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Atlantic Intracoastal Waterway (AIWW) Sediment sampling & analysis

→ FSBPA 35th National Conference on Beach Preservation Technology
Feb 03, 2022

Welcome

> Agenda

- **Background**
  - Introduction to project team
- **Field Activities**
  - Scope and objective
  - Spatial extent and sample locations
  - Equipment and methods
- **Post-Sampling Analysis**
  - Geological inspection and core logging
  - Chemical analysis
  - Geotechnical analysis of physical samples
- **Application**
  - Altamaha Sound Bird Island
  - Future dredging cycles

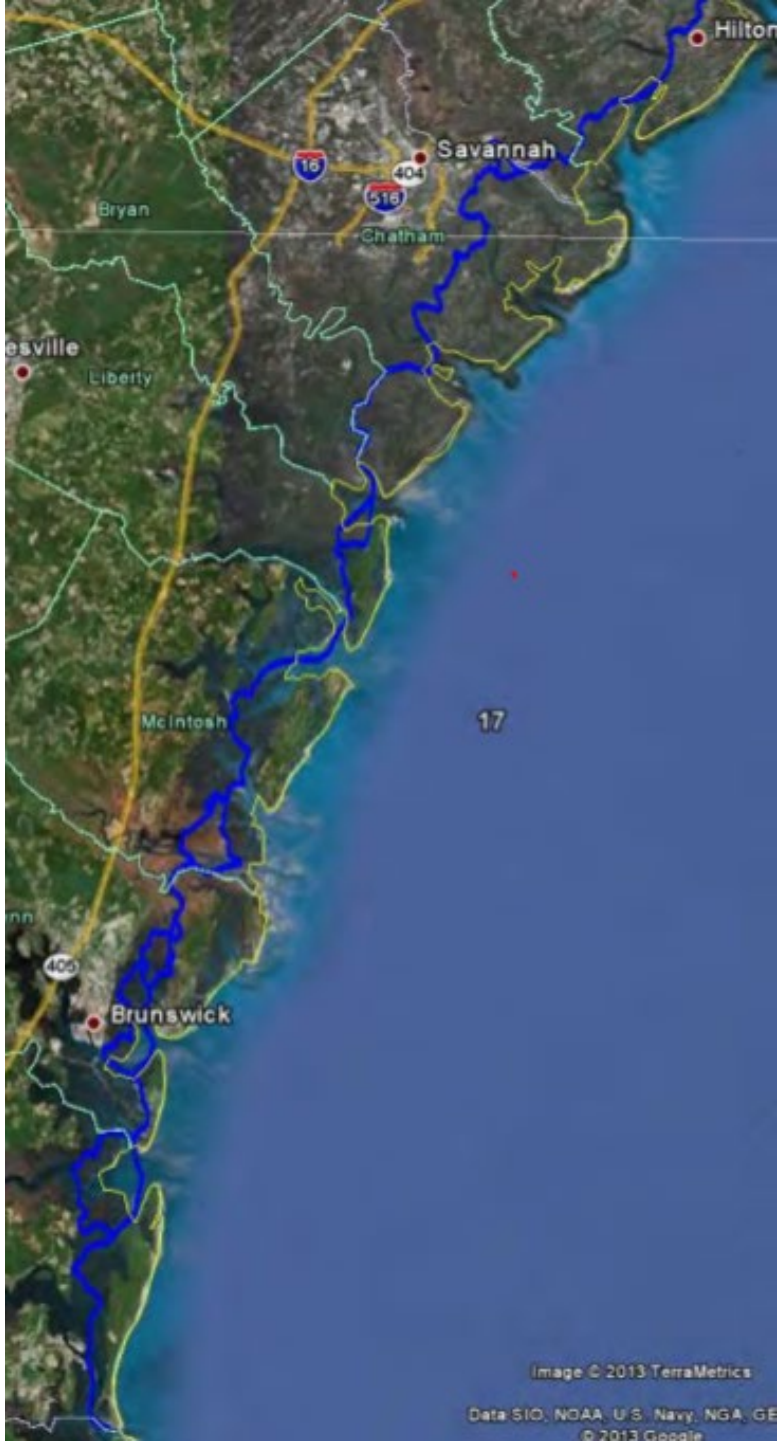
AIWW and USACE Responsibility

Savannah District:

- 161 miles of shallow draft channel from Port Royal Sound, SC to Cumberland Sound, GA
- Authorized depth is -12 ft MLLW
- Commercial and recreational benefits
- Required to monitor and maintain depth

Recent AIWW maintenance dredging:

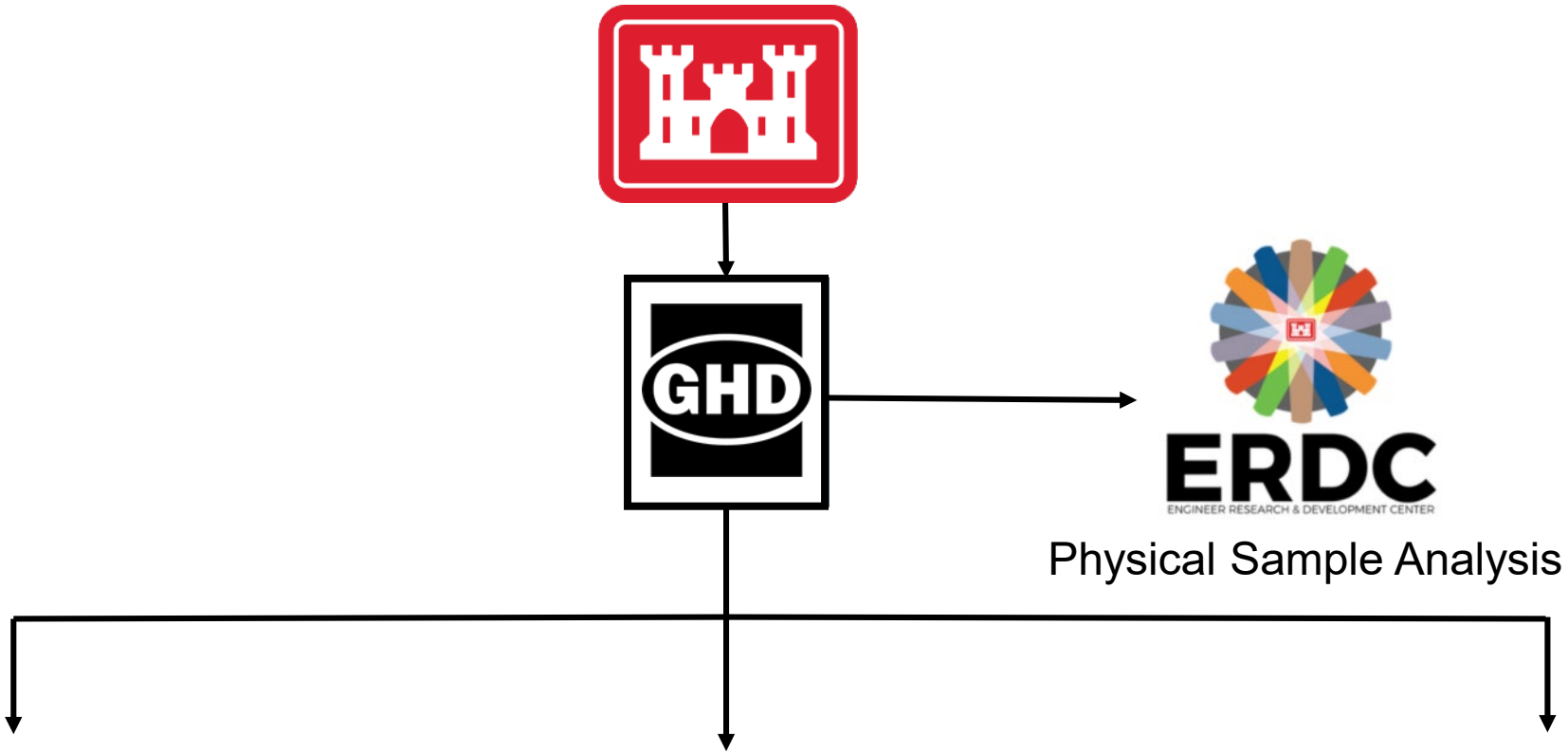
- FY 2010 – Florida Passage, Buttermilk and Altamaha Sounds, and Fields Cut
- FY 2019 – Jekyll Creek, Buttermilk Sound, Hell Gate, Fields Cut. Included a successful beneficial reuse pilot project in Jekyll Creek
- FY 2021 – Elba Cut and Altamaha Sound



