

CEA

TECHNICAL REPORT

1999 Sediment Sampling Program

Technical Memorandum

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Introduction

The purpose of this technical memorandum is to document field activities conducted during the week of March 22, 1999 by Quantitative Environmental Analysis, LLC (QEA) with assistance from Ocean Surveys, Inc. (OSI). These field activities were performed within the Thompson Island Pool of the Hudson River (Figure 1), in the vicinity of Hot Spot 14 (HS14) and Hot Spot 16 (HS16).

The field activities included the following data collection tasks:

- sediment sampling;
- sediment probing; and
- collection of hydrographic data, including river cross-sections and flow velocity.

The field activities were conducted from a 24 ft enclosed cabin survey vessel equipped with twin outboard engines, provided by OSI. Data collection equipment included a differential global positioning system (DGPS), an OSI Maretrack II trackline control and data logging system, an Innerspace 448 survey grade depth sounder, a Coastal Mini-Tide digital recording water level gauge, and an RD Instruments Acoustic Doppler Current Profiler (ADCP).

Sediment Sampling

Sediment sampling was conducted on March 22 – 23, 1999. The samples were collected by QEA personnel, with assistance from OSI. Target coordinates were selected for the sample locations prior to initiating the sampling. These target locations were supplied electronically to OSI, who loaded this information on their on-board computer system. OSI then used the DGPS to maneuver to each target location. Once in position, the vessel was held in place with an anchor and a 150 lb.

down weight. The boat was typically positioned within 5 feet or less of the target coordinates. OSI recorded the coordinates at the locations that the samples were actually collected (Table 1). The accuracy of the DGPS system was verified at least once per day by placing the rover antenna on a point with known fixed coordinates. The system accuracy was typically within 1 ft. of the fixed point coordinates.

Sediment sampling procedures were generally consistent with those used during the 1998 Thompson Island Pool Sediment Coring Program (O'Brien & Gere, 1999). Upon arrival at each sampling location, sediment samples were collected by QEA personnel using a push core sampling apparatus equipped with 3 inch OD acrylic tubes. Upon retrieval, the cores were placed in a sediment extrusion device. The sediment core was extruded in 5 cm increments, separated with a stainless steel broad knife, and placed in containers. A new piece of acrylic tubing was used at each sampling location. The broad knife was decontaminated between segments using soap, water, acetone, hexane, and distilled water. The top three 5 cm core segments were retained for analysis. These segments were designated as 0-5 cm, 5-10 cm, and 10-15 cm. Sample containers were labeled, placed in a cooler, and maintained at approximately 4°C. The samples were then submitted to Northeast Analytical, Inc. (NEA) for congener specific PCBs by NEA method NEA608CAP (NEA, 1990); total organic carbon (TOC) by USEPA method 9060 (USEPA, 1997), moisture content (NEA, 1998a), and bulk density (NEA, 1998b) determinations. Observations, including a physical description of the samples, were recorded on field logs and are summarized in Table 1. A summary of sample descriptions and analytical results are presented in Table 1 and Table 3, respectively. Total PCB concentrations are also presented in Figures 2 and 3. Laboratory data packages are presented in Exhibit A.

A discrepancy between GIS data developed by GE (QEA, 1999) and EPA (USEPA, 1998)

of the Hudson River shoreline in the vicinity of HS16 was observed during the sediment sampling. The original target coordinates for the HS16 sampling locations were based on the EPA shoreline data. Upon attempting the travel to several of the sampling locations, the target coordinates were found to be on or very close to the shore. The sampling locations were shifted in the field approximately 25 – 50 ft. to the west to compensate for this condition. OSI recorded the coordinates of the actual sampling locations (Table 1). OSI also obtained coordinates at several locations along the eastern and western shoreline to verify the actual location of the Hudson River shoreline in this area. The discrepancy between the GE and EPA versions of the shoreline in the vicinity of HS16 has been observed previously in GIS views (QEA, 1999); however, prior to this sampling program, it was unclear which version was most representative. The field observations from this survey indicate that the GE shoreline data are more representative than the EPA shoreline data in the vicinity of HS16. However, the GE and EPA versions of the shoreline in the HS14 area appear to be reasonably consistent.

Sediment Probing

Sediment depths and characteristics were estimated by probing the river bed in selected portions of HS 14 and HS16. The sediment probing was conducted on March 24 – 25, 1999. Target coordinates were developed for stations spaced 25 feet apart along transects across the river at HS14 and HS16, as illustrated in Figure 4. The probing was conducted by positioning the OSI survey vessel at the target coordinates for each data collection point. The sediment was then probed with a 20 ft. long ½ in. diameter conduit calibrated in 1 ft. increments. The approximate depth of penetration and estimated sediment texture was recorded at each point. Data was not collected at locations where water depths exceeded 20 feet. The results of the sediment probing are presented in Table 2.

Hydrographic Data Collection

Hydrographic data were collected on March 23-24, 1999 from the transects utilized for the probing study (Figure 4). River cross-sections were developed by OSI along each transect using a data logging sonar system. The sonar system was calibrated to provide river bed elevations based upon the elevation of the water's surface in the vicinity of the study area. The water elevation was determined by measuring the elevation approximately 1 mile upstream at a vertical control point established in 1991. An electronic data logging tide gauge was set up at a fixed point in HS14 (McDonald property dock) and was calibrated to the water surface elevation measured at the vertical control point. The variations in water level elevations recorded during the survey are presented in Figure 5. These data were collected to adjust the river bed elevations measured during the subsequent survey if significant variation in the water level occurred during the period of data collection was observed. To obtain river bed elevation data, OSI positioned the survey vessel on the transect line using the GPS, and traveled along the transect collecting depth soundings on a continuous basis. The resultant river cross-sections are presented in Figures 6 - 9.

Current velocity measurements were obtained on March 25, 1999. These measurements were obtained along each transect with instrumentation based on acoustic doppler technology. A boat-mounted RD Instruments 1,200 kHz Workhorse Acoustic Doppler Current Profiler was utilized to collect the velocity data. The RDI ADCP was deployed over the side of the survey vessel and positioned appropriately to profile the water column below the vessel. The ADCP utilized four transducers that produce a 1,200 kHz acoustic wave emanating in four directions each tilted 20° off center and evenly spaced around the head of the instrument. The instrument measures the Doppler shift in the acoustic signal as the sound reflects off moving particles within the water column. The Doppler shift is recorded for each transducer from various depths resulting in a net water current speed and direction at a selected vertical resolution. The motion of the ADCP through the water (i.e.

boat motion) is subtracted from data automatically using both navigational inputs from the DGPS navigation system and from the ADCP's internal bottom tracking software. Current velocity data were recorded with a ½ meter vertical resolution and 30 foot horizontal resolution along each transect. Each data point was developed from 20 individual samples collected over a sampling duration of 7.7 seconds. This resulted in a speed standard deviation of 0.50 cm s⁻¹. Flow velocity data for each transect are presented in Exhibit B and presented in figures as follows:

Figure 10 – HS14 Vertically Averaged Current Vectors

Figure 11 – HS14 Bottom Current Vectors

Figure 12 – HS16 Vertically Averaged Current Vectors

Figure 13 – HS16 Bottom Current Vectors

Figures 10 and 12 depict vertically averaged current vectors that indicate the direction and magnitude of the water current velocity averaged throughout the entire water column at each station. Figures 11 and 13 depict the direction and magnitude of the water current velocity approximately 0.5 meters above the river bed.

Data Management

OSI provided a copy of the hydrographic data to QEA in electronic format. Analytical data has been entered into the GE Hudson River database.

References

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TABLES

TABLE 1
GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT
HIS14 & 16 SEDIMENT SAMPLE LOCATIONS

Station	Date	Sample	Sample	Position NY State Plane East NAD27		Observations
		Depth (cm)	Time (hrs-est)	Easting (ft)	Northing (ft)	
P14-01	3/22/99	0 - 5	12:57	700,579	1,172,542	Brown silt w/wood chips (boulders at target, moved slightly east)
		5 - 10	12:57			Brown silt w/wood chips
		10 - 15	12:57			Brown silt w/wood chips
P14-02	3/22/99	0 - 5	13:30	700,651	1,172,299	Brown silt w/organic matter, highway culvert discharge ~150 upstream
		5 - 10	13:31			Brown silt w/organic matter
		10 - 15	13:32			Brown silt w/organic matter
P14-03	3/22/99	0 - 5	13:53	700,592	1,172,150	Thin layer brown silt over hard bottom, sheen
		5 - 10	13:54			Brown silt
		10 - 15	13:55			Brown silt
P14-04	3/22/99	0 - 5	14:28	700,500	1,171,974	Coarse sand, shale fragments (only 5 cm recovered)
P14-05	3/22/99	0 - 5	15:04	700,642	1,172,009	Fine brown sand and silt, ~6-8 in. over hard bottom, sheen
		5 - 10	15:05			Fine brown sand and silt
		10 - 15	15:06			Fine brown sand and silt
P14-06	3/23/99	0 - 5	15:24	700,533	1,171,656	Coarse brown sand (only 10 cm recovered)
		5 - 10	15:25			Coarse brown sand
P14-07	3/22/99	0 - 5	16:15	700,748	1,171,731	Brown silt w/organic matter
		5 - 10	16:16			Brown silt w/organic matter
		10 - 15	16:17			Brown silt w/organic matter
P14-08	3/23/99	NS	8:15	700,682	1,171,542	Not sampled, 3-4 in. coarse sand/gravel, no recovery
P14-09	3/23/99	0 - 5	8:26	700,675	1,171,385	Thin layer aqueous brown silt over hard bottom, (only 5 cm recovered)
P14-10	3/23/99	0 - 5	8:49	700,811	1,171,430	Fine brown sand and silt (pigment and plastic shreds below 15 cm)
		5 - 10	8:50			Fine brown sand and silt
		10 - 15	8:51			Fine brown sand and silt
P14-11	3/23/99	NS		700,810	1,171,276	Not Sampled, rocky bottom
P14-12	3/23/99	0 - 5	10:16	700,828	1,171,113	Trace silt, coarse sand/fine gravel
		5 - 10	10:17			Coarse sand/fine gravel
		10 - 15	10:18			Coarse sand/fine gravel

TABLE 1
GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT
HS14 & 16 SEDIMENT SAMPLE LOCATIONS

Station	Date	Sample	Sample	Position NY State Plane East NAD27		Observations
		Depth (cm)	Time (hrs-est)	Easting (ft)	Northing (ft)	
P14-13	3/23/99	0 - 5	10:39	700,950	1,171,164	Brown silt, some organic matter
		5 - 10	10:40			Brown silt, some organic matter, Blind Duplicate #1
		10 - 15	10:41			Brown silt, some organic matter
P16-01	3/23/99	NS	11:00	700,320	1,168,218	Location moved west (target coordinates on land), not sampled, rock
P16-02	3/23/99	NS	11:15	700,291	1,168,141	Location moved west (target coordinates on land), not sampled, rock
P16-03	3/23/99	0 - 5	11:41	700,292	1,168,030	Location moved west (target coordinates on land), brown fine to medium sand (~6-8 in. over hard bottom)
		5 - 10	11:42			Brown fine to medium sand
		10 - 15	11:43			Brown fine to medium sand
P16-04	3/23/99	NS	12:40	700,218	1,167,989	Location moved west (target coordinates on land) Not sampled, hard bottom (rock)
P16-05	3/23/99	0 - 5	12:56	700,256	1,167,923	Location moved west (target coordinates on land), brown medium sand
		5 - 10	12:57			Brown medium sand, Blind Duplicate #2
		10 - 15	12:58			Brown medium sand, wood chips, organic matter

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TABLE 1
GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT
HS14 & 16 SEDIMENT SAMPLE LOCATIONS

Station	Date	Sample	Sample	Position NY State Plane East NAD27		Observations
		Depth (cm)	Time (hrs-est)	Easting (ft)	Northing (ft)	
P16-06	3/23/99	0 - 5	13:22	700,228	1,167,866	Location moved west (target coordinates on land), brown silt
		5 - 10	13:23			Brown silt
		10 - 15	13:24			Brown silt, yellow pigment
P16-07	3/23/99	0 - 5	13:47	700,231	1,167,807	Location moved west (target coordinates on land), brown fine sand
		5 - 10	13:48			Brown fine sand
		10 - 15	13:49			Brown fine sand
P16-08	3/23/99	0 - 5	14:09	700,191	1,167,776	Location moved west (target coordinates on land), brown silt
		5 - 10	14:10			Brown silt, plastic shreds
		10 - 15	14:11			Brown silt, plastic shreds
P16-09	3/23/99	0 - 5	14:30	700,216	1,167,721	Location moved west (target coordinates on land), brown silt
		5 - 10	14:31			Brown fine sand w/wood chips
		10 - 15	14:32			Brown fine sand w/wood chips
P16-10	3/23/99	0 - 5	14:50	700,134	1,167,682	Location moved west (target coordinates on land), brown silt (~6 in. over hard bottom)
		5 - 10	14:51			Brown silt w/shale fragments
		10 - 15	14:52			Brown silt w/shale fragments

