Gahagan & Bryant Associates, Inc.
5803 Kennett Pike, Suite D
Centreville Square
Wilmington, DE 19807-1195
(302) 652-4948 FAX (302) 655-9218
GBAWilmington@gba-inc.com

ENGINEERS ★ SURVEYORS

February 16, 2009

Subject: Submission of Required Deliverables for the Multi Beam Portion of the referenced Hydrographic Survey conducted upon the Passaic River, Vicinity of Newark, N.J.
Purchase Order #2068711 – Continuing Services Agreement

To: Mr. Donald Boye
ENSR Corporation
2 Technology Park Drive
Westford, MA 01886

From: Douglas C. Moore, PLS
Survey Division Manager
Gahagan & Bryant Associates, Inc.

Dear Mr. Boye:

Enclosed, please find the results and required deliverables submitted by Gahagan & Bryant Associates, Inc. re: multi-beam surveys conducted on the Passaic River.

Surveys were conducted to meet requirements generated via the Request for Qualifications and Request for Proposal for Multi-beam and Single Beam Bathymetry survey of the Lower Passaic River, dated September, 2008 and the subsequent proposal submitted by GBA and accepted by ENSR.

Multi-beam and single-beam surveys were conducted based upon the aforementioned criteria from River Mile 0 to River Mile 14.

It has been a pleasure working with you on this project and GBA looks forward to a continuing relationship with you and ENSR on future projects.

Please do not hesitate to contact me if any items require clarification.

Sincerely,

GAHAGAN & BRYANT ASSOCIATES, INC.

Douglas C. Moore, PLS
Survey Division Manager

623709

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.55
1        National Geodetic Survey,   Retrieval Date = NOVEMBER  8, 2007
 AJ3348 ***********************************************************************
 AJ3348  HT_MOD      -  This is a Height Modernization Survey Station.
 AJ3348  CORS        -  This is a GPS Continuously Operating Reference Station.
 AJ3348  DESIGNATION -  NJ INST OF TECH 2 CORS ARP
 AJ3348  CORS_ID     -  NJI2
 AJ3348  PID         -  AJ3348
 AJ3348  STATE/COUNTY-  NJ/ESSEX
 AJ3348  USGS QUAD   -  ELIZABETH (1995)
 AJ3348
 AJ3348                        *CURRENT SURVEY CONTROL
 AJ3348  ______________________________________________________________________
 AJ3348* NAD 83(CORS)-  40 44 29.30573(N)    074 10 39.72731(W)     ADJUSTED
 AJ3348* NAVD 88     -        50.24   (meters)     164.8    (feet)  GPS OBS
 AJ3348  ______________________________________________________________________
 AJ3348  EPOCH DATE  -        2002.00
 AJ3348  X           -   1,319,482.656 (meters)                     COMP
 AJ3348  Y           -  -4,656,035.856 (meters)                     COMP
 AJ3348  Z           -   4,140,724.998 (meters)                     COMP
 AJ3348  ELLIP HEIGHT-          17.929 (meters)          (03/??/02) ADJUSTED
 AJ3348  GEOID HEIGHT-         -32.30  (meters)                     GEOID03
 AJ3348  HORZ ORDER  -  SPECIAL (CORS)
 AJ3348  ELLP ORDER  -  SPECIAL (CORS)
 AJ3348
 AJ3348.ITRF positions are available for this station.
 AJ3348.The coordinates were established by GPS observations
 AJ3348.and adjusted by the National Geodetic Survey in March 2002.
 AJ3348.The coordinates are valid at the epoch date displayed above.
 AJ3348.The epoch date for horizontal control is a decimal equivalence
 AJ3348.of Year/Month/Day.
 AJ3348
 AJ3348.The orthometric height was determined by GPS observations and a
 AJ3348.high-resolution geoid model using precise GPS observation and
 AJ3348.processing techniques.
 AJ3348
 AJ3348.The PID for the CORS L1 Phase Center is AJ7974.
 AJ3348
 AJ3348.The XYZ, and position/ellipsoidal ht. are equivalent.
 AJ3348
 AJ3348.The ellipsoidal height was determined by GPS observations
 AJ3348.and is referenced to NAD 83.
 AJ3348
 AJ3348.The geoid height was determined by GEOID03.
 AJ3348
 AJ3348;                   North         East     Units Scale Factor Converg.
 AJ3348;SPC NJ       -   211,890.703   177,219.575   MT  0.99990912   +0 12 37.3
 AJ3348;SPC NJ       -   695,178.08    581,427.89   sFT  0.99990912   +0 12 37.3
 AJ3348
 AJ3348!             -  Elev Factor  x  Scale Factor =   Combined Factor
 AJ3348!SPC NJ       -   0.99999719  x   0.99990912  =   0.99990631
 AJ3348
 AJ3348                          SUPERSEDED SURVEY CONTROL
 AJ3348
 AJ3348  NAD 83(CORS)-  40 44 29.30562(N)    074 10 39.72764(W) AD(1997.00) c
 AJ3348  ELLIP H (06/??/01)   17.928  (m)                       GP(1997.00) c c
 AJ3348
 AJ3348.Superseded values are not recommended for survey control.
```

```
AJ3348.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AJ3348.See file dsdata.txt to determine how the superseded data were derived.
AJ3348
AJ3348_U.S. NATIONAL GRID SPATIAL ADDRESS: 18TWL6942610384(NAD 83)
AJ3348_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
AJ3348
AJ3348                          STATION DESCRIPTION
AJ3348
AJ3348'DESCRIBED BY NATIONAL GEODETIC SURVEY 2002
AJ3348'STATION IS A GPS CORS.  LATEST INFORMATION INCLUDING POSITIONS AND
AJ3348'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
AJ3348'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
AJ3348'   FTP CORS.NGS.NOAA.GOV: CORS/COORD  AND  CORS/STATION_LOG
AJ3348'   HTTP://WWW.NGS.NOAA.GOV  UNDER PRODUCTS AND SERVICES.