Scope and Objective

- Objective
  - Inform the development of a Dredge Material Management Plan (DMMP) - future maintenance dredging and beneficial reuse
- Scope of Effort
  - Sediment capture via vibracore
    - 10-ft cores with at least 80% recovery (8-ft) OR best core out of 3 attempts
    - 5-gallon bucket physical sample
  - Geological investigation and reporting
  - Chemical analysis of a subset of collected samples

Project Team



Physical Sample Analysis

Vibracore Services

Onsite Safety Personnel

Chemical Sample Handling

Geological Logging

Chemical Sample Analysis

Project team

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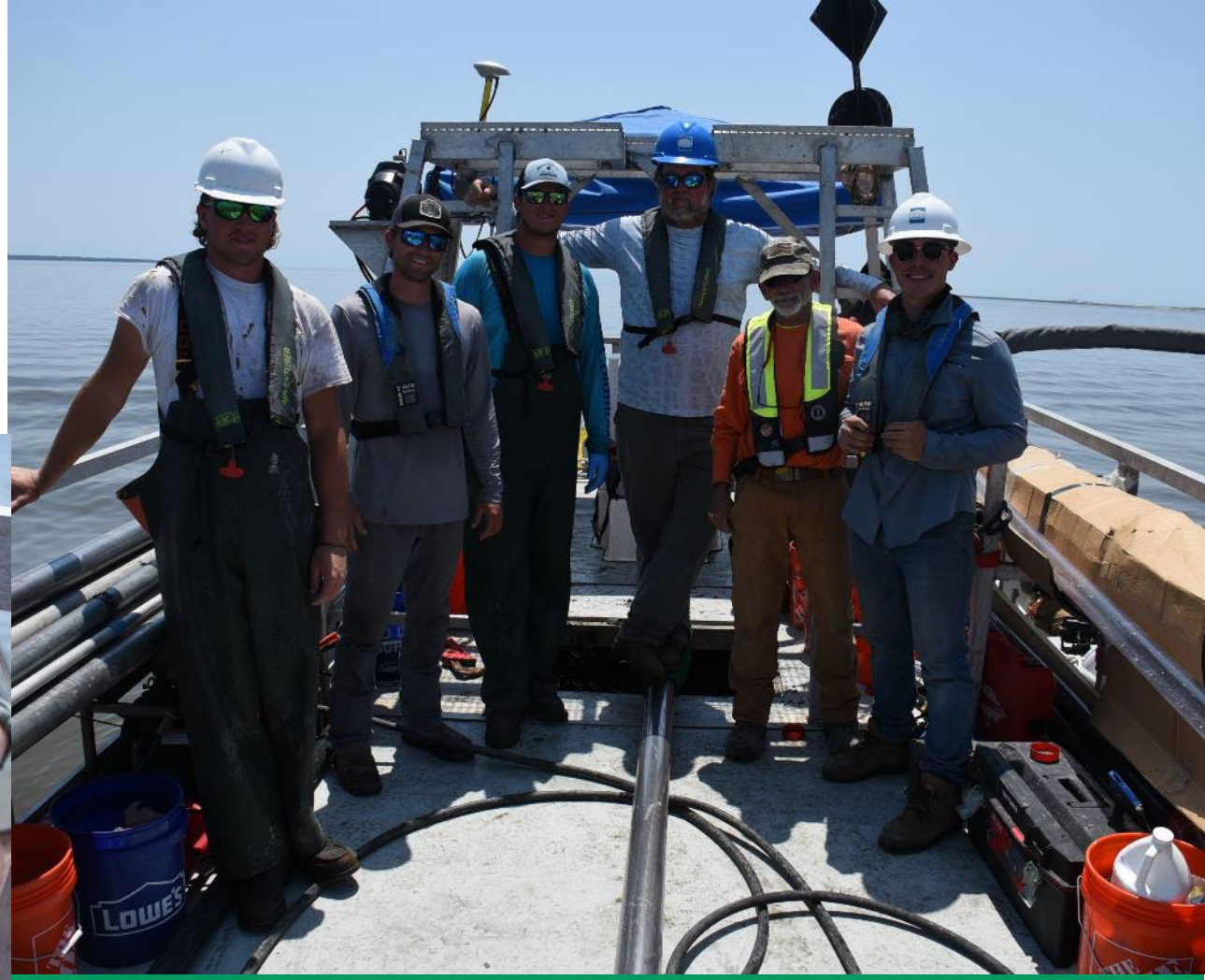
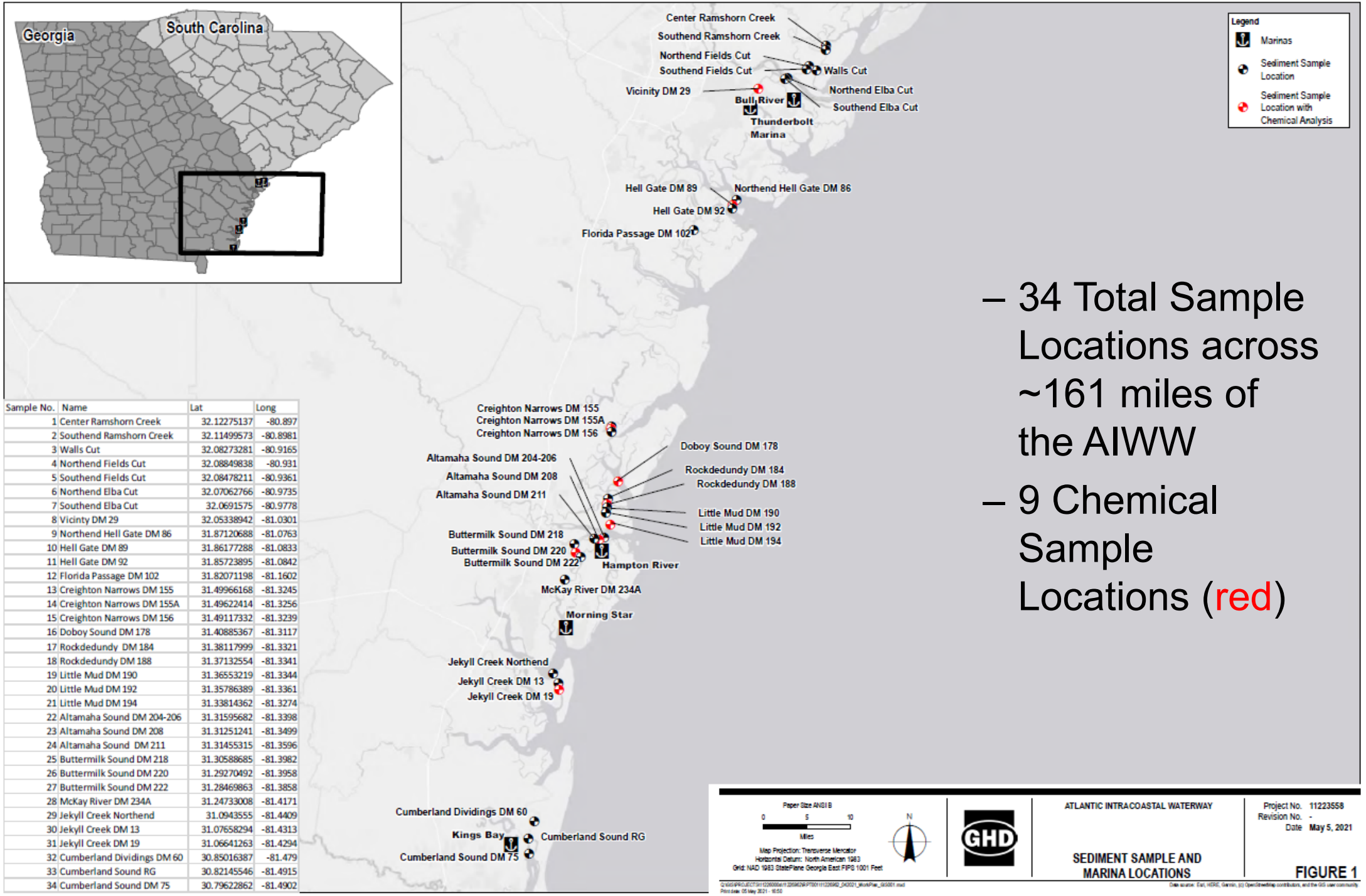
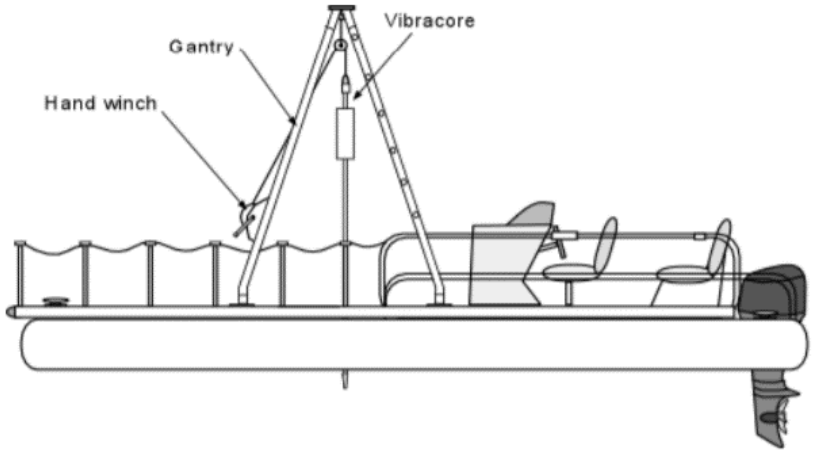


Spatial Extent & Sample Locations



Sample No.	Name	Lat	Long
1	Center Ramshorn Creek	32.12275137	-80.897
2	Southend Ramshorn Creek	32.11499573	-80.8981
3	Walls Cut	32.08273281	-80.9165
4	Northend Fields Cut	32.08849838	-80.931
5	Southend Fields Cut	32.08478211	-80.9361
6	Northend Elba Cut	32.07062766	-80.9735
7	Southend Elba Cut	32.0691575	-80.9778
8	Vicinty DM 29	32.05338942	-81.0301