TABLE 2
GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT
HS14 & 16 SEDIMENT PROBING RESULTS

Date	Sampling Station ID	Time (Hrs- EST)	Position NY State Plane East NAD27		Observation
			Easting (ft)	Northing (ft)	
3/23/99	L1-1	16:19:34	700,575	1,172,542	6.0 in. coarse sand
	L1-2	16:19:59	700,548	1,172,542	Hard Bottom
	L1-3	16:20:15	700,521	1,172,540	Hard Bottom
	L1-4	16:20:34	700,497	1,172,531	Hard Bottom
	L1-5	16:20:56	700,474	1,172,539	Hard Bottom
	L1-6	16:21:29	700,448	1,172,536	6.0 in. gravel
	L1-7	16:21:51	700,421	1,172,535	6.0 in. gravel
	L1-8	16:22:22	700,395	1,172,534	Hard Bottom
	L1-9	16:23:01	700,369	1,172,531	6.0 in. Gravel
	L1-10	16:23:29	700,343	1,172,531	6.0 in. Gravel
	L1-11	16:23:51	700,318	1,172,528	6.0 in. Gravel
	L1-12	16:24:30	700,293	1,172,524	Hard Bottom
	L1-13	16:24:57	700,267	1,172,528	Hard Bottom
	L1-14	16:25:33	700,241	1,172,527	Hard Bottom
	L1-15	16:26:05	700,217	1,172,522	6.0 in. Gravel
	L1-16	16:26:41	700,191	1,172,519	6.0 in. Sand
	L1-17	16:27:07	700,162	1,172,522	6.0 in. Sand
	L1-18	16:27:32	700,137	1,172,518	3.0 Ft. Soft Sediment
	L1-19	16:28:32	700,113	1,172,522	1.5 Ft. Sand
	L1-20	16:29:41	700,088	1,172,531	6.0 in. Gravel
3/23/99	L2-1	16:36:17	700,659	1,172,268	4.5 Ft. soft sediment
	L2-2	16:38:27	700,639	1,172,267	3.0 Ft soft sediment
	L2-3	16:39:36	700,617	1,172,265	2.5 Ft. soft sediment
	L2-4	16:40:29	700,588	1,172,263	6.0 in. Gravel
	L2-5	16:41:37	700,564	1,172,259	Hard Bottom
	L2-6	16:42:20	700,539	1,172,256	6.0 in. Gravel
	L2-7	16:42:41	700,515	1,172,248	No Data (24.0 Ft. water depth)
	L2-8	16:43:54	700,474	1,172,245	6.0 in. Gravel
	L2-9	16:44:16	700,449	1,172,245	6.0 in. Gravel
	L2-10	16:44:41	700,424	1,172,241	1.0 Ft. Coarse Sand
	L2-11	16:45:28	700,399	1,172,239	1.0 Ft. Sand
	L2-12	16:45:49	700,374	1,172,230	1.5 Ft. Soft Sediment
	L2-13	16:46:11	700,347	1,172,231	1.0 Ft. Soft Sediment
	L2-14	16:46:32	700,322	1,172,226	6.0 in. Gravel
	L2-15	16:50:12	700,298	1,172,225	Hard Bottom
	L2-16	16:50:38	700,273	1,172,224	Hard Bottom
	L2-17	16:51:02	700,248	1,172,219	6.0 in. Sand
	L2-18	16:51:37	700,223	1,172,214	6.0 in. Sand
	L2-19	16:52:15	700,199	1,172,216	6.0 in. Gravel
	L2-20	16:52:50	700,175	1,172,211	6.0 in. Gravel
	L2-21	16:53:34	700,150	1,172,210	6.0 in. Gravel

TABLE 2
GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT
HS14 & 16 SEDIMENT PROBING RESULTS

Date	Sampling Station ID	Time (Hrs- EST)	Position NY State Plane East NAD27		Observation
			Easting (ft)	Northing (ft)	
3/23/99	L3-1	16:59:09	700,681	1,171,930	3.0 Ft. Soft Sediment
	L3-2	17:00:00	700,663	1,171,910	1.5 Ft. Soft Sediment
	L3-3	17:00:57	700,639	1,171,902	Hard Bottom
	L3-4	17:01:24	700,614	1,171,903	Hard Bottom
	L3-5	17:01:56	700,591	1,171,894	Hard Bottom
	L3-6	17:02:18	700,566	1,171,891	Hard Bottom
	L3-7	17:03:09	700,541	1,171,892	Hard Bottom
	L3-8	17:03:55	700,517	1,171,886	6.0 in. Sand
	L3-9	17:04:45	700,493	1,171,880	Hard Bottom
	L3-10	17:05:16	700,468	1,171,881	Hard Bottom
	L3-11	17:05:47	700,444	1,171,872	Hard Bottom
	L3-12	17:06:21	700,419	1,171,866	Hard Bottom
	L3-13	17:06:42	700,397	1,171,854	6 in. Gravel
	L3-14	17:07:22	700,373	1,171,857	6 in. Gravel
	L3-15	17:07:57	700,347	1,171,855	6 in. Gravel
	L3-16	17:08:18	700,323	1,171,851	Hard Bottom
	L3-17	17:08:49	700,298	1,171,847	1.0 Ft. Soft Sediment
	L3-18	17:09:16	700,274	1,171,840	2.0 Ft. Soft Sediment
	L3-19	17:10:04	700,249	1,171,836	1.5 Ft. Soft Sediment
	L3-20	17:10:34	700,223	1,171,836	1.0 Ft. Soft Sediment
	L3-21	17:11:16	700,199	1,171,829	6.0 in. Sand
	L3-22	17:11:48	700,174	1,171,825	3.0 Ft. soft sediment
	L3-23	17:12:38	700,150	1,171,824	6.0 in. Gravel
	L3-24	17:13:12	700,128	1,171,825	>4.0 Ft. Soft Sediment
3/24/99	L4-1	09:41:32	700,778	1,171,696	>4.0 Ft. Soft Sediment
	L4-2	09:43:45	700,758	1,171,686	>2.0 Ft. Soft Sediment
	L4-3	09:44:20	700,735	1,171,675	>3.0 Ft. Soft Sediment
	L4-4	09:44:43	700,710	1,171,673	2.0 Ft. Soft Sediment
	L4-5	09:45:05	700,687	1,171,661	6.0 in. Gravel
	L4-6	09:45:57	700,666	1,171,653	6.0 in. Gravel
	L4-7	09:46:49	700,643	1,171,648	6.0 in. Gravel
	L4-8	09:47:28	700,618	1,171,638	1.0 Ft. Sand
	L4-9	09:48:18	700,593	1,171,632	6.0 in. Sand
	L4-10	09:48:51	700,567	1,171,622	2.0 Ft. Soft Sediment
	L4-11	09:49:38	700,542	1,171,620	2.0 Ft. Soft Sediment
	L4-12	09:50:07	700,521	1,171,606	1.5 Ft. Soft Sediment
	L4-13	09:50:47	700,498	1,171,599	1.0 Ft. Soft Sediment
	L4-14	09:51:06	700,472	1,171,591	2.0 Ft. Soft Sediment
	L4-15	09:52:03	700,449	1,171,585	3.0 Ft. Soft Sediment
	L4-16	09:53:08	700,425	1,171,575	2.0 Ft. Soft Sediment
	L4-17	09:53:33	700,402	1,171,565	6.0 in. Gravel
	L4-18	09:53:59	700,378	1,171,562	6.0 in. Sand
	L4-19	09:54:28	700,356	1,171,551	6.0 in. Sand
	L4-20	09:55:00	700,333	1,171,541	6.0 in. Sand
	L4-21	09:55:38	700,309	1,171,535	2.0 Ft. Soft Sediment
	L4-22	09:56:05	700,284	1,171,527	1.0 Ft. Sand
	L4-23	09:56:34	700,260	1,171,522	1.0 Ft. Sand
	L4-24	09:57:13	700,236	1,171,515	>3.0 Ft. Soft Sediment
	L4-25	09:58:00	700,212	1,171,508	>3.0 Ft. Soft Sediment
	L4-26	09:58:29	700,188	1,171,498	>3.0 Ft. Soft Sediment
	L4-27	09:59:00	700,165	1,171,485	>3.0 Ft. Soft Sediment

TABLE 2
GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT
HS14 & 16 SEDIMENT PROBING RESULTS

Date	Sampling Station ID	Time (Hrs- EST)	Position NY State Plane East NAD27		Observation
			Easting (ft)	Northing (ft)	
3/24/99	L5-1	10:02:35	700,852	1,171,449	3.0 Ft. Soft Sediment
	L5-2	10:03:18	700,828	1,171,447	>3.0 Ft. Soft Sediment
	L5-3	10:04:05	700,808	1,171,431	3.0 Ft. Soft Sediment
	L5-4	10:04:41	700,782	1,171,427	3.0 Ft. Soft Sediment
	L5-5	10:05:17	700,760	1,171,415	2.0 Ft. Soft Sediment
	L5-6	10:06:37	700,736	1,171,411	1.0 Ft. Sand
	L5-7	10:07:48	700,714	1,171,401	1.0 Ft. Sand
	L5-8	10:08:13	700,691	1,171,388	6.0 in. Sand
	L5-9	10:08:40	700,666	1,171,379	6.0 in. Sand
	L5-10	10:09:07	700,641	1,171,371	3.0 in. Sand
	L5-11	10:09:31	700,617	1,171,363	1.0 Ft. Soft Sediment
	L5-12	10:09:58	700,593	1,171,353	6.0 in. Sand
	L5-13	10:10:29	700,570	1,171,344	1.0 Ft. Soft Sediment
	L5-14	10:10:55	700,547	1,171,335	2.0 Ft. Soft Sediment
	L5-15	10:11:21	700,524	1,171,324	6.0 in. Sand
	L5-16	10:11:43	700,500	1,171,315	1.0 Ft. Sand
	L5-17	10:12:07	700,476	1,171,307	1.0 Ft. Sand
	L5-18	10:12:30	700,453	1,171,296	1.0 Ft. Soft Sediment
	L5-19	10:12:49	700,428	1,171,290	>2.0 Ft. Soft Sediment
	L5-20	10:13:12	700,404	1,171,278	>2.0 Ft. Soft Sediment
	L5-21	10:13:34	700,381	1,171,271	>1.0 Ft. Soft Sediment
	L5-22	10:13:58	700,356	1,171,264	>2.0 Ft. Soft Sediment
	L5-23	10:14:28	700,332	1,171,255	>3.0 Ft. Soft Sediment
	L5-24	10:15:02	700,308	1,171,247	>3.0 Ft. Soft Sediment
	L5-25	10:15:49	700,284	1,171,240	>3.0 Ft. Soft Sediment
	L5-26	10:16:42	700,261	1,171,234	>3.0 Ft. Soft Sediment
3/24/99	L6-1	10:20:57	701,002	1,171,194	3.0 Ft. Soft Sediment
	L6-2	10:21:49	700,978	1,171,188	>4.0 Ft. Soft Sediment
	L6-3	10:22:22	700,956	1,171,177	>4.0 Ft. Soft Sediment
	L6-4	10:22:51	700,932	1,171,166	3.0 Ft. Soft Sediment
	L6-5	10:23:19	700,910	1,171,155	1.0 Ft. Soft Sediment
	L6-6	10:23:45	700,885	1,171,146	1.0 Ft. Sand
	L6-7	10:24:14	700,861	1,171,136	3.0 Ft. Soft Sediment
	L6-8	10:24:43	700,838	1,171,130	3.0 Ft. Soft Sediment
	L6-9	10:25:14	700,815	1,171,121	3.0 Ft. Soft Sediment
	L6-10	10:25:50	700,791	1,171,113	3.0 Ft. Soft Sediment
	L6-11	10:26:20	700,767	1,171,104	>3.0 Ft. Soft Sediment
	L6-12	10:26:47	700,743	1,171,093	3.0 Ft. Soft Sediment
	L6-13	10:27:13	700,720	1,171,083	1.0 Ft. Sand
	L6-14	10:27:43	700,696	1,171,076	>3.0 Ft. Soft Sediment
	L6-15	10:28:18	700,672	1,171,070	2.0 Ft. Soft Sediment
	L6-16	10:28:49	700,649	1,171,059	3.0 Ft. Soft Sediment
	L6-17	10:29:16	700,626	1,171,050	3.0 Ft. Soft Sediment
	L6-18	10:29:43	700,601	1,171,039	1.0 Ft. Sand
	L6-19	10:30:14	700,578	1,171,033	1.0 Ft. Sand
	L6-20	10:30:45	700,555	1,171,022	1.0 Ft. Sand
	L6-21	10:31:13	700,531	1,171,017	1.0 Ft. Sand
	L6-22	10:31:51	700,508	1,171,007	>2.0 Ft. Soft Sediment
	L6-23	10:32:26	700,486	1,170,997	1.0 Ft. Soft Sediment
	L6-24	10:33:07	700,462	1,170,989	6.0 in. Sand
	L6-25	10:33:45	700,439	1,170,980	>3.0 Ft. Soft Sediment
	L6-26	10:34:32	700,415	1,170,972	>3.0 Ft. Soft Sediment
	L6-27	10:35:16	700,392	1,170,963	>3.0 Ft. Soft Sediment
	L6-28	10:35:55	700,365	1,170,950	>3.0 Ft. Soft Sediment

