples

FIELD ID (TAMS/MPI)	EPA ID	Date Collected	EPA SDG	STL SDG	HERBICIDES		Units	Comment
					2,4-D	2,4,5-T		
A1-01	B1FB9	7/12/2004	BIFJ9	101319	U	U	ug/kg	
A1-12	B1FC0	7/12/2004	BIFJ9	101319	U	U	ug/kg	
A1-23	B1FC1	7/12/2004	BIFJ9	101319	U	U	ug/kg	
A2-01	B1FC2	7/12/2004	BIFJ9	101319	U	U	ug/kg	
A2-12	B1FC3	7/12/2004	BIFJ9	101319	U	U	ug/kg	
A2-23	B1FC4	7/12/2004	BIFJ9	101319	U	U	ug/kg	
A3-01	B1FC5	7/12/2004	BIFJ9	101319	U	U	ug/kg	
A3-12	B1FC6	7/12/2004	BIFJ9	101319	U	U	ug/kg	
A3-23	B1FC7	7/12/2004	BIFJ9	101319	U	U	ug/kg	
B1-01	B1FC8	7/13/2004	BIFJ8	101319	U	U	ug/kg	
B1-12	B1FC9	7/13/2004	BIFJ8	101319	U	U	ug/kg	
B1-23	B1FD0	7/13/2004	BIFJ8	101319	U	U	ug/kg	
B2-01	B1FD1	7/13/2004	BIFJ8	101319	U	U	ug/kg	
B2-12	B1FD2	7/13/2004	BIFJ8	101319	U	U	ug/kg	
B2-23	B1FD3	7/13/2004	BIFJ8	101319	U	U	ug/kg	
B3-01	B1FD4	7/13/2004	BIFJ8	101319	U	U	ug/kg	
B3-12	B1FD5	7/13/2004	BIFJ8	101319	U	U	ug/kg	
B3-23	B1FD6	7/13/2004	BIFJ8	101319	U	U	ug/kg	
C1-01	B1FD7	7/13/2004	BIFJ8	101324	U	U	ug/kg	
C1-12	B1FD8	7/13/2004	BIFJ8	101324	U	U	ug/kg	
C1-23	B1FD9	7/13/2004	BIFJ8	101324	U	U	ug/kg	
C2-01	B1FE0	7/13/2004	BIFJ8	101319	U	U	ug/kg	
C2-12	B1FE1	7/13/2004	B1FJ9	101319	U	U	ug/kg	
C2-23	B1FE2	7/13/2004	B1FJ9	101324	U	U	ug/kg	
C3-01	B1FE3	7/13/2004	BIFJ9	101324	U	U	ug/kg	
C3-12	B1FE4	7/13/2004	BIFJ9	101324	320 P	U	ug/kg	
C3-23	B1FE5	7/13/2004	BIFJ9	101324	U	U	ug/kg	
C53-23	B1FG4	7/13/2004	BIFJ9	101324	260	U	ug/kg	Duplicate of C3-23
C53-12	B1FG5	7/13/2004	BIFJ9	101324	U	U	ug/kg	Duplicate of C3-12
C53-01	B1FG6	7/13/2004	BIFJ9	101324	U	U	ug/kg	Duplicate of C3-01
T-17	B1FG7	7/13/2004	B1FJ9	101324	U	U	ug/kg	
D1-01	B1FE6	7/13/2004	BIFJ9	101324	U	U	ug/kg	
D1-12	B1FE7	7/13/2004	B1FJ8	101324	U	U	ug/kg	
D1-23	B1FE8	7/13/2004	B1FJ8	101324	U	U	ug/kg	

TABLE 4-7
Herbicides (2,4-D and 2,4,5-T) Data
Passaic River Pilot Study July 2004 Core Samples

FIELD ID (TAMS/MPI)	EPA ID	Date Collected	EPA SDG	STL SDG	HERBICIDES 2,4-D	HERBICIDES 2,4,5-T	Units	Comment
D2-01	B1FE9	7/13/2004	BIFJ8	101324	U	U	ug/kg	
D2-12	B1FF0	7/13/2004	BIFJ8	101324	U	U	ug/kg	
D2-23	B1FF1	7/13/2004	BIFJ8	101324	230 P	U	ug/kg	
D3-01	B1FF2	7/13/2004	BIFJ8	101324	U	U	ug/kg	
D3-12	B1FF3	7/13/2004	B1FJ9	101324	340 P	U	ug/kg	
D3-23	B1FF4	7/13/2004	B1FJ8	101324	750	U	ug/kg	
E1-01	B1FF5	7/14/2004	B1FK0	101328	U	U	ug/kg	
E1-12	B1FF6	7/14/2004	B1FK0	101328	U	67	ug/kg	
E1-23	B1FF7	7/14/2004	B1FK0	101328	U	U	ug/kg	
E2-01	B1FF8	7/14/2004	B1FK0	101328	U	U	ug/kg	
E2-12	B1FF9	7/14/2004	B1FK0	101328	U	U	ug/kg	
E2-23	B1FG0	7/14/2004	B1FK0	101328	U	40 P	ug/kg	
E3-01	B1FG1	7/14/2004	B1FK0	101328	U	U	ug/kg	
E3-12	B1FG2	7/14/2004	B1FK0	101328	U	U	ug/kg	
E3-23	B1FG3	7/14/2004	B1FK0	101328	U	49 P	ug/kg	
Number of Detections					5	3		
Archive core samples (3-4 ft interval)								
A134	A134	11/1/2004	NA	103483	U	U	ug/kg	
A334	A334	11/1/2004	NA	103483	U	U	ug/kg	
B234	B234	11/1/2004	NA	103483	U	U	ug/kg	
C134	C134	11/1/2004	NA	103483	U	U	ug/kg	
C334	C334	11/1/2004	NA	103483	U	U	ug/kg	
D234	D234	11/1/2004	NA	103483	U	U	ug/kg	
E134	E134	11/1/2004	NA	103483	U	U	ug/kg	
E334	E334	11/1/2004	NA	103483	U	U	ug/kg	

Blank cell (associated with 'U' qualifier) indicates analyte not detected.
P qualifier indicate laboratory precision criteria not met.
Quantitation limit for 2,4-D typically about 200 ug/kg; limit for 2,4,5-T typically about 40 ug/kg.
DATA NOT VALIDATED OR REVIEWED

TABLE 4-8
Total TCDD Concentration Data
Passaic River Pilot Study July 2004 Cores

TAMS (Field) ID	STL (Lab) ID	Sample Date	Method	2,3,7,8-TCDD	Total TCDD	Qual	Units	Comment
A01C	H4G150114-001	7/12/2004	1613B	250	380	EMPC	ng/kg	
A12C	H4G150114-002	7/12/2004	1613B	220	350	EMPC	ng/kg	
A23C	H4G150114-003	7/12/2004	1613B	1000	1300	EMPC	ng/kg	
B01C	H4G150114-004	7/13/2004	1613B	380	580	EMPC	ng/kg	
B12C	H4G150114-005	7/13/2004	1613B	520	720	EMPC	ng/kg	
B23C	H4G150114-006	7/13/2004	1613B	1000	1300	EMPC	ng/kg	
C01C	H4G150114-008	7/13/2004	1613B	560	630	EMPC	ng/kg	
C12C	H4G150114-009	7/13/2004	1613B	230	290	EMPC	ng/kg	
C23C	H4G150114-010	7/13/2004	1613B	300	370	EMPC	ng/kg	
D01C	H4G150114-011	7/13/2004	1613B	290	420	EMPC	ng/kg	
D12C	H4G150114-012	7/13/2004	1613B	400	590	EMPC	ng/kg	
D23C	H4G150114-013	7/13/2004	1613B	1200	1500	EMPC	ng/kg	
E01C	H4G160116-003	7/14/2004	1613B	200	290	EMPC	ng/kg	
E12C	H4G160116-004	7/14/2004	1613B	500	690	EMPC	ng/kg	
E23C	H4G160116-005	7/14/2004	1613B	1600	1900	EMPC	ng/kg	
523C	H4G160116-001	7/14/2004	1613B	3400	3800	EMPC	ng/kg	Dup E23C
T17	H4G150114-007	7/13/2004	1613B	130	210	EMPC	ng/kg	Vendor Comp
B1FG8	H4G160116-002	7/14/2004	1613B	ND	ND	U	pg/L	Field Blank
Archive (3-4 ft) Row Composite Core Samples								
A134C	H4K020194-001	10/29/2004	1613B	1800	1800		ng/kg	A1, A2, A3
B134C	H4K020194-002	10/29/2004	1613B	2000	2000	EMPC	ng/kg	B1, B2, B3
C134C	H4K020194-003	10/29/2004	1613B	2500	2500		ng/kg	C1, C2, C3
D134C	H4K020194-004	10/29/2004	1613B	1400	1400	EMPC	ng/kg	D1, D2, D3
E134C	H4K020194-005	10/29/2004	1613B	1700	1700	EMPC	ng/kg	E1, E2, E3

EMPC = Estimated maximum possible concentration; data do not meet all qualitative identification criteria.
U, ND = Not detected
All analyses by STL - Knoxville, TN
Data are not validated and should be considered preliminary
2,3,7,8-TCDD shown is only for that specific isomer, as reported by STL. It is not the TEQ.

Table 4-9
Mercury and Lead Data
Passaic River Pilot Study July 2004 Cores

Sample ID		Mercury		Lead		
TAMS ID	EPA ID	Result	Q	Result	Q	Units
A1-01	B1FB9	3.5	J	270	J	mg/Kg
A1-12	B1FC0	2.6	J	360	J	mg/Kg
A1-23	B1FC1	2.8	J	450	J	mg/Kg
A2-01	B1FC2	1.7	J	250	J	mg/Kg
A2-12	B1FC3	4.4	J	520	J	mg/Kg
A2-23	B1FC4	4.4		720		mg/Kg
A3-01	B1FC5	1.9	J	290	J	mg/Kg
A3-12	B1FC6	5.3	J	550	J	mg/Kg
A3-23	B1FC7	4.5		630		mg/Kg
B1-01	B1FC8	2.2	J	260	J	mg/Kg
B1-12	B1FC9	2.8	J	320	J	mg/Kg
B1-23	B1FD0	4.1	J	520	J	mg/Kg
B2-01	B1FD1	1.9	J	210	J	mg/Kg
B2-12	B1FD2	5.5	J	430	J	mg/Kg
B2-23	B1FD3	5.4	J	610	J	mg/Kg
B3-01	B1FD4	2.6	J	310	J	mg/Kg
B3-12	B1FD5	4.7	J	560	J	mg/Kg
B3-23	B1FD6	4.7		580		mg/Kg
C1-01	B1FD7	1.8	J	310	J	mg/Kg
C1-12	B1FD8	3.5	J	370	J	mg/Kg
C1-23	B1FD9	5.0	J	620	J	mg/Kg
C2-01	B1FE0	2.2	J	240	J	mg/Kg
C2-12	B1FE1	3.6	J	420	J	mg/Kg
C2-23	B1FE2	4.3	J	680	J	mg/Kg
C3-01	B1FE3	2.7	J	280	J	mg/Kg
C3-12	B1FE4	4.0	J	520	J	mg/Kg
C3-23	B1FE5	5.7		580		mg/Kg
C53-01	B1FG6	2.6	J	320	J	mg/Kg
C53-12	B1FG5	4.3	J	520	J	mg/Kg
C53-23	B1FG4	3.8		590		mg/Kg
D1-01	B1FE6	2.3	J	300	J	mg/Kg
D1-12	B1FE7	3.1	J	450	J	mg/Kg
D1-23	B1FE8	5.3	J	720	J	mg/Kg
D2-01	B1FE9	2.0	J	290	J	mg/Kg
D2-12	B1FF0	4.6	J	430	J	mg/Kg
D2-23	B1FF1	5.2	J	660	J	mg/Kg
D3-01	B1FF2	2.2	J	330	J	mg/Kg
D3-12	B1FF3	4.4	J	440	J	mg/Kg
D3-23	B1FF4	12	J	660	J	mg/Kg
E1-01	B1FF5	2.9	J	280	J	mg/Kg
E1-12	B1FF6	4.0	J	420	J	mg/Kg
E1-23	B1FF7	4.9	J	1,100	J	mg/Kg
E2-01	B1FF8	2.1	J	290	J	mg/Kg
E2-12	B1FF9	5.4	J	510	J	mg/Kg
E2-23	B1FG0	4.7		580		mg/Kg
E3-01	B1FG1	2.1	J	300	J	mg/Kg
E3-12	B1FG2	4.5	J	470	J	mg/Kg
E3-23	B1FG3	4.1		600		mg/Kg
FB01	B1FG8	---	0.20U	---	10U	ug/L
T17	B1FG7	1.4	J	210	J	mg/Kg

Table 4-9
Mercury and Lead Data
Passaic River Pilot Study July 2004 Cores

Sample ID		Mercury		Lead		
TAMS ID	EPA ID	Result	Q	Result	Q	Units
Archive Core Samples (3-4 ft interval)						
A134	AF06255	6.9		850		mg/Kg
A334	AF06255	7.7		610		mg/Kg
B234	AF06256	7.8		580		mg/Kg
C134	AF06257	7.1		630		mg/Kg
C334	AF06258	5.8		590		mg/Kg
D234	AF06259	6.9		570		mg/Kg
E134	AF06260	6.7		680		mg/Kg
E334	AF06261	5.4		540		mg/Kg

J = Estimated value
All samples analyzed by USEPA Region 2 DESA laboratory.
Data are considered EPA-validated.

TABLE 4-10
TOC Concentration Data
Passaic River Pilot Study July 2004 Cores

TAMS ID	EPA ID	Parameter	Value	Qualifier	Units	Sample Date	Comment
A1-01	B1FB9	TOC	58,000		mg/Kg	7/14/2004	
A1-12	B1FC0	TOC	56,000		mg/Kg	7/14/2004	
A1-23	B1FC1	TOC	54,000		mg/Kg	7/14/2004	
A2-01	B1FC2	TOC	60,000		mg/Kg	7/14/2004	
A2-12	B1FC3	TOC	55,000		mg/Kg	7/14/2004	
A2-23	B1FC4	TOC	57,000		mg/Kg	7/14/2004	
A3-01	B1FC5	TOC	49,000		mg/Kg	7/14/2004	
A3-12	B1FC6	TOC	49,000		mg/Kg	7/14/2004	
A3-23	B1FC7	TOC	55,000		mg/Kg	7/14/2004	
B1-01	B1FC8	TOC	61,000		mg/Kg	7/14/2004	
B1-12	B1FC9	TOC	54,000		mg/Kg	7/14/2004	
B1-23	B1FD0	TOC	81,000		mg/Kg	7/14/2004	
B2-01	B1FD1	TOC	52,000		mg/Kg	7/14/2004	
B2-12	B1FD2	TOC	46,000		mg/Kg	7/14/2004	
B2-23	B1FD3	TOC	52,000		mg/Kg	7/14/2004	
B3-01	B1FD4	TOC	50,000		mg/Kg	7/14/2004	
B3-12	B1FD5	TOC	51,000		mg/Kg	7/14/2004	
B3-13	B1FD6	TOC	60,000		mg/Kg	7/14/2004	
C1-01	B1FD7	TOC	58,000		mg/Kg	7/14/2004	
C1-12	B1FD8	TOC	50,000		mg/Kg	7/14/2004	
C1-23	B1FD9	TOC	57,000		mg/Kg	7/14/2004	
C2-01	B1FE0	TOC	59,000		mg/Kg	7/14/2004	
C2-12	B1FE1	TOC	51,000		mg/Kg	7/14/2004	
C2-23	B1FE2	TOC	63,000		mg/Kg	7/14/2004	
C3-01	B1FE3	TOC	53,000		mg/Kg	7/14/2004	
C3-12	B1FE4	TOC	50,000		mg/Kg	7/14/2004	
C3-23	B1FE5	TOC	58,000		mg/Kg	7/14/2004	
C53-01	B1FG6	TOC	52,000		mg/Kg	7/14/2004	Duplicate C3-01
C53-12	B1FG5	TOC	51,000		mg/Kg	7/14/2004	Duplicate C3-12
C53-23	B1FG4	TOC	49,000		mg/Kg	7/14/2004	Duplicate C3-23
D1-01	B1FE6	TOC	57,000		mg/Kg	7/15/2004	
D1-12	B1FE7	TOC	55,000		mg/Kg	7/15/2004	
D1-23	B1FE8	TOC	59,000		mg/Kg	7/15/2004	
D2-01	B1FE9	TOC	70,000		mg/Kg	7/15/2004	
D2-12	B1FF0	TOC	63,000		mg/Kg	7/15/2004	
D2-23	B1FF1	TOC	61,000		mg/Kg	7/15/2004	
D3-01	B1FF2	TOC	54,000		mg/Kg	7/15/2004	
D3-12	B1FF3	TOC	60,000		mg/Kg	7/15/2004	
D3-23	B1FF4	TOC	73,000		mg/Kg	7/15/2004	
E1-01	B1FF5	TOC	63,000		mg/Kg	7/15/2004	
E1-12	B1FF6	TOC	56,000		mg/Kg	7/15/2004	
E1-23	B1FF7	TOC	63,000		mg/Kg	7/15/2004	
E2-01	B1FF8	TOC	51,000		mg/Kg	7/16/2004	
E2-12	B1FF9	TOC	50,000		mg/Kg	7/16/2004	
E2-23	B1FG0	TOC	45,000		mg/Kg	7/16/2004	
E3-01	B1FG1	TOC	52,000		mg/Kg	7/16/2004	
E3-12	B1FG2	TOC	60,000		mg/Kg	7/16/2004	
E3-23	B1FG3	TOC	51,000		mg/Kg	7/16/2004	
T-17	B1FG7	TOC	59,000		mg/Kg	7/14/2004	

TABLE 4-10
TOC Concentration Data
Passaic River Pilot Study July 2004 Cores

TAMS ID	EPA ID	Parameter	Value	Qualifier	Units	Sample Date	Comment
Archive cores (3-4 ft interval)							
A134	AF06254	TOC	68,000		mg/Kg	10/19/2005	
A334	AF06255	TOC	57,000		mg/Kg	10/19/2005	
B234	AF06256	TOC	56,000		mg/Kg	10/19/2005	
C134	AF06257	TOC	50,000		mg/Kg	10/19/2005	
C334	AF06258	TOC	51,000		mg/Kg	10/19/2005	
D234	AF06259	TOC	48,000		mg/Kg	10/19/2005	
E134	AF06260	TOC	52,000		mg/Kg	10/19/2005	
E334	AF06261	TOC	46,000		mg/Kg	10/19/2005	
		Avg TOC	53,000		mg/Kg		
		Std Dev	6652		mg/Kg		

All TOC analyses by USEPA Region 2 DESA laboratory and are considered EPA-validated.

TABLE 4-11A
Field Duplicate C3-01
Passaic River Pilot Study July 2004 Cores

	C3-01			C53-01 (Dup C3-01)			
Analyte	**Value**	**Qual**	**Unit**	**Value**	**Qual**	**Unit**	**RPD**
Aluminum	11,000	J	mg/kg	12,000	J	mg/kg	8.7%
Antimony	---	UJ	mg/kg	---	UJ	mg/kg	NC
Arsenic	10	J	mg/kg	12	J	mg/kg	18.2%
Barium	140	J	mg/kg	140	J	mg/kg	0.0%
Beryllium	---	UJ	mg/kg	---	UJ	mg/kg	NC
Cadmium	4.5	J	mg/kg	5.0	J	mg/kg	10.5%
Calcium	5,100	J	mg/kg	5,300	J	mg/kg	3.8%
Chromium	130	J	mg/kg	150	J	mg/kg	14.3%
Cobalt	---	UJ	mg/kg	---	UJ	mg/kg	NC
Copper	190	J	mg/kg	210	J	mg/kg	10.0%
Iron	25,000	J	mg/kg	28,000	J	mg/kg	11.3%
Lead	280	J	mg/kg	320	J	mg/kg	13.3%
Magnesium	5,900	J	mg/kg	6,300	J	mg/kg	6.6%
Manganese	400	J	mg/kg	450	J	mg/kg	11.8%
Mercury	2.7	J	mg/kg	2.6	J	mg/kg	3.8%
Nickel	34	J	mg/kg	37	J	mg/kg	8.5%
Potassium	2,000	J	mg/kg	1,900	J	mg/kg	5.1%
Selenium	---	UJ	mg/kg	---	UJ	mg/kg	NC
Silver	4.7	J	mg/kg	5.4	J	mg/kg	13.9%
Sodium	7,900	J	mg/kg	7,900	J	mg/kg	0.0%
Thallium	---	UJ	mg/kg	---	UJ	mg/kg	NC
Vanadium	33	J	mg/kg	37	J	mg/kg	11.4%
Zinc	490	J	mg/kg	560	J	mg/kg	13.3%
Total Organic Carbon	53,000		mg/kg	52,000		mg/kg	1.9%
4,4'-DDD	29	J	ug/kg	35	J	ug/kg	18.8%
4,4'-DDE	32	J	ug/kg	48	J	ug/kg	40.0%
4,4'-DDT	28	JN	ug/kg		R	ug/kg	NC
PAH (total)	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1016	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1221	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1232	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1242	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1248	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1254	360		ug/kg	450	P	ug/kg	22.2%
Aroclor 1260	87	U	ug/kg	---	U	ug/kg	NC
Total PCBs (Aroclors)	447		ug/kg	450		ug/kg	0.7%

U = Not Detected
J = Estimated Value
RPD = Relative Percent Difference
NC = Not Calculable (Analyte not detected in one or both analyses)
R = Rejected datum; no usable information on presence or absence of analyte
P = precision criteria (agreement between both GC columns) not met

TABLE 4-11B
Field Duplicate C3-12
Passaic River Pilot Study July 2004 Cores

	C3-12			C53-12			
Analyte	**Value**	**Qual**	**Unit**	**Value**	**Qual**	**Unit**	**RPD**
Aluminum	12,000	J	mg/kg	12,000	J	mg/kg	0.0%
Antimony	---	UJ	mg/kg	---	UJ	mg/kg	
Arsenic	10	J	mg/kg	10	J	mg/kg	0.0%
Barium	180	J	mg/kg	180	J	mg/kg	0.0%
Beryllium	---	UJ	mg/kg	---	UJ	mg/kg	
Cadmium	8.7	J	mg/kg	8.2	J	mg/kg	5.9%
Calcium	5,100	J	mg/kg	5,200	J	mg/kg	1.9%
Chromium	250	J	mg/kg	230	J	mg/kg	8.3%
Cobalt	12	J	mg/kg	13	J	mg/kg	8.0%
Copper	310	J	mg/kg	290	J	mg/kg	6.7%
Iron	25,000	J	mg/kg	25,000	J	mg/kg	0.0%
Lead	520	J	mg/kg	520	J	mg/kg	0.0%
Magnesium	5,200	J	mg/kg	5,300	J	mg/kg	1.9%
Manganese	350	J	mg/kg	340	J	mg/kg	2.9%
Mercury	4.0	J	mg/kg	4.3	J	mg/kg	7.2%
Nickel	57	J	mg/kg	54	J	mg/kg	5.4%
Potassium	1,800	J	mg/kg	1,800	J	mg/kg	0.0%
Selenium	---	UJ	mg/kg	---	UJ	mg/kg	
Silver	7.3	J	mg/kg	6.3	J	mg/kg	14.7%
Sodium	6,400	J	mg/kg	5,900	J	mg/kg	8.1%
Thallium	---	UJ	mg/kg	---	UJ	mg/kg	
Vanadium	44	J	mg/kg	46	J	mg/kg	4.4%
Zinc	790	J	mg/kg	800	J	mg/kg	1.3%
Total Organic Carbon	50,000		mg/kg	51,000		mg/kg	2.0%
4,4'-DDD	44	DJ	ug/kg	58	DJ	ug/kg	27.5%
4,4'-DDE	90	J	ug/kg	71	DJ	ug/kg	23.6%
4,4'-DDT	69	JN	ug/kg	280	DJ	ug/kg	120.9%
PAHs (total)	17,700		ug/kg	96,100		ug/kg	137.8%
Aroclor 1016	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1221	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1232	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1242	1800	DP	ug/kg	1800	DP	ug/kg	0.0%
Aroclor 1248	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1254	1000	DP	ug/kg	1200	DP	ug/kg	18.2%
Aroclor 1260	---	U	ug/kg	---	U	ug/kg	NC
Total PCBs (Aroclors)	2800		ug/kg	3000		ug/kg	6.9%

U = Not Detected
J = Estimated Value
RPD = Relative Percent Difference
NC = Not Calculable (Analyte not detected in one or both analyses)
N = Presumptive evidence that analyte is present (not all identification criteria met)
P = precision criteria (agreement between both GC columns) not met
D = result from dilution analysis.

TABLE 4-11C
Field Duplicate C3-23 Data
Passaic River Pilot Study July 2004 Cores

	C3-23			C53-23			
Analyte	**Value**	**Qual**	**Unit**	**Value**	**Qual**	**Unit**	**RPD**
Aluminum	13,000		mg/kg	13,000		mg/kg	0.0%
Antimony	---	U	mg/kg	---	U	mg/kg	
Arsenic	17		mg/kg	15		mg/kg	12.5%
Barium	200		mg/kg	200		mg/kg	0.0%
Beryllium	---	U	mg/kg	---	U	mg/kg	
Cadmium	11		mg/kg	11		mg/kg	0.0%
Calcium	5,700		mg/kg	5,900		mg/kg	3.4%
Chromium	320		mg/kg	280		mg/kg	13.3%
Cobalt	11		mg/kg	12		mg/kg	8.7%
Copper	330		mg/kg	300		mg/kg	9.5%
Iron	24,000		mg/kg	25,000		mg/kg	4.1%
Lead	580		mg/kg	590		mg/kg	1.7%
Magnesium	5,100		mg/kg	5,300		mg/kg	3.8%
Manganese	380		mg/kg	380		mg/kg	0.0%
Mercury	5.7		mg/kg	3.8		mg/kg	40.0%
Nickel	56		mg/kg	54		mg/kg	3.6%
Potassium	1,700		mg/kg	1,600		mg/kg	6.1%
Selenium	---	U	mg/kg	---	U	mg/kg	
Silver	7.2		mg/kg	7.0		mg/kg	2.8%
Sodium	4,800		mg/kg	4,700		mg/kg	2.1%
Thallium	---	U	mg/kg	---	U	mg/kg	
Vanadium	52		mg/kg	51		mg/kg	1.9%
Zinc	860		mg/kg	850		mg/kg	1.2%
Total Organic Carbon	58,000		mg/kg	49,000		mg/kg	16.8%
4,4'-DDD	60	DJ	ug/kg	50	DJ	ug/kg	18.2%
4,4'-DDE	93	DJ	ug/kg	88	DJ	ug/kg	5.5%
4,4'-DDT	23	JN	ug/kg	21	JN	ug/kg	9.1%
PAHs (total)	19,200		ug/kg	28,500		ug/kg	39.0%
Aroclor 1016	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1221	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1232	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1242	2,600	DP	ug/kg	2,400	DP	ug/kg	8.0%
Aroclor 1248	---	U	ug/kg	---	U	ug/kg	NC
Aroclor 1254	1,200	DP	ug/kg	1,300	DP	ug/kg	8.0%
Aroclor 1260	---	U	ug/kg	---	U	ug/kg	NC
Total PCBs (Aroclors)	3800		ug/kg	3700		ug/kg	2.7%

U = Not Detected
J = Estimated Value
RPD = Relative Percent Difference
NC = Not Calculable (Analyte not detected in one or both analyses)
N = Presumptive evidence that analyte is present (not all identification criteria met)
P = precision criteria (agreement between both GC columns) not met
D = result from dilution analysis.

TABLE 4-11D
Field Duplicate Data - E23C
Passaic River Pilot Study July 2004 Cores

	E23C			523C			
Analyte	**Value**	**Qual**	**Unit**	**Value**	**Qual**	**Unit**	**RPD**
Total TCDD	1600	EMPC	ng/kg	3400	EMPC	ng/kg	72.0%
2,3,7,8-TCDD	1900	EMPC	ng/kg	3800	EMPC	ng/kg	66.7%
Aroclor 1248	3100		ug/kg	2800		ug/kg	10.2%
Aroclor 1254	2000		ug/kg	1700		ug/kg	16.2%
Total Aroclors	5100		ug/kg	4500		ug/kg	12.5%
PCB Congeners (total)	7192		ug/kg	7695		ug/kg	6.7%

All analyses by STL - Knoxville, TN
U = Not Detected
J = Estimated Value
RPD = Relative Percent Difference
NC = Not Calculable (Analyte not detected in one or both analyses)
N = Presumptive evidence that analyte is present (not all identification criteria met)
P = precision criteria (agreement between both GC columns) not met
D = result from dilution analysis.
EMPC = Estimated maximum possible concentration; data do not meet all qualitative identification criteria.

TABLE 4-12
Geotechnical Data
Passaic River July 2004 Core Samples (0-3 ft)

Field ID	Lab ID	EPA ID	Sample Date	Solids, Percent IN623	Moisture Content D2216	Liquid Limit D4318 LL	Plasticity Index D4318 Pl	Plastic Limit D4318 PL	Specific Gravity D854
A1-01	579185	B1FB9	07/12/2004	32.6 %	185.0 %	73	27	46	2.16
A1-12	579186	B1FC0	07/12/2004	42.4 %	137.8 %	74	30	44	2.06
A1-23	579187	B1FC1	07/12/2004	47.8 %	111.9 %	63	16	47	2.44
A2-01	579188	B1FC2	07/12/2004	35.0 %	170.0 %	78	35	43	2.56
A2-12	579189	B1FC3	07/12/2004	41.3 %	138.6 %	85	43	42	2.32
A2-23	579190	B1FC4	07/12/2004	50.4 %	103.8 %	64	26	38	2.37
A3-01	579191	B1FC5	07/12/2004	39.3 %	143.2 %	93	47	46	2.48
A3-12	579192	B1FC6	07/12/2004	41.8 %	133.6 %	89	46	43	2.32
A3-23	579193	B1FC7	07/12/2004	48.0 %	105.7 %	64	19	45	2.32
B1-01	579194	B1FC8	07/13/2004	35.9 %	163.3 %	75	NP	NUV	2.39
B1-12	579195	B1FC9	07/13/2004	44.8 %	143.8 %	74	18	56	2.38
B1-23	579196	B1FD0	07/13/2004	44.5 %	115.6 %	65	24	41	2.41
B2-01	579197	B1FD1	07/13/2004	33.9 %	170.8 %	116	63	53	2.42
B2-12	579198	B1FD2	07/13/2004	40.4 %	146.1 %	71	27	44	2.48
B2-23	579199	B1FD3	07/13/2004	43.9 %	113.5 %	66	25	41	2.39
B3-01	579200	B1FD4	07/13/2004	37.3 %	159.8 %	66	26	40	2.44
B3-12	579201	B1FD5	07/13/2004	39.6 %	128.3 %	53	NP	NUV	2.45
B3-23	579202	B1FD6	07/13/2004	53.2 %	93.8 %	53	17	36	2.45
C1-01	579238	B1FD7	07/13/2004	37.6 %	151.2 %	66	22	44	2.31
C1-12	579239	B1FD8	07/13/2004	41.1 %	137.9 %	67	27	39	2.32
C1-23	579240	B1FD9	07/13/2004	46.1 %	120.0 %	71	26	44	2.28
C2-01	579203	B1FE0	07/13/2004	36.5 %	174.9 %	105	49	56	2.40
C2-12	579204	B1FE1	07/13/2004	53.0 %	102.6 %	50	14	36	2.51
C2-23	579228	B1FE2	07/13/2004	47.7 %	105.8 %	60	20	40	2.24
C3-01	579229	B1FE3	07/13/2004	37.0 %	160.6 %	65	24	41	2.25
C3-12	579230	B1FE4	07/13/2004	41.5 %	132.5 %	55	12	43	2.21
C3-23	579231	B1FE5	07/13/2004	50.5 %	97.2 %	57	17	40	2.41
D1-01	579241	B1FE6	07/13/2004	36.8 %	158.2 %	70	30	40	2.28
D1-12	579242	B1FE7	07/13/2004	45.9 %	131.0 %	62	15	47	2.29
D1-23	579243	B1FE8	07/13/2004	47.7 %	117.7 %	67	13	54	2.34
D2-01	579244	B1FE9	07/13/2004	35.1 %	172.9 %	71	14	57	2.29
D2-12	579245	B1FF0	07/13/2004	44.2 %	130.9 %	64	11	52	2.29
D2-23	579246	B1FF1	07/13/2004	48.2 %	100.8 %	61	23	39	2.34

TABLE 4-12
Geotechnical Data
Passaic River July 2004 Core Samples (0-3 ft)

Field ID	Lab ID	EPA ID	Sample Date	Solids, Percent IN623	Moisture Content D2216	Liquid Limit D4318 LL	Plasticity Index D4318 Pl	Plastic Limit D4318 PL	Specific Gravity D854
D3-01	579247	B1FF2	07/13/2004	39.0 %	146.3 %	66	19	47	2.31
D3-12	579236	B1FF3	07/13/2004	39.9 %	140.7 %	64	25	39	2.31
D3-23	579237	B1FF4	07/13/2004	39.7 %	151.3 %	74	24	50	2.17
E1-01	579263	B1FF5	07/14/2004	37.8 %	158.5 %	99	48	51	2.38
E1-12	579264	B1FF6	07/14/2004	42.0 %	123.1 %	72	30	42	2.35
E1-23	579265	B1FF7	07/14/2004	45.7 %	118.9 %	70	24	46	2.52
E2-01	579266	B1FF8	07/14/2004	36.8 %	161.7 %	107	61	47	2.38
E2-12	579267	B1FF9	07/14/2004	46.2 %	112.0 %	102	58	44	2.34
E2-23	579268	B1FG0	07/14/2004	54.0 %	87.3 %	54	20	34	2.34
E3-01	579269	B1FG1	07/14/2004	38.8 %	139.0 %	65	21	43	2.36
E3-12	579270	B1FG2	07/14/2004	41.0 %	143.3 %	64	24	40	2.38
E3-23	579271	B1FG3	07/14/2004	52.0 %	102.0 %	55	16	39	2.33
T-17comp	579235	B1FG7	07/13/2004	36.4 %	154.3 %	67	22	46	2.32
Average (excludes T17 composite)				42.5 %	134.3 %	71.2	27.3	44.2	2.35
Median (excludes T17 composite)				41.5 %	137.8 %	66.0	24.0	43.0	2.34

NP = Not performed (no result reported by laboratory).
NUV = No Usable Value; "0" was reported by laboratory; not considered to be a usable result.
Note: Moisture Content (ASTM D2216) is the ratio of the water in the sample to the dry solids.

TABLE 4-13
Grain Size Data
Passaic River July 2004 Core Samples (0-4 ft)

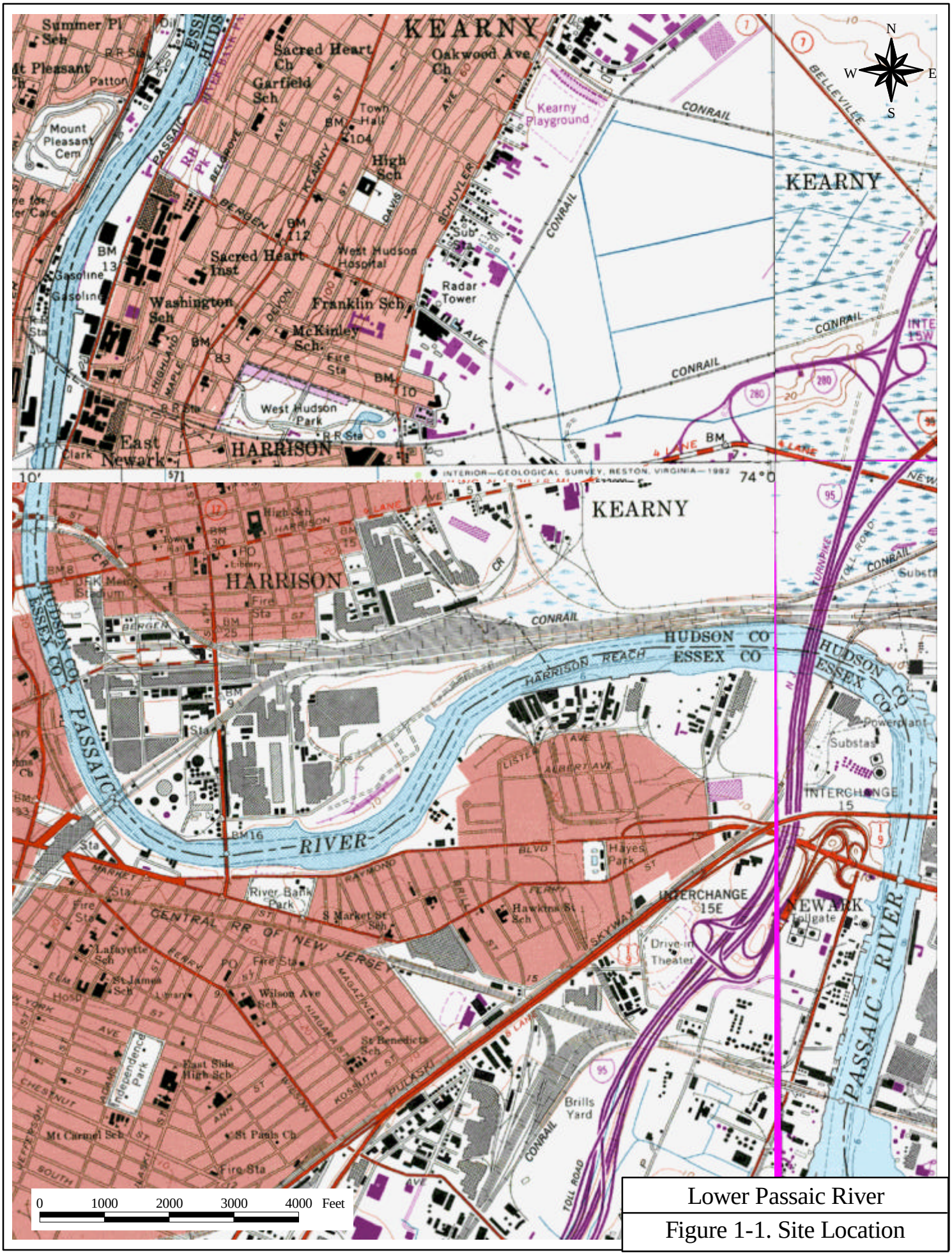
Field ID	EPA ID	Sample Date	GRANULE > 2 mm, %	SAND, %	SILT, %	CLAY AND COLLOIDS, %	SUM, %
A1-01	B1FB9	07/12/2004	0.0 %	33.0 %	60.0 %	7.1 %	100.1 %
A2-01	B1FC2	07/12/2004	0.0 %	13.0 %	81.0 %	5.6 %	99.6 %
A3-01	B1FC5	07/12/2004	0.0 %	44.0 %	51.0 %	5.9 %	100.9 %
B1-01	B1FC8	07/13/2004	0.0 %	23.0 %	64.0 %	14 %	101.0 %
B2-01	B1FD1	07/13/2004	0.0 %	27.0 %	59.0 %	14 %	100.0 %
B3-01	B1FD4	07/13/2004	0.0 %	20.0 %	74.0 %	5.7 %	99.7 %
C1-01	B1FD7	07/13/2004	0.0 %	16.0 %	79.0 %	5.5 %	100.5 %
C2-01	B1FE0	07/13/2004	0.0 %	25.0 %	65.0 %	9.9 %	99.9 %
C3-01	B1FE3	07/13/2004	0.0 %	34.0 %	60.0 %	6.3 %	100.3 %
D1-01	B1FE6	07/13/2004	0.0 %	12.0 %	79.0 %	8.4 %	99.4 %
D2-01	B1FE9	07/13/2004	0.0 %	11.0 %	77.0 %	12 %	100.0 %
D3-01	B1FF2	07/13/2004	0.0 %	40.0 %	56.0 %	4.6 %	100.6 %
E1-01	B1FF5	07/14/2004	0.0 %	39.0 %	56.0 %	4.3 %	99.3 %
E2-01	B1FF8	07/14/2004	ND	ND	ND	ND	ND
E3-01	B1FG1	07/14/2004	0.0 %	34.0 %	61.0 %	4.7 %	99.7 %
AVERAGE (0-1 FT INTERVAL)			0.0 %	26.5 %	65.9 %	7.7 %	100.1 %
A1-12	B1FC0	07/12/2004	0.0 %	5.0 %	85.0 %	10 %	100.0 %
A2-12	B1FC3	07/12/2004	0.2 %	41.0 %	52.0 %	6.5 %	99.7 %
A3-12	B1FC6	07/12/2004	0.0 %	44.0 %	51.0 %	5.9 %	100.9 %
B1-12	B1FC9	07/13/2004	0.0 %	24.0 %	61.0 %	16 %	101.0 %
B2-12	B1FD2	07/13/2004	0.0 %	27.0 %	59.0 %	14 %	100.0 %
B3-12	B1FD5	07/13/2004	0.0 %	33.0 %	62.0 %	4.4 %	99.4 %
C1-12	B1FD8	07/13/2004	0.0 %	6.4 %	85.0 %	8.4 %	99.8 %
C2-12	B1FE1	07/13/2004	0.0 %	50.0 %	45.0 %	5.4 %	100.4 %
C3-12	B1FE4	07/13/2004	0.0 %	32.0 %	60.0 %	7.3 %	99.3 %
D1-12	B1FE7	07/13/2004	0.0 %	14.0 %	78.0 %	7.8 %	99.8 %
D2-12	B1FF0	07/13/2004	0.0 %	28.0 %	65.0 %	7.1 %	100.1 %
D3-12	B1FF3	07/13/2004	0.0 %	39.0 %	56.0 %	5.7 %	100.7 %
E1-12	B1FF6	07/14/2004	0.0 %	39.0 %	56.0 %	4.3 %	99.3 %
E2-12	B1FF9	07/14/2004	0.0 %	46.0 %	51.0 %	2.9 %	99.9 %
E3-12	B1FG2	07/14/2004	0.0 %	41.0 %	54.0 %	5.3 %	100.3 %
AVERAGE (1-2 FT INTERVAL)			0.0 %	31.3 %	61.3 %	7.4 %	100.0 %
A1-23	B1FC1	07/12/2004	0.0 %	16.0 %	78.0 %	5.6 %	99.6 %
A2-23	B1FC4	07/12/2004	0.0 %	31.0 %	65.0 %	4.3 %	100.3 %
A3-23	B1FC7	07/12/2004	0.0 %	16.0 %	77.0 %	7.7 %	100.7 %
B1-23	B1FD0	07/13/2004	5.5 %	34.0 %	54.0 %	6.3 %	99.8 %
B2-23	B1FD3	07/13/2004	0.0 %	23.0 %	66.0 %	10 %	99.0 %
B3-23	B1FD6	07/13/2004	0.1 %	29.0 %	64.0 %	7.3 %	100.4 %
C1-23	B1FD9	07/13/2004	0.0 %	13.0 %	79.0 %	7.8 %	99.8 %
C2-23	B1FE2	07/13/2004	0.0 %	34.0 %	58.0 %	7.8 %	99.8 %
C3-23	B1FE5	07/13/2004	0.0 %	21.0 %	74.0 %	5.4 %	100.4 %
D1-23	B1FE8	07/13/2004	0.0 %	11.0 %	87.0 %	2.2 %	100.2 %
D2-23	B1FF1	07/13/2004	0.0 %	13.0 %	81.0 %	5.9 %	99.9 %
D3-23	B1FF4	07/13/2004	0.0 %	54.0 %	42.0 %	3.8 %	99.8 %
E1-23	B1FF7	07/14/2004	0.0 %	42.0 %	54.0 %	4.1 %	100.1 %
E2-23	B1FG0	07/14/2004	0.0 %	31.0 %	67.0 %	2.7 %	100.7 %
E3-23	B1FG3	07/14/2004	0.0 %	45.0 %	52.0 %	3.0 %	100.0 %
AVERAGE (2-3 FT INTERVAL)			0.4 %	27.5 %	66.5 %	5.6 %	100.0 %

TABLE 4-13
Grain Size Data
Passaic River July 2004 Core Samples (0-4 ft)

Field ID	EPA ID	Sample Date	GRANULE > 2 mm, %	SAND, %	SILT, %	CLAY AND COLLOIDS, %	SUM, %
A2-34	AF06247	11/2/2004	0.0 %	8.4 %	85.0 %	6.6 %	100.0 %
B1-34	AF06248	11/2/2004	0.0 %	10.2 %	83.0 %	6.5 %	99.7 %
B3-34	AF06249	11/2/2004	0.0 %	7.9 %	84.0 %	8.0 %	99.9 %
C2-34	AF06250	11/2/2004	0.0 %	8.5 %	86.0 %	5.7 %	100.2 %
D1-34	AF06251	11/2/2004	0.0 %	9.6 %	83.0 %	7.1 %	99.7 %
D3-34	AF06252	11/2/2004	0.0 %	14.3 %	77.0 %	8.4 %	99.7 %
DE-34	AF06253	11/2/2004	0.0 %	8.2 %	87.0 %	4.5 %	99.7 %
AVERAGE (3-4 FT INTERVAL)			0.0 %	9.6 %	83.6 %	6.7 %	99.8 %
AVERAGE (ALL INTERVALS)			0.1 %	23.4 %	70.2 %	6.3 %	100.0 %

ND = No data for this sample
Analyses by USEPA Region 2 DESA Laboratory

Figures



Lower Passaic River

Figure 1-1. Site Location

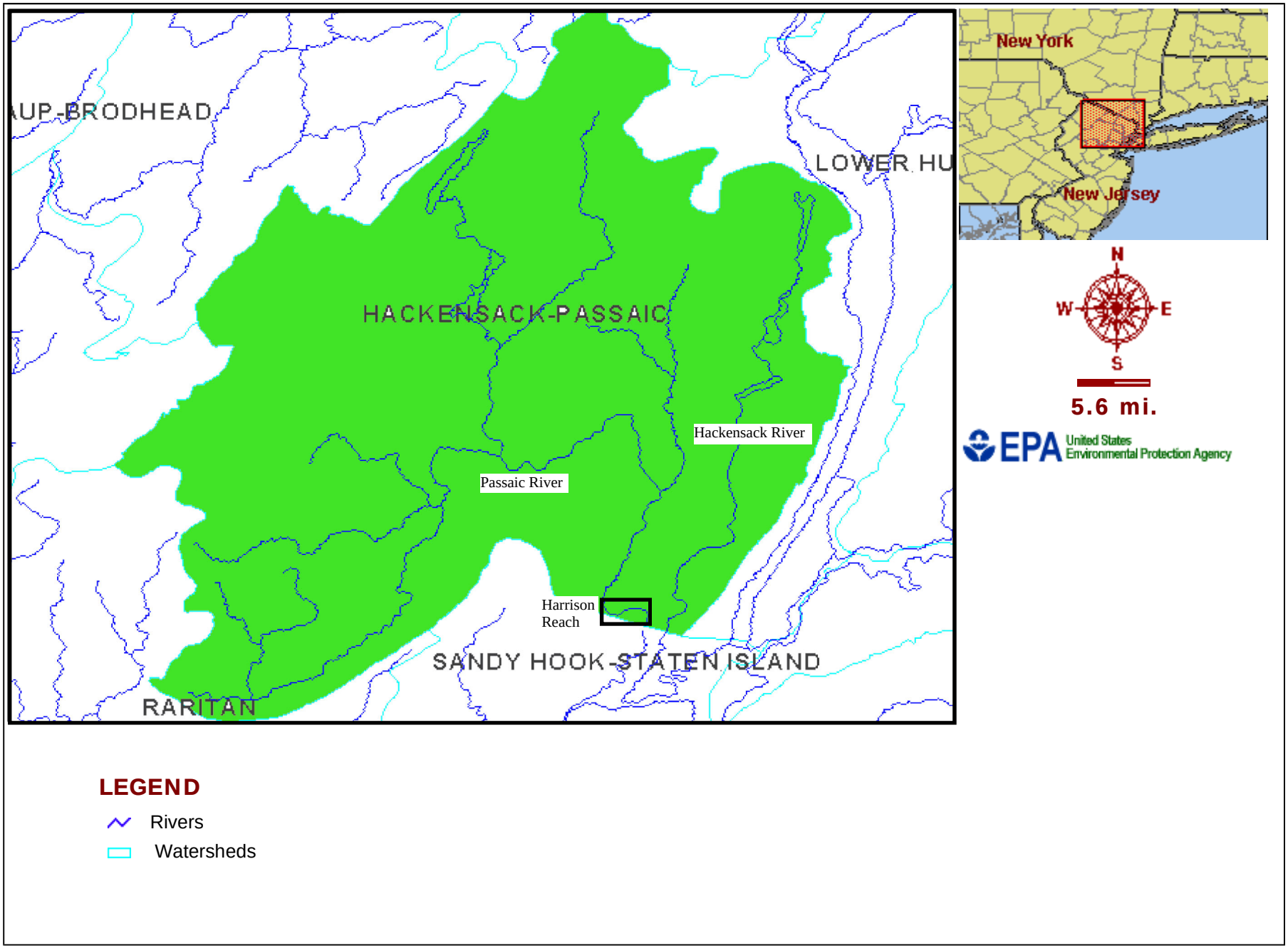


Figure 1-2
Hackensack - Passaic Watershed

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

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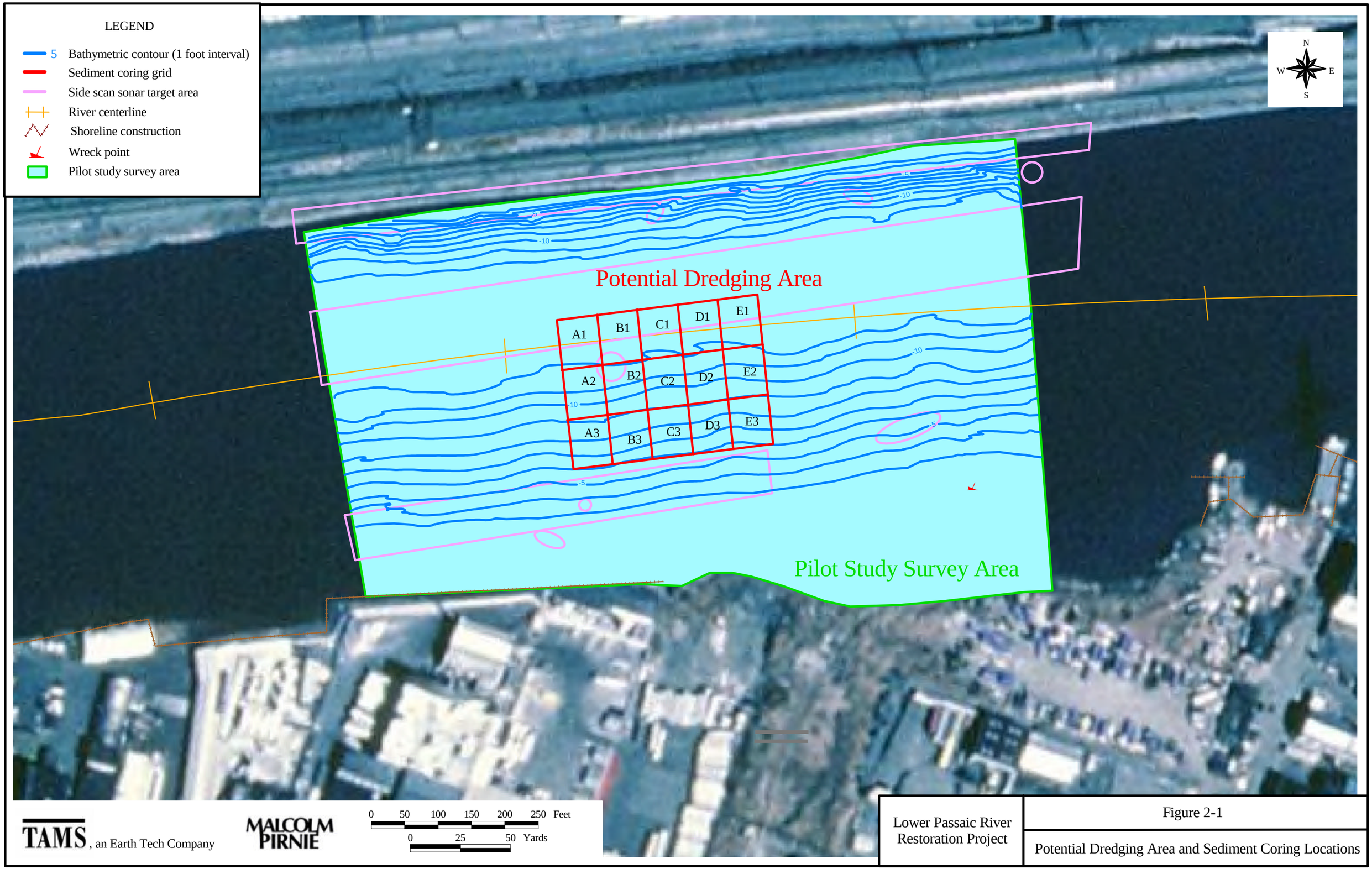
Lower Passaic River Restoration Project