9	Northend Hell Gate DM 86	31.87120688	-81.0763
10	Hell Gate DM 89	31.86177288	-81.0833
11	Hell Gate DM 92	31.85723895	-81.0842
12	Florida Passage DM 102	31.82071198	-81.1602
13	Creighton Narrows DM 155	31.49966168	-81.3245
14	Creighton Narrows DM 155A	31.49622414	-81.3256
15	Creighton Narrows DM 156	31.49117332	-81.3239
16	Doboy Sound DM 178	31.40885367	-81.3117
17	Rockdedundy DM 184	31.38117999	-81.3321
18	Rockdedundy DM 188	31.37132554	-81.3341
19	Little Mud DM 190	31.36553219	-81.3344
20	Little Mud DM 192	31.35786389	-81.3361
21	Little Mud DM 194	31.33814362	-81.3274
22	Altamaha Sound DM 204-206	31.31595682	-81.3398
23	Altamaha Sound DM 208	31.31251241	-81.3499
24	Altamaha Sound DM 211	31.31455315	-81.3596
25	Buttermilk Sound DM 218	31.30588685	-81.3982
26	Buttermilk Sound DM 220	31.29270492	-81.3958
27	Buttermilk Sound DM 222	31.28469863	-81.3858
28	McKay River DM 234A	31.24733008	-81.4171
29	Jekyll Creek Northend	31.0943555	-81.4409
30	Jekyll Creek DM 13	31.07658294	-81.4313
31	Jekyll Creek DM 19	31.06641263	-81.4294
32	Cumberland Dividings DM 60	30.85016387	-81.479
33	Cumberland Sound RG	30.82145546	-81.4915
34	Cumberland Sound DM 75	30.79622862	-81.4902