*** retrieval complete.
Elapsed Time = 00:00:00
```

GBA
MULTIBEAM SURVEY LOG

Date 11-18-2008 **Project ID #** 631-08

Vessel Name Sea Fix **Description** Passaic River Multibeam

Raw Data Directory Raw.20081118 **Echo Sounder** Reson 8101

Matrix/LNW File 20081118 **Positioning** POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 5.0 **General Remarks**

 # People 3 **HORZ/VERT CHECKIN**

S.O.S./Draft 1474+/- /3.3 Time RTK Tide Tide Board

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
13:55	r1	r1.r2w	44.82	1.5	
13:59	r1	r1a.raw	44.82	1.4	
14:04	r1	r1b.r2w	224.82	1.1	
1408	r1	r1c.r2w	44.82	1.2	
14:22	r2	r2A.r2w	224.82	1.3	
14:24	r2	r2B.r2w	44.82	1.2	
14:26	r3	r3.r2w	224.82	1.2	
14:28	r3	r3A.r2w	44.82	1.1	off line (+/-) 10-15'
14:30	r4	r4.r2w	224.82	1.2	
14:33	r4	r4A.raw	44.82	1.0	
14:36	r5	r5.r2w	224.82	1.0	BAD (LOST RTK FIX)
1439	r5	r5A.raw	224.82	1.0	BAD (LOST RTK FIX)
14:41	r5	r5B.r2w	44.82	1.0	BAD?
14:51	r5	r5C.r2w	224.82	1.0	
14.54	x9	x9.r2w	135.00	1.1	
14.55	x8	x8.r2w	315.0	1.0	
14:57	x7	x7.r2w	135.00	1.0	
1504	PY2-1	PY2-1.raw	109.85	1.0	
?	PY2-5	PY-2-5.raw	—	—	BAD (IGNORE)
15:10	PY2-1	PY2-1G.raw	189.85	1.0	

Prepared by: SBS

GBA
MULTIBEAM SURVEY LOG

Date 11-18-2008 Project ID # 631-08

Vessel Name Sea Fix Description Passaic River Multibeam

Raw Data Directory raw20081118 Echo Sounder Reson 8101

Matrix/LNW File 20081118 Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 5.0 General Remarks

People 3 HORZ/VERT CHECKIN

S.O.S./Draft /3.3 Time RTK Tide Tide Board

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
15:12	PY2_1	PY2_1H.raw	289.85	0.9	
15:14	PY2_2	PY2_2A.raw	109.86	0.9	
15:16	PY2_2	PY2_2B.raw	289.85	0.9	
15:18	PY2_3	PY2_3.raw	109.86	0.9	
15:19	PY2_3	PY2_3A.raw	289.86	0.9	
15:21	PY2_4	PY2_4.raw	109.85	0.9	
15:23	PY2_4	PY2_4A.raw	289.85	0.9	

Prepared by: _____

GBA
MULTIBEAM SURVEY LOG

Date: 11/19/08
Vessel Name: Sea Fix
Project ID #: 631-08
Description: Passaic River Multibeam

Raw Data Directory: 2008 11 19
Matrix/LNW File:
Average Boat Speed (kts): 5
People: 4
S.O.S./Draft: 1.4/1.4
Echo Sounder: Reson 8101
Positioning: POSMV 320 w/ Leica RTK
General Remarks: Beam Angle & SR Test
HORZ/VERT CHECKIN
Time: RTK Tide: Tide Board:

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
	R1	R1.RAW	224		Reference surface
8:01	R2	R2.RAW	44/224		
8:05	R3	R3.RAW	224	1.1	
	R4	R4.RAW	44	1.1	
	R5	R5.RAW	224	1.1	
8:11	X9	X9.RAW	315	1.1	
	X8	X8.RAW	135		
8:14	X7	X7.RAW	315		
	X6	X6.RAW	224/135		
8:16	X5	X5.RAW	315		
	X4	X4.RAW	135		
8:18	X3	X3.RAW	315		
8:20	X2	X2.RAW	135		
8:21	X1	X1.RAW	315		
		Beam Test Line			
8:23	R3	R3A.RAW			Multibeam
8:36		Bar check			
		5'			

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 11/19/2008 Project ID # 631-08

Vessel Name Sea Fix Description Passaic River Multibeam

Raw Data Directory 20081119 Echo Sounder Reson 8101

Matrix/LNW File Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 5.0 General Remarks

People 4 HORZ/VERT CHECKIN

S.O.S./Draft 1474 Time RTK Tide Tide Board

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
902	R2	r2A.r2w	224.82	1.2	Singlebeam (begin) Test
904	R3	r3B.r2w	44.82	1.2	
906	R4	r4A.r2w	224.82	1.2	BAD NO RTK
910	R4	r4B.r2w	44.82	1.0	
915	X6	X6A.r2w	315.0	1.1	
917	X4	X4A.r2w	135.0	1.1	
919	X2	X2B.r2w	315.0	0.9	

Prepared by: _____

GBA
MULTIBEAM SURVEY LOG

Date: 11/19/08
Vessel Name: Sea Fix
Project ID #: 631-08
Description: Passaic River Multibeam

Raw Data Directory: 2008 11 19
Matrix/LNW File: A1.LNW
Echo Sounder: Reson 8101
Positioning: POSMV 320 w/ Leica RTK
Average Boat Speed (kts):
People: 3
S.O.S./Draft: 13.6
General Remarks: Sunny, clear Seas 1-2 Wind 15-20 K/S
HORZ/VERT CHECKIN

Time	RTK Tide	Tide Board
1210	3.8 Ft	3.8 Ft

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
12:15	Sound Velocity Cast				
12:20	A01+	19.RAW	161°	1.7	Red Toe of channel
12:26	A01+123	.RAW	341°	1.7	
12:37	A01-130	.RAW	161°	1.7	
12:39	A01-135	.RAW	341°	1.7	
1264	A01-140	.RAW	161°	1.6	
1305	A01-150	RAW	341°	0.9	
1308	001_170	.RAW	161	0.9	
13:11	A01-190	.RAW	341°	0.9	
13:15	A01-198	.RAW	341°	1.2	
1328	[illegible]	.RAW	357°	1.4	
1331	A02085	.RAW	177°	1.4	
1336	A02-093	RAW	357°	1.4	
1341	A02-101	RAW	177°	1.5	
1345	A02 110	.RAW	357°	1.5	
1354	A02-130	.RAW	357	1.1	
1400	A02 138	.RAW	177°	1.2	
14:06	A02-144	.RAW	357°	1.22	
14:13	A02-064	.RAW	177°	1.2	
14:19	A02 142	.RAW	357°	1.2	

Prepared by: _____

GBA
MULTIBEAM SURVEY LOG

Date: 11/19/08
Vessel Name: Sea Fix
Project ID #: 631-08
Description: Passaic River Multibeam

Raw Data Directory: 20081117
Matrix/LNW File: A02 / A01
Average Boat Speed (kts): 4
People:
S.O.S./Draft:
Echo Sounder: Reson 8101
Positioning: POSMV 320 w/ Leica RTK
General Remarks:

HORZ/VERT CHECKIN

Time	RTK Tide	Tide Board
16:05	2.40	2.40 ✓

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
14:21	A02_148	.RAW	177	1.1	
14:26	A02_050	.RAW	357	1.0	
14:	A02_041	.RAW	177	1.0	Along Seawall SFBDC Barges
14:40	A02_032	.RAW	357		Along Barges @ Seawall
14:49	A01_097	.RAW	161	1.0	mid channel
14:56	A01_084	.RAW	341	1.0	
15:03	A01_075	.RAW	161	1.0	
15:07	A01_061	.RAW	341	0.9	
15:16	A01_048	.RAW	161	1.5	Line aborted Tug wash
15:27	A01_047	.RAW	341	1.4	
15:35	A01_37	.RAW	161		Barges @ Seawall
15:42	A01_26	.RAW	341	1.0	
	16:00	Sound Velocity		casts	

Prepared by: EC / JPS

GBA
MULTIBEAM SURVEY LOG

Date: 11/20/08 | Project ID #: 631-08

Vessel Name: Sea Fix | Description: Passaic River Multibeam

Raw Data Directory: 2008 11 20 | Echo Sounder: Reson 8101

Matrix/LNW File: | Positioning: POSMV 320 w/ Leica RTK

Average Boat Speed (kts): 5.0 | General Remarks: Partly Cloudy 35°F. (Seas - Calm) Winds -- 10-15

People: 3 | HORZ/VERT CHECKIN

S.O.S./Draft: 1454 / | Time: 7:40 | RTK Tide: 0' | Tide Board: NGVD27 0'

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
08:11 (AM)	A02-58	A02-58 .RAW	177°	1.3	Begin Fulton Multibeam Survey A01-A02
08:15	A02-042	A02-042 .RAW	357°	1.4	
08:22	A02-074	A02-074 .RAW	177°	1.4/1.0	
08:25	A02-105	A02-105.RAW	357°	1.0	
08:30	A02-116	A02-116.RAW	177°	1.0	
08:33	A02-116	A02-116A .RAW	177°	1.0	
08:42	A01-114	A01-114 .RAW	161°	0.9	Begin Fulton MB Survey A01 (L.F.)
08:46	A01-103	A01-103 .RAW	341°	0.9	
08:57	A01-080	A01-080.RAW	161°	1.1	
09:02	A01-091	A01-091 .RAW	341°	1.1	
09:09	A01-067	A01-067 .RAW	161°	1.1	
09:14	A01-056	A01-056.RAW	341°	1.1	
09:21	A01-041	A01-041.RAW	161°	1.0	
09:26	A01-143	A01-143.RAW	161°	0.9	
09:29	A01-179	A01-179.RAW	341°	0.9	
0930	A01-180	A01-180.RAW	341°	0.9	
09:55	A03-067	A03-067.RAW	10°	1.1	11/20/2008 (cont.) Begin A03 section
10:01	A03-074	A03-074.RAW	189°	1.2	
10:06	A03-081	A03-081 .RAW	10°	1.2	
10:14	A03-090	A03-090.RAW	189°	1.2	

Prepared by: JPS / E.D.

GBA
MULTIBEAM SURVEY LOG

Date 11-20-2008 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081120.RAW | Echo Sounder Reson 8101

Matrix/LNW File A03/A04 | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 5.0 | General Remarks PARTLY CLOUDY COLD 30's +/-

People 3 | HORZ/VERT CHECKIN Time / RTK Tide / Tide Board

S.O.S./Draft 1454

★ = DISREGARD RTK LOST ???)

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
10:20	A03-095	A03_095.RAW	10°	1.2	Lost RTK Fix (25 sec +/-)
10:25	A03-102	A03_102.RAW	189°	1.3/0.9	
10:30-31)	A03_107	A03-107.RAW	10°	1.2	Lost RTK Fix (very brief ~ 10-15 sec +/-)
10:37	A03_113	A03_113.RAW	189°	1.1	
10:43-44)	A03-117	A03_117.RAW	10°	1.1	Lost RTK Fix (Approx 30 sec +/-)
10:48	A03-063	A03_063.RAW	189°	1.1	Lost RTK Fix (" " " ")
10:54	A03-052	A03-052.RAW	10°	1.0	
11:00-11:02)	A03-046	A03-046.RAW	189°	1.1	
★ 11:05	A03-040	A03-040.RAW ★	10°	1.0	★ MULTIPLE LOSSES OF FIXED RTK POSITION Lost RTK Fix (TEMP Approx 20-25 sec +/-)
11:10	A03-045	A03_045.RAW	189°	1.1	
11:20	A04_106	A04_106.RAW	17°	1.1	Begin A04 Cell Section
11:25	A04_111	A04_111.RAW	196°	1.2	
11:32	A04_120	A04_120.RAW	17°	1.3	
11:40	A04_118	A04_118.RAW	196°	1.3	
11:46	A04_128	A04_128.RAW	17°	1.3	
11:53	A04_125	A04_125.RAW	196°	1.3	
12:02	A04_144	A04_144.RAW	17°	1.9	
12:06+/-	A04_141	A04_141.RAW	196°	2.0	Vessel symbol (spinning on the line) ← 90° point
12:21	A03_125	A03_125.RAW	189°	1.9	A03 section (short) ← LOST RTK FIX VERY BRIEFLY
12:27	A03_129	A03_129.RAW	9°	1.7	

Prepared by: JPS/ED

GBA
MULTIBEAM SURVEY LOG

Date 11/20/08 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081120 | Echo Sounder Reson 8101

Matrix/LNW File A03/ A05 | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts)

General Remarks

People 3

HORZ/VERT CHECKIN
Time | RTK Tide | Tide Board

S.O.S./Draft

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
12:33	A03_0138.RAW		190°	1.7	Port Beam 80°
	12:40 Sound velocity cast				
12:51	A05_107.RAW		10°		
12:56	A05.116	A05_116.RAW	189°	1.7	
13:03	A05121	A05.121.RAW	10°	0.9	
13:09	A05_129	A05_129.RAW	189°	1.2	
13:16	A05-130	A05-130.RAW	10°	1.3	SB Beam to 80°
13:23	A05_128	A05-128 RAW	189°	1.4	Port " 80° (flip)
13:38	A05_065	A05_065.RAW	189°	2.0/1.6	SB & Port Beam to 80°
13:44	A05_053	A05053.RAW	10°	1.5	Port 80° SB 65°
13:52	A05_047	A05-047.RAW	189°	1.4	P. beam < 80° / SB beam < 80°
13:58	A05-041	A05-041.RAW	10°	1.1	
14:05	A04_49	A04_49.RAW	196°	1.2	A04 (channel Ribinbegin) Beam (SB) to 65°
—	A04_43	A04_43.RAW	17°	1.3	
14:13	A04_037	A04_037.RAW	196°	1.2	SB 80° Beam / 65° beam Port
14:16	A04_050	A04_050RAW	196°	1.3	
14:20	A04_044.RAW		17°		
14:32	A06_070	A06_070.RAW	355°	1.0	A06 Begin section (shoal)
14:35	A06_064	A06_064.RAW	175°	1.1	

Prepared by:

Page ____ of ____

GBA
MULTIBEAM SURVEY LOG

Date: 11/20/08 | Project ID #: 631-08

Vessel Name: Sea Fix | Description: Passaic River Multibeam

Raw Data Directory: 20081120.raw | Echo Sounder: Reson 8101

Matrix/LNW File: | Positioning: POSMV 320 w/ Leica RTK

Average Boat Speed (kts): 5.0 K | General Remarks: 30° Cloudy 2:30pm-3:00pm

People: 3 | HORZ/VERT CHECKIN

S.O.S./Draft: | Time: 1545 | RTK Tide: 2.8 | Tide Board: 2.8

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
14:38	A06_058	A06_058.RAW	355°	1.9	
14:41	A06_055	A06_055.RAW	175°	1.1	
14:44	A06_049	A06_049.RAW	355°	1.9	
14:47	A06_105	A06_105.RAW	355°	1.0	BACK TO 65° beam ↓ on Both SB & PORT
14:51	A06_112	A06_112.RAW	175°	1.0	PORT TO ↓ 80°
14:59	A07_115	A07_115.RAW	332°	1.0	A07 Start Shore beam
1503	A07_120	A07_120.RAW	152°	0.9	SB beam ↓ to 80°
1507	A07_131	A07_131.RAW	332°	0.9	
1512	A07_128	A07_128.RAW	152°	0.9	
1515	A07_082	A07_082.RAW	332°	0.9	65°/65° ↓ beams (x2)
1519	A07_075	A07_075.RAW	152°	0.9	SB Beam ↓ to 80° (PORT 69°)
1522	A07_068	A07_068.RAW	332°	1.4	PORT TO ↓ 80° (SB ↓ 69°)
1527	A08_117	A08_117.RAW	296°	2.0	A08
1534	A08_108	A08_108.RAW	116°	2.3	
15:38	A08_102	A08_102.RAW	296°	1.0	
15:47	A08_178	A08_178.RAW	296°	1.0	80°/80° beam ↓
1553	A08_096	A08_096.RAW	116	2.0	Back
1557	A07_087	A07_087.RAW	152°	1.0	Channel Filling A07
1559	A07_096	A07_096.RAW	332°	0.9	" " "
1603	A07_103	A07_103.RAW	152°	1.0	

Prepared by: JPS

GBA
MULTIBEAM SURVEY LOG

Date 20081120 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081120 | Echo Sounder Reson 8101

Matrix/LNW File " | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4.0 - 5.0 | General Remarks

People 3 | HORZ/VERT CHECKIN

S.O.S./Draft | Time | RTK Tide | Tide Board

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
16:10	A06.085	A06085.RAW	355°	0.9	
16:14	A06.095	A06095.RAW	175°	0.9	
		Sand Vernier Test			16:20 (PM).

Prepared by: _____

Page _____ of _____

GBA
MULTIBEAM SURVEY LOG

Date 11/21/08 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam Single

Raw Data Directory _____ | Echo Sounder Reson 8101

Matrix/LNW File 2008 Passaic.SB | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4kts | General Remarks Single Beam Line (X-sections)

People 3

S.O.S./Draft 1795/1.4

HORZ/VERT CHECKIN

Time	RTK Tide	Tide Board	
7:50	-0.20	-0.20	✓

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