Figure 1-3

Harrison Reach And Pilot Study Survey Area



Lower Passaic River Restoration Project

Figure 2-1

Potential Dredging Area and Sediment Coring Locations

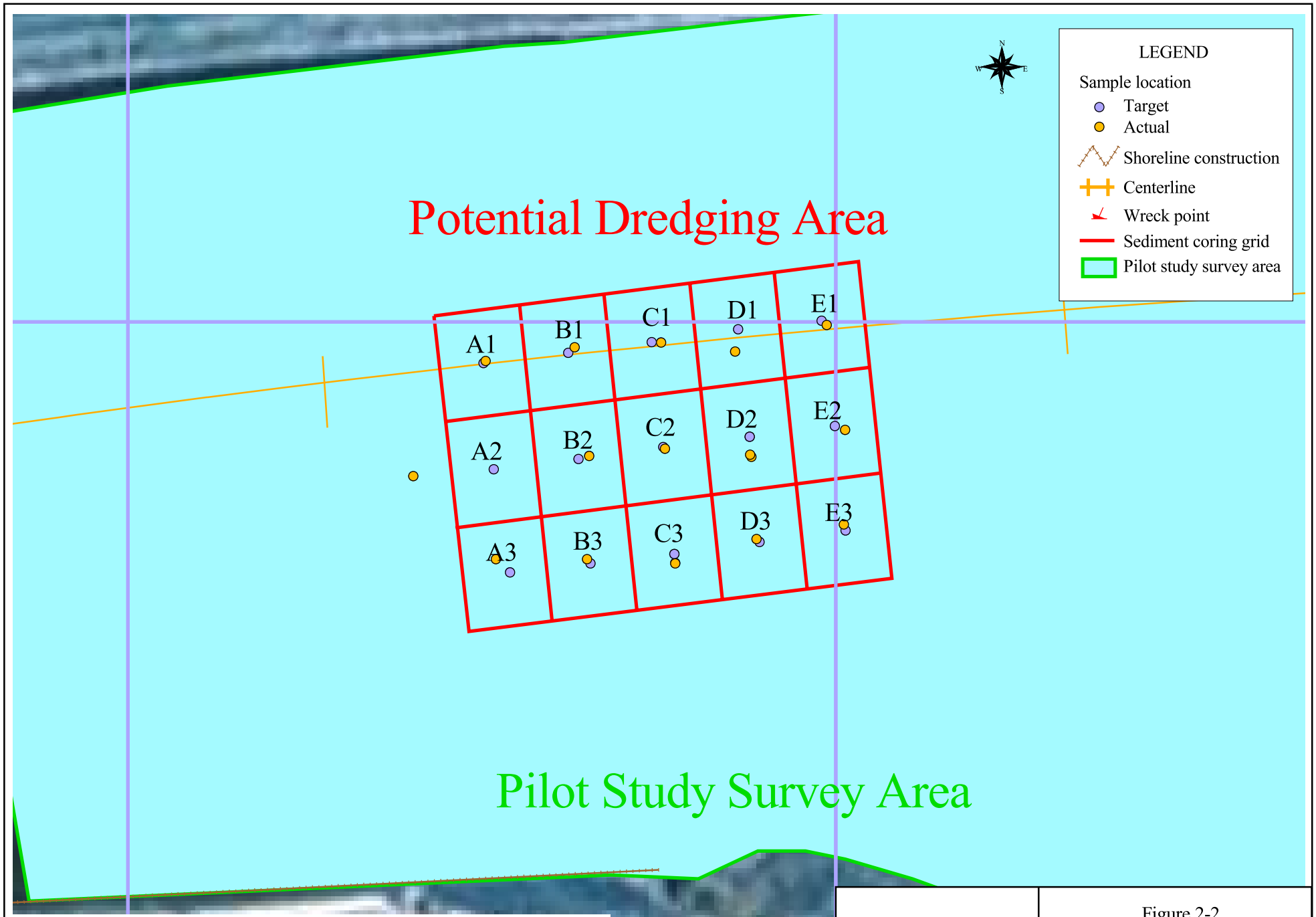


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Figure 2-2

Comparison of Target and Actual Core Locations

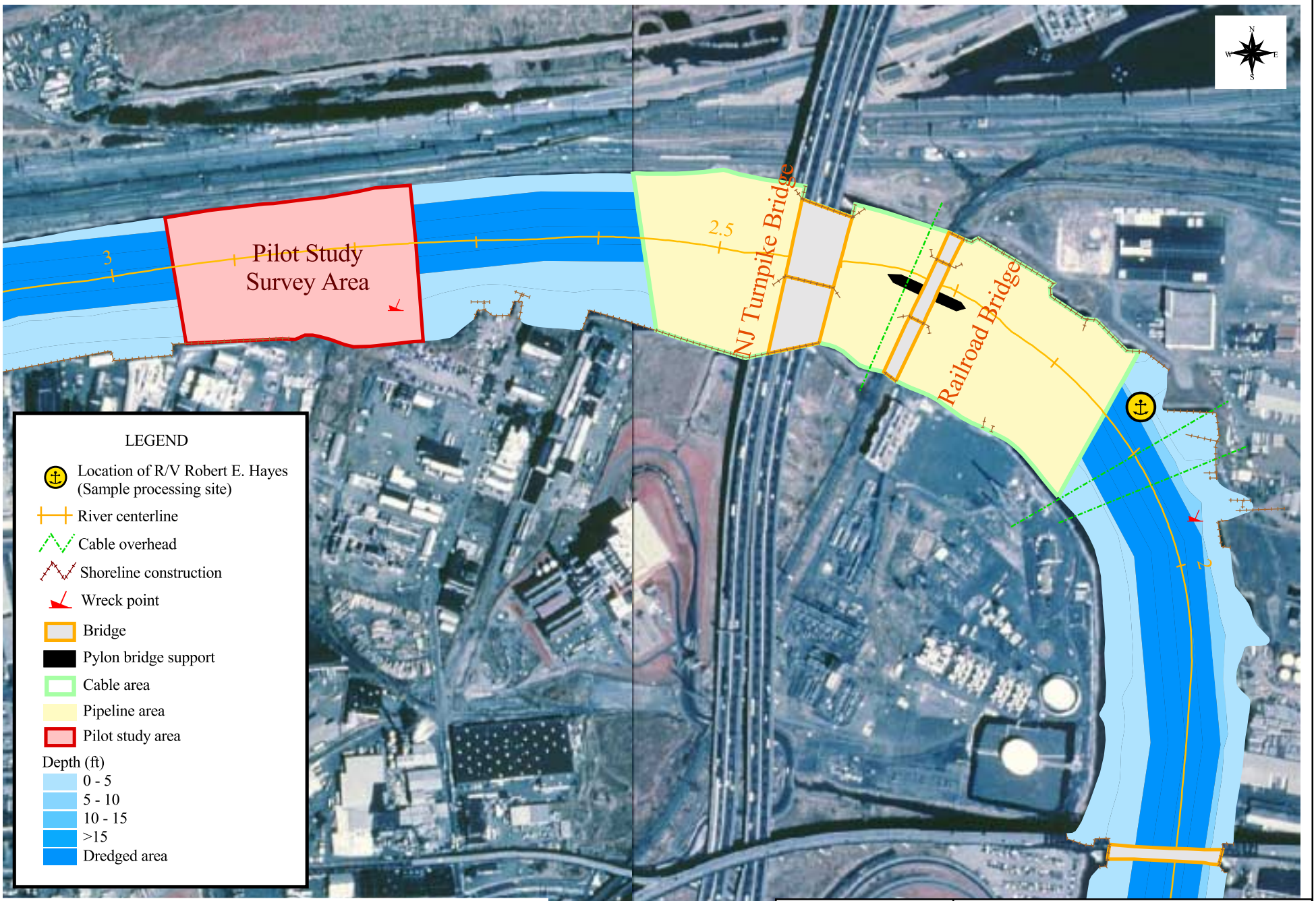

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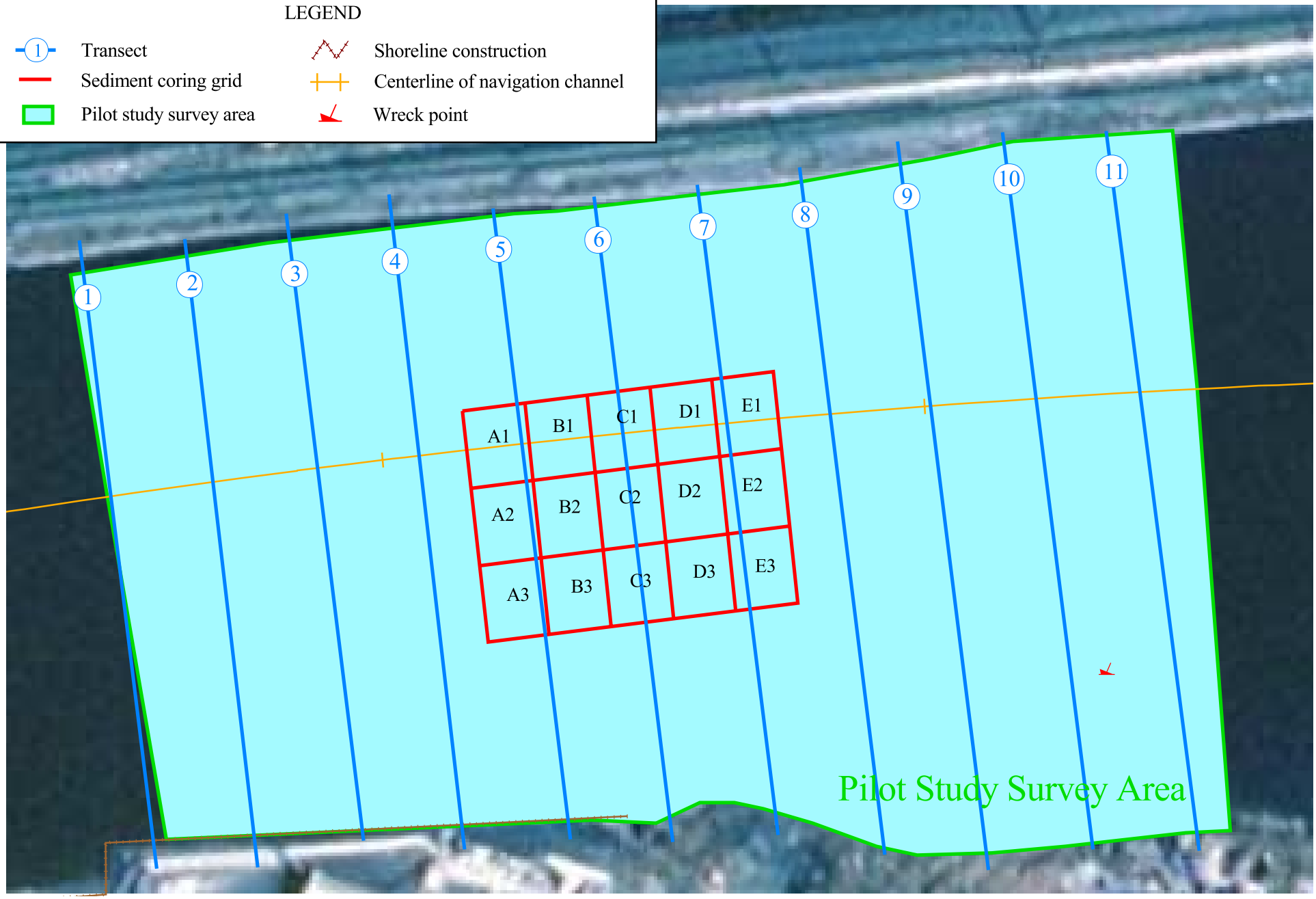
Figure 2-3

Location of Sample Processing Vessel



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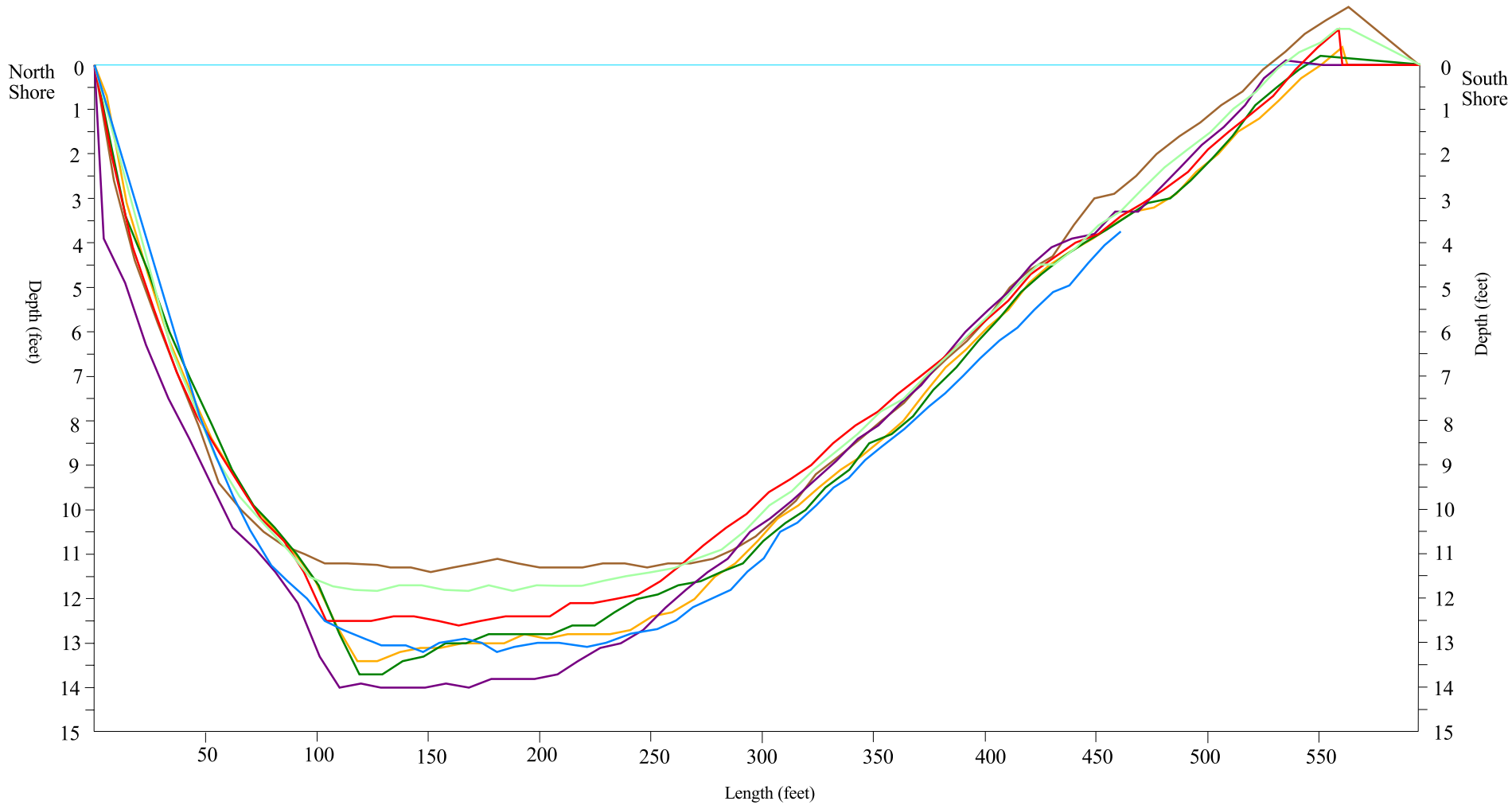
0 50 100 150 Feet

0 10 20 30 40 50 Yards

N W E S

Lower Passaic River Restoration Project	Plane View of Transect Locations
	Figure 3-1



LEGEND

- November 2004 River profile
- March 2004 River profile
- August 2001 River profile
- June 1999 River profile
- May 1997 River profile
- November 1996 River profile
- March/April 1995 River profile
- River surface

Note: Bathymetry data is referenced to the USACE Mean Low Water (MLW).

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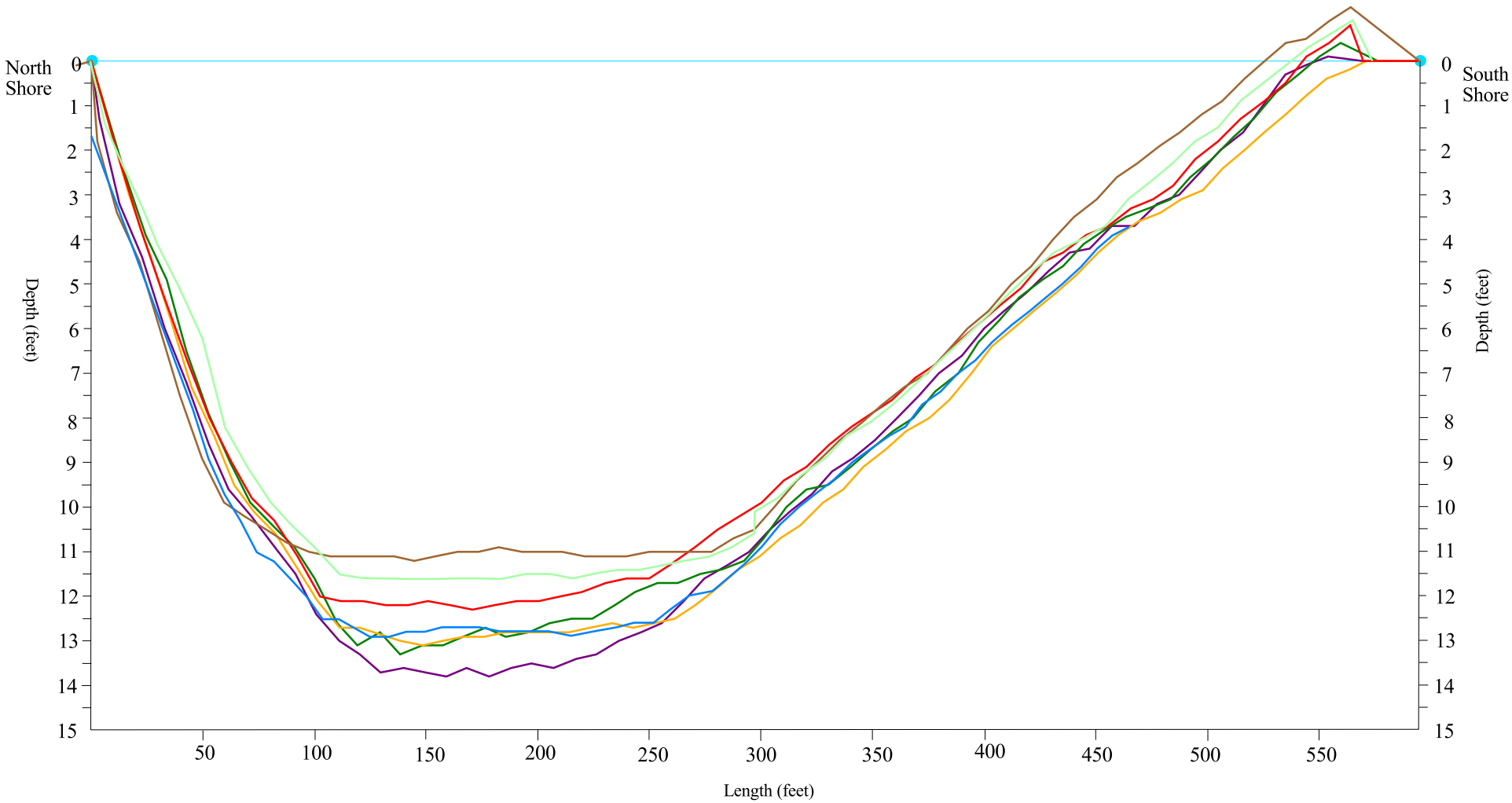
Lower Passaic River Restoration Project	River Profile for Transect 1
	Figure 3-2



LEGEND

- November 2004 River profile
- March 2004 River profile
- August 2001 River profile
- June 1999 River profile
- May 1997 River profile
- November 1996 River profile
- March/April 1995 River profile
- River surface

Note: Bathymetry data is referenced to the USACE Mean Low Water (MLW).

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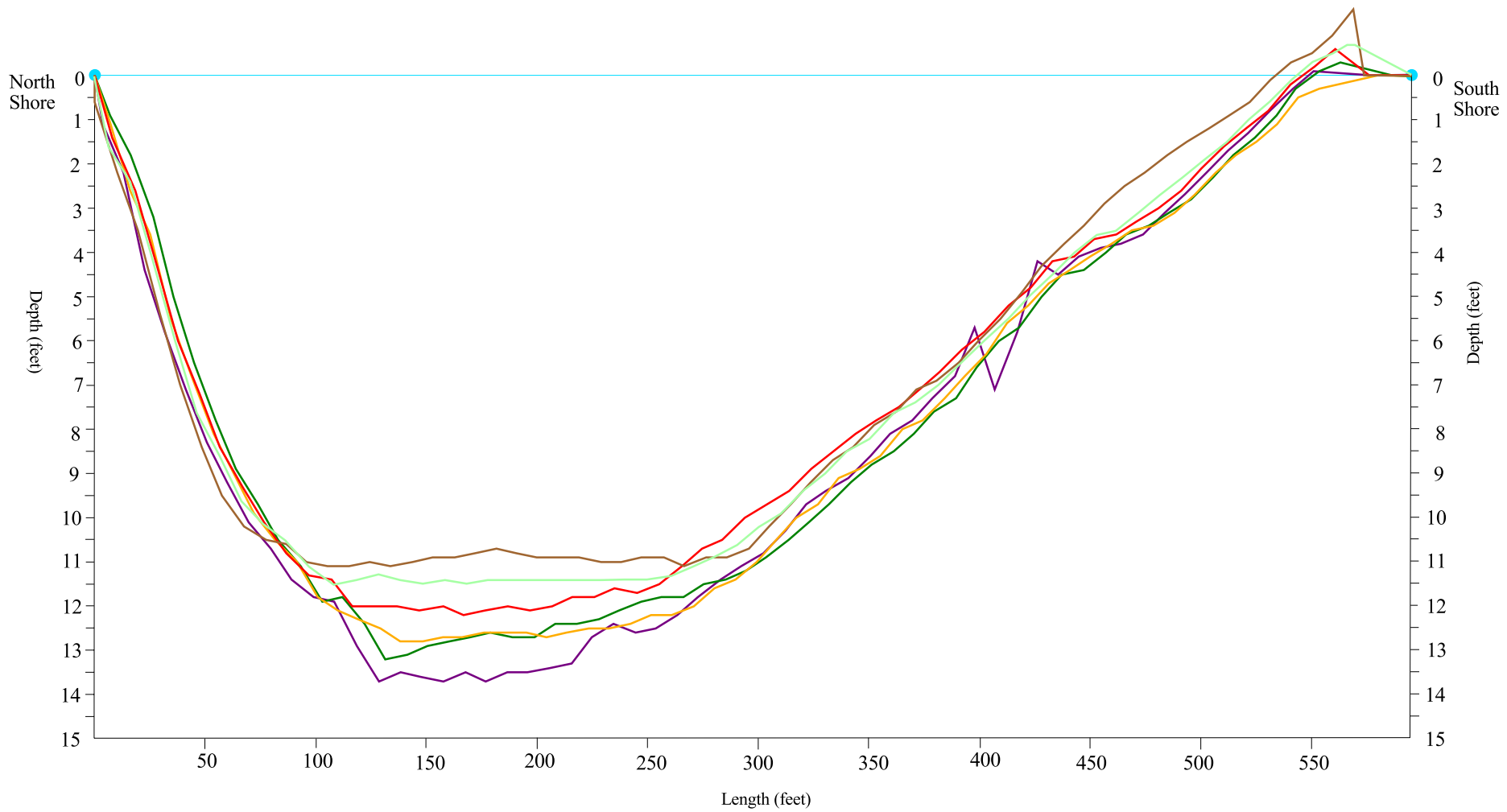
Lower Passaic River Restoration Project	River Profile for Transect 2
	Figure 3-3



LEGEND

- November 2004 River profile
- August 2001 River profile
- June 1999 River profile
- May 1997 River profile
- November 1996 River profile
- March/April 1995 River profile
- River surface

Note: Bathymetry data is referenced to the USACE Mean Low Water (MLW).
March 2004 transect not included due to boat track not coinciding with previous surveys.

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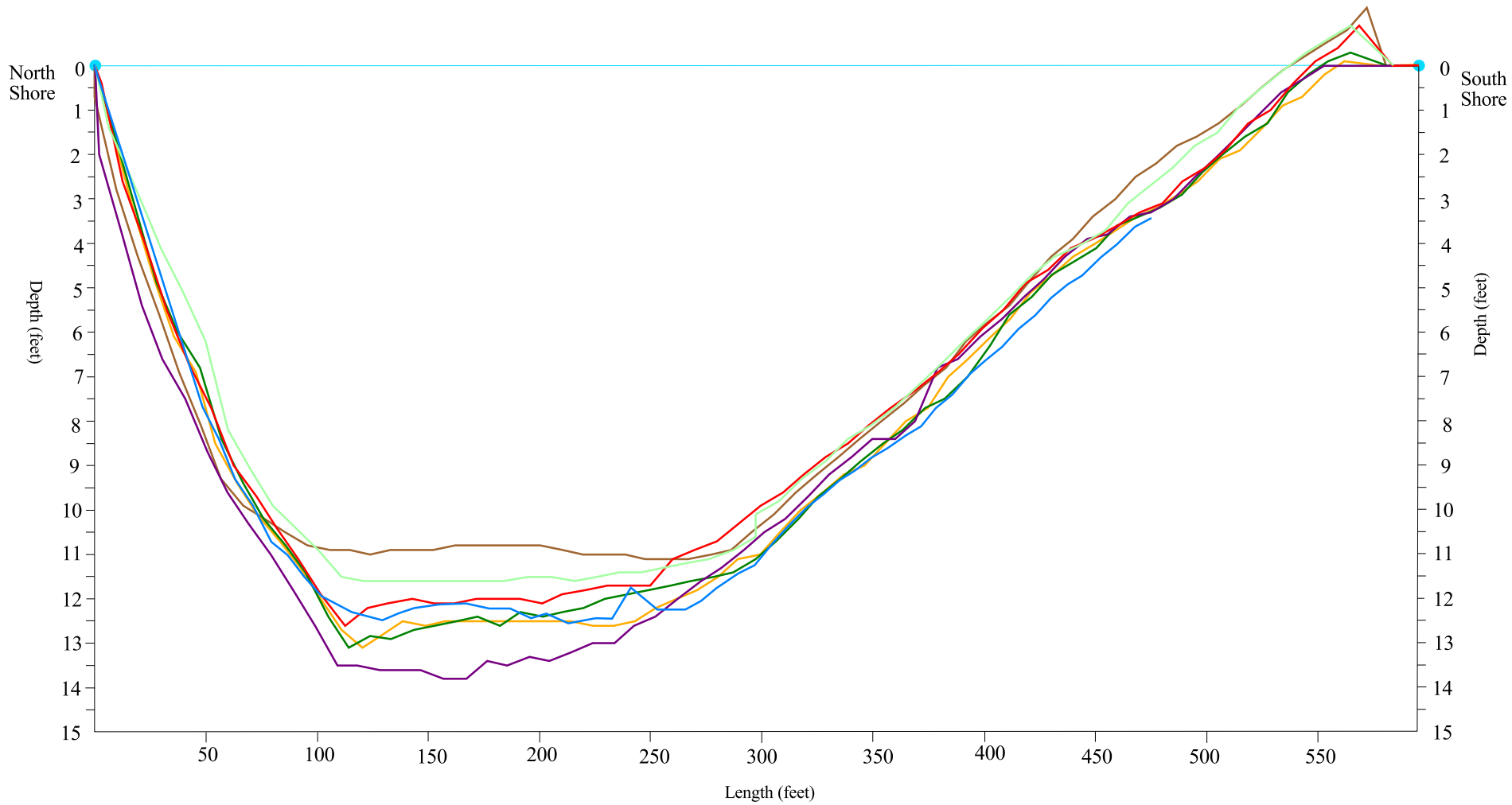
Lower Passaic River Restoration Project	River Profile for Transect 3
	Figure 3-4



LEGEND

- November 2004 River profile
- March 2004 River profile
- August 2001 River profile
- June 1999 River profile
- May 1997 River profile
- November 1996 River profile
- March/April 1995 River profile
- River surface

Note: Bathymetry data is referenced to the USACE Mean Low Water (MLW).

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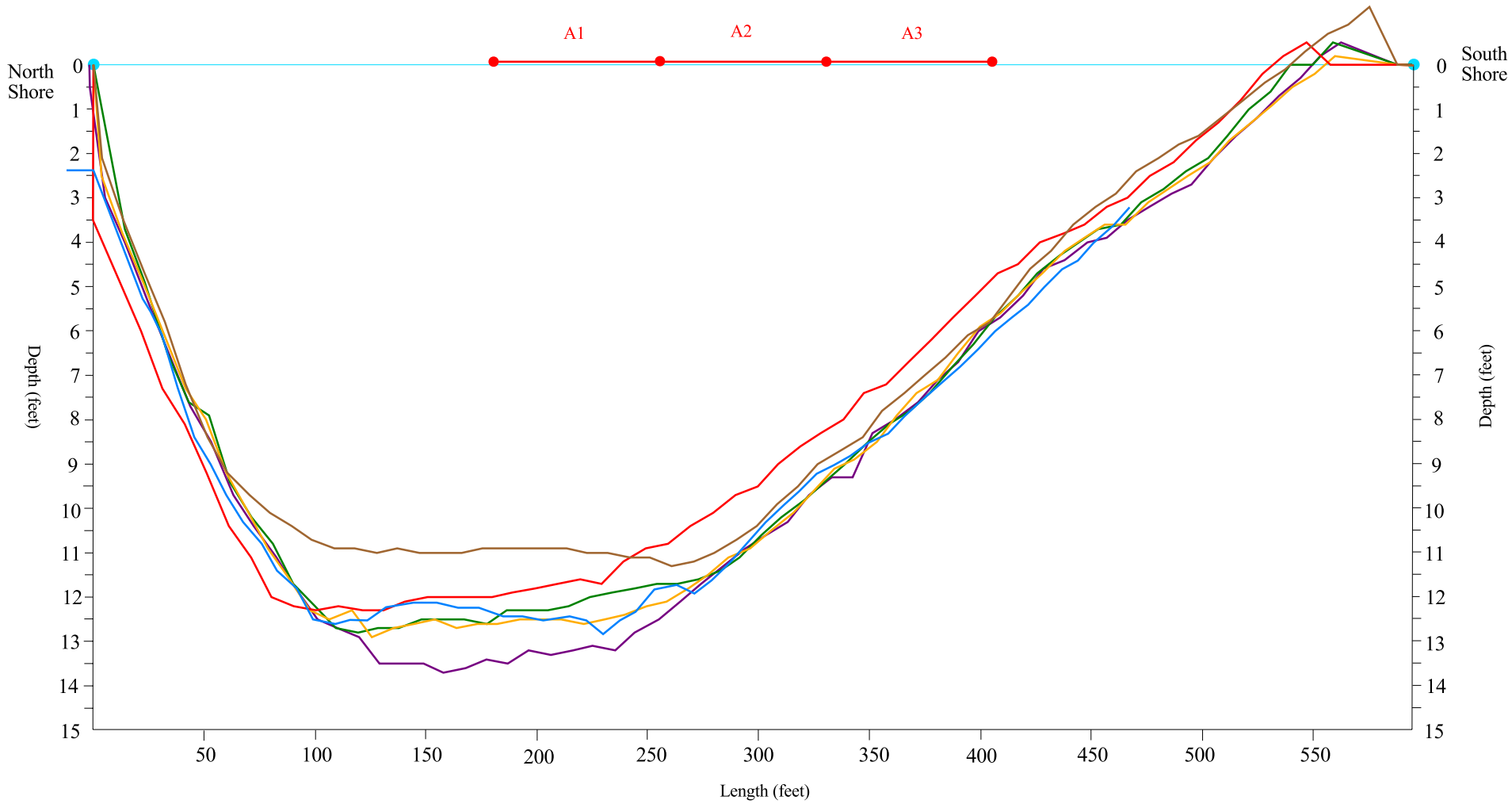
Lower Passaic River Restoration Project	River Profile for Transect 4
	Figure 3-5



LEGEND

- March 2004 River profile
- August 2001 River profile
- June 1999 River profile
- May 1997 River profile
- November 1996 River profile
- March/April 1995 River profile
- River surface

Note: Bathymetry data is referenced to the USACE Mean Low Water (MLW).
November 2004 transect not included due to boat track not coinciding with previous surveys.

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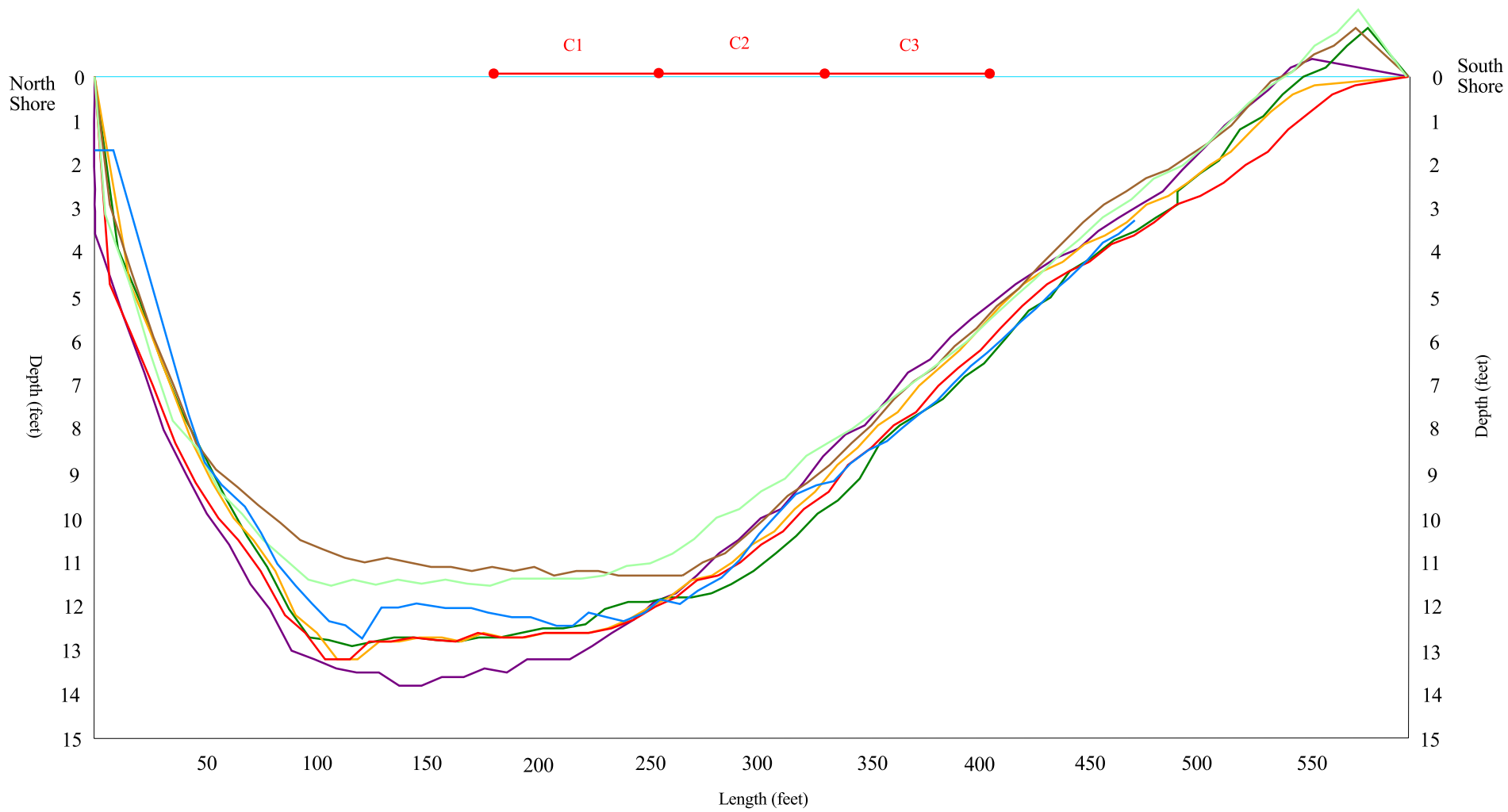
Lower Passaic River Restoration Project	River Profile for Transect 5
	Figure 3-6



LEGEND

- November 2004 River profile
- March 2004 River profile
- August 2001 River profile
- June 1999 River profile
- May 1997 River profile
- November 1996 River profile
- March/April 1995 River profile
- River surface

Note: Bathymetry data is referenced to the USACE Mean Low Water (MLW).

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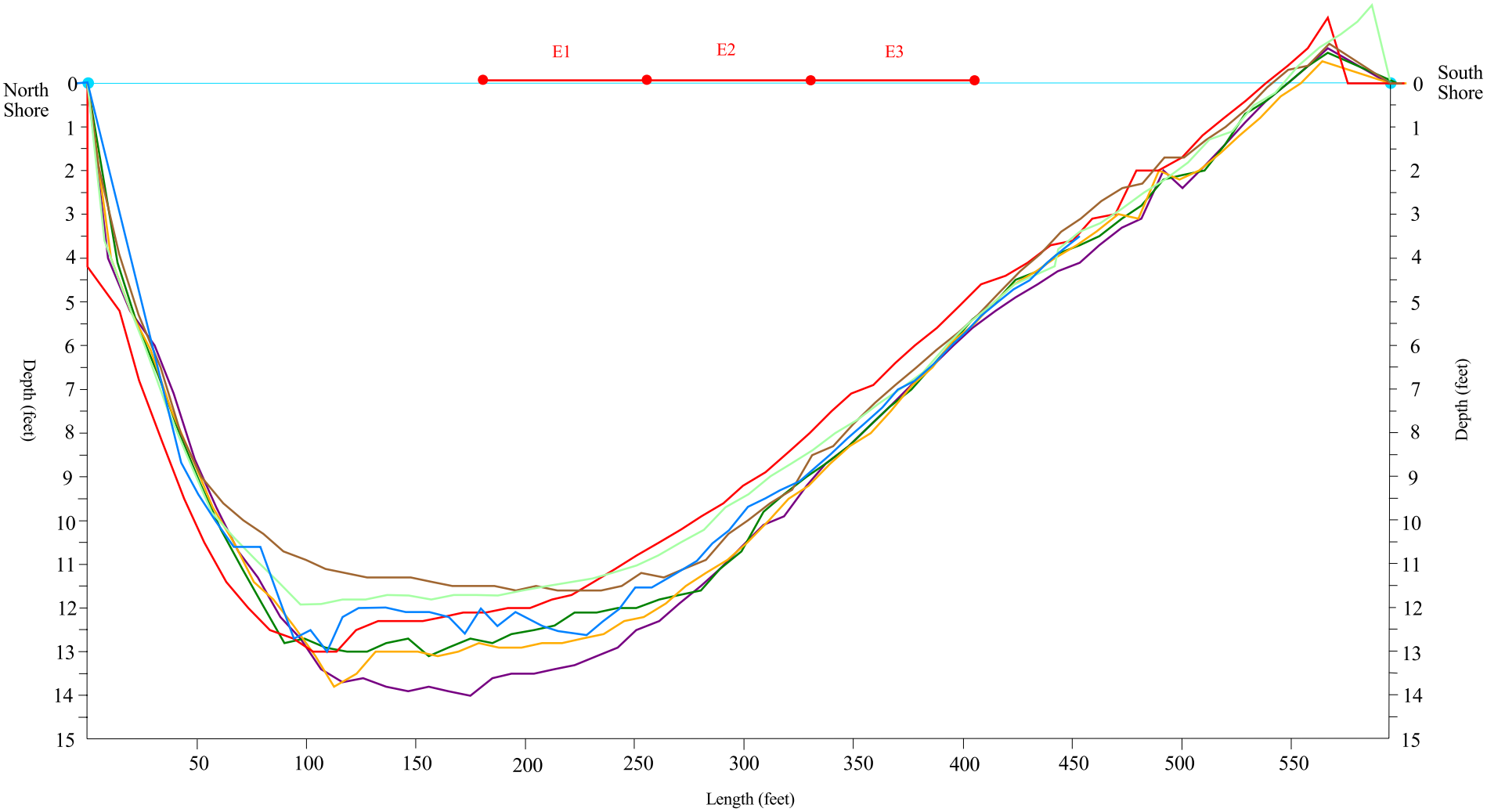
Lower Passaic River Restoration Project	River Profile for Transect 6
	Figure 3-7



LEGEND

- November 2004 River profile
- March 2004 River profile
- August 2001 River profile
- June 1999 River profile
- May 1997 River profile
- November 1996 River profile
- March/April 1995 River profile
- River surface

Note: Bathymetry data is referenced to the USACE Mean Low Water (MLW).

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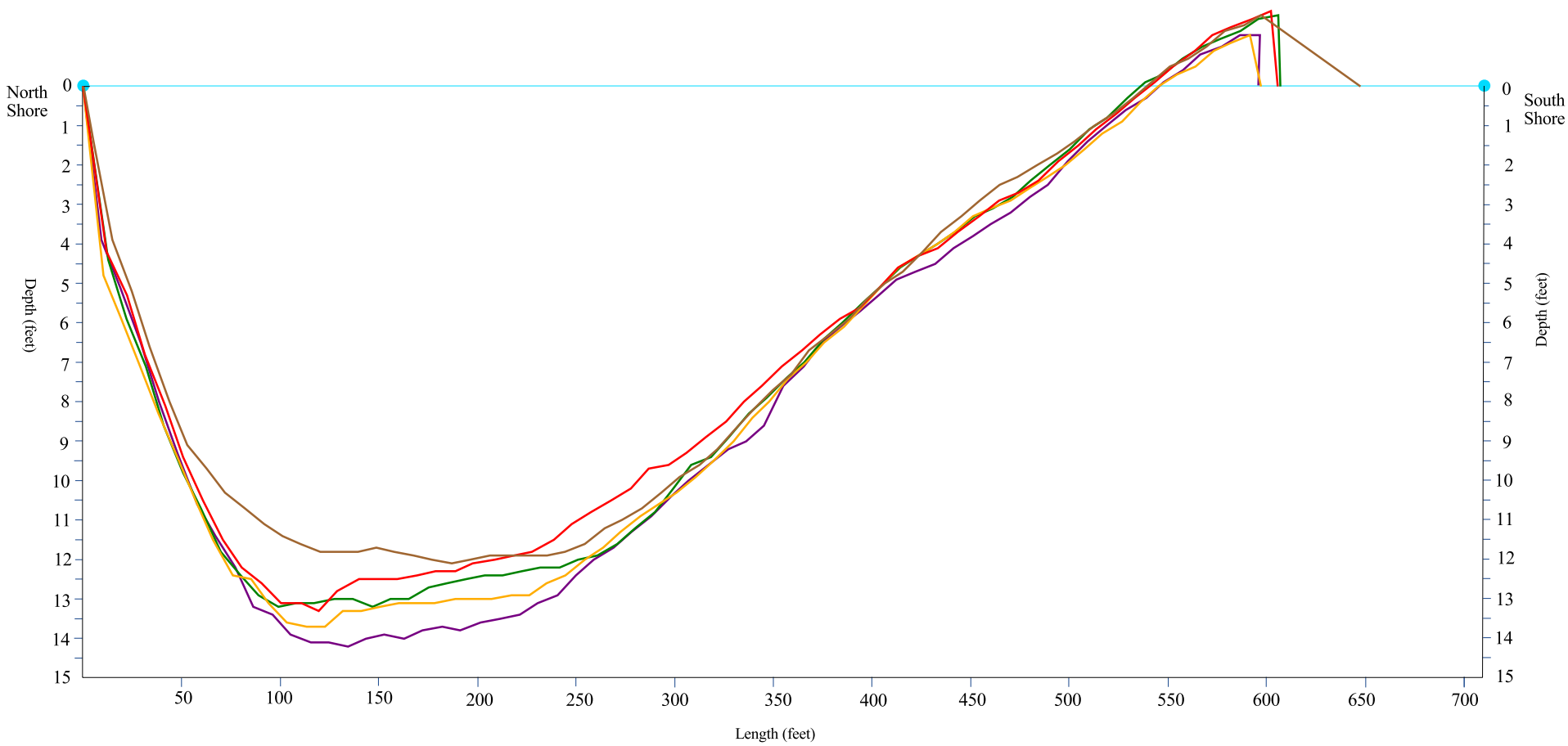
Lower Passaic River Restoration Project	River Profile for Transect 7
	Figure 3-8



LEGEND

- August 2001 River profile
- June 1999 River profile
- May 1997 River profile
- November 1996 River profile
- March/April 1995 River profile
- River surface

Note: Bathymetry data is referenced to the USACE Mean Low Water (MLW). March and November 2004 transects not included due to boat tracks not coinciding with previous surveys.

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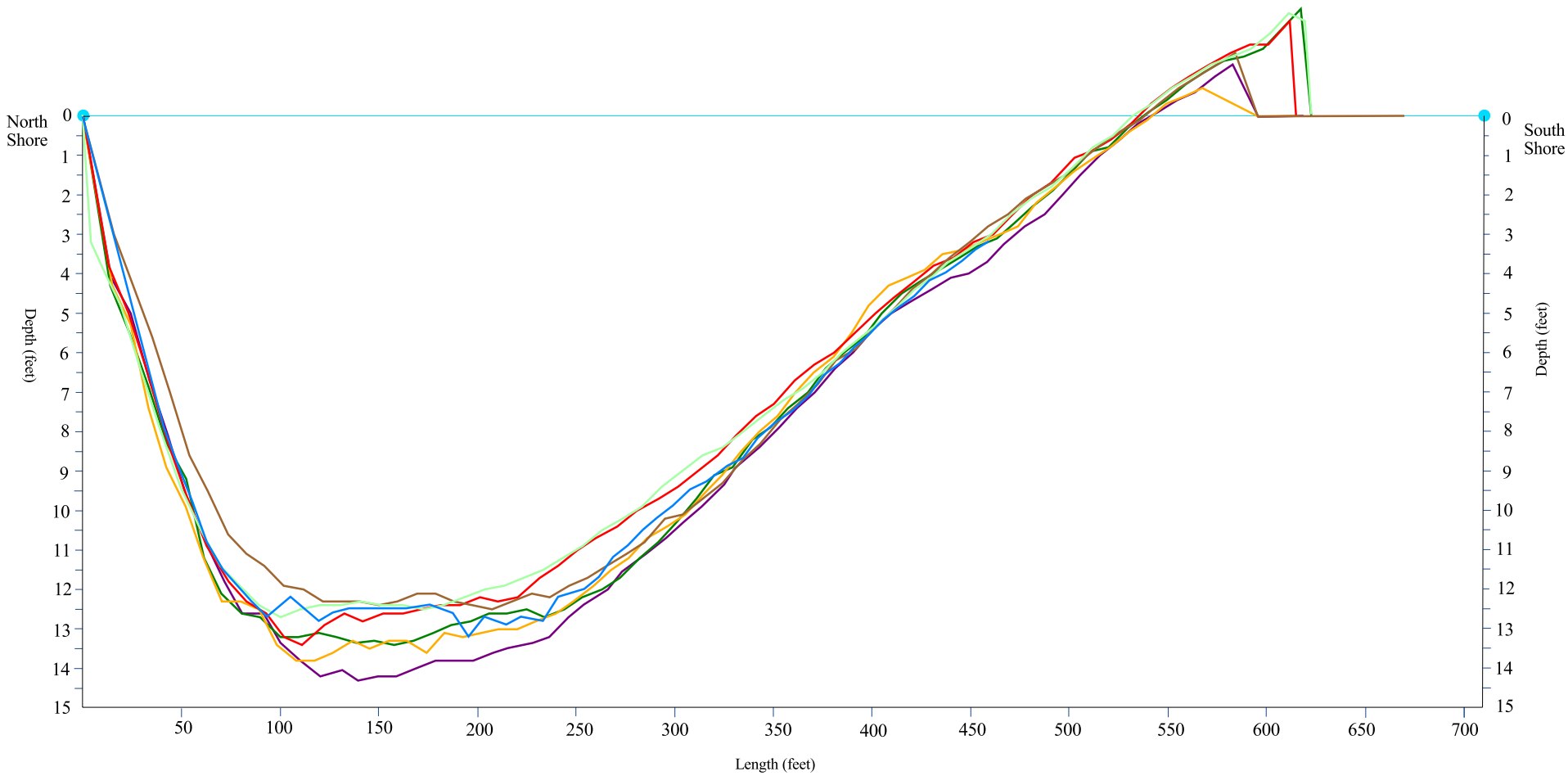
Lower Passaic River Restoration Project	River Profile for Transect 8
	Figure 3-9



LEGEND

- November 2004 River profile
- March 2004 River profile
- August 2001 River profile
- June 1999 River profile
- May 1997 River profile
- November 1996 River profile
- March/April 1995 River profile
- River surface

Note: Bathymetry data is referenced to the USACE Mean Low Water (MLW).

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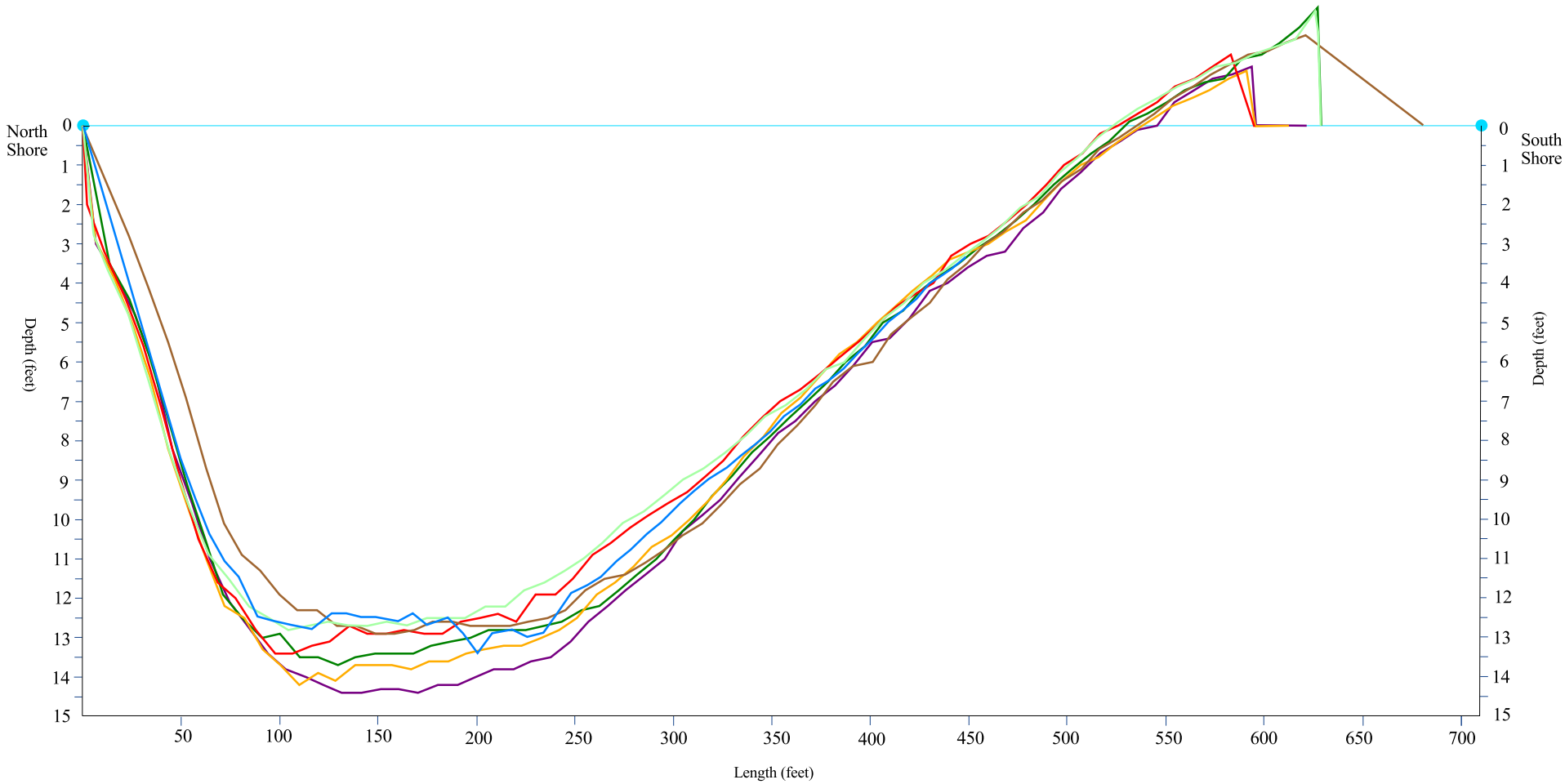
MALCOLM PIRNIE

Lower Passaic River Restoration Project	River Profile for Transect 9
	Figure 3-10



LEGEND

- November 2004 River profile
- March 2004 River profile
- August 2001 River profile
- June 1999 River profile
- May 1997 River profile
- November 1996 River profile
- March/April 1995 River profile
- River surface

Note: Bathymetry data is referenced to the USACE Mean Low Water (MLW).

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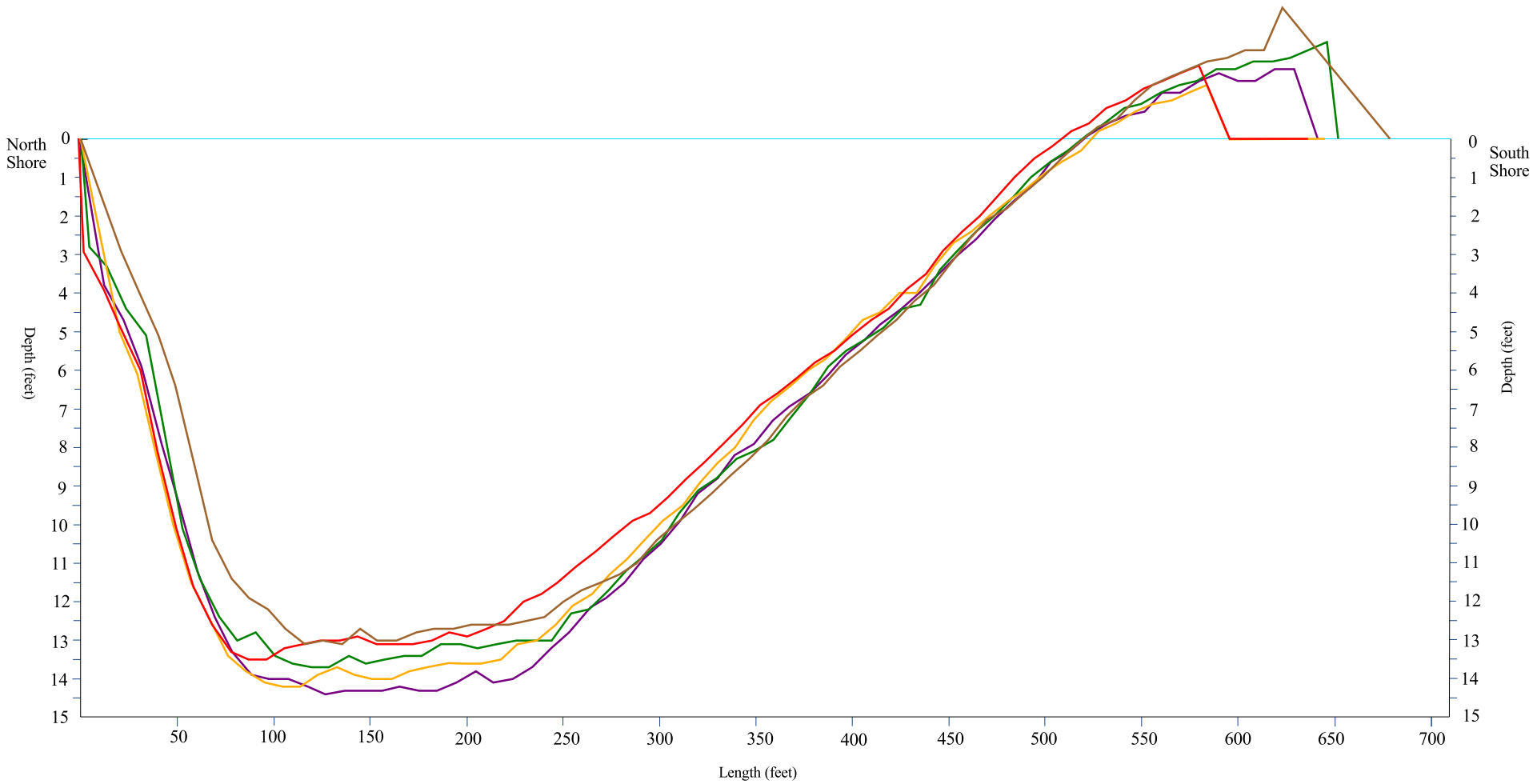
MALCOLM PIRNIE

Lower Passaic River Restoration Project	River Profile for Transect 10
	Figure 3-11



LEGEND

- August 2001 River profile
- June 1999 River profile
- May 1997 River profile
- November 1996 River profile
- March/April 1995 River profile
- River surface

Notes: Bathymetry data is referenced to the USACE Mean Low Water (MLW). March and November 2004 transects not included due to boat tracks not coinciding with previous surveys.