- 34 Total Sample Locations across ~161 miles of the AIWW
- 9 Chemical Sample Locations (red)



Equipment and Methods

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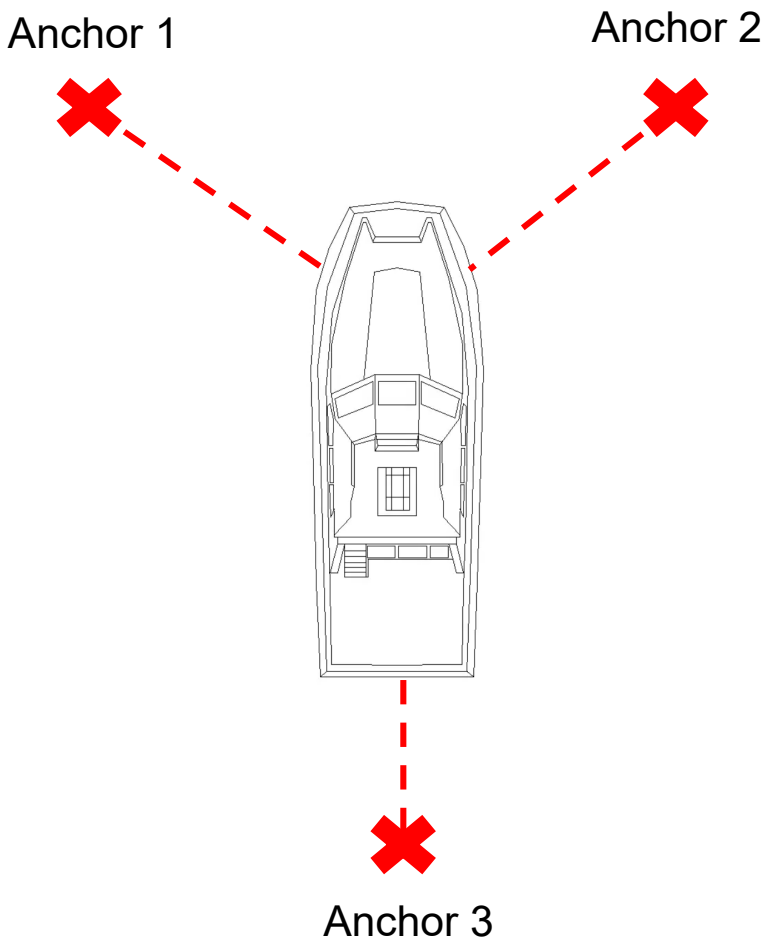
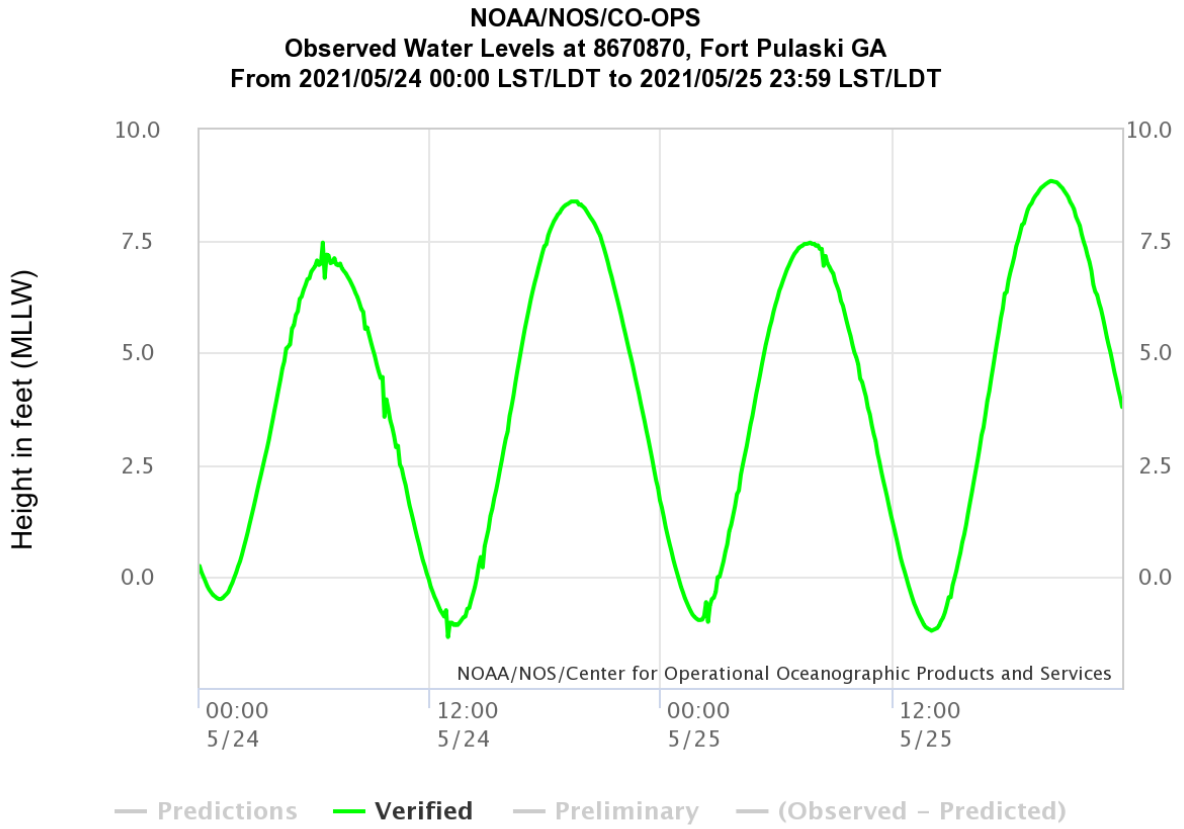
Equipment and Methods