8:00	Bar check		5°, 20°, 15°, 10°, 5°		
8:14	0059	0059.RAW	97°	1.0	Single beam X-sects
8:15	0059	0059A.RAW	277°	1.0	
8:18	0078	0078.RAW	259°	1.2	
8:20	0078	0078A.RAW	79°	1.0	
8:24	0104	0104.RAW	184°	0.9	
8:26	0104	0104A.RAW	5°	0.9	
8:31	0148	0148.RAW	148°	0.9	
8:32	0148	0148A.RAW	329°	0.9	
8:34	0148	0148B.RAW	148°	0.9	
8:36	0153	0153.RAW	134°	0.9	
8:38	0153	0153A.RAW	314°	0.9	
8:42	0178	0178.RAW	310°	1.0	
8:43	0178	0178A.RAW	160°	0.9	
8:46	0192	0192.RAW	358°	1.0	
8:47	0192	0192A.RAW	178°	1.0	
8:50	0204	0204.RAW	188°	1.6	
8:51	0204	0204A.RAW	?	0.9	
852	0204	0204B.RAW	184	1.0	

Prepared by: ECD · JPS

GBA
MULTIBEAM SURVEY LOG

Date 11/21/2008 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam SINGLE

Raw Data Directory 2008 PASSAIC SB | Echo Sounder Reson 8101

Matrix/LNW File " " " " | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 5.0

People 30

S.O.S./Draft 4795/1.4

General Remarks Single Beam (X-sections)

HORZ/VERT CHECKIN

Time	RTK Tide	Tide Board	
10:31	-0.70	-0.70	✓

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
855	0235	0235.RAW	253°	1.0	Singlebeam X-sects (cont.)
8:57	0235	0235A.RAW	73°	1.0	
9:02	0277	0277.RAW	278°	1.0	
9:03	0277	0277A.RAW	98°	1.0	
9:06	0305	0305.RAW	118°	1.1	
9:08	0305	0305A.RAW	298°	1.1	
9:14	0368	0368.RAW	311°	1.1	
9:15	0368	0368C.RAW	131°	1.1	
9: X	0389	0389.RAW	969	09/	UNABLE TO RUN (LOW TIDE)
9: X	0389	0389.RAW	X°	0.9	UNABLE TO COMPLETE #0389 (LOW TIDE)
10	18	Bar Check			

Prepared by: _____

GBA
MULTIBEAM SURVEY LOG

Date: 11-21-2008 | Project ID #: 631-08

Vessel Name: Sea Fix | Description: Passaic River Multibeam

Raw Data Directory: (C:\PDTS\PASSAIC MB\) 20081121.RAW | Echo Sounder: Reson 8101

Matrix/LNW File: ↳ SAME | Positioning: POSMV 320 w/ Leica RTK

Average Boat Speed (kts): 4.0-5.0 | General Remarks: CLEAR/SUNNY 30°F%

People: 3 | HORZ/VERT CHECKIN

S.O.S./Draft: _____

Time	RTK Tide	Tide Board	
10:31	-0.70	-0.70	✓

Begin MULTIBEAM DATA COLLECTION 10:15AM +/- 11/21/2008

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
		SOUND VELOCITY	CHECK/TEST @ 10:25 AM.		
		TIDE BOARD CHECK @ 10:31			A.M.
10:37	A04-098	A04_098.RAW	197°	1.1	Begin MBeam (A04 section)
10:45	A04-092	A04-092.RAW	17°	1.1	
10:50	A04_086	A04_086_RAW	197°	1.0	
10:57	A04_080	A04_080.RAW	17°	1.0	
11:04	A04_074	A04_074.RAW	197°	0.9	
11:11	A04_068	A04_068.RAW	17°	1.1	
11:17	A04_062	A04_062.RAW	197°	1.1	
11:24	A04_056	A04_056.RAW	17°	1.2	
11:31	A05_100	A05_100.RAW	10°	1.2	Begin Multibeam (A05 section fill-in)
11:38	A05_092	A05_092.RAW	190°	1.2	
11:43	A05_087	A05_087.RAW	10°	1.2	
11:49	A05_079	A05_079.RAW	190°	1.2	
11:55	A05_074	A05_074.RAW	10°	1.2/1.7	
12:02	A05_069	A05_069.RAW	190°	1.8	
12:08	A05_071	A05_071.RAW	10°	1.9	
12:14	A08_121	A08_121.RAW	296°	1.7	Begin MBeam (Sect A08 fill-in)
12:23	A08_129	A08_129.RAW	116°	1.2	(note A08 is section w/
12:27	A08_133	A08_133.RAW	296°	1.7	two tracks RTK ↑/↓.)

Prepared by: J.PS/E.C.D

GBA
MULTIBEAM SURVEY LOG

Date 11-21-2008 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory (OP1 Passaic08) 20081121.RAW | Echo Sounder Reson 8101

Matrix/LNW File " " | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4.5 - 5.0 Kts | General Remarks

People 3 | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
12:31	A08_137	A08_137.RAW	116°	1.7	
12:36	A08_140	A08-140.RAW	297°	1.6	
12:40	A08_145	A08-145.RAW	116°	1.6	
12:45	A08_162	A08_162.RAW	297°	1.1	
12:46	A08_164	A08-164.RAW	117°	1.1	
12:51	A08_159	A08-159.RAW	297°	1.4/2.6	(K2 Bridges)
12:53	A08_159	A08-159.RAW	117°	1.8/2.6	
13:08	B01-136	B01-136.RAW	270°	1.2	
13:11	B01_141	B01-141.RAW	90°	1.3	
13:14	B01_145	B01-145.RAW	270°	2.3	
13:17	B01_151	B01_151.RAW	90°	1.3	
13:20	B01_155	B01_155.RAW	270°	1.4	
13:24	B01_158	B01_158.RAW	90° ✓	1.4	Port Beam ± to 90° (58 - 65°)
1331	B01_161	B01_161.RAW	90° ✓	1.5	" " " " " "
1339	B01-105	B01_105.RAW	90°	1.5	
13:44	B01_099	B01_099.RAW	90°	1.4	
13:49	B01_094	B01_094.RAW	270°	1.2	
13:53	B01_092	B01_092.RAW	90°	1.1	
13:58(?)	B01_086	B01_086.RAW	270°	1.2	
14:00	B01_083	B01_083.RAW	90°	1.2	

Prepared by: JPS/ECD

GBA
MULTIBEAM SURVEY LOG

Date: 11-21-2008 | Project ID #: 631-08

Vessel Name: Sea Fix | Description: Passaic River Multibeam

Raw Data Directory: (Passaic08) 20081121.raw | Echo Sounder: Reson 8101

Matrix/LNW File: " | Positioning: POSMV 320 w/ Leica RTK

Average Boat Speed (kts): 4-5 kts | General Remarks:

People: 3

S.O.S./Draft:

HORZ/VERT CHECKIN

Time	RTK Tide	Tide Board	
16:16	16:26	3.00	3.00 ✓

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
14:07	B02-124. RAW		264	1.2	
14:15	B02 127. RAW		84°	1.2	
14:22	B02-132. RAW		264°	1.0	
14:29	B02-133. RAW		84°	1.0	
14:37	B02-081. RAW		264°	1.0	
14:45	B02-076. RAW		84°	1.0	
14:53	B02-073. RAW		264°	1.0	
15:00	B02-068. RAW		84°	0.9	
15	B02-069. RAW		264°	1.0	
15:16	B03-095. RAW		248°	1.1	
15:22	B03-090. RAW		244°	1.5	
15:27	B03084	B03084.RAW	248°	1.0	
15:32	B03-078	B03_078.RAW	68°	1.0	
15:37	B03-076	B03_076.RAW	248°	1.0	
15:43	B03-071	B03_071.RAW	68°	1.1	
15:50	B03-122	B03_122.RAW	248°	1.0	No data
15:57	B03-121	B03_121.RAW	248°	1.0	
16:01	B03_054	B03-054.RAW	68°	0.9	
1603	B03_053	B03-053.RAW	248	0.9	
1605	B03-122	B03-122.RAW	68°	0.9	
16:11	B03-117	B03-117.RAW	248	0.9	

16:15 SV Profile

Prepared by: JPS / FCD

GBA
MULTIBEAM SURVEY LOG

Date 11-22-2008 **Project ID #** 631-08

Vessel Name Sea Fix **Description** Passaic River Multibeam

Raw Data Directory (Passaic08 Folder) 20081122.raw **Echo Sounder** Reson 8101

Matrix/LNW File Same directory folder(") **Positioning** POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4.5-5.0 kts **General Remarks** PARTLY CLOUDY 38° (TIDE: GOING OUT @ 7:10 AM)

 # People 3 **HORZ/VERT CHECKIN**

S.O.S./Draft 4'3" / | Time | RTK Tide | Tide Board |
|---|---|---|
| 07:31 | 0.00 | 0.00 ✓ |

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
		Sound Velocity Check →		@ 07:40 AM ✓	
07:44	B01-129	B01_129.RAW	90°	1.1	FILL IN BEGIN SECTION (B02) (CHANNEL)
07:47	B01-124	B01_124.RAW	270°	1.5	
07:51	B01-119	B01_119.RAW	90°	1.1	
07:52	B01-114	B01_114.RAW	270°	1.5	
07:57	B01-112	B01_112.RAW	90°	1.1	
07:59	B01-107	B01_107.RAW	270°	1.5/1.1	
0802	B02-089	B02_089.RAW	264°	1.1	BEGIN FILL IN CHANNEL OF SECTION (B02)
08:11	B02-080	B02_080.RAW	84°	1.0/1.1	
08:18	B02-092	B02_092.RAW	264°	1.0/0.9	
08:27	B02-096	B02_096.RAW	84°	0.9	
08:33	B02-101	B02_101.RAW	264°	0.9	
08:41	B02-104	B02_104.RAW	84°	0.9	
08:46	B02-109	B02_109.RAW	264°	1.0	
08:54	B02-112	B02_112.RAW	84°	1.0	
08:59	B02-115	B02_115.RAW	264°	1.0	
09:07	B02-116	B02_116.RAW	84°	0.9	
09:15	B03-112	B03_112.RAW	249°	0.9	(B03) Section begin fill-in (channel)
09:21	B03-107	B03_107.RAW	69°	0.9	
09:25	B03-104	B03_104.RAW	249°	0.9	

Prepared by: JPS

GBA
MULTIBEAM SURVEY LOG

Date 11-22-2008 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory passaic08 Elder 20081122.raw | Echo Sounder Reson 8101

Matrix/LNW File | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4.0-5.0kts | General Remarks 29° Sunny 9:40 AM TIDE - LOW

People 3 | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft 4756 |

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
09:31	B03_100	B03_100 .RAW	69°	0.9	
09:X	B03_X	B03_X .RAW	—	—	X N/A disregard XXXXXX
09:36	B04_071	B04_071 .RAW	213°	1.0	(B04) begin section (all).
09:44	B04_060	B04_060 .RAW	33°	1.1	
09:49	B04_074	B04_074 .RAW	213°	1.1	
09:56	B04_065	B04_065 .RAW	33°	1.2	
10:01	B04_062	B04_062 .RAW	213°	1.2	
10:08	B04_081	B04_081 .RAW	33°	1.2	
10:12	B04_084	B04_084 .RAW	213°	1.2	
10:17	B04_090	B04_090 .RAW	33°	0.9	
10:21	B04_091	B04_091 .RAW	213°	0.9	
10:25	B04_096	B04_096 .RAW	33°	1.2	
10:28	B04_101	B04_101 .RAW	213°	1.2	
10:31	B04_105	B04_105 .RAW	33°	1.1	
10:32	B04_061	B04_061 .RAW	213	1.1	
10:39	B04_049	B04_049 .RAW	33°	1.0	
10:43	B04_049	B04_049B.RAW	213°	1.0	
10:47	B04_44	B04_044 .RAW	33°	1.0	
10:52	B04_40	B04_040 .RAW	213°		
		.RAW			

Prepared by: JC

GBA
MULTIBEAM SURVEY LOG

Date 11-22-2008 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081122.raw | Echo Sounder Reson 8101

Matrix/LNW File " " B05 | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 5.0 | General Remarks

People 3 | HORZ/VERT CHECKIN Time 11:40 | RTK Tide -2.0 | Tide Board -2.0

S.O.S./Draft 4ft 6 in

~~UTC~~ EST Time	MB RNG	File	Line AZ	HDOP	Remarks
10:57	B05_038.RAW		231	1.0	start B01
10:59	B05_042.RAW		51	1.0	
11:02	B05_045.RAW		231	1.0	
11:04	B05_049.RAW		51	1.1	
11:07	B05_052.RAW		231	1.1	
11:17	B05_054.RAW		51	1.1	
11:21	B05_032.RAW		231	1.2	
11:23	B05_027.RAW		51	1.2	
11:27	B05_026.RAW		231	1.	

Prepared by: ECD / JPS

GBA
MULTIBEAM SURVEY LOG

Date 11-23-2008

Vessel Name **Sea Fix**

Project ID # **631-08**

Description **Passaic River Multibeam**

Raw Data Directory CP: \Passaic08MB\ 20081123.raw

Matrix/LNW File (Same) " "

Echo Sounder Reson 8101

Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4.5-5.0 kts

People 3

S.O.S./Draft 4701.4+/- | 0.0

General Remarks 28° Clear

HORZ/VERT CHECKIN

Time	RTK Tide	Tide Board
0742	0.5'	0.5'

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
07:56	B05-020	B05-020.RAW	232°	1.1	11/23/2008 Begin Fill in section B05
07:59	B05-016	B05-016.RAW	52°	1.1	
08:02	B05-011	B05-011.RAW	232	1.1	Port beam ∡s to 80° (SB∡=60°)
08:06	B05-054	B05-054.RAW	52°	1.0	Port & S.B. beam ∡s to 60°
08:10	B04-022	B04-022.RAW	33°	1.0-1.6	Begin sect ~~B04~~ fill in shoal (SB beam ∡ set to 80°)
08:15	B04-076	B04-076.RAW	213°	0.9	
08:18	B04-105	B04-105.RAW	213°	0.9	
08:26	B04-075	B04-075.RAW	33°	0.9	
08:37	B05-059	B05-059.RAW	232°	0.9	Begin B05 section fill in shoal (back to 60° 80 SB beam ∡s)
08:40	B05-062	B05-062.RAW	52°	0.9-1.0	(beam ∡ flip 80°-60°)
08:43	B06-104	B06-104.RAW	265°	1.0	Begin B06 Section
08:51	B06-111	B06-111.RAW	85°	1.0	SB Beam to 80° / Port = 60°
08:59	B06-099	B06-099.RAW	265°	1.1	Beam ∡ = 60° & 60°
09:08	B06.97	B06.097.RAW	85°	0.9	
09:13	B06.95	B06.95.RAW	265	0.9	
09:22	B06.91	B06.91.RAW	85°	0.9	Lost Fix under Bridge
09:27	B06.89	B06.89.RAW	265	0.9	
09:39	B06.85	B06.85.RAW	85°	1.1	
9:42	B06.81	B06.81.RAW	265°	1.1	
	B06.079	B06.079.RAW	85°	1.2	

Prepared by: J.S.

Page ____ of ____

GBA
MULTIBEAM SURVEY LOG

Date: 11-23-2008 | Project ID #: 631-08

Vessel Name: Sea Fix | Description: Passaic River Multibeam

Raw Data Directory: OPT PASSAICCEMBI 20081123.raw | Echo Sounder: Reson 8101

Matrix/LNW File: | Positioning: POSMV 320 w/ Leica RTK

Average Boat Speed (kts): 4.5-5.0 kts | General Remarks: 32°F Calm / CLEAR

People: 3

S.O.S./Draft: 4701.4 /

HORZ/VERT CHECKIN

Time	RTK Tide	Tide Board	
LAST IN 0742	0.50	0.50	✓

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
9:52	BOG-071	BOG. 71 RAW	265 ✓	1.2	
	BOG.068	BOG. 68 RAW	85°	1.2	
10:07	BOG. 53	BOG. 53. RAW	265	1.2	
10:15	BOG.115	BOG 115.RAW	85°	1.2	
10:19	BOG.119	BOG 119	265°	0.9	
10:22	BOG122	BOG-122.RAW	85°	1.3	
10:27	BOG-125	BOG. 125. RAW	265	0.9	
10:34	BOG-128	BOG. 128. RAW	265°	1.1	
10:41	BO7-062	20 BO7-062.R	275	1.1	
10:43	BO7.066	BO7.066	95°	1.0	
10:45	BO7059	BO7-059.RAW	275°	1.6	
10:48	BO7-054	BO7.054 RAW	95°	1.0	
10:50	BO7 048	BO7-048.RAW	275°		
10:53	BO7 041	BO7. 041	95°		
	BO7-24				
10:59	BO7.21	BO7-21	275		
	BO7-24		95	1.0	along Seawall
11:04	BO7.21	BO7-21	275		

Prepared by: JS

GBA
MULTIBEAM SURVEY LOG

Date _____ Project ID # 631-08

Vessel Name Sea Fix Description Passaic River Multibeam

Raw Data Directory _____ Echo Sounder Reson 8101

Matrix/LNW File B08 / B07 Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) _____ General Remarks _____

People _____ HORZ/VERT CHECKIN

S.O.S./Draft _____ Time RTK Tide Tide Board

UTC Time	MB RNG File	Line AZ	HDOP	Remarks
11:11	B08_045.RAW	295	1.1	
11:13	B08_040.RAW	115	1.1	
11:16	B08_035.RAW	295°	1.1	
11:19	B08_031.RAW	115°	1.2	
11:21	B08_27.RAW	295°	2.0	Sewer Hill & Buildings
11:24	B08_24.RAW	115°	1.8	steel sheet pile wall