TABLE 2
GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT
HS14 & 16 SEDIMENT PROBING RESULTS

Date	Sampling Station ID	Time (Hrs- EST)	Position NY State Plane East NAD27		Observation
			Easting (ft)	Northing (ft)	
3/24/99	L7-1	10:44:41	700,560	1,168,667	1.0 Ft. Sand
	L7-2	10:46:07	700,538	1,168,678	Hard Bottom
	L7-3	10:46:38	700,515	1,168,688	Hard Bottom
	L7-4	10:47:15	700,493	1,168,699	No Data
	L7-5	10:47:46	700,470	1,168,711	No Data
	L7-6	10:48:10	700,448	1,168,720	No Data
	L7-7	10:48:34	700,426	1,168,732	Hard Bottom
	L7-8	10:49:03	700,404	1,168,743	Hard Bottom
	L7-9	10:49:36	700,382	1,168,756	Hard Bottom
	L7-10	10:50:05	700,359	1,168,767	1.0 Ft. Sand
	L7-11	10:50:35	700,337	1,168,778	>3.0 Ft. Soft Sediment
	L7-12	10:51:18	700,315	1,168,790	>3.0 Ft. Soft Sediment
	L7-13	10:51:47	700,291	1,168,795	>3.0 Ft. Soft Sediment
	L7-14	10:52:30	700,272	1,168,811	Hard Bottom
	L7-15	10:53:12	700,256	1,168,821	>3.0 Ft. Soft Sediment
3/24/99	L8-1	10:56:49	700,400	1,168,378	Hard Bottom
	L8-2	10:57:44	700,376	1,168,386	Hard Bottom
	L8-3	10:58:25	700,356	1,168,400	Hard Bottom
	L8-4	10:58:50	700,332	1,168,409	Hard Bottom
	L8-5	10:59:21	700,311	1,168,424	Hard Bottom
	L8-6	10:59:45	700,286	1,168,428	No Data
	L8-7	11:00:10	700,266	1,168,444	No Data
	L8-8	11:00:36	700,244	1,168,456	No Data
	L8-9	11:01:04	700,225	1,168,471	Hard Bottom
	L8-10	11:01:33	700,202	1,168,481	1.0 Ft. Sand
	L8-11	11:02:06	700,179	1,168,489	1.0 Ft. Sand
	L8-12	11:02:36	700,157	1,168,500	>2.0 Ft. Soft Sediment
	L8-13	11:03:14	700,136	1,168,513	>2.0 Ft. Soft Sediment
	L8-14	11:03:51	700,114	1,168,526	>4.0 Ft. Soft Sediment
	L8-15	11:04:31	700,091	1,168,534	3.0 Ft. Soft Sediment
	L8-16	11:05:00	700,082	1,168,544	3.0 Ft. Soft Sediment
3/24/99	L9-1	11:09:29	700,315	1,168,086	6.0 in. Gravel
	L9-2	11:11:42	700,294	1,168,091	6.0 in. Soft sediment
	L9-3	11:13:40	700,273	1,168,097	Hard Bottom
	L9-4	11:14:17	700,249	1,168,101	Hard Bottom
	L9-5	11:15:10	700,227	1,168,111	Hard Bottom
	L9-6	11:16:21	700,204	1,168,118	Hard Bottom
	L9-7	11:17:38	700,181	1,168,128	Hard Bottom
	L9-8	11:18:33	700,158	1,168,137	Hard Bottom
	L9-9	11:18:55	700,133	1,168,142	Hard Bottom
	L9-10	11:19:19	700,109	1,168,148	Hard Bottom
	L9-11	11:19:48	700,088	1,168,161	6.0 in. Sand
	L9-12	11:20:24	700,064	1,168,167	6.0 in. Sand
	L9-13	11:20:56	700,039	1,168,174	1.0 Ft. Sand
	L9-14	11:21:18	700,018	1,168,187	>1.0 Ft. Soft Sediment
	L9-15	11:21:44	699,994	1,168,180	>1.0 Ft. Soft Sediment
	L9-16	11:22:18	699,976	1,168,198	>1.0 Ft. Soft Sediment
	L9-17	11:22:46	699,953	1,168,210	>1.0 Ft. Soft Sediment
	L9-18	11:23:45	699,928	1,168,214	>2.0 Ft. Soft Sediment
	L9-19	11:24:15	699,904	1,168,225	>4.0 Ft. Soft Sediment
	L9-20	11:24:33	699,897	1,168,226	>3.0 Ft. Soft Sediment

TABLE 2
GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT
HS14 & 16 SEDIMENT PROBING RESULTS

Date	Sampling Station ID	Time (Hrs- EST)	Position NY State Plane East NAD27		Observation
			Easting (ft)	Northing (ft)	
3/24/99	L10-1	11:28:17	700,224	1,167,752	2.0 Ft. Soft Sediment
	L10-2	11:29:55	700,206	1,167,763	3.0 Ft. Soft Sediment
	L10-3	11:30:55	700,180	1,167,769	2.0 Ft. Soft Sediment
	L10-4	11:32:08	700,157	1,167,776	Hard Bottom
	L10-5	11:32:34	700,133	1,167,781	Hard Bottom
	L10-6	11:33:09	700,109	1,167,782	1.0 Ft. Sand
	L10-7	11:35:11	700,085	1,167,792	Hard Bottom
	L10-8	11:35:46	700,061	1,167,801	Hard Bottom
	L10-9	11:36:12	700,037	1,167,807	Hard Bottom
	L10-10	11:36:40	700,013	1,167,813	1.0 Ft. Sand
	L10-11	11:37:04	699,988	1,167,815	No Data
	L10-12	11:37:27	699,967	1,167,830	No Data
	L10-13	11:37:41	699,942	1,167,834	No Data
	L10-14	11:38:02	699,918	1,167,841	No Data
	L10-15	11:38:19	699,894	1,167,842	No Data
	L10-16	11:38:39	699,871	1,167,852	No Data
	L10-17	11:38:57	699,846	1,167,855	No Data
	L10-18	11:39:14	699,821	1,167,861	No Data
	L10-19	11:39:33	699,798	1,167,869	2.0 Ft. Soft Sediment
	L10-20	11:39:58	699,774	1,167,878	>3.0 Ft. Soft Sediment
	L10-21	11:40:33	699,752	1,167,878	>3.0 Ft. Soft Sediment
3/24/99	L11-1	11:44:42	700,189	1,167,526	>3.0 Ft. Soft Sediment
	L11-2	11:45:39	700,165	1,167,531	2.0 Ft. Soft Sediment
	L11-3	11:46:21	700,140	1,167,528	1.0 Ft. Soft Sediment
	L11-4	11:47:11	700,116	1,167,530	Hard Bottom
	L11-5	11:48:07	700,091	1,167,532	Hard Bottom
	L11-6	11:48:50	700,067	1,167,532	1.0 Ft. Sand
	L11-7	11:50:01	700,041	1,167,530	1.0 Ft. Sand
	L11-8	11:51:32	700,019	1,167,543	1.0 Ft. Sand
	L11-9	11:52:44	699,996	1,167,547	1.0 Ft. Sand
	L11-10	11:53:55	699,971	1,167,542	>6.0 in. Sand
	L11-11	11:54:23	699,946	1,167,541	No Data
	L11-12	11:54:55	699,923	1,167,554	Hard Bottom
	L11-13	11:55:19	699,899	1,167,548	3.0 in. Sand
	L11-14	11:55:45	699,875	1,167,554	No Data
	L11-15	11:56:10	699,850	1,167,557	No Data
	L11-16	11:56:26	699,826	1,167,564	No Data
	L11-17	11:56:45	699,801	1,167,569	No Data
	L11-18	11:57:05	699,777	1,167,564	1.0 Ft. Sand
	L11-19	11:57:26	699,751	1,167,559	3.0 Ft. Soft Sediment
	L11-20	11:57:58	699,728	1,167,563	>3.0 Ft. Soft Sediment
	L11-21	11:58:25	699,704	1,167,568	>4.0 Ft. Soft Sediment
	L11-22	11:58:48	699,679	1,167,572	3.0 Ft. Soft Sediment
	L11-23	11:59:21	699,655	1,167,574	>3.0 Ft. Soft Sediment
	L11-24	12:00:16	699,629	1,167,575	4.0 Ft. Soft Sediment
	L11-25	12:00:50	699,608	1,167,575	4.0 Ft. Soft Sediment

LE 3
GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT
HS 14 AND 16 DATA SUMMARY