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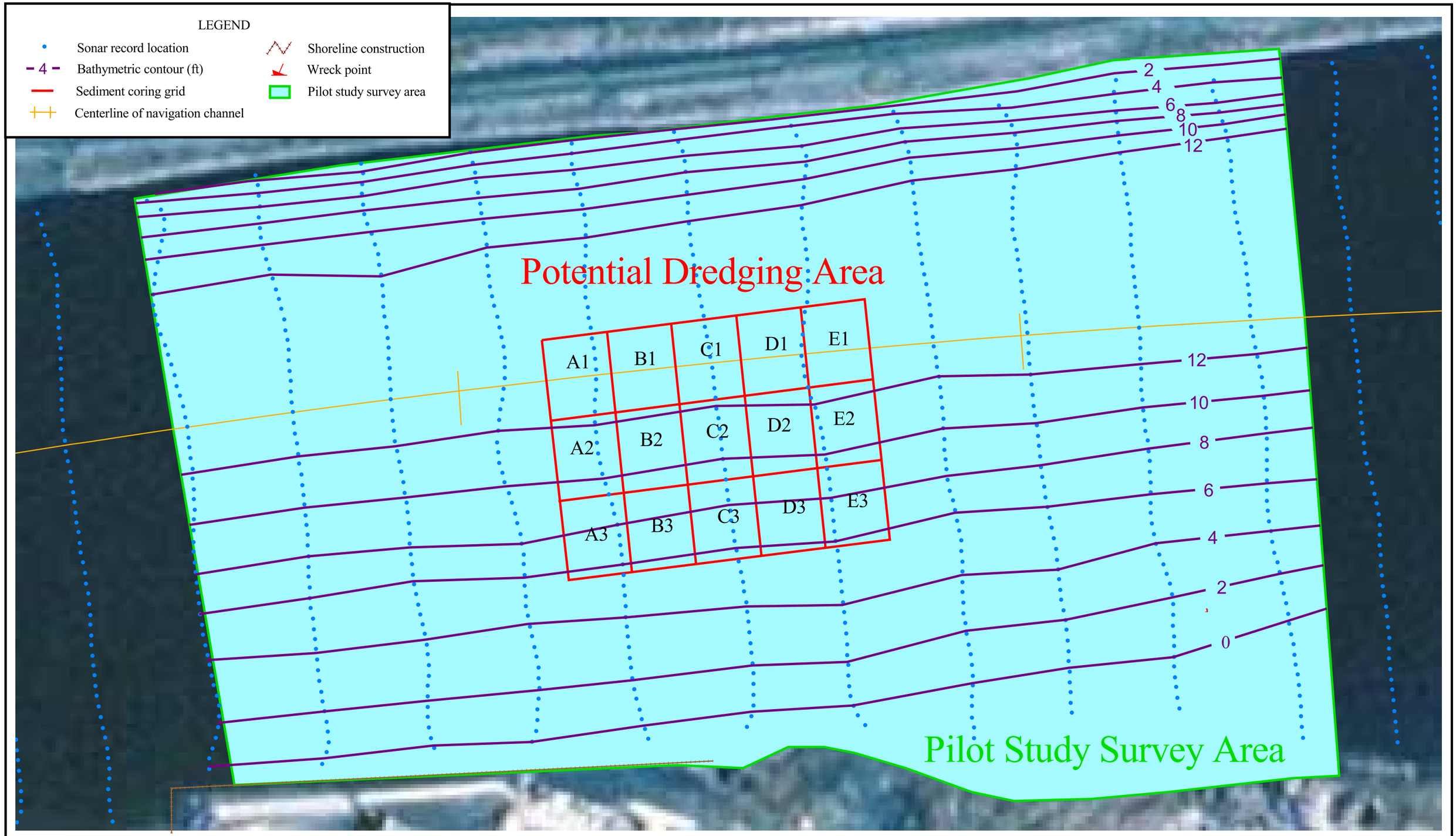
MALCOLM PIRNIE

Lower Passaic River Restoration Project	River Profile for Transect 11
	Figure 3-12



TAMS, an Earth Tech Company

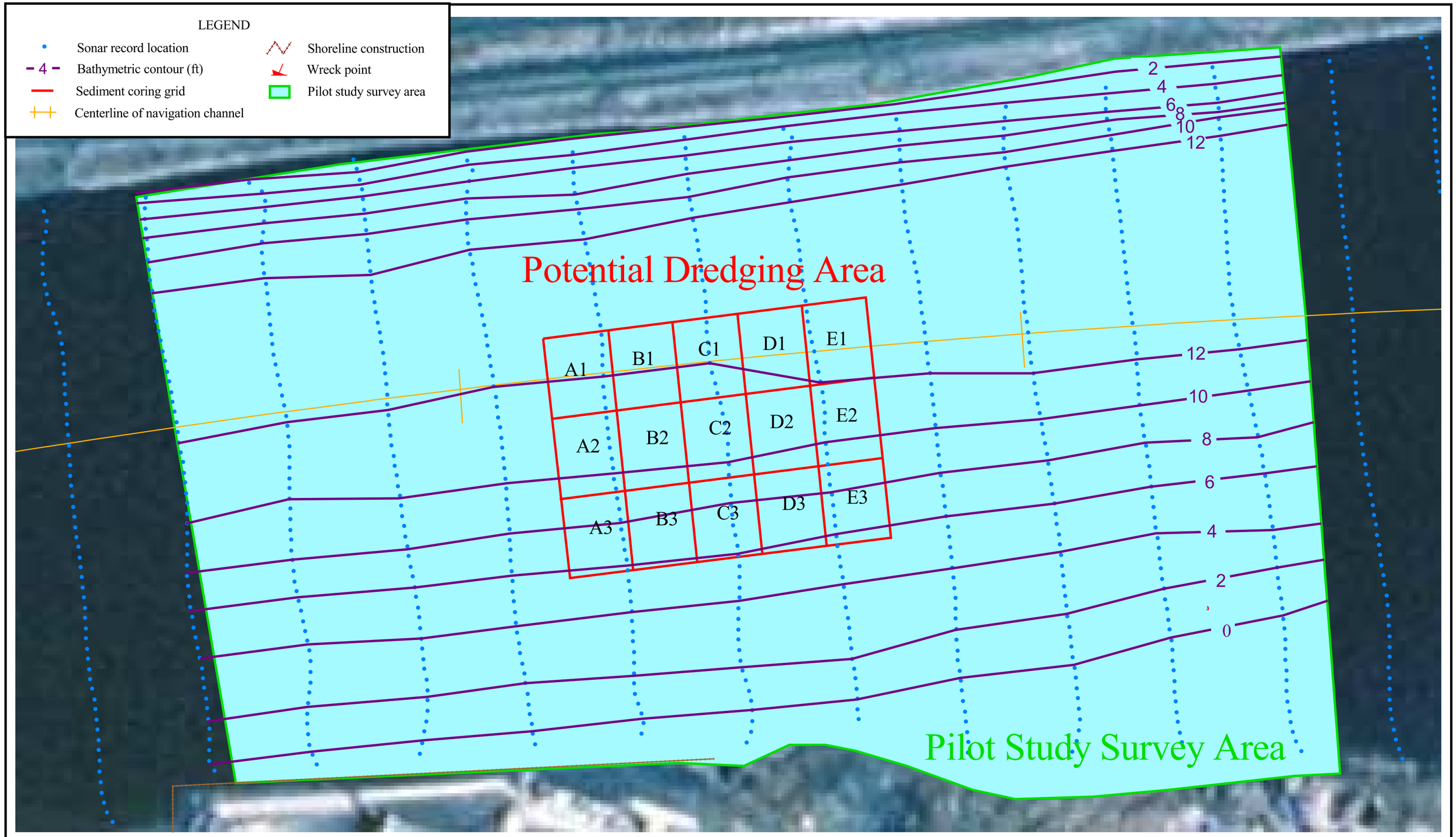
MALCOLM PIRNIE

0 50 100 150 200 Feet

0 25 50 Yards

N W E S

Lower Passaic River Restoration Project	Figure 3-13
	March/April 1995 Bathymetry



TAMS, an Earth Tech Company

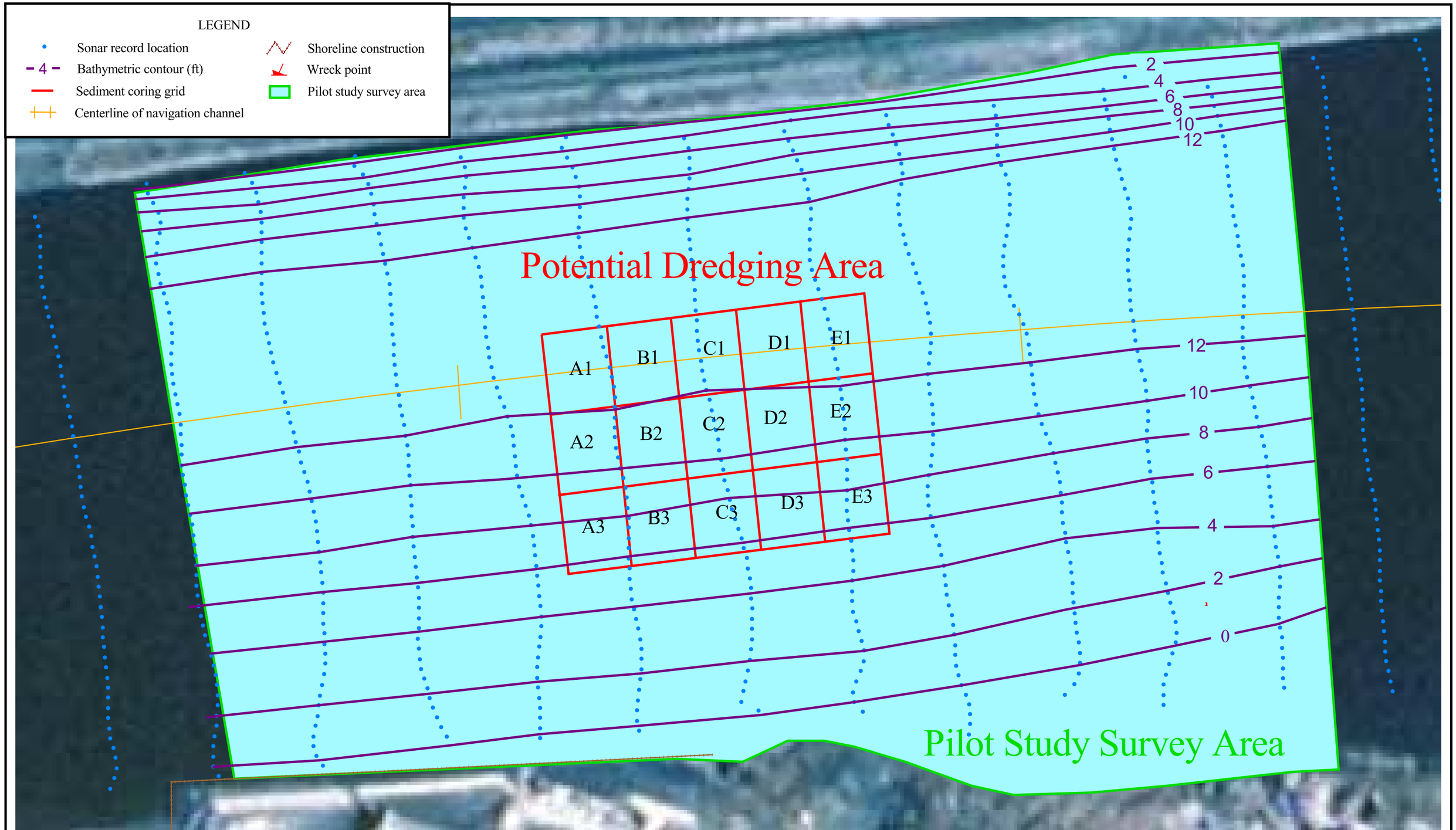
MALCOLM PIRNIE

0 50 100 150 200 Feet

0 25 50 Yards

N W E S

Lower Passaic River Restoration Project	Figure 3-14
	November 1996 Bathymetry



TAMS, an Earth Tech Company

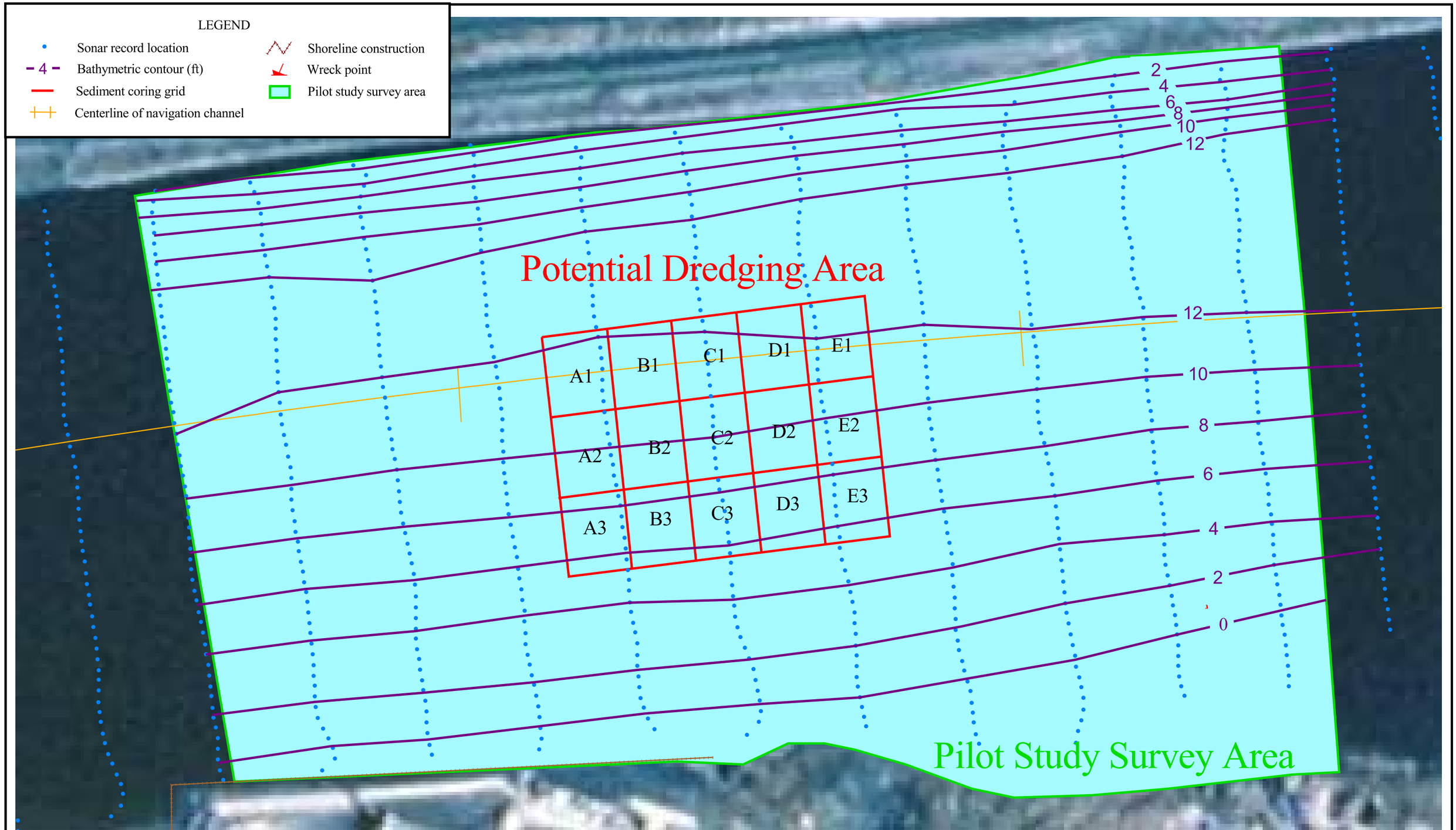
MALCOLM PIRNIE

0 50 100 150 200 Feet

0 25 50 Yards

N W E S

Lower Passaic River Restoration Project	Figure 3-15
	May 1997 Bathymetry



TAMS, an Earth Tech Company

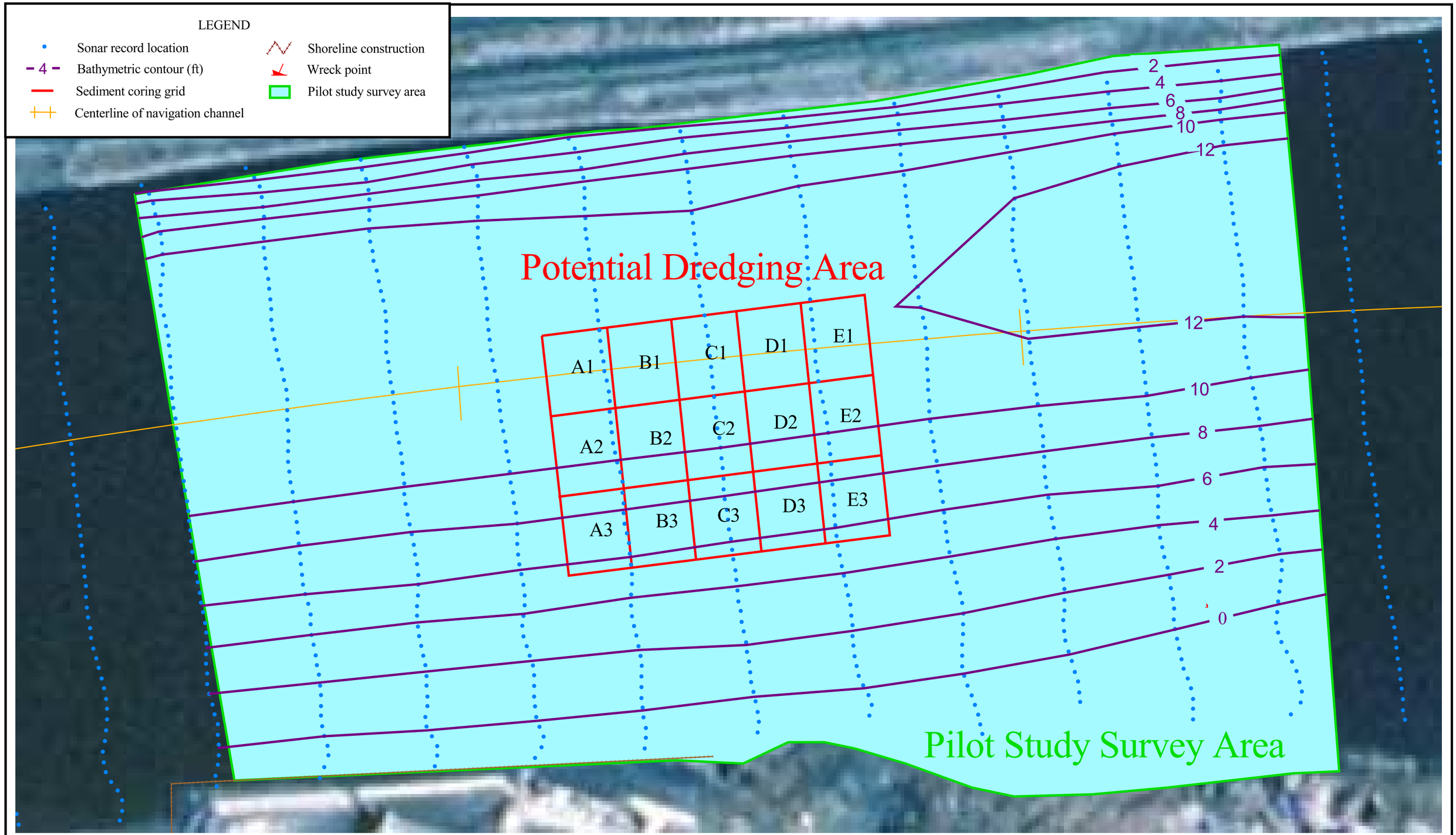
MALCOLM PIRNIE

0 50 100 150 200 Feet

0 25 50 Yards

N W E S

Lower Passaic River Restoration Project	Figure 3-16
	June 1999 Bathymetry



TAMS, an Earth Tech Company

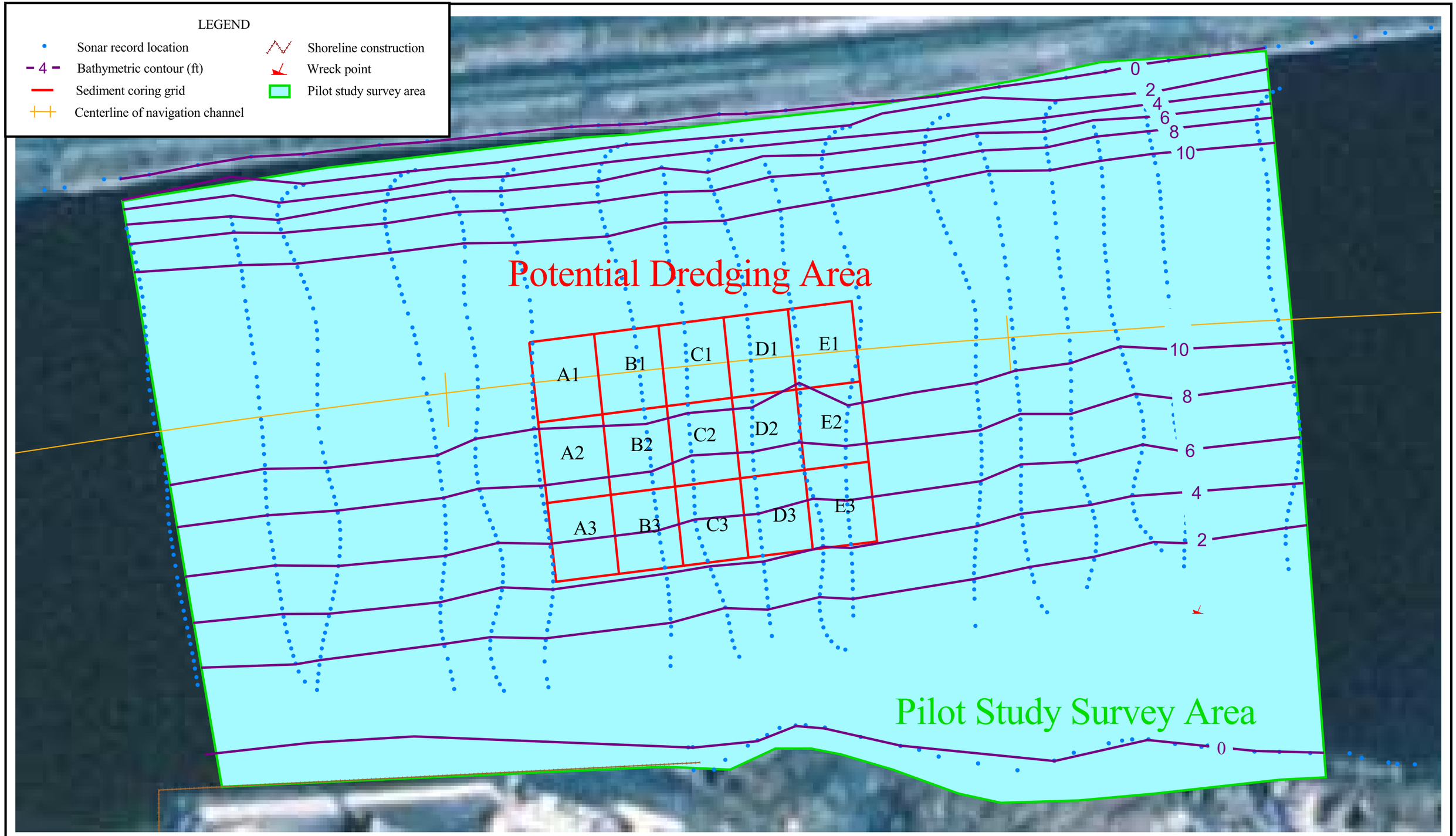
MALCOLM PIRNIE

0 50 100 150 200 Feet

0 25 50 Yards

N W E S

Lower Passaic River Restoration Project	Figure 3-17
	August 2001 Bathymetry



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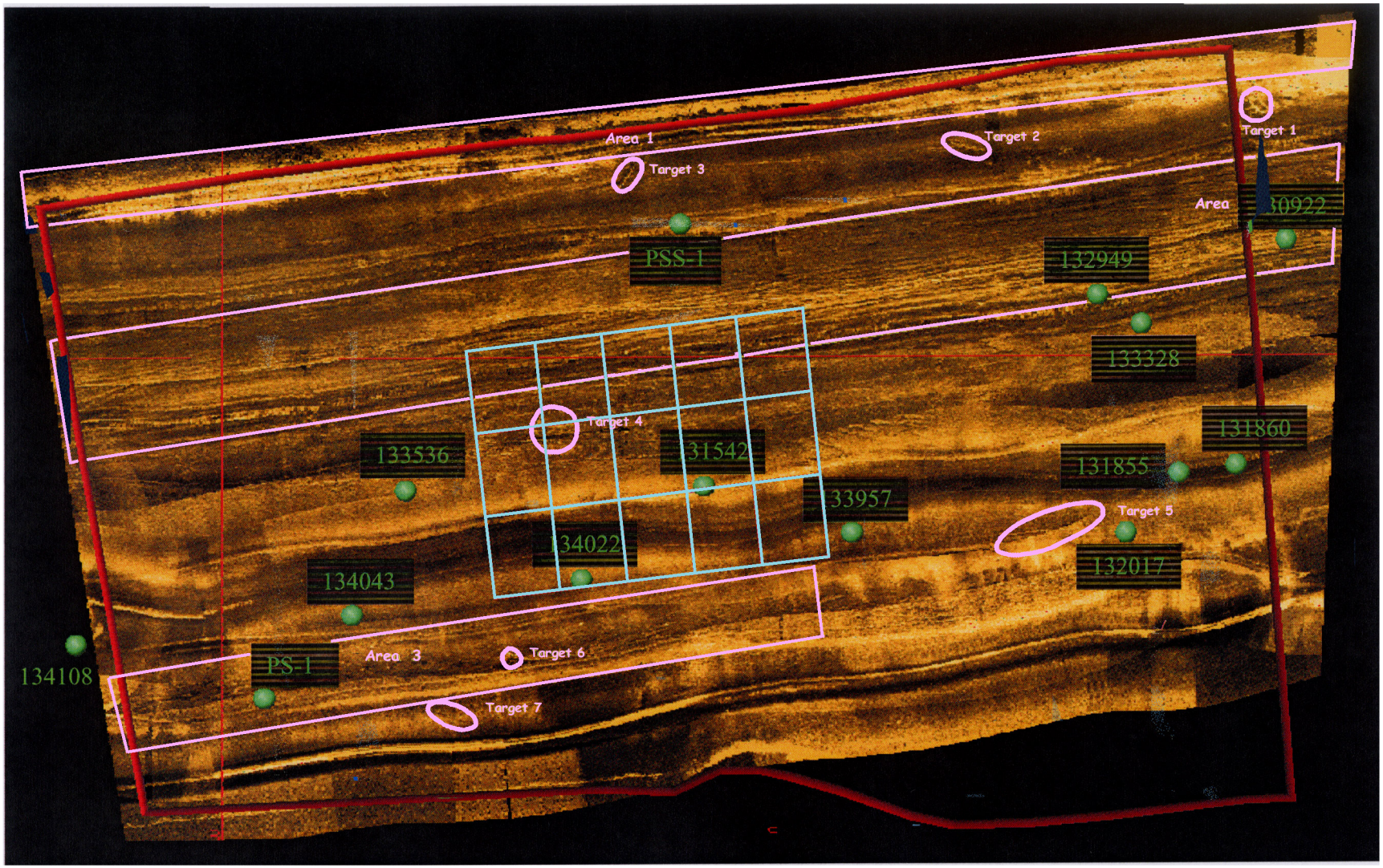
MALCOLM PIRNIE

Lower Passaic River Restoration Project	Figure 3-18
	March 2004 Bathymetry



LEGEND

- Magnetic anomalies and sub-bottom target
- Side scan sonar target
- Sediment coring grid

N

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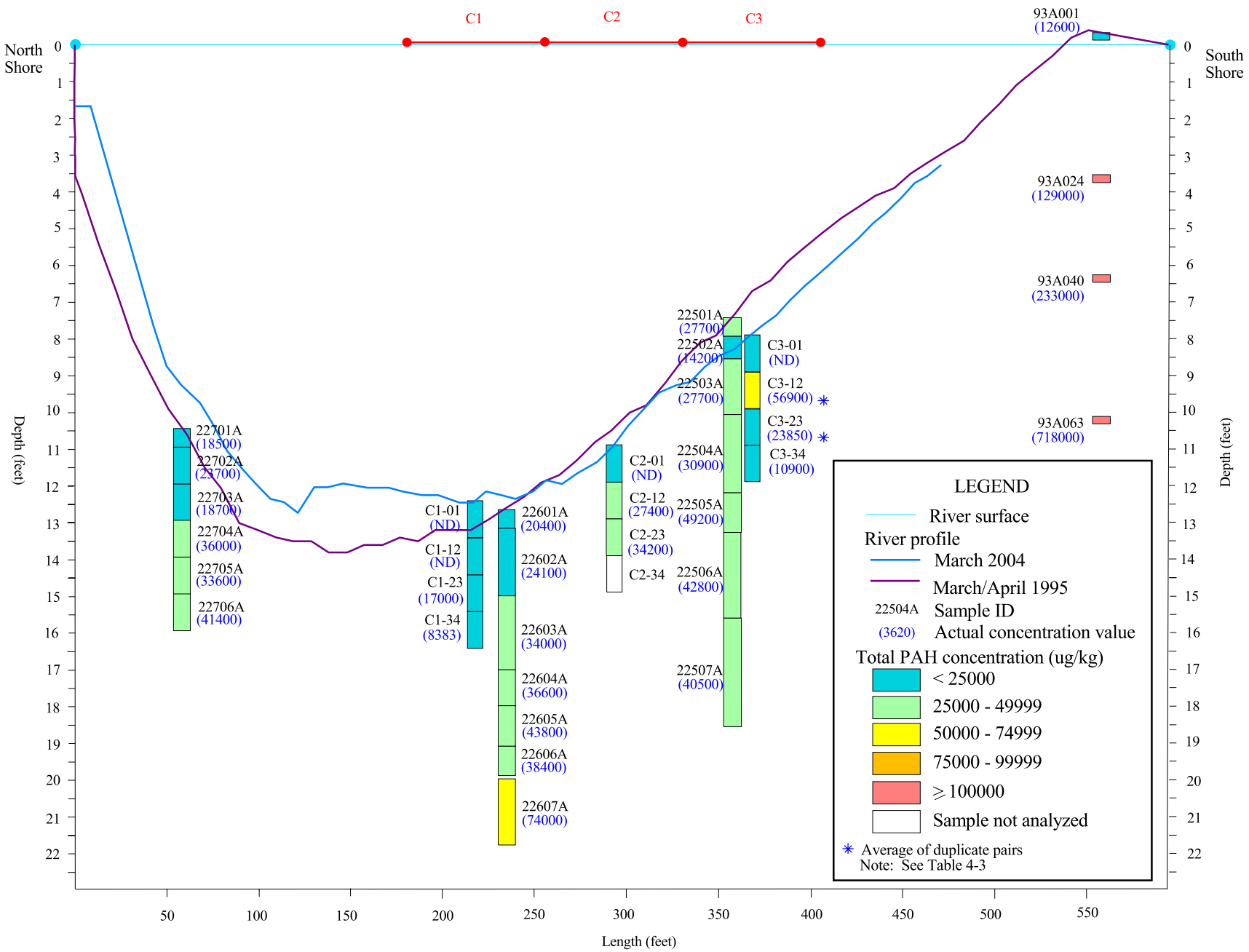
an Earth Tech Company

MALCOLM PIRNIE

Lower Passaic River Restoration Project

Figure 3-19

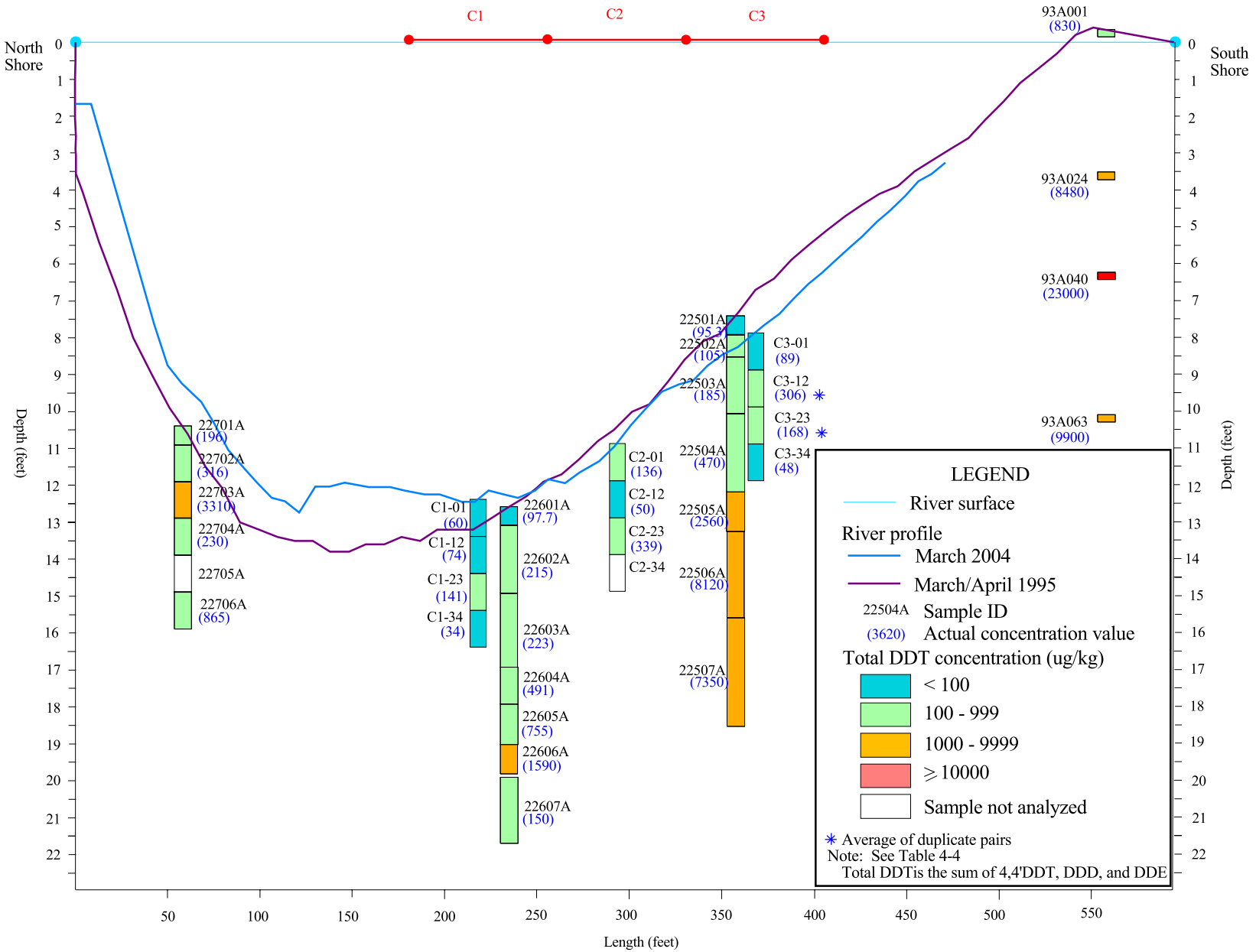
Magnetic Anomalies and Sub-bottom Profiler Targets Overlaid on Side Scan Sonar Targets and Mosaic



TAMS an Earth Tech Company

MALCOLM PIRNIE

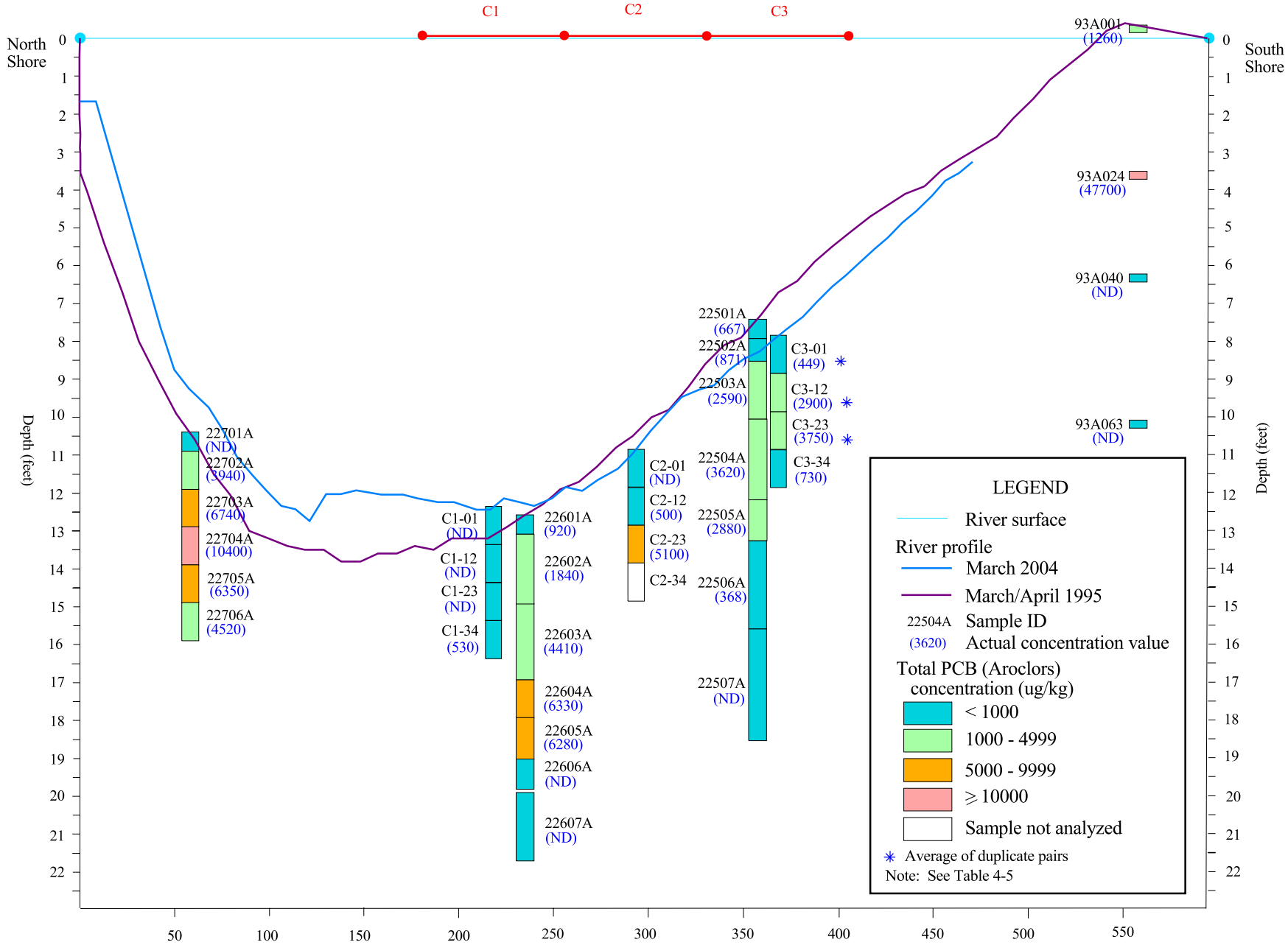
Lower Passaic River Restoration Project	Total PAH Levels and River Profile for Transect 6
	Figure 4-1



TAMS an Earth Tech Company

MALCOLM PIRNIE

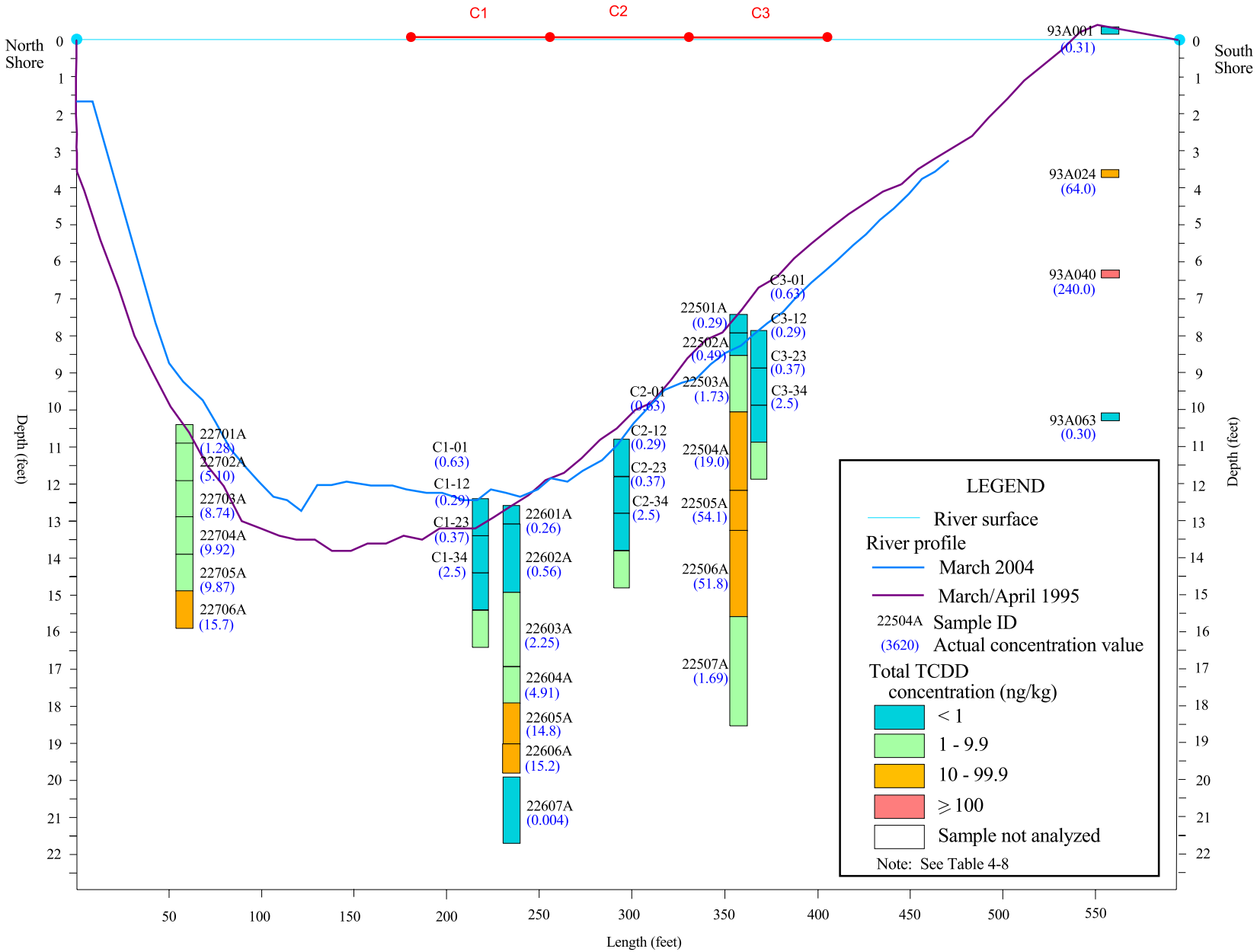
Lower Passaic River Restoration Project	Total DDT Levels and River Profile for Transect 6
	Figure 4-2



TAMS
an Earth Tech Company

MALCOLM PIRNIE

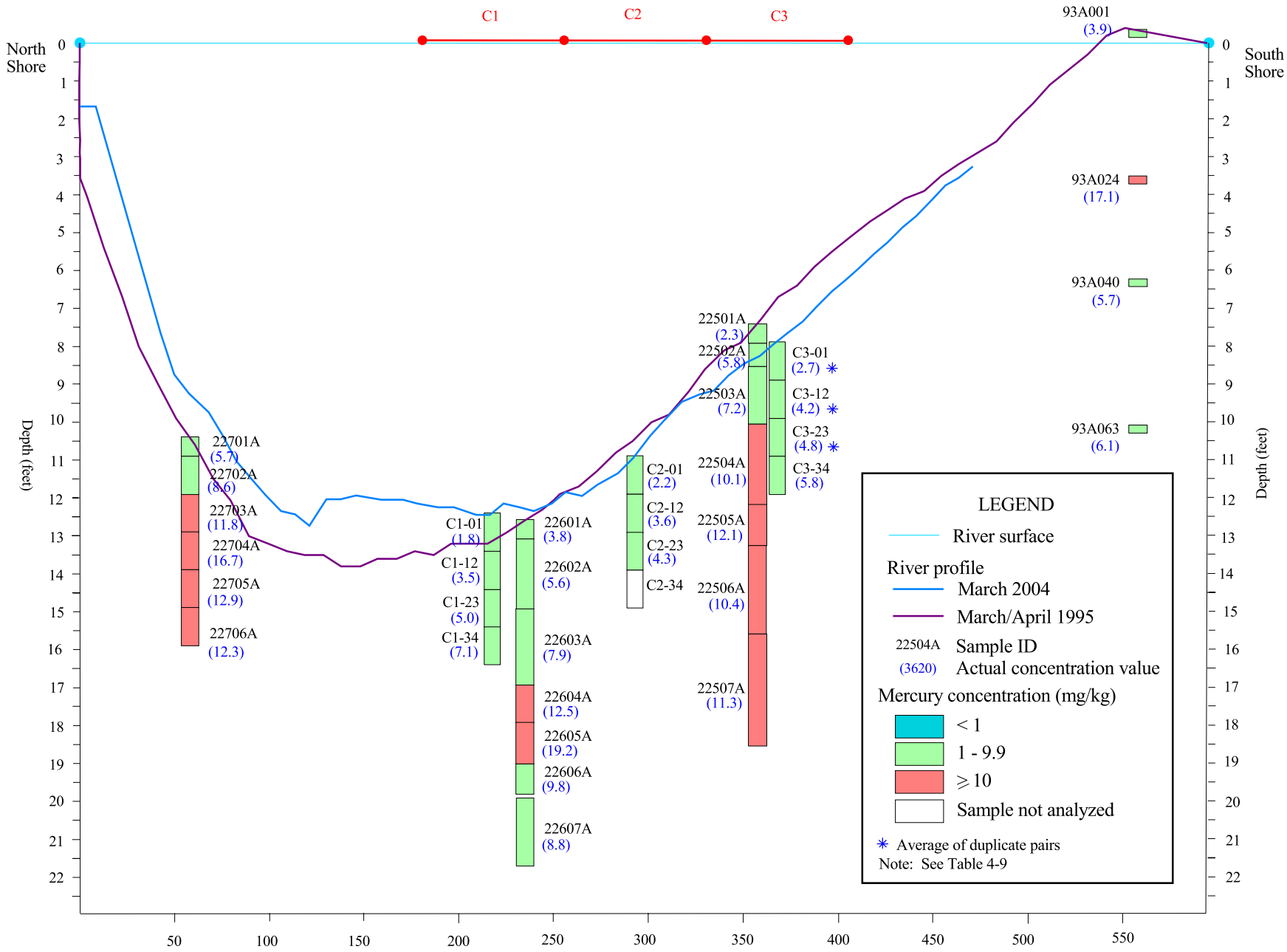
Lower Passaic River Restoration Project	Total PCB (Aroclors) Levels and River Profile for Transect 6
	Figure 4-3



TAMS an Earth Tech Company

MALCOLM PIRNIE

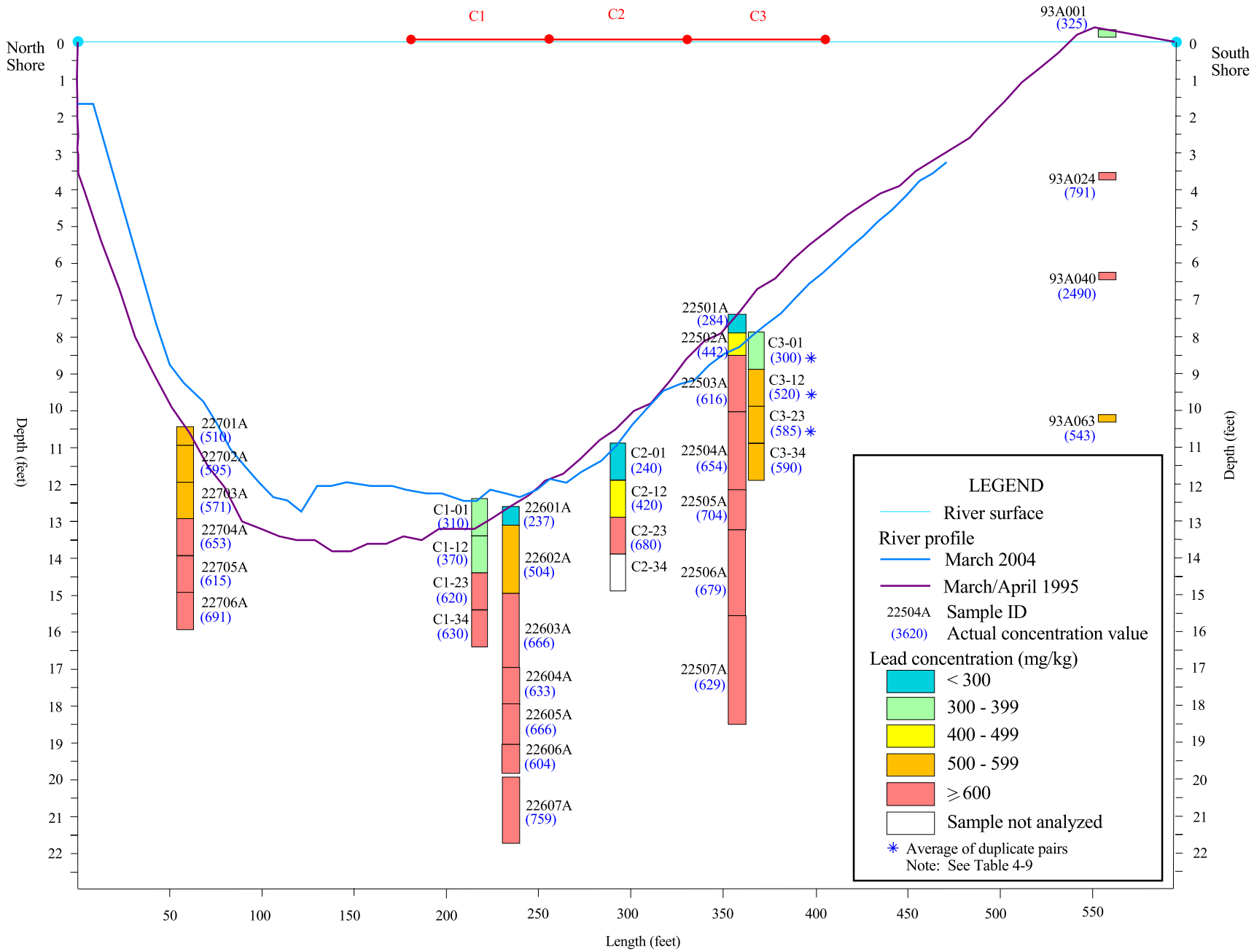
Lower Passaic River Restoration Project	Total TCDD Levels and River Profile for Transect 6
	Figure 4-4



TAMS an Earth Tech Company

MALCOLM PIRNIE

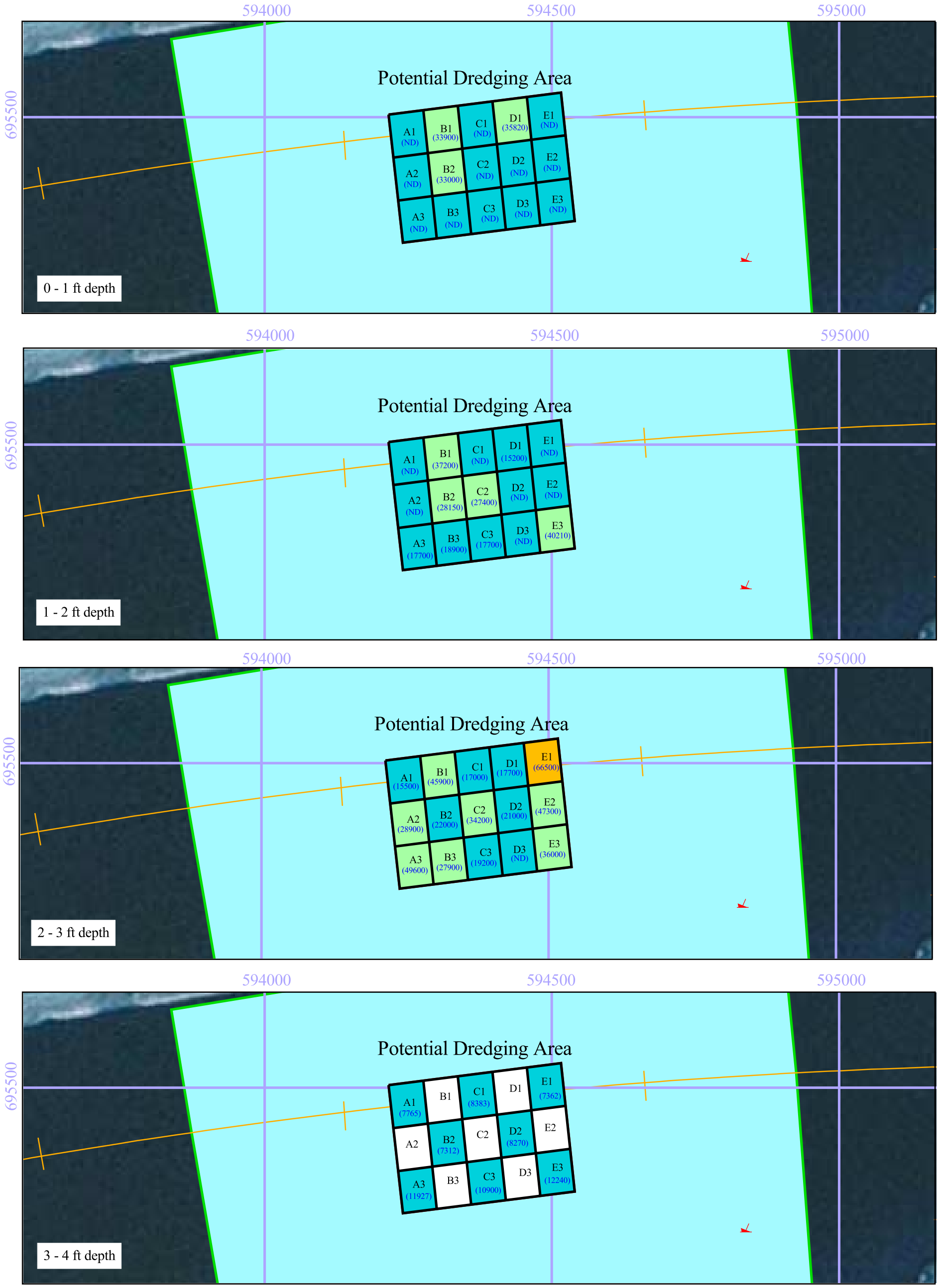
Lower Passaic River Restoration Project	Mercury Levels and River Profile for Transect 6
	Figure 4-5



TAMS
an Earth Tech Company

MALCOLM PIRNIE

Lower Passaic River Restoration Project	Lead Levels and River Profile for Transect 6
	Figure 4-6



LEGEND

Total PAH concentration (ug/kg)

- < 25000
- 25000 - 49999
- 50000 - 74900
- ⩾ 75000
- Sample Not Analyzed

Note: See Table 4-3

- C1 Sediment coring grid
- (22000) Actual concentration value
- Coordinate grid
- Centerline
- Wreck point
- Pilot study area

N W E S

0 50 100 150 200 250 300 Feet

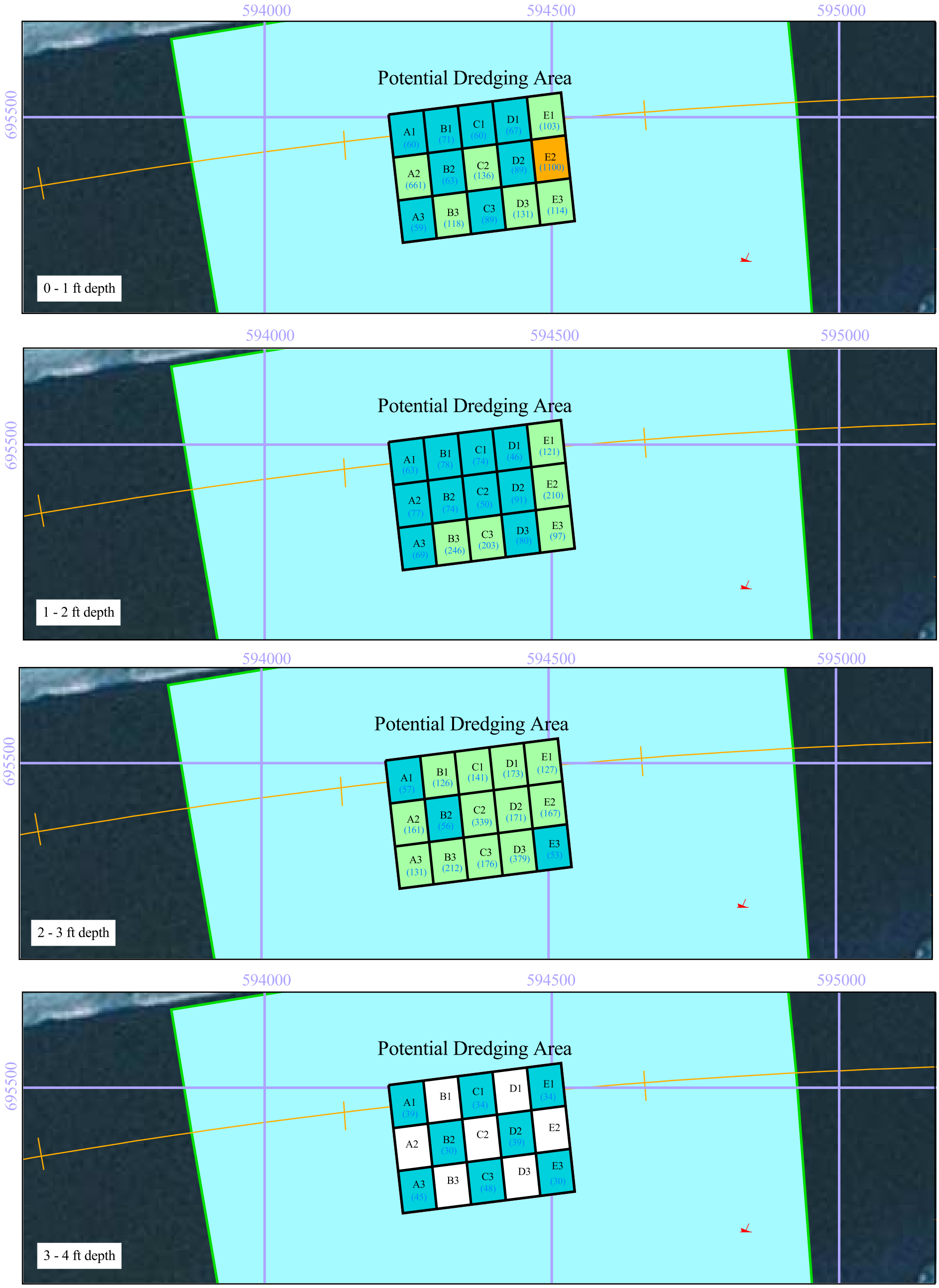
TAMS an Earth Tech Company

MALCOLM PIRNIE

Lower Passaic River Restoration Project

Figure 4-7

Total PAH Concentrations within Potential Dredging Area



LEGEND

Total DDT concentration (ug/kg)		
< 100	C1	Sediment coring grid
100 - 999	(2596)	Actual concentration value
1000 - 9999		Coordinate grid
⩾ 10000		Centerline
Sample Not Analyzed		Wreck point
		Pilot study area

Notes: See Table 4-4
Total DDT is the sum of valid detections of 4,4'DDD, 4,4'-DDE, and 4,4'-DDT.