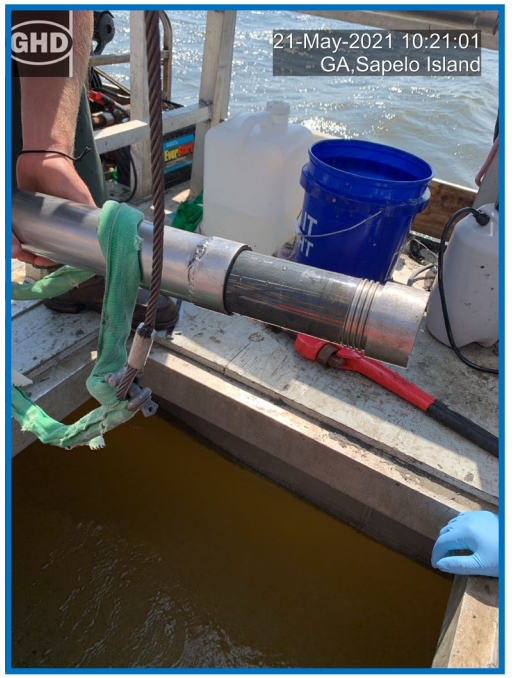


- Large tidal range along coastal GA = strong currents
- 3-point anchor system for station keeping
- Average positional offset from provided sample coordinate <6ft

Equipment and Methods

Liner Used (Vibracore)

No Liner (Physical Sample)



Equipment and Methods – Chemical samples

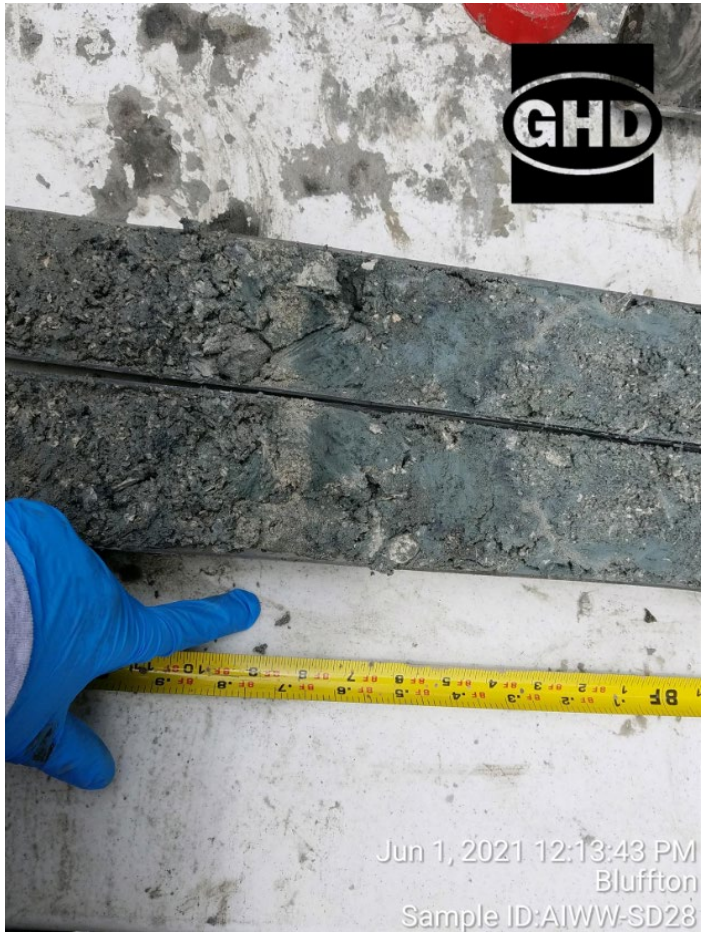
Decontamination of Equipment

Sediments extruded into clean bucket liner

Samples jarred and labelled appropriately

Post-Sampling - Geological Investigation and Logging

- Cores split longitudinally and characteristics inspected
- Typical items of interest may include:
  - Debris
  - Shell/wood
  - Evidence of contamination
  - Depth layering



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BORING NUMBER SD28
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CLIENT USACE Savannah District
PROJECT NAME AIWW Vibracores W912HN21F2011
PROJECT NUMBER 11226962 - Atlantic Intercoastal Waterway (AIWW)
PROJECT LOCATION AIWW-Coastal Georgia
DATE STARTED 5/20/21 COMPLETED 5/20/21
GROUND ELEVATION 0 ft HOLE SIZE n/a
DRILLING CONTRACTOR Athena Technologies, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Vibracore
AT TIME OF DRILLING --
DRILLER n/a LOGGED BY M. Casey
AT END OF DRILLING --
NOTES Location: #28 McKay River DM 234A. Depth of water: 12.6 ft
AFTER DRILLING --

DEPTH FROM MUDLINE, (ft)	ELEV (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	REMARKS
0.0	0.0		Alternating dark gray silty to clayey SAND (SP-SC/SM) to grayish-brown fine SAND to slightly silty fine SAND (SP/SP-SM) (heterolithic deposits) With some wood			Vertical elevation is referenced to the mudline. Horizontal coordinates (GA East 1001 State Plane): EASTING (X): 890389.75 NORTHING (Y): 454432.42 Start time: 0900 hrs
2.5	-2.5		With some wood			
	-4.7		Greenish-gray sandy CLAY (CL)			
5.0	-5.0					
	-5.5		Dark gray sandy CLAY (CL)	VC	98	
	-6.4		Pale green to green and greenish-gray, sandy CLAY (CL) with some to abundant shell and CLAY seams increasing shell content with depth			
7.5	-7.5					
	-9.6		Dark greenish-gray silty CLAY with dark gray SAND seam (SP-SC) (heterolithic deposit)			End time: 0910 hrs Approx. penetration depth: 11 ft
10.0	-10.0					

Bottom of borehole at 11.0 feet.