						HOMOLOG DISTRIBUTION (% WT.)						
Location	Date Collected	Density grams(dry)/ml(wet)	Moisture (%)	TOC (mg/Kg)	Total PCB (mg/Kg)	MONO	DI	TRI	TETRA	PENTA	HEXA	HEPTA
P14-01 0-5CM	3/22/99	0.51	58.95	27000	28	13.81	34.1	28.29	15.55	5.71	1.9	0.53
P14-01 5-10CM	3/22/99	0.63	52.66	26000	439	27.05	55.33	12.28	3.7	1.26	0.29	0.08
P14-01 10-15CM	3/22/99	0.68	50.37	27000	1433	27.53	53.93	11.12	4.35	2.33	0.56	0.14
P14-02 0-5CM	3/22/99	0.76	46.6	19000	26	16.76	37.34	29.8	11.32	3.22	1.14	0.32
P14-02 5-10CM	3/22/99	0.75	46.83	25000	104	17.4	47.55	23.68	7.6	2.42	0.83	0.37
P14-02 10-15CM	3/22/99	0.73	48.37	18000	284	19.48	58.12	15.46	4.56	1.51	0.6	0.2
P14-03 0-5CM	3/22/99	0.29	74.57	48000	277	20.51	57.86	14.01	5.04	1.44	0.67	0.29
P14-03 5-10CM	3/22/99	0.31	72.61	46000	427	21.42	59.54	12.46	4.37	1.22	0.6	0.25
P14-03 10-15CM	3/22/99	0.28	75.23	61000	603	23.28	58.56	11.98	3.94	1.11	0.66	0.3
P14-04 0-5CM	3/22/99	1.73	15.85	2600	13	33.98	45.1	14.83	4.32	1.26	0.38	0.11
P14-05 0-5CM	3/22/99	0.36	69.23	63000	611	29.65	50.61	11.65	4.74	2.17	0.78	0.28
P14-05 5-10CM	3/22/99	0.31	72.57	81000	1273	29.78	53.92	9.95	3.59	1.65	0.72	0.29
P14-05 10-15CM	3/22/99	0.27	75.73	82000	1301	28.69	56.41	9.78	3.22	1.05	0.54	0.22
P14-06 0-5CM	3/23/99	1.51	21.57	4300	16	18.57	35.54	32.28	10.07	2.61	0.85	0.08
P14-06 5-10CM	3/23/99	1.25	28.58	9900	188	25.94	55.26	13.04	3.87	1.35	0.4	0.11
P14-07 0-5CM	3/22/99	0.45	64.17	49000	13	27.68	23.59	24.6	15.82	5.67	2.05	0.46
P14-07 5-10CM	3/22/99	0.55	57.72	32000	19	26.98	23.81	24.4	16.65	5.65	2.04	0.41
P14-07 10-15CM	3/22/99	0.51	59.9	32000	28	25.17	29.44	24.33	14.37	4.79	1.56	0.32
P14-09 0-5CM	3/23/99	0.15	86.28	92000	88	16.46	46.51	22.6	8.58	3.5	1.52	0.61
P14-10 0-5CM	3/23/99	0.74	48.57	13000	41	20.91	32.85	27.81	12.7	4.05	1.32	0.28
P14-10 5-10CM	3/23/99	0.91	39.83	18000	329	20.83	50.35	19.41	6.42	2.25	0.58	0.13
P14-10 10-15CM	3/23/99	0.67	50.2	32000	23	21.68	33.5	26.18	12.47	4.13	1.59	0.34
P14-12 0-5CM	3/23/99	0.72	47.42	13000	24	26.01	35.75	25.13	8.94	2.93	1	0.2
P14-12 5-10CM	3/23/99	1.52	19.74	4000	25	20.52	40.18	27.1	8.51	2.75	0.81	0.12
P14-12 10-15CM	3/23/99	1.58	17.64	3000	9	23.44	37.4	27.86	8.14	2.39	0.68	0.07
P14-13 0-5CM	3/23/99	0.78	43.26	17000	20	19.62	30.09	29.28	14.65	4.47	1.55	0.28
P14-13 5-10CM	3/23/99	0.84	41.76	26000	41	17.52	34.16	30.28	12.8	3.71	1.24	0.23
P14-13 10-15CM	3/23/99	0.83	42.32	22000	87	12	39.24	33.95	10.73	2.81	0.97	0.24
P14-13 5-10CM BD	3/23/99	0.8	43.79	22000	48	16.82	33.97	30.6	12.83	4.12	1.33	0.29
P16-03 0-5CM	3/23/99	0.98	36.53	12000	3	24.1	18.49	23.61	21.78	8.09	3.3	0.55
P16-03 5-10CM	3/23/99	1.09	32.17	17000	7	14.51	16.16	27.42	27.14	10.31	3.7	0.64
P16-03 10-15CM	3/23/99	1.28	26.25	4800	6	16.5	23.72	29.9	20.91	6.47	2.14	0.32
P16-05 0-5CM	3/23/99	1.04	34.28	6800	3	29.7	24.48	25.05	14.31	4.44	1.67	0.24
P16-05 5-10CM	3/23/99	1.46	20.61	3800	3	26.84	26.59	29.2	12.62	3.43	1.16	0.14
P16-05 10-15CM	3/23/99	1.6	17.6	4600	6	20	30.19	33.5	11.51	3.16	1.13	0.34
P16-05 5-10CM BD	3/23/99	1.43	22.38	3400	5	23.39	24.8	31.61	13.89	4.3	1.58	0.34
P16-06 0-5CM	3/23/99	0.55	57.06	33000	15	25.18	33.19	21.92	13.46	4.3	1.56	0.3
P16-06 5-10CM	3/23/99	0.66	50.78	33000	21	28.21	36.86	19.44	10.48	3.47	1.27	0.24
P16-06 10-15CM	3/23/99	0.78	45.07	20000	29	24.48	35.37	23.85	11.05	3.61	1.28	0.29

LE 3
GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT
HS 14 AND 16 DATA SUMMARY

						HOMOLOG DISTRIBUTION (% WT.)						
Location	Date Collected	Density grams(dry)/ml(wet)	Moisture (%)	TOC (mg/Kg)	Total PCB (mg/Kg)	MONO	DI	TRI	TETRA	PENTA	HEXA	HEPTA
P16-07 0-5CM	3/23/99	0.96	37.66	13000	6	30.06	23.44	25.49	13.96	4.76	1.8	0.4
P16-07 5-10CM	3/23/99	1.36	23.75	3500	14	12.94	35.86	34.77	11.42	3.56	1.13	0.27
P16-07 10-15CM	3/23/99	1.25	27.08	7900	110	11.3	52.14	23.69	7.46	2.96	1.51	0.66
P16-08 0-5CM	3/23/99	0.5	59.73	41000	24	24.24	33.32	22.9	13.66	4.18	1.42	0.25
P16-08 5-10CM	3/23/99	0.59	54.63	36000	75	27.47	43.07	17.96	7.93	2.57	0.81	0.16
P16-08 10-15CM	3/23/99	0.83	66.83	65000	1135	29.94	52.34	10.8	4.04	1.95	0.64	0.23
P16-09 0-5CM	3/23/99	0.79	43.98	10000	5	19.28	25.74	32.01	15.22	5.1	2.14	0.4
P16-09 5-10CM	3/23/99	1.23	27.99	3100	4	19.93	25.57	31.53	15.77	4.9	1.92	0.28
P16-09 10-15CM	3/23/99	1.04	33.46	3900	11	11.82	46.92	30.67	8.48	1.73	0.35	0.03
P16-10 0-5CM	3/23/99	0.52	59.06	31000	25	28.53	33.78	21.17	11.42	3.51	1.25	0.27
P16-10 5-10CM	3/23/99	0.48	60.68	54000	198	18.92	46.54	21.1	7.34	2.94	1.7	0.93
P16-10 10-15CM	3/23/99	0.49	60.3	44000	311	19.81	56.22	15.72	5.32	1.61	0.83	0.35

Notes:

BD = Blind duplicate sample

314436

FIGURES



0.5 0 0.5 1 Miles



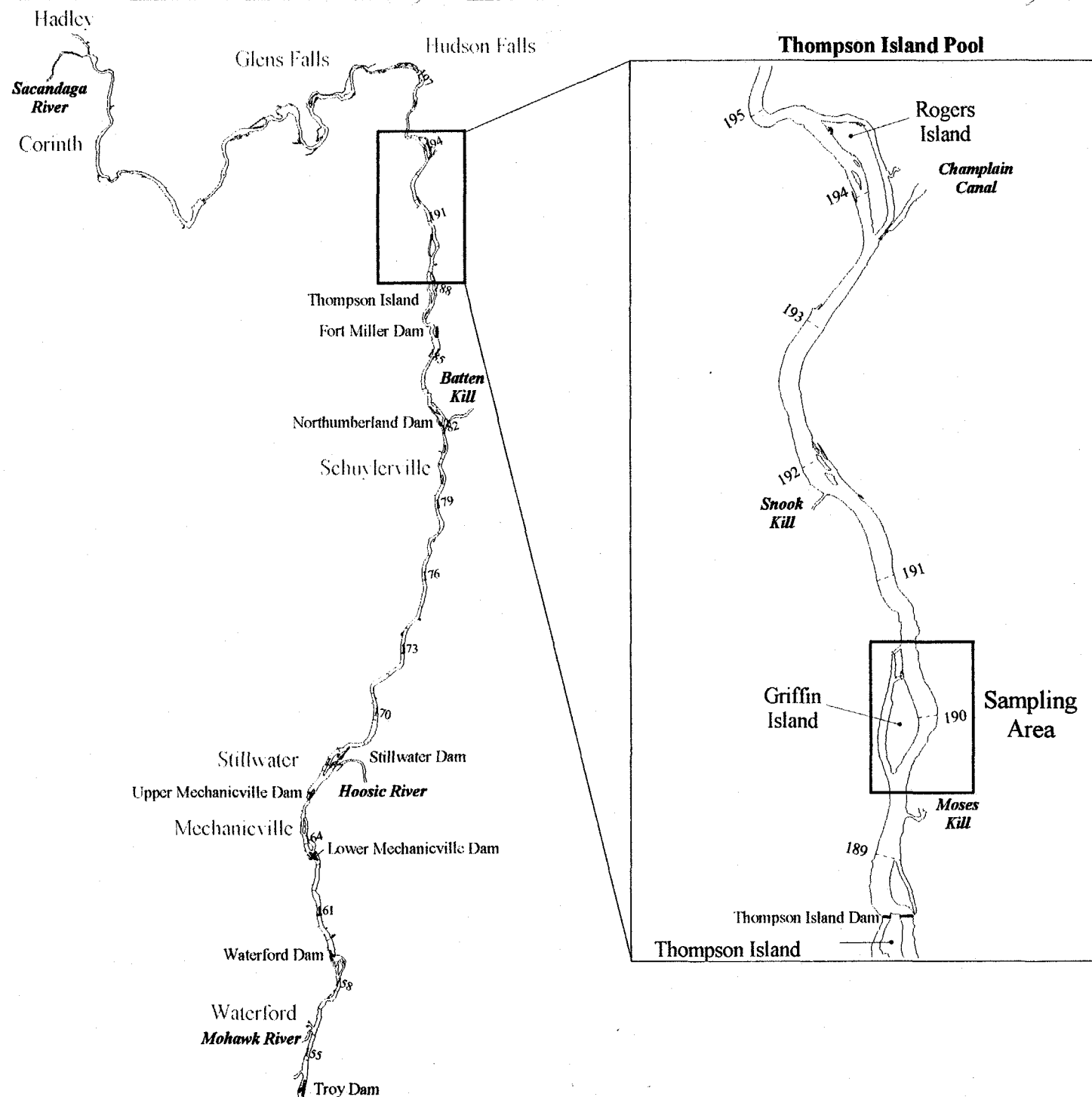
Note: Numbers along river indicate river miles measured from the Battery

NAME: D_Drive\CE\Noel\gl\proj\exam\of\center.apr



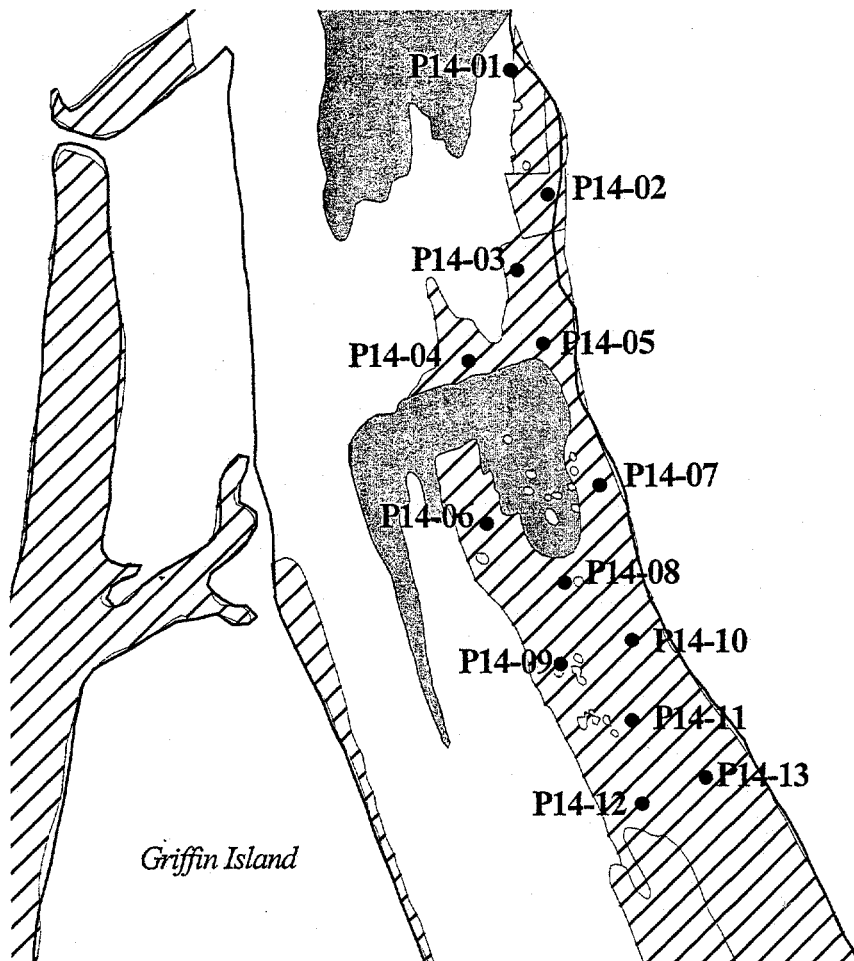
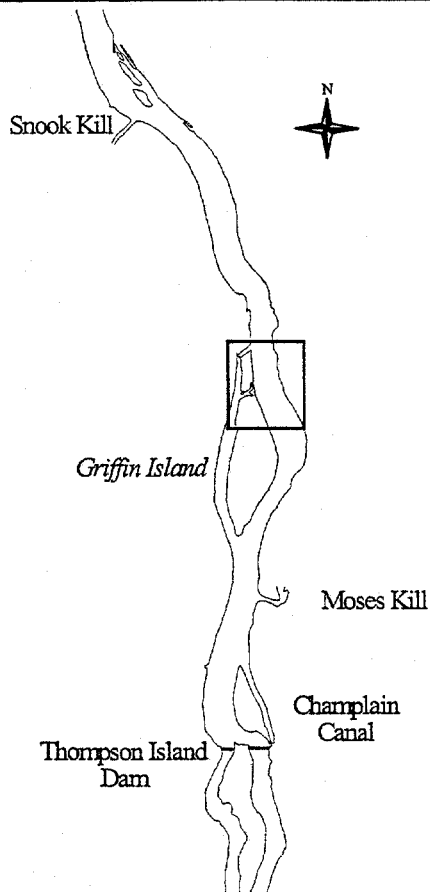
Project: GE200d 200

July, 1909



314438

LOCATION MAP



Graphic Scale

100 0 100 200 300 400 Feet

Legend

- Sampling Locations
- ~ Shoreline
- Coarse
- Finer
- Rock

Note: Sediment types based upon USEPA sidescan sonar images.