N W E S

0 50 100 150 200 250 300 Feet

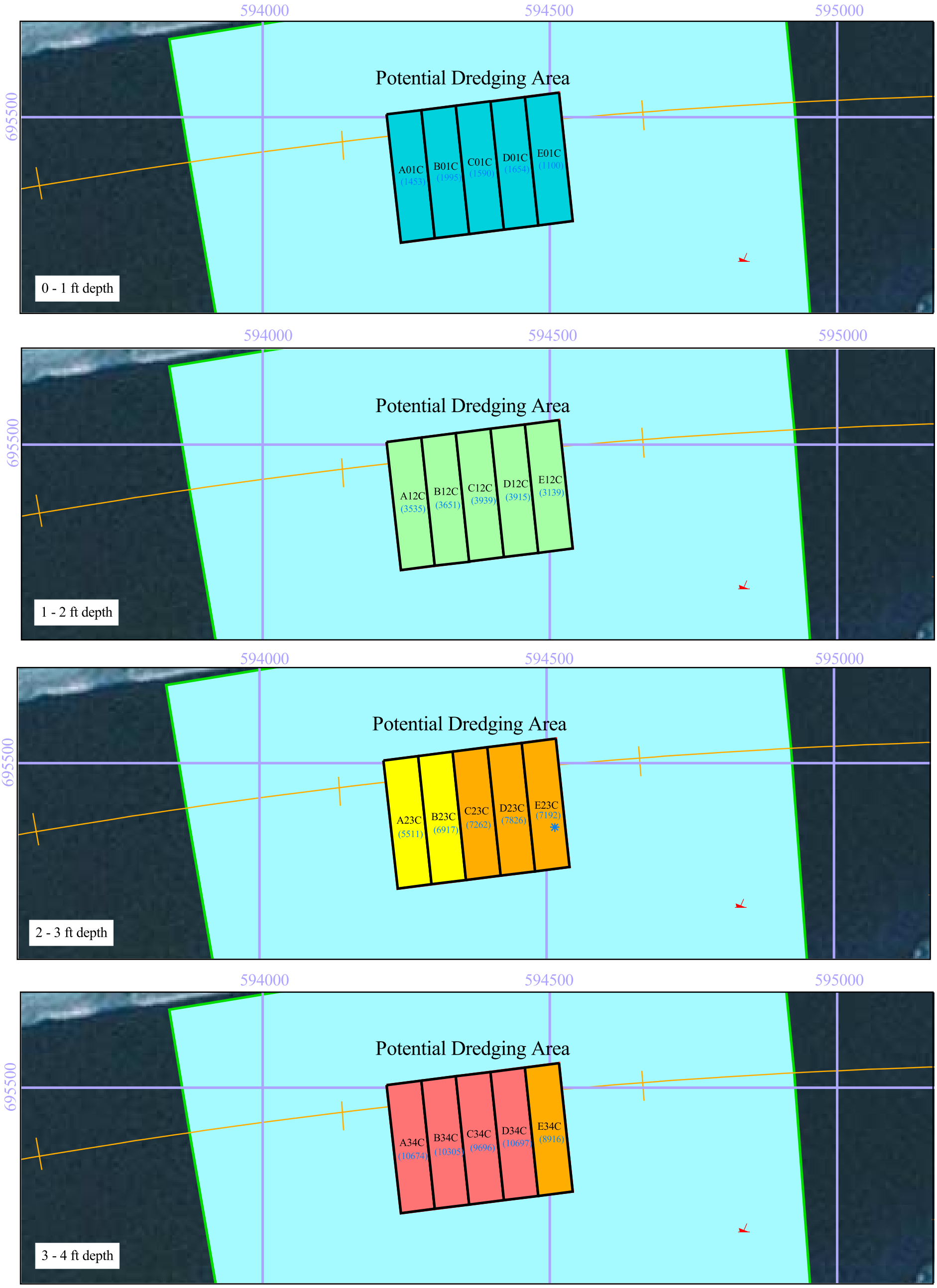
TAMS an Earth Tech Company

MALCOLM PIRNIE

Lower Passaic River Restoration Project

Figure 4-8

Total DDT Concentrations within Potential Dredging Area



LEGEND

Total PCB Congener concentration (ug/kg)

- < 3000
- 3000 - 4999.9
- 5000 - 6999.9
- 7000 - 8999.9
- ≥ 9000

Note: See Table 4-6

- C1 Sediment coring grid
- (2596) Actual concentration value
- Coordinate grid
- Centerline
- Wreck point
- Pilot study area
- ✳ Average of duplicate pair.

N W E S

0 50 100 150 200 250 300 Feet

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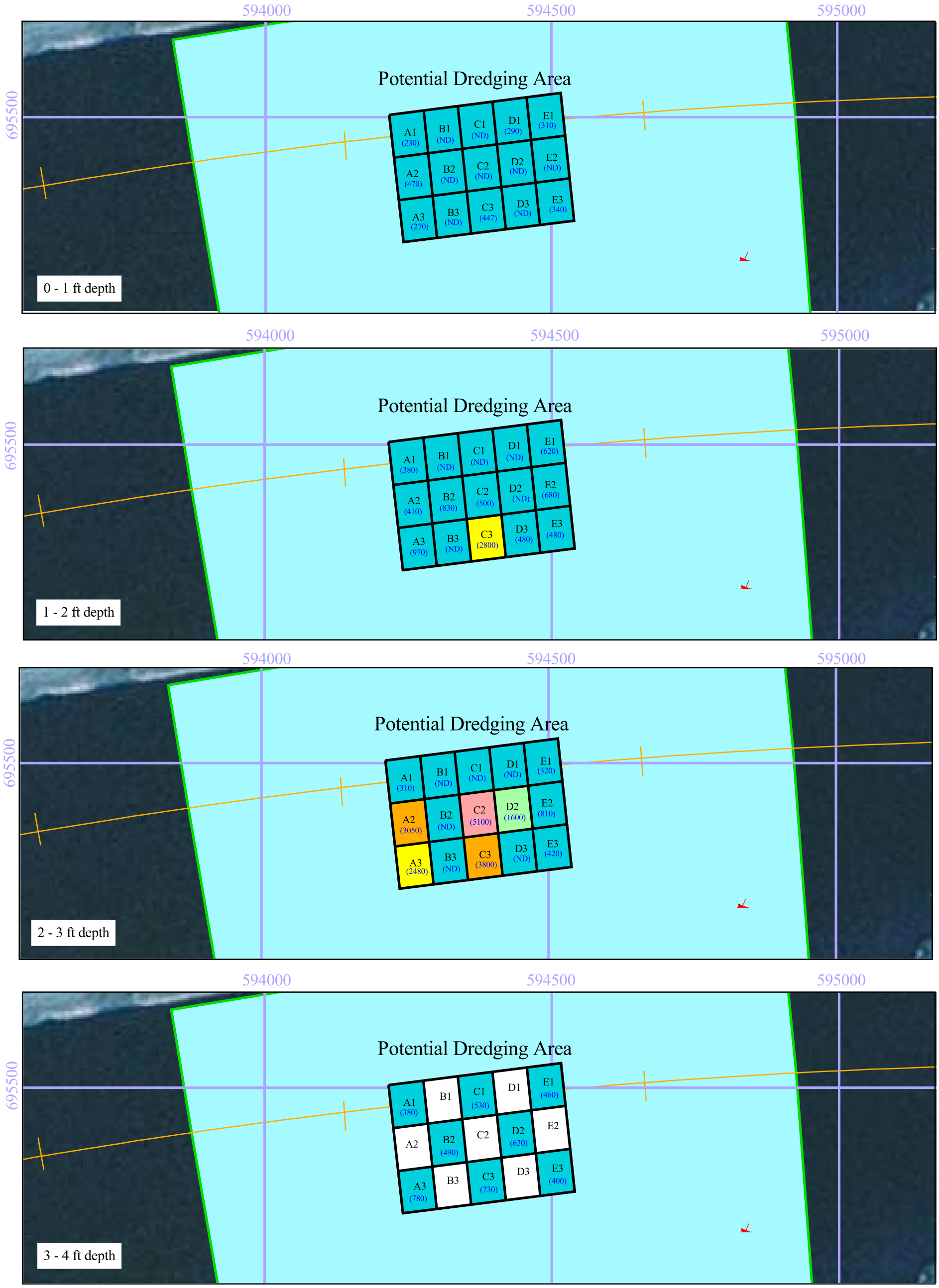
MALCOLM PIRNIE

Lower Passaic River Restoration Project	Figure 4-9
	Total PCB (Congeners) Concentrations within Potential Dredging Area



LEGEND

Total PCB (Aroclors) concentration (ug/kg)

- < 1000
- 1000 - 1999.9
- 2000 - 2999.9
- 3000 - 3999.9
- ≥ 4000
- Sample Not Analyzed

Note: See Table 4-5

- C1 — Sediment coring grid
- (312) — Actual concentration value
- Coordinate grid
- Centerline
- Wreck point
- Pilot study area

N W E S

0 50 100 150 200 250 300 Feet

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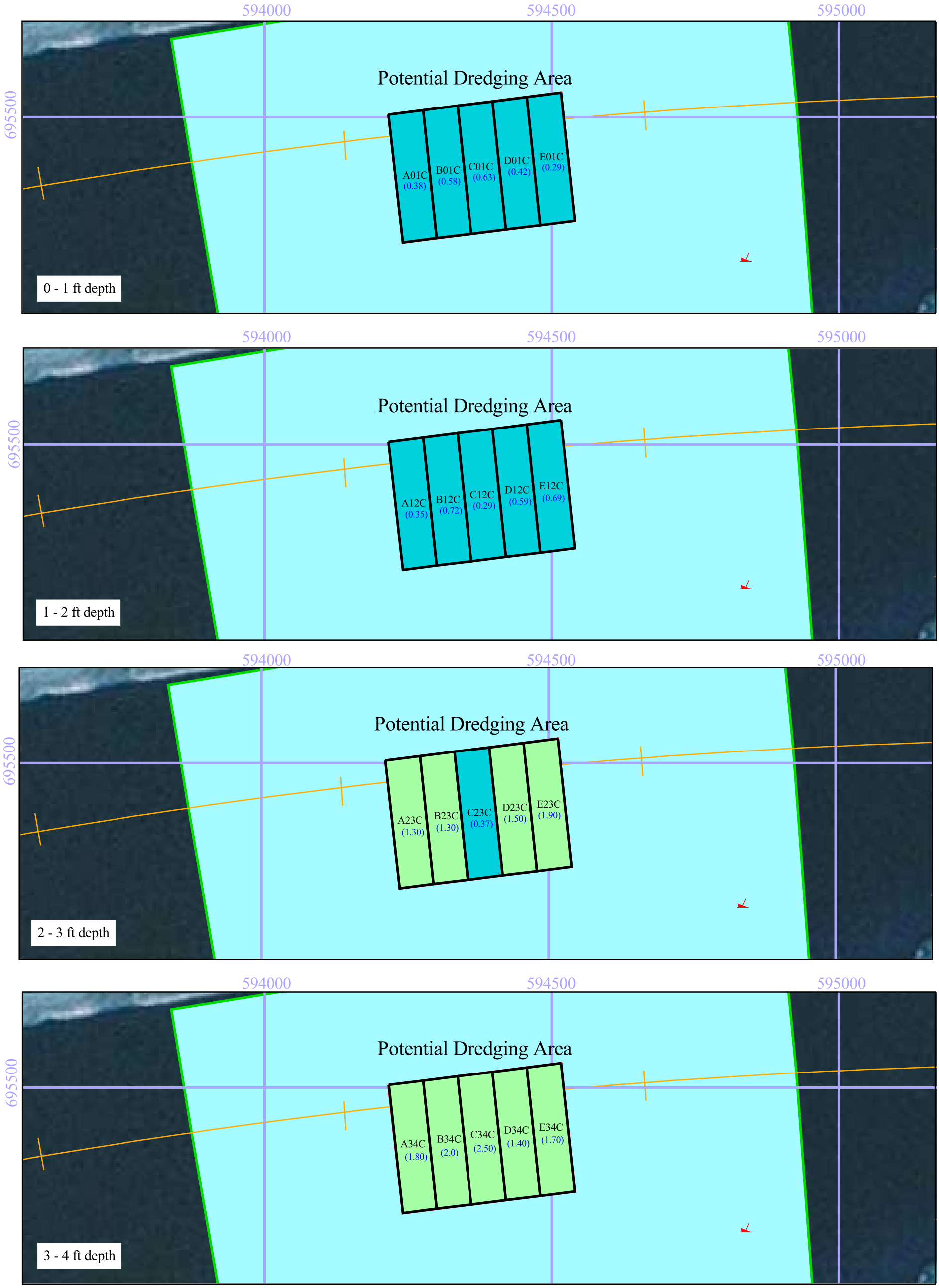
Lower Passaic River Restoration Project	Figure 4-10
	Total PCB (Aroclors) Concentrations within Potential Dredging Area



LEGEND

TCDD concentration (ng/kg)
- < 1
- 1 - 10
- 10 - 100
- ⩾ 100

- C1 Sediment coring grid
- (1.3) Actual concentration value
- Coordinate grid
- Channel centerline
- Wreck point
- Pilot study area

Note: See Table 4-8

N W E S

0 50 100 150 200 250 300 Feet

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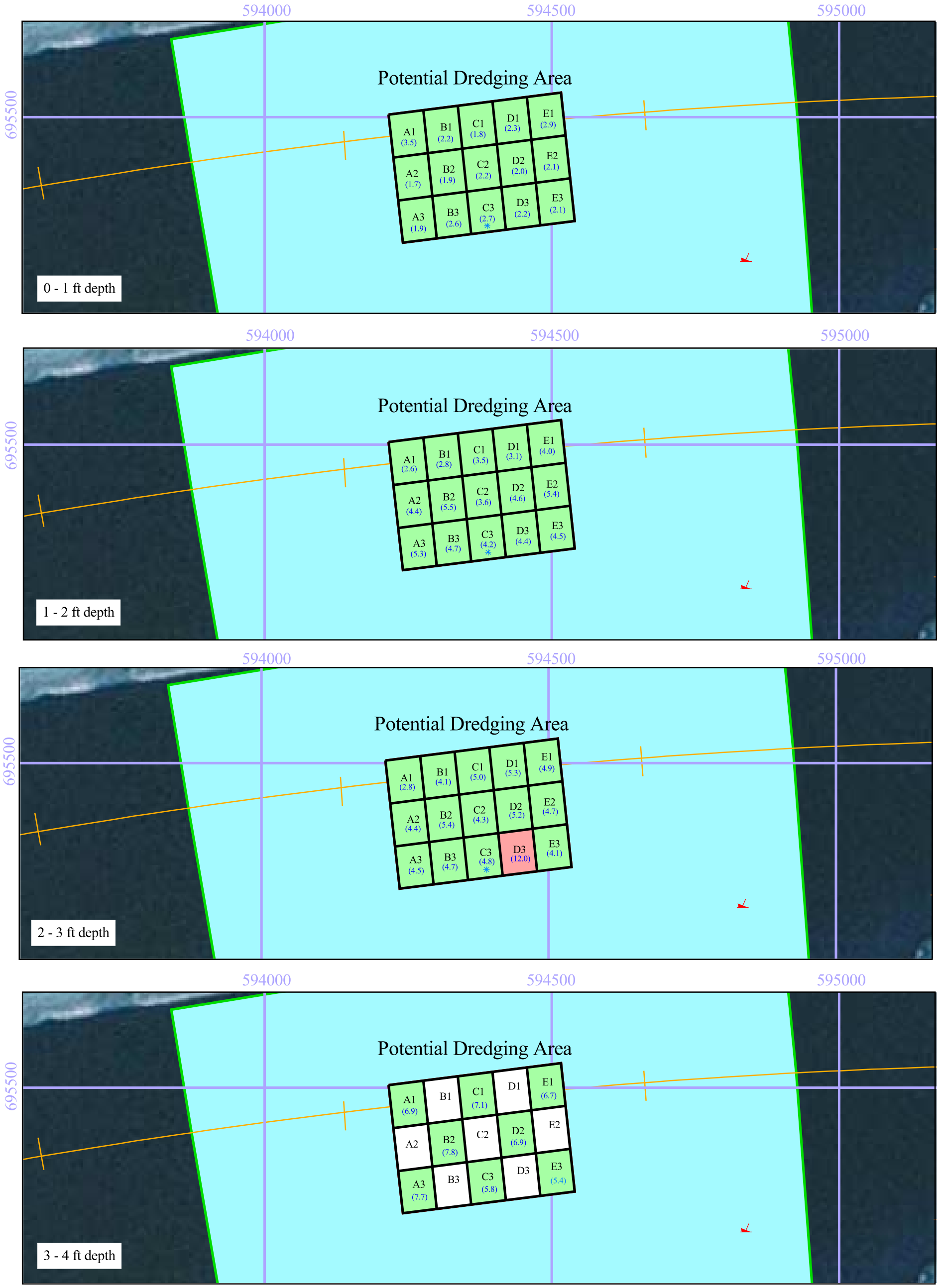
Lower Passaic River Restoration Project

Figure 4-11

Total TCDD Concentrations within Potential Dredging Area



LEGEND

Mercury concentration (mg/kg)
- < 1
- 1 - 9.9
- ⩾ 10
- Sample Not Analyzed

Note: See Table 4-9

- C1 Sediment coring grid
- (2.8) Actual concentration value
- Coordinate grid
- Centerline
- Wreck point
- Pilot study area
- * Average of duplicate pair

N W E S

0 50 100 150 200 250 300 Feet

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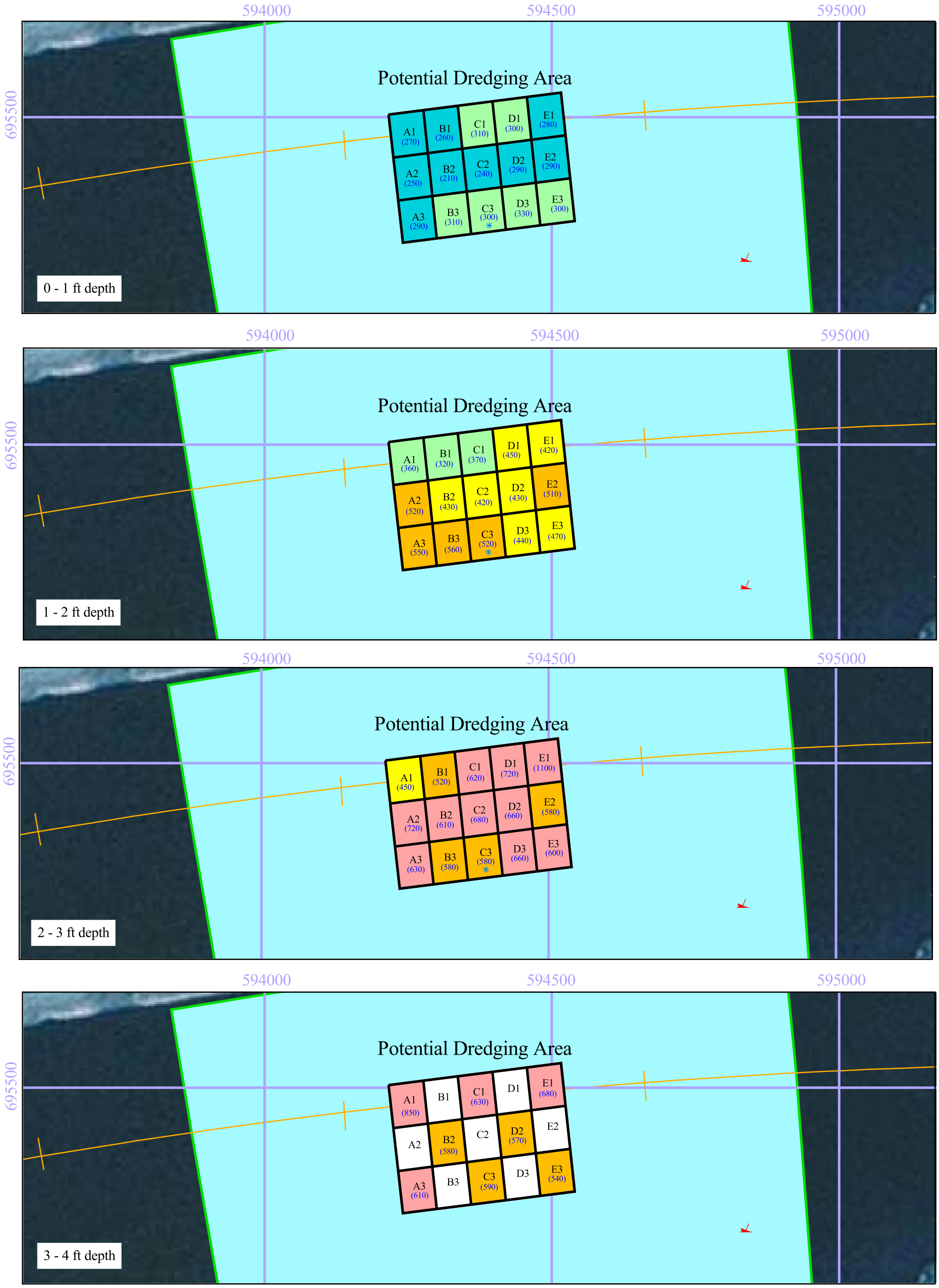
MALCOLM PIRNIE

Lower Passaic River Restoration Project

Figure 4-12

Mercury Concentrations within Potential Dredging Area



LEGEND

Lead concentration (mg/kg)
- < 300
- 300 - 399
- 400 - 499
- 500 - 599
- ⩾ 600
- Sample Not Analyzed

Note: See Table 4-9

- C1 Sediment coring grid
- (450) Actual concentration value
- Coordinate grid
- Centerline
- Wreck point
- Pilot study area

* Average of duplicate pair

N W E S

0 50 100 150 200 250 300 Feet

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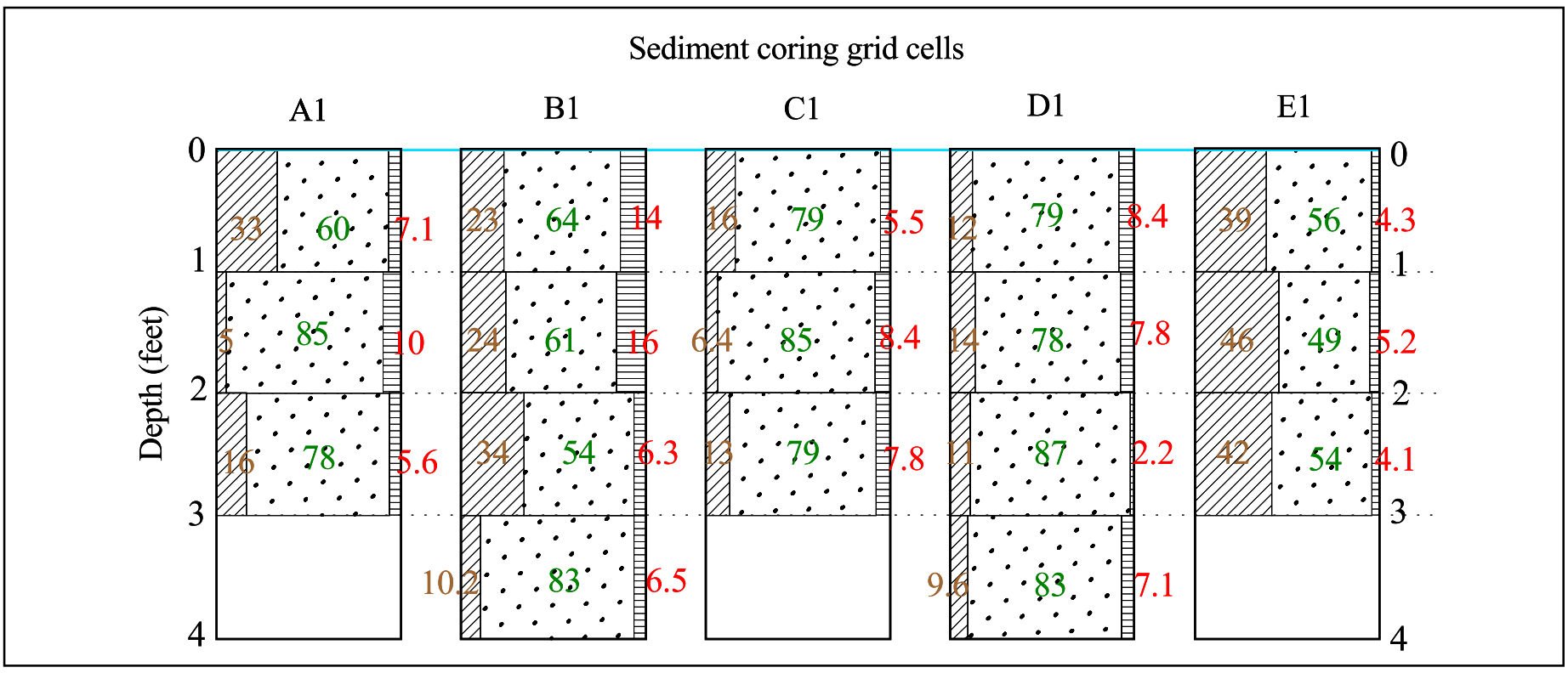
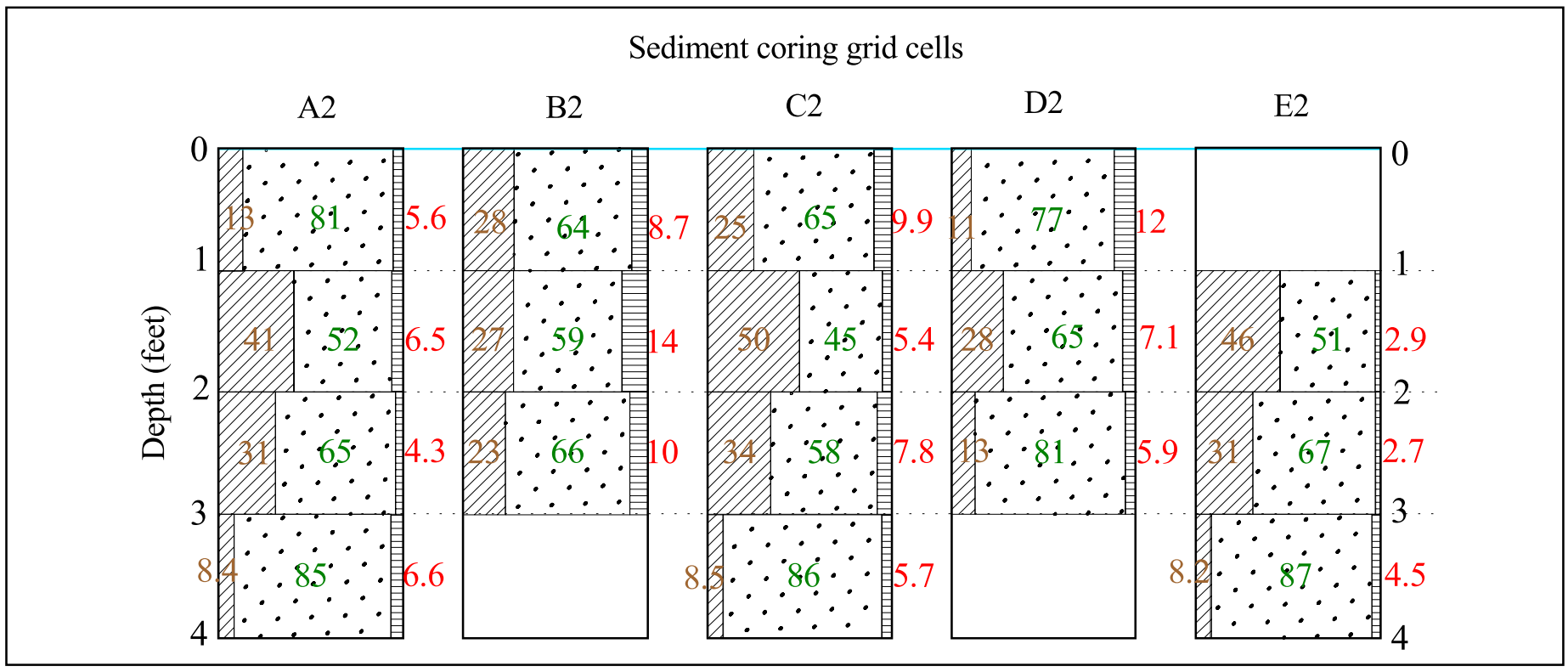
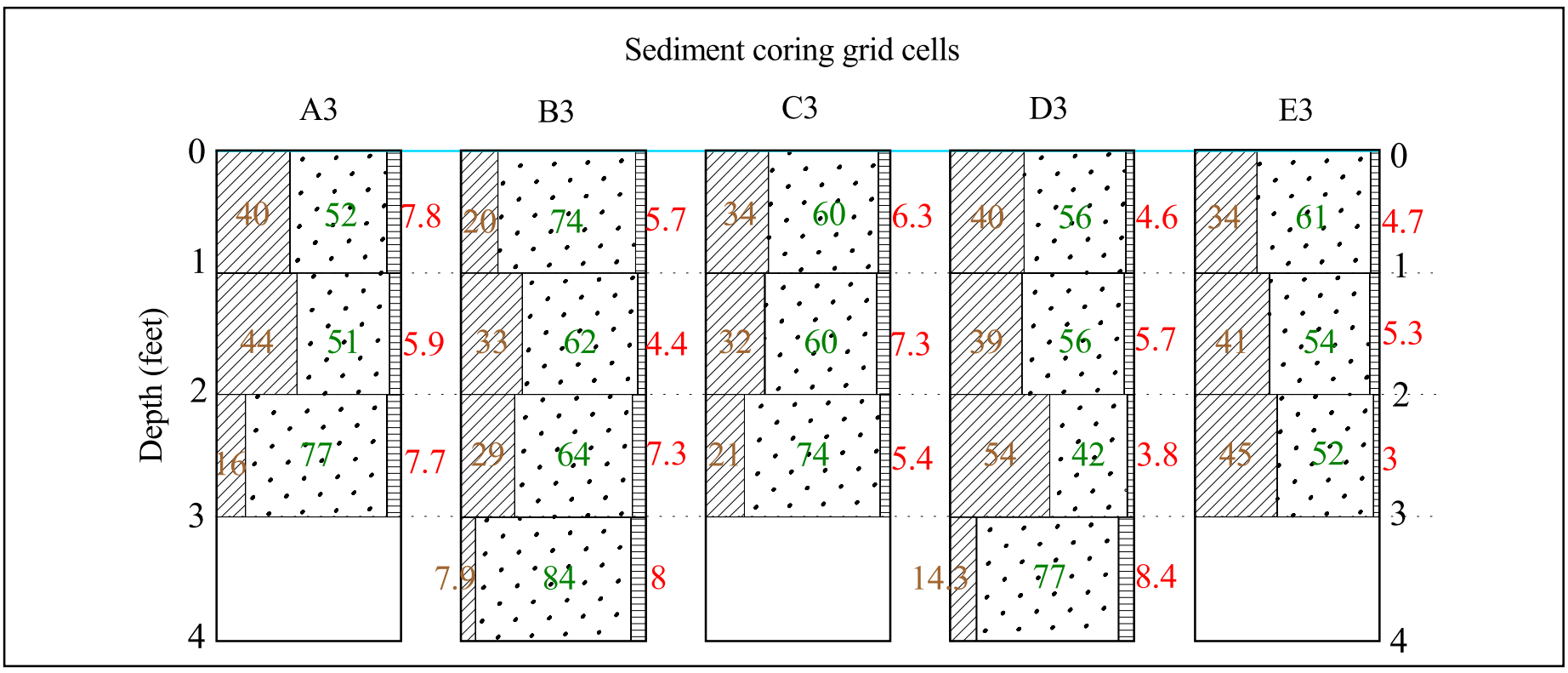
Lower Passaic River Restoration Project	Figure 4-13
	Lead Concentrations within Potential Dredging Area







Note: B1-23 also included 5.5% Granule, >2mm. This fraction was not significant (i.e., ≤0.2%) in all other samples.

LEGEND

Sediment type and percentage

- 16 Sand
- 77 Silt
- 7.7 Clay

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MALCOLM PIRNIE

Lower Passaic River Restoration Project	Figure 4-14
	Cross-section of Sediment Coring Grid Cells Showing Sediment Type

Appendix

A

Appendix A:

Coring Logs

PASSAIC RIVER SEDIMENT SAMPLING AND ANALYSIS PROGRAM

Coring Field Log

Relinquished by: Lisa Baron Date: 7/12/04 Time: 1515 Sampler: Steve ~~Broward~~ Brodman

Received by: Jim Nichols Date: 7/12/04 Time: 1525 Weather: Rain

Core ID	Date	Time	Northing	Easting	Water Depth (ft)	~~Probing Depth (in)~~	Sediment Type	Sediment Description	Sample Type **	Core Recovered	Tube Material *	Penetration (in)	Recovery (in)
A-3	7/12/04	1450	695322.20	39429882	11.8			Black, fines, silty	C	☑	L	84	76
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			

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

EARTH TECH

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/12/04
A-3	Northing: 695322.89 Easting: 594269.58	Time: 1450

Name(s) of ASI Samplers: Steve Bradman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling:	Was the core barrel rinsed thoroughly between collection of each core?
Water depth: 11.8 ft ~~Stage of tide:~~ NAVD29: -2.18 Sediment description: Black, mucky, silty fines,	☑ Yes ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1446
Were multiple attempts made to advance the core? ☐ Yes ☑ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: A-3

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695322.20	594259.82		4	C	L	84	76	90	F
Final 1	695322.20	594259.82		4	C	L	84	76	90	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Confirm core labeling and handling by checking appropriate boxes below:

☐ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, iced)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

NO DECON ON BOAT

Additional comments on sampling operations (if necessary):

- A second core was collected from this location for Montclair State U.

Name (printed):	Agency:
Erika K Zamek	MPI
Signature:	Date:
Erika Zamek	7/12/01

PASSAIC RIVER SEDIMENT SAMPLING AND ANALYSIS PROGRAM

Coring Field Log

(UB)

Relinquished by: Erika Zamek Date: 7/12/04 Time: 1645 Sampler: Steve ~~Brocant~~ Brodman

Received by: Florence Rollins Date: 7/12/04 Time: 1645 Weather: Rain

Core ID	Date	Time	Northing	Easting	Water Depth (ft)	Probing Depth (in)	Sediment Type	Sediment Description	Sample Type **	Core Recovered	Tube Material *	Penetration (in)	Recovery (in)
A-2	7/12/04	1545	695390.89	594201.30	15ft		Fines	Black, silty	C	☑	L	84	80.5
A-1	7/12/04	1606	695472.20	594252.49	17.4ft		Fines	Dark, silty	C	☑	L	84	54
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			

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

EARTH TECH

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/12/04
A-2	Northing: 695395.66 Easting: 594258.30	Time: 1545

Name(s) of ASI Samplers: Steve Brodman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling:	Was the core barrel rinsed thoroughly between collection of each core?
Water depth: 15 ft ~~Stage of tide:~~ NAVD 29: - Sediment description: Black, mucky, fines, silty	☑ Yes ☐ No ☐ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1530 / 1540
Were multiple attempts made to advance the core? ☑ Yes ☐ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: A-2

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695397.15	594296.18		4	C	L	84	0	0	R
2	695390.89	594201.30		4	C	L	84	80.5	96	F
Final 2	695390.89	594201.30		4	C	L	84	80.5	96	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

NO DECON on BOAT

Additional comments on sampling operations (if necessary):

Attempt #1 => core lost at bottom of liner/barrel.

- Boat was not re-located ~~during~~ between attempts. Core barrel + vibracore unit were lowered in a different part of the moon pool.

- Boat did not appear to move during core collection operation (no visual indication or physical indication observed), yet N + E coords had changed by > 60 ft.

Name (printed):	Agency:
Erika K Zamek	MPI
Signature: Erika K Zamek	Date: 7/12/04

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/12/04
A-1	Northing: 695470.75 Easting: 594251.09	Time: 1606

Name(s) of ASI Samplers: Steve Brodman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling:	Was the core barrel rinsed thoroughly between collection of each core?
Water depth: 17.45ft ~~Stage of tide:~~ NAVD29 : -3.14 Sediment description: Dark, mucky, fines, silty	~~☒ Yes~~ ☐ No ☒ n/a
Core advanced via: ☒ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1603
Were multiple attempts made to advance the core? ☐ Yes ☒ No	Was a core catcher utilized? ☒ Yes ☐ No

Core Attempt Chart

Core ID #: A-1

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695472.20	594252.49		4	C	L	84	54	64	F
Final 1	695472.20	594252.49		4	C	L	84	54	64	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

NO DECON ON BOAT

Additional comments on sampling operations (if necessary):

- Small plug (1-2") of sediment lost during capping process.

Name (printed):	Agency:
Erika K Zamek	MPI
Signature: Erika Zamek	Date: 7/12/04

PASSAIC RIVER SEDIMENT SAMPLING AND ANALYSIS PROGRAM

Coring Field Log

Relinquished by: Erika Zamek Date: 7/13/04 Time: 1104 Sampler: Steve Brodman

Received by: Florence Rollino Date: 7/13/04 Time: 1104 Weather: Light rain, cloudy, light wind

Core ID	Date	Time	Northing	Easting	Water Depth (ft)	~~Probing Depth (in)~~	Sediment Type	Sediment Description	Sample Type **	Core Recovered	Tube Material *	Penetration (in)	Recovery (in)
~~B-3~~	~~7/13/04~~	~~1003~~	~~695337.99~~	~~594323.86~~	~~11.5ft~~		~~Fines~~	~~Dark, Silty~~	~~C~~	~~☑~~	~~L~~	~~84~~	~~70~~
B-2	7/13/04	1025	695405.20	594323.60	13.6		Fines	Dark, silty	C	☑	L	84	78
B-1	7/13/04	1049	695481.70	594315.3	16		Fines	Dark, silty	C	☑	L	84	75
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			

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

EARTH TECH

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/13/04
B-1	Northing: 695477.84 Easting: 594310.94	Time: 1049

Name(s) of ASI Samplers: Steve Bradman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling:	Was the core barrel rinsed thoroughly between collection of each core?
Water depth: 16 ft ~~Stage of tide:~~ NAVD29: -1.04 Sediment description: Dark, silty, fines	~~☑ Yes~~ ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1039
Were multiple attempts made to advance the core? ☐ Yes ☑ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: B-1

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695481.70	594315.31		4	C	L	84	75	89	F
Final 1	695481.70	594315.31		4	C	L	84	75	89	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Core Sampling Oversight Log

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

NO BOAT DECON

Additional comments on sampling operations (if necessary):.

None

Name (printed): Erica K Zamell	Agency: MPI
Signature: Erica Zamell	Date: 7/13/04

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	~~Date:~~ Time 1025
B-2	Northing: 695402.90 Easting: 594317.94	~~Time:~~ Date 7/13/04

Name(s) of ASI Samplers: Steve Bradman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling:	Was the core barrel rinsed thoroughly between collection of each core?
Water depth: 13.6 ft ~~Stage of tide:~~ NAVD29: -0.97 Sediment description: Dark, silty, mucky	☑ ~~Yes~~ ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1015
Were multiple attempts made to advance the core? ☐ Yes ☑ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: B-2

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695405.20	5494325.60		4	C	L	84	78	93	F
Final 1	695405.20	5494325.60		4	C	L	84	78	93	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright~~, iced)~~

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

NO BOAT DECON

Additional comments on sampling operations (if necessary):

core tipped slightly during capping

Name (printed): Erika K Zamek	Agency: MPI
Signature: Erika Zamek	Date: 7/13/04

PASSAIC RIVER SEDIMENT SAMPLING AND ANALYSIS PROGRAM

Coring Field Log

Relinquished by: Erika Zamek Date: 7/13/04 Time: 1255

Received by: Florence Rollino Date: 7/13/04 Time: 1255

Sampler: Steve Brodman

Weather: Light rain, wind

Core ID	Date	Time	Northing	Easting	Water Depth (ft)	~~Probing Depth (in)~~	Sediment Type	Sediment Description	Sample Type **	Core Recovered	Tube Material *	Penetration (in)	Recovery (in)
C-3	7/13/04	1146	695329.55	594386.43	9.7		Fines	Dark, Silty	C	☑	L	84	79
C-3 DUP	7/13/04	1146	695329.32	594386.43	9.7		Fines	Dark, Silty	C	☑	L	84	75
C-2	7/13/04	1220	695410.05	594329.10	12		Fines	Dark, Silty	C	☑	L	84	77
C-1	7/13/04	1234	695485.26	594326.25	14.3		Fines	Dark, Silty	C	☑	L	84	69
										☐			
										☐			
										☐			
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										☐			

*Tube Material: A=Aluminum, L=Lexan

**Sediment Type: C=Core, G=Grab

EARTH TECH

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/13/04
C-3	Northing: 695335.843 Easting: 594355.88	Time: 1140

Name(s) of ASI Samplers: Steve Brodman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling: Water depth: 9.7 ft ~~Stage of tide:~~ NAVD 29: – 1.22 Sediment description: Dark, Silty fines	Was the core barrel rinsed thoroughly between collection of each core? ☐ Yes ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1130
Were multiple attempts made to advance the core? ☐ Yes ☑ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: C-3

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695329.55	594386.43		4	C	L	84	79	94	F
Final 1	695329.55	594386.43		4	C	L	84	79	94	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Core Sampling Oversight Log

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

NO BOAT DECON

Additional comments on sampling operations (if necessary):

C-3 DUP also collected @ this site

Name (printed): Erika K Zamek	Agency: MPI
Signature: Erika Zamek	Date: 7/13/04

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/13/04
C-3 DUP	Northing: 695335.84 Easting: 594385.88	Time: 1146

Name(s) of ASI Samplers: Steve Bradman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling: Water depth: 9.75ft ~~Stage of tide:~~ NAVD29: -1.22 Sediment description: Dark, silty fines	Was the core barrel rinsed thoroughly between collection of each core? ☐ Yes ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1142
Were multiple attempts made to advance the core? ☐ Yes ☑ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: C-3 DUP

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695329.32	594386.35		4	C	L	84	75	89	F
Final 1	695329.32	594386.35		4	C	L	84	75	89	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Core Sampling Oversight Log

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

NO BOAT DECON

Additional comments on sampling operations (if necessary):

Duplicate of ~~B~~ C-3

Name (printed): Erika K Zamek	Agency: MPI
Signature: Erika K Zamek	Date: 7/13/04

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/13/04
C-2	Northing: 695411.34 Easting: 594377.87	Time: ~~1200~~ 1210

Name(s) of ASI Samplers:

Describe results of probing conducted prior to core sampling: Water depth: 12.0 ft ~~Stage of tide:~~ NAVD29' -0.0 Sediment description: Dark, silty fines	Was the core barrel rinsed thoroughly between collection of each core? ☐ Yes ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1200 / 1203
Were multiple attempts made to advance the core? ☑ Yes ☐ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: C-2

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695409.85	594376.89		4	C	L	0	0	0	R
2	695410.08	594379.10		4	C	L	84	77	92	F
Final 2	695410.08	594379.10		4	C	L	84	77	92	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Core Sampling Oversight Log

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

NO BOAT DECON

Additional comments on sampling operations (if necessary):

#1 ⇒ Core barrel did not penetrate seds. Sampler believes it encountered a rock + bent over during the attempt

Name (printed): Erika Zemek	Agency: MPI
Signature: Erika Zemek	Date: 7/13/04

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/13/04
C-1	Northing: 695485.46 Easting: 594369.89	Time: 1234

Name(s) of ASI Samplers: Steve Bradman, Leroy (Brewie)

Describe results of probing conducted prior to core sampling: Water depth: 14.3 ft ~~Stage of tide:~~ NAVD 29: -0.25 Sediment description: Dark, silty fines	Was the core barrel rinsed thoroughly between collection of each core? ☐ Yes ☐ No ☒ n/a
Core advanced via: ☒ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1224
Were multiple attempts made to advance the core? ☐ Yes ☒ No	Was a core catcher utilized? ☒ Yes ☐ No

Core Attempt Chart

Core ID #: C-1

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695485.26	594376.25		4	C	L	84	69	82	F
Final 1	695485.26	594376.25		4	C	L	84	69	82	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Core Sampling Oversight Log

Not labeled.

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

~~NOT~~ NO BOAT DECON

Additional comments on sampling operations (if necessary):

- Needed an additional nose cone to complete cores to bring back to processing area. Lost length of nose cone + length of core cap and of sediment, approx 13+2=15 in. 69 inches of sediment in tube after loss of 15 from removal of nose cone.

Name (printed): Erika K Zamek	Agency: MPI
Signature: Erika Zamek	Date: 7/13/04

PASSAIC RIVER SEDIMENT SAMPLING AND ANALYSIS PROGRAM

Coring Field Log

Relinquished by: Erika Zamek Date: 7/13/04 Time: 1543 Sampler: Steve Brodman

Received by: Florence Rollins Date: 7/13/04 Time: 1543 Weather: Cloudy, wind

Core ID	Date	Time	Northing	Easting	Water Depth (ft)	~~Probing Depth (in)~~	Sediment Type	Sediment Description	Sample Type **	Core Recovered	Tube Material *	Penetration (in)	Recovery (in)
B-3	7/13/04	1405	695332.10	594324.58	9.65		Fines	Dark, silty	C	☑	L	81	65
D-1	7/13/04	1430	694703.70	594442.88	14.9		Fines	Dark, silty	C	☑	L	78	73
D-2	7/13/04	1456	695401.60	594400.30	13.1		Fines	Dark, silty	C	☑	L	~~84~~	~~83~~ 70
D-2D	7/13/04	1510	695405.90	594431.14	13.1		Fines	Dark, silty	C	☑	L	84	79
										☐			
										☐			
										☐			
										☐			
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*Tube Material: A=Aluminum, L=Lexan **Sediment Type: C=Core, G=Grab

EARTH TECH

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/13/04
B-3	Northing: 695329.16 Easting: 594326.41	Time: 1405

Name(s) of ASI Samplers: Steve Brodman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling: Water depth: 9.65ft ~~Stage of tide:~~ NAVD29: -0.45 Sediment description: Dark, mucky fines, silty	Was the core barrel rinsed thoroughly between collection of each core? ☐ Yes ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1355
Were multiple attempts made to advance the core? ☐ Yes ☑ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: B-3

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695332.10	594324.08		4	C	L	84	76.5	91	F
Final 1	695332.10	594324.08		4	C	L	84	76.5	91	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Core Sampling Oversight Log

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☑ Proper decontamination solutions (Alconox) used

☑ Decontamination waste collected for proper disposal (if applicable)

Additional comments on sampling operations (if necessary):

- Second core collected from this location. First core was lost during transfer to processing vessel.

- "Top" of core easily disturbed by tapping gently.

Name (printed): Erikak Zamek	Agency: MPI
Signature: [illegible]	Date: 7/13/04

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/13/04
D-1	Northing: 695494.510 Easting: 594430.67	Time: ~~7~~ 1430

Name(s) of ASI Samplers: Steve Bradman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling:

Water depth: 14.98
~~Stage of tide:~~ NAVD29: -0.83
Sediment description: Fines, Dark, silty, muddy

Was the core barrel rinsed thoroughly between collection of each core?

☐ Yes ☐ No ☑ n/a

Core advanced via:

☑ Vibracore ☐ Combination

Vibracore timing (separate different attempts with a "/"):

Start time: 1415

Were multiple attempts made to advance the core?

☐ Yes ☑ No

Was a core catcher utilized?

☑ Yes ☐ No

Core Attempt Chart

Core ID #: D-1

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695478.70	594428.80		4	C	L	78	73	94	F
Final 1	695478.70	594428.80		4	C	L	78	73	94	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Core Sampling Oversight Log

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☑ Proper decontamination solutions (Alconox) used

☑ Decontamination waste collected for proper disposal (if applicable)

Additional comments on sampling operations (if necessary):

"Top" of sediment easily disturbed by tapping gently.

Name (printed): Erika K Zamek	Agency: MPI
Signature: Erika Zamek	Date: 7/13/04

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/13/04
D-2	Northing: 699418.53 Easting: 594439.01	Time: 1456

Name(s) of ASI Samplers: Steve Brodman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling: Water depth: 13.1 ft ~~Stage of tide:~~ NAVD29: ~ 1.29 Sediment description: Silty, mucky, Dark	Was the core barrel rinsed thoroughly between collection of each core? ☐ Yes ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1443
Were multiple attempts made to advance the core? ☐ Yes ☑ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: D-2

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	699404.60	594440.30		4	C	L	84	70	83	F
Final 1	699404.60	594440.30		4	C	L	84	70	83	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Core Sampling Oversight Log

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☑ Proper decontamination solutions ~~(Alconox)~~ used

☑ Decontamination waste collected ~~for proper~~ disposal (if applicable)

Additional comments on sampling operations (if necessary):

- 76" w/ nose cone. (recovery)
- nose cone removed so duplicate could be taken @ this location.

Name (printed): Erika L Zamek	Agency: MPI
Signature: Erika Zamek	Date: 7/13/04

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/13/04
D-2 DUP	Northing: 695418.53 Easting: 594439.01	Time: 1510

Name(s) of ASI Samplers: Steve Brodman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling: Water depth: 13.1 ~~Stage of tide:~~ NAVD29: -1.29 Sediment description:	Was the core barrel rinsed thoroughly between collection of each core? ☐ Yes ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1458
Were multiple attempts made to advance the core? ☐ Yes ☑ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: D-2 DUP

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695405.90	594439.14		4	C	L	84	79	94	F
Final 1	695405.90	594439.14		4	C	L	84	79	94	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Core Sampling Oversight Log

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright~~, iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☑ Proper decontamination solutions ~~(Alconox)~~ River H_2O (DI) used

☑ Decontamination waste collected for proper disposal (if applicable)

Additional comments on sampling operations (if necessary):

Duplicate core taken from location D-2.

Name (printed): Erika K Zamek	Agency: MPI
Signature: Erika Zamek	Date: 7/13/04

PASSAIC RIVER SEDIMENT SAMPLING AND ANALYSIS PROGRAM

Coring Field Log

Relinquished by: Erika Zamek Date: 7/13/04 Time: 1637 Sampler: Steve Brodman

Received by: Florence Rollins Date: 7/13/04 Time: 1637 Weather: Cloudy, [illegible]

Core ID	Date	Time	Northing	Easting	Water Depth (ft)	Probing Depth (in)	Sediment Type	Sediment Description	Sample Type **	Core Recovered	Tube Material *	Penetration (in)	Recovery (in)
D-3	7/13/04	1620	655346.31	574443.79	12.5		Fines	Dark, silty	C	☑	L	84	78
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			
										☐			

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

EARTH TECH

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/13/04
D-3	Northing: 695344.44 Easting: 594445.83	Time: 1620

Name(s) of ASI Samplers: Steve Brodman, Lercy (Brownie)

Describe results of probing conducted prior to core sampling: Water depth: 12.5 ft ~~Stage of tide:~~ NADV29: -1.97 Sediment description: Dark, silty, mucky	Was the core barrel rinsed thoroughly between collection of each core? ☐ Yes ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 1608
Were multiple attempts made to advance the core? ☐ Yes ☑ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: D-3

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695346.31	594443.79		4	C	L	84	78	93	F
Final 1	695346.31	594443.79		4	C	L	84	79	93	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Core Sampling Oversight Log

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright~~, iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

NO BOAT DECON/

Additional comments on sampling operations (if necessary):

None

Name (printed): Erika K Zamek	Agency: MPI
Signature: Erika Zamek	Date: 7/13/04

PASSAIC RIVER SEDIMENT SAMPLING AND ANALYSIS PROGRAM

Coring Field Log

Relinquished by: Erika Zamek Date: 7/14/04 Time: 1045 Sampler: Steve Brodman

Received by: [illegible] Date: 7/14/04 Time: 1045 Weather: Overcast

Core ID	Date	Time	Northing	Easting	Water Depth (ft)	~~Probing Depth (in)~~	Sediment Type	Sediment Description	Sample Type **	Core Recovered	Tube Material *	Penetration (in)	Recovery (in)
E-3	7/14/04	0927	695356.60	594505.50	12.0		Fines	Dark, Silty	C	Y	L	84	79.5
E-2	7/14/04	0948	695423.50	594506.3	15		Fines	Dark, Silty	C	Y	L	84	82.5
E-1	7/14/04	1010	695497.48	594483.50	17		Fines	Dark, Silty	C	Y	L	84	76.5
										L			
										L			
										L			
										L			
										L			
										L			
										L			
										L			
										L			
										L			
										L			
										L			

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

♏

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/14/04
E-3	Northing: 695352.38 Easting: 594506.71	Time: 0927

Name(s) of ASI Samplers: Steve Bradman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling: Water depth: 12.09 ~~Stage of tide:~~ NAVD29: - 2.68 Sediment description: Dark, silty, mucky	Was the core barrel rinsed thoroughly between collection of each core? ☐ Yes ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 0919
Were multiple attempts made to advance the core? ☐ Yes ☑ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: E-3

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in) 79.5	Recovery %	Disposition of attempt*
1	695356.60	594505.50		4	C	L	84	~~84~~	95	F
Final 1	695356.60	594505.50		4	C	L	84	79.5	95	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

NO BOAT DECON

Additional comments on sampling operations (if necessary):

None

Name (printed): Erika K Zamek	Agency: MPI
Signature: Erika Zamek	Date: 7/14/03

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/14/04
E-2	Northing: 695426.19 Easting: 594498.99	Time: 0948

Name(s) of ASI Samplers: Steve Bradman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling:	Was the core barrel rinsed thoroughly between collection of each core?
Water depth: 15ft ~~Stage of tide:~~ NAVD29: -2.25 Sediment description: Dark, Silty, mucky	☐ Yes ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 0937
Were multiple attempts made to advance the core? ☐ Yes ☑ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: E-2

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695423.50	594506.35		4	C	L	84	82.5		F
Final 1	695423.50	594506.35		4	C	L	84	82.5		F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPLICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

NO BOAT DECON

Additional comments on sampling operations (if necessary):

None

Name (printed): Erika K Zamek	Agency: MPI
Signature: Erika K Zamek	Date: 7/14/09

PASSAIC RIVER SITE, NEW JERSEY
LOWER PASSAIC RIVER RESTORATION PROJECT

CORE SAMPLING

Sediment Core Designation:	Target Sediment Core Location:	Date: 7/14/04
E-1	Northing: 695500.60 Easting: 594489.89	Time: 1010

Name(s) of ASI Samplers: Steve Bradman, Leroy (Brownie)

Describe results of probing conducted prior to core sampling:	Was the core barrel rinsed thoroughly between collection of each core?
Water depth: 1.78 ~~Stage of tide:~~ NAVD29: -1.73 Sediment description: Dark, silty, mucky	☐ Yes ☐ No ☑ n/a
Core advanced via: ☑ Vibracore ☐ Combination	Vibracore timing (separate different attempts with a "/"): Start time: 0958
Were multiple attempts made to advance the core? ☐ Yes ☑ No	Was a core catcher utilized? ☑ Yes ☐ No

Core Attempt Chart

Core ID #: E-1

Core Attempts	Northing	Easting	Offset (ft)	Tube Diameter (in)	Sample Type (core/ ponar/field blank)	Tube Material	Penetration Depth (in)	Recovery Depth (in)	Recovery %	Disposition of attempt*
1	695497.48	594493.50		4	C	L	84	76.5	91	F
Final 1	695497.48	594493.50		4	C	L	84	76.5	91	F

*Disposition: R-Relocation/P-Collect Ponar/A-Abandoned/D-Disposed/
S-Save until complete/F-Final Saved

Confirm core labeling and handling by checking appropriate boxes below:

☑ Core Labeled ☑ Core Sealed ☐ Marked with "Up" ☑ Stored (upright, ~~iced~~)

Deviations:

Necessary information (specified in core collection SOP) recorded into the field database:

☐ Yes ☐ No (comment:) NOT APPICABLE

Correct decontamination procedures performed for core nose catcher assembly (if applicable):

☐ Proper decontamination solutions (Alconox) used

☐ Decontamination waste collected for proper disposal (if applicable)

NO BOAT DECON

Additional comments on sampling operations (if necessary):

- Odor detected from sediments that leaked out the core catcher during the capping process
- water too deep for spuds to seat. Boat was held in place by sampler manually (using the GPS as an indicator of drift).