DRAFT

ENVIRONMENTAL BASIC VIBRACORE - GINT STD US.GDT - 6/16/21 16:14 - C:\USERS\PHILWM\FILES\MISC\WORK\AIWW\VIBRACORES\AIWW LOGS.GPJ

Post-Sampling - Chemical Analysis

- Nine chemical samples
- Samples were analyzed for:
  - Metals
  - Polychlorinated Biphenyls (PCB)
  - Organochlorine Pesticides
  - Polyaromatic Hydrocarbons (PAH)
- Exceedance of Groundwater SSL thresholds for metal content, one exceedance for PCB's
- One ESV exceedance for arsenic – naturally occurring, common for marine sediments in the southeast

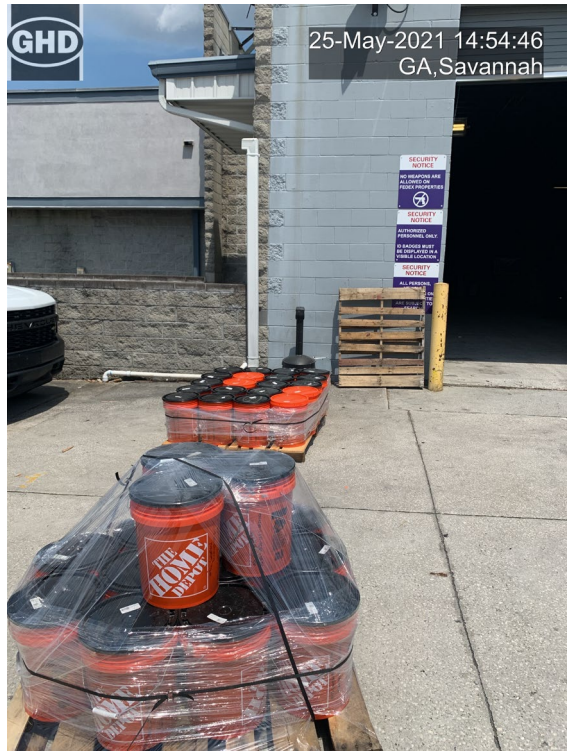
Parameters	ESVs for Marine Sediment (a)	EPA RSLs for Protection of GW SSLs (b)	Units	SD8	SD10	SD14	SD16	SD18	SD21	SD23	SD26	SD31
				05/23/21	05/24/21	05/22/21	05/21/21	05/21/21	05/21/21	05/20/21	05/20/21	05/19/21
Aluminum	--	3000	mg/kg	14000[b]	14000[b]	23000[b]	3100[b]	4400[b]	23000[b]	600	15000[b]	25000[b]
Antimony	2	0.27	mg/kg	0.075 J	0.068 J	0.098 J	0.13 U	0.14 U	0.13 J	0.12 U	0.068 J	0.12 J
Arsenic	7.24	0.29	mg/kg	6.5[b]	11[ab]	14[ab]	2.2[b]	3.2[b]	13[ab]	0.93[b]	4.7[b]	18[ab]
Barium	--	82	mg/kg	20	20	30	5.3	6.3	38	4.4	27	31
Beryllium	--	3.2	mg/kg	0.55	0.83	1.2	0.21	0.27	1.3	0.066	0.56	1.4
Cadmium	0.68	0.38	mg/kg	0.087	0.080 J	0.10 J	0.048 J	0.018 J	0.14	0.059 U	0.025 J	0.14 J
Chromium	52.3	180000	mg/kg	33	27	37	5.6	7.1	34	1.9	13	43
Cobalt	--	0.027	mg/kg	3.2[b]	4.3[b]	6.0[b]	0.86[b]	1.5[b]	8.1[b]	0.58[b]	4.1[b]	6.6[b]
Copper	18.7	46	mg/kg	9.7	5.9	9.2	1.0	1.9	11	0.26	7.1	12
Iron	--	35	mg/kg	15000[b]	17000[b]	24000[b]	3800[b]	5600[b]	24000[b]	1600[b]	13000[b]	27000[b]
Lead	30.2	14	mg/kg	14	12	17[b]	2.5	3.2	17b	0.72	8.1	20b
Lithium	--	1.2	mg/kg	19[b]	24[b]	38[b]	4.5[b]	6.8[b]	34[b]	0.94	18[b]	41[b]
Manganese	--	2.8	mg/kg	130[b]	330[b]	260[b]	37[b]	72[b]	640[b]	23[b]	370[b]	590[b]
Mercury	0.13	0.1	mg/kg	0.042	0.044	0.045 J	0.019 U	0.020 U	0.063	0.018 U	0.018 J	0.097
Nickel	15.9	2.6	mg/kg	6.3[b]	7.5[b]	11[b]	1.4	2.1	11[b]	0.58	5.9[b]	13[b]
Selenium	--	0.26	mg/kg	0.25 J	0.39 J[b]	0.50 J[b]	0.32 U	0.11 J	0.57 J[b]	0.29 U	0.19 J	0.65 J[b]
Silver	0.73	0.08	mg/kg	0.057 J	0.037 J	0.045 J	0.063 U	0.068 U	0.073 J	0.059 U	0.073 U	0.066 J
Thallium	--	0.14	mg/kg	0.13	0.14	0.21[b]	0.046 J	0.068 U	0.21[b]	0.059 U	0.15[b]	0.22[b]
Vanadium	--	8.6	mg/kg	52[b]	36[b]	49[b]	6.9	11[b]	56[b]	2.0	28[b]	61[b]
Zinc	124	37	mg/kg	35	33	47[b]	7.5	11	66[b]	3.0	22	63[b]

Chemical analysis - Metals

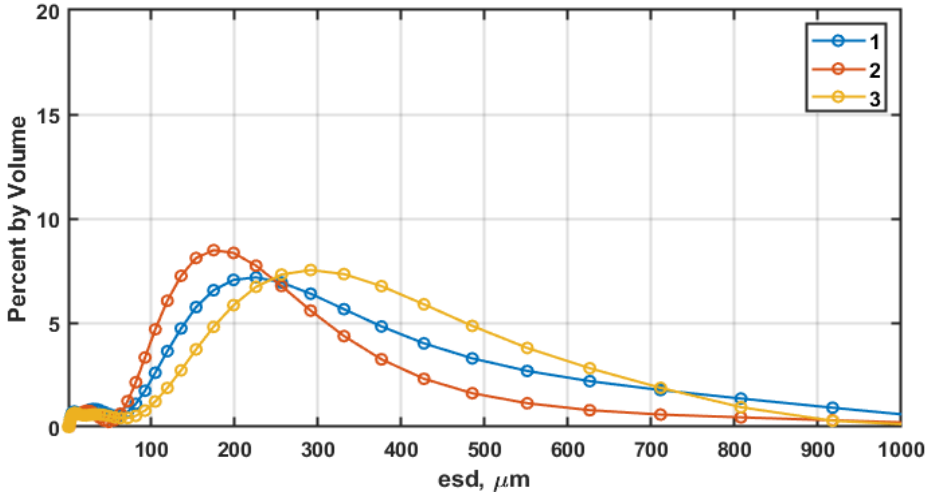
Parameters	ESVs for Marine Sediment (a)	EPA RSLs for Protection of GW SSLs (b)	Units	SD8	SD10	SD14	SD16	SD18	SD21	SD23	SD26	SD31
				05/23/21	05/24/21	05/22/21	05/21/21	05/21/21	05/21/21	05/20/21	05/20/21	05/19/21
Aroclor-1016 (PCB-1016)	--	0.013	mg/kg	0.00059 U	0.0011 U	0.0012 U	0.00054 U	0.00058 U	0.0011 U	0.00050 U	0.00061 U	0.0013 U
Aroclor-1221 (PCB-1221)	--	0.00008	mg/kg	0.00059 U	0.0011 U	0.0012 U	0.00054 U	0.00058 U	0.0011 U	0.00050 U	0.00061 U	0.0013 U
Aroclor-1232 (PCB-1232)	--	0.00008	mg/kg	0.00059 U	0.0011 U	0.0012 U	0.00054 U	0.00058 U	0.0011 U	0.00050 U	0.00061 U	0.0013 U
Aroclor-1242 (PCB-1242)	--	0.0012	mg/kg	0.00059 U	0.0011 U	0.0012 U	0.00054 U	0.00058 U	0.0011 U	0.00050 U	0.00061 U	0.0013 U
Aroclor-1248 (PCB-1248)	--	0.0012	mg/kg	0.0036[b]	0.0011 U	0.0012 U	0.00054 U	0.00058 U	0.0011 U	0.00050 U	0.00061 U	0.0013 U
Aroclor-1254 (PCB-1254)	--	0.002	mg/kg	0.00059 U	0.0011 U	0.0012 U	0.00054 U	0.00058 U	0.0011 U	0.00050 U	0.00061 U	0.0013 U
Aroclor-1260 (PCB-1260)	--	0.0055	mg/kg	0.00059 U	0.0011 U	0.0012 U	0.00054 U	0.00058 U	0.0011 U	0.00050 U	0.00061 U	0.0013 U