GENERAL ELECTRIC COMPANY
Hudson River Project

Figure 2.
Hot Spot 14 Sediment Sampling
Locations and Total PCBs Results.

\\msl01\Drive\GE\hudson\projects\hudson\fig2.apr

OEA
Quantitative Environmental Analysis, LLC

Project: GE/Hud 190

July, 1999

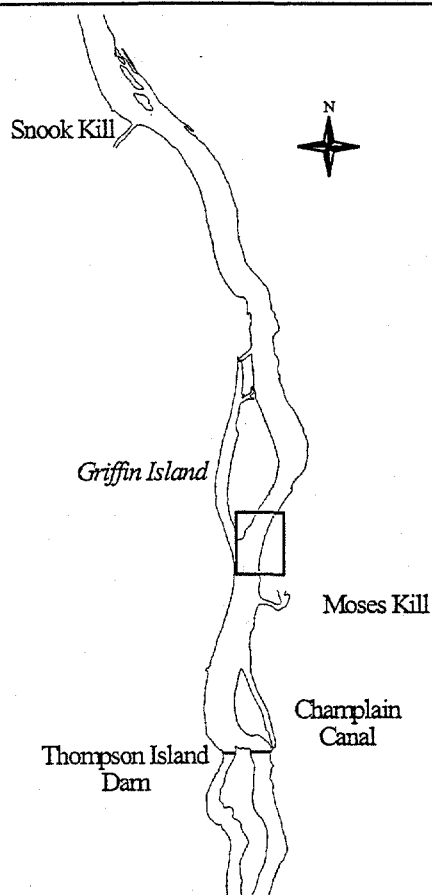
Total PCB Results [ppm]

Note: Samples have been corrected for analytical bias (O'Brien & Gere, 1997).

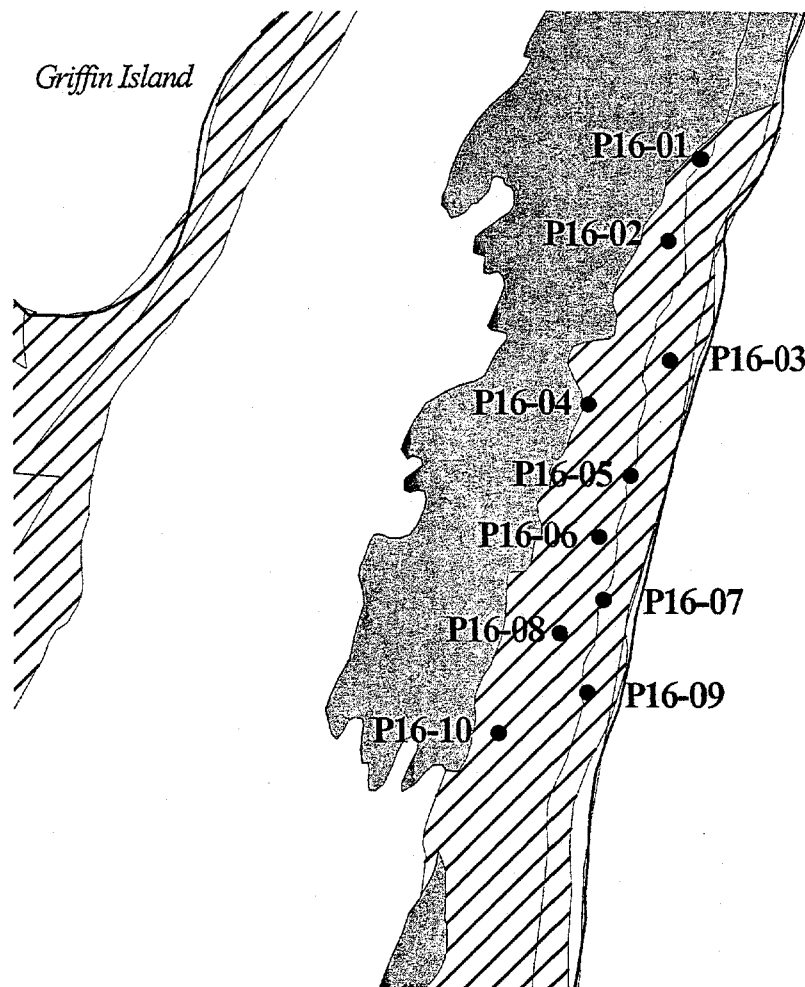
Core	0-5 cm	5-10 cm	10-15 cm
P14-01	28	439	1433
P14-02	26	104	284
P14-03	277	427	603
P14-04	13	NS	NS
P14-05	611	1273	1301
P14-06	16	188	NS
P14-07	13	19	28
P14-08	NS	NS	NS
P14-09	88	NS	NS
P14-10	41	329	23
P14-11	NS	NS	NS
P14-12	24	25	9
P14-13	20	41 (48)	87

NS = Core section was not recovered due to hard bottom; Samples in () are duplicate samples.

LOCATION MAP



Griffin Island



Graphic Scale

100 0 100 200 Feet

Legend

- Sampling Locations
- ~ Shoreline
- Coarse
- ▨ Finer
- Rock

Note: Sediment types based upon USEPA sidescan sonar images.



GENERAL ELECTRIC COMPANY
Hudson River Project

Figure 3.
Hot Spot 16 Sediment Sampling
Locations and Total PCBs Results.

\\MileID_Drive\GE\Hudson\proj\hudson\milling99.asp

OEA
Quantitative Environmental Analysis, LLC

Project: GEHud 190

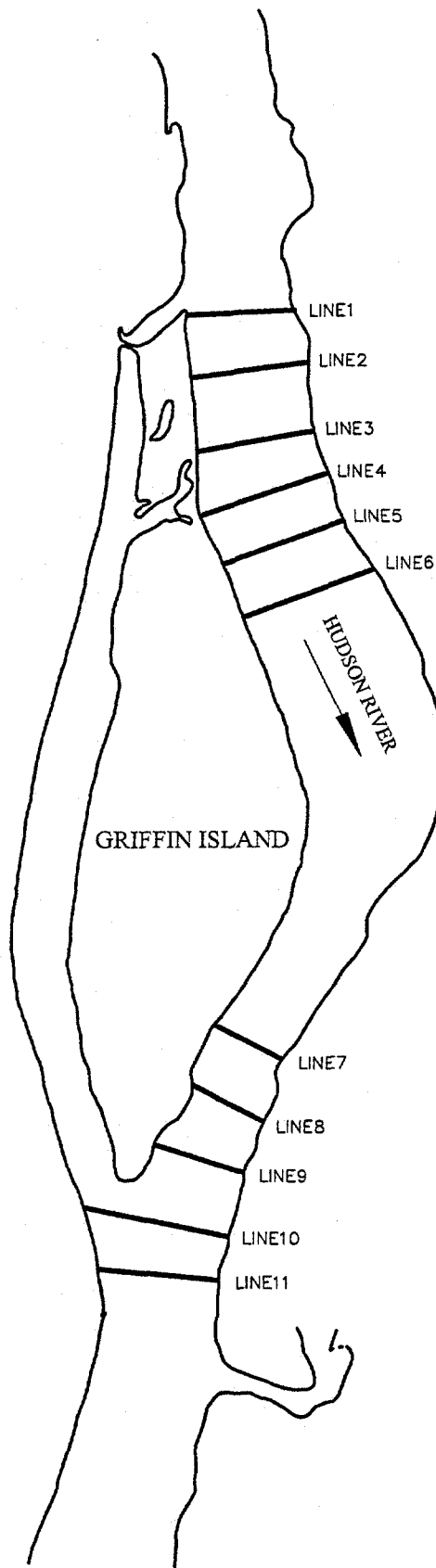
July, 1999

Total PCB Results [ppm]

Note: Samples have been corrected for analytical bias (O'Brien & Gere, 1997).

Core	0-5 cm	5-10 cm	10-15 cm
P16-01	NS	NS	NS
P16-02	NS	NS	NS
P16-03	3	7	6
P16-04	NS	NS	NS
P16-05	3	3 (5)	6
P16-06	15	21	29
P16-07	6	14	110
P16-08	24	75	1135
P16-09	5	4	11
P16-10	25	198	311

NS = Core section was not recovered due to hard bottom; Samples in () are duplicate samples.



GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT
HYDROGRAPHIC DATA COLLECTION TRANSECTS

HS14-16transsects

FIGURE 4

SCALE: 1 IN = 1000 FT

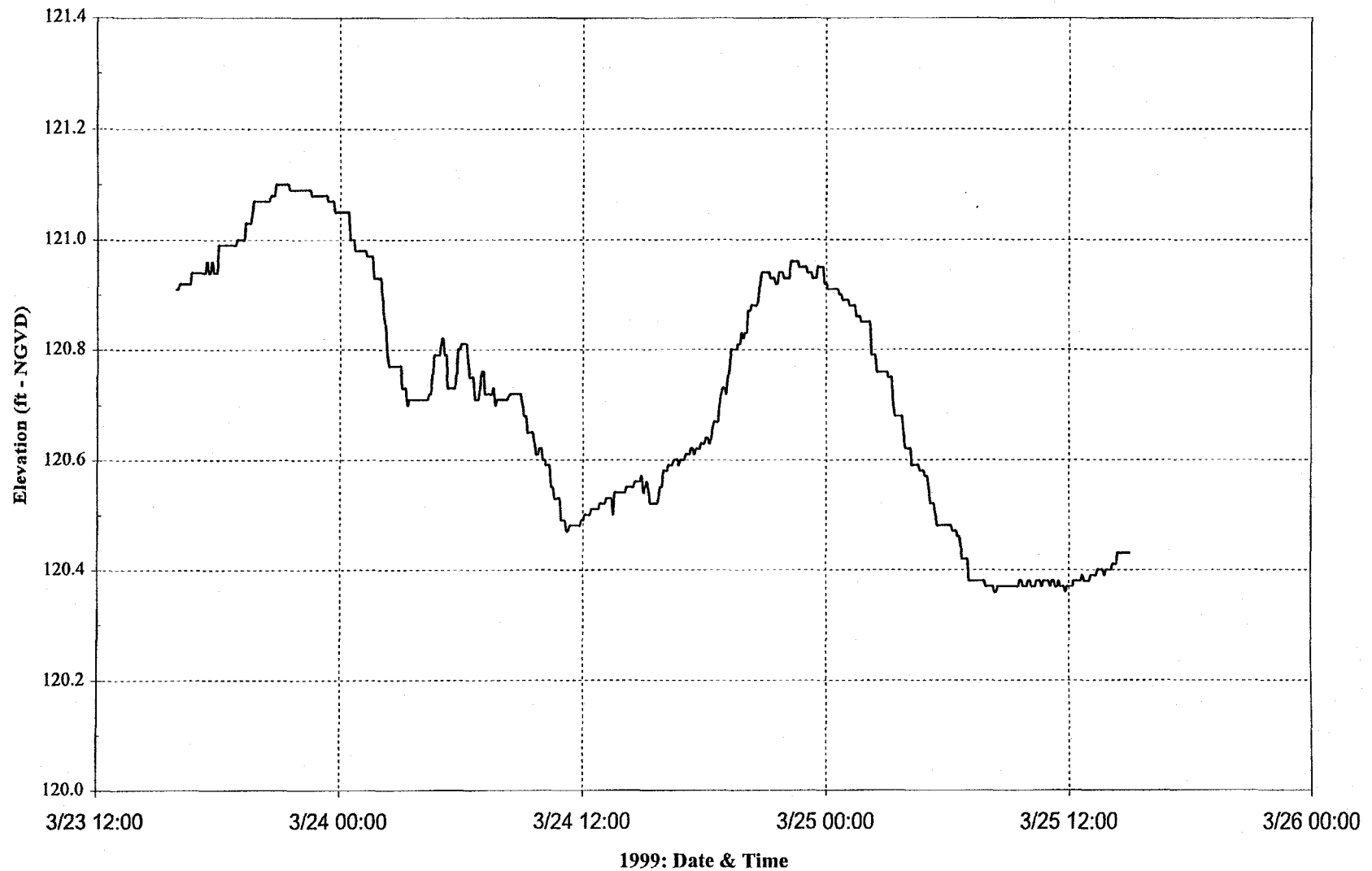
OEA
Quantitative Environmental Analysis, LLC