Name (printed): Erika Zamek	Agency: MPI
Signature: Erika Zamek	Date: 7/14/04

B

Appendix B:
Geophysical Survey Reports

Appendix B1:
Hydrographic and Side Scan Sonar Survey Report

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

Hydrographic Survey
Side Scan Sonar Survey

SPONSOR

NEW JERSEY DEPARTMENT OF TRANSPORTATION-OMR
OFFICE OF MARITIME RESOURCES
1035 Parkway Avenue, E&O Building
Trenton, NJ 08625-0837

SPONSOR REPRESENTATIVE

TAMS Consultants, Inc.
300 Broadacres Drive
Bloomfield, NJ 07003

NJDOT Agreement No. 2001-NJMR02
Task Order #OMR-03-6

April 21, 2004 Draft
May 25, 2004 Final

ASI Job No. 24-011

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MAPS, DRAWINGS and ENCLOSURES

Figure 1a Base Map (scale 1” = 50’) 2 copies ..... Enclosed
Figure 1b Sonar Targets Map (scale 1” = 50’) 2 copies ..... Enclosed
Figure 1c Sonar Mosaic Map (scale 1” = 50’) 2 copies ..... Enclosed
Figure 1d Hydrographic Survey Map (scale 1” = 50’) 2 copies ..... Enclosed

Figure 2a Base Map (scale 1” = 100’) 2 copies ..... Enclosed
Figure 2b Sonar Targets Map (scale 1” = 100’) 2 copies ..... Enclosed
Figure 2c Sonar Mosaic Map (scale 1” = 100’) 2 copies ..... Enclosed
Figure 2d Hydrographic Survey Map (scale 1” = 100’) 2 copies ..... Enclosed

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SIGNATURE PAGE

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

This report as well as all records and raw data were audited and found to be an accurate reflection of the study. Copies of raw data will be maintained by Aqua Survey, Inc, 469 Point Breeze Road, Flemington, New Jersey, 08822.

_____

James A. Nickels Date
Vice President and Field Project Manager

_____

James M. Todd Date
Executive Vice President

I. INTRODUCTION

A. Project Overview

The objective of this study was to perform hydrographic and side-scan sonar surveys of an approximate 1000-foot section of the Lower Passaic River within the Harrison Reach. This information will be used, in conjunction with subsequent sediment chemistry data, to accurately characterize the site. ASI performed the Hydrographic Survey and Side Scan Sonar Survey.

II. TEST ADMINISTRATION

A. Sponsor

New Jersey Department of Transportation-OMR
Office of Maritime Resources
1035 Parkway Avenue, E&O Building
Trenton, NJ 08625-0837

B. Sponsor Representative

TAMS Consultants, Inc.
300 Broadacres Drive
Bloomfield, NJ 07003

C. Survey Company

Aqua Survey, Inc.
469 Point Breeze Road
Flemington, New Jersey 08822

D. Dates of Surveys

Date of Survey Initiation: March 17, 2004
Date of Survey Completion: March 18, 2004
Date of Draft Report : April 21, 2004

III. MATERIALS AND METHODS

The hydrographic and side-scan sonar surveys were conducted in a section of the Lower Passaic River within the Harrison Reach using the R/V Delaware, a 21-foot survey vessel. The vessel was equipped with a real-time kinematic (RTK) system for positioning. Hypack Max survey management software was used for survey control and ship track recording. An Innerspace 455 survey grade fathometer was used to collect the water depth data. The RTK system used was a Trimble 5700. Specification for both pieces of equipment can be found in the Appendix Section of this report.

A. Hydrographic Survey

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

The survey drawings show shoreline features in the vicinity of the Site that were supplied by TAMS consultants as geo-referenced base maps. The geo-referenced shoreline features are shown for more than 1000 feet along the riverbank. The features shown are 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

B. Side Scan Sonar Survey

A side scan survey was conducted in the same 1000-foot section of the river where the hydrographic survey was done. This survey was conducted using a Marine Sonic System running at 600 KHz frequency. RTK was used for positioning and Hypack Max survey management software was used for survey control and ship track recording. This survey was conducted by running lines parallel to the shoreline spaced 50-feet apart. Thirteen lines were run resulting in greater than 150% coverage.

A mosaic of the riverbed in the study area was created, accompanied by annotation of individual objects in a target file. All of the individual survey maps were plotted on Mylar and presented on the same scale to enable them to be combined using overlays. This enables the data to be layered together forming a composite picture of the project area. The sonar mosaic was plotted on bright white paper, as the image was nearly opaque and lost significant detail when plotted on Mylar.

As part of the side-scan sonar survey, sediment samples at 30 locations were to be selected from the top 2 inches for ground truthing to help characterize the side-scan sonar results. A total of 7 samples were actually collected (Table 1). A field geologist classified the samples. The locations were selected in the field, based on the side-scan sonar images and the need to verify signal/sediment types.

Table 1

PILOT STUDY SAMPLE COORDINATES

			Coordinates		
Sample #	**Depth (feet)**	**Time (PM)**	**Latitude**	**Longitude**	**Description**
PR GS - 1	2.2	12:56	40°44.481N	74°.07.954W	Brown fine silt/clay
PR GS - 2	1.5	1:06	40°44.481N	74°.07.915 W	Brown/black silt/clay/sand
PR GS - 3	< 2	1:15	40°44.487N	74°.07.821 W	Black/green/fine sand/silt/shells/oil sheen
PR GS - 4	< 2	1:20	40°44.407N	74°.07.776 W	Brown/silt/fine clay/organic detritus
PR GS - 5	4.5	1:35	40°44.510N	74°.07.650 W	Brown/black/detritus/ fine silt/clay/oil sheen
PR GS - 6	6.3	1:42	40°44.513N	74°.07.649 W	Brown / mixed with some black/ silty
PR GS - 7	< 2	1:48	40°44.494N	74°.07.731 W	Brown sediments coating 90-95% black/ fine silt
PR GS - 8		1:58	40°44.490N	74°.07.850 W	

Table 2

Pilot Study Area Coordinates

COORD_ID	X_NJSP83 (ft)	Y_NJSP83 (ft)	LAT	LONG
NW	593836.83218	695636.70265	40.74260	-74.13291
SW	593930.30747	695090.48985	40.74110	-74.13258
NE	594901.58273	695775.31583	40.74297	-74.12907
SE	594957.17076	695100.14481	40.74111	-74.12888

Table 1

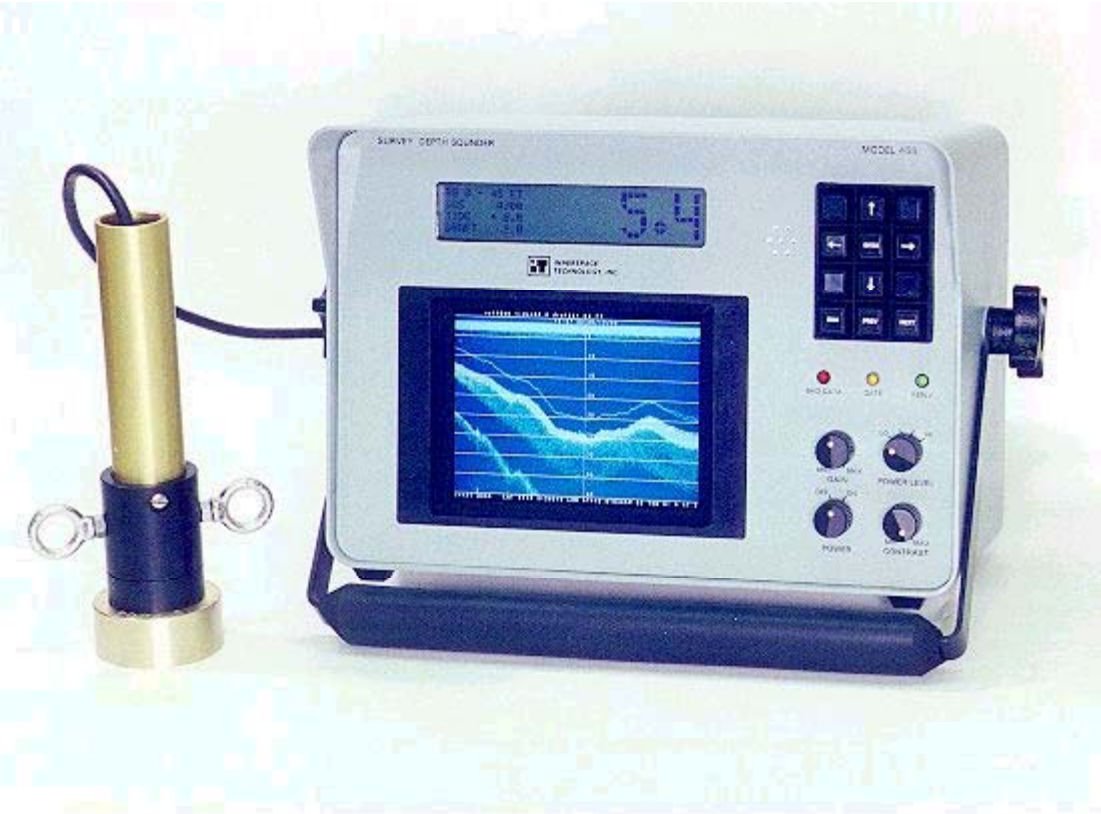
Sidescan Survey Target File

Designator	Easting	Northing	Description
Area 1	Entire length of North side of the survey area		Debris including tires, rocks, poles and other objects extend approx. 20 feet into the river from the sea wall along the North side of the survey area.
Target 1	594933.5	695720.1	Tree 15 feet long projecting 3' into the water column
Target 2	594644.3	695687.7	Probable 26 foot long piling laying on surface
Target 3	594363.6	695664.0	Probable 37 foot long piling laying on surface
Area 2	Entire length of survey area parallel with seawall		Parallel lines in the sediment extending between 100 and 200 feet off of the seawall along the Northern bank of the survey area. They are fairly shallow ridges probably caused by barges touching bottom or dragging ropes or chains while transiting the area.
Target 4	594297.3	695434.6	1420 square foot. area of probable differential bottom composition. Possibly organic debris.
Target 5	594776.9	695355.3	Propeller mark in sediment extending 78 feet to the South West
Target 6	594258.8	695228.5	250 square foot. area of probable differential bottom composition. Possibly organic debris.
Target 7	594181.0	695184.9	Propeller mark in sediment extending 36 feet to the South East
Area 3	Southwest area of survey area		Scattered debris over an approximately 30 foot wide area extending from the Western edge of the survey area about 500 feet to the East, about 90 feet from the Southern shore.

APPENDIX

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

Trimble 5700 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 depth of 1 meter
Waterproof: Will survive a 1 meter drop onto concrete; shock and vibration tested to 40G random,
Shock: 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.

Marine Sonic Technology, Ltd.

New Product
"CENTURION"
Side Scan Sonar System

Click for a larger version.

Small, compact and rugged, the NEW "**Centurion**" Sea Scan® PC Splash Proof Computer System sets the industry standard for a high resolution, portable, self-contained, low cost sonar system. Designed with the Search and Recovery Community in mind, the system can be operational within minutes and only needs a 12 VDC power source. The software is user friendly and the daylight readable screen allows for easy target detection and identification. Incorporating many of the proven features found in the previous splash proof, the NEW "**Centurion**" has been updated to provide state of the art electronics and connectivity.

New Features

- Computer is **13"x11"x6"** and weighs only **12 pounds**
- High-Bright, daylight readable, 10.4" color flat screen display
- Increased connectivity, network and USB compatible
- 300 MHz Processor and 20 GB Hard Drive
- Operates on a 12 VDC power source
- Case and connectors are fully waterproof and designed for increased durability and shock resistance
- Fully compatible with all previous MSTL towfish and cables

Standard Components

- External R/W CD ROM Drive
- 2 USB ports and 100 base-T Ethernet connection
- JRC Self Contained DGPS, Garmin eTrex Legend GPS, keyboard and waterproof mouse
- Connection for standard keyboards and pointing devices

Complete "Centurion" System Includes

Single Frequency Towfish (150, 300, 600, 900 or 1200 kHz), 100 & 30 Meter Tow Cables, 1 Set of Line Weights, Rugged Shipping Containers, Tool Kit, Factory Training, Operator's Manual, 24/7 Technical Support and a One-Year Limited Warranty

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
1	594363.8	695127.0	0	Southern shoreline
2	594367.9	695127.4	0	Southern shoreline
3	594368.7	695105.8	0	Southern shoreline
4	594387.7	695106.4	0	Southern shoreline
5	594398.2	695115.6	0	Southern shoreline
6	594419.3	695128.7	0	Southern shoreline
7	594428.3	695133.7	0	Southern shoreline
8	594437.2	695138.6	0	Southern shoreline
9	594448.8	695145.3	0	Southern shoreline
10	594463.5	695147.5	0	Southern shoreline
11	594472.9	695147.8	0	Southern shoreline
12	594490.8	695145.5	0	Southern shoreline
13	594524.3	695136.8	0	Southern shoreline
14	594561.1	695128.4	0	Southern shoreline
15	594578.4	695124.8	0	Southern shoreline
16	594596.7	695118.5	0	Southern shoreline
17	594633.3	695112.1	0	Southern shoreline
18	594669.9	695105.7	0	Southern shoreline
19	594704.3	695114.7	0	Southern shoreline
20	594722.5	695122.0	0	Southern shoreline
21	594754.8	695130.8	0	Southern shoreline
22	594776.8	695134.4	0	Southern shoreline
23	594791.7	695134.6	0	Southern shoreline
24	594816.6	695130.4	0	Southern shoreline
25	594841.3	695127.5	0	Southern shoreline
26	594846.9	695128.6	0	Southern shoreline
27	594866.0	695124.7	0	Southern shoreline
28	594890.6	695123.1	0	Southern shoreline
29	594913.7	695122.8	0	Southern shoreline
30	594942.3	695121.7	0	Southern shoreline
31	594979.0	695121.4	0	Southern shoreline
32	594990.3	695117.2	0	Southern shoreline
33	595015.1	695112.9	0	Southern shoreline
34	595023.4	695111.8	0	Southern shoreline
35	595039.7	695111.4	0	Southern shoreline
36	595065.2	695114.1	0	Southern shoreline
37	595084.6	695122.8	0	Southern shoreline
38	595095.7	695133.5	0	Southern shoreline
39	595113.8	695155.7	0	Southern shoreline
40	595133.5	695181.5	0	Southern shoreline
41	595151.2	695200.3	0	Southern shoreline
42	595170.4	695211.8	0	Southern shoreline
43	595183.7	695214.5	0	Southern shoreline
44	595195.0	695223.1	0	Southern shoreline
45	595230.9	695243.8	0	Southern shoreline
46	595234.3	695243.5	0	Southern shoreline
47	595241.9	695240.6	0	Southern shoreline

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
48	594490.8	695145.5	0	Southern shoreline
49	594524.3	695136.8	0	Southern shoreline
50	594561.1	695128.4	0	Southern shoreline
51	594578.4	695124.8	0	Southern shoreline
52	594596.7	695118.5	0	Southern shoreline
53	594633.3	695112.1	0	Southern shoreline
54	594669.9	695105.7	0	Southern shoreline
55	594704.3	695114.7	0	Southern shoreline
56	594722.5	695122.0	0	Southern shoreline
57	594754.8	695130.8	0	Southern shoreline
58	594767.4	695133.5	0	Southern shoreline
59	594776.8	695134.4	0	Southern shoreline
60	594791.7	695134.6	0	Southern shoreline
61	594816.6	695130.4	0	Southern shoreline
62	594841.3	695127.5	0	Southern shoreline
63	594846.9	695128.6	0	Southern shoreline
64	594866.0	695124.7	0	Southern shoreline
65	594890.6	695123.1	0	Southern shoreline
66	594913.7	695122.8	0	Southern shoreline
67	594942.3	695121.7	0	Southern shoreline
68	594979.0	695121.4	0	Southern shoreline
69	594990.3	695117.2	0	Southern shoreline
70	595015.1	695112.9	0	Southern shoreline
71	595023.4	695111.8	0	Southern shoreline
72	595039.7	695111.4	0	Southern shoreline
73	595065.2	695114.1	0	Southern shoreline
74	595084.6	695122.8	0	Southern shoreline
75	595095.7	695133.5	0	Southern shoreline
76	595113.8	695155.7	0	Southern shoreline
77	595133.5	695181.5	0	Southern shoreline
78	595151.2	695200.3	0	Southern shoreline
79	595170.4	695211.8	0	Southern shoreline
80	595183.7	695214.5	0	Southern shoreline
81	595195.0	695223.1	0	Southern shoreline
82	595230.9	695243.8	0	Southern shoreline
83	595234.3	695243.5	0	Southern shoreline
84	595241.9	695240.6	0	Southern shoreline
85	595231.1	695819.0	0	Northern shoreline
86	595186.8	695814.4	0	Northern shoreline
87	595149.2	695810.6	0	Northern shoreline
88	595097.1	695802.5	0	Northern shoreline
89	595069.1	695798.2	0	Northern shoreline
90	595055.0	695796.7	0	Northern shoreline
91	595012.1	695791.6	0	Northern shoreline
92	594984.6	695788.1	0	Northern shoreline
93	594943.8	695782.5	0	Northern shoreline
94	594913.0	695779.3	0	Northern shoreline

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
95	594900.2	695778.0	0	Northern shoreline
96	594848.7	695770.7	0	Northern shoreline
97	594810.6	695766.0	0	Northern shoreline
98	594780.5	695761.6	0	Northern shoreline
99	594751.9	695755.9	0	Northern shoreline
100	594715.2	695750.1	0	Northern shoreline
101	594653.0	695741.6	0	Northern shoreline
102	594595.6	695733.0	0	Northern shoreline
103	594553.9	695728.6	0	Northern shoreline
104	594516.9	695726.2	0	Northern shoreline
105	594454.5	695719.7	0	Northern shoreline
106	594417.5	695716.6	0	Northern shoreline
107	594392.5	695716.0	0	Northern shoreline
108	594324.1	695707.6	0	Northern shoreline
109	594299.8	695706.4	0	Northern shoreline
110	594280.2	695705.8	0	Northern shoreline
111	594255.3	695704.5	0	Northern shoreline
112	594188.8	695697.7	0	Northern shoreline
113	594121.0	695690.7	0	Northern shoreline
114	594076.6	695687.4	0	Northern shoreline
115	594005.6	695678.7	0	Northern shoreline
116	593957.0	695676.4	0	Northern shoreline
117	593907.6	695668.6	0	Northern shoreline
118	593862.4	695659.8	0	Northern shoreline
119	593835.6	695656.4	0	Northern shoreline
120	593820.1	695655.5	0	Northern shoreline
121	593783.6	695647.6	0	Northern shoreline
122	593764.8	695645.7	0	Northern shoreline
123	593735.6	695639.9	0	Northern shoreline
124	593719.5	695638.3	0	Northern shoreline
125	593692.9	695632.8	0	Northern shoreline
126	593682.2	695631.7	0	Northern shoreline
127	593659.5	695628.0	0	Northern shoreline
128	593641.4	695625.5	0	Northern shoreline
129	593627.3	695624.0	0	Northern shoreline
130	593611.3	695621.7	0	Northern shoreline
131	594914.1	695739.8	-5.54	Elevation in NGVD29
132	594907.8	695736.7	-5.94	Elevation in NGVD29
133	594901.9	695732.4	-6.54	Elevation in NGVD29
134	594897.2	695727.0	-7.35	Elevation in NGVD29
135	594893.8	695720.4	-8.46	Elevation in NGVD29
136	594892.5	695713.5	-9.36	Elevation in NGVD29
137	594892.7	695706.5	-10.2	Elevation in NGVD29
138	594893.7	695699.5	-11.1	Elevation in NGVD29
139	594895.4	695691.4	-11.4	Elevation in NGVD29
140	594897.0	695683.4	-12.1	Elevation in NGVD29
141	594899.2	695673.6	-12.6	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
142	594901.7	695660.2	-12.9	Elevation in NGVD29
143	594902.7	695652.9	-12.8	Elevation in NGVD29
144	594903.3	695645.8	-12.8	Elevation in NGVD29
145	594903.7	695635.6	-12.7	Elevation in NGVD29
146	594903.8	695628.3	-12.9	Elevation in NGVD29
147	594903.7	695618.8	-12.7	Elevation in NGVD29
148	594903.5	695609.5	-12.9	Elevation in NGVD29
149	594903.3	695598.7	-12.8	Elevation in NGVD29
150	594903.3	695591.5	-13.2	Elevation in NGVD29
151	594903.2	695582.8	-12.9	Elevation in NGVD29
152	594903.6	695573.4	-13.1	Elevation in NGVD29
153	594904.2	695564.6	-13	Elevation in NGVD29
154	594906.1	695553.4	-13	Elevation in NGVD29
155	594908.0	695543.4	-13	Elevation in NGVD29
156	594910.3	695533.4	-12.7	Elevation in NGVD29
157	594912.7	695524.6	-12.6	Elevation in NGVD29
158	594914.6	695517.0	-12.2	Elevation in NGVD29
159	594916.4	695509.3	-12	Elevation in NGVD29
160	594917.9	695502.3	-11.7	Elevation in NGVD29
161	594919.4	695495.3	-11.2	Elevation in NGVD29
162	594921.2	695486.9	-10.8	Elevation in NGVD29
163	594922.6	695479.8	-10.3	Elevation in NGVD29
164	594925.0	695471.3	-9.87	Elevation in NGVD29
165	594926.9	695463.1	-9.57	Elevation in NGVD29
166	594928.4	695455.4	-9.27	Elevation in NGVD29
167	594929.9	695446.7	-8.97	Elevation in NGVD29
168	594931.1	695437.5	-8.57	Elevation in NGVD29
169	594932.2	695430.4	-8.27	Elevation in NGVD29
170	594933.0	695423.0	-7.97	Elevation in NGVD29
171	594933.1	695414.6	-7.67	Elevation in NGVD29
172	594932.6	695407.5	-7.17	Elevation in NGVD29
173	594932.1	695399.8	-6.97	Elevation in NGVD29
174	594931.3	695392.4	-6.37	Elevation in NGVD29
175	594930.3	695384.9	-5.97	Elevation in NGVD29
176	594929.2	695377.5	-5.87	Elevation in NGVD29
177	594927.3	695369.9	-5.47	Elevation in NGVD29
178	594925.6	695363.1	-5.08	Elevation in NGVD29
179	594923.6	695354.3	-4.78	Elevation in NGVD29
180	594922.1	695347.0	-4.38	Elevation in NGVD29
181	594920.7	695338.6	-4.08	Elevation in NGVD29
182	594920.0	695331.1	-3.68	Elevation in NGVD29
183	594919.6	695323.6	-3.48	Elevation in NGVD29
184	594919.6	695316.5	-2.98	Elevation in NGVD29
185	594921.0	695301.7	-3.17	Elevation in NGVD29
186	594922.2	695293.0	-2.97	Elevation in NGVD29
187	594800.6	695738.3	-3.6	Elevation in NGVD29
188	594794.6	695734.4	-4.4	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
189	594790.5	695728.0	-5.2	Elevation in NGVD29
190	594789.4	695720.4	-6.41	Elevation in NGVD29
191	594790.1	695713.2	-7.72	Elevation in NGVD29
192	594791.1	695705.7	-8.82	Elevation in NGVD29
193	594792.2	695698.7	-9.83	Elevation in NGVD29
194	594793.5	695691.7	-10.6	Elevation in NGVD29
195	594795.3	695684.4	-11.3	Elevation in NGVD29
196	594796.8	695677.4	-11.8	Elevation in NGVD29
197	594798.3	695670.5	-12.2	Elevation in NGVD29
198	594800.6	695659.3	-12.4	Elevation in NGVD29
199	594801.6	695652.3	-12.8	Elevation in NGVD29
200	594802.6	695644.2	-13.2	Elevation in NGVD29
201	594803.1	695637.2	-12.8	Elevation in NGVD29
202	594803.8	695629.1	-12.7	Elevation in NGVD29
203	594804.3	695619.8	-12.7	Elevation in NGVD29
204	594804.8	695611.8	-12.9	Elevation in NGVD29
205	594805.1	695604.8	-12.8	Elevation in NGVD29
206	594805.6	695597.7	-13.1	Elevation in NGVD29
207	594806.1	695590.6	-12.7	Elevation in NGVD29
208	594807.4	695578.3	-12.8	Elevation in NGVD29
209	594808.2	695570.2	-13	Elevation in NGVD29
210	594809.3	695559.7	-12.8	Elevation in NGVD29
211	594810.7	695546.6	-12.7	Elevation in NGVD29
212	594812.1	695533.7	-12.9	Elevation in NGVD29
213	594813.4	695521.8	-12.3	Elevation in NGVD29
214	594814.4	695514.5	-12.6	Elevation in NGVD29
215	594815.6	695503.2	-12	Elevation in NGVD29
216	594816.0	695493.1	-11.5	Elevation in NGVD29
217	594815.9	695480.9	-11.1	Elevation in NGVD29
218	594815.8	695473.1	-10.7	Elevation in NGVD29
219	594815.5	695465.3	-10.2	Elevation in NGVD29
220	594815.3	695456.3	-9.83	Elevation in NGVD29
221	594815.1	695445.9	-9.53	Elevation in NGVD29
222	594815.4	695436.4	-9.14	Elevation in NGVD29
223	594816.1	695429.3	-8.94	Elevation in NGVD29
224	594817.5	695421.9	-8.64	Elevation in NGVD29
225	594819.0	695415.1	-8.24	Elevation in NGVD29
226	594820.7	695407.5	-7.94	Elevation in NGVD29
227	594822.0	695400.2	-7.53	Elevation in NGVD29
228	594823.3	695393.2	-7.23	Elevation in NGVD29
229	594824.2	695386.0	-6.83	Elevation in NGVD29
230	594825.1	695377.4	-6.33	Elevation in NGVD29
231	594825.8	695368.1	-5.92	Elevation in NGVD29
232	594826.5	695358.8	-5.42	Elevation in NGVD29
233	594827.0	695349.6	-5.11	Elevation in NGVD29
234	594826.9	695342.5	-4.71	Elevation in NGVD29
235	594826.8	695335.4	-4.42	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
236	594826.3	695327.4	-4.13	Elevation in NGVD29
237	594825.9	695319.7	-3.83	Elevation in NGVD29
238	594825.3	695310.2	-3.34	Elevation in NGVD29
239	594825.2	695302.9	-3.04	Elevation in NGVD29
240	594824.9	695295.6	-3.54	Elevation in NGVD29
241	594804.1	695310.4	-3.33	Elevation in NGVD29
242	594798.9	695316.7	-3.63	Elevation in NGVD29
243	594794.0	695322.0	-3.82	Elevation in NGVD29
244	594789.1	695327.4	-4.01	Elevation in NGVD29
245	594784.4	695332.8	-4.39	Elevation in NGVD29
246	594780.8	695339.4	-4.68	Elevation in NGVD29
247	594778.6	695346.7	-4.98	Elevation in NGVD29
248	594777.4	695353.8	-5.38	Elevation in NGVD29
249	594777.1	695362.0	-5.78	Elevation in NGVD29
250	594778.1	695369.9	-6.18	Elevation in NGVD29
251	594779.6	695377.4	-6.48	Elevation in NGVD29
252	594781.3	695384.5	-6.68	Elevation in NGVD29
253	594783.3	695392.1	-7.08	Elevation in NGVD29
254	594785.5	695401.1	-7.38	Elevation in NGVD29
255	594786.7	695408.5	-7.78	Elevation in NGVD29
256	594787.6	695416.1	-8.08	Elevation in NGVD29
257	594787.6	695423.1	-8.38	Elevation in NGVD29
258	594786.9	695430.8	-8.68	Elevation in NGVD29
259	594785.3	695439.6	-8.98	Elevation in NGVD29
260	594783.1	695446.8	-9.28	Elevation in NGVD29
261	594780.8	695453.5	-9.58	Elevation in NGVD29
262	594777.5	695462.9	-10.1	Elevation in NGVD29
263	594775.2	695469.9	-10.4	Elevation in NGVD29
264	594772.8	695477.8	-10.8	Elevation in NGVD29
265	594770.5	695484.7	-11.1	Elevation in NGVD29
266	594768.0	695492.3	-11.5	Elevation in NGVD29
267	594765.8	695499.2	-11.7	Elevation in NGVD29
268	594763.4	695507.3	-11.9	Elevation in NGVD29
269	594761.5	695514.2	-12.4	Elevation in NGVD29
270	594759.8	695521.0	-12.9	Elevation in NGVD29
271	594757.9	695528.9	-13	Elevation in NGVD29
272	594756.4	695536.6	-12.8	Elevation in NGVD29
273	594755.3	695546.7	-12.9	Elevation in NGVD29
274	594754.9	695554.1	-13.4	Elevation in NGVD29
275	594754.4	695561.5	-12.9	Elevation in NGVD29
276	594753.8	695569.3	-12.5	Elevation in NGVD29
277	594752.5	695579.6	-12.7	Elevation in NGVD29
278	594751.7	695587.0	-12.4	Elevation in NGVD29
279	594751.1	695594.3	-12.6	Elevation in NGVD29
280	594750.6	695605.7	-12.5	Elevation in NGVD29
281	594750.6	695613.3	-12.5	Elevation in NGVD29
282	594750.4	695620.8	-12.4	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
283	594750.1	695627.9	-12.4	Elevation in NGVD29
284	594749.9	695638.1	-12.8	Elevation in NGVD29
285	594749.4	695648.9	-12.7	Elevation in NGVD29
286	594748.9	695658.3	-12.6	Elevation in NGVD29
287	594748.3	695665.9	-12.5	Elevation in NGVD29
288	594747.2	695675.4	-11.5	Elevation in NGVD29
289	594746.2	695682.6	-11.1	Elevation in NGVD29
290	594744.8	695690.2	-10.4	Elevation in NGVD29
291	594743.1	695697.2	-9.47	Elevation in NGVD29
292	594741.1	695704.2	-8.46	Elevation in NGVD29
293	594705.3	695726.9	-3.85	Elevation in NGVD29
294	594700.2	695722.0	-4.45	Elevation in NGVD29
295	594696.5	695715.9	-5.26	Elevation in NGVD29
296	594694.8	695708.9	-6.07	Elevation in NGVD29
297	594695.2	695701.5	-7.58	Elevation in NGVD29
298	594696.0	695693.6	-8.68	Elevation in NGVD29
299	594697.0	695686.4	-9.58	Elevation in NGVD29
300	594697.8	695679.2	-10.5	Elevation in NGVD29
301	594699.0	695672.1	-11.1	Elevation in NGVD29
302	594700.4	695664.2	-11.7	Elevation in NGVD29
303	594702.2	695651.9	-12	Elevation in NGVD29
304	594703.2	695643.6	-12.5	Elevation in NGVD29
305	594704.1	695634.4	-12.9	Elevation in NGVD29
306	594704.8	695623.9	-12.6	Elevation in NGVD29
307	594705.5	695614.7	-12.5	Elevation in NGVD29
308	594706.4	695601.3	-12.4	Elevation in NGVD29
309	594707.4	695589.0	-12.5	Elevation in NGVD29
310	594708.2	695581.8	-12.5	Elevation in NGVD29
311	594709.3	695572.7	-12.4	Elevation in NGVD29
312	594710.3	695565.2	-12.8	Elevation in NGVD29
313	594712.1	695553.6	-12.7	Elevation in NGVD29
314	594713.4	695545.6	-12.8	Elevation in NGVD29
315	594715.0	695535.3	-12.6	Elevation in NGVD29
316	594716.3	695525.5	-12.8	Elevation in NGVD29
317	594717.2	695518.0	-12.4	Elevation in NGVD29
318	594718.5	695505.5	-12.4	Elevation in NGVD29
319	594719.2	695493.8	-12.2	Elevation in NGVD29
320	594719.4	695486.6	-11.8	Elevation in NGVD29
321	594719.6	695478.9	-11.3	Elevation in NGVD29
322	594719.8	695467.7	-10.8	Elevation in NGVD29
323	594719.9	695458.7	-10.5	Elevation in NGVD29
324	594719.8	695448.2	-10.1	Elevation in NGVD29
325	594720.0	695440.8	-9.82	Elevation in NGVD29
326	594719.9	695433.1	-9.52	Elevation in NGVD29
327	594720.3	695423.7	-9.23	Elevation in NGVD29
328	594720.8	695416.3	-8.93	Elevation in NGVD29
329	594721.7	695408.5	-8.43	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
330	594723.2	695399.9	-8.04	Elevation in NGVD29
331	594725.2	695392.1	-7.74	Elevation in NGVD29
332	594727.4	695384.5	-7.43	Elevation in NGVD29
333	594729.7	695377.2	-7.13	Elevation in NGVD29
334	594732.2	695369.6	-6.63	Elevation in NGVD29
335	594735.0	695361.8	-6.23	Elevation in NGVD29
336	594737.4	695355.0	-5.83	Elevation in NGVD29
337	594740.0	695347.1	-5.43	Elevation in NGVD29
338	594741.8	695340.3	-5.23	Elevation in NGVD29
339	594743.0	695332.7	-4.93	Elevation in NGVD29
340	594743.6	695324.2	-4.42	Elevation in NGVD29
341	594743.5	695316.6	-4.12	Elevation in NGVD29
342	594742.8	695309.4	-3.92	Elevation in NGVD29
343	594741.5	695301.5	-3.62	Elevation in NGVD29
344	594739.0	695291.6	-3.23	Elevation in NGVD29
345	594736.8	695283.6	-3.04	Elevation in NGVD29
346	594734.8	695276.1	-3.44	Elevation in NGVD29
347	594697.7	695252.8	-3.19	Elevation in NGVD29
348	594692.6	695258.5	-3.19	Elevation in NGVD29
349	594689.4	695265.9	-3.18	Elevation in NGVD29
350	594685.5	695280.7	-3.18	Elevation in NGVD29
351	594683.7	695287.7	-3.38	Elevation in NGVD29
352	594681.9	695294.4	-3.68	Elevation in NGVD29
353	594680.1	695302.1	-3.97	Elevation in NGVD29
354	594678.3	695310.4	-4.17	Elevation in NGVD29
355	594676.9	695318.1	-4.57	Elevation in NGVD29
356	594675.8	695326.4	-4.87	Elevation in NGVD29
357	594675.0	695333.7	-5.17	Elevation in NGVD29
358	594674.2	695341.3	-5.57	Elevation in NGVD29
359	594673.7	695348.4	-5.87	Elevation in NGVD29
360	594673.2	695355.6	-6.27	Elevation in NGVD29
361	594673.0	695363.8	-6.57	Elevation in NGVD29
362	594673.0	695371.2	-7.07	Elevation in NGVD29
363	594673.3	695379.9	-7.47	Elevation in NGVD29
364	594673.5	695388.5	-7.77	Elevation in NGVD29
365	594673.5	695397.5	-8.17	Elevation in NGVD29
366	594673.2	695405.2	-8.67	Elevation in NGVD29
367	594673.3	695413.1	-8.87	Elevation in NGVD29
368	594673.1	695423.7	-9.27	Elevation in NGVD29
369	594672.8	695432.1	-9.47	Elevation in NGVD29
370	594672.2	695440.7	-9.88	Elevation in NGVD29
371	594671.5	695448.8	-10.2	Elevation in NGVD29
372	594670.8	695455.8	-10.5	Elevation in NGVD29
373	594669.9	695463.5	-10.9	Elevation in NGVD29
374	594669.3	695470.7	-11.2	Elevation in NGVD29
375	594668.6	695477.9	-11.7	Elevation in NGVD29
376	594667.9	695485.5	-12	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
377	594666.8	695498.8	-12.2	Elevation in NGVD29
378	594666.0	695506.3	-12.8	Elevation in NGVD29
379	594665.2	695517.2	-12.7	Elevation in NGVD29
380	594664.6	695524.8	-12.9	Elevation in NGVD29
381	594663.7	695536.1	-12.7	Elevation in NGVD29
382	594663.1	695544.1	-13.2	Elevation in NGVD29
383	594662.4	695551.7	-12.6	Elevation in NGVD29
384	594660.8	695563.5	-12.4	Elevation in NGVD29
385	594659.1	695575.2	-12.5	Elevation in NGVD29
386	594658.1	695582.7	-12.5	Elevation in NGVD29
387	594656.5	695594.3	-12.5	Elevation in NGVD29
388	594655.0	695603.7	-12.5	Elevation in NGVD29
389	594653.6	695612.0	-12.6	Elevation in NGVD29
390	594652.3	695619.1	-12.8	Elevation in NGVD29
391	594649.6	695633.1	-12.2	Elevation in NGVD29
392	594647.2	695645.0	-12.7	Elevation in NGVD29
393	594645.7	695652.6	-12.3	Elevation in NGVD29
394	594644.0	695659.8	-11.9	Elevation in NGVD29
395	594642.0	695666.7	-11.5	Elevation in NGVD29
396	594639.4	695674.8	-10.8	Elevation in NGVD29
397	594637.4	695681.7	-9.78	Elevation in NGVD29
398	594635.2	695688.4	-8.88	Elevation in NGVD29
399	594632.6	695695.9	-7.88	Elevation in NGVD29
400	594605.4	695715.4	-4.1	Elevation in NGVD29
401	594598.2	695712.8	-4.31	Elevation in NGVD29
402	594591.0	695707.5	-4.7	Elevation in NGVD29
403	594586.7	695701.8	-5.71	Elevation in NGVD29
404	594584.5	695695.1	-6.81	Elevation in NGVD29
405	594583.6	695688.0	-7.82	Elevation in NGVD29
406	594583.3	695680.9	-8.82	Elevation in NGVD29
407	594583.3	695672.2	-9.72	Elevation in NGVD29
408	594583.9	695664.6	-10.5	Elevation in NGVD29
409	594585.0	695657.2	-11.1	Elevation in NGVD29
410	594586.9	695650.3	-11.7	Elevation in NGVD29
411	594589.2	695643.4	-12.1	Elevation in NGVD29
412	594591.8	695636.2	-12.4	Elevation in NGVD29
413	594596.2	695625.7	-12.8	Elevation in NGVD29
414	594598.8	695619.1	-12.9	Elevation in NGVD29
415	594601.4	695612.3	-12.9	Elevation in NGVD29
416	594604.1	695605.4	-12.5	Elevation in NGVD29
417	594607.7	695596.8	-12.5	Elevation in NGVD29
418	594612.3	695586.1	-12.5	Elevation in NGVD29
419	594616.9	695575.5	-12.5	Elevation in NGVD29
420	594619.6	695568.8	-12.6	Elevation in NGVD29
421	594622.3	695561.8	-12.4	Elevation in NGVD29
422	594625.1	695554.6	-12.7	Elevation in NGVD29
423	594629.0	695541.9	-12.7	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
424	594630.5	695534.0	-13	Elevation in NGVD29
425	594631.4	695524.4	-12.8	Elevation in NGVD29
426	594631.6	695516.5	-13	Elevation in NGVD29
427	594631.6	695508.7	-13	Elevation in NGVD29
428	594631.4	695501.7	-12.8	Elevation in NGVD29
429	594631.2	695490.5	-12.6	Elevation in NGVD29
430	594631.1	695481.3	-12.4	Elevation in NGVD29
431	594631.2	695473.6	-12.1	Elevation in NGVD29
432	594631.7	695465.6	-11.7	Elevation in NGVD29
433	594632.4	695457.5	-11.3	Elevation in NGVD29
434	594633.2	695450.0	-10.8	Elevation in NGVD29
435	594634.1	695442.0	-10.5	Elevation in NGVD29
436	594634.8	695434.0	-10.1	Elevation in NGVD29
437	594635.4	695426.1	-9.85	Elevation in NGVD29
438	594636.0	695417.7	-9.54	Elevation in NGVD29
439	594636.4	695410.6	-9.24	Elevation in NGVD29
440	594636.7	695403.1	-8.93	Elevation in NGVD29
441	594636.8	695395.6	-8.73	Elevation in NGVD29
442	594636.6	695388.4	-8.33	Elevation in NGVD29
443	594636.4	695381.3	-8.03	Elevation in NGVD29
444	594635.8	695372.5	-7.62	Elevation in NGVD29
445	594635.4	695364.5	-7.22	Elevation in NGVD29
446	594634.9	695357.3	-6.92	Elevation in NGVD29
447	594634.4	695350.1	-6.62	Elevation in NGVD29
448	594633.6	695342.6	-6.22	Elevation in NGVD29
449	594632.9	695334.9	-5.82	Elevation in NGVD29
450	594632.1	695327.3	-5.42	Elevation in NGVD29
451	594631.5	695319.6	-5.12	Elevation in NGVD29
452	594630.9	695311.6	-4.92	Elevation in NGVD29
453	594630.3	695303.9	-4.52	Elevation in NGVD29
454	594629.9	695296.1	-4.21	Elevation in NGVD29
455	594629.6	695289.1	-3.91	Elevation in NGVD29
456	594629.7	695281.3	-3.61	Elevation in NGVD29
457	594629.8	695274.0	-3.31	Elevation in NGVD29
458	594630.1	695265.5	-3.11	Elevation in NGVD29
459	594630.8	695240.2	-3.4	Elevation in NGVD29
460	594514.3	695704.6	-3.85	Elevation in NGVD29
461	594507.1	695703.0	-4.86	Elevation in NGVD29
462	594500.3	695699.6	-5.17	Elevation in NGVD29
463	594494.9	695694.6	-5.57	Elevation in NGVD29
464	594491.4	695688.5	-6.48	Elevation in NGVD29
465	594489.2	695681.5	-7.28	Elevation in NGVD29
466	594488.1	695674.4	-8.18	Elevation in NGVD29
467	594488.0	695666.8	-9.09	Elevation in NGVD29
468	594488.8	695659.5	-9.79	Elevation in NGVD29
469	594490.8	695652.6	-10.3	Elevation in NGVD29
470	594493.3	695645.5	-10.9	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
471	594496.0	695638.2	-11.4	Elevation in NGVD29
472	594498.3	695631.2	-11.8	Elevation in NGVD29
473	594500.4	695623.7	-12.2	Elevation in NGVD29
474	594502.5	695616.0	-12.6	Elevation in NGVD29
475	594505.4	695605.1	-12.6	Elevation in NGVD29
476	594509.2	695592.4	-12.1	Elevation in NGVD29
477	594511.8	695584.4	-12.2	Elevation in NGVD29
478	594514.1	695577.4	-12.2	Elevation in NGVD29
479	594517.0	695567.2	-12.1	Elevation in NGVD29
480	594520.2	695554.7	-12.2	Elevation in NGVD29
481	594522.2	695545.6	-12.4	Elevation in NGVD29
482	594523.7	695535.8	-12.7	Elevation in NGVD29
483	594524.4	695523.6	-12.3	Elevation in NGVD29
484	594524.3	695516.4	-12.9	Elevation in NGVD29
485	594523.7	695507.0	-12.7	Elevation in NGVD29
486	594522.8	695499.8	-12.9	Elevation in NGVD29
487	594521.1	695490.3	-12.5	Elevation in NGVD29
488	594519.2	695481.4	-12	Elevation in NGVD29
489	594516.6	695469.0	-12.2	Elevation in NGVD29
490	594515.4	695461.9	-12	Elevation in NGVD29
491	594514.1	695452.8	-11.9	Elevation in NGVD29
492	594512.8	695444.4	-11.7	Elevation in NGVD29
493	594511.9	695437.4	-11.1	Elevation in NGVD29
494	594511.1	695430.0	-10.7	Elevation in NGVD29
495	594510.6	695421.5	-10.2	Elevation in NGVD29
496	594510.4	695413.1	-9.96	Elevation in NGVD29
497	594510.2	695405.7	-9.56	Elevation in NGVD29
498	594510.1	695396.3	-9.26	Elevation in NGVD29
499	594510.1	695388.1	-8.86	Elevation in NGVD29
500	594510.6	695375.2	-8.56	Elevation in NGVD29
501	594511.0	695367.8	-8.16	Elevation in NGVD29
502	594511.4	695360.4	-7.96	Elevation in NGVD29
503	594511.8	695353.1	-7.46	Elevation in NGVD29
504	594512.5	695345.8	-7.26	Elevation in NGVD29
505	594513.0	695338.6	-6.86	Elevation in NGVD29
506	594513.7	695331.3	-6.55	Elevation in NGVD29
507	594514.4	695323.7	-6.25	Elevation in NGVD29
508	594515.0	695316.1	-5.85	Elevation in NGVD29
509	594515.6	695307.3	-5.46	Elevation in NGVD29
510	594516.2	695298.1	-5.05	Elevation in NGVD29
511	594516.5	695290.2	-4.65	Elevation in NGVD29
512	594516.8	695282.1	-4.35	Elevation in NGVD29
513	594516.9	695274.5	-4.05	Elevation in NGVD29
514	594517.1	695265.5	-3.75	Elevation in NGVD29
515	594517.2	695257.5	-3.35	Elevation in NGVD29
516	594517.3	695249.6	-3.15	Elevation in NGVD29
517	594509.9	695218.1	-3.14	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
518	594503.0	695220.0	-3.21	Elevation in NGVD29
519	594497.0	695225.8	-3.26	Elevation in NGVD29
520	594492.8	695231.4	-3.31	Elevation in NGVD29
521	594489.5	695238.7	-3.36	Elevation in NGVD29
522	594487.5	695246.0	-3.4	Elevation in NGVD29
523	594486.3	695254.2	-3.45	Elevation in NGVD29
524	594486.0	695261.7	-3.49	Elevation in NGVD29
525	594486.2	695269.5	-3.81	Elevation in NGVD29
526	594486.9	695276.6	-4.11	Elevation in NGVD29
527	594487.8	695285.2	-4.51	Elevation in NGVD29
528	594488.7	695292.4	-4.71	Elevation in NGVD29
529	594489.3	695300.1	-5.01	Elevation in NGVD29
530	594489.6	695307.5	-5.31	Elevation in NGVD29
531	594489.3	695314.5	-5.71	Elevation in NGVD29
532	594489.0	695321.7	-6.01	Elevation in NGVD29
533	594488.3	695329.0	-6.41	Elevation in NGVD29
534	594487.0	695337.8	-6.81	Elevation in NGVD29
535	594485.3	695345.2	-7.01	Elevation in NGVD29
536	594483.1	695352.4	-7.41	Elevation in NGVD29
537	594480.0	695360.8	-7.81	Elevation in NGVD29
538	594477.5	695367.5	-8.11	Elevation in NGVD29
539	594474.5	695375.0	-8.5	Elevation in NGVD29
540	594472.2	695381.8	-8.8	Elevation in NGVD29
541	594470.4	695388.9	-9.1	Elevation in NGVD29
542	594469.2	695397.5	-9.3	Elevation in NGVD29
543	594468.1	695404.4	-9.5	Elevation in NGVD29
544	594467.6	695411.7	-9.71	Elevation in NGVD29
545	594467.3	695421.3	-10.2	Elevation in NGVD29
546	594467.5	695428.4	-10.5	Elevation in NGVD29
547	594467.7	695435.6	-10.9	Elevation in NGVD29
548	594467.8	695445.2	-11.2	Elevation in NGVD29
549	594467.9	695456.8	-11.5	Elevation in NGVD29
550	594467.8	695464.4	-11.5	Elevation in NGVD29
551	594467.8	695471.5	-12	Elevation in NGVD29
552	594467.3	695479.1	-12.3	Elevation in NGVD29
553	594466.8	695486.4	-12.6	Elevation in NGVD29
554	594465.8	695499.6	-12.5	Elevation in NGVD29
555	594465.0	695506.7	-12.4	Elevation in NGVD29
556	594463.2	695519.0	-12.1	Elevation in NGVD29
557	594461.9	695526.9	-12.4	Elevation in NGVD29
558	594460.6	695534.4	-12	Elevation in NGVD29
559	594459.0	695541.8	-12.6	Elevation in NGVD29
560	594457.6	695548.7	-12.2	Elevation in NGVD29
561	594456.1	695557.1	-12.1	Elevation in NGVD29
562	594454.1	695568.2	-12.1	Elevation in NGVD29
563	594452.9	695577.3	-12	Elevation in NGVD29
564	594451.8	695589.6	-12	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
565	594451.5	695596.9	-12.2	Elevation in NGVD29
566	594451.1	695604.1	-13	Elevation in NGVD29
567	594450.9	695611.8	-12.5	Elevation in NGVD29
568	594450.4	695619.1	-12.7	Elevation in NGVD29
569	594449.6	695626.2	-11.8	Elevation in NGVD29
570	594448.1	695634.8	-10.6	Elevation in NGVD29
571	594445.1	695645.8	-10.6	Elevation in NGVD29
572	594442.2	695654.2	-10	Elevation in NGVD29
573	594439.0	695661.8	-9.4	Elevation in NGVD29
574	594435.5	695669.0	-8.69	Elevation in NGVD29
575	594413.4	695691.6	-4.27	Elevation in NGVD29
576	594403.8	695692.1	-4.38	Elevation in NGVD29
577	594396.6	695690.3	-4.69	Elevation in NGVD29
578	594389.9	695686.1	-5.29	Elevation in NGVD29
579	594385.3	695680.4	-5.89	Elevation in NGVD29
580	594382.9	695673.6	-7.19	Elevation in NGVD29
581	594381.9	695662.8	-7.6	Elevation in NGVD29
582	594382.7	695655.4	-8.7	Elevation in NGVD29
583	594385.0	695648.5	-9.5	Elevation in NGVD29
584	594388.1	695641.8	-10	Elevation in NGVD29
585	594390.8	695635.1	-10.3	Elevation in NGVD29
586	594393.5	695628.4	-10.9	Elevation in NGVD29
587	594395.7	695621.7	-11.3	Elevation in NGVD29
588	594398.3	695614.3	-11.9	Elevation in NGVD29
589	594400.8	695607.3	-12.3	Elevation in NGVD29
590	594403.6	695599.7	-12.6	Elevation in NGVD29
591	594406.3	695591.6	-12.6	Elevation in NGVD29
592	594408.6	695584.0	-12.1	Elevation in NGVD29
593	594410.8	695575.9	-12	Elevation in NGVD29
594	594413.7	695564.8	-12.1	Elevation in NGVD29
595	594415.1	695557.7	-12	Elevation in NGVD29
596	594416.3	695548.9	-12.1	Elevation in NGVD29
597	594417.6	695537.8	-12.2	Elevation in NGVD29
598	594418.7	695525.4	-12.1	Elevation in NGVD29
599	594419.5	695518.0	-12.3	Elevation in NGVD29
600	594420.5	695509.4	-12.5	Elevation in NGVD29
601	594421.0	695501.9	-12.4	Elevation in NGVD29
602	594421.6	695494.0	-12.5	Elevation in NGVD29
603	594422.0	695486.8	-12.5	Elevation in NGVD29
604	594422.7	695476.9	-12.4	Elevation in NGVD29
605	594423.1	695468.5	-12	Elevation in NGVD29
606	594423.2	695459.8	-12.1	Elevation in NGVD29
607	594423.3	695448.7	-11.9	Elevation in NGVD29
608	594423.4	695441.5	-11.7	Elevation in NGVD29
609	594423.3	695433.8	-11.5	Elevation in NGVD29
610	594423.2	695425.2	-11	Elevation in NGVD29
611	594423.2	695417.1	-10.6	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
612	594423.3	695409.2	-10.2	Elevation in NGVD29
613	594423.5	695401.5	-9.72	Elevation in NGVD29
614	594424.1	695393.8	-9.12	Elevation in NGVD29
615	594424.9	695385.3	-9.11	Elevation in NGVD29
616	594425.7	695377.7	-9.01	Elevation in NGVD29
617	594426.8	695367.1	-8.71	Elevation in NGVD29
618	594427.5	695359.1	-8.21	Elevation in NGVD29
619	594428.2	695351.9	-8.01	Elevation in NGVD29
620	594428.8	695344.6	-7.7	Elevation in NGVD29
621	594429.6	695337.4	-7.4	Elevation in NGVD29
622	594430.4	695328.8	-7	Elevation in NGVD29
623	594431.2	695321.6	-6.7	Elevation in NGVD29
624	594432.2	695313.1	-6.3	Elevation in NGVD29
625	594433.1	695305.5	-5.9	Elevation in NGVD29
626	594434.0	695297.9	-5.6	Elevation in NGVD29
627	594434.8	695290.6	-5.2	Elevation in NGVD29
628	594435.8	695282.3	-4.9	Elevation in NGVD29
629	594436.5	695274.7	-4.5	Elevation in NGVD29
630	594437.4	695266.3	-4.1	Elevation in NGVD29
631	594438.2	695258.3	-3.8	Elevation in NGVD29
632	594439.2	695250.2	-3.51	Elevation in NGVD29
633	594440.0	695242.5	-3.11	Elevation in NGVD29
634	594441.4	695230.6	-3.5	Elevation in NGVD29
635	594411.2	695211.4	-3.35	Elevation in NGVD29
636	594406.7	695219.7	-3.32	Elevation in NGVD29
637	594404.9	695226.6	-3.3	Elevation in NGVD29
638	594403.3	695234.5	-3.28	Elevation in NGVD29
639	594401.9	695242.7	-3.26	Elevation in NGVD29
640	594400.1	695249.8	-3.56	Elevation in NGVD29
641	594398.2	695257.1	-3.76	Elevation in NGVD29
642	594396.0	695263.9	-4.16	Elevation in NGVD29
643	594393.1	695271.7	-4.56	Elevation in NGVD29
644	594390.3	695278.6	-4.86	Elevation in NGVD29
645	594387.2	695286.0	-5.26	Elevation in NGVD29
646	594384.6	695292.7	-5.55	Elevation in NGVD29
647	594381.6	695300.7	-5.95	Elevation in NGVD29
648	594379.1	695307.4	-6.25	Elevation in NGVD29
649	594376.7	695314.3	-6.55	Elevation in NGVD29
650	594374.1	695322.0	-6.95	Elevation in NGVD29
651	594371.9	695329.4	-7.35	Elevation in NGVD29
652	594370.4	695337.6	-7.66	Elevation in NGVD29
653	594369.7	695344.8	-7.96	Elevation in NGVD29
654	594369.5	695351.8	-8.26	Elevation in NGVD29
655	594369.2	695360.3	-8.46	Elevation in NGVD29
656	594369.0	695368.1	-8.76	Elevation in NGVD29
657	594368.8	695376.1	-9.16	Elevation in NGVD29
658	594368.3	695383.7	-9.26	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
659	594367.7	695393.1	-9.46	Elevation in NGVD29
660	594366.5	695402.5	-9.96	Elevation in NGVD29
661	594365.7	695409.5	-10.4	Elevation in NGVD29
662	594365.1	695418.8	-11	Elevation in NGVD29
663	594364.6	695426.9	-11.4	Elevation in NGVD29
664	594363.9	695437.3	-11.7	Elevation in NGVD29
665	594363.4	695445.6	-11.9	Elevation in NGVD29
666	594362.8	695454.3	-11.8	Elevation in NGVD29
667	594362.7	695461.4	-12.1	Elevation in NGVD29
668	594362.6	695471.1	-12.3	Elevation in NGVD29
669	594362.4	695478.6	-12.2	Elevation in NGVD29
670	594362.2	695486.9	-12.1	Elevation in NGVD29
671	594361.7	695494.2	-12.4	Elevation in NGVD29
672	594361.4	695501.3	-12.4	Elevation in NGVD29
673	594360.6	695513.2	-12.2	Elevation in NGVD29
674	594359.8	695521.8	-12.2	Elevation in NGVD29
675	594358.3	695532.4	-12.1	Elevation in NGVD29
676	594357.1	695539.8	-12	Elevation in NGVD29
677	594354.3	695551.2	-12	Elevation in NGVD29
678	594350.6	695563.9	-11.9	Elevation in NGVD29
679	594347.9	695571.8	-12	Elevation in NGVD29
680	594345.8	695579.4	-12	Elevation in NGVD29
681	594344.3	695588.2	-12.7	Elevation in NGVD29
682	594343.1	695595.5	-12.4	Elevation in NGVD29
683	594342.4	695602.7	-12.3	Elevation in NGVD29
684	594342.3	695610.8	-11.9	Elevation in NGVD29
685	594342.6	695618.2	-11.5	Elevation in NGVD29
686	594343.1	695626.5	-11	Elevation in NGVD29
687	594343.3	695634.1	-10.3	Elevation in NGVD29
688	594343.2	695641.4	-9.74	Elevation in NGVD29
689	594342.3	695652.0	-9.24	Elevation in NGVD29
690	594340.9	695659.5	-8.74	Elevation in NGVD29
691	594339.0	695666.6	-7.64	Elevation in NGVD29
692	594306.3	695688.0	-3.66	Elevation in NGVD29
693	594298.2	695685.7	-3.77	Elevation in NGVD29
694	594291.7	695681.8	-4.28	Elevation in NGVD29
695	594286.7	695676.7	-4.98	Elevation in NGVD29
696	594283.0	695669.8	-5.78	Elevation in NGVD29
697	594281.2	695662.9	-6.59	Elevation in NGVD29
698	594280.3	695655.8	-7.39	Elevation in NGVD29
699	594279.4	695648.6	-8.4	Elevation in NGVD29
700	594279.6	695641.4	-9.2	Elevation in NGVD29
701	594280.5	695634.1	-9.7	Elevation in NGVD29
702	594282.1	695625.6	-10.2	Elevation in NGVD29
703	594283.9	695618.4	-10.6	Elevation in NGVD29
704	594286.0	695611.1	-11.2	Elevation in NGVD29
705	594288.1	695604.0	-11.6	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
706	594290.4	695596.7	-12.2	Elevation in NGVD29
707	594292.7	695590.0	-12.4	Elevation in NGVD29
708	594296.2	695579.7	-12.5	Elevation in NGVD29
709	594299.8	695569.9	-12	Elevation in NGVD29
710	594302.2	695563.3	-12	Elevation in NGVD29
711	594305.4	695553.4	-12.1	Elevation in NGVD29
712	594308.5	695540.4	-12.1	Elevation in NGVD29
713	594310.0	695533.0	-12.1	Elevation in NGVD29
714	594311.7	695525.2	-12.2	Elevation in NGVD29
715	594313.0	695517.6	-12.4	Elevation in NGVD29
716	594314.1	695509.4	-12.3	Elevation in NGVD29
717	594315.4	695499.4	-12.3	Elevation in NGVD29
718	594317.4	695486.4	-12.4	Elevation in NGVD29
719	594319.0	695472.3	-12.4	Elevation in NGVD29
720	594319.7	695464.4	-12.5	Elevation in NGVD29
721	594320.5	695457.0	-12.3	Elevation in NGVD29
722	594321.5	695449.8	-12.3	Elevation in NGVD29
723	594322.5	695441.6	-12.1	Elevation in NGVD29
724	594323.6	695433.9	-11.9	Elevation in NGVD29
725	594325.1	695420.2	-11.5	Elevation in NGVD29
726	594326.3	695412.6	-11.2	Elevation in NGVD29
727	594327.4	695404.7	-10.7	Elevation in NGVD29
728	594328.6	695396.2	-10.3	Elevation in NGVD29
729	594329.2	695388.9	-9.88	Elevation in NGVD29
730	594329.9	695381.1	-9.58	Elevation in NGVD29
731	594330.6	695373.7	-9.28	Elevation in NGVD29
732	594331.6	695363.7	-8.88	Elevation in NGVD29
733	594332.6	695356.5	-8.78	Elevation in NGVD29
734	594333.6	695349.4	-8.58	Elevation in NGVD29
735	594334.7	695341.8	-8.18	Elevation in NGVD29
736	594335.6	695334.1	-7.88	Elevation in NGVD29
737	594336.7	695325.9	-7.58	Elevation in NGVD29
738	594337.8	695317.6	-7.17	Elevation in NGVD29
739	594339.4	695308.7	-6.77	Elevation in NGVD29
740	594340.7	695301.7	-6.47	Elevation in NGVD29
741	594342.1	695294.4	-5.87	Elevation in NGVD29
742	594343.9	695284.0	-5.57	Elevation in NGVD29
743	594344.9	695277.0	-5.27	Elevation in NGVD29
744	594345.6	695269.5	-4.97	Elevation in NGVD29
745	594346.2	695262.4	-4.47	Elevation in NGVD29
746	594347.0	695254.6	-4.27	Elevation in NGVD29
747	594347.3	695246.7	-3.86	Elevation in NGVD29
748	594347.7	695239.4	-3.56	Elevation in NGVD29
749	594347.7	695231.8	-3.16	Elevation in NGVD29
750	594347.3	695210.7	-3.56	Elevation in NGVD29
751	594347.2	695202.9	-3.36	Elevation in NGVD29
752	594201.2	695664.6	-5.29	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
753	594195.6	695660.4	-5.59	Elevation in NGVD29
754	594191.3	695654.6	-6.1	Elevation in NGVD29
755	594189.6	695647.3	-7.3	Elevation in NGVD29
756	594189.5	695639.7	-8.41	Elevation in NGVD29
757	594190.3	695632.4	-9.02	Elevation in NGVD29
758	594192.5	695625.4	-9.72	Elevation in NGVD29
759	594195.0	695618.1	-10.3	Elevation in NGVD29
760	594197.9	695610.0	-10.8	Elevation in NGVD29
761	594200.3	695603.1	-11.4	Elevation in NGVD29
762	594202.7	695594.9	-11.8	Elevation in NGVD29
763	594204.8	695587.5	-12.5	Elevation in NGVD29
764	594207.5	695577.5	-12.6	Elevation in NGVD29
765	594209.5	695570.8	-12.5	Elevation in NGVD29
766	594211.7	695562.9	-12.5	Elevation in NGVD29
767	594213.8	695555.3	-12.3	Elevation in NGVD29
768	594216.2	695543.1	-12.2	Elevation in NGVD29
769	594217.5	695532.6	-12.2	Elevation in NGVD29
770	594218.3	695523.3	-12.3	Elevation in NGVD29
771	594218.7	695513.4	-12.3	Elevation in NGVD29
772	594218.7	695502.9	-12.5	Elevation in NGVD29
773	594218.6	695494.1	-12.5	Elevation in NGVD29
774	594218.5	695484.7	-12.6	Elevation in NGVD29
775	594218.8	695472.9	-12.5	Elevation in NGVD29
776	594218.9	695464.9	-12.6	Elevation in NGVD29
777	594218.9	695457.7	-12.9	Elevation in NGVD29
778	594219.0	695450.0	-12.6	Elevation in NGVD29
779	594219.2	695442.7	-12.4	Elevation in NGVD29
780	594219.6	695434.2	-11.9	Elevation in NGVD29
781	594220.5	695424.0	-11.7	Elevation in NGVD29
782	594221.2	695415.9	-11.9	Elevation in NGVD29
783	594221.8	695408.3	-11.6	Elevation in NGVD29
784	594222.5	695400.1	-11.2	Elevation in NGVD29
785	594223.2	695392.9	-10.8	Elevation in NGVD29
786	594224.5	695384.0	-10.3	Elevation in NGVD29
787	594225.7	695376.1	-9.94	Elevation in NGVD29
788	594226.9	695369.1	-9.64	Elevation in NGVD29
789	594228.0	695361.5	-9.24	Elevation in NGVD29
790	594229.3	695353.6	-9.04	Elevation in NGVD29
791	594230.5	695346.0	-8.84	Elevation in NGVD29
792	594231.8	695338.4	-8.54	Elevation in NGVD29
793	594233.3	695329.1	-8.34	Elevation in NGVD29
794	594234.4	695322.0	-7.94	Elevation in NGVD29
795	594235.7	695313.7	-7.54	Elevation in NGVD29
796	594237.0	695304.6	-7.13	Elevation in NGVD29
797	594237.8	695297.4	-6.83	Elevation in NGVD29
798	594238.1	695289.2	-6.43	Elevation in NGVD29
799	594238.0	695281.4	-6.02	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
800	594237.8	695274.1	-5.72	Elevation in NGVD29
801	594237.5	695266.9	-5.43	Elevation in NGVD29
802	594236.5	695258.8	-5.03	Elevation in NGVD29
803	594235.3	695251.0	-4.63	Elevation in NGVD29
804	594234.0	695243.7	-4.43	Elevation in NGVD29
805	594232.7	695236.2	-4.03	Elevation in NGVD29
806	594231.2	695226.9	-3.63	Elevation in NGVD29
807	594230.5	695219.8	-3.23	Elevation in NGVD29
808	594230.2	695207.0	-3.33	Elevation in NGVD29
809	594232.3	695190.8	-3.23	Elevation in NGVD29
810	594233.8	695183.0	-4.22	Elevation in NGVD29
811	594192.2	695179.8	-3.58	Elevation in NGVD29
812	594188.4	695185.9	-3.55	Elevation in NGVD29
813	594185.2	695192.5	-3.51	Elevation in NGVD29
814	594182.7	695201.2	-3.48	Elevation in NGVD29
815	594180.5	695209.5	-3.45	Elevation in NGVD29
816	594179.4	695218.9	-3.42	Elevation in NGVD29
817	594179.8	695226.7	-3.62	Elevation in NGVD29
818	594180.8	695235.3	-4.02	Elevation in NGVD29
819	594182.3	695242.6	-4.32	Elevation in NGVD29
820	594184.9	695251.3	-4.72	Elevation in NGVD29
821	594186.9	695258.1	-4.92	Elevation in NGVD29
822	594189.1	695265.9	-5.22	Elevation in NGVD29
823	594190.3	695273.2	-5.62	Elevation in NGVD29
824	594191.2	695281.0	-5.92	Elevation in NGVD29
825	594191.6	695288.3	-6.32	Elevation in NGVD29
826	594191.4	695295.8	-6.62	Elevation in NGVD29
827	594190.7	695302.8	-6.92	Elevation in NGVD29
828	594189.1	695310.6	-7.42	Elevation in NGVD29
829	594186.9	695317.7	-7.72	Elevation in NGVD29
830	594184.6	695324.4	-8.12	Elevation in NGVD29
831	594182.1	695330.9	-8.32	Elevation in NGVD29
832	594179.2	695338.6	-8.61	Elevation in NGVD29
833	594176.4	695345.8	-8.82	Elevation in NGVD29
834	594174.0	695352.6	-9.12	Elevation in NGVD29
835	594171.7	695359.6	-9.33	Elevation in NGVD29
836	594169.7	695366.3	-9.63	Elevation in NGVD29
837	594168.1	695373.7	-9.93	Elevation in NGVD29
838	594166.9	695381.5	-10.3	Elevation in NGVD29
839	594166.2	695388.8	-10.7	Elevation in NGVD29
840	594165.7	695397.3	-11.2	Elevation in NGVD29
841	594165.8	695404.8	-11.4	Elevation in NGVD29
842	594166.0	695414.2	-11.7	Elevation in NGVD29
843	594166.5	695421.8	-12	Elevation in NGVD29
844	594167.0	695428.8	-12.2	Elevation in NGVD29
845	594167.8	695441.5	-12.2	Elevation in NGVD29
846	594168.2	695453.4	-11.7	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
847	594168.1	695462.3	-12.4	Elevation in NGVD29
848	594167.8	695469.3	-12.4	Elevation in NGVD29
849	594166.9	695481.6	-12.5	Elevation in NGVD29
850	594165.4	695491.8	-12.3	Elevation in NGVD29
851	594164.2	695498.8	-12.4	Elevation in NGVD29
852	594162.5	695507.4	-12.2	Elevation in NGVD29
853	594160.5	695516.8	-12.2	Elevation in NGVD29
854	594158.3	695527.2	-12.1	Elevation in NGVD29
855	594156.3	695538.9	-12.1	Elevation in NGVD29
856	594155.1	695549.8	-12.2	Elevation in NGVD29
857	594154.8	695556.9	-12.3	Elevation in NGVD29
858	594155.2	695564.8	-12.5	Elevation in NGVD29
859	594155.9	695578.8	-12.3	Elevation in NGVD29
860	594155.9	695592.6	-11.9	Elevation in NGVD29
861	594155.5	695599.9	-11.5	Elevation in NGVD29
862	594154.5	695607.6	-11	Elevation in NGVD29
863	594153.1	695615.0	-10.7	Elevation in NGVD29
864	594151.0	695622.9	-9.9	Elevation in NGVD29
865	594148.5	695630.3	-9.3	Elevation in NGVD29
866	594145.5	695637.5	-8.4	Elevation in NGVD29
867	594142.3	695644.1	-7.69	Elevation in NGVD29
868	594110.0	695663.9	-3.24	Elevation in NGVD29
869	594102.9	695662.2	-3.75	Elevation in NGVD29
870	594096.5	695659.1	-3.84	Elevation in NGVD29
871	594090.9	695654.5	-4.34	Elevation in NGVD29
872	594086.8	695648.5	-5.34	Elevation in NGVD29
873	594084.2	695641.7	-6.64	Elevation in NGVD29
874	594082.6	695634.5	-7.74	Elevation in NGVD29
875	594081.6	695626.2	-8.64	Elevation in NGVD29
876	594081.5	695618.8	-9.34	Elevation in NGVD29
877	594082.2	695611.7	-10.1	Elevation in NGVD29
878	594083.6	695604.5	-10.6	Elevation in NGVD29
879	594084.9	695597.3	-11.1	Elevation in NGVD29
880	594086.3	695590.1	-11.6	Elevation in NGVD29
881	594088.2	695581.0	-12	Elevation in NGVD29
882	594090.0	695573.9	-12.6	Elevation in NGVD29
883	594092.9	695563.3	-12.6	Elevation in NGVD29
884	594095.0	695556.6	-12.8	Elevation in NGVD29
885	594097.4	695548.5	-12.7	Elevation in NGVD29
886	594099.6	695541.7	-12.5	Elevation in NGVD29
887	594103.1	695530.6	-12.3	Elevation in NGVD29
888	594107.3	695517.6	-12.3	Elevation in NGVD29
889	594109.0	695510.6	-12.4	Elevation in NGVD29
890	594110.7	695503.1	-12.4	Elevation in NGVD29
891	594113.0	695491.9	-12.4	Elevation in NGVD29
892	594114.5	695484.2	-12.5	Elevation in NGVD29
893	594117.3	695470.3	-12.6	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
894	594120.3	695456.3	-12.6	Elevation in NGVD29
895	594122.1	695447.8	-12.6	Elevation in NGVD29
896	594123.7	695440.7	-12.7	Elevation in NGVD29
897	594125.3	695431.7	-12.5	Elevation in NGVD29
898	594126.8	695422.6	-12.4	Elevation in NGVD29
899	594128.0	695414.9	-12.1	Elevation in NGVD29
900	594129.2	695406.6	-12	Elevation in NGVD29
901	594130.3	695398.9	-11.7	Elevation in NGVD29
902	594131.3	695391.6	-11.4	Elevation in NGVD29
903	594132.5	695383.8	-11	Elevation in NGVD29
904	594133.7	695375.2	-10.5	Elevation in NGVD29
905	594134.8	695367.4	-10.1	Elevation in NGVD29
906	594136.0	695358.9	-9.68	Elevation in NGVD29
907	594137.0	695351.8	-9.38	Elevation in NGVD29
908	594137.8	695342.8	-9.08	Elevation in NGVD29
909	594138.2	695335.2	-8.87	Elevation in NGVD29
910	594138.4	695326.7	-8.47	Elevation in NGVD29
911	594138.5	695319.6	-8.37	Elevation in NGVD29
912	594138.1	695312.4	-7.97	Elevation in NGVD29
913	594137.7	695304.8	-7.67	Elevation in NGVD29
914	594137.0	695297.6	-7.36	Elevation in NGVD29
915	594136.2	695289.5	-7.06	Elevation in NGVD29
916	594135.3	695281.8	-6.66	Elevation in NGVD29
917	594134.6	695274.1	-6.26	Elevation in NGVD29
918	594133.9	695266.2	-5.96	Elevation in NGVD29
919	594133.4	695259.2	-5.56	Elevation in NGVD29
920	594133.2	695252.1	-5.26	Elevation in NGVD29
921	594133.4	695243.7	-4.76	Elevation in NGVD29
922	594134.2	695235.5	-4.36	Elevation in NGVD29
923	594135.4	695228.2	-4.06	Elevation in NGVD29
924	594137.0	695221.3	-3.55	Elevation in NGVD29
925	594139.9	695209.6	-3.25	Elevation in NGVD29
926	594142.7	695197.6	-3.64	Elevation in NGVD29
927	594144.4	695190.2	-3.54	Elevation in NGVD29
928	594146.1	695181.5	-3.33	Elevation in NGVD29
929	594005.6	695650.3	-3.72	Elevation in NGVD29
930	593998.5	695647.9	-4.03	Elevation in NGVD29
931	593990.7	695642.9	-4.43	Elevation in NGVD29
932	593985.8	695637.0	-5.14	Elevation in NGVD29
933	593982.8	695630.6	-6.04	Elevation in NGVD29
934	593981.6	695622.4	-6.65	Elevation in NGVD29
935	593982.5	695615.4	-8.26	Elevation in NGVD29
936	593984.8	695608.8	-9.37	Elevation in NGVD29
937	593987.5	695602.1	-10.2	Elevation in NGVD29
938	593990.6	695595.1	-10.8	Elevation in NGVD29
939	593993.9	695587.6	-11.1	Elevation in NGVD29
940	593997.3	695580.5	-11.5	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
941	594000.3	695573.8	-11.9	Elevation in NGVD29
942	594003.5	695566.7	-12.4	Elevation in NGVD29
943	594006.3	695560.0	-12.6	Elevation in NGVD29
944	594009.0	695553.5	-12.7	Elevation in NGVD29
945	594011.9	695545.5	-12.7	Elevation in NGVD29
946	594014.9	695535.4	-12.7	Elevation in NGVD29
947	594017.4	695522.5	-12.7	Elevation in NGVD29
948	594018.3	695514.8	-12.6	Elevation in NGVD29
949	594018.6	695506.9	-12.6	Elevation in NGVD29
950	594019.0	695495.8	-12.5	Elevation in NGVD29
951	594019.2	695483.4	-12.6	Elevation in NGVD29
952	594018.9	695473.5	-12.7	Elevation in NGVD29
953	594018.7	695464.3	-12.8	Elevation in NGVD29
954	594018.6	695455.5	-12.8	Elevation in NGVD29
955	594018.7	695445.8	-12.7	Elevation in NGVD29
956	594019.1	695435.5	-12.7	Elevation in NGVD29
957	594020.1	695423.9	-12.6	Elevation in NGVD29
958	594022.1	695410.8	-12.4	Elevation in NGVD29
959	594024.0	695401.4	-12.1	Elevation in NGVD29
960	594026.2	695392.1	-11.9	Elevation in NGVD29
961	594028.2	695383.7	-11.6	Elevation in NGVD29
962	594030.1	695376.2	-11.2	Elevation in NGVD29
963	594032.1	695368.9	-10.9	Elevation in NGVD29
964	594034.4	695360.2	-10.5	Elevation in NGVD29
965	594036.0	695353.3	-10	Elevation in NGVD29
966	594037.8	695345.2	-9.59	Elevation in NGVD29
967	594039.3	695336.7	-9.29	Elevation in NGVD29
968	594040.0	695329.4	-9.08	Elevation in NGVD29
969	594040.2	695320.9	-8.78	Elevation in NGVD29
970	594040.0	695313.2	-8.48	Elevation in NGVD29
971	594039.4	695305.0	-8.18	Elevation in NGVD29
972	594038.3	695295.9	-7.68	Elevation in NGVD29
973	594037.1	695287.3	-7.38	Elevation in NGVD29
974	594036.0	695280.3	-7.08	Elevation in NGVD29
975	594034.5	695272.1	-6.57	Elevation in NGVD29
976	594033.1	695265.2	-6.37	Elevation in NGVD29
977	594031.2	695256.1	-5.87	Elevation in NGVD29
978	594029.5	695249.2	-5.57	Elevation in NGVD29
979	594027.5	695241.3	-5.27	Elevation in NGVD29
980	594025.7	695233.8	-4.87	Elevation in NGVD29
981	594024.3	695226.8	-4.57	Elevation in NGVD29
982	594022.9	695219.0	-4.27	Elevation in NGVD29
983	594021.6	695211.5	-3.97	Elevation in NGVD29
984	594020.6	695203.7	-3.47	Elevation in NGVD29
985	594019.7	695195.7	-3.26	Elevation in NGVD29
986	594019.0	695188.5	-3.46	Elevation in NGVD29
987	594018.4	695180.6	-3.56	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
988	594007.1	695188.2	-4.02	Elevation in NGVD29
989	594001.4	695197.6	-3.32	Elevation in NGVD29
990	593998.5	695205.1	-3.72	Elevation in NGVD29
991	593996.3	695212.2	-3.92	Elevation in NGVD29
992	593994.3	695219.0	-4.21	Elevation in NGVD29
993	593992.4	695226.1	-4.61	Elevation in NGVD29
994	593990.4	695234.3	-5.01	Elevation in NGVD29
995	593988.8	695241.7	-5.31	Elevation in NGVD29
996	593987.3	695248.6	-5.61	Elevation in NGVD29
997	593986.0	695256.4	-5.91	Elevation in NGVD29
998	593984.7	695265.1	-6.31	Elevation in NGVD29
999	593983.6	695272.6	-6.71	Elevation in NGVD29
1000	593982.4	695280.5	-7.01	Elevation in NGVD29
1001	593981.2	695288.1	-7.41	Elevation in NGVD29
1002	593979.8	695296.3	-7.7	Elevation in NGVD29
1003	593978.5	695303.4	-8.2	Elevation in NGVD29
1004	593977.2	695310.6	-8.4	Elevation in NGVD29
1005	593975.8	695318.9	-8.69	Elevation in NGVD29
1006	593974.5	695326.8	-8.99	Elevation in NGVD29
1007	593973.3	695335.2	-9.39	Elevation in NGVD29
1008	593972.3	695343.2	-9.69	Elevation in NGVD29
1009	593971.5	695350.6	-9.99	Elevation in NGVD29
1010	593970.9	695359.1	-10.4	Elevation in NGVD29
1011	593970.5	695367.5	-10.9	Elevation in NGVD29
1012	593970.3	695375.1	-11.3	Elevation in NGVD29
1013	593970.0	695382.4	-11.6	Elevation in NGVD29
1014	593969.8	695389.7	-11.9	Elevation in NGVD29
1015	593969.2	695400.0	-12	Elevation in NGVD29
1016	593968.6	695408.3	-12.3	Elevation in NGVD29
1017	593967.9	695415.8	-12.6	Elevation in NGVD29
1018	593967.0	695424.7	-12.6	Elevation in NGVD29
1019	593966.2	695432.3	-12.7	Elevation in NGVD29
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1021	593964.1	695452.6	-12.9	Elevation in NGVD29
1022	593963.1	695462.7	-12.8	Elevation in NGVD29
1023	593962.1	695471.7	-12.8	Elevation in NGVD29
1024	593960.5	695484.7	-12.8	Elevation in NGVD29
1025	593959.2	695493.6	-12.7	Elevation in NGVD29
1026	593957.9	695502.5	-12.7	Elevation in NGVD29
1027	593956.6	695510.1	-12.7	Elevation in NGVD29
1028	593955.4	695517.9	-12.8	Elevation in NGVD29
1029	593954.1	695525.9	-12.8	Elevation in NGVD29
1030	593952.9	695533.4	-12.9	Elevation in NGVD29
1031	593951.6	695542.1	-12.9	Elevation in NGVD29
1032	593950.1	695555.9	-12.5	Elevation in NGVD29
1033	593949.3	695563.1	-12.5	Elevation in NGVD29
1034	593948.3	695570.2	-12	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