11:27	B08_57.RAW	295°	1.2	
11:30	B08_56.RAW	115°		
11:33	B08_060.RAW	295°	1.2	
11:37	B08064.RAW	115°	1.2	
11:39	B08_062.RAW	295°		
11:44	B07_33.RAW	318°		
11:48	B07_42.RAW	138°	1.8	
11:51	B07_46.RAW	318°	1.8	
11:54	B07_50.RAW	138°	1.9	
11:57	B07_54.RAW	318°	1.9	
12:00	B07_58.RAW	138°		
12:04	B07_21.RAW	318	1.9	
12:08	B09_24.RAW	318°	1.9	
12:10	B07_20.RAW	138	1	

Prepared by: Eco

GBA
MULTIBEAM SURVEY LOG

Date 11/23/08 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 2008 11 23 | Echo Sounder Reson 8101

Matrix/LNW File B09 / C01 | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) _____ | General Remarks _____

People _____ | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft _____

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
12:12	B09_016	B09_016.RAW	318°		
12:14	B09-013	B09_013.R	138°		
12:17	B09_064	B09_064.R	318°		
12:19	B09_68	.RAW			
12:21	C01_032	.RAW	335°		
12:25	C01_056	.RAW	155°	1.7	
12:27	C01_060	.RAW	335°	1.6	
12:29	C01_064	.RAW	155°	1.6	
12:31	C01_068	.RAW	335°	2.2/1.6	(bridge)
12:33	C01_071	.RAW	155°	1.6	
12:35	C01_074	.RAW	335°	2.1/1.6	(bridge)
12:38	C01_078	.RAW	155°	1.7	
12:40	C01_080	.RAW	335°	1.6	
12:43	C01_049	.RAW	155°	1.6	60°/120° beam Ss
12:45	C01_047	.RAW	335°	1.6/2.1	(bridge)
12:47	C01_045	.RAW	155°	1.1	
12:51	C01_040	.RAW	155°	0.9	
12:54	C01_037	.RAW	335°	2.0/1.6/0.9	
12:56	C01_035	.RAW	155°	1.2	

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date: 11-23-2009 | Project ID #: 631-08

Vessel Name: Sea Fix | Description: Passaic River Multibeam

Raw Data Directory: PASSAIC08.MB 20081123.RAW | Echo Sounder: Reson 8101

Matrix/LNW File: (SAME) | Positioning: POSMV 320 w/ Leica RTK

Average Boat Speed (kts): 5.0 kts. | General Remarks: 33° CLEAR/SUNNY/CALM

People: 3 | HORZ/VERT CHECKIN Time: RTK Tide: Tide Board:

S.O.S./Draft: 1420@1.0@1331PM

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
13:00	C01_030	.RAW	335°	1.7	
13:02	C01_030	.RAW	155°	1.3	
1307	C02_032	.RAW	342°	1.3	
1316	C02_049	.RAW	162°	1.4	SOUND VELOCITY CHECK @ 13:31 (1420@1.0+/-)
13:22	C02_064	.RAW	342°	1.4	
13:32	C02_059	.RAW	162°	(1.4) 2.0↓+/-	(bridge @ start of line)
13:40	C02_054	.RAW	342°	1.1	
13:46	C02_058	.RAW	162°	1.2	
13:54	C02_046	.RAW	342°	2.1↓	
14:00	C02_037	.RAW	162°	1.2	
14:07	C02_035	.RAW	342°	1.1	
14:14	C02_033	.RAW	162°	1.0	
14:22	C02_033	.RAW	342°	1.1	
1429	C02_037	.RAW	162°	1.1	
14:37	C02_026	.RAW	342	1.0	
14:45	C02_1021	.RAW	162°	1.0	
14:55	C02_078	.RAW	342°	0.9	
15:03	C02_82	.RAW	162°	1.0	
15:16	C01_092	.RAW	155°	1.9	
15:20	C01_023	.RAW	155°	1.9	

Prepared by: JS | ED

GBA
MULTIBEAM SURVEY LOG

Date: 11/23/08 | Project ID #: 631-08

Vessel Name: Sea Fix | Description: Passaic River Multibeam

Raw Data Directory: 20081123 | Echo Sounder: Reson 8101

Matrix/LNW File: B01 / B05 | Positioning: POSMV 320 w/ Leica RTK

Average Boat Speed (kts): | General Remarks:

People: | HORZ/VERT CHECKIN

S.O.S./Draft: | Time: 1653 | RTK Tide: 25 | Tide Board: 215 ✓

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
15:24	Col 020	RAW	155	2.0	
15:27	col_014	RAW	355	2.0	
15:32	B09_010	RAW	137	1.9	
15:34	B09_007	RAW	317	1.0	
15:38	B07062	RAW	317	1.0	
15:42	B07_066	RAW	137°	1.0	
15:46	B08_66	RAW	115°	1.6	
15:50	606-020	RAW			
15:55	B07_067	RAW	96°	0.9	
15:59	B07_071	RAW	96°	0.9	
1606	B06_006	RAW	85°	0.9	
1613	B06053	RAW	265°	0.9	
1620	B06_112	RAW	265°	0.9	
1626	B06_142	RAW	85°	0.9	
1633	B06_146	RAW	265°	0.9	
1640	B06134	RAW	85°	1.0	
		Survey Complete			

Prepared by: ECB

GBA
MULTIBEAM SURVEY LOG

Date 11-24-2008 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory C:\PROJECTS\PASSAIC08MB\20081124-RAW (PASSAIC08MB) | Echo Sounder Reson 8101

Matrix/LNW File | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4.5-5.0 Kts. | General Remarks 32° CLEAR

People 3

HORZ/VERT CHECKIN

S.O.S./Draft

Time	RTK Tide	Tide Board
0801 am	2.10	2.10

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
		Tide board check @ 0801 am (see H/Z checkin above)			
		Sound Velocity Check @			am
	8:25	Sound velocity cast for C3			
8:30		C03-069.RAW	176°	1.1	under Bridge
8:34		C03-73.RAW	356°	1.1	
8:36		C03-77.RAW	176°	1.3	
8:41		C03-18.RAW	356°	1.3	
8:		C03-014.RAW			
8:49		Cobb-024.RAW	88	1.1	
8:53		C04-021.RAW	188°	1.1	
		C04-068.RAW			
9:11		C03-05.RAW	176	1.1	
9:13		C03-62.RAW	356		
09:16		C03-059.RAW	176°	1.1	
09:19		C03-053.RAW	356	2.0	
09:		C03-035.RAW	176°	2.0	
09:27		C03-039.RAW	356	1.1	
09:28		C03-043.RAW	176		

Prepared by: JRS

GBA
MULTIBEAM SURVEY LOG

Date 11-24-2008 Project ID # 631-08

Vessel Name Sea Fix Description Passaic River Multibeam

Raw Data Directory 20081124.raw (PassaicOBMB) Echo Sounder Reson 8101

Matrix/LNW File Same " " " " Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4.5-5.0 kts General Remarks

People 3 HORZ/VERT CHECKIN

S.O.S./Draft 14ft/m/S

Time	RTK Tide	Tide Board
10:22	-0.8	-0.8

UTC Time	MB RNG File	Line AZ	HDOP	Remarks
9:31	C03_029.RAW	356	2.0	
9:34	C03_026.RAW	176°	2.0	
9:40	C04_027.RAW	8°	1.1	
9:49	C04_039.RAW	188°	1.2	
9:55	C04_048.RAW	8°	1.2	
9:58	C04_057.RAW	188°		
10:03	C04_061_RAW	8°		
10:08	C04_065_RAW			
	10:12 sound velocity cast			
Return To Dock Prep off sick personnel				
	11:48 SV Profile			
11:55	C05_020.RAW	7°	7°	
11:01	C05_016_RAW	187°	1.7	
12:04	C05_013_RAW	7°	1.7	
12:08	C05_007_RAW	7°	1.7	
12:10	C05_011_RAW	187	1.7	
12:13	C05_012_RAW	7°	1.7	-1.67 Tide
12:21	C05_007_RAW	187°	1.7	
12:27	C05_031_RAW	7°	1.6	

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 11/24/08 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081124 | Echo Sounder Reson 8101

Matrix/LNW File C05, C06, C07 | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4kts | General Remarks

People 2 | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft 1418

UTC Time	MB RNG File	Line AZ	HDOP	Remarks
12:34	C5_035.RAW	187°	1.6	
12:40	C5_039.RAW	7°	1.6	
12:46	C5_043.RAW	187°	1.9	
12:52	C5_047_RAW	7		
12:58	C5_~~053~~_RAW	187		
	~~C5_053~~			
13:12	C6_35_RAW	170	1.3	
13:13	C6_37_RAW	197°	1.4	
13:15	C6_42_RAW	17°	1.4	
13:18	C6_45_RAW	197°	1.4	
13:20	C6_48_RAW	17°	1.5	
13:22	C6_52.RAW	197°	1.5	
13:24	C6_30_RAW	17°	1.5	
13:26	C6_26_RAW	197°	1.5	
13:28	C6_21_RAW	17°	2.0	
13:30	C6_18_RAW	197°	1.5	
13:31	C6_15_RAW	17°	2.0	
13:34	C7_~~022~~_RAW	25°	1.1	
13:45	C7_022.RAW	205°	1.2	
13:50	C7_031.RAW	25°	1.2	

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 11/24/2008 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081124 | Echo Sounder Reson 8101

Matrix/LNW File C07/C08 | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4kts | General Remarks

People | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
13:55	C07_35	.RAW	205°	1.2	
13:59	C07_39	.RAW	25°	1.2	
14:04	C07_43	.RAW	205°	1.2	
14:08	C07_47	.RAW	25°	1.0	
14:13	C07_51	.RAW	205°	1.0	
14:17	C07_55	.RAW	25°	1.1	
14:22	C07_59	.RAW	205°	1.1	
14:25	C07_63	.RAW	25°	1.1	
14:29	C07_67	.RAW	205°	1.1	
14:33	C07_71	.RAW	25°	1.1	
14:41	C08_79	.RAW	35°	1.1	
14:46	C08_71	.RAW	215°	1.0	
14:52	C08_67	.RAW	35°	0.9	
14:56	C08_65	.RAW	215°	1.0	
15:02	C08_61	.RAW	35°	0.9	
15:07	C08_57	.RAW	215°	1.4	
15:13	C08_53	.RAW	35°	1.9	
15:18	C08_49	.RAW	215	1.1	
15:24	C08_45	.RAW	35°	1.0	
15:29	C08_41	.RAW	215°	1.0	

RTK Lost Solution

15:46 SV Profile

Prepared by: ECP

GBA
MULTIBEAM SURVEY LOG

Date: 11/25/08
Vessel Name: Sea Fix
Project ID #: 631-08
Description: Passaic River Multibeam

Raw Data Directory: 20081125
Matrix/LNW File: B04/B05
Average Boat Speed (kts): 5.0kts
People: 3
S.O.S./Draft: SV 4751.3 +/- 1

Echo Sounder: Reson 8101
Positioning: POSMV 320 w/ Leica RTK
General Remarks:

HORZ/VERT CHECKIN

Time	RTK Tide	Tide Board
07:24	4.40'	4.40' ✓

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
07:38	B04_112	.RAW	213°	1.1	Begin fill in section (B04) (SB hg to 80°)
07:47	B04_026	.RAW	33°	1.1	
07:53	B04_027	.RAW	213°	1.0	
0756	B04_038	.RAW	33°	1.0	
0804	B05_010	.RAW	232°	1.0	Begin (B05) section fill in
0808	B05_007	.RAW	232°	0.9	
0813	B06_136	.RAW	265°	0.8	Begin (B06) SB BX to 80° (@60°)
0830	B08_001	.RAW	295°	0.9	Begin B08 sect fill in
0833	B08_018	.RAW	115°	1.2	
0835	B09_073	.RAW	318°	1.0	
0838	B09_006	.RAW	138°	1.0	
0845	C01_093	.RAW	156°	1.0	Begin (C01)
0849	C01_013	.RAW	156°	1.2	
085	C02_013	.RAW	342°	1.2	
09:04	C02.022	.RAW	342°	1.1	
09:35	C05_010	.RAW	7°	1.6	
9:43	C05_050	.RAW	187°	1.2	
9:	C05.55	.RAW	7°	1.2	
9:57	C05_56	.RAW	187	1.2	
1005	C06_50	.RAW	16°	0.9	

Prepared by:

Page 1 of

GBA
MULTIBEAM SURVEY LOG

Date: 11/25/08

Vessel Name: Sea Fix

Project ID #: 631-08

Description: Passaic River Multibeam

Raw Data Directory: C06 / C07 / C08 / C09

Matrix/LNW File: " " "

Average Boat Speed (kts): 5.0 kts

People: 3

S.O.S./Draft:

Echo Sounder: Reson 8101

Positioning: POSMV 320 w/ Leica RTK

General Remarks:

HORZ/VERT CHECKIN

Time	RTK Tide	Tide Board

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
1007	C06.56	C6.56.RAW	196°	0.9	
10:	C06-62	.RAW	17°	1.0	
1016	C06 "	RAW	196°	1.1	
10:18	C06-07	.RAW	17	1.3	
10:16	C07.21	.RAW	25	1.1	
10:24	C08.79	C08-79.R	35°	1.1	
10 30	C08.80	C08 .7RAW	215°	1.0	
10:40	C09-036	C09-36.RAW	18°	1.0	
10:43	C09.038	C09-38.RAW	198°	1.0	
10:	C09.042	C09.042.RA	18°	1.0	
10:49	C09.47	C09_047.RAW	198	1.1	
10:52	C09.056	.RAW	18°	1.1	
10:56	C09 062	.RAW	198°	1.1	
1059	C09_066	.RAW	18°	1.1	
11:02	C09 067	.RAW	198°	1.0	
11:05	C09 076	RAW	18°	1.1	
1108	C09_079	.RAW	198°	1.1	
11 14	C10-031	RAW	2°	1.2	
1117	C10-038	RAW	182°	1.2	
1119	C10-041	.RAW	2°	1.2	

Prepared by: ECP / JPS

Page 2 of

GBA
MULTIBEAM SURVEY LOG

Date 11-25-08 **Project ID #** 631-08

Vessel Name Sea Fix **Description** Passaic River Multibeam

Raw Data Directory 2008\1125\raw **Echo Sounder** Reson 8101

Matrix/LNW File _____ **Positioning** POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 5.0kts **General Remarks** _____

 # People 3 **HORZ/VERT CHECKIN** Time RTK Tide Tide Board

S.O.S./Draft _____

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
1123	C10_041	.RAW	197°	1.2	
1125	C10_047	.RAW	2°	1.2	
1128	C10_050	.RAW	182°	1.2	
1131	C10_026	.RAW	2°	1.2	
1134	C10_023	.RAW	182°	1.2	
1137	C10_019	.RAW	20	1.7	
1142	C11_052	.RAW	23°	1.7	
1144	C11_055	.RAW	203°	1.8	
1146	C11_059	.RAW	23°	1.9	
1148	C11_061	.RAW	203°	1.9	
1151	C11_049	.RAW	23°	1.9	
1153	C11_043	.RAW	203°	1.7	
1155	C11_039	.RAW	23°	1.7	
1157	C11_034	.RAW	203°	1.7	
1159	C11_030	.RAW	23°	1.7	
12:02	C11_022	.RAW	203°	1.7	
1206	D01_091	.RAW	41°	1.7	
1209	D01_094	.RAW	221°	1.6	
1214	D01_098	.RAW	41°	1.7	
1215	D01_101	.RAW	221	1.6	

Prepared by: JRB/ECD

GBA
MULTIBEAM SURVEY LOG

Date 11/25/08 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 2008NOS.card | Echo Sounder Reson 8101

Matrix/LNW File | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 5 knots | General Remarks

People 3 | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
12:30	DOL.104.	.RAW	41°	1.6	
1235	DOL.111	.RAW	221°	1.6	
1245	DOL.113	.RAW	41°	0.9	
1253	DOL.118	.RAW	221°	0.9	
13:01	DOL.116	.RAW	41°	1.3	
13:09	DOL.121	.RAW	221°	1.4	
13:17	DOL_084	.RAW	41°	1.5	
132	DOL 080	.RAW	~221°	1.5	
13:38	DOL_083	.RAW	41°	1.1	
13:47	DO2.64	.RAW	212°	1.2	
13:	DO2.60	.RAW	32°	1.4	
1352	DO2_56	.RAW	212°	1.2	
1356	DO2_52	.RAW	32°	1.2	
14:03	DO2.41	.RAW	32°	1.0	
1404	DO3_41	.RAW	355°	1.1	
1411	DO3_45	.RAW	175°	1.0	
1416	DO3-57	.RAW	355°	1.1	
1422	DO3.55	.RAW	175	1.1	
1427	DO3_41	.RAW	355°	1.0	
1430	DO3_42	RAW	175°	1.5	

Prepared by: OBS/GAD

GBA
MULTIBEAM SURVEY LOG

Date 11/25/2008 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory passic08mb 20081125.raw | Echo Sounder Reson 8101

Matrix/LNW File " | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 5.0 kts. | General Remarks

People 3 | HORZ/VERT CHECKIN

S.O.S./Draft 4665 +/- | Time 16:22 RTK Tide +1.60 Tide Board +1.60 ✓

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
14:31	003_38	.RAW	355°	2.7/1.6	