Chemical analysis - PCBs

Post-Sampling – Physical Analysis



- All 34 physical sediment samples were shipped to ERDC in Vicksburg, MS
- Samples were analyzed for:
  - Plasticity index
  - Organic content
  - Water content and bulk density
  - Grain size
- Results included in final GHD report

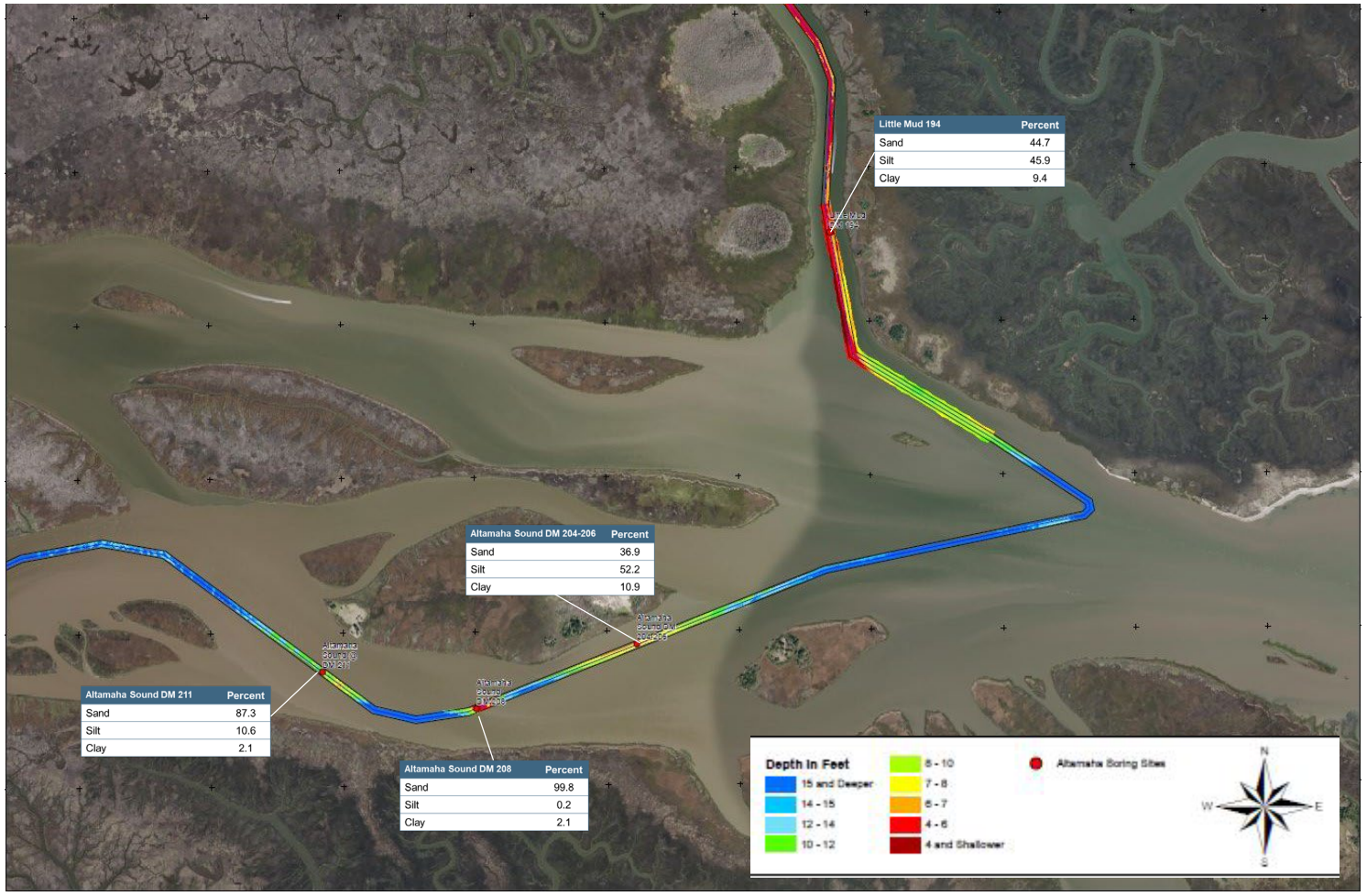


Summary

- 34 vibracores, 34 physical samples, and 9 chemical samples collected along 161 miles of the AIWW
- Significant spatial variability of the sediments
- Several locations >98% sand content, low organics, suitable median grain size →
  - potential beach nourishment reuse
- Multiple locations contained pluff mud (fine-grained, high organics)
  - potential reuse via thin layer placement, bird island construction