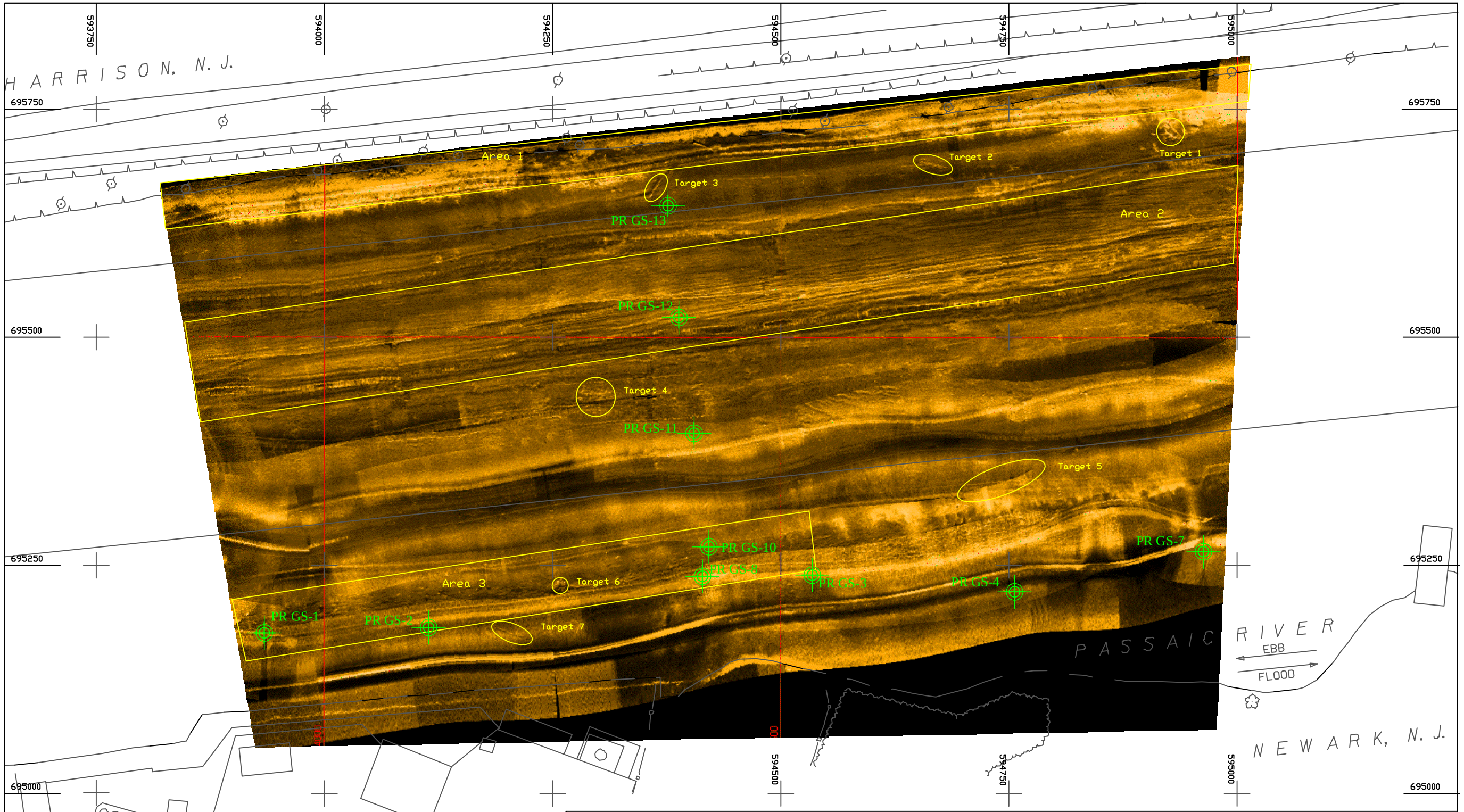
PENZD of Hydrographic Data

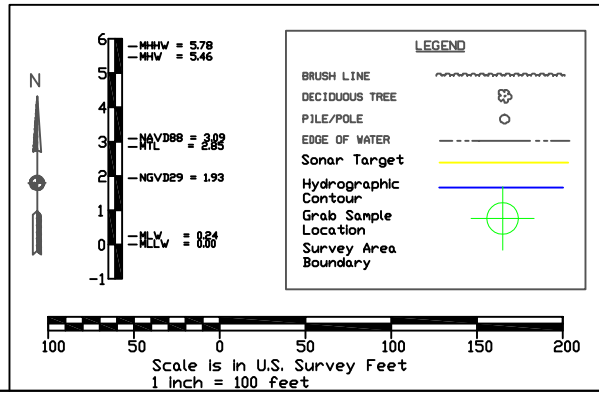
Point	Easting	Northing	Z	Description
1035	593946.9	695577.5	-11.6	Elevation in NGVD29
1036	593945.5	695585.0	-11.2	Elevation in NGVD29
1037	593943.9	695592.2	-11	Elevation in NGVD29
1038	593942.4	695599.2	-10.3	Elevation in NGVD29
1039	593941.0	695606.6	-9.72	Elevation in NGVD29
1040	593939.7	695613.5	-8.92	Elevation in NGVD29
1041	593938.2	695620.4	-7.82	Elevation in NGVD29
1042	593907.2	695185.2	-4.11	Elevation in NGVD29
1043	593906.1	695192.4	-3.92	Elevation in NGVD29
1044	593904.9	695200.3	-3.73	Elevation in NGVD29
1045	593903.8	695207.5	-4.03	Elevation in NGVD29
1046	593902.4	695214.8	-4.43	Elevation in NGVD29
1047	593900.8	695223.2	-4.93	Elevation in NGVD29
1048	593899.3	695230.5	-5.13	Elevation in NGVD29
1049	593897.7	695238.4	-5.53	Elevation in NGVD29
1050	593895.8	695246.8	-5.93	Elevation in NGVD29
1051	593894.3	695254.0	-6.22	Elevation in NGVD29
1052	593892.4	695262.4	-6.62	Elevation in NGVD29
1053	593890.8	695270.2	-7.02	Elevation in NGVD29
1054	593889.3	695277.9	-7.41	Elevation in NGVD29
1055	593888.2	695285.1	-7.71	Elevation in NGVD29
1056	593886.6	695296.1	-8.21	Elevation in NGVD29
1057	593885.1	695306.3	-8.61	Elevation in NGVD29
1058	593884.0	695313.5	-8.91	Elevation in NGVD29
1059	593882.8	695320.6	-9.31	Elevation in NGVD29
1060	593881.7	695327.6	-9.52	Elevation in NGVD29
1061	593880.7	695335.1	-9.92	Elevation in NGVD29
1062	593879.9	695343.6	-10.3	Elevation in NGVD29
1063	593879.5	695351.4	-10.5	Elevation in NGVD29
1064	593879.2	695358.9	-11.1	Elevation in NGVD29
1065	593878.8	695366.3	-11.4	Elevation in NGVD29
1066	593878.3	695373.8	-11.8	Elevation in NGVD29
1067	593877.5	695382.1	-12	Elevation in NGVD29
1068	593876.1	695390.5	-12.2	Elevation in NGVD29
1069	593874.5	695397.8	-12.5	Elevation in NGVD29
1070	593872.4	695406.2	-12.7	Elevation in NGVD29
1071	593869.6	695417.8	-12.8	Elevation in NGVD29
1072	593867.1	695428.7	-13	Elevation in NGVD29
1073	593865.7	695437.1	-13.1	Elevation in NGVD29
1074	593864.0	695449.5	-13	Elevation in NGVD29
1075	593862.6	695459.1	-13	Elevation in NGVD29
1076	593861.3	695469.6	-13.1	Elevation in NGVD29
1077	593860.7	695477.3	-13.2	Elevation in NGVD29
1078	593860.6	695484.4	-13	Elevation in NGVD29
1079	593860.4	695491.9	-12.9	Elevation in NGVD29
1080	593860.0	695503.3	-13	Elevation in NGVD29
1081	593859.4	695510.4	-13.2	Elevation in NGVD29

Points, Eastings, Northings, Elevation, Description

PENZD of Hydrographic Data

Point	Easting	Northing	Z	Description
1082	593858.8	695518.1	-13	Elevation in NGVD29
1083	593857.8	695529.1	-13	Elevation in NGVD29
1084	593857.3	695536.3	-12.9	Elevation in NGVD29
1085	593856.1	695546.4	-12.7	Elevation in NGVD29
1086	593854.8	695554.6	-12.5	Elevation in NGVD29
1087	593853.4	695562.3	-12	Elevation in NGVD29
1088	593851.6	695570.9	-11.6	Elevation in NGVD29
1089	593850.0	695578.3	-11.2	Elevation in NGVD29
1090	593847.7	695587.5	-10.4	Elevation in NGVD29
1091	593845.7	695594.9	-9.72	Elevation in NGVD29
1092	593843.4	695602.4	-8.82	Elevation in NGVD29
1093	593841.2	695609.7	-7.91	Elevation in NGVD29





Aqua Survey Inc.
469 Point Breeze Rd.
Flemington, NJ 08822
(908) 788-8700

Survey of : PASSAIC RIVER, HARRISON REACH, NEWARK, NJ

NOTES:

1. The information depicted on this map represents the results of surveys made on the date indicated.
2. Coordinates shown hereon are expressed in U.S. Survey Feet and referenced to the North American Datum of 1983 (NAD83) New Jersey Mercator State Plane coordinate system.
3. Elevations hereon are expressed in U.S. Survey feet and are referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).
4. Sounding data point plots and contours are referenced to NGVD 29.
5. Planimetric details were supplied by TAMS Consultants. The date of the original planimetric survey is not known.

SURVEY DATE: 17 AND 18 MARCH, 2004
PLOTTED BY: M. PADDOVER
APPROVED BY: J. A. NICKELS
DATE: 16 APRIL 2004

The subject Hydrographic survey was completed utilizing the following equipment:
Vessel: R/V Delaware
Positioning System: Trimble Real Time Kinematic DGPS
Echo Sounder: IT 455 at 200 khz
Navigation/Data Acquisition: Hypack Max v. 2.12.52.0

Appendix B2:
Magnetometer and Sub-Bottom Survey Report

TECHNICAL REPORT
ENVIRONMENTAL DREDGING AND SEDIMENT DECONTAMINATION TECHNOLOGY DEMONSTRATION PILOT STUDY
LOWER PASSAIC RIVER RESTORATION PROJECT
MAGNETOMETER AND SUB-BOTTOM PROFILER DEBRIS SURVEY

SPONSOR

NEW JERSEY DEPARTMENT OF TRANSPORTATION-OMR
OFFICE OF MARITIME RESOURCES
1035 Parkway Avenue, E&O Building
Trenton, NJ 08625-0837

Draft

SPONSOR REPRESENTATIVE

Earth Tech
300 Broadcrest Drive
Bloomfield, NJ 07003

SURVEY COMPANY

Aqua Survey Inc.
469 Point Breeze Rd.
Flemington, NJ 08822

ASI Project Number 24-225

December 3, 2004

TECHNICAL REPORT
ENVIRONMENTAL DREDGING AND SEDIMENT
DECONTAMINATION TECHNOLOGY DEMONSTRATION
PILOT STUDY
LOWER PASSAIC RIVER RESTORATION PROJECT
MAGNETOMETER AND SUB-BOTTOM PROFILER
DEBRIS SURVEY

SPONSOR

NEW JERSEY DEPARTMENT OF TRANSPORTATION-OMR
OFFICE OF MARITIME RESOURCES
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SPONSOR REPRESENTATIVE

Earth Tech
300 Broadcrest Drive
Bloomfield, NJ 07003

ASI Project Number 24-225

This report, as well as all records and raw data were audited and found to be an accurate reflection of the study. Copies of raw data will be maintained by Aqua Survey, Inc., 469 Point Breeze Road, Flemington, NJ 08822.

James Nickels **Date**
Vice President and Field Project Manager

James Todd **Date**
Executive Vice President

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I. SUMMARY

The goal of the debris survey was to identify buried objects that may be hazards to the dredging operation in the proposed pilot study area (Figure 1). Both sub-bottom and magnetometer surveys were conducted in an attempt to identify objects buried beneath the surface of the sediment.

The survey work encompassed the entire river bottom, to the MLW mark along each shoreline. The survey extended for 1000 feet along the river centerline from bank to bank (Figure 1). The survey work was conducted in NAD83 and NJ State Plane feet (horizontal datum) and NGVD 1929 for the vertical datum.

A Geometrics G-882 marine cesium magnetometer system was used for the initial magnetometer survey. During the survey, the sensor was towed at a depth of 1 to 5 feet and approximately 40 feet behind the survey vessel to ensure the sensor was not detecting the vessel itself.

An Edgetech X-STAR chirp sonar system was used with a SB-216S towfish to perform sub-bottom profiling along the Harrison Reach of the Passaic River. During the survey, the SB-216S was towed at a depth between 3 and 6 ft. and approximately 6 ft. aft of the navigational antenna on the port side of the Aqua Survey, Inc. vessel R/V *Delaware.*

Surveys lines were initially surveyed using a magnetometer, then subsequently surveyed using the X-STAR sonar. The magnetometer survey revealed 12 distinct magnetic anomalies as well as significant levels of background geologic interference. Of those 12 targets identified by the magnetometer survey only two could be correlated with reflections in the sub-bottom profiles. In addition to these two targets, two potential targets, not detected in the magnetometer survey, were imaged by the chirp system. Images of the magnetic signatures as well as the four targets observed on the chirp profiles are shown within the text of this report.

None of the targets located were found to have signatures indicative of historically significant submerged cultural resources. Because all of the materials generating the targets are buried below the surface of the sediment, it is impossible to positively identify them using remote sensing equipment. Whether the targets identified are a concern for the future dredging operations cannot be determined. Should the potential exist for the dredging equipment to be damaged by the targets, further investigation may be necessary to determine the nature and depth of burial of the material generating the anomaly. This could be accomplished using jet probing to delineate the size and shape of the object as well as its depth of burial.

N
W E
S

500 250 0 500 1,000 1,500
Feet

Harrison Reach
Pilot Study Area

Lower Passaic River
Restoration Project

Figure 1

II. TEST ADMINISTRATION

A. Sponsor

New Jersey Department of Transportation - OMR
Office of Maritime Resources
1035 Parkway Avenue, E&O Building
Trenton, NJ 08625-0837

B. Survey Company

Aqua Survey Inc.
469 Point Breeze Rd.
Flemington, NJ 08822

C. Dates of Survey

Date of Survey Initiation:	November 10, 2004
Date of Survey Completion:	November 17, 2004

D. Survey Participants

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III. MATERIALS, METHODS, AND RESULTS

A. Magnetometer Data Collection

A magnetometer survey was conducted in order to detect the presence of buried ferrous debris not detected during the side-scan sonar survey. The magnetometer survey also complemented and aided in the interpretation of the side-scan sonar survey results, gathered from a survey in the spring of 2004, regarding debris and potentially significant historic submerged cultural resources. The survey methodology was designed to provide data indicating the position, and relative size of ferrous targets in the survey area, as well as archaeological data essential for complying with the National Historic Preservation Act of 1966, as amended, through 1992 (36 CFR 800, *Protection of Historic Properties*) and the Abandoned Shipwreck Act of 1987 (*Abandoned Shipwreck Act Guidelines*, National Park Service, *Federal Register*, Vol. 55, No. 3, December 4, 1990, pages 50116-50145).

A Geometrics G-882 marine cesium magnetometer system magnetometer capable of plus or minus 0.01 gamma resolution was be used to conduct the survey. Survey lines were run at 25-foot intervals to ensure complete coverage of the survey area. Data was recorded at 0.5 second intervals and electronically paired with positioning data from a real-time kinematic global positioning system using an onboard computer running Hypack Max 4.3 survey software.

To ensure reliable target identification and assessment, analysis of the magnetic data was initially carried out as it is generated. Significant magnetic anomalies were marked as targets during the survey and were re-surveyed using the magnetometer to better determine the size and characteristics of the anomaly.

Post-processing of the data involved examining each survey line individually and annotating anomalies detected. Using contouring software, magnetic data generated during the survey was contour plotted at 10 gamma intervals for analysis and accurate location of the material generating each magnetic anomaly as well as determining the presence of clusters of targets. Magnetic targets were isolated and analyzed in accordance with intensity, duration, areal extent and signature characteristics.

Data generated by the remote sensing equipment was used to support an assessment of each magnetic signature. Analysis of each target signature included consideration of magnetic characteristics previously demonstrated to be reliable indicators of historically significant submerged cultural resources. Assessment of each target includes recommendations for additional investigation to determine the exact nature of the cultural material generating the signature and its potential National Register significance. All targets are listed and described and a map has been produced that shows their location within the project area (Figure 2).

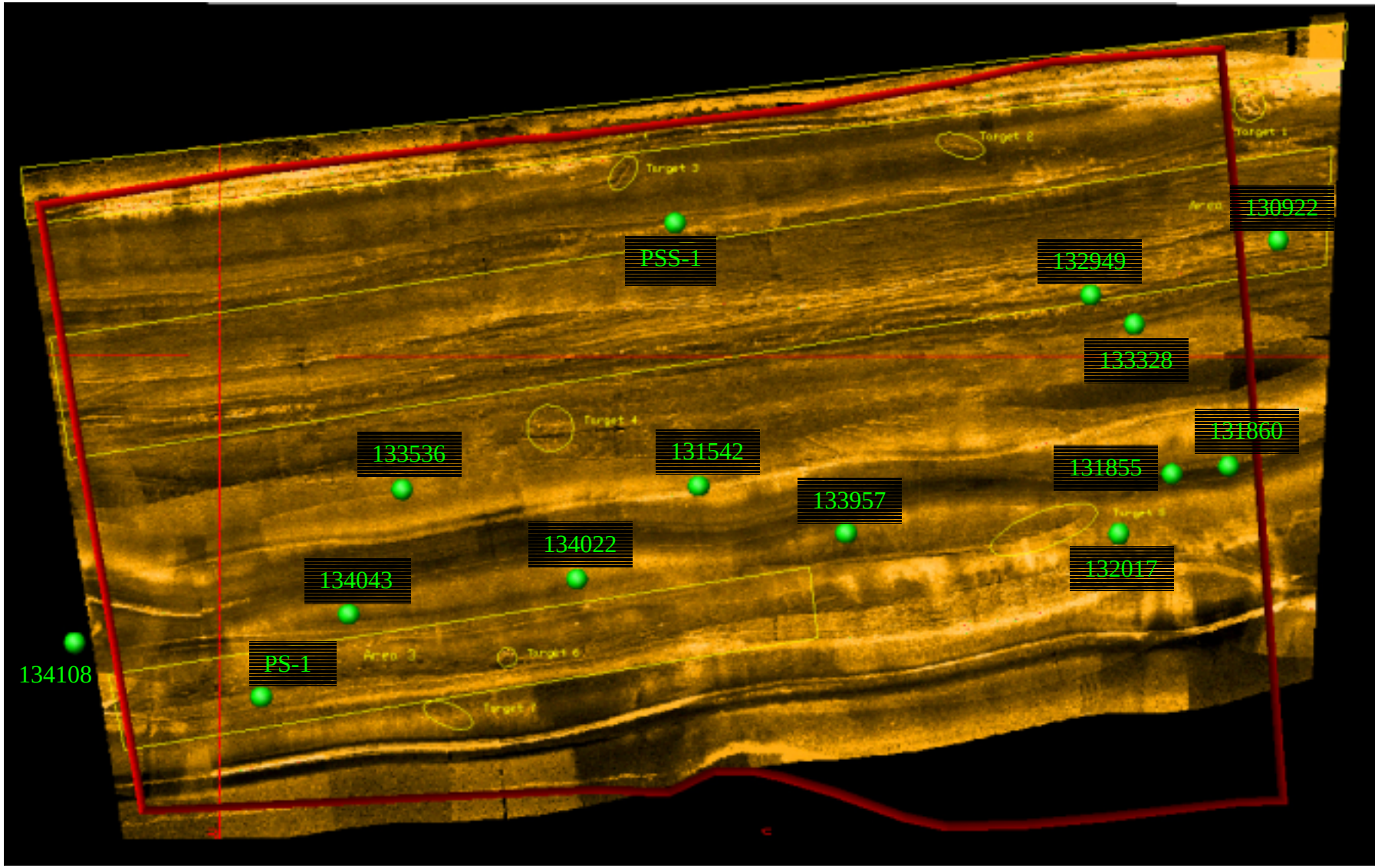

Figure 2. Locations of magnetic anomalies and sub-bottom profiler targets overlaid on side-scan sonar targets and mosaic. Yellow labeled targets are from the side-scan sonar survey. Green labeled targets are from the magnetometer/sub-bottom survey.

B. Magnetometer Results

A Geometrics G-882 marine cesium magnetometer system was used for the magnetometer survey. During the survey, the sensor was towed at a depth of 1 to 5 feet and approximately 40 feet behind the survey vessel to ensure the sensor was not detecting the vessel itself. The magnetometer survey revealed 12 distinct magnetic anomalies as well as significant levels of background geologic interference. The location of each of the magnetic anomalies was checked on the side-scan sonar mosaic and no targets were duplicated in the two surveys.

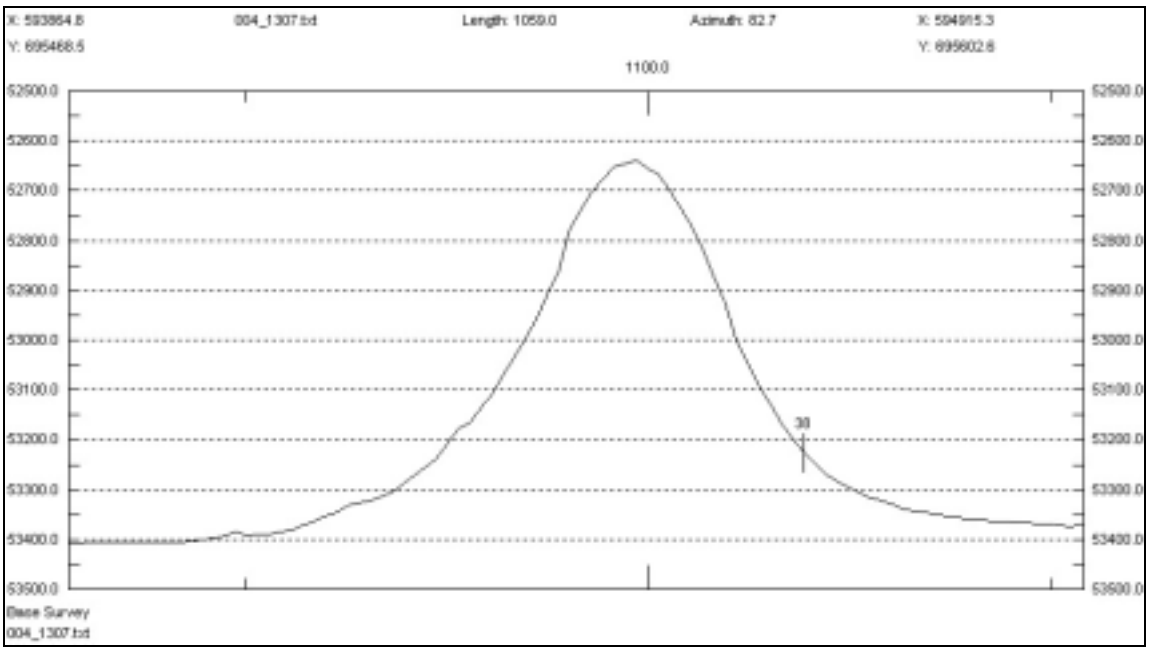

Figure 3. Magnetic signature 130922.

Target Designation	Easting	Northing	Gammas	Duration
130922	594953.5	695603.9	1132	100’

The magnetic signature was identified on lane 4. The target is located just outside the eastern edge of study area by 35 feet, but was marked due to its intensity. The location of this target is shown in figure 2. The detectable monopolar negative signature had a maximum intensity of 1132 gammas and was detected for 100 linear feet. Analysis of the magnetic signature suggests that material generating the anomaly is associated with a single large ferrous object and does not represent the complex type of signature generally associated with shipwreck sites. The magnetic anomaly does not correspond to any targets detected in the earlier side-scan sonar survey. The signature was not found to have characteristics indicative of historically significant submerged cultural resources.

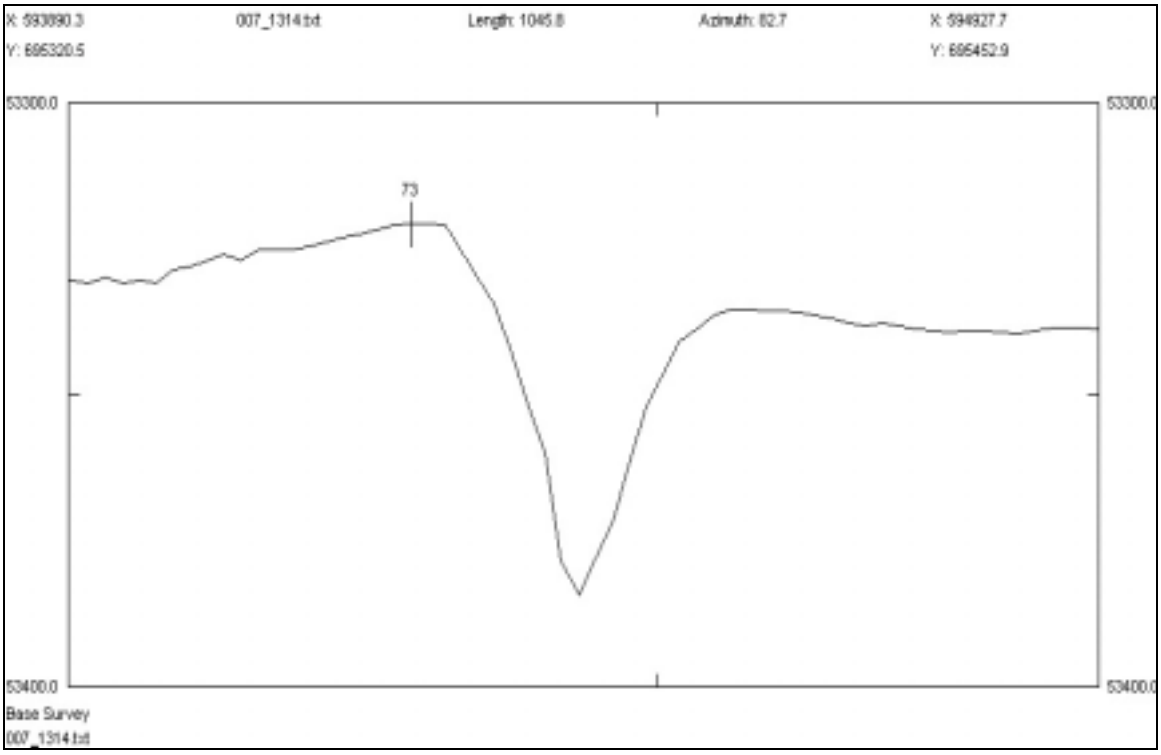

Figure 4. Magnetic signature 131542.

Target Designation	**Easting**	**Northing**	**Gammas**	**Duration**
131542	594431.5	695382.4	64.4	20’

The magnetic signature was identified on lane 7. The location of this target is shown in figure 2. The detectable monopolar positive signature had a maximum intensity of 64.4 gammas and was detected for 20 linear feet. Analysis of the magnetic signature suggests that material generating the anomaly is associated with a single small ferrous object and does not represent the complex type of signature generally associated with shipwreck sites. The magnetic anomaly does not correspond to any targets detected in the earlier side-scan sonar survey. The signature was not found to have characteristics indicative of historically significant submerged cultural resources.

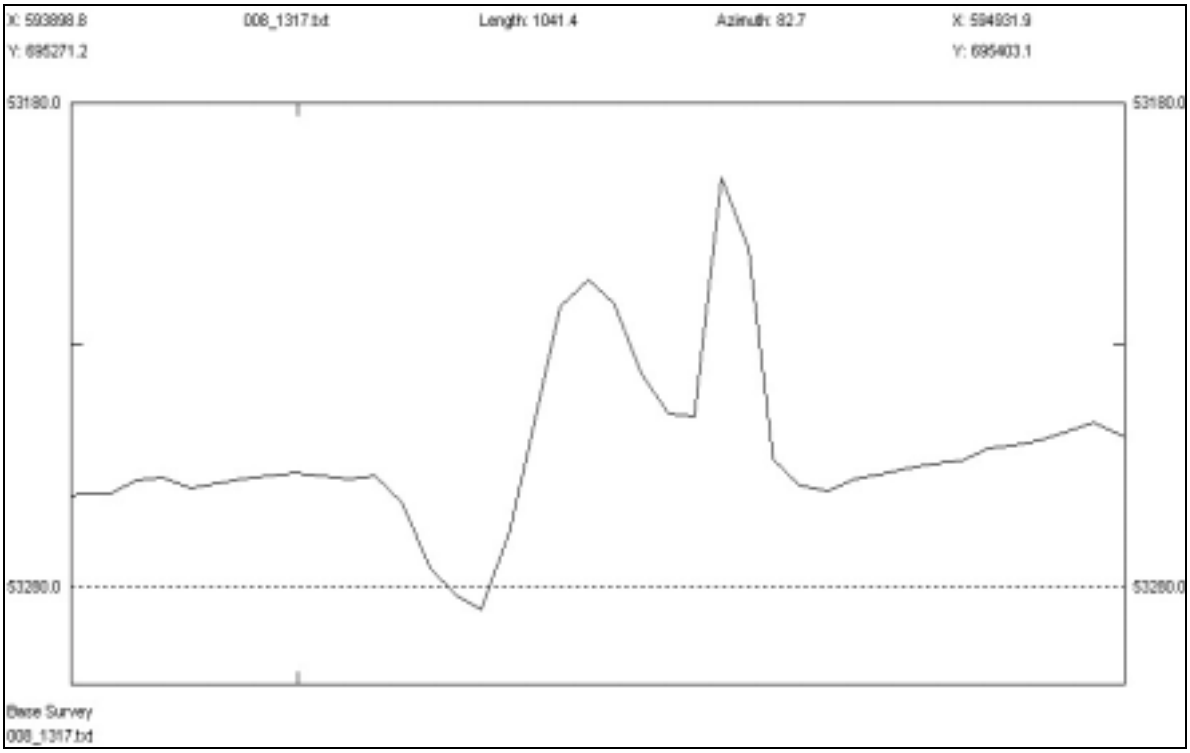

Figure 5. Magnetic signature 131855.

Target Designation	**Easting**	**Northing**	**Gammas**	**Duration**
131855	594857.7	695393.4	89.7	22’

The magnetic signature was identified on lane 8. The location of this target is shown in figure 2. The detectable multicomponent signature had a maximum intensity of 89.7 gammas and was detected for 22 linear feet. Analysis of the magnetic signature suggests that material generating the anomaly is associated with a single small ferrous object or group of small objects such as an anchors, pipes, chain, or wire rope and does not represent the complex type of signature generally associated with shipwreck sites. The magnetic anomaly does not correspond to any targets detected in the earlier side-scan sonar survey. The signature was not found to have characteristics indicative of historically significant submerged cultural resources.

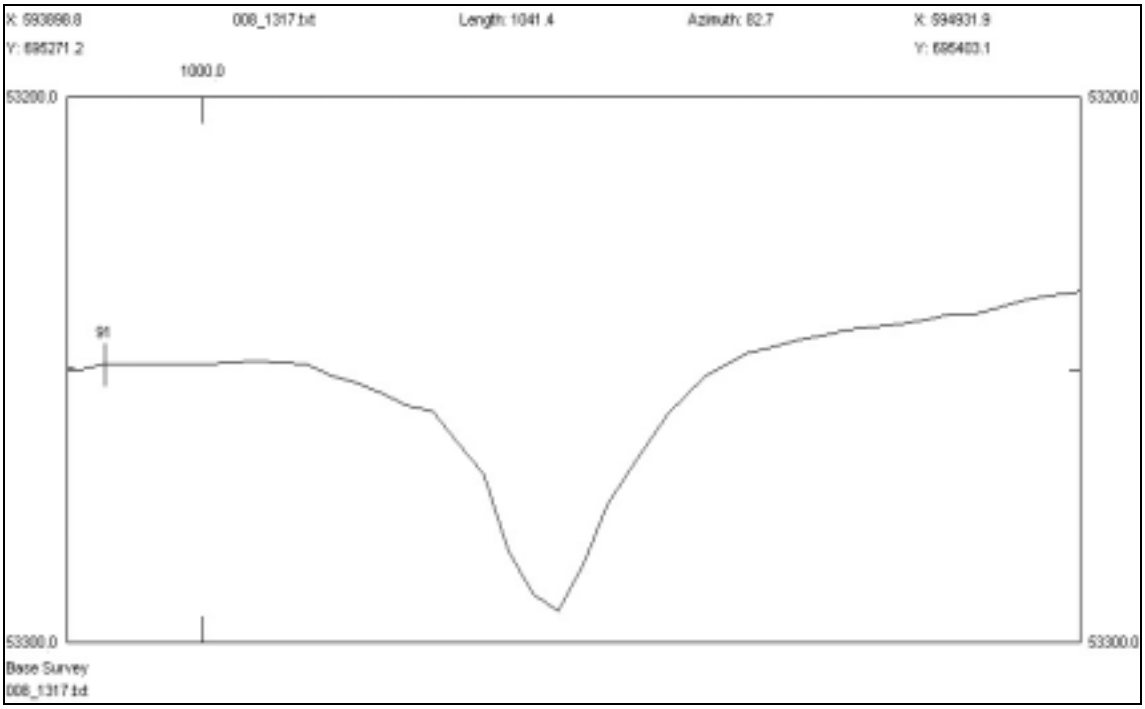

Figure 6. Magnetic signature 131860.