1436	003_34	.RAW	175°	1.0	
1440	003_30	.RAW	355°	1.0	
1445	003_19	.RAW	8°	1.0	
1447	003_35	.RAW	188°	0.9	
14:57	004_41	.RAW	188	0.9	
14:53	004_46	.RAW	8°	1.0	
14:55	004_42	.RAW	188°	1.0	
14:57	004_24	.RAW	8°	0.9	
15:00	004_20	.RAW	188°	0.8	
15:10	005_24	.RAW	260	1.0	
15:	05_28	RAW	206°	1.0	
15:27	05_27	.RAW	26	1.0	
15:31	05_32	RAW	206°	1.0	
15:38	05_39	.RAW	26°	0.9	
15:43	05_42	RAW	206°	0.9	
15:47	05_48	RAW	26°	0.9	
15:52	05_52	.RAW	206°		

Prepared by: ECD/JPS

GBA
MULTIBEAM SURVEY LOG

Date 12/2/2008 — Project ID # 631-08

Vessel Name Sea Fix — Description Passaic River Multibeam

Raw Data Directory 20081202 — Echo Sounder Reson 8101

Matrix/LNW File 006 — Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) ____ — General Remarks ____

People 3 — HORZ/VERT CHECKIN: Time 07:20, RTK Tide -0.15, Tide Board -0.11

S.O.S./Draft 1427

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
	08:00	SVP = 1427			
08:07		D06_47.RAW	36°		Do not use
8:10		D06_49A.RAW	36°	1.0	
8:13		D06_43.RAW	216°	1.0	
8:17		D06_35.RAW	36°	1.0	
8:20		D06_35 RAW	216°	1.0	
8:24		D06_31 .RAW	36°	1.0	
8:28		D06_27.RAW	216°	1.0	
8:32		D06_51.RAW	36°	0.9	
8:35		D06_55.RAW	216°	0.9	
08:41		D06_57.RAW	36°	0.9	
08:44		D06_63.RAW	216°	0.9	
	09:00	SVP			
9:04		C06_71.RAW	16°		
9:07		C06_06.RAW			
9:10		C07_005.RAW	25°	1.2	
9:14		C07_005.RAW	205°	1.2	
9:18		C07_37	25°	1.2	
9:24		C08_31 RAW	35°	1.2	
9:30		C08_27.RAW	215°	1.2	

Prepared by: SCO

GBA
MULTIBEAM SURVEY LOG

Date: 12/02/08 | Project ID #: 631-08

Vessel Name: Sea Fix | Description: Passaic River Multibeam

Raw Data Directory: | Echo Sounder: Reson 8101

Matrix/LNW File: | Positioning: POSMV 320 w/ Leica RTK

Average Boat Speed (kts): | General Remarks:

People: | HORZ/VERT CHECKIN

S.O.S./Draft: | Time | RTK Tide | Tide Board

UTC Time	MB RNG File	Line AZ	HDOP	Remarks
9:40	c08-87.RAW	35	0.9	
9:46	c08-91.RAW	215	1.2	
9:56	c09-26.RAW	19°	1.1	
9:58	c09-30.RAW	198°	1.1	
10:02	c09-081.RAW	18°	1.0	
10:05	c09-085.RAW	198°	1.0	mooring Barge
10:11	c10-017.RAW	20	1.0	
10:14	c10-016 RAW	182°	1.0	
10:17	c10-052.RAW	2°	1.0	
10:19	c10-056.RAW	182°	0.9	
10:22	c10-060.RAW	2°	1.1	
10:25	c10-064.RAW	182°	1.1	
10:30	c10-068.RAW	2°	1.1	
10:34	c11-061.RAW	172°	1.1	
10:36	c11-065.RAW	12	1.1	
10:38	c11-068.RAW	220°	1.1	
10:41	c11-073.RAW	202°	1.1	
10:43	c11-077.RAW	22°	1.1	
	c11-25.RAW	202°		
10:48	c11-17.RAW	22°		

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date: 12/02/08
Vessel Name: Sea Fix
Project ID #: 631-08
Description: Passaic River Multibeam

Raw Data Directory: 20081202
Matrix/LNW File: D01, D02, D03, D04
Average Boat Speed (kts):
People:
S.O.S./Draft:
Echo Sounder: Reson 8101
Positioning: POSMV 320 w/ Leica RTK
General Remarks:
HORZ/VERT CHECKIN
Time RTK Tide Tide Board

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
10:51	D01_123.	RAW	41°	1.2	
10:56	D01_127.	RAW	221°	2.0	
11:02	D01_136.	RAW	41°	1.1	
11:08	D01_075.	RAW	221°	1.8	
11:15	D01_073.	RAW	41°	1.8	
11:24	D02_66.	RAW	320	2.4	
11:26	D02_70.	RAW	212°	2.1	
11:30	D02_46.	RAW	320	1.7	
11:33	D02_42.	RAW	212	2.1	
11:35	D02_38.	RAW	320	2.1	
11:38	D02_34.	RAW	212°	2.1	
11:43	D02_30.	RAW	320	2.1	
11:47	D03_45.	RAW	354°	1.7	
11:52	D03_41.	RAW	174°	1.7	
11:57	D03_37.	RAW	354°	1.6	
12:02	D03_69.	RAW	175	1.6	
12:07	D03_65.	RAW	354°	1.6	
12:13	D03_61.	RAW	175°	1.2	
12:15	D04_51.	RAW	80	0.9	
12:	D04_55.	RAW	188°		

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 12/02/08
Vessel Name Sea Fix
Project ID # 631-08
Description Passaic River Multibeam

Raw Data Directory 20081202
Matrix/LNW File D04, D05, D06
Average Boat Speed (kts) 4kts
People 2
S.O.S./Draft 1428
Echo Sounder Reson 8101
Positioning POSMV 320 w/ Leica RTK
General Remarks
HORZ/VERT CHECKIN
Time RTK Tide Tide Board

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
12:19	D04_63.	RAW	7°	0.9	
12:21	D04_15.	RAW	188°	0.9	
12:23	D04_15	RAW	18°	1.2	
12:29	D05_54.	RAW	~~188~~	1.3	
12:	D5_58.	RAW	206°	1.3	
12:	D5_61.	RAW	26°	1.4	
12:35	D5_14.	RAW	206°	1.4	
12:37	D5_10	RAW	26°	1.4	
12:40	D5_55	RAW	206°	1.4	
12:44	D5_58.	RAW	206°	1.4	
12:47	D05_12.	RAW	26°	1.9	
12:50	D05_08.	RAW	206	2.0	
12:57	D06_67.	RAW	36°	1.5	
13:00	D06_71.	RAW	216°	1.1	
13:08	D0625.	RAW	36°	1.1	
13:12	D06_29	RAW	216°	1.6	
13:19	D07_13.	RAW	28°	1.2	
13:24	D07_08	RAW	208°	1.5	
13:28	D07_53	RAW	28°	1.2	
13:33	D0755.	RAW	208°	1.0	

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date: 12/8/08
Vessel Name: Sea Fix
Project ID #: 631-08
Description: Passaic River Multibeam

Raw Data Directory: 20081202
Matrix/LNW File: D07, D08
Average Boat Speed (kts): 4kt
People: 2
S.O.S./Draft: 1429 m/s
Echo Sounder: Reson 8101
Positioning: POSMV 320 w/ Leica RTK
General Remarks:
HORZ/VERT CHECKIN
Time RTK Tide Tide Board

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
13:37	D07-	51. RAW	28°	1.0	
13:43	D08-	42. RAW	300°	1.3	
13:45	D08-	38. RAW	215°	1.5	
13:48	D08-75	RAW	35°	1.1	
13:51	D08-	77. RAW	215°	1.1	
13:54	D08-68	- RAW	35°	1.0	
13:57	D07-64	_RAW	215°	1.0	
13:59	D08-060	_ RAW	35°	1.1	Lost RTK End of Line
14:04	D08-056	_ RAW	215°	1.1	
14:07	D08-052	. RAW	35°	1.1	
14:05	D08-048	_ RAW	215°	1.1	
14:13	D07-20	. RAW	208°	1.0	
14:16	D07-24	. RAW	28°	0.9	
14:21	D07-28	. RAW	208°	1.0	
14:24	D07-32	. RAW	28°	0.9	
14:29	D07-36	. RAW	208°	0.9	
14:33	D07-40	RAW	28°	0.9	
14:38	D07-44	RAW	208°	1.9	

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 12/02/08 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081202 | Echo Sounder Reson 8101

Matrix/LNW File D09, E01 | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4kts | General Remarks

People 2 | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft

UTC Time	MB RNG File	Line AZ	HDOP	Remarks
14:48	D09_20.RAW	19°		DO NOT USE BAD RTK
14:52	D09_20A.RAW	19°	1.0	
14:53	D09_24.RAW	199°	1.0	
14:56	D09_28.RAW	19°	1.0	
14:58	D09_32.RAW	199°	1.0	
14:59	D09_36.RAW	19°	1.0	
15:00	D09_40.RAW	199°	1.0	Bad RTK @ end +.27
15:03	D09_44.RAW	19°	1.0	
15:04	D09_48.RAW	199°	1.2	
15:05	D09_52.RAW	19°	1.2	
15:12	E01_36.RAW	346°	0.9	
15:18	E01_40.RAW	166	0.5	
15:22	E01_44.RAW	346	0.9	
15:29	E01_48.RAW	166	0.9	
15:32	E01_52.RAW	346°	0.9	
15:36	E01_56.RAW	166°	0.9	
15:38	E01_60.RAW	346°	1.0	
15:42	E01_64.RAW	166°	0.9	
15:44	E01_32.RAW	346	0.9	
15:49	E01_28.RAW	166°	0.5	

Prepared by: ECO

GBA
MULTIBEAM SURVEY LOG

Date: 12/02/08
Vessel Name: Sea Fix
Project ID #: 631-08
Description: Passaic River Multibeam

Raw Data Directory: 20081202
Matrix/LNW File: E01
Average Boat Speed (kts):
People:
S.O.S./Draft:

Echo Sounder: Reson 8101
Positioning: POSMV 320 w/ Leica RTK
General Remarks:

HORZ/VERT CHECKIN

Time	RTK Tide	Tide Board
16:10	-0.3	-0.3

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
15:52	E01_024.RAW		346°	0.9	
15:59		SVP Profile			

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date: 12/03/08 | Project ID #: 631-08
Vessel Name: Sea Fix | Description: Passaic River Multibeam

Raw Data Directory: 20081203 | Echo Sounder: Reson 8101
Matrix/LNW File: D09, E01, E02, E03 F01 | Positioning: POSMV 320 w/ Leica RTK
Average Boat Speed (kts): | General Remarks: 14:00 SUP
People: 2 | HORZ/VERT CHECKIN
S.O.S./Draft: 1428 m/s

Time	RTK Tide	Tide Board
1.07	-2.32	2.30

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
14:09	D09-19	D09_19.RAW	198°	1.0	
14:11	D09-15	D09-15.RAW	18°	1.0	
14:13	D0953	D09_53.RAW	198°	1.1	
14:15	D09-57	.RAW	18°	2.0	
14:17	E01 31	.RAW	346°	0.9	
14:22	E01-27	.RAW	166°	0.5	
14:26	E01-65	.RAW	346	2.0	
14	E01-69	.RAW	166°	2.0	
14:36	E01-73	.RAW	346	1.5	
14:42	E02-28	.RAW	2°	1.0	
1448	E02-24	.RAW	182°	1.0	
1447	E02-20	.RAW	2°	1.0	
1449	E02-64	.RAW	182°	1.0	
1451	E02-68	.RAW	2°	1.0	
14:53	E02-72	.RAW	182°	1.0	
14:56	E03-60	.RAW	24°	1.0	
	E03-64	.RAW	204°	1.0	
14:59	E03-28	.RAW	24°	1.0	
15:02	E03-21	.RAW	204°	0.9	
15:04	E03-20	.RAW	24°	0.9	

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 12/3/08 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory p20081203 | Echo Sounder Reson 8101

Matrix/LNW File F01, E03, E02 | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4kts | General Remarks

People 2 | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft 1428 m/s

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
15:06		F01_06.RAW	6°	0.9	
15:10		F01_22.RAW	186°	0.9	
15:15		F01_18.RAW	6°	0.9	
15:20		F01_52.RAW	186°	0.9	
15:22		F01_56.RAW	6°	0.7	
15:27		F01_60.RAW	186°	0.9	
15:31		F01_48.RAW	6°	1.0	
15:35		F01_44.RAW	186°	0.9	
15:38		F01_40.RAW	6°	0.5	
15:43		F01_36.RAW	186°	0.9	
15:47		E03_32.RAW	204°	0.9	
15:49		E03_36.RAW	24°	0.9	
15:51		E03_40.RAW	204°	0.9	
15:53		E03_44.RAW	24°	0.5	
15:55		E03_48.RAW	204°	0.9	
15:57		E03_52.RAW	24°	1.0	
15:59		E03_56.RAW	204°	1.0	
16:00		E03_58.RAW	24°	1.0	
16:03		E02_32.RAW	182 ~~204~~°	1.0	
16:10		E02_36.RAW	~~24~~ 202°	1.5	

Prepared by: GCD

GBA
MULTIBEAM SURVEY LOG

Date: 12/3/08
Vessel Name: Sea Fix
Project ID #: 631-08
Description: Passaic River Multibeam

Raw Data Directory: 20081203
Matrix/LNW File: E02
Average Boat Speed (kts): 4kts
People: 2
S.O.S./Draft: 1428 m/s
Echo Sounder: Reson 8101
Positioning: POSMV 320 w/ Leica RTK
General Remarks:
HORZ/VERT CHECKIN

Time	RTK Tide	Tide Board
17:11	-0.75	+0.9

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
16:12		E02_40.RAW	181°	1.4	
16:14		E02_44.RAW	2°	1.4	
16:16		E02_48.RAW	182°	1.4	
16:19		E02_52.RAW	20	1.4	
16:24		F02_24.RAW	358°	1.4	
16:27		F02_28.RAW	178°	1.4	
16:28		F02_32.RAW	358°	1.3	
16:30		F02_36.RAW	178°	1.3	
16:31		F02_40.RAW	358°	1.3	
16:33		F02_44.RAW	178°	1.3	
16:35		F02_48.RAW	358°	1.3	
16:37		F02_52.RAW	178°	1.3	
16:39		F02_56.RAW	358°	1.3	
16:40		SVP Profile			

Prepared by: ECO

GBA
MULTIBEAM SURVEY LOG

Date 12/04/08 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081204 | Echo Sounder Reson 8101

Matrix/LNW File F03, F04, G01 | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4K15 | General Remarks

People 2 | HORZ/VERT CHECKIN

S.O.S./Draft 1425 m/s | Time 0725 | RTK Tide -0.8 | Tide Board -0.9

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
07:40	Sound Velocity	Profile	1425 m/s		
7:46	F03_20.RAW		192°	1.2	
7:50	F03_24.RAW		12°	1.0	
7:54	F03_28.RAW		192°	1.0	
7:57	F03_32.RAW		12°	1.0	
8:01	F03_36.RAW		192°	1.0	
0805	F03_40.RAW		12°	1.0	
0810	F04_16.RAW		35°	1.0	
0812	F04_20.RAW		215°	1.0	
0813	F04_24.RAW		35°	1.0	
0814	F04_28.RAW		215°	1.0	
0816	F04_32.RAW		35°	1.0	
818	F04_36.RAW		215°	1.0	
8:19	F04_35.RAW		35	1.0	
8:21	G01_24.RAW		58°	1.0	
8:23	G01_28.RAW		238	1.0	
8:25	G01_32.RAW		58°	1.0	
826	G01_36.RAW		238°	0.9	
827	G01_40.RAW		58°	09	

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 12/4/2008 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 601, 602, 603, 604 | Echo Sounder Reson 8101

Matrix/LNW File | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) | General Remarks

People | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft

UTC Time	MB RNG File	Line AZ	HDOP	Remarks
8:29	601_44.RAW	239	1.1	
8:31	602_028.RAW	74°	1.1	
8:35	602_32.RAW	254°	0.9	
8:41	602_36.RAW	74°	1.0	
8:45	602_40.RAW	254°	1.0	
8:50	602_44.RAW	74°	0.9	
8:54	602_48.RAW	254°	1.1	
8:58	602_52.RAW	74°	1.1	
9:01	602_56.RAW	254°	1.2	
09:04	602_60.RAW	74°	1.2	
09:08	603_28.RAW	254°	1.2	
09	603_32.RAW	~~254°~~ 240	1.2	
09	603_36.RAW	~~254°~~ 66°	1.2	
9:15	603_40.RAW	246°	1.2	
9:18	603_44.RAW	66°	1.1	
9:19	603_48.RAW	246	1.2	
9:22	603_52.RAW	66°	1.2	
9:26	603_56.RAW	246°	1.2	
9:28	604_32.RAW	35°	1.1	
9:32	604_36.RAW	215°	0.9	

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 12/4/2008 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081204 | Echo Sounder Reson 8101

Matrix/LNW File 604, H01, H02, H03 | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4 kts | General Remarks

People 2 | HORZ/VERT CHECKIN

S.O.S./Draft 1426 m/s | Time RTK Tide Tide Board

UTC Time	MB RNG File	Line AZ	HDOP	Remarks