GENhud 190

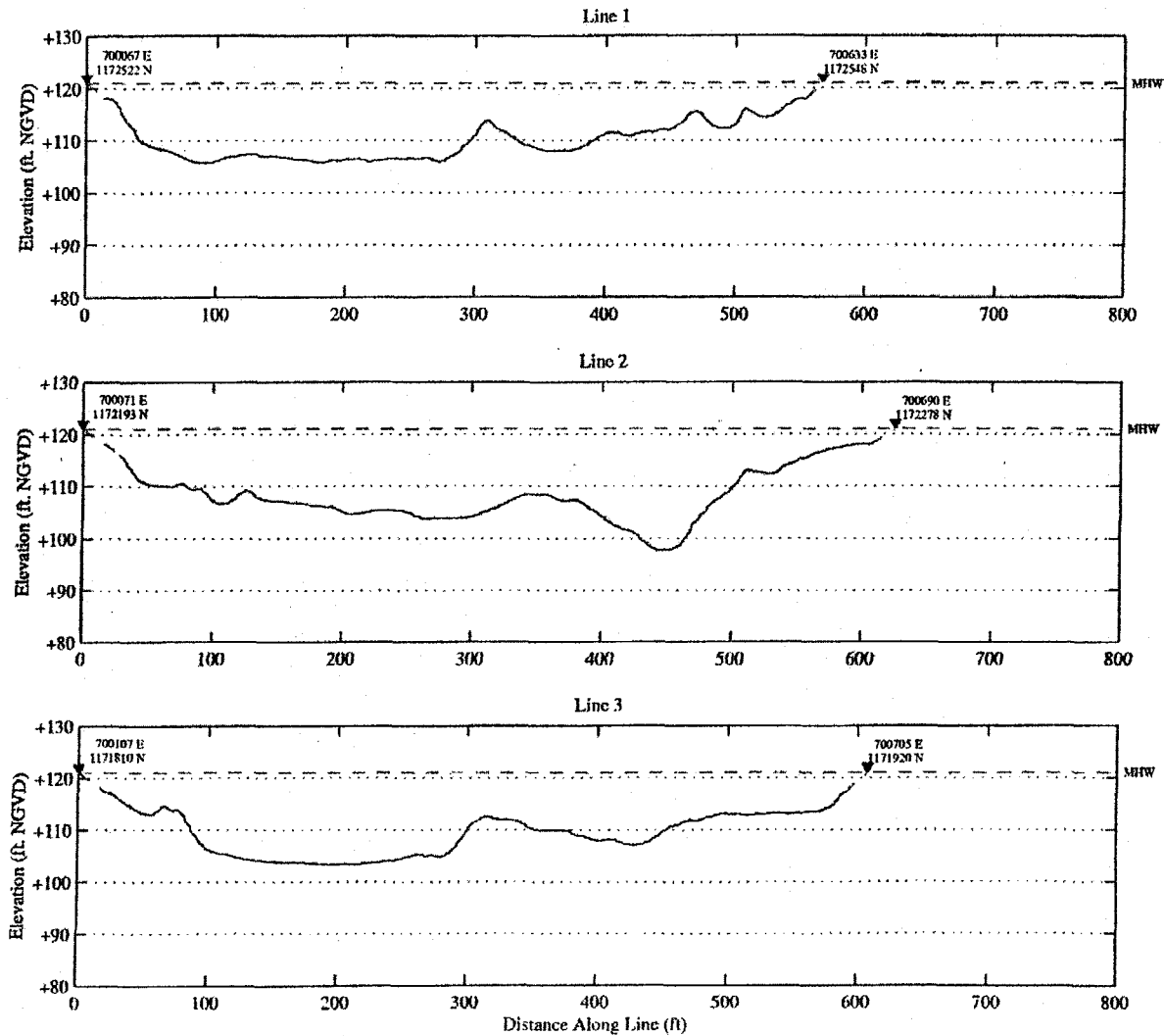
July, 1999

314441

Figure 5
Thompson Island Pool Water Elevation
March 23 - 25, 1999



Note: Data provided by Ocean Surveys, Inc.



Note: Data provided by Ocean Surveys, Inc
MHW = Mean Height of Water Column
NGVD = National Geodetic Vertical Datum (1929)

GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT HOTSPOT 14 1999 HYDROGRAPHIC DATA
RIVER BED CROSS SECTIONS - SURVEY LINES 1-3

MDL: D:\GENhud\line123.ppt

FIGURE 6

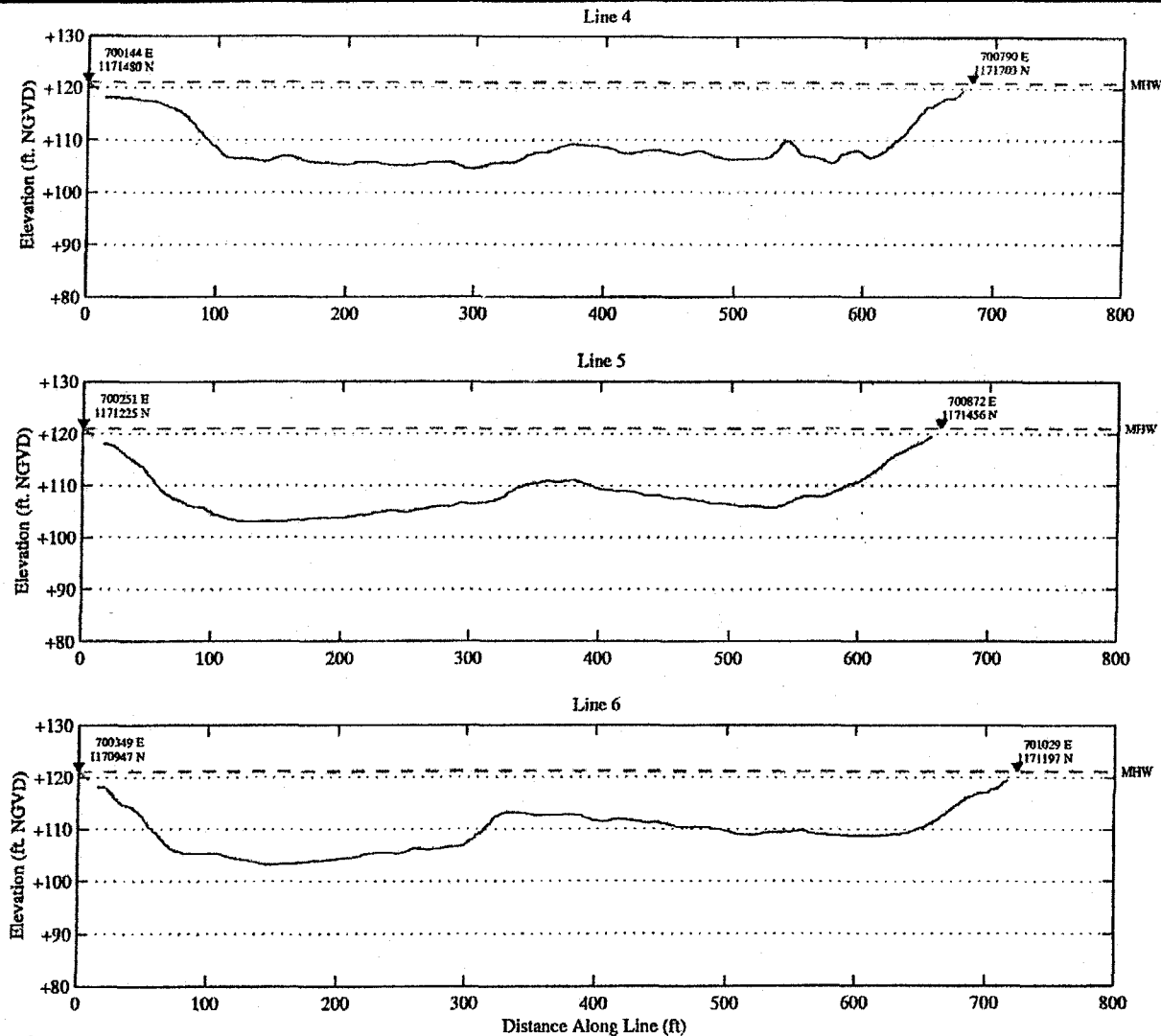
SCALE: AS SHOWN



GENhud 190

July, 1999

314443



Note: Data provided by Ocean Surveys, Inc
MHW = Mean Height of Water Column
NGVD = National Geodetic Vertical Datum (1929)

GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT HOTSPOT 14 1999 HYDROGRAPHIC DATA
RIVER BED CROSS SECTIONS - SURVEY LINES 4-6

MDL: D:\GENhudVine456.ppt

FIGURE 7

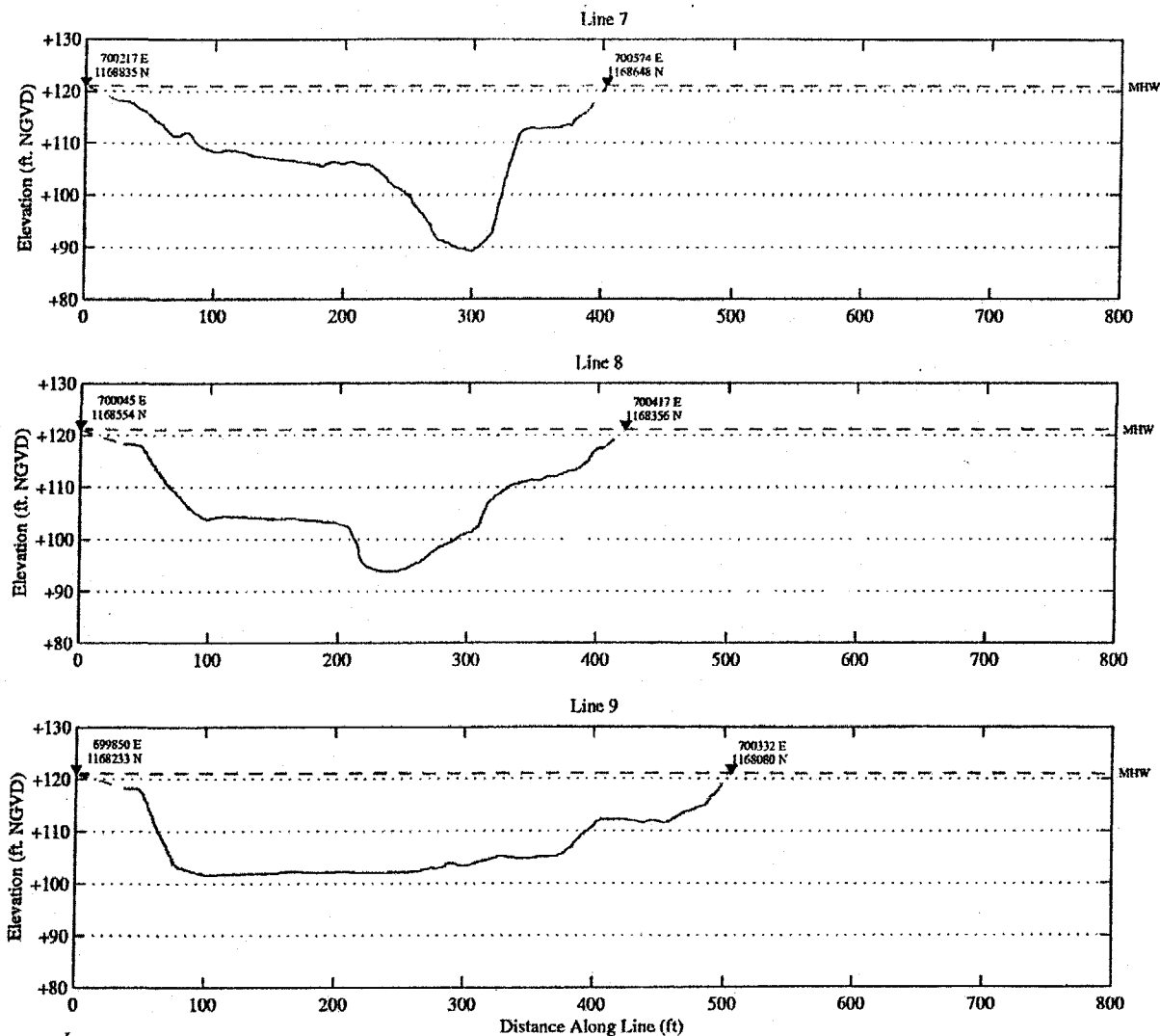
SCALE: AS SHOWN

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Quantitative Environmental Analysis, LLC