Target Designation	**Easting**	**Northing**	**Gammas**	**Duration**
131860	594908.8	695400.2	46.0	24’

The magnetic signature was identified on lane 8. The location of this target is shown in figure 2. The detectable monopolar positive signature had a maximum intensity of 46.0 gammas and was detected for 24 linear feet. Analysis of the magnetic signature suggests that material generating the anomaly is associated with a single small ferrous object such as an anchor, pipe, chain, or wire rope and does not represent the complex type of signature generally associated with shipwreck sites. The magnetic anomaly does not correspond to any targets detected in the earlier side-scan sonar survey. The signature was not found to have characteristics indicative of historically significant submerged cultural resources.

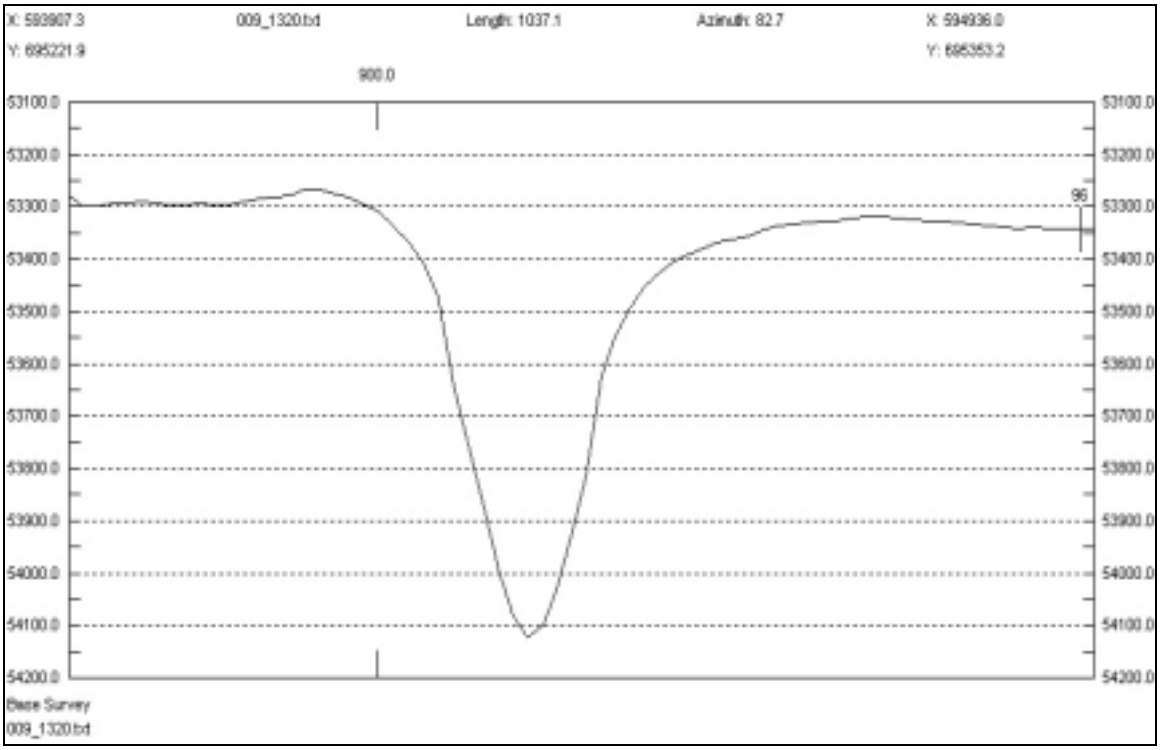

Figure 7. Magnetic signature 132017.

Target Designation	**Easting**	**Northing**	**Gammas**	**Duration**
132017	594810.0	695339.5	852.6	32’

The magnetic signature was identified on lane 9. The location of this target is shown in figure 2. The detectable monopolar positive signature had a maximum intensity of 852.6 gammas and was detected for 32 linear feet. Analysis of the magnetic signature suggests that material generating the anomaly is associated with a single large ferrous object and does not represent the complex type of signature generally associated with shipwreck sites. The magnetic anomaly does not correspond to any targets detected in the earlier side-scan sonar survey. The signature was not found to have characteristics indicative of historically significant submerged cultural resources.

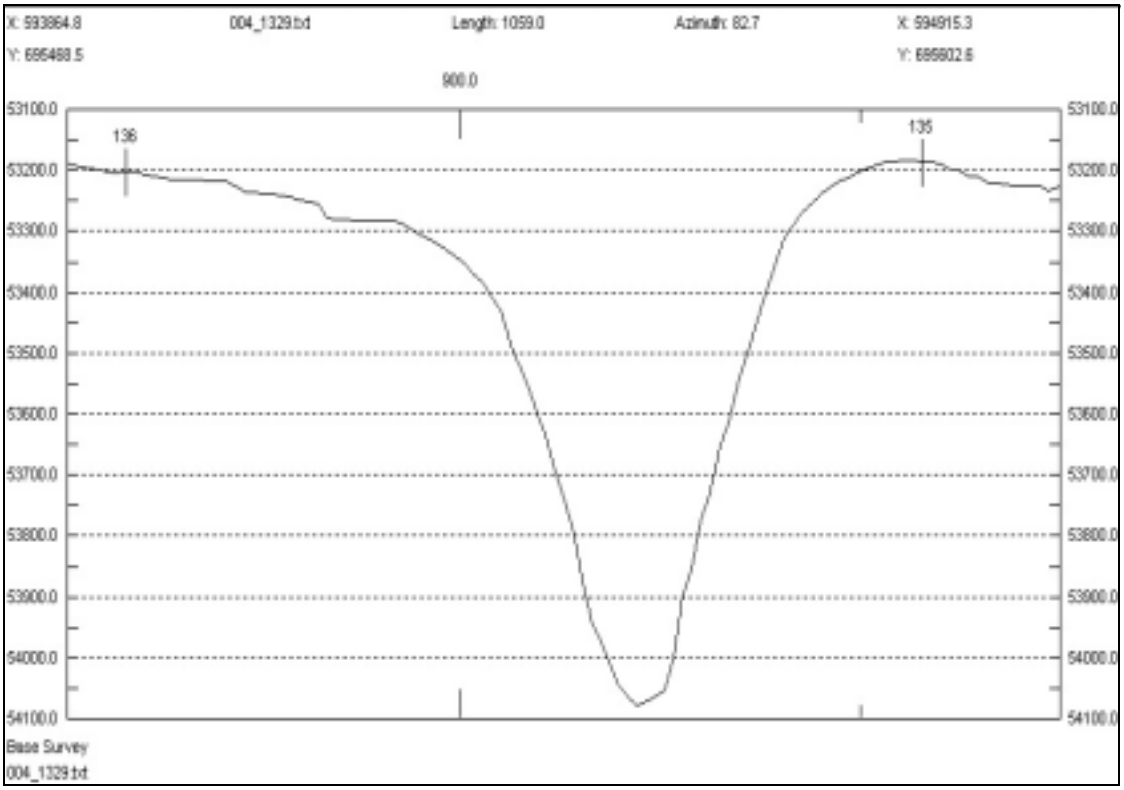

Figure 8. Magnetic signature 132949.

Target Designation	Easting	Northing	Gammas	Duration
132949	594784.7	695554.4	893.1	73’

The magnetic signature was identified on lane 4.5. The location of this target is shown in figure 2. The detectable monopolar positive signature had a maximum intensity of 893.1 gammas and was detected for 73 linear feet. Analysis of the magnetic signature suggests that material generating the anomaly is associated with a single large ferrous object and does not represent the complex type of signature generally associated with shipwreck sites. The magnetic anomaly does not correspond to any targets detected in the earlier side-scan sonar survey. The signature was not found to have characteristics indicative of historically significant submerged cultural resources.

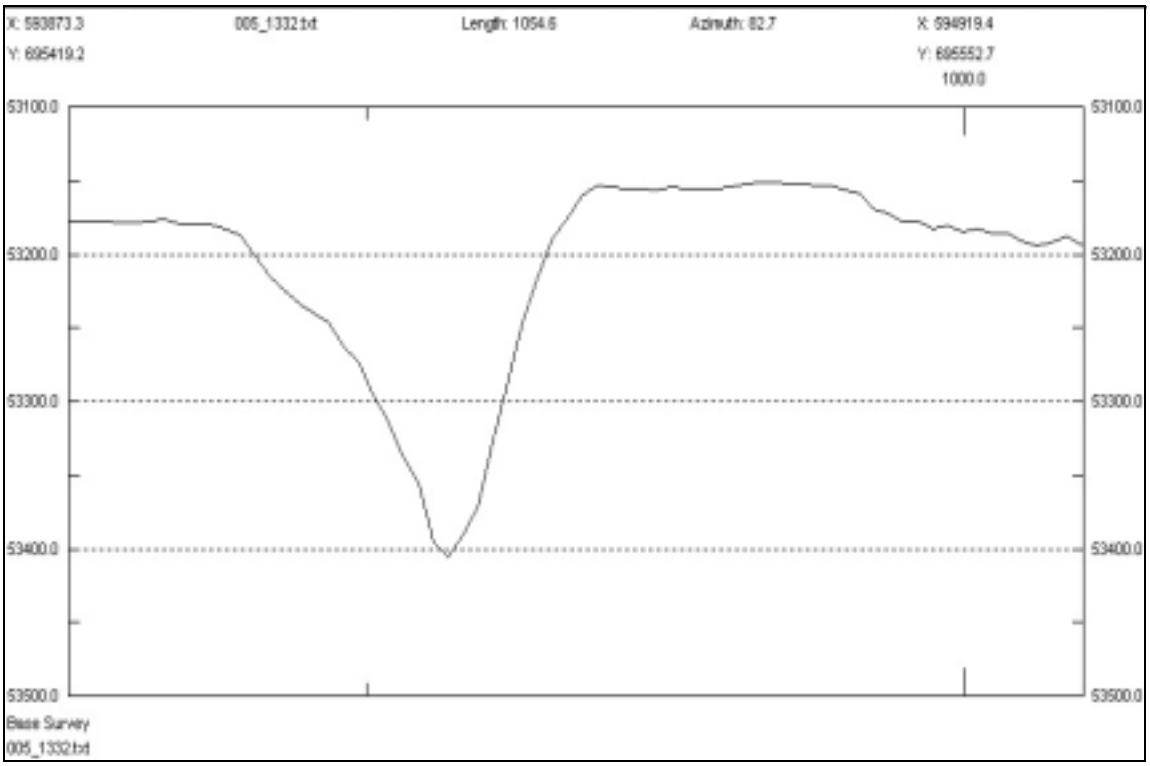

Figure 9. Magnetic signature 133328.

Target Designation	**Easting**	**Northing**	**Gammas**	**Duration**
133328	594824.0	695528.1	202.3	33’

The magnetic signature was identified on lane 5.5. The location of this target is shown in figure 2. The detectable monopolar positive signature had a maximum intensity of 202.3 gammas and was detected for 33 linear feet. Analysis of the magnetic signature suggests that material generating the anomaly is associated with a single ferrous object such as an anchor, pipe, chain, or wire rope and does not represent the complex type of signature generally associated with shipwreck sites. The magnetic anomaly does not correspond to any targets detected in the earlier side-scan sonar survey. The signature was not found to have characteristics indicative of historically significant submerged cultural resources.

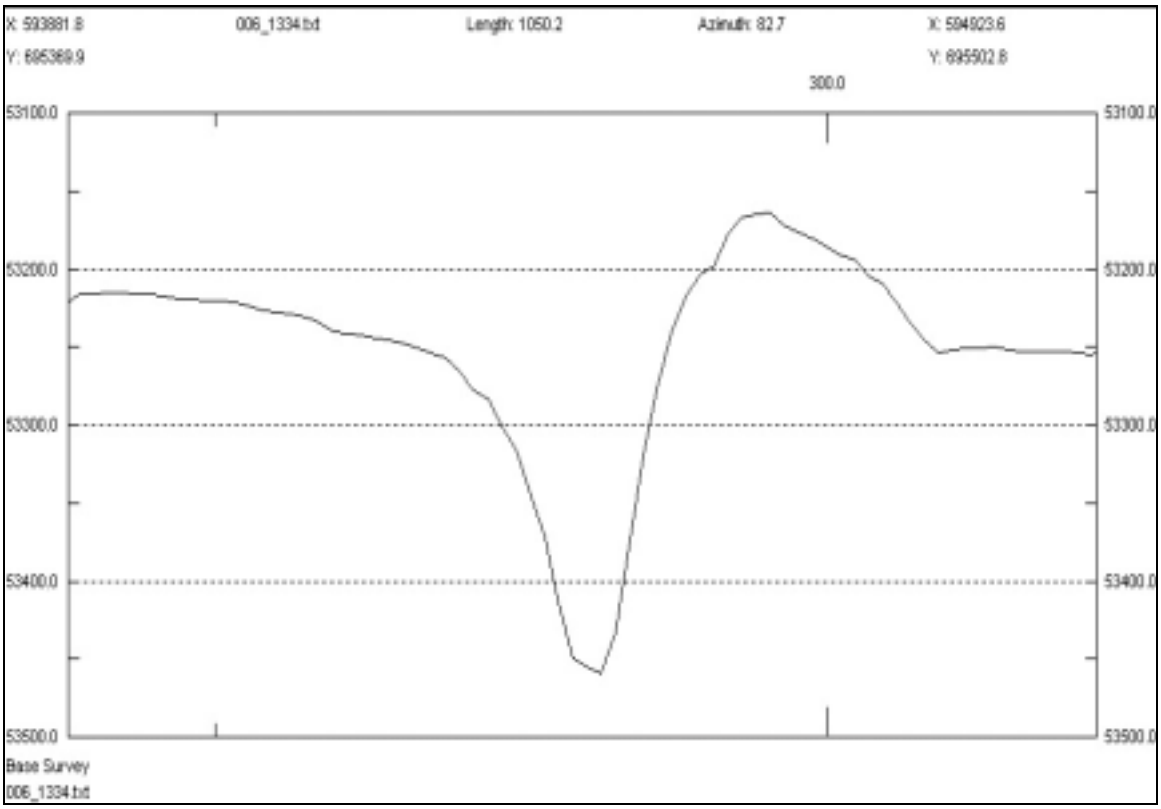

Figure 10. Magnetic signature 133536.

Target Designation	**Easting**	**Northing**	**Gammas**	**Duration**
133536	594164.4	695379.1	293	50’

The magnetic signature was identified on lane 6.5. The location of this target is shown in figure 2. The detectable dipolar signature had a maximum intensity of 293 gammas and was detected for 50 linear feet. Analysis of the magnetic signature suggests that material generating the anomaly is associated with a single small ferrous object such as a pipe or length of wire rope or chain and does not represent the complex type of signature generally associated with shipwreck sites. The magnetic anomaly does not correspond to any targets detected in the earlier side-scan sonar survey. The signature was not found to have characteristics indicative of historically significant submerged cultural resources.

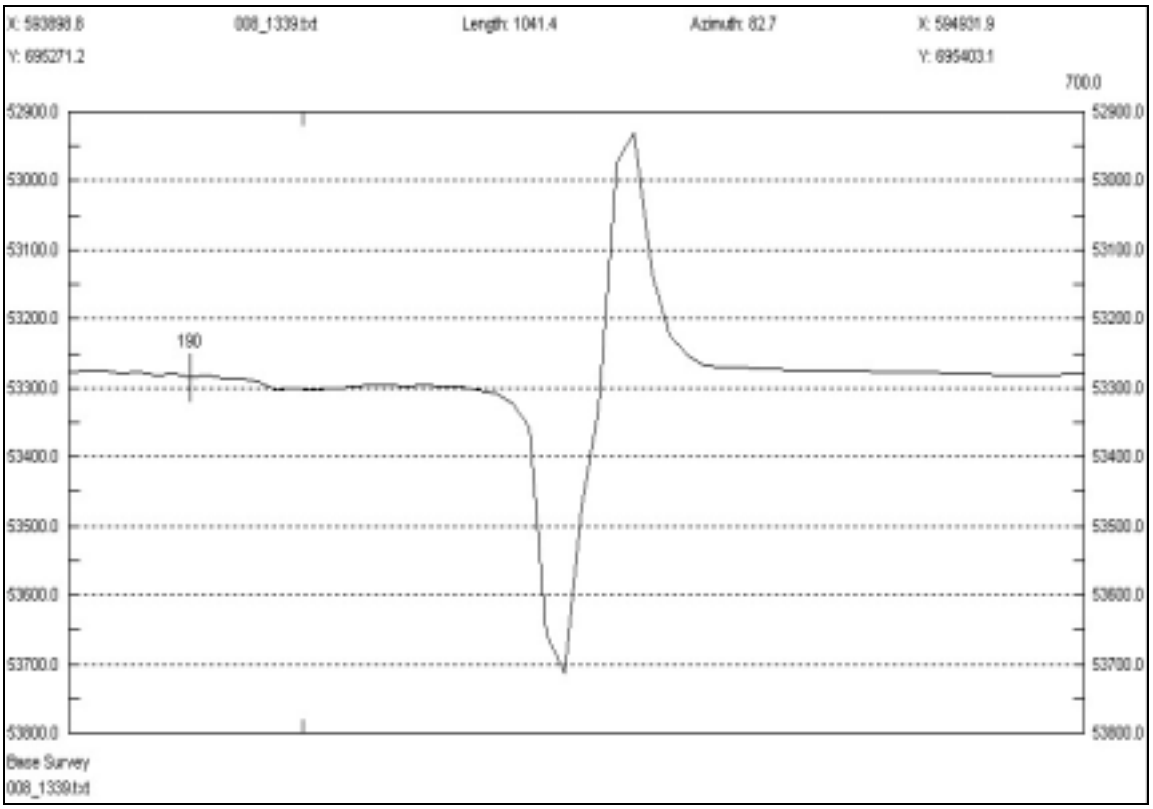

Figure 11. Magnetic signature 133957.

Target Designation	Easting	Northing	Gammas	Duration
133957	594564.4	69539.9	775.2	18’

The magnetic signature was identified on lane 8.5. The location of this target is shown in figure 2. The detectable dipolar signature had a maximum intensity of 775.2 gammas and was detected for 18 linear feet. Analysis of the magnetic signature suggests that material generating the anomaly is associated with a single ferrous object and does not represent the complex type of signature generally associated with shipwreck sites. The magnetic anomaly does not correspond to any targets detected in the earlier side-scan sonar survey. The signature was not found to have characteristics indicative of historically significant submerged cultural resources.

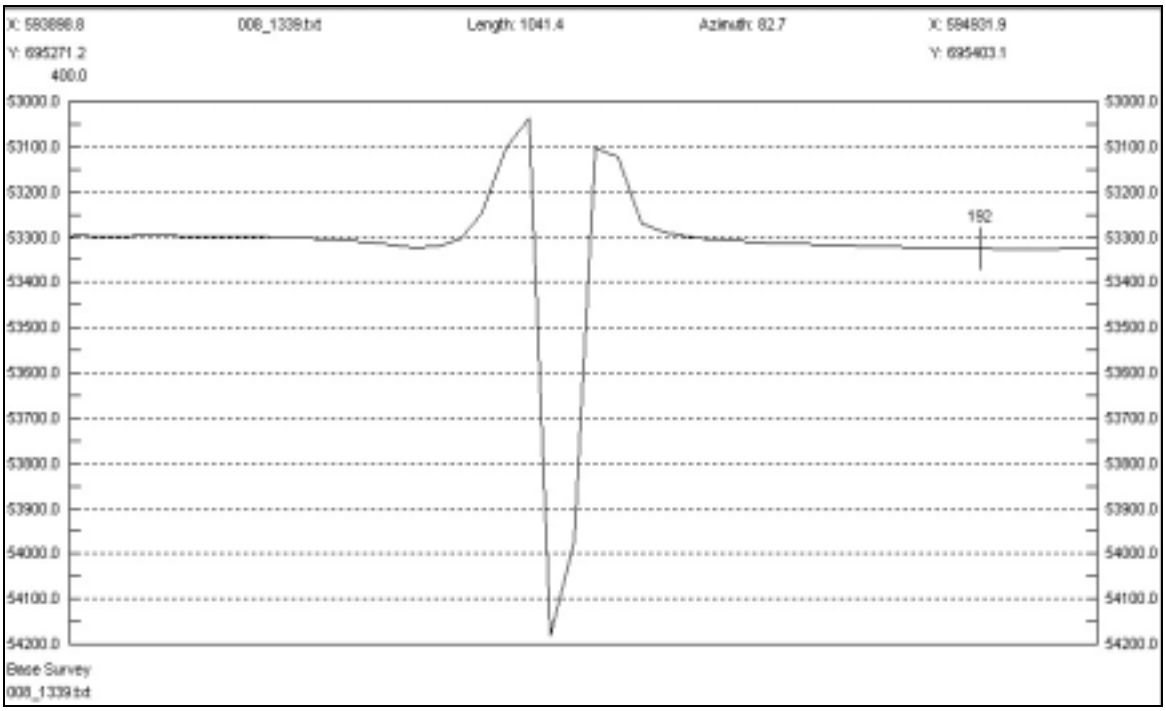

Figure 12. Magnetic signature 134022.

Target Designation	Easting	Northing	Gammas	Duration
134022	594322.1	695298.5	1153	18’

The magnetic signature was identified on lane 8.5. The location of this target is shown in figure 2. The detectable multicomponent signature had a maximum intensity of 1153 gammas and was detected for 18 linear feet. Analysis of the magnetic signature suggests that material generating the anomaly is associated with a single ferrous object such as a coil of wire rope or chain and does not represent the complex type of signature generally associated with shipwreck sites. The magnetic anomaly does not correspond to any targets detected in the earlier side-scan sonar survey. The signature was not found to have characteristics indicative of historically significant submerged cultural resources.

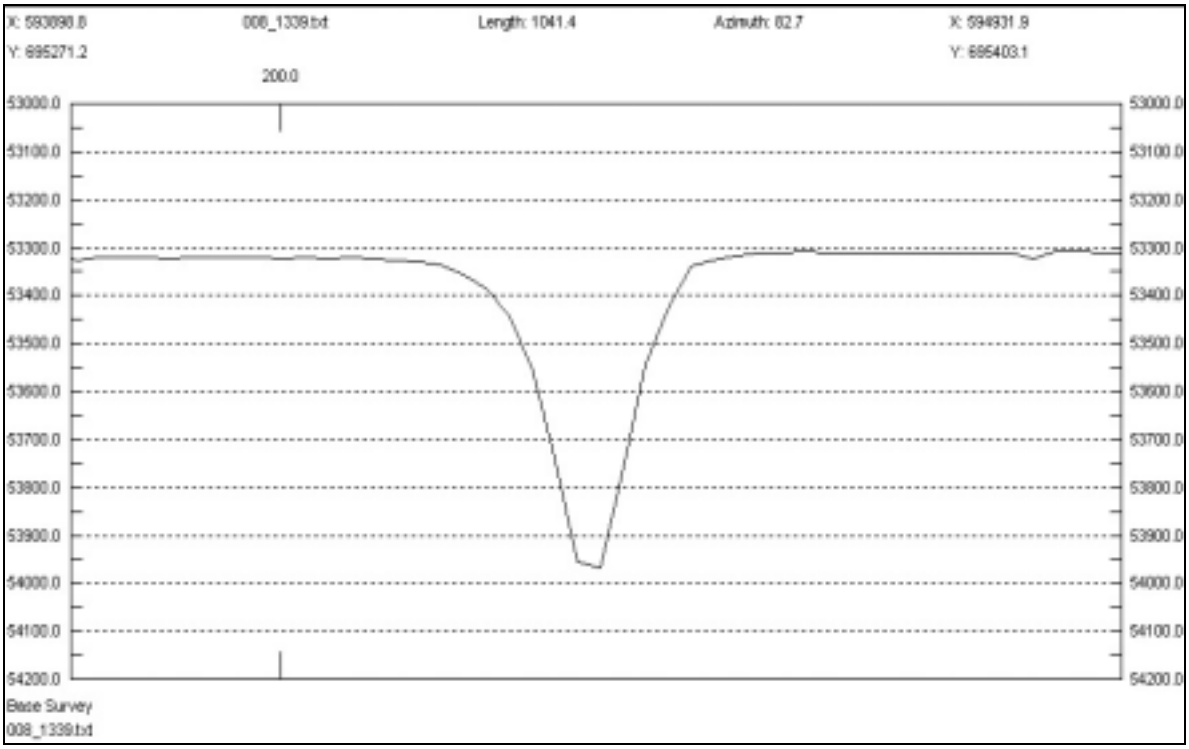

Figure 13. Magnetic signature 134043.

Target Designation	Easting	Northing	Gammas	Duration
134043	594116.3	695267.0	662.4	20’

The magnetic signature was identified on lane 8.5. The location of this target is shown in figure 2. The detectable monopolar positive signature had a maximum intensity of 662.4 gammas and was detected for 20 linear feet. Analysis of the magnetic signature suggests that material generating the anomaly is associated with a single ferrous object and does not represent the complex type of signature generally associated with shipwreck sites. The magnetic anomaly does not correspond to any targets detected in the earlier side-scan sonar survey. The signature was not found to have characteristics indicative of historically significant submerged cultural resources.

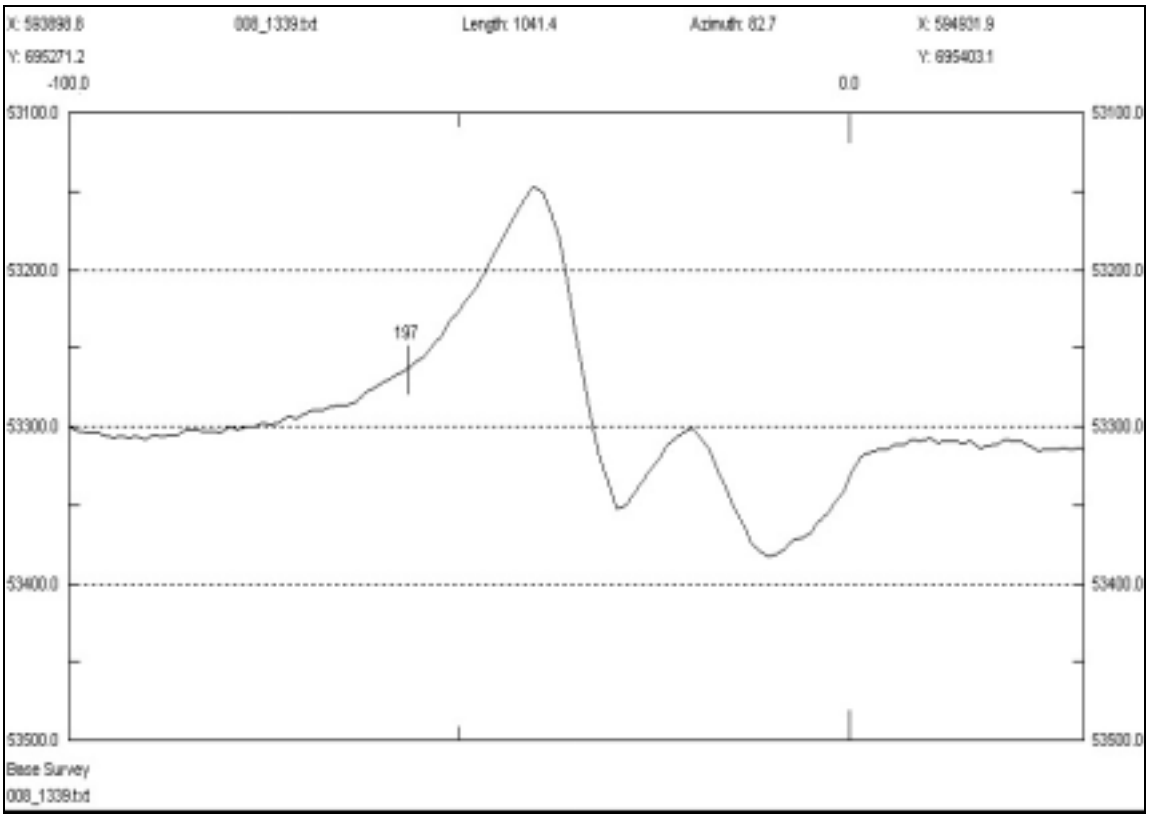

Figure 14. Magnetic signature 134108.

Target Designation	Easting	Northing	Gammas	Duration
134108	593869.4	695241.1	235	77’

The magnetic signature was identified on lane 8.5. The location of this target is shown in figure 2. The target is located just outside the western edge of study area by 32 feet, but was marked due to its intensity. The detectable multicomponent signature had a maximum intensity of 235 gammas and was detected for 77 linear feet. Analysis of the magnetic signature suggests that material generating the anomaly is associated with a single or small group of ferrous objects such as wire rope, chain, pipe, or anchors and does not represent the complex type of signature generally associated with shipwreck sites. The magnetic anomaly does not correspond to any targets detected in the earlier side-scan sonar survey. The signature was not found to have characteristics indicative of historically significant submerged cultural resources.

Figure 15. Edgetech X-STAR sonar system. SB-216S towfish is shown on the left and topside amplifier, computer monitor, and digital recording system is shown on the right.

C. Sub-Bottom Profiler Data Collection

An Edgetech X-STAR sonar system with a SB-216S towfish (Figure 15) was used to collect the chirp sub-bottom profiling data during a survey along the Harrison Reach of the Passaic River. The principal objective of the survey was to collect chirp images along lines that had been previously surveyed with a magnetometer.

Chirp profilers use acoustic methods to generate high-resolution (on the order of 0.5-1 ft) cross-sectional images of the marine sub-bottom to depths of up to 100 ft beneath the seafloor. These profilers transmit a wide band FM sound pulse that is linearly swept over a full spectrum frequency range (i.e., a "chirp"). The transmitted sound pulses travel through the water column and sub-bottom and are reflected when changes in acoustic impedance (equivalent to a material's sonic velocity times its density) are encountered. Acoustic impedance changes commonly occur at boundaries between materials (e.g., interfaces between water and sediments, sediments and gas, and sediments and buried objects). The reflected sound pulses travel back to the profiler where their amplitudes, as a function of travel-time, are digitally recorded.

During the survey, the SB-216S was towed at a depth between 3 and 6 ft. It was towed approximately 6 ft aft of the navigational antenna on the port side of the Aqua Survey, Inc. vessel *Delaware*. The SB-216S emitted a chirp sound pulse with a frequency range of 2-15 kHz, eight times per second. Given this sampling interval with an average speed of 1 to 2 knots, the horizontal spacing between individual pulses displayed on the chirp profiles was on the order of 0.2-0.5 ft.

Geographic position (i.e., latitude and longitude) along the chirp profiles was determined with Trimble RTK Positioning System (Model # 5700). The data from the RTK were also used by the HYPACK helm guidance and position recording software. These navigational data were logged at one-second intervals by HYPACK and the X-STAR digital recording system.

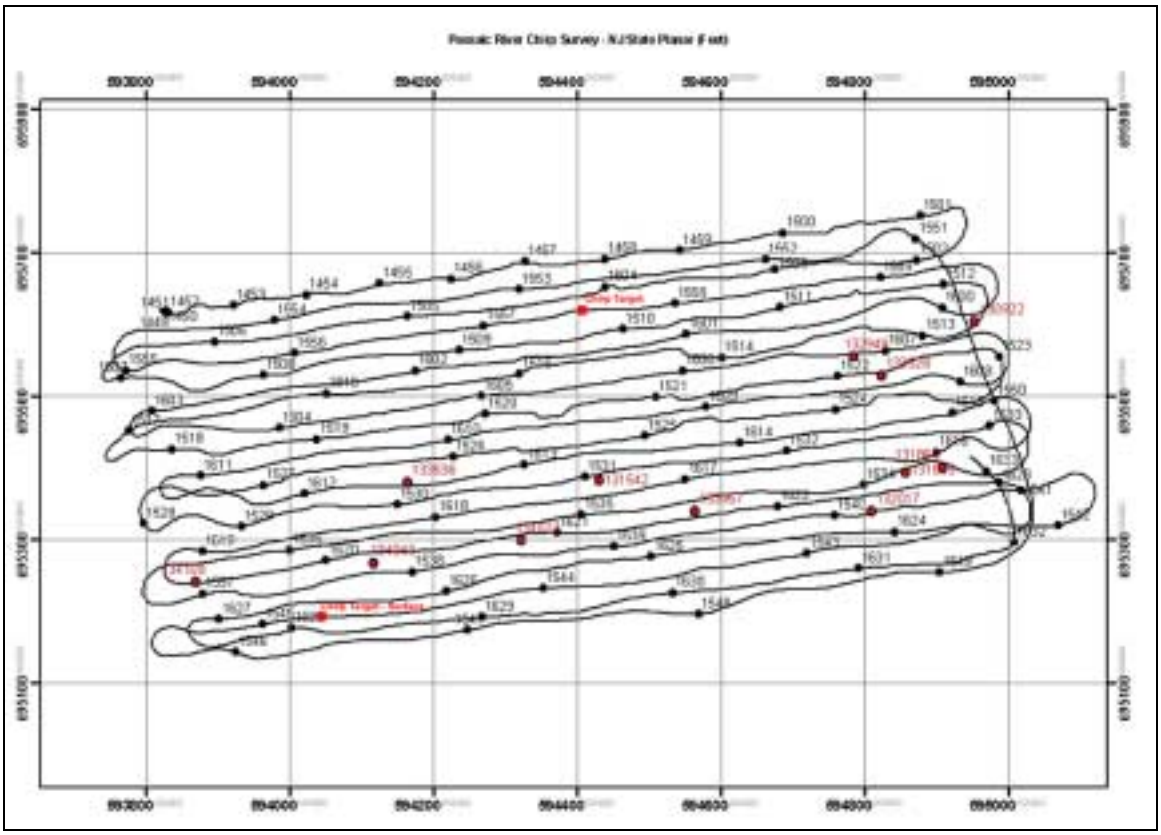

Figure 16. Track lines of the *Delaware* during the chirp survey. Black circles are one-minute time (in GMT) marks along the track lines. Red circles are targets identified during the magnetics survey. Chirp reflections could be correlated with targets 132949 and 133328. Red rectangle denotes target that was identified on the chirp profiles that was not associated with a corresponding magnetic anomaly.

To correct the navigational data to the position of the SB-216S, we estimated its layback (distance aft of the navigational antenna) during the survey while at the average towing speed of 1-2 knots. This distance of about 6 ft was used to correct the SB-216S position relative to the navigation data. The navigational data for the targets identified in the earlier magnetics survey and their corresponding positions along the chirp profiles are presented in Table 1 along with one potential target identified in the chirp data that was not associated with a magnetic anomaly. Along the chirp profiles, the position of the magnetics targets were identified as either the closest profile position to the target (i.e., in the case that the target was not associated with reflections in the chirp data) or the central geographic co-ordinates of the chirp reflections that corresponded with a target. For the targets associated with chirp reflections, the positional information (i.e., WGS84 latitude and longitude as logged by the RTK system) was calculated from the Edgetech data screen during playback. These points were then translated into NAD83 New Jersey State Plane eastings and northings in feet. The estimate of the positional accuracy of the RTK system is 1 to 3 cm. The estimation for the layback error is 1 to 2 ft. Adding the two potential errors generates an error estimate of 1 to 2 ft in the definition of the geographic location of the identified targets.

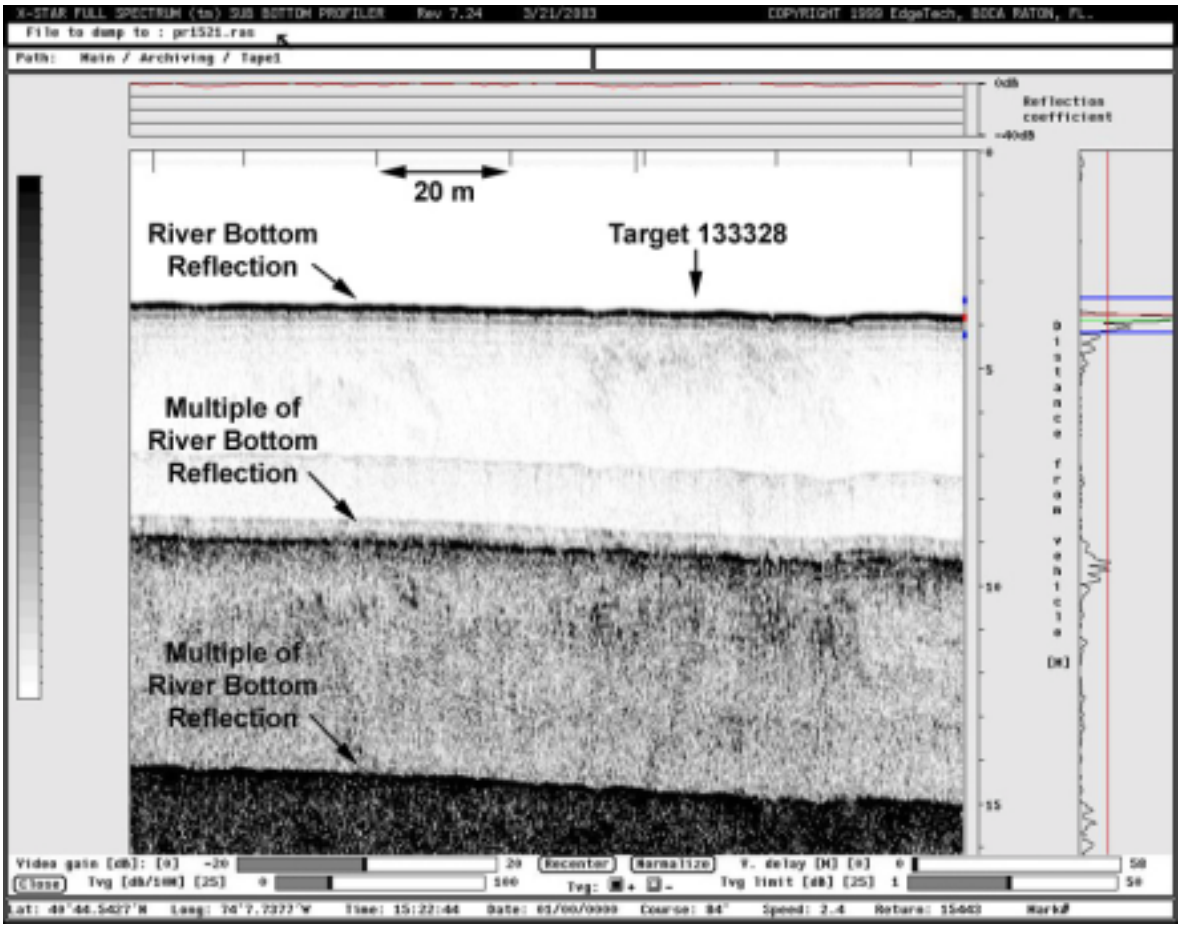

Figure 17. Example of computer monitor "real-time" chirp system output. A series of reflections, as a function of depth beneath the towfish, are shown in the center. The strength of the river bottom reflection (shown along top) and sub-bottom events (shown to the right) are also displayed. Along the bottom, RTK derived position, time, course, and speed are shown.

During the survey, the data were observed in "real-time" on the X-STAR monitor (Figure 17). The data displayed included the reflection coefficient of the river bottom (a measure of the acoustic impedance contrast at the water/sediment interface), the relative amplitude of bottom and sub-bottom reflections, a cross-sectional image of the last ~600 chirp pulses that were recorded, as well as the current position, time, date, course and speed of the R/V *Delaware*.

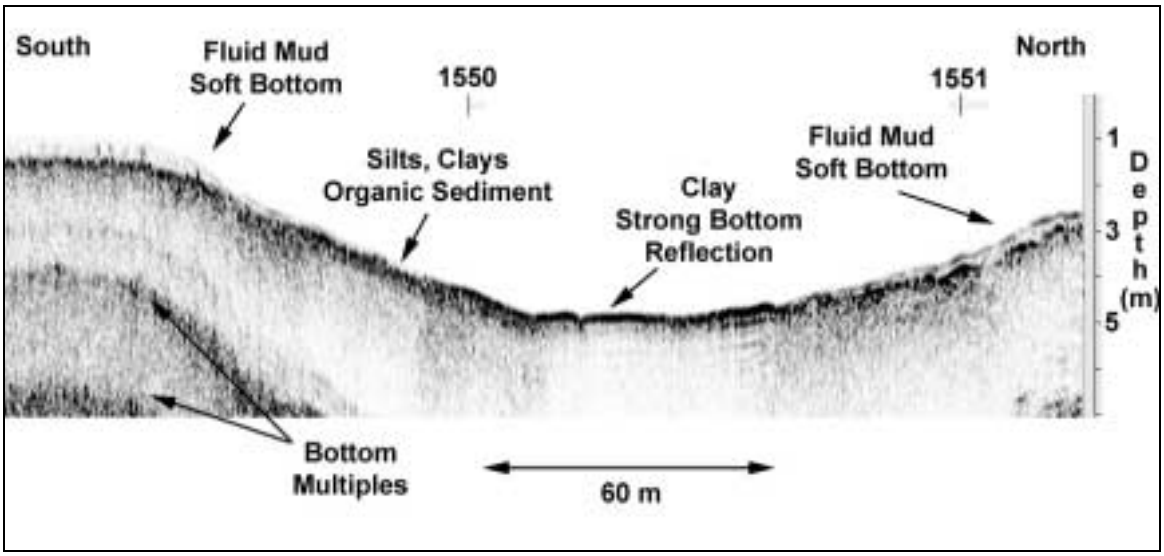

Figure 18. Chirp profile collected across the Harrison Reach of Passaic River. Depths are below towfish in meters. 1550 and 1551 denote time in minutes (GMT). The position of this track line is shown in Figure 2. The presence gas in organic, gassy sediments and well-consolidated silt/clay sediments along the river bottom prevented the significant penetration of the chirp acoustic signal.

D. Sub-bottom Profiler Results

As shown in Figure 18, three major types of bottom sediments were encountered during the chirp survey. In shallower water depths along the edges of the channel of the Passaic River, a soft bottom characterized by fluid muds at the sediment water interface with underlying organic fine-grained sediments was imaged by the chirp system. The underlying fine-grained sediments were associated with a high-amplitude chirp reflection most likely due to gas contained within these sediments. Along the slopes of the channel, gassy silt and clay organic-rich sediments were present. The presence of gas, most likely produced by the decay of organic material within the sediments reduces the penetration of the chirp acoustic signals. In the deepest portions of the river along the channel, well-consolidated silt and clay sediments with gas produced a high amplitude reflection at the sediment/water interface. This strong reflection reduced the amount of chirp energy that could penetrate further into the subsurface.

Target Number	Target ID	Magnetics Target Position	Target Dist. From Chirp Track	Chirp Target Position	Comments
1	130922	594953.5E 695603.9N	3.4’	594955.5E 695601.7N	Not imaged by chirp
2	131542	594431.5E 695382.4N	9.4’	594429.5E 695391.4N	Not imaged by chirp
3	131855	594857.7E 695393.4N	6.6’	594854.9E 695399.6N	Not imaged by chirp
4	131860	594908.8E 695400.2N	6.2’	594910.8E 695405.7N	Not imaged by chirp
5	132017	594810.0E 695339.5N	1.2’	594810.2E 695338.5N	Not imaged by chirp
6	132949	594784.7E 695554.4N	5.2’	594784.2E 695559.6N	Imaged by chirp
7	133328	594824.0E 695528.1N	4.8’	594822.8E 695533.2N	Imaged by chirp
8	133536	594164.4E 695379.1N	4.4’	594165.0E 695374.9N	Not imaged by chirp
9	133957	594564.4E 695339.9N	8.5’	594566.5E 695331.5N	Not imaged by chirp
10	134022	594322.1E 695298.5N	8.8’	594320.0E 695307.2N	Not imaged by chirp
11	134043	594116.3E 695267.0N	11.8’	594117.7E 695254.8N	Not imaged by chirp
12	134108	593869.4E 695241.1N	1.8’	593870.0E 695239.6N	Not imaged by chirp
13	PSS-1	-	-	594410.4E 695619.5N	Not detected by magnetics. Potential sub-surface target
14	PS-1	-	-	594037.7E 695192.3N	Not detected by magnetics. Potential surface target

Table 1. Targets as identified by magnetic and chirp surveys. All positions are NAD New Jersey State Plane eastings and northings in feet. If the chirp did not image the target, the position as listed in the table is the central location where chirp profiles were examined for reflections associated with targets.

The presence of gaseous sediments and well-consolidated sediments along the river bottom prevented the penetration of acoustic signals deeper into the sub-bottom and thus limited the effectiveness of the chirp system during the survey. Although the chirp system acoustic signal was able to penetrate in a few areas and image a few targets, overall the sediments present in the survey area severely limited the acoustic imaging efforts. Due to these gaseous sediments only two targets identified during the magnetometer survey were partially imaged by the sub-bottom system. Two other targets were recorded setting the total number of observed target at four (Figures 19-22). Of the two targets that were not associated with magnetic signals, one was observed at the surface (identified as potential target – surface) and was characterized by a high-amplitude, rather square-shaped reflection (Figure 19). The second target (identified as potential target – sub-surface) was characterized by reflections that ranged in depth from 3 to 10 ft beneath the surface (Figure 20).

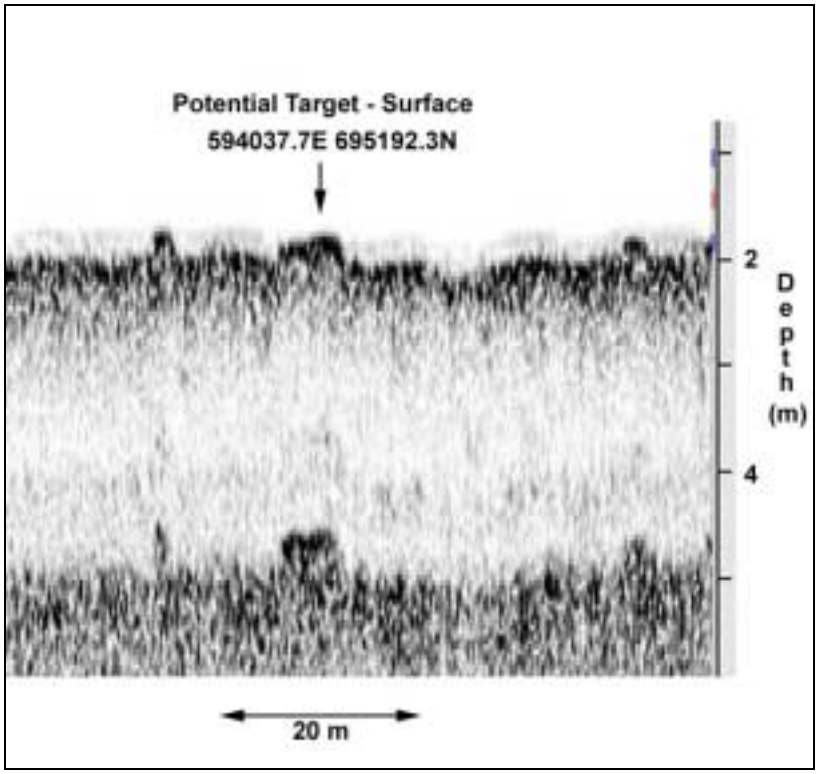

Figure 19. Potential target- surface (PS-1) that was identified during the chirp survey. This target is not associated with a magnetic anomaly. The location of this target is shown in Figure 2.

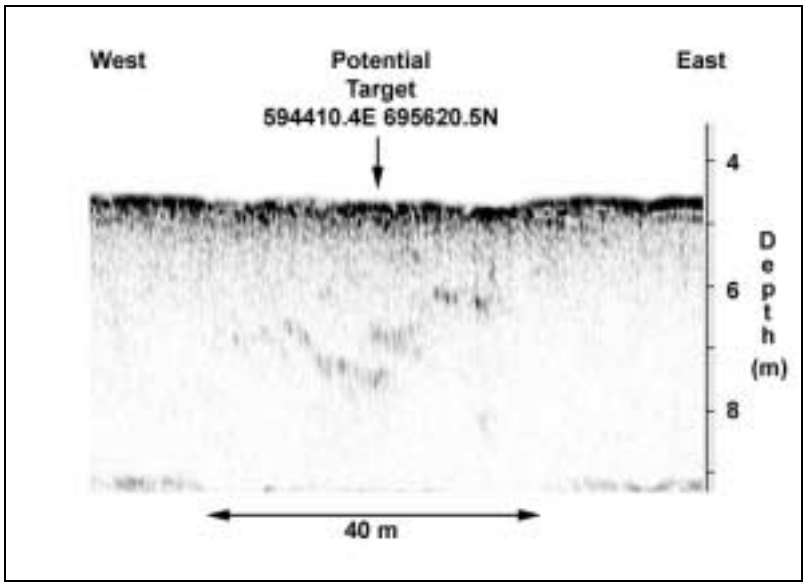

Figure 20. Potential target-sub-surface (PSS-1) that was identified during the chirp survey. This target is not associated with a magnetic anomaly. The location of this target is shown in Figure 2.

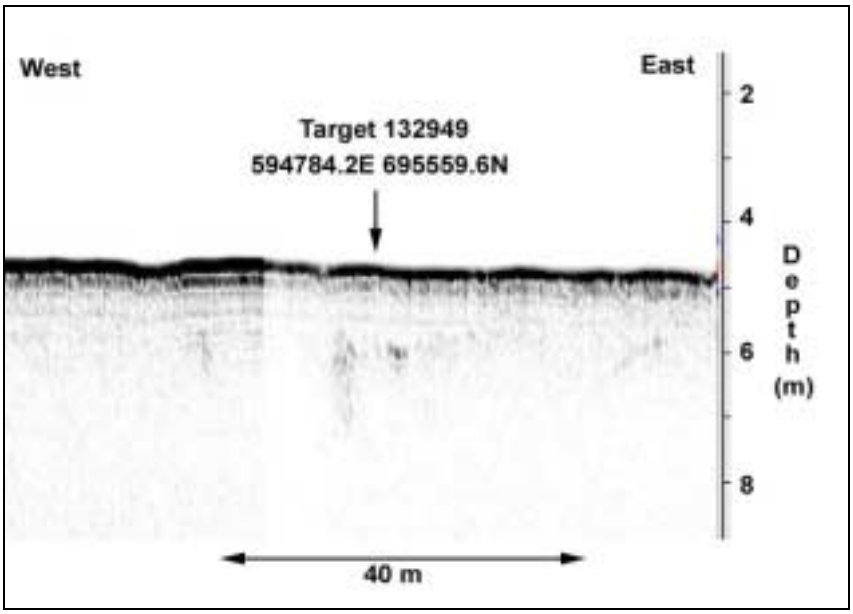

Figure 21. Target 132949 with associated chirp reflections. This target was identified during the magnetic survey. The location of this target is shown in Figure 2. The position in NAD83 New Jersey State Plane co-ordinates is the geographic central portion of the chirp reflections.

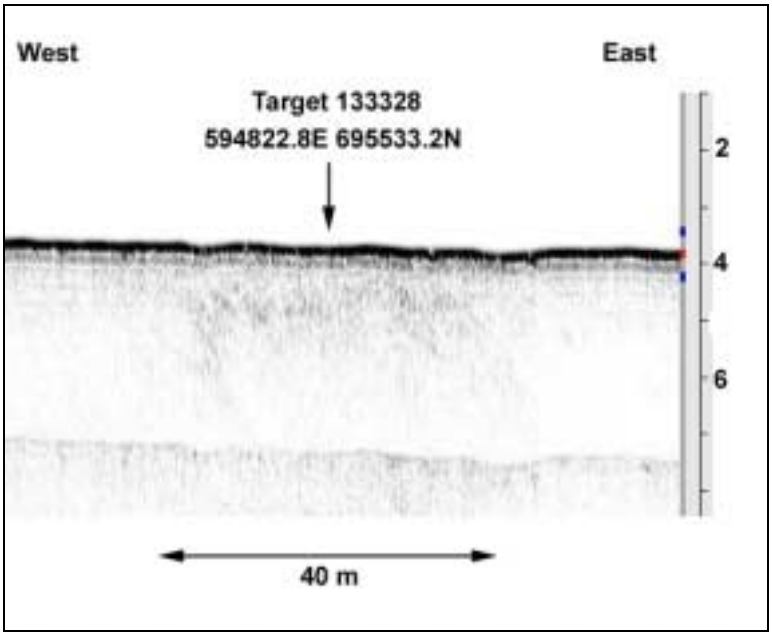

Figure 22. Target 133328 with associated chirp reflections. This target was identified during the magnetic survey. The location of this target is shown in Figure 2. The position in NAD83 New Jersey State Plane co-ordinates is the geographic central portion of the chirp reflections.

E. Problems Encountered

The only problem encountered with the magnetic remote sensing survey was the significant amount of geologic background noise encountered in the survey area. This results in magnetometer records that are more difficult to interpret and very small targets may be obscured. Though these objects would not be of significant size in relation to the dredging operations, they may be important from a submerged cultural resources standpoint. In order to minimize the effects of geologic interference, it is recommended that future magnetic surveys in this area be conducted using a gradiometer rather than a magnetometer.

In terms of using chirp acoustic methods to image targets as identified by the magnetic survey, there were two major problems that the river bottom presented in our survey. First, the acoustic reflection coefficient at the bottom surface in the area of the well-consolidated silt/clay sediments is high. This limited the amount of acoustic energy that penetrated deeper into the sub-bottom. Second, in areas of fine-grained silts and clays, there were high amplitude returns from the river bottom. Both of these bottom types were associated with the presence of organic-rich gaseous sediments in a layer that was mostly unbroken in the survey area. These muds, which may contain significant amounts of organically produced gas, created situations in which little acoustic energy traveled below these sediments. Due to these two conditions, the chirp system was unable to get significant penetration into the sub-bottom. This limited the effectiveness of the system to image targets in the sub-surface.

Appendix A

Chirp Profiles Within the Vicinity of 12 targets Identified in Magnetic Survey

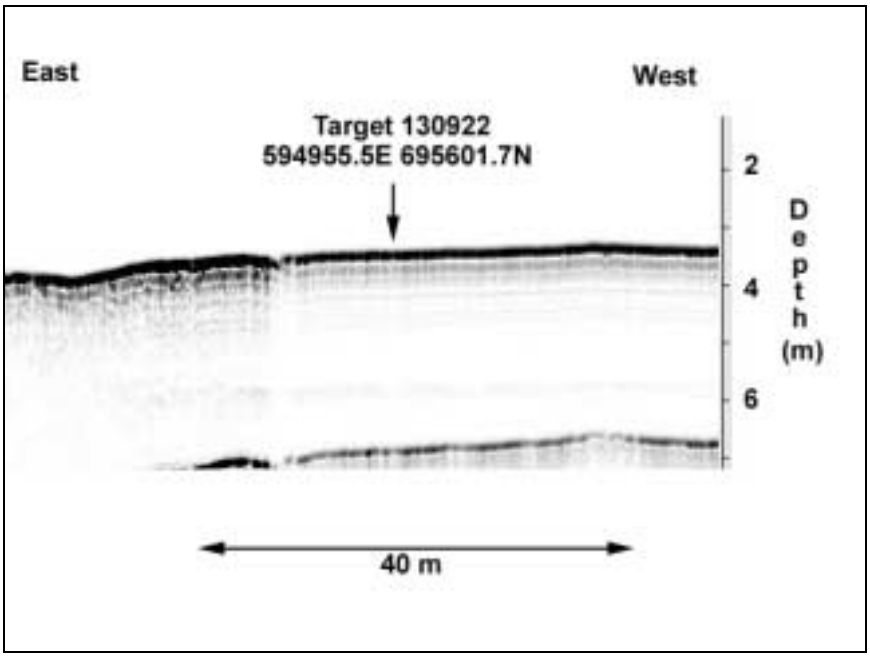

Figure A-1. Target 130922. Location of the target is shown in Figure 2.