9:34	604_40. RAW	35°	1.2	
9:37	604-44. RAW	215°	1.2	
9:40	604-48. RAW	35°	1.2	
9:43	604-52. RAW	215°	1.2	
9	604 56. RAW	35°	1.3	
9:59	H01_28.RAW	- -	1.0	
10:02	H01-26. RAW	193	1.3	
10:07	H01-60. RAW	13°	1.2	
10:12	H01-64. RAW	193°	1.1	
10:19	H01-056. RAW	13°	1.2	
10:24	H02-16. RAW	3°	1.1	
10:27	H02-14. RAW	183°	1.6	
10:29	H02-40. RAW	3°	1.2	
10:32	H02-44 RAW	183°	2.0	
10:35	H02 BG. RAW	3°	2.0	
10:38	H03. 10. RAW	332°	2.0	
10:40	H03.18. RAW			
10:43	H03.44. RAW	332	2.0	
10:45	H03.48. RAW			

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 12/04/08
Vessel Name Sea Fix
Project ID # 631-08
Description Passaic River Multibeam

Raw Data Directory 20081204
Matrix/LNW File F02
Average Boat Speed (kts) 5kts
People 2
S.O.S./Draft 1426 m/s
Echo Sounder Reson 8101
Positioning POSMV 320 w/ Leica RTK
General Remarks
HORZ/VERT CHECKIN
Time RTK Tide Tide Board

UTC Time	MB RNG File	Line AZ	HDOP	Remarks
1057	F02_22.RAW	358°		
10:59	F02_20.RAW	178°		
11:02	F02_55.RAW	358°		Do Not Use - Bad RTK
1104	F02_59.RAW	178		
11:08	F03_19.RAW	12°		
11:11	F03_17.RAW	192°		
11:16	F03_46.RAW	12°		
11:19	F03_50.RAW	192°		RTK In+Out
11:	F03_54.RAW	12°		
11:28	F04_37.RAW	35°		
11:30	F04_43.RAW	215		
11:32	F04_47.RAW	35		
11:34	F04_51.RAW	215°	1.7	
11:36	F04_12.RAW	35°		
11:37	F04_11.RAW	215°	1.7	
1140	G01_09.RAW	570	1.7	
1142	G01_53.RAW	237°	1.7	
1144	G01_57.RAW	57°		
1145	G01_23.RAW	237°		
1147	G01_20	57°	1.6	

Prepared by: ECO

GBA
MULTIBEAM SURVEY LOG

Date 12/04/08 — Project ID # 631-08

Vessel Name Sea Fix — Description Passaic River Multibeam

Raw Data Directory _____ — Echo Sounder Reson 8101

Matrix/LNW File _____ — Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) _____ — General Remarks _____

People _____ — HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft _____

UTC Time	MB RNG File	Line AZ	HDOP	Remarks
11:49	G02_29.RAW	75	1.6	
11:53	G02_25.RAW	255	1.6	
11:57	G02_56.RAW	75	1.7	
12:02	G02_60.RAW	255	1.7	
12:10	G03_26.RAW	67°	1.7	
12:11	G03_23.RAW	247	1.6	
12:13	G03_64.RAW	67°	1.6	
12:15	G03_68.RAW	247°	1.7	
12:18	G032.5.RAW	247°	1.8	
12:20	G03_22.RAW	247°	1.8	
12:22	G04_32A.RAW	35°	1.8	
12:24	G04_31.RAW	215°	1.9	
12:27	G04_29.RAW	35°	1.9	
12:39	H04_17.RAW	344	2.0	
12:41	H04_15.RAW	164°	1.5	
12:43	H04_46.RAW	344°	1.6	
12:45	H04_50.RAW	164°	1.6	
12:47	H04_41.RAW	344	1.6	
12:50	H05_40.RAW	338°	1.6	
12:53	H05_44.RAW	158°	1.5	

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 12/4/08 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081204 | Echo Sounder Reson 8101

Matrix/LNW File 105 | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 4kts | General Remarks

People 2 | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft 426/MS

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
13:50	H05_48	.RAW	158°	1.1	
13:53	H05_A	.RAW	338°	1.1	
13:55	H05_A	.RAW	158°	1.1	
13:57	H05_25		338°	1.0	
14:00	H06_14	.RAW	6°	1.3	
14:02	H06_12	.RAW	186	1.1	
14:03	H06_44	.RAW	6°	1.1	
14:04	H06_48	.RAW	186°	1.1	
14:05	H07_46	.RAW	28°	2.0	
14:11	H07_44	.RAW	208°	2.2	
14:14	H07_12	.RAW	28°	1.3	
14:17	H07_10	.RAW	208°	1.3	
14:19	H07_16	.RAW	28°	1.1	
14:23	H08_44	.RAW	10°	2.0	
14:27	H08_48	.RAW	150°	1.9	
14:30	H08_52	.RAW	10°	2.4	
14:34	H08_16	.RAW	190°	1.0	
14:38	H08_14	.RAW	10°		
14:48	H01_40	.RAW	190°	1.0	
14:53	H01_44	.RAW	14°	1.0	

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 12/4/08 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081204 | Echo Sounder Reson 8101

Matrix/LNW File | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) | General Remarks

People | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
14:58	H01_42	.RAW	194°	1.0	Do not USE
15:19	H01_42A	.RAW	194°	0.9	
15:24	H01_37	.RAW	14°	1.0	
15:26	H01_41	.RAW	194°	0.9	
15:32	H02_21	.RAW	3°	1.0	
15:34	H02_25	.RAW	183°	1.0	
15:36	H02_29	.RAW	3°	1.0	
15:39	H02_30	.RAW	183°	1.2	
15:43	H03_23	.RAW	332°	0.9	
15:45	H03_29	.RAW	152°	1.2	
15:47	H03_33	.RAW	332°	1.0	
15:	H03_37	.RAW	152°	1.0	
15:53	H04_23	.RAW	344°	1.0	
15:58	H04_27	.RAW	164°	1.1	
15:	H04_32	.RAW	344°	1.0	
15:59	H05_27	.RAW	338	1.1	
16:01	H05_34	.RAW	158°	1.1	
16:04	H06_20	.RAW	6°	1.6	
16:06	H06_24	.RAW	186°	1.6	
16:07	H06_29	.RAW	6°	1.6	

Prepared by: ECO

GBA
MULTIBEAM SURVEY LOG

Date: 12/4/08
Vessel Name: Sea Fix
Project ID #: 631-08
Description: Passaic River Multibeam

Raw Data Directory: H06, H07
Matrix/LNW File: 20081204
Average Boat Speed (kts): 5kts
People: 2
S.O.S./Draft: 1426 m/s

Echo Sounder: Reson 8101
Positioning: POSMV 320 w/ Leica RTK
General Remarks:
HORZ/VERT CHECKIN

Time	RTK Tide	Tide Board
16:45	+0.2	+0.2

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
16:10	H06_36.RAW		60°	1.6	
16:12	H07_21.RAW		280°		
16:15	H07_25.RAW		208°		
16:17	H07_29.RAW		280°		
16:20	H08_24.RAW		10°		
16:24	H08_28.RAW		190°		
16:28	H08_32.RAW		10°		
16:31	H08_36.RAW		190°		
16:34	H08_40.RAW		10°		
		SVP Profile		1426 m/s	

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 12/5/08 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081205 | Echo Sounder Reson 8101

Matrix/LNW File Single Beam | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) 5KTS | General Remarks

People 2 | HORZ/VERT CHECKIN

S.O.S./Draft 4775/1.4 | Time 08:45 | RTK Tide -0.25 | Tide Board -0.25 ✓

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
	Single Beam Survey Line				
8:50	Bar check				
	5', 25', 10' 5'				
8:55	0059	0059	270	1.1	
856		0059 A	277	1.1	
857		0059 B	97	1.1	
859		0059 C	277	1.2	
9:00		0059 D	097	1.2	
9:01		0059 E	277	1.2	
9:03		0059 F	97	1.2	
9:04		0059 G	277	1.2	
9:05		0059 H	97	1.2	
9:06	↓	0059 I	277	1.2	
9:11	0078	0078	80°	1.2	
9:13	0078	0078 A	260	1.2	
9:17	0104	0104	1840	1.2	
9:18	0104	0104A	04°	0.9	

Prepared by: ECO

GBA
MULTIBEAM SURVEY LOG

Date: 12/5/08
Vessel Name: Sea Fix
Project ID #: 631-08
Description: Passaic River Multibeam

Raw Data Directory: 20081205
Matrix/LNW File: SBLines
Average Boat Speed (kts): 5kts
People: 2
S.O.S./Draft: 4775 / 1.4
Echo Sounder: Reson 8101
Positioning: POSMV 320 w/ Leica RTK
General Remarks
HORZ/VERT CHECKIN
Time RTK Tide Tide Board

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
9:23	0148	0148	148	0.9	
9:24	0148	0148A	328	0.9	
9:26	0153	0153	135°	1.0	
9:28	0153	0153A	315°	1.0	
9:32	0178	0178	160°	1.1	
9:33	0178	0178A	340°	1.1	
9:37	0192	0192	178	1.1	
9:38	0192	0192A	358	1.1	
9:42	0204	0204	188°	1.1	
9:43	0204	0204A	8°	1.1	
9:44	0204	0204B	188	1.0	
9:45	0	0204C	8	1.0	
9:45		0204D	188	1.1	
9:46		0204E	8	1.0	
9:47		0204F	188	1.0	
9:48		0204G	8	1.1	
9:49		0204H	188	1.0	
9:50	↓	0204I	8	1.1	

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 12/05/08 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 20081205 | Echo Sounder Reson 8101

Matrix/LNW File SB Lines | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) _____ | General Remarks _____

People _____ | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft 4.75 / 1.4

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
9:54	0235	0235	252°	1.0	
9:55		0235A	72°	1.1	
10:06	0277	0277	277	1.4	
10:09		0277A	97°	1.4	
10:10	0305	0305	298°	1.1	
10:11	0305	0305A	118	1.1	
10:12	0305	0305B	298	1.1	
10:14		0305C	118	1.1	
10:15		0305D	298	1.1	
10:16		0305E	118	1.1	
10:17		0305F	298	1.1	
10:18		0305G	118	1.1	
10:19		0305H	298	1.1	
10:20		0305I	118	1.1	
10:26	0369	0368	310	1.1	
10:27		0368A	130	1.2	
10:32	0389	0389	275	1.9	VG offline
10:33		0389A	275	1.	
10:35		0389B	95		
10:40	Bar check		10', 5'		

SV chng = 1.2ft

Prepared by: ECD

GBA
MULTIBEAM SURVEY LOG

Date 12/05/2008 | Project ID # 631-08

Vessel Name Sea Fix | Description Passaic River Multibeam

Raw Data Directory 2008 1205 | Echo Sounder Reson 8101

Matrix/LNW File H09, | Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) | General Remarks

People 2 | HORZ/VERT CHECKIN Time RTK Tide Tide Board

S.O.S./Draft 1425 m/s

UTC Time	MB RNG File	Line AZ	HDOP	Remarks
11:03	H09_20.RAW	18°	1.8	
11:07	H09_24.	198°	1.9	
11:10	H09_28.RAW	18°	2.1	
11:14	H09_32.RAW	198°	1.9	
11:17	H09_36.RAW	18°	1.9	
11:21	H09_40.RAW	198°	2.0	
11:24	H09_44RAW	18°	1.8	
11:28	H09_48.RAW	198°	1.7	
11:31	H09_52.RAW	18°	1.6	
11:37	H10_10.RAW	4°	1.6	
11:39	H10_16_RAW	184	1.6	
11:41	H10_22_RAW	4°	1.6	
11:43	H10_26_RAW	184°	1.6	
11:45	H10_30_RAW	4°	1.6	
11:48	H11_14.RAW	347°	1.6	
11:50	H11_12.RAW	167°		
11:53	H11_19.RAW	347	0.9	
11:55	H1123.RAW	167°	0.7	
11:57	H11_27.RAW	347°	0.9	
12:00	H11_31.RAW	167°	0.9	

Prepared by: GCD

GBA
MULTIBEAM SURVEY LOG

Date 11/5/08 — Project ID # 631-08

Vessel Name Sea Fix — Description Passaic River Multibeam

Raw Data Directory H11 & H12 — Echo Sounder Reson 8101

Matrix/LNW File — Positioning POSMV 320 w/ Leica RTK

Average Boat Speed (kts) — General Remarks

People — HORZ/VERT CHECKIN

S.O.S./Draft — Time 13:55 — RTK Tide -3.1' — Tide Board -3.0 ✓

UTC Time	MB RNG	File	Line AZ	HDOP	Remarks
12:02	H11-35	.RAW	347°		
12:05	H11-37	.RAW	167°		
12:07	H11 43	.RAW	347°		
12:11	H12-09	.RAW	11°		oil boom in River
12:15	H12-13	RAW	191°		
12:23	H12-17	RAW	191°	1.9	
12:26	H12-21	.RAW	11°	1.9	
12:29	H12-25	.RAW	191°	1.4	
12:33	H12-29	.RAW	11°	2.0	
13:17	H12-37	.RAW	191°	1.5	
13:20	H12-41	.RAW	11°	1.2	
13:25	H10-33	.RAW	184°	1.1	
13:28	H10 37	.RAW	4°	1.1	
13:30	H10-41	.RAW	184°	1.1	
13:32	H10-45	.RAW	4°	1.5	
13:33	H10-05	.RAW	184°	1.1	
13:39	H09-20	.RAW	4°	1.4	
13:43	H09-16	.RAW	184°	1.4	
13:47	H09_20B	.RAW	16	2.5	

Prepared by: SCO

Passaic River Tide Gauge Reference Locations

Tide Gauge	Northing	Easting	NGVD29	NAVD88
Rte 3	725024.70	596261.04	6.70	5.67
Pathmark	702962.53	586313.32	7.97	6.88
Jackson	692419.38	587570.54	4.64	3.53
Clay	698734.57	585004.08	5.65	4.55
Rte 7	711700.65	589716.24	5.62	4.56
Union	731382.11	596191.38	8.51	7.49
Monroe	741595.16	599435.33	4.83	3.83
Gregory	736449.28	597288.15	4.06	3.05

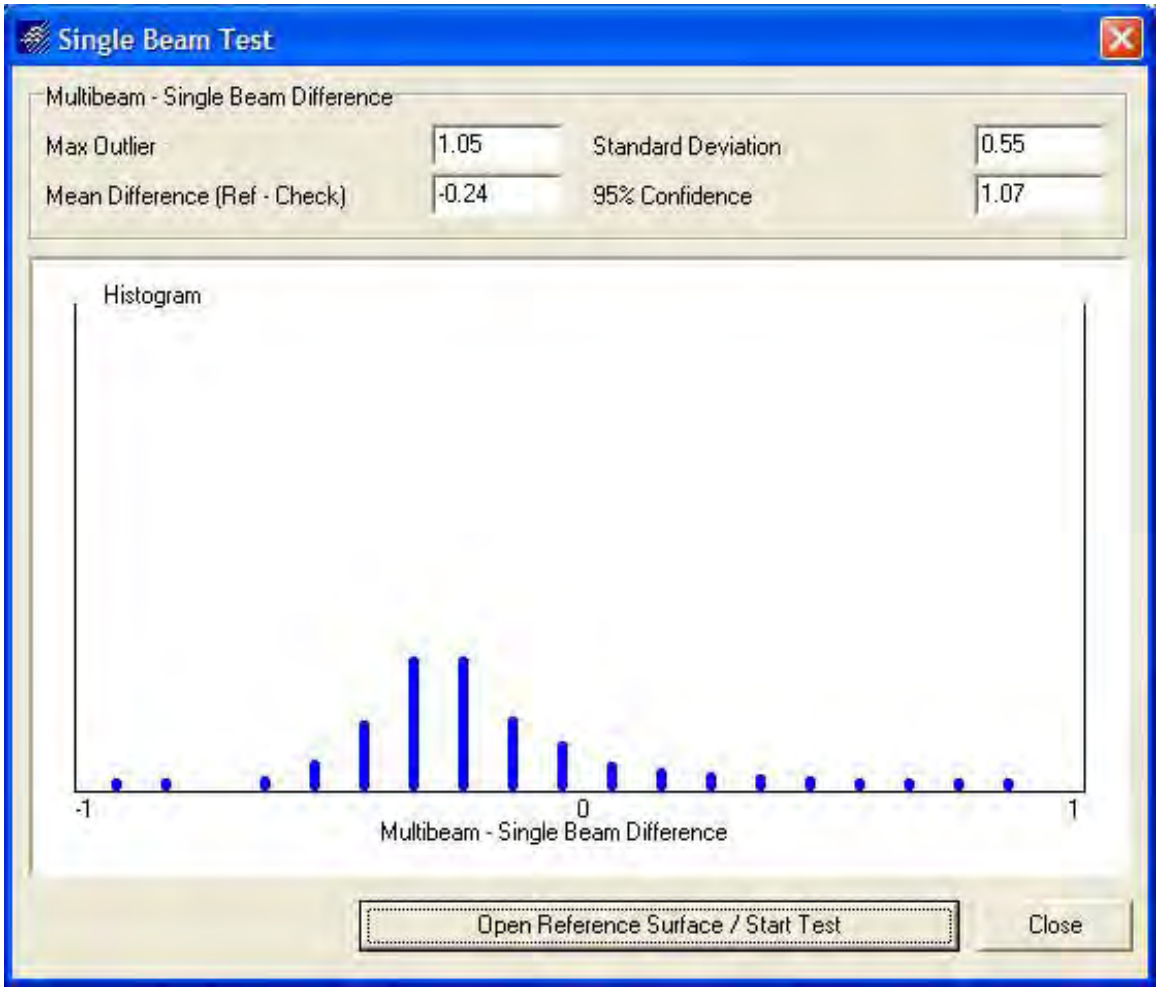
Horizontal Coordinates - NAD83 NJ State Plane (2900) Feet
Vertical Units - Feet
December 5 2008

Roll Correction

Pitch Correction

Yaw Correction

Single beam/Multibeam Reference Surface



Overview of Multibeam Beam Daily Survey Reports
Passaic River, N.J. - River Mile 0 to River Mile 14

The following information is representative of GBA's Daily Surveying Activities in reference to the multi-beam survey of the Passaic River from mile marker 0 to 14

Week of 11/12/2008
The Leica GPS1200, Real-Time Kinematic GPS receiver was shipped to GBA's Baltimore office where survey technicians integrated the unit. The GPS1200 receiver was interfaced with a Verizon CDMA modem allowing the unit to receive real-time corrections generated at the New Jersey Institute of Technology via the internet. The Leica system in turn was integrated with the HYPACK survey package on board the S/V SeaFix.

11/18/2008
Survey team, consisting of party chief Ed DeAngelo, USCG Licensed Vessel Captain William (Hunter) Daisey and Surveyor Jason Stroupe mobilized from Baltimore MD to Carteret, New Jersey (4 hours). Survey Vessel SeaFix is launched and moored at the Elizabeth City Marina. Multibeam Patch Testing was initiated in Newark Bay.

11/19/2008
GBA was joined by Mr. Steve Aubrey from ENSR. The first half of the day spent collecting and processing data to perform the Multibeam/Single Beam QA/QC. In addition the tide board that was used during the 2007 survey was recovered and verified against reference benchmarks set by GBA in August 2007. The height of the RTK tides on the vessel checked against the tide board and calibrated well.

Following all calibration procedures we began survey operations at the mouth of the Passaic River collecting data in sections A01 & A02.

11/20/2008
The survey collected multibeam hydrographic soundings in sections A01, A02, A03, A04, A05, A06, A07, A08. The shoaler channel edges were surveyed during periods of high tide, will the deeper sections near mid channel were surveyed at low tide.