GENhud 190

July, 1999

314444



Note: Data provided by Ocean Surveys, Inc
MHW = Mean Height of Water Column
NGVD = National Geodetic Vertical Datum (1929)

GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT HOTSPOT 16 1999 HYDROGRAPHIC DATA
RIVER BED CROSS SECTIONS - SURVEY LINES 7-9

MDL: D:\GENhud\line789.ppt

FIGURE 8

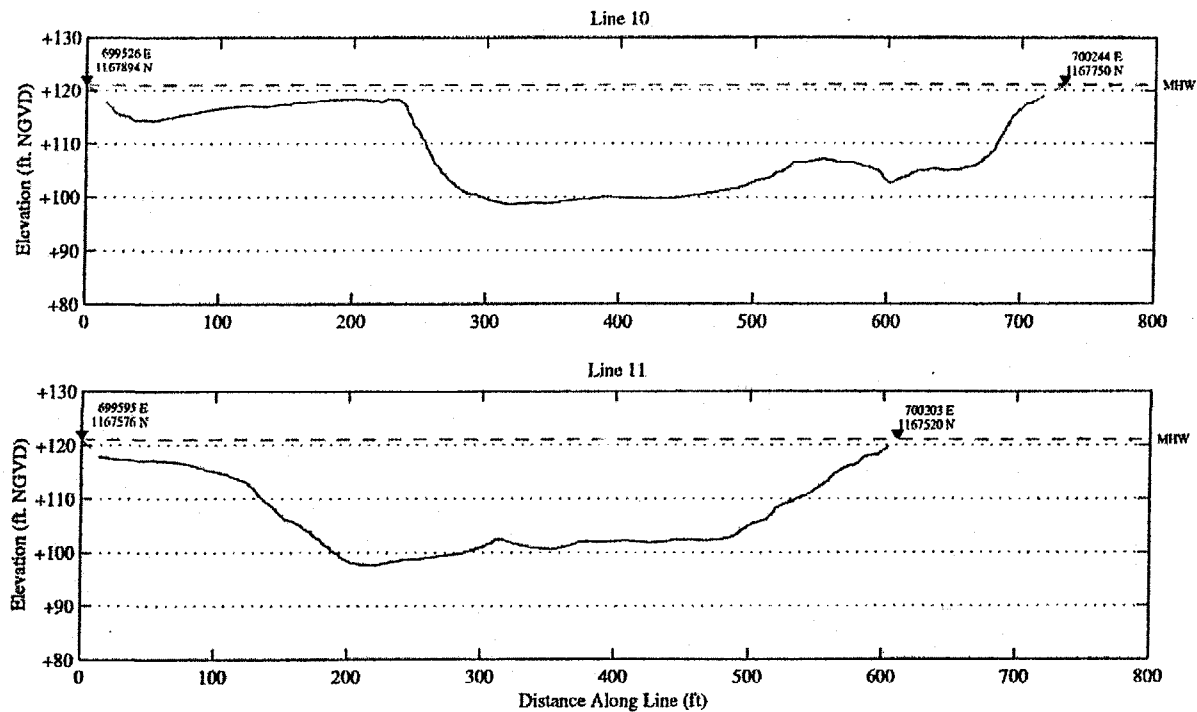
SCALE: AS SHOWN

QEA
Quantitative Environmental Analysis, LLC

GENhud 190

July, 1999

314445



Note: Data provided by Ocean Surveys, Inc
 MHW = Mean Height of Water Column
 NGVD = National Geodetic Vertical Datum (1929)

GENERAL ELECTRIC COMPANY
HUDSON RIVER PROJECT HOTSPOT 16 1999 HYDROGRAPHIC DATA
RIVER BED CROSS SECTIONS - SURVEY LINES 10-11

MDL: D:\GENhud\line1011.ppt

FIGURE 9

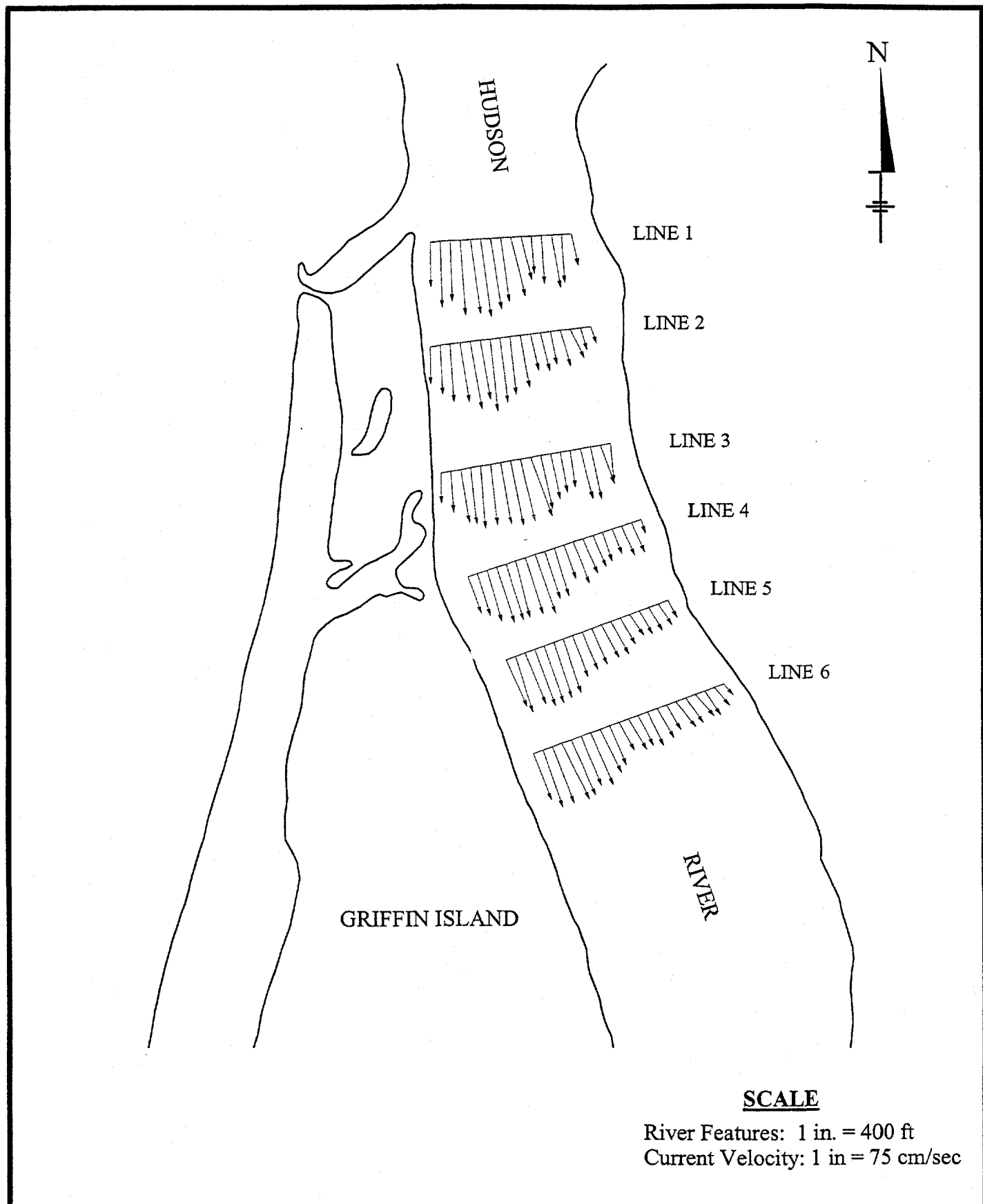
SCALE: AS SHOWN

OEA
 Quantitative Environmental Analysis, LLC

GENhud 190

July, 1999

314446



GENERAL ELECTRIC COMPANY
 HUDSON RIVER PROJECT
 HS14 VERTICALLY AVERAGED
 CURRENT VECTORS

HS14velocity1.TCW

FIGURE 10

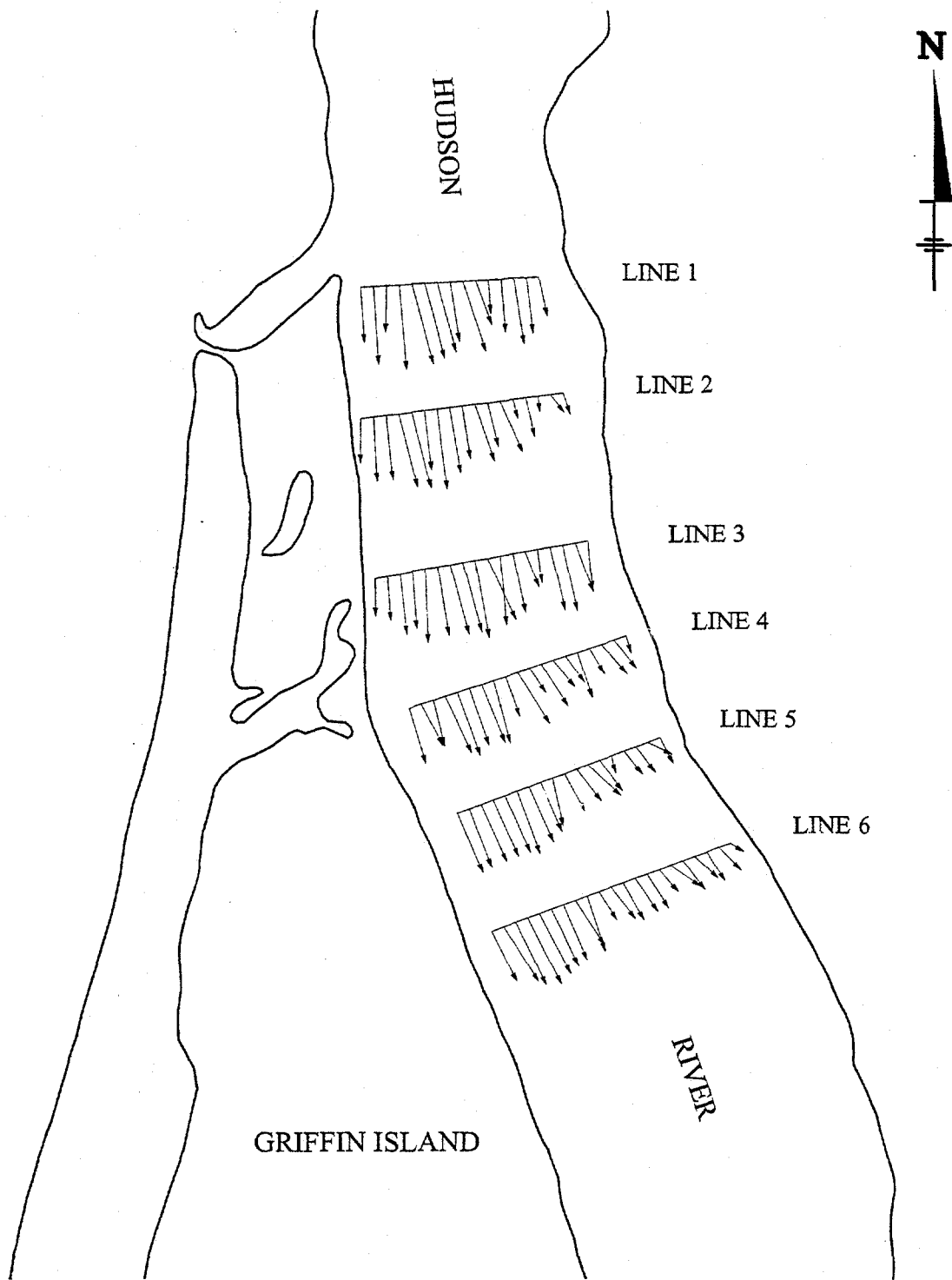
SCALE: AS SHOWN

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 Quantitative Environmental Analysis, LLC