Video – AIWW Vibracoring

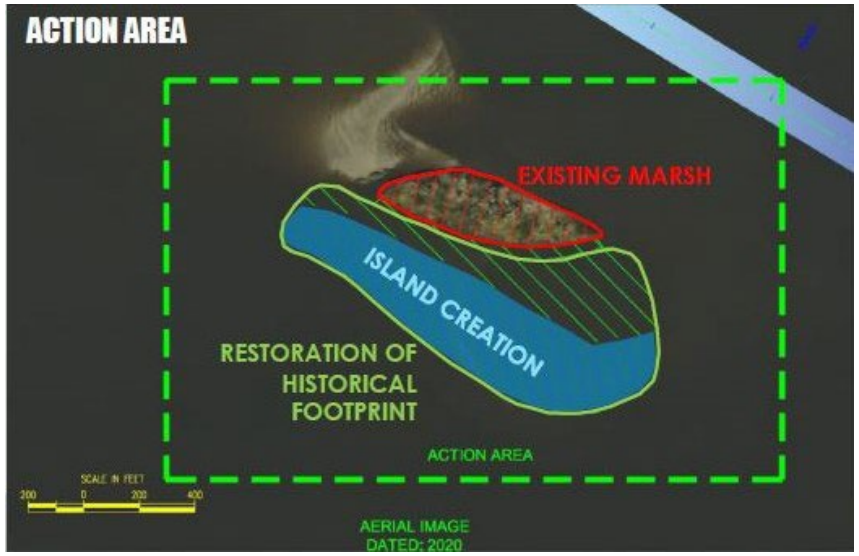
Application



Altamaha Sound Open Water Placement

Shorebird Nesting Habitat

- Open water, unconfined placement creating 13.2 acre nesting habitat
- Existing tidal mudflat in shallow water
- Recent hurricanes have reduced offshore bars



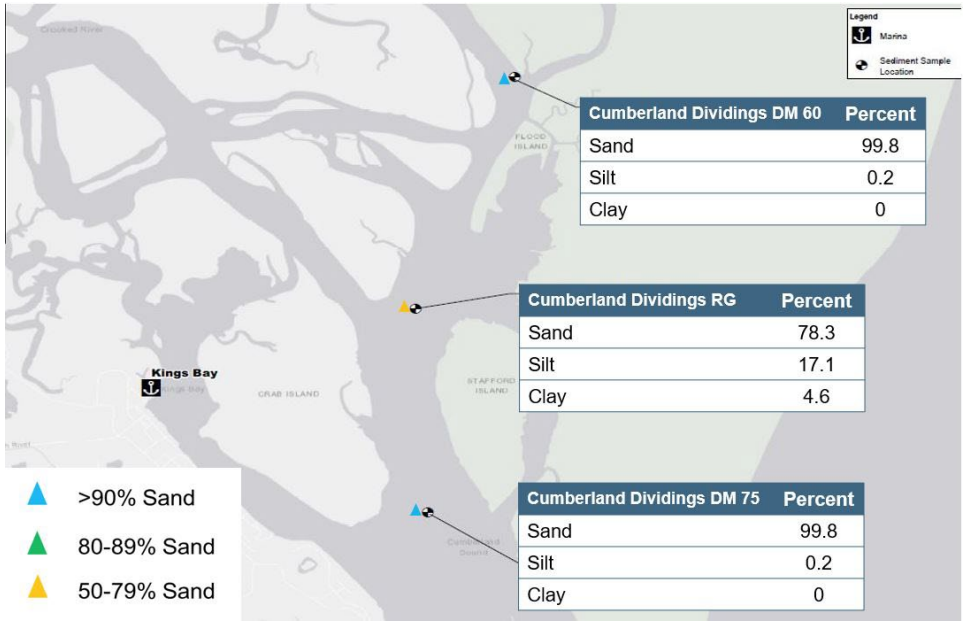
Sediment Behavior

- Formation of mud aggregates during dredging and placement
- Sediment is less likely to be dispersed throughout the system
- Increases feasibility to use sediment in island construction projects

Future Dredging Cycles

- Beneficial Use opportunities at Cumberland Sound
  - National Park Service uses dredged material to maintain roads

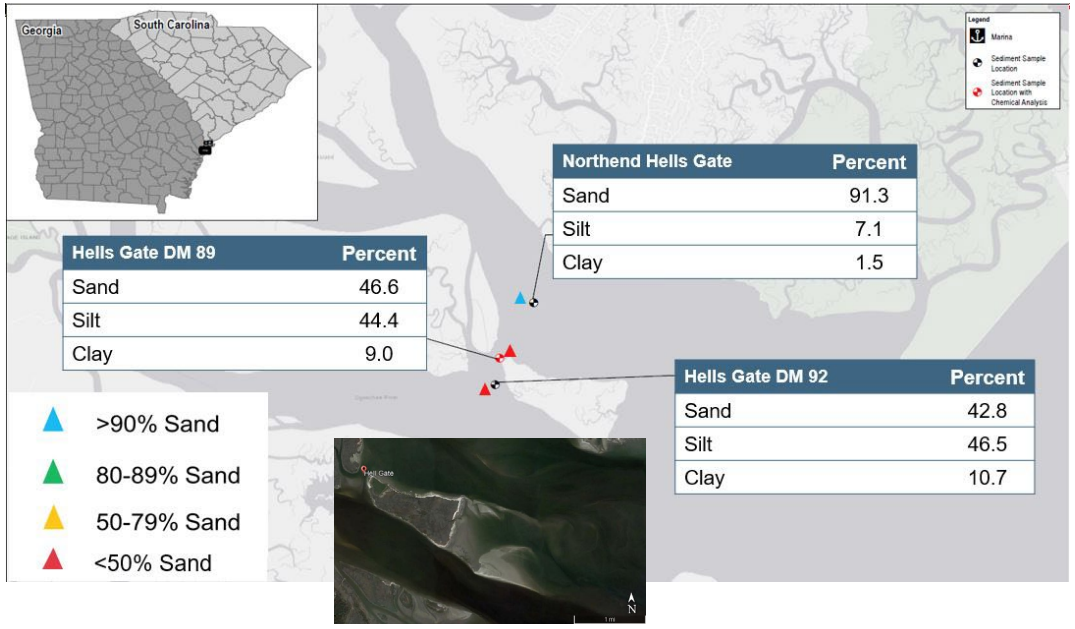
- Potential Open Water Placement Site at Hell's Gate



Cumberland Dividings DM 60	Percent
Sand	99.8
Silt	0.2
Clay	0

Cumberland Dividings RG	Percent
Sand	78.3
Silt	17.1
Clay	4.6

Cumberland Dividings DM 75	Percent
Sand	99.8
Silt	0.2
Clay	0



Northend Hells Gate	Percent
Sand	91.3
Silt	7.1
Clay	1.5

Hells Gate DM 89	Percent
Sand	46.6
Silt	44.4
Clay	9.0

Hells Gate DM 92	Percent
Sand	42.8
Silt	46.5
Clay	10.7

Video – Altamaha Bird Island

Thank you