11/21/2008
The survey collected multibeam hydrographic soundings in sections A04, A05, A08, B01, B02, B03. The shoaler channel edges were surveyed during periods of high tide, will the deeper sections near mid channel were surveyed at low tide.

Single-beam data were collect along cross sections 59, 78, 104, 148, 153, 178, 192, 204, 235, 277, 305.

11/22/2008
The survey collected multibeam hydrographic soundings in sections B01, B02, B03, B04, & B05. The shoaler channel edges were surveyed during periods of high tide, will the deeper sections near mid channel were surveyed at low tide.

11/23/2008
The survey collected multibeam hydrographic soundings in sections B04, B05, B06, B07, B08, B09, C01, & C02. The shoaler channel edges were surveyed during periods of high tide, will the deeper sections near mid channel were surveyed at low tide.

11/24/2008
The survey collected multibeam hydrographic soundings in sections C03, C04, C05, C06, C07, C08,. The shoaler channel edges were surveyed during periods of high tide, will the deeper sections near mid channel were surveyed at low tide.

11/25/2008
The survey collected multibeam hydrographic soundings in sections B04, B05, B06, B08, B09, C01, C02, C05, C06, C07, C08, C09, C10, C11, D01, D02, D03, D04, D05. The shoaler channel edges were surveyed during periods of high tide, will the deeper sections near mid channel were surveyed at low tide.

11/26/2008
The Survey Crew and vessel demobilized back to the GBA offices in Baltimore MD for the Thanksgiving Holiday weekend

12/01/2008
Survey team, consisting of party chief Ed DeAngelo, USCG Licensed Vessel Captain Travis Schmidt and Surveyor Jason Stroupe mobilized from Baltimore MD to Carteret, New Jersey (4 hours). Survey Vessel SeaFix is launched at the Elizabeth City Marina. The crew moored the SeaFix at the Project floating dock located near RM 12.

12/02/2008
The survey collected multibeam hydrographic soundings in sections C06, C07, C08, C09, C10, C11, D01, D02,. D03, D04, D05, D06, D07, D08, D09, & E01. The shoaler channel edges were surveyed during periods of high tide, will the deeper sections near mid channel were surveyed at low tide.

12/03/2008
The survey collected multibeam hydrographic soundings in sections D09, E01 E02, E03, F01, F02. The shoaler channel edges were surveyed during periods of high tide, will the deeper sections near mid channel were surveyed at low tide.

12/04/2008
The survey collected multibeam hydrographic soundings in sections F02, F03, F04, G01, G01, G02, G03, G04,. H01, H02, H03, H04, H05, H06, H07, & H08. The shoaler channel

edges were surveyed during periods of high tide, will the deeper sections near mid channel were surveyed at low tide.

12/05/2008
The survey collected multibeam hydrographic soundings in sections H09, H10, H11, & H12. The shoaler channel edges were surveyed during periods of high tide, will the deeper sections near mid channel were surveyed at low tide.

Single-beam data were collect along cross sections 59, 78, 104, 148, 153, 178, 192, 204, 235, 277, 305, 368, and 389. Lines 59, 204, & 305 were surveyed a minimum of five times to provide replicate data for statistically analyses to be conducted by ENSR.

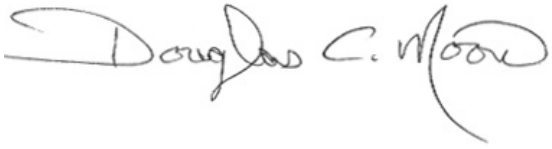
Finally, GBA survey technicians met with Captain Al Modjeski (AECOM). Aboard the ENSR john boat, the survey crew traveled to 8 tide gauge locations along the Lower Passaic River. Nearby reference points with a clear line of site to the GPS satellites were identified while the horizontal & vertical locations were recorded with the Leica GPS 1200 RTK receiver in mobile mode. While GBA survey technicians operated the GPS equipment, Captain Al Modjeski recorded physical location notes for later recovery.

GBA personnel reviewed the previous day's collected data to ensure total coverage and accuracy requirements were met and deemed the multi-beam field data collection portion of this project complete.

Note: Please see attached GBA Daily Multi-beam Survey Logs for the multi-beam data collection portion of the Project, which commenced on November 18, 2008 and concluded on December 5, 2008.

Prepared By:
Edward DeAngelo

Reviewed and Submitted by:
GAHAGAN & BRYANT ASSOCIATES, INC.



Douglas C. Moore, NJPLS/ACSM Certified Hydrographer
Survey Division Manager
Date: February 16, 2009

February 16, 2009

Overview of GBA's Multi-beam Survey Procedures, Equipment and Quality Control and Quality Assurance Procedures utilized, based upon RFP/RFQ generated on March 15, 2007 for Multi-beam and Single Beam Bathymetry Survey of the Lower Passaic River, River Mile 0 to River Mile 14

MULTI-BEAM SURVEY

Multi-Beam Survey Scope of Work

GBA's multi-beam survey was performed to collect detailed bathymetry data that will be used for the development and execution of the RI/FS. GBA clearly understands the specific items of interest and uses of the multi-beam data beyond standard bathymetry mapping, which includes:

- Mapping/visualization of surficial debris
- Identification, mapping and visualization of shoreline structures including failing sheetpiling, bulkheads and slopes
- Identification, mapping and visualization of in water structures including bridge abutments

GBA's surveys and data processing were based upon these understandings. All multi-beam surveys were conducted to meet requirements outlined in the Army Corps of Engineers EM 1110-2-1003, dated January 1, 2002, augmented by the April 2004 update to Chapter 11 – Multi-beam Surveys for "Navigation and Dredging Supports Surveys over Hard Bottom".

Areas to be Surveyed using Multi-beam

The area GBA surveyed with multi-beam extended from approx. 200 feet offshore of the LPRSA project boundary, as shown on figure 1 to the downstream face of the Wallington Avenue Bridge, which basically is from River Mile 0 to River Mile 14. This area was proposed by GBA, based upon water depth and accepted by the client, based upon our proposal and subsequent conversations.

Within the river, GBA made every possible attempt to collect data bank to bank to an elevation of -6.0 NGVD. Issues contributing to the limitation of obtaining -6.0 NGVD at all locations were clearly outlined in our proposal and discussed with Mr. Boye from ENSR during the conduct of our survey. GBA utilized a Reson 8101 SeaBat with a total beam angle of 210 degrees to best meet the aforementioned criteria. Shallow water was a major concern for this project requirement and I believe our field crew handled this issue in a very professional and safe manner, while collecting the best data set possible for the client.

Multi-beam Equipment

The following multi-beam equipment was utilized by GBA during the multi-beam data collection segment of the project:

- The Multi-beam data collection system consisted of a Reson 8101 SeaBat system operating at +/- 240 kHz, with a total beam angle of 210 degrees. Each individual beam angle measures 1.5 degrees X 1.5 degrees. The 8101 was upgraded to include Reson's backscatter and side scan software options. The Reson's 8101 transmitter and receiver (transducer) is permanently mounted on a bow deployable arm, designed by GBA to best suit the shallow draft requirement of this project plus ensure the stability of the transducer.
- The survey vessel Sea Fix is a 25 foot aluminum hulled vessel constructed by Thomas Marine in 1997. It is powered by twin 175 HP outboard motors with a onboard power generating system to operate the survey equipment.
- Primary horizontal and vertical positioning was accomplished by utilizing a Leica Systems GPS 1200 RTK rover/receiver with a CDMA cell phone modem. RTK corrections were obtained via the CDMA modem from a permanent CORS (Continuously Operating Reference System) site located at the New Jersey Institute of Technology (NJIT) in Newark, NJ. See attached specifics on the NJIT site and Station Description for NJI2, which is the NGS control point utilized for the NJIT CORS site. This method of positioning was chosen in lieu of establishing our own transmitting base stations at numerous control points due to the security issue and also it allowed us to spend more time collecting multi-beam data. Primary and secondary survey control from the single beam segment of this project was utilized to check the accuracy and precision of the Leica/CORS System and Station, as referenced in Mr. DeAngelo's survey reports. No additional horizontal or vertical control was established for the multi-beam segment of this project. Please see control information submitted for the single beam survey for further information, if required. The NJIT CORS Station and the Leica 1200 was used for all horizontal and vertical positioning, included water surface elevations/tide.
- An Applanix POSMV 320 with Version 4 upgrade and True Heave Option was utilized as GBA's attitude sensor to obtain heave, pitch, roll and yawl plus provide inertial positioning when loss of the GPS satellite constellation occurred due to line of sight or multipath issues.
- Odom single beam Echotrak Mark II echo sounder operating at +/- 200 kHz
- Applied Micro Systems Smart Sound Velocity Profiler and Pressure sensor system
- Dual PC based computer systems running the most recent versions of Hypack and Hysweep
- All USCG required safety equipment

The abovementioned multi-beam equipment meets or exceeds requirements as outlined in the referenced RFP/RFQ for this project.

Multi-beam data collection and processing
GBA made all efforts to ensure that the multi-beam data collected had 50% overlap (200% bottom coverage). This was the case the majority of the time, but shallow water depths was the limiting factor on some of the survey lines and 200% overlap was not possible in the shallower depths as referenced in GBA's initial proposal and subsequent conversations with Mr. Boye.

Multi-beam survey deliverables
Deliverables from the Multi-beam survey shall include:

1. Report documenting how the survey was performed, what equipment was used, who performed the survey, how data was processed and how QC requirements were met.

A. **Report documenting how the survey was performed**.
The majority of the information in reference to the conduct of the survey is embedded within other portions of GBA's submission. Please see Equipment List, Overview of Multi-beam Daily Survey Reports and Overview of Quality Control and Quality Assurance Procedures.

A brief overview is as follows:
GBA installed the Reson 8101 and Leica GPS 1200 on the Sea Fix at our Baltimore Office on November 12, 13. GBA survey team departed for the Passaic River on November 18th, 2008. Multibeam patch testing and QA/QC test were initiated immediately. Survey lines were established based upon channel coordinates to best obtain 200% bottom coverage.
The multi-beam survey commenced on November 19th and concluded on December 5th.

B. Equipment used: Please see Equipment List

C. **Who performed the survey: Please see below**
The primary field survey team consisted of:
Mr. Edward DeAngelo, Scientist/Survey Manager/Lead Project Surveyor
Please see attached resume for Mr. DeAngelo
Mr. Travis Schmidt, USCG Licensed Vessel Captain
Mr. William Daisey, USCG Licensed Vessel Captain
Mr. Jason Stroupe, Survey Technician
Office data processing personnel:
Mr. Edward DeAngelo, See above
Mr. John Drake, GBA Engineer and CAD Specialist
Ms. Sarah Halpin, GBA Engineer and Multi-beam Processing Specialist
Project Manager: Douglas Moore, PLS – Survey Division Manager

D. **How data was processed and how QC requirements were met**
QC/QA for all GBA survey projects commence immediately upon receipt