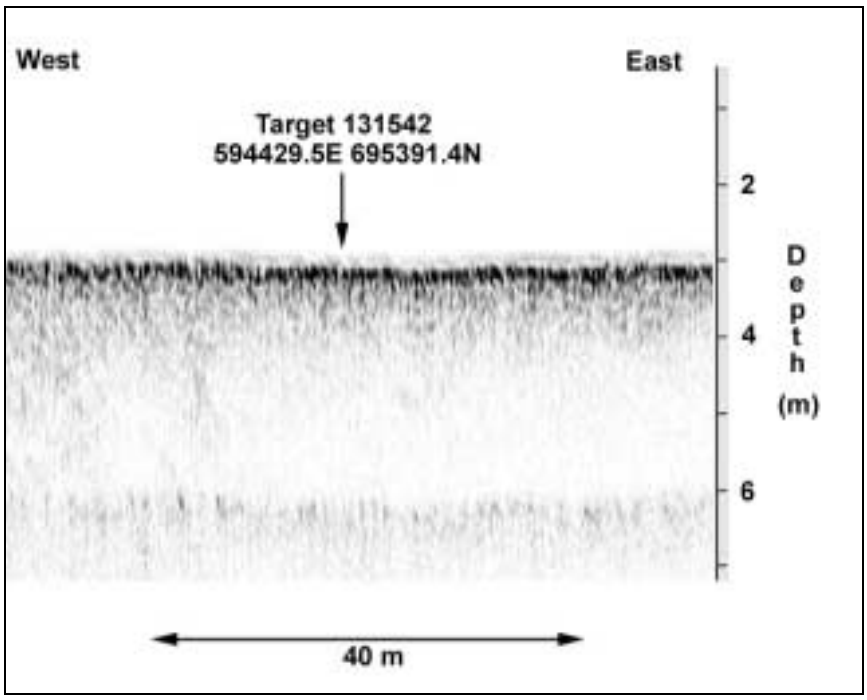

Figure A-2. Target 131542. Location of the target is shown in Figure 2.

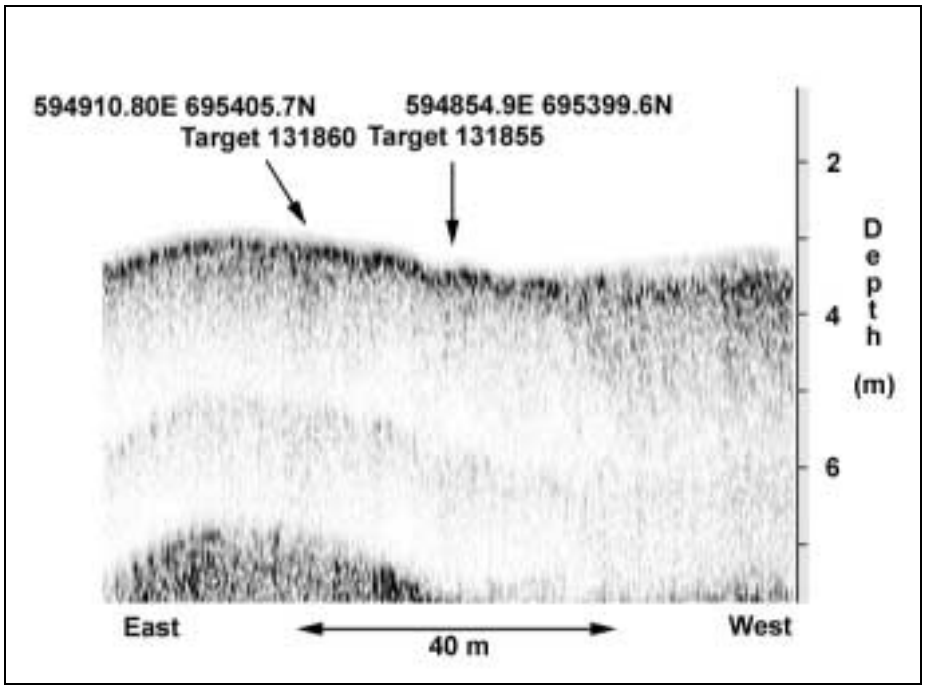

Figure A-3. Targets 131855 and 131860. Location of the targets is shown in Figure 2.

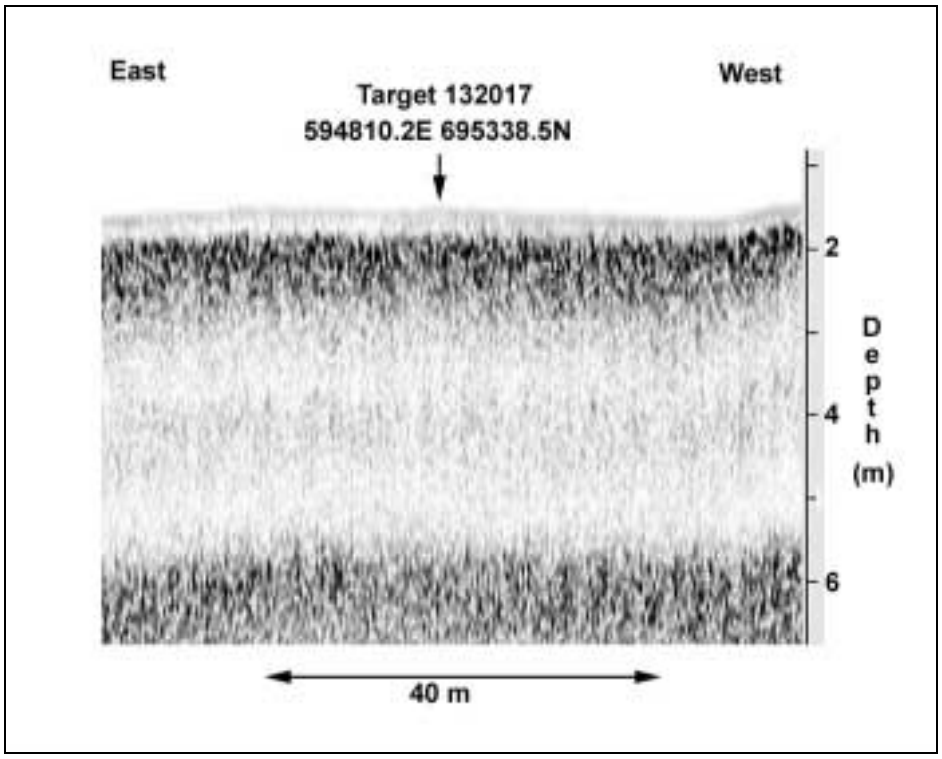

Figure A-4. Target 132017. Location of the target is shown in Figure 2.

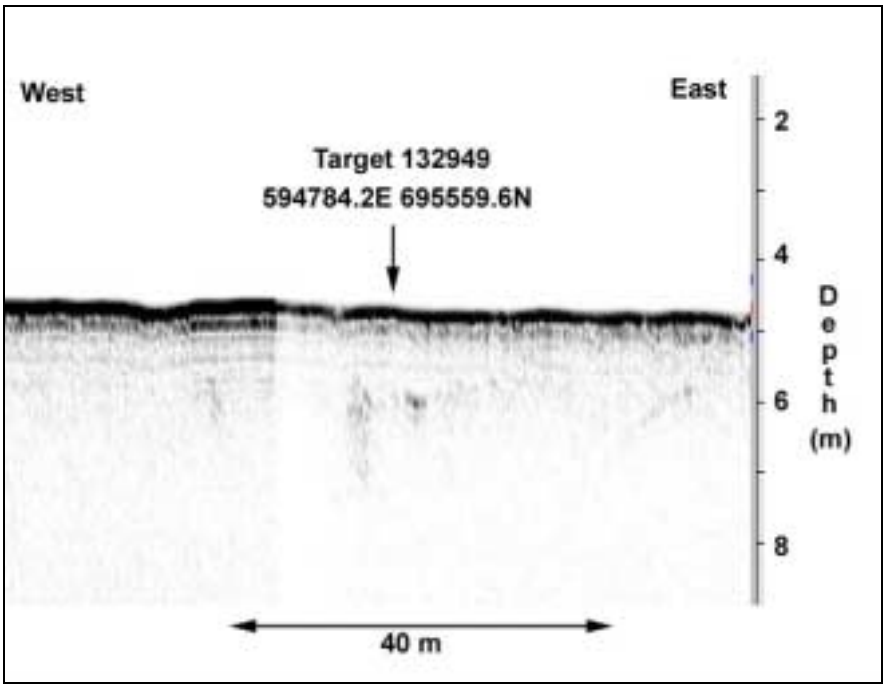

Figure A-5. Target 132949. Location of the target is shown in Figure 2.

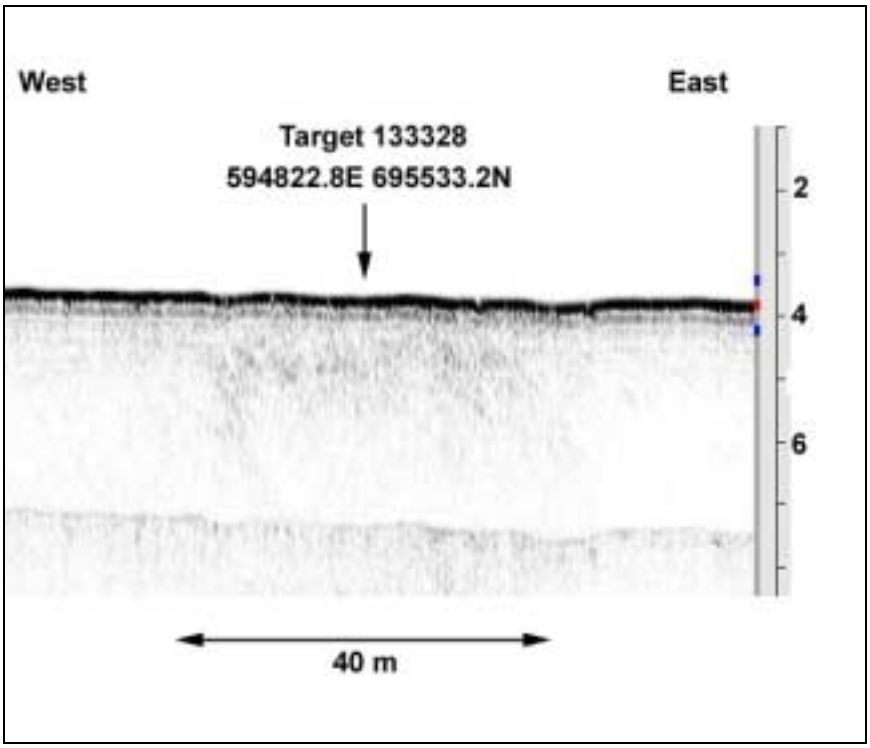

Figure A-6. Target 133328. Location of the target is shown in Figure 2.

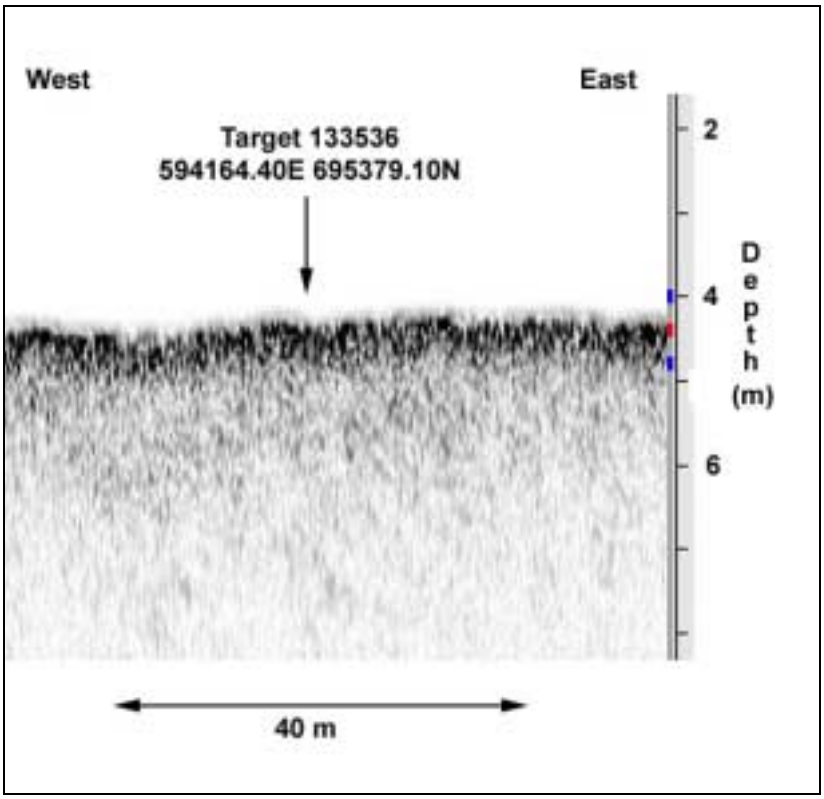

Figure A-7. Target 133536. Location of the target is shown in Figure 2.

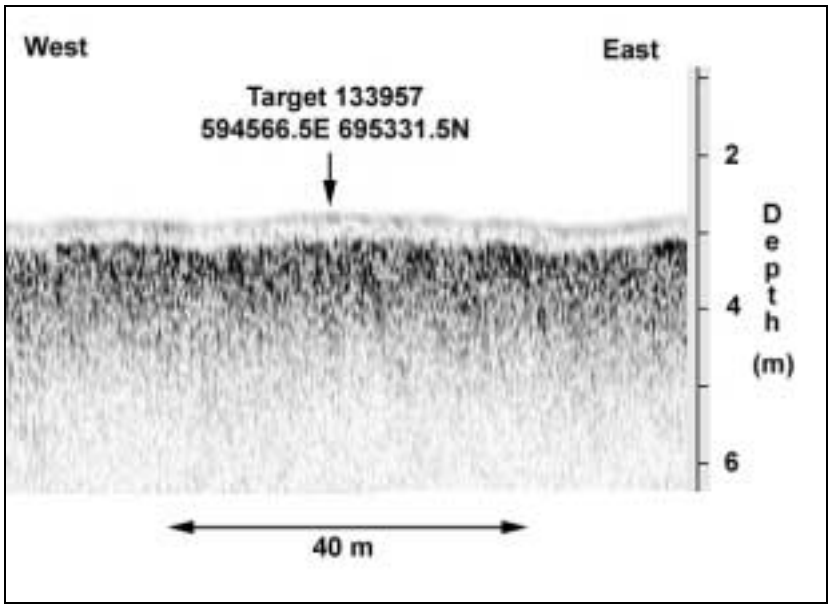

Figure A-8. Target 133957. Location of the target is shown in Figure 2.

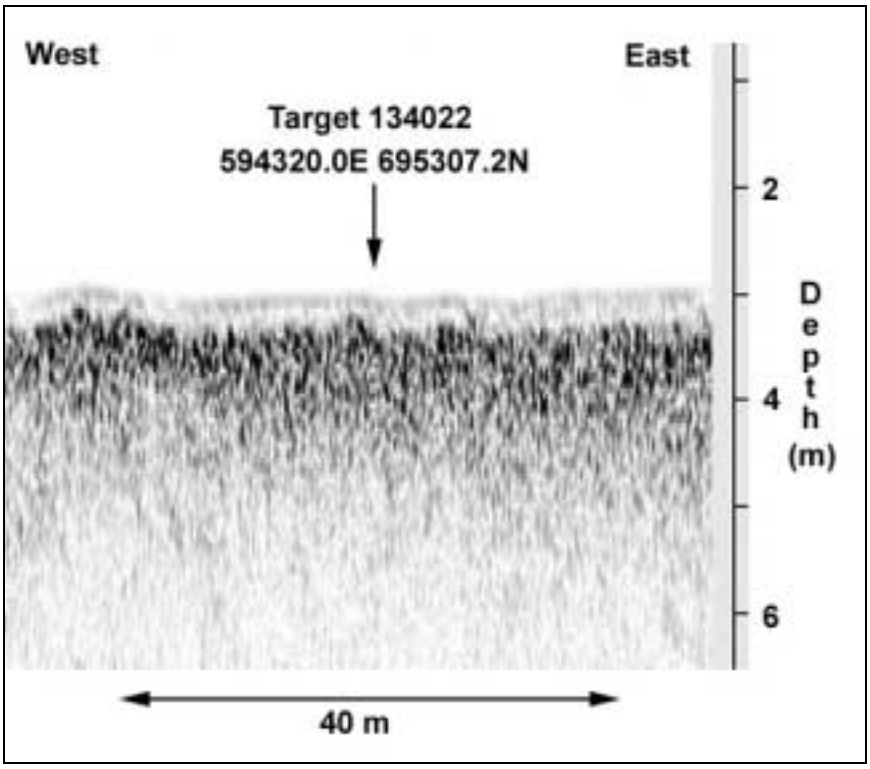

Figure A-9. Target 134022. Location of the target is shown in Figure 2.

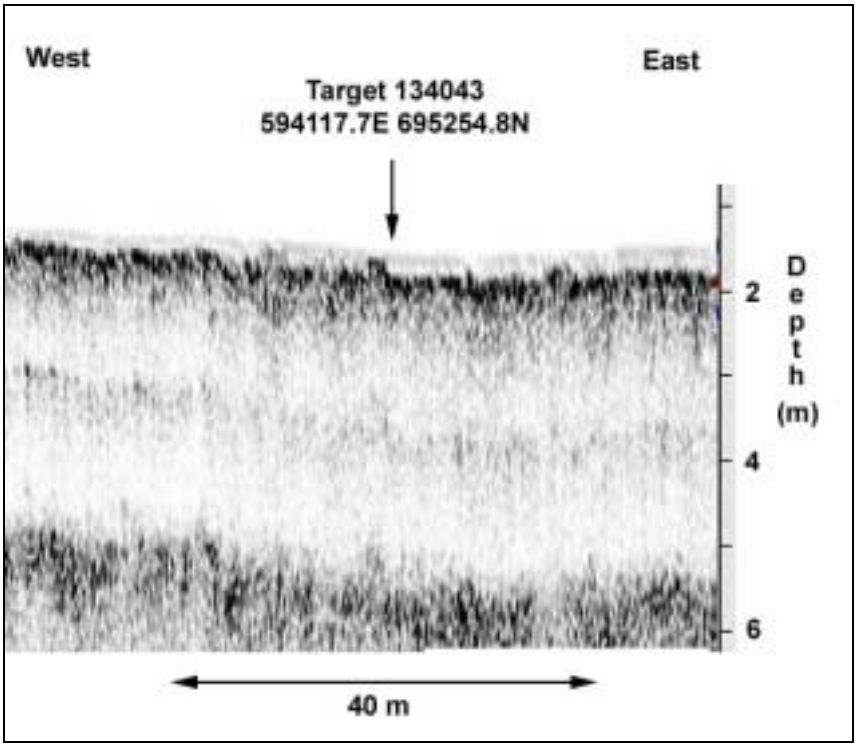

Figure A-10. Target 134043. Location of the target is shown in Figure 2.

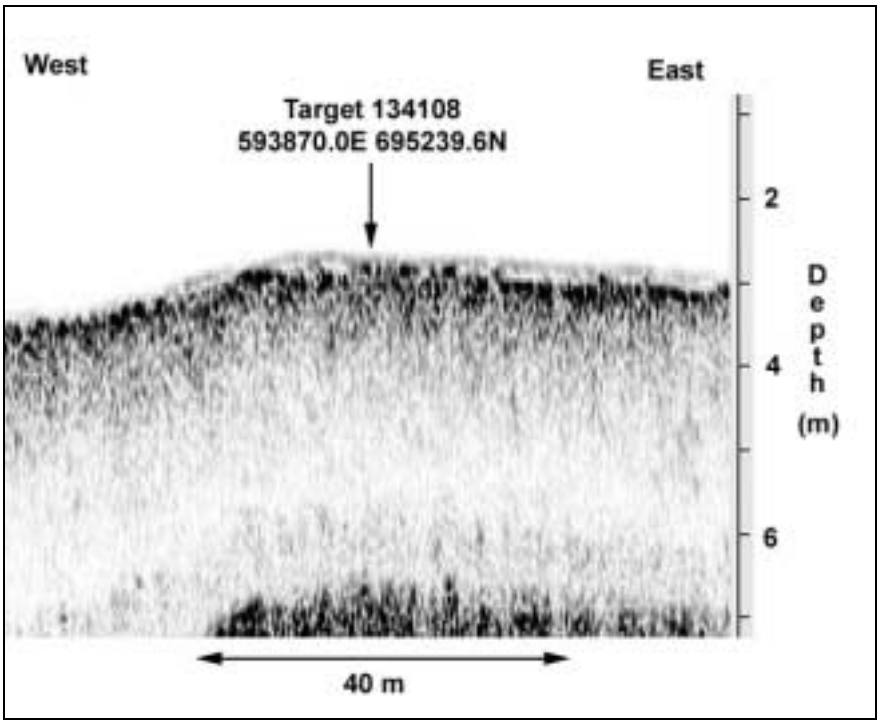

Figure A-11. Target 134108. Location of the target is shown in Figure 2.

Appendix B

Equipment Specifications

G-882 MARINE MAGNETOMETER

- ***CESIUM VAPOR HIGH PERFORMANCE – Highest detection range and probability of detecting all sized ferrous targets***
- ***NEW STREAMLINED DESIGN FOR TOW SAFETY – Low probability of fouling in lines or rocks***
- ***NEW QUICK CONVERSION FROM NOSE TOW TO CG TOW – Simply remove a stainless steel locking pin, move tow point and reinsert. New easy carry handle built in!***
- ***NEW INTERNAL CM-221 COUNTER MODULE – Provides Flash Ram for storage of default parameters set by user***
- ***NEW ECHOSOUNDER / ALTIMETER OPTION***
- ***NEW DEPTH RATING – 4,000 psi !***
- ***HIGHEST SENSITIVITY IN THE INDUSTRY – 0.004 nT/Hz RMS with the internal CM-221 Mini-Counter***
- ***EASY PORTABILITY & HANDLING – no winch required- single man operation, 44 lbs with 200 ft cable (without weights or depressor wing)***
- ***COMBINE TWO SYSTEMS FOR INCREASED COVERAGE – Internal CM-221 Mini-Counter provides multi-sensor data concatenation allowing side by side coverage which maximizes detection of small targets and reduces noise***

G-882 with Weight Collar Depth Option

Very high resolution Cesium Vapor performance is now available has been incorporated into a low cost, small size system for professional surveys in shallow or deep water. High sensitivity and sample rates of total field measurements are maintained for all applications. The well proven Cesium sensor is combined with a unique new CM-221 Larmor counter and ruggedly packaged for small or large boat operation. Use your computer and standard printer with our MagLog Lite™ software to log, display and print GPS position and magnetic field data. Model G–882 is the lowest priced - highest performance fully operational marine mag system ever offered.

The G-882 is flexible for operation in small boat, shallow water surveys as well as deep tow applications (4,000 psi rating, telemetry over steel coax available to 10Km). Being small and lightweight (44 lbs net, no weights) it is easily deployed and operated by one man. But add several no-foul weight collars and the system can quickly weigh in at more than 100 lbs. Power may be supplied from a 24 to 30 VDC battery supply or the included 110/220 VAC power supply. The tow cable uses high strength Kevlar and it's length is standard at 200 ft (61 m) with optional cable up to 500m (no telemetry). The shipboard end of the tow cable is attached to a junction box or on-board cable for quick and simple hookup to power and output of data into any IBM PC computer. A rugged fiber-wound fiberglass housing provides selectable orientation of the sensor and therefore maintains operations throughout the world with only small limitations as to direction of survey in equatorial regions.

The G-882 Cesium magnetometer provides the same operating sensitivity and sample rates as the larger deep tow model G-880. MagLogLite™ Logging Software is offered with each magnetometer and allows recording and display of data and position with Automatic Anomaly Detection! Additional options include: MagMap2000 plotting and contouring software and post acquisition processing software MagPick™ (free from our website.)

The G-882 system is particularly well suited for the detection and mapping of all sizes of ferrous objects. This includes anchors, chains, cables, pipelines, ballast stone and other scattered shipwreck debris, munitions of all sizes, aircraft, engines and any other object with magnetic expression. Objects as small as a 5 inch screwdriver are readily detected provided that the sensor is close to the seafloor and within practical detection range.(Refer to table at right).

The design of this special marine unit is directed toward the largest number of user needs. It is not intended to meet all marine requirements such as deep tow through long cables or monitoring fish altitude. Rugged design with highest performance at lowest cost are the goals.

Typical Detection Range For Common Objects

Ship 1000 tons	0.5 to 1 nT at 800 ft (244 m)
Anchor 20 tons	0.8 to 1.25 nT at 400 ft (120 m)
Automobile	1 to 2 nT at 100 ft (30 m)
Light Aircraft	0.5 to 2 nT at 40 ft (12 m)
Pipeline (12 inch)	1 to 2 nT at 200 ft (60 m)
Pipeline (6 inch)	1 to 2 nT at 100 ft (30 m)
100 KG of iron	1 to 2 nT at 50 ft (15 m)
100 lbs of iron	0.5 to 1 nT at 30 ft (9 m)
10 lbs of iron	0.5 to 1 nT at 20 ft (6 m)
1 lb of iron	0.5 to 1 nT at 10 ft (3 m)
Screwdriver 5 inch	0.5 to 2 nT at 12 ft (4 m)
1000 lb bomb	1 to 5 nT at 100 ft (30 m)
500 lb bomb	0.5 to 5 nT at 50 ft (16 m)
Grenade	0.5 to 2 nT at 10 ft (3 m)
20 mm shell	0.5 to 2 nT at 5 ft (1.8 m)

MODEL G-882 CESIUM MARINE MAGNETOMETER SYSTEM SPECIFICATIONS

Operating Principle:	Self-oscillating split-beam Cesium Vapor (non-radioactive)
Operating Range:	20,000 to 100,000 nT
Operating Zones:	The earth's field vector should be at an angle greater than 6° from the sensor's equator and greater than 6° away from the sensor's long axis. Automatic hemisphere switching.
CM-221 Counter Sensitivity:	<0.004 nT/√Hz rms. Typically 0.02 nT P-P at a 0.1 second sample rate or 0.002 nT at 1 second sample rate. Up to 10 samples per second
Heading Error:	±1 nT (over entire 360° spin and tumble)
Absolute Accuracy:	<3 nT throughout range
Output:	RS-232 at 9600 Baud
Mechanical:	
Sensor Fish:	Body 2.75 in. (7 cm) dia., 4.5 ft (1.37 m) long with fin assembly (11 in. cross width), 40 lbs. (18 kg) Includes Sensor and Electronics and 1 main weight. Additional collar weights are 14lbs (6.4kg) each, total of 5 capable
Tow Cable:	Kevlar Reinforced multiconductor tow cable. Breaking strength 3,600 lbs, 0.48 in OD, 200 ft maximum. Weighs 17 lbs (7.7 kg) with terminations.
Operating Temperature:	-30°F to +122°F (-35°C to +50°C)
Storage Temperature:	-48°F to +158°F (-45°C to +70°C)
Altitude:	Up to 30,000 ft (9,000 m)
Water Tight:	O-Ring sealed for up to 9000 ft (2750 m) depth operation
Power:	24 to 32 VDC, 0.75 amp at turn-on and 0.5 amp thereafter
Accessories:	
Standard:	CM-201 View Utility Software operation manual and ship case
Optional:	Telemetry to 10Km coax, gradiometer (longitudinal or transverse)
MagLog Lite™ Software:	Logs, displays and prints Mag and GPS data at 10 Hz sample rate. Automatic anomaly detection and single sheet Windows printer support

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE ***4/03***

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GEOMETRICS China Laurel Industrial Co. Inc. - Beijing Office, Room 2508-2511, Full Link Plaza #18
Chaoyangmenwai Dajie, Chaoyang District, Beijing, China 100020
10-6588-1126 (1127, 1130), 10-6588-1132 • Fax 010-6588-1162

GEOMETRICS

FULL SPECTRUM
SUB-BOTTOM PROFILER

X-STAR

Sub-Bottom Profiler Shallow Tow System

X-STAR is a high resolution wideband Frequency Modulated (FM) sub-bottom profiler utilizing EdgeTech's proprietary FULL SPECTRUM™ CHIRP technology. The system transmits a FM pulse that is linearly swept over a full spectrum frequency range (for example 2-16 kHz for 20 milliseconds.) The acoustic return received at the hydrophones is passed through a pulse compression filter, generating high resolution images of the sub-bottom stratigraphy in oceans, lakes, and rivers.

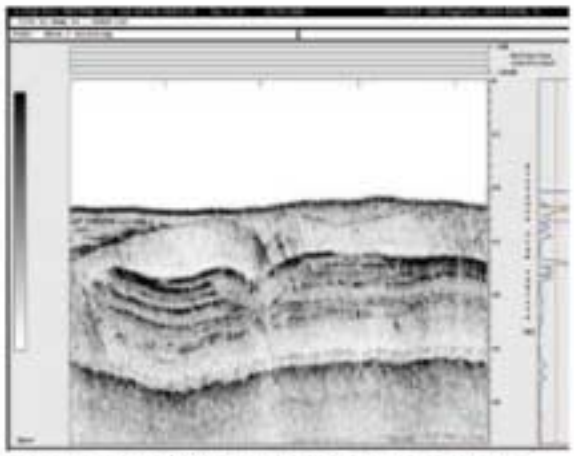
Because the FM pulse is generated by a digital to analog converter with a wide dynamic range and a transmitter with linear components, the energy, amplitude, and phase characteristics of the acoustic pulse are precisely controlled. This precision results in high repeatability and signal definition required for sediment classification.

Several stable, low drag tow vehicles are available that contain wide band transmitter arrays and sensitive line array receivers that can operate in water depths up to 300 meters. The selection of tow vehicle depends on the sub-bottom characteristics and resolution required.

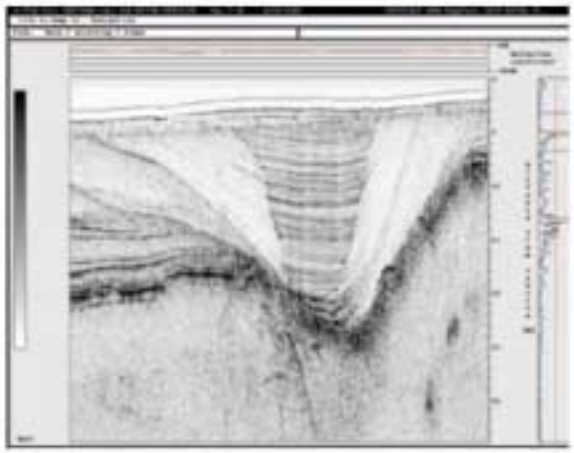
Full Spectrum Benefits

FM pulses have been used in radar for over 30 years and are sometimes called chirp or swept frequency pulses. Its application in sonar systems has come with the availability of high speed Digital Signal Processors (DSP).

Full Spectrum signal processing technology uses a proprietary matched filter to process wideband signals. This matched filter uses special amplitude and phase weighting functions for the transmitted pulse and a pulse compression filter that maximizes the Signal to Noise Ration (SNR) of the acoustic images over a wide band of operating frequencies. These X-STAR signal processing features provide a significant SNR improvement in the acoustic image generated by other impulse and chirp sonars with band limiting components that are limited in dynamic range.



Unequalled images that combine good penetration and high resolution. 20-30 dB improved SNR over conventional systems by using Full Spectrum (FM) Pulses.



• EEZ resource development • Geo-technical surveys • Hazard surveys • Environmental site investigations • Geological studies • Sediment classification • Buried object location • Search and recovery • Locate and map buried pipelines and cables • Mining and dredging surveys • Bridge and shoreline scour surveys

EdgeTech
THE SOUND SOLUTION

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FULL SPECTRUM
SUB-BOTTOM PROFILER

One of the outstanding aspects of Full Spectrum signal processing is the use of a broad bandwidth transmitting pulse that sweeps out over a range of frequencies. This generates a great deal of acoustic energy in the water. Instead of trying to operate with one very sharp acoustic peak pulse, like conventional CW systems, the Full Spectrum sonar spreads the transmission out over a long time duration. In addition, to the resolution improvement, the process of correlation processing achieves a signal processing gain over the background noise. To equal the typical performance of the Full Spectrum sonar pulse, conventional pulsed sonar would have to operate at a peak pulse power 100 times higher than the Full Spectrum pulse.

Normally, when using long pulses the resolution of the seabed is lost. Resolution of the seabed is regained after correlation processing the received signal. This is because the output of the correlation is a very sharp wavelet that has duration of the order of the inverse of the sweep bandwidth. Thus, the more bandwidth used, the sharper this pulse will become.

Another important feature, which enhances the ability of the Full Spectrum Sub-bottom Profiler system to classify sediments, is realized by the built-in de-convolution of the system response from the output pulse. The sonar's system impulse response is measured at the factory and is used to design a unique output pulse that will prevent the source from ringing. In addition to this, the Full Spectrum wavelet is weighted in the frequency domain to have a Gaussian like shape. As the Gaussian shaped spectrum is attenuated by the sediment, energy is lost but its bandwidth is preserved. Thus, even after being attenuated by 20 meters of sand, the Full Spectrum pulse has approximately the same resolution as a non-attenuated pulse.

The Full Spectrum Sonar side lobes are greatly reduced in the effective transducer aperture. The wide bandwidth of the sweep frequency smears the side lobes of the transducer and thus achieving a beam pattern with virtually no side lobes. The effective spatial beam width obtained after processing the Full Spectrum sub-bottom pulse is typically 20 degrees measured to the -3db points. This feature is clear when inspecting the Full Spectrum records. Since the transmitted pulse is highly repeatable and its peak amplitude is precisely known, the sediment reflective values can be estimated from the peak pulse amplitude measurements of the bottom returns.

Use different tow vehicles for desired penetration and resolution. The topside portion remains the same. The FM pulse is user selected based on the sub-bottom conditions at the survey site and the type of sub-bottom features that need to be imaged.

Configuration

The X-STAR sub-bottom profiler has a separate transmitter(s) constructed from wideband piston type transducers and separate acoustic receivers that are a discrete line array of PZT crystals. Separate receiving and transmitting arrays are used to preserve linearity and to allow simultaneous transmission and reception. The acoustic sensors are mounted in tow vehicles designed for profiling at ship speeds varying from 0 (drifting) to 7 knots.

X-STAR is designed for modular deployment. The heart of the system is a Signal Amplifier and Processor (Model FS-SB). It is here where the Full Spectrum signal is generated for output and filtered on reception. One of four tow vehicles may be connected. While EdgeTech supplies its own Topside Display Processor (Model TD-SB), it is also possible to interface other 3rd Party Topsides. EdgeTech has entered into agreements with several Topside Manufactures who support the EdgeTech Full Spectrum products.

Contact EdgeTech for X-STAR systems that are available in several other deployment options; Hull Mount, Deep Towed, ROV Mounted, and AUV/UUV Mounted.

FULL SPECTRUM
SUB-BOTTOM PROFILER

Towfish Model	SB-424	SB-216S	SB-0512	SB-0408
Frequency Range	4-24 kHz	2 - 16 kHz	500 Hz - 12 kHz	400 Hz - 8 kHz
Pulse Type	FM	FM	FM	FM
Standard Pulse Bandwidths / Length (other custom pulses available)	3-24 kHz / 10 ms 4-24 kHz / 10 ms 4-20 kHz / 10 ms 4-16 kHz / 10 ms	2-15 kHz / 20 ms 2-12 kHz / 20 ms 2-10 kHz / 20 ms	2-12 kHz / 20 ms 2-10 kHz / 20 ms 2-8 kHz / 40 ms 1.5-7.5 kHz / 40 ms 1-6 kHz / 40 ms 1-5 kHz / 40 ms 0.5-5 kHz / 40 ms	1.5-10 kHz / 20 ms 1-7 kHz / 40ms 1-6 kHz / 40 ms 0.7-4.5 kHz / 40 ms 0.6-3.0 kHz / 40 ms 0.4-2.4 kHz / 40 ms
Vertical Resolution	4 cm / 4-24 kHz 6 cm / 4-20 kHz 8 cm / 4-16 kHz	6 cm / 2-15 kHz 8 cm / 2-12 kHz 10 cm / 2-10 kHz	8 cm / 2-12 kHz 12 cm / 1.5–7.5 kHz 19 cm / 1- 5 kHz	9 cm / 1.5 kHz-10 kHz 15 cm / 1-6 kHz 37 cm / 0.4-2.4 kHz
Penetration (typical)				
in coarse calcareous sand	2	6	20	40
in clay	40	80	200	300
Beam Width (depends on center frequency)	16° / 4-24 kHz 19° / 4-20 kHz 23° / 4-16 kHz	17° / 2-15 kHz 20° / 2-12 kHz 24° / 2-10 kHz	16° / 2-12 kHz 24° / 1.5–7.5 kHz 32° / 1- 6 kHz	10° / 1.5 kHz-10 kHz 14° / 1-7 kHz 37° / 0.4-2.4 kHz
Transmitters	1	1	4	2
Receive Arrays	2	2	4	8
Size (centimeters)	77L x 50W x 34H	105L x 67W x 46H	210L x 134W x 46H	249 L x 214W x 91
Weight (kilograms)	22	44	186	364
Shipping weight (kg.)	82	122	288	consult factory
dimension (cm.)	L89 x W64 x H54	L115 x W79 x H59	L172 x W137 x H58	
Cable Requirements	3 shielded twisted pairs (5 used)	same	same	3 shielded twisted pairs (all used)
Max Depth (meters)	300	300	300	300
GeoStar Interface	Yes	Yes	No	No

Other System Specifications

Tow Speed	3-5 knots optimal, 7 knots maximum safe operational
MaximumTow Fish Operating Depth	300 meters (1,000 feet)
Optimum tow height	3 to 5 meters above seafloor
Calibration	Each system is acoustic tank tested to calibrate for reflection coefficient measurements

FULL SPECTRUM
SUB-BOTTOM PROFILER

FS-SB Full Spectrum Processor

Main Processor	Intel CPU with high speed PCI bus
Digital Signal Processor	TMS320
Memory	32 MB RAM
Storage	Hard drive, CD-ROM, floppy disk
Operating System	Windows® 98
I/O to Topside Processor	Ethernet
A/D	Analog Input, 16 bit resolution, 200 kHz max. sampling rate
D/A	Analog Output,16 bit resolution, 200 kHz max. sampling rate
Pulse Type	Full Spectrum (Frequency Modulated with amplitude and phase weighting)
Pulse Trigger	Internal or External
Pulse Repetition	0.5 to 12 Hz
Trigger In	TTL negative edge triggered (Middle BNC)
Trigger Out	TTL negative edge triggered. Minimum 5ms long pulse (Lower BNC)
Sampling Rate	Typically 20, 25, 40, or 50 kHz depending on the pulse upper frequency
Acoustic Power	212 dB ref 1$_{\mu}$Pa peak at center frequency of system
Input Power	120 or 220 VAC Auto Sensing
Power Amplifier	Type: Two channel, Gain: 33dB per channel, Power output: 2000 Watts peak, Power input: 110-120V/60Hz or 220-240 V/50Hz Manually Switchable
Topside Display Processors w/ Support	EdgeTech, CODA Technologies Ltd., Sea Corp., TEI Inc.
Environment	Temperature: 0 to 40°C, Humidity: 5% to 95% relative, Vibration: Normal ship environment
Enclosure	Portable steel case suitable for transit. Unit can be removed from case and mounted in a 19" rack. Size: 50W x 60D x 33H cm. (19.5x23.5x13 in), Weight: 46 kg (102 lbs.)
Shipping Containers	Size: 109L x 79W x 71H cm. (43x31x28 in), Weight: 150 kg (330 lbs.) Material: Sealed high impact polyurethane case

EdgeTech Topside Display Processor

Options	Diagnostics Kit (Video Display, Keyboard, Mouse), Spare Parts Kit, Optional Pulses
Main processor	SPARC Workstation
Operating System	UNIX
Display	17" Color Monitor
Operator Controls	A/D Gain, Two Stage TVG, Bottom Tracking, Digital Gain, Preamplifier Gain, Horizontal and Vertical Zoom, Direct Path Suppression, Swell Filter, Annotation
Video Displays	Bottom Tracking, Reflection Coefficient, Signal Amplitude, Navigation Map, Scale Lines, Track Lines
Navigation	NMEA 0183, X/Y, N/E, Navigation I/O Utility, Track lines, Event/Fix Marks, Sediment Classification Color vs. Echo Strength
Annotation	Keyboard, RS232 Port
Event Mark	Via Keyboard, Switch Closure, RS232 Port
Printer Support	EPC Models 9800, 8300, 1086, HSP-100, CODECO Model 850 & 1200F, Alden Model 9315 CTP, Ultra Model 183/200
Mass Storage	DAT
I/O Ports	Ethernet, Serial, SCSI, Parallel, Event Mark, Keyboard, Trackball, External Trigger In, Trigger Out, Heave Compensation Input
Power	105-125VAC or 210-250VAC, selectable, 47-63 Hz
Enclosure	Portable steel case suitable for transit. May be removed from cases and installed in 19-inch rack. Size: 50.3W x 50.3D x 15.3H cm. (19.8 x 19.8 x 6 in.), Weight: 32 kg (71 lbs.)
Environment	Temperature: Operating 5°C to 40°C Non-operating -40°C to 45°C. Humidity: Operating 20% to 80% relative humidity, non-condensing. Non-operating 5%-95%. Vibration: Normal ship environment
Options	Spare Parts Kit, Replay Software, Ethernet Output of Data, Dual Mass Storage, Software Services Agreement

Specifications subject to change without notice.

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MS750

Dual Frequency RTK Receiver for Precise Dynamic Positioning

Key features and benefits

- **20 Hz position update rate**
- **Less than 20 milliseconds position latency**
- **Centimeter-level position accuracy**
- **Front panel display & keypad for status monitoring and configuration**
- **User-defined local coordinates direct from receiver**
- **Industry standard CAN bus interface**

The MS750™ represents the highest level of accuracy and response available from a dual frequency GPS receiver. The receiver is specifically designed to allow the easy integration of reliable centimeter-level positions to any guidance or control application.

Dual Frequency RTK Receiver for Precise Dynamic Positioning

Accuracy and Response Times

Dynamic platforms, require virtually instantaneous position reports multiple times per second. The MS750 delivers positions to guidance or control loop software twenty times per second with a latency of less than 20 milliseconds. This responsiveness is matched with a horizontal accuracy of two centimeters and vertical accuracy of three centimeters. For the most precise applications, the MS750 provides one centimeter accuracy horizontally at a 5 Hz rate with a small increase in latency.

Interfacing and Configuration Ease

The MS750 is designed to plug right into your application with minimal development. An easy to-use application file interface enables the user to completely program receiver operation with a single command. Alternately, the receiver can be configured via the user-friendly built-in display and keyboard interface, or by the included Windows-based Configuration Toolbox software. Multiple configurations can be stored in the receiver as files and activated when desired. Local datum and transformation parameters may be loaded directly into the receiver. Therefore, output grid coordinates are compatible with GPS and traditional survey systems that may be in use on the same site. ASCII or Binary messages may be output through any of the three bi-directional serial ports. The receiver also includes support for the industry standard CAN (Controller Area Network) interface.

Advanced Technology

The accuracies, update rates and latencies available in the MS750 are made possible through a GPS architecture specifically designed for demanding dynamic positioning applications. Reliable operation in the most adverse environments, such as radio interference experienced at construction or mining sites, is a strict requirement. Custom designed hardware with Supertrak™ multibit GPS signal technology and Everest™ advanced multipath suppression provide superior tracking especially for weaker, low elevation satellites.

Both the RTCM format for differential GPS corrections and Trimble's published Compact Measurement Record (CMR) differential data can be received simultaneously, allowing the receiver to choose the optimum source and provide seamless navigation. Available as an option is the ability to calculate the baseline vector between two moving receivers to centimeter accuracy. The MS750 addresses a vast range of applications in the field of machine positioning, guidance and control.

Trimble

MS750

Dual Frequency RTK Receiver for Precise Dynamic Positioning

STANDARD FEATURES

- Centimeter accuracy, real-time positioning
- 20 Hz position updates
- < 20 ms position latency
- Front panel display & keypad
- User-defined local coordinates direct from receiver
- 3 serial I/O ports
- 2 CAN ports
- 1 PPS Output
- Trimble CMR Input/Output
- RTCM Input/Output
- One year hardware warranty
- Compact, easy mounting design
- Synchronized 5 Hz position updates

OPTIONS AND ACCESSORIES

- Moving Base RTK
- Rugged L1/L2 machine mount antenna
- Micro-Centered Antenna
- 5 m, 7.5 m, 10 m, 24 m & 30 m antenna cables
- Data extension cable
- Extended hardware warranty
- Firmware and Software update service

ORDERING INFORMATION

MS750 **Part Number 36577-00**

Includes MS750 receiver, Configuration Toolbox software, operating manual, power/data cable, data/1 PPS cable

PHYSICAL CHARACTERISTICS

Size	14.5cmW × 5.1cmH × 23.9cmD (5.7"W × 2.0" H × 9.4"D)
Weight	1.0 kg (2.25 lbs)
Power	12VDC/24VDC, 9 Watts

ENVIRONMENTAL CHARACTERISTICS

Operating temp	-20°C to +60°C
Storage temp	-30°C to +80°C
Humidity	MIL 810 E, Meth. 507.3 Proc III, Aggravated, 100% condensing
Vibration	MIL 810 D, Tailored Random 3gRMS Operating Random 6.2gRMS Survival
Mechanical Shock	MIL 810 D ± 40 g Operating ± 75 g Survival
EMC	
Radiated Emissions	CISPR 12
Conducted Emissions	SAE J1113/41
Radiated Immunity	ISO/DIS 13766, 30V/m
ESD	±15KV
Input Voltage Transients	ISO 7637-2

TECHNICAL SPECIFICATIONS

Tracking	9 channels L1 C/A code, L1/L2 full cycle carrier Fully operational during P-code encryption		
Signal processing	Supertrak Multibit Technology Everest Multipath Suppression		
Positioning mode	**Accuracy**[1]	**Latency**[2]	**Max Rate**
Synchronized RTK	1cm+ 2ppm Horizontal 2cm+ 2 ppm Vertical	300ms[3]	5 Hz Std
Low Latency	2cm+ 2ppm Horizontal[4] 3cm+ 2 ppm Vertical	< 20ms	20Hz
DGPS	< 1m	< 20ms	20Hz

[1] 1 sigma level
[2] At maximum output rate
[3] Dependent on data link throughput
[4] Assumes 1 second data link delay

Initialization	Automatic OTF (on-the-fly) while moving
Time required	Typically < 1 minute
Range	Up to 20 km from base for RTK
Start-up	< 90 seconds from power on to positioning < 30 seconds with recent ephemeris
Communications	3 × RS-232 ports. Baud rates up to 115,200 2 × CAN/J1939
Configuration	Via front panel display & keypad, Configuration Toolbox Software or user definable application files
Output Formats	NMEA-0183: GGK, GGA, ZDA, VTG, GST, PJT and PJK Trimble Binary Streamed Output

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YOUR LOCAL TRIMBLE OFFICE OR REPRESENTATIVE

Trimble 5700 GPS System

One receiver, many configurations, for greater flexibility and choice

The Trimble® 5700 GPS receiver is an advanced, but easy-to-use, surveying instrument that is rugged and versatile enough for any job.

Combine your 5700 with the antenna and radio that best suit your needs, and then add the Trimble controller and software of your choice for a total surveying solution. The powerful 5700 GPS system will provide all the advanced technological power and unparalleled flexibility you need to increase your efficiency and productivity in any surveying environment.

Advanced GPS receiver technology

The 5700 is a 24-channel dual-frequency RTK GPS receiver featuring the advanced Trimble Maxwell™ technology for superior tracking of GPS satellites, increased measuring speed, longer battery life through less power use, and optimal precision in tough environments. WAAS and EGNOS capability lets you perform real-time differential surveys to GIS grade without a base station.

Modular design for versatility

For topographic, boundary, or engineering surveying, clip the receiver to your belt, carry it in a comfortable backpack, or configure it with all components on a lightweight range pole. With the receiver attached to your site vehicle, you can survey a surface as fast as you can drive! For control applications, attach the receiver to a tripod...it's designed to work the way your job requires.

Full metal jacket...and lightweight

The 5700 GPS receiver boasts the toughest mechanical and waterproofing specs in the business. Its magnesium alloy case is stronger than aluminum, but also 30% lighter—the 5700 weighs just 1.4 kg (3 lb) with batteries. Whether you're collecting control points on a tripod, or scrambling down a scree slope collecting real-time kinematic data, the receiver is light enough and tough enough to carry on performing.

Fast and efficient data storage and communications

Use the receiver's CompactFlash memory to store more than 3,400 hours of continuous L1/L2 data collection at an average of 15-second intervals. Transfer data to a PC at speeds of more than 1 megabit per second through the super-fast USB port. Your choice of UHF radio modem is built in to the receiver to provide RTK communications receiving without the need for cables or extra power!

Your choice of Trimble antenna

Choose the high-accuracy Trimble GPS antenna that best suits your needs: the lightweight and portable Zephyr™ antenna for RTK roving, or the Zephyr Geodetic™ antenna for geodetic surveying.

The Zephyr Geodetic antenna offers submillimeter phase center repeatability and excellent low-elevation tracking, while the innovative design of its Trimble Stealth™ ground plane literally burns up multipath energy using technology similar to that used by stealth aircraft to hide from radar. The Zephyr Geodetic antenna thus provides unsurpassed accuracy from a portable antenna.

Key Benefits

- Industry-leading technology provides superior performance
- Flexible configurations put you in total control
- Rugged, high-performance hardware is built to last
- With the Trimble controller and software of your choice, enjoy seamless integrated surveying

Trimble.

Trimble 5700 GPS System

General

- Front panel for on/off, one-button push data logging, CompactFlash card formatting, ephemeris and application file deletion, and restoring default controls
- LED indicates for satellite tracking, radio-link, data logging, and power monitoring
- Tripod clip or integrated base case

Performance specifications

Measurements

- Advanced Trimble Maxwell technology
- High-precision multiple correlator L1 and L2 pseudorange measurements
- Unfiltered, unsmoothed pseudorange measurement 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 <1 mm precision in a 1 Hz 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[1]

Horizontal ..... ±(0.25 m + 1 ppm) RMS
Vertical ..... ±(0.5 m + 1 ppm) RMS
WAAS differential positioning accuracy typically <5 m 2DRMS[2]

Static and FastStatic GPS surveying[1]

Horizontal ..... ±5 mm + 0.5 ppm RMS
Vertical ..... ±5 mm + 1 ppm (× baseline length) RMS

Kinematic surveying[1]

Real-time and postprocessed kinematic surveys
Horizontal ..... ±(10 mm + 1 ppm) (× baseline length) RMS
Vertical ..... ±(20 mm + 1 ppm) RMS
Initialization time ..... Single/Multi-base minimum 10 sec + 0.5 times baseline length in km, up to 30 km
Scalable GPS infrastructure initialization time ..... <30 seconds typical anywhere within coverage area
Initialization reliability[3] ..... typically >99.9%

Hardware

5700 GPS receiver

Physical:
Casing ..... Tough, lightweight, fully sealed magnesium alloy
Waterproof ..... Tested to IPX7 standards
Shock and vibration ..... Tested and meets the following environmental standards:
Shock ..... MIL-STD-810F to survive a 1 m (3.28 ft) drop onto concrete
Vibration ..... MIL-STD-810-F on each axis
Weight ..... With internal batteries, internal radio, internal battery charger, standard UHF antenna: 1.4 kg (3 lb)
As entire RTK rover with batteries for greater than 7 hours, less than 4 kg (8.8 lb)
Dimensions (W×H×L) ..... 13.5 cm × 8.5 cm × 24 cm (5.3 in × 3.4 in × 9.5 in)

Electrical:
Power ..... DC input 11 to 28 V DC with over voltage protection
Power consumption ..... 2.5 W receiver only, 3.75 W including internal radio
Battery ..... Greater than 10 hours data logging, or greater than 7 hours of RTK operation on two internal 2.0 Ah lithium ion batteries
Battery weight ..... 0.1 kg (3.5 oz)
Battery charger ..... Internal with external AC power adapter; no requirement for external charger
Power output ..... 11.5 to 20 V DC (Port 1), 11.5 to 27.5 V DC (Port 3) on external power input
Certification ..... Class B Part 15 FCC certification, CE Mark approved, C-Tick approved, Canadian FCC

Environmental:
Operating temperature[4] ..... –40 °C to 65 °C (–40 °F to 149 °F)
Storage temperature ..... –40 °C to 80 °C (–40 °F to 176 °F)
Humidity ..... 100%, condensing

Communications and data storage:

- 2 external power ports, 2 internal battery ports, 3 RS232 serial ports
- Integrated USB for data download speeds in excess of 1 Mb per second
- External GPS antenna connector
- CompactFlash advanced lightweight and compact removable data storage. Options of 64 MB or 128 MB from Trimble
- More than 3,600 hours continuous L1+L2 logging at 15 seconds with 6 satellites typical with 128 MB card
- Fully integrated, fully sealed internal UHF radio modem option
- GSM, cellphone, and CDPD modem support
- Dual event marker input capability
- 1 Hz, 2 Hz, 5 Hz, and 10 Hz positioning and data logging
- 1 pulse per second output capability
- CMR, CMR+, RTCM 2.x and 3.x input and output standard
- 14 NMEA outputs

Zephyr antenna

Dimensions ..... 16.2 cm (6.38 in) diameter × 6.2 cm (2.44 in) height
Weight ..... 0.55 kg (1.20 lb)
Operating temperature ..... –40 °C to 70 °C (–40 °F to 158 °F)
Humidity ..... 100% humidity proof, fully sealed
Shock and vibration ..... Tested and meets the following environmental standards:
Shock ..... MIL-STD-810-F to survive a 2 m (6.56 ft) drop onto concrete
Vibration ..... MIL-STD-810-F on each axis

- 4-point antenna feed for submillimeter phase center repeatability
- Integral low noise amplifier
- 50 dB antenna gain

Zephyr Geodetic antenna

Dimensions ..... 34.3 cm (13.5 in) diameter × 7.6 cm (3 in) height
Weight ..... 1.31 kg (2.88 lb)
Operating temperature ..... –40 °C to 70 °C (–40 °F to 158 °F)
Humidity ..... 100% humidity proof, fully sealed
Shock and vibration ..... Tested and meets the following environmental standards:
Shock ..... MIL-STD-810-F to survive a 2 m (6.56 ft) drop onto concrete
Vibration ..... MIL-STD-810-F on each axis

- 4-point antenna feed for submillimeter phase center repeatability
- Integral low noise amplifier
- 50 dB antenna gain
- Trimble Stealth ground plane for reduced multipath

1. Accuracy may be subject to conditions such as multipath, obstructions, satellite geometry, and atmospheric parameters. Always follow recommended survey practices.
2. Depends on WAAS/EGNOS system performance.
3. May be affected by atmospheric conditions, signal multipath, and satellite geometry. Initialization reliability is continuously monitored to ensure highest quality.
4. Receiver operates normally to –40 °C (–40 °F) but some differential functions such as USB download or internal battery charging are not recommended at temperatures below freezing.

Specifications subject to change without notice.

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C

Appendix C:
Photographs

Passaic River Pilot Study
July 12, 2004 - July 14, 2004
Field Sampling Photographs

Photo 1: Robert E. Hayes, an ASI lift barge vessel used as base for sampling.

Photo 2: Close up view of Robert E. Hayes vessel.

Photo 3: Arrangements in progress for rain protection in core processing area.

Photo 4: Samples in buckets collected for tractability studies.

Photo 5: Core processing in progress on the barge.

Photo 6: Core cutting in progress on the barge.

Photo 7: Core being marked for cutting.

Photo 7: Core in place for cutting.

Photo 8: Core secured on the barge before cutting.

Photo 9: Core placed in bowl for weighing and sample collection.

Photo 11: Core placed in bowl for sample collection.

Photo 11: Core placed in bowl for sample collection.

Photo 12: Core placed in bowl for sample collection.