GENhud 190

July, 1999

314447



SCALE

River Features: 1 in. = 400 ft
 Current Velocity: 1 in = 75 cm/sec

**GENERAL ELECTRIC COMPANY
 HUDSON RIVER PROJECT
 HS14 BOTTOM CURRENT VECTORS**

HS14velocity2.TCW

FIGURE 11

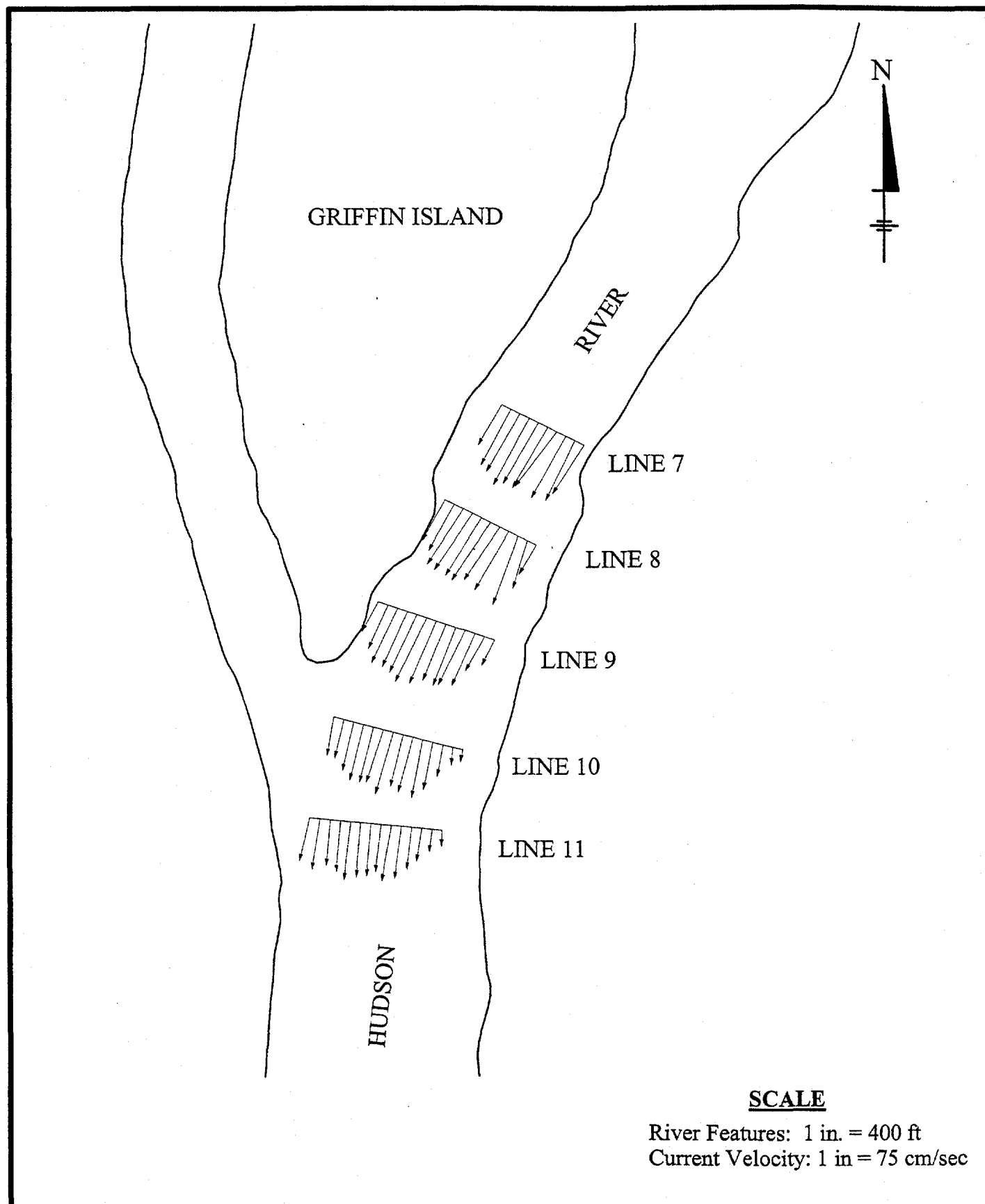
SCALE: AS SHOWN

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 Quantitative Environmental Analysis, u.c.

GENhud 190

July, 1999

314448



**GENERAL ELECTRIC COMPANY
 HUDSON RIVER PROJECT
 HS16 VERTICALLY AVERAGED
 CURRENT VECTORS**

HS16velocity1.TCW

FIGURE 12

SCALE: AS SHOWN

OEA
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GENhud 190

July, 1999

314449

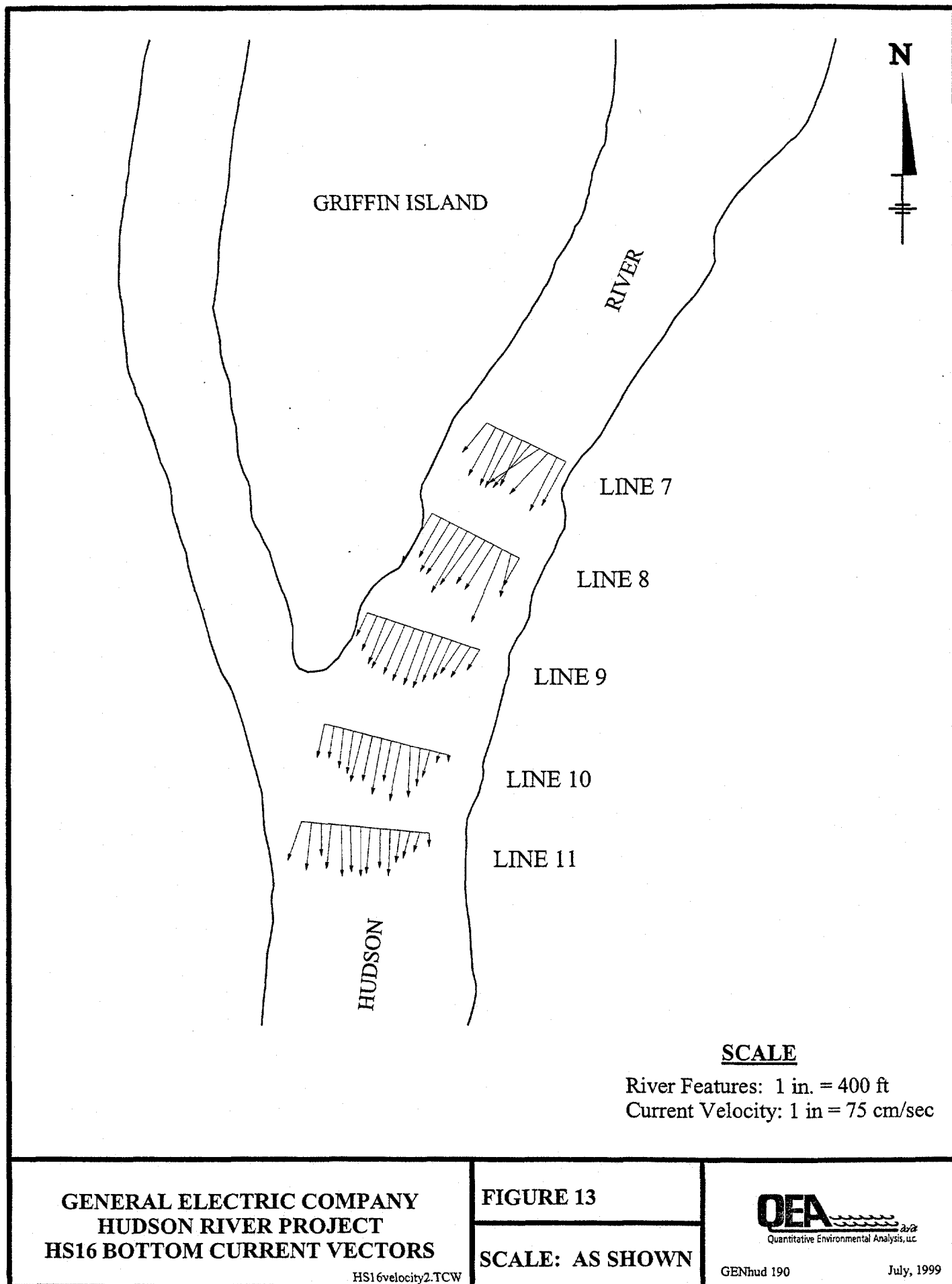


EXHIBIT A

**LABORATORY DATA PACKAGES
(BOUND SEPARATELY)**

EXHIBIT B

**ACOUSTIC DOPPLER CURRENT PROFILER
DATA**

Acoustic Doppler Current Profiler Data
QEA, Inc.
25 March 1999
OSI Job# 99SES010

Bins marked as depths.

Lines 1-11

DATE	TIME	NORTHING	EASTING	VERT	AVG	1.29m		1.79m		2.29m		2.79m		3.29m		3.79m		4.29m		4.79m		5.29m		5.79m		6.29m		6.79m		7.29m		7.79m		8.29m		
YYMMDD	HHMMSS	Y(ft)	X(ft)	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	SPEED	DIR	
cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	cm/s	degT	
990325	102247	1172518	700120	25	179	28	183	23	178	NaN	NaN	25	176	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102302	1172520	700150	37	178	39	180	40	179	41	177	36	176	34	181	35	176	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102314	1172522	700180	34	178	39	177	39	175	38	180	35	178	34	177	21	181	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102327	1172523	700210	42	176	44	176	43	176	42	175	41	177	38	175	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102341	1172525	700240	42	172	49	176	45	174	43	173	41	172	40	170	37	165	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102354	1172527	700270	44	172	49	172	49	172	47	173	43	174	40	172	35	165	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102407	1172528	700300	40	171	43	176	43	174	42	173	40	169	39	169	32	165	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102417	1172530	700330	36	172	42	170	38	173	37	174	35	172	33	169	27	171	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102430	1172532	700360	34	166	34	171	34	163	32	167	34	166	33	162	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102445	1172534	700390	25	166	29	170	21	160	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102456	1172535	700420	21	175	27	173	23	171	23	177	19	180	15	176	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102507	1172537	700450	27	176	30	179	27	174	27	177	24	175	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102519	1172539	700480	30	170	31	169	30	171	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102528	1172540	700510	27	176	30	178	25	173	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	102539	1172542	700540	18	168	18	168	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	103556	1172204	700120	21	179	21	179	20	180	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	103614	1172208	700150	28	177	32	179	27	177	22	173	29	177	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	103625	1172212	700179	33	176	33	179	37	178	35	175	31	173	29	174	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	103633	1172215	700209	34	171	36	171	34	172	33	174	32	172	34	166	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
990325	103642	1172219	700239	39	170	42	173	43	171	38	173	39	168	35	166	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
990325	103652	1172223	700269	34	170	38	172	37	170	36	169	34	168	32	169	27	173	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
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990325	103715	1172230	700328	37	173	43	174	44	174	39	176	38	172	34	172	33	172	30	170	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	103726	1172234	700358	33	174	36	177	38	177	36	173	35	174	32	174	29	172	24	171	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	103736	1172238	700388	30	170	34	173	31	169	31	170	29	169	30	175	27	161	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	103749	1172241	700418	21	167	22	172	22	167	21	163	20	166	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	103759	1172245	700447	22	166	24	171	23	169	20	171	20	169	20	163	25	156	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	103810	1172249	700477	19	169	25	168	23	172	22	173	21	167	18	165	15	169	12	170	9	164	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
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990325	103841	1172260	700566	13	163	16	163	16	177	12	163	10	142	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	103850	1172264	700596	10	161	10	161	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	104944	1171821	700152	17	179	17	179	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
990325	105014	1171826	700181	23	176	21	178	28	174	NaN	NaN	20	176	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
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990325	105037	1171837	700240	32	174	36	178	33	177	33	174	32	172	30	169	26	176	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
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990325	105055	1171847	700300	34	174																															

314454

314455