of surveying contract. Preliminary QC/QA procedures for the 2008 Passaic River Project were the same used during the 2007 survey. The procedures were provided to all field and office personnel involved with the project on August 22, 2007. These procedures were primary in our ongoing data collection and review process for the project. All procedures outlined in the August 22, 2007 Overview of Quality Control and Quality Assurance Procedures for the Passaic River Multi-beam Survey were followed and performed during the conduct of the survey.

Please see the following pages in reference to our preliminary and ongoing QC/QA efforts.

Please see enclosed onsite calibration and performance tests which include Patch Test Results, Single Beam/Reference Surface QC Test and Beam Angle Test.

AUGUST 22, 2007

OVERVIEW OF QUALITY CONTROL AND QUALITY ASSURANCE PROCEDURES FOR THE PASSAIC RIVER MULTI-BEAM SURVEY

GENERAL INFORMATION

- **ALL MULTI-BEAM SURVEYS SHALL BE CONDUCTED TO MEET OR EXCEED REQUIREMENTS FOR NAVIGATION AND DREDGING SUPPORT SURVEYS FOR HARD BOTTOM MATERIALS AS OUTLINED IN THE CORPS OF ENGINEERS HYDROGRAPHIC SURVEY MANUAL EM 1110-2-1003, DATED JANUARY 1, 2002. THE TWO SPECIFIC CHAPTERS TO BE REFERENCED ARE CHAPTER 3, CORPS ACCURACY STANDARDS, QUALITY CONTROL AND QUALITY ASSURANCE REQUIREMENTS, TABLE 3-1 AND CHAPTER 11, ACOUSTIC MULTIBEAM SURVEY SYSTEMS FOR DEEP DRAFT PROJECTS DATED 1 APRIL 2004. DIGITAL COPIES OF THESE REFERENCES HAVE BEEN PROVIDED. ALL SURVEY TEAM MEMBERS ARE TO REVIEW THE REFERENCED CHAPTERS AND BECOME FAMILIAR WITH THE REQUIREMENTS OF THIS PROJECT.**

- **SPECIFIC COVERAGE AND DEPTH REQUIREMENTS ARE OUTLINED IN THE RFP AND HAVE BEEN PRESENTED TO MR. DEANGELO AND OTHER TEAM MEMBERS. OUR PROPOSAL HAS ALSO BEEN PROVIDED. EACH TEAM MEMBER SHALL BECOME FAMILIAR WITH THE RFP AND OUR PROPOSAL. THE BASIC REQUIREMENT IS 200% COVERAGE AND OBTAINING DEPTHS TO 0 NGVD 29 UTILIZING 90 DEGREE BEAM ANGLES. ON SITE DECISIONS SHALL BE MADE BY THE CHIEF SURVEYOR TO BEST MEET THESE PARAMETERS, WITH THE UNDERSTANDING THAT THE BEAM ANGLE MAY HAVE TO BE OPENED MORE THAN 90 DEGREES AND 200 % COVERAGE MAY NOT BE POSSIBLE IN DEPTHS LESS THAN 15 FEET.**
- **REPORTS SHALL BE GENERATED EVERY OTHER DAY TO OUR PRIMARY CLIENT, ENSR TO INFORM THEM OF OUR SURVEY STATUS.**

- **ALL SAFETY PROCEDURES SHALL BE FOLLOWED ON THIS PROJECT, ESPECIALLY THE WEARING OF PFD'S WHEN ON DECK, DEPARTING THE VESSEL OR PERFORMING ANY OTHER FUNCTIONS OUTSIDE THE MAIN CABIN AREA.**
- **ANY QUESTIONS, PRIOR TO OR DURING THE CONDUCT OF THIS SURVEY, PLEASE CONTACT ME DIRECTLY.**

PROCEDURES TO BE CONDUCTED PRIOR TO DEPARTING BALTIMORE

- **ESTABLISH ACOUSTIC DRAFT OF THE RESON 8101 TRANSDUCER VIA BAR CHECK/PLATE PROCEDURES.**

- **PERFORM INTERNAL CALIBRATION ON THE SOUND VELOCITY PROFILER AS INDICATED IN CHAPTER 11, PAGE 9-31 OF THE CORPS HYDRO MANUAL. THIS CALIBRATION SHALL BE PERFORMED ONCE PRIOR TO THE START OF THE SURVEY AND THEN ONCE A WEEK DURING THE CONDUCT OF THE SURVEY.**

- **ALL DEVICE OFFSETS SHALL BE VERIFIED, AS PER CHAPTER 11, PAGE 11-16, 11-17.**

- **A PATCH TEST SHALL BE PERFORMED AS PER CHAPTER 11, PAGES 11-19 THRU 11-22. RESULTS SHALL MEET REQUIREMENTS OUTLINED IN CHAPTER 11, PAGE 11-41.**

- **QC/QA/PERFORMANCE TESTS, AS INDICATED IN CHAPTER 11, PAGES 11-15 AND 11-25 SHALL BE PERFORMED. TESTS RESULTS SHALL MEET REQUIREMENTS FOR NAVIGATION AND DREDGING SUPPORT SURVEYS – HARD BOTTOM MATERIALS AS INDICATED IN CHAPTER 11, TABLE 11-2, PAGE 11-38 , MAXIMUM OUTLIERS BETWEEN DATA SET COMPARISON POINTS NOT TO EXCEED 1.0 FEET, MAXIMUM ALLOWABLE MEAN BIAS BETWEEN DATA SETS < 0.1 FEET AND DEPTH STANDARD DEVIATION AT 95% CONFIDENCE LEVEL FOR DEPTHS > 15 FEET AND < 40 FEET SHALL BE +/- 1.0 FEET, AS INDICATED IN TABLE 3-1.**

- **ALL QC/QA PROCEDURES SHALL BE CLEARLY DOCUMENTED IN A FORMAT THAT CAN EASILY BE REVIEWED BY GBA PERSONNEL AND SUBMITTED TO OUR CLIENT, IF REQUESTED.**

- **PLEASE REVIEW THE APPLICABLE CHAPTERS IN THE CORPS MANUAL TO ENSURE I HAVE COVERED ALL PRELIMINARY REQUIREMENTS.**

FIELD QC/QA PROCEDURES TO BE CONDUCTED ON SITE

- **PATCH TEST AND QC/QA PERFORMANCE TESTS SHALL BE CONDUCTED ON SITE WITH RTK POSITIONING PRIOR TO THE START OF THE FIELD SURVEYING ACTIVITIES AND ALL CRITERIA MET FOR HARD BOTTOM SURVEYS.**

- **A DAILY LOG SHALL BE KEPT TO CLEARLY DOCUMENT ALL SURVEYING ACTIVITIES AND CLEAR AND CONCISE INFORMATION SHALL BE PROVIDED FOR EACH SURVEY LINE. SURVEY STATUS INFORMATION SHALL BE PROVIDED TO ENSR (DON BOYE) VIA E-MAIL INDICATING OUR PROGRESS AND ANY PROBLEMS WE ARE ENCOUNTERING EVERY OTHER DAY.**

- **DAILY CHECKS SHALL BE PERFORMED TO ENSURE BACKSCATTER DATA IS BEING COLLECTED TO MEET REQUIREMENTS FOR INTENSITY VALUES AND SIDE SCAN IMAGERY RESULTS.**

- **SOUND VELOCITY PROFILER CASTS SHALL BE PERFORMED AT A MINIMUM OF 3 TIMES DURING THE COURSE OF THE SURVEY DAY OR AT ADDITIONAL TIMES DUE TO FIELD CONDITIONS. INTERNAL CALIBRATION CHECKS SHALL BE PERFORMED ON THE SVP ON A WEEKLY BASIS.**

- **HORIZONTAL AND VERTICAL POSITIONING CHECKS SHALL BE PERFORMED AT A MINIMUM OF TWICE PER DAY. ASSUME THESE CHECKS SHALL BE PERFORMED VIA A ROVING SHORE BASED GPS SYSTEM WITH CONTROLLER.**

- **PLEASE REVIEW CORPS REQUIREMENTS TO ENSURE I COVERED ALL DAILY SURVEY REQUIREMENTS.**

- **ALL QC/QA PROCEUDRES SHALL BE CLEARLY DOCUMENTED IN A FORMAT THAT CAN BE EASILY REVIEWED BY GBA PERSONNEL AND SUBMITTED TO ENSR IF REQUESTED.**

- **DATA PROCESSING AND REVIEW PROCEDURES SHALL BE DISCUSSED AT A LATER DATE.**

Additional Field QC/QA Procedures
On a ongoing basis, during or immediately following the conduct of the multi-beam field data collection efforts, the Lead Surveyor on site evaluated the quality of the collected data based upon coverage, overlap, minimum elevation obtained, comparison of depths on overlapping swaths, data gaps, positioning accuracy, comparison of water surface readings (set tide gauges versus RTK GPS) and made immediate onsite decisions as to the accuracy and validity of data and discern if any areas needed to be re-surveyed.

Overview of Office Processing Procedures
The initial processing of the multi-beam data was performed on site, by Mr. DeAngelo to ensure that all accuracy and coverage issues were satisfied. The multi-beam data was then transferred to GBA's Baltimore and Houston Offices for final processing. We utilized the personnel at these offices due to the fact that they are very familiar with multi-beam data collection and post processing and also in order to meet our projected delivery schedule for the multi-beam data.
The raw data was reviewed for obvious outliers and then processed through all phases with Hysweep software. Overlapping swaths were reviewed and compared for coverage, depth repeatability, accuracy and gaps. Field QC processes were reviewed and tide readings compared and applied to the raw data. GBA's initial single beam surveys from River Mile .5 to River Mile 8.2 were overlaid with the multi-beam data to ensure accuracy of the data sets. Once the multi-beam data was edited and verified it was formulated into final products, such as contours and binned data.

Additional analyses were performed with the multibeam dataset. The data from both 2007 and 2008 were binned to 5' x 5'matrices saving one average depth value per bin. The gridded data from both surveys were compared to each to determine

Multi-beam survey deliverables (Continued)

2. All raw data in electronic format for potential future use.
   See digital data on included USB external hard drive

3. Processed Multi-beam data in electronic format (ASCII X,Y,Z) in the project's datum's (NAD 83 New Jersey State Plane Coordinates Feet) (NGVD29) for:
   a. Full density shot (after processing)
   b. Binned to 1' x 1' bin with one value per bin using shot depth closest to cell center.
   c. Binned to 3' x 3' bin with one value per bin using shot depth closest to cell center.
   d. Binned to 5' x 5' bin with one value per bin using average depth for comparison with 2007 multibeam data.

   See digital data on included USB external hard drive
4. Bathymetry contours at 0.5' (changed from 1.0' on original RFP/RFQ as per my conversations with Mr. Boye) in hard copy (1" = 200' scale) and in digital AutoCAD compatible format in the project's datum.

5. Bathymetric Delta contours at 0.5’ intervals in hard copy (1” = 200’ scale) and in digital AutoCAD compatible format in the project’s datum.

See digital data on included USB external hard drive and enclosed hard copy drawings.

6. Acoustic backscatter data.

See digital data on included USB external hard drive.

7. Navigational data showing tracklines (electronic format)

See digital data on included USB external hard drive.

8. Water surface elevation data used to process data (electronic format)

See digital data on included USB external hard drive.

Overview of GBA's Single Beam Survey Procedures, including Quality Control and Quality Assurance Procedures Utilized, based upon RFP/RFQ generated in September 2008 for Multi-beam and Single Beam Bathymetry Survey of the Lower Passaic River

Single Beam Survey Scope of Work

The single beam survey was performed to duplicate the methods and equipment that has been used for previous surveys of the river so that comparisons can be made between the previous surveys and GBA's survey.

Thirteen individual cross-sections surveyed during the 2007 project were identified in the September 2008 Quality Assurance Plan, Lower Passaic River Restoration Project. GBA used the same HYPACK Line file used during the 2007 survey. Three randomly chosen transects were run a minimum of 5 times to provide data for further statistcal analyses to be performed by ENSR. Profiles were overlaid on our base map and compared to the existing lines to ensure the lines GBA was to survey exactly matched the provided lines

Equipment - See Equipment list provided in Multibeam Survey Section.

Quality Control and Quality Assurance Procedures

D. Field Procedures

GBA field crews and processing individuals followed all criteria outlined in the Army Corps of Engineers EM 1110-2-1003, "Hydrographic Surveying", dated 1 January 2002 to meet the requirements for Navigation and Dredging Support over Soft Bottom. *Note: Multi-beam surveys were conducted to meet the criteria for Navigation and Dredging Support Surveys over hard bottom. The Corps Manual does not suggest single beam surveys for hard bottom material surveys, nor do they provide single beam standards for hard bottom material surveys.

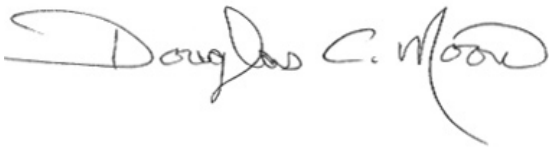
E. Processing/Office Procedures

Our office processing procedures included all requirements outlined in the Corps Hydrographic Survey Manual. We reviewed all the raw data field to ensure the validity of the depth and position data, checked speed of sound settings and bar check information, overlaid previous 2007 survey data obtained GBA, and compared it to the current data, checked horizontal and vertical positioning checks, compared digital data to the sounding record chart, applied tidal corrections, checked and ensured proper latency values were applied. All data was reviewed and compiled in Hypack and GBA's software program ODP

F. Deliverables for Single Beam Survey

1. **All raw data in electronic format.**
2. **Processed bathymetry data in electronic format (ASCII X,Y,Z) in project datums.**
3. **Cross Section plots of 13 transects in AutoCad format overlaid with cross-sectional data from the August 2007 singlebeam survey .**
4. **Water surface elevation data used in processing of data (electronic format)**

Prepared and Submitted By:
GAHAGAN & BRYANT ASSOCIATES, INC.



Douglas C. Moore, NJPLS/ACSM Certified Hydrographer
Survey Division